

WORLD POPULATION CONFERENCE, 1965

Volume I: SUMMARY REPORT

UNITED NATIONS



Department of Economic and Social Affairs

PROCEEDINGS OF THE WORLD POPULATION CONFERENCE

Belgrade, 30 August-10 September 1965

Volume I: SUMMARY REPORT

**UNITED NATIONS
New York, 1966**

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PREFACE

The *Proceedings of the World Population Conference, 1965*, are published in four volumes, arranged as follows:

VOLUME I

Summary report

Organization of the Conference

Programme of meetings

Summary report of meetings

Officers of the Conference and members of committees

List of participants and observers

VOLUME II

Selected papers and summaries of the papers for meetings

A.4. Future population trends and prospects

A.1. Fertility

B.1. Factors and patterns of fertility in areas where fertility is relatively high

B.2. Factors and patterns of fertility in areas where fertility is relatively low

B.13. Studies relevant to family planning

A.2. Mortality

B.3. Mortality, morbidity and causes of death

B.12. Population genetics

VOLUME III

Selected papers and summaries of the papers for meetings

B.4. Projections of population size and age-sex structure

B.5. Projections of urban and rural population, economically active population, households and families

B.6. Methods of obtaining basic demographic measures where data are lacking or defective

B.7. New developments in measurement and analysis of factors of population growth and structure

B.8. Promotion of demographic research and training in developing countries

B.10. Population and natural resources

A.7. Demographic aspects of agricultural development and food supply

VOLUME IV

Selected papers and summaries of the papers for meetings

- A.9. Demographic aspects of savings, investments, technological development and industrialization
- A.10. Demographic aspects of economic growth
- A.6. Demographic aspects of educational development
- B.9. International migration as related to economic and demographic problems of developing countries
- A.5. Demographic aspects of labour supply and employment
- B.11. Definition and measurement of economically active population, employment, unemployment and underemployment
- A.8. Demographic aspects of urban development and housing
- A.3. Internal migration, with special reference to rural-urban movements

All papers contributed by authors invited by the organizers for their meetings and a few selected volunteered papers are published in the alphabetical order of their authors within each meeting. Only summaries of the other volunteered papers contributed by participants are included in the *Proceedings*.

In addition, twenty-six background papers were prepared to summarize the state and recent developments of knowledge on the topics of almost all meetings and to provide a basis for discussion at the Conference. Most of these background papers prepared for topical meetings of the Conference will form the basis of chapters on the revised edition of *The Determinants and Consequences of Population Trends* and hence are not included in the Conference *Proceedings*.

All cross-references to papers contained in these volumes are given in the following form:

Name of the author, title of the paper, *Proceedings*, vol. I, vol. II, vol. III or vol. IV.

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I. ORGANIZATION OF THE CONFERENCE

The World Population Conference, which was held in Belgrade, Yugoslavia, from 30 August to 10 September 1965, in accordance with the provisions of Economic and Social Council resolutions 820 C (XXI) and 933 B (XXXV) and General Assembly resolution 1838 (XVII), was the second scientific Conference on the problems of population to be convened under the auspices of the United Nations, the first one having been held in Rome in 1954. The Conference was held upon the invitation of the Government of Yugoslavia, which generously provided the host facilities.

COLLABORATING ORGANIZATIONS

The resolution of the Economic and Social Council provided that the Conference was to be convened by the United Nations with the close collaboration of the International Union for the Scientific Study of Population and five specialized agencies: the International Labour Organisation, the Food and Agriculture Organization of the United Nations, the United Nations Educational, Scientific and Cultural Organization, the World Health Organization, and the International Bank for Reconstruction and Development. These specialized agencies and the International Union for the Scientific Study of Population shared with the United Nations in the planning of the Conference, provisions of facilities, the preparation of documents, the scientific discussions and the financing of the project.

PREPARATORY COMMITTEE

The Secretary-General was assisted in the preparations for the Conference by a Preparatory Committee consisting of representatives of collaborating organizations and experts invited by the International Union for the Scientific Study of Population, the International Statistical Institute and the Inter-American Statistical Institute. The Committee held four meetings, the first in Geneva from 27-29 June 1962, the second in New York from 16-20 August 1963, the third in Belgrade from 23-25 September 1964 and the fourth in Belgrade on 27 and 28 August 1965. During the intervals the Committee was asked to give advice. A Sub-Committee of the Preparatory Committee collaborated closely with the Secre-

tariat throughout the period of preparations on matters relating to the organization of the Conference and the programme.

ARRANGEMENT OF THE PROGRAMME

Upon the advice of the Preparatory Committee, the Secretariat established a programme for the Conference which consisted of—in addition to opening and closing sessions—twenty-three sessions of three-hour duration on various topics of interest to the United Nations and the collaborating specialized agencies relating to the trends of population, factors influencing them, economic and social implications of population changes, measures of population policy and certain technical and methodological problems in demographic research and data collections. Nine of these twenty-three sessions were plenary meetings and fourteen were held in series of two sessions simultaneously. The topics and the sequence of the meetings are listed below in the section headed “Programme of Meetings”. In each topical meeting, special attention was given to the problems of developing countries. In addition, there were two plenary sessions at the end of the programme devoted to review of the results of the topical sessions. In these final sessions, the rapporteur of the topical session presented brief summaries of the results of discussions at these sessions.

ORGANIZATION OF TOPICAL MEETINGS

For each meeting of the Conference, with the advice of the Preparatory Committee, the Secretary-General appointed an organizer who, in consultation with the Sub-Committee on Arrangements, was responsible for the details of the programme, topics, selecting experts to be invited to contribute papers relating to various aspects of topics of each meeting.

CONDUCT OF MEETINGS

Since the Conference papers had been distributed to participants in advance, most of the time of the meetings was not used for presentation of papers by authors. A moderator, appointed for each topical meeting, introduced the discussion with a statement summing up highlights of the contributed papers and assessing their importance in relation to existing

knowledge on the topic of the meeting and oriented the discussion at the meeting. Following the moderator's statement at each session, the floor was given to participants who signified, before or during the session, their desire to take part in the discussion. In general, the chairman was constrained to set rather short time limits for participants' remarks in order to give an opportunity for all those who signified their desire to speak.

Every meeting had a rapporteur who had the responsibility of presenting a summary of the results of the discussions and the main points brought out in the papers submitted to the meeting, as well as the moderator's statement. The rapporteur's statement was also a balanced presentation of views on controversial questions expressed in the discussion.

The moderators' statements and the summaries of discussions prepared by the rapporteurs for various meetings are presented in subsequent sections of this volume.

In accordance with the terms of the Economic and Social Council's resolution whereby holding of the Conference under United Nations auspices was authorized, no resolutions were adopted and no attempt was made to formulate any consensus of views expressed by participants. The purpose, as the Council had defined it, was merely to provide for an exchange of views among experts on the major problems of population and related questions of research and data collection.

PARTICIPATION

The Economic and Social Council requested the Secretary-General to invite to participate in the Conference, in their individual capacity, experts nominated by Governments of Member States of the United Nations and members of the specialized agencies, the International Union for the Scientific Study of Population and certain of the non-governmental organizations in consultative status with the United Nations, having scientific interest in population and related fields, and the United Nations Department of Economic and Social Affairs.

A total of 852 attended the Conference from the 1,400 experts that were invited—almost twice the number of 435 participants who attended the first World Population Conference in Rome in 1954. The large increase in participation in 1965 can be interpreted as a sign of increased interest and importance attached to population problems by governments and scientific institutions throughout the world. Eighty-eight countries were represented by participants attending the Conference, whereas

seventy-four countries were represented at the Rome Conference in 1954.

Special attention was given to the population problems of developing countries in the programme of the Conference and special efforts were made to encourage and facilitate participation of experts from such countries, with 176 participants coming from Asia, sixty-four from Latin America and fifty-five from Africa.

DOCUMENTATION

Each participant was invited to submit a paper related to one of the topical meetings. Upon the recommendation of the Preparatory Committee, the length of the papers was limited to the space of approximately 2,500 words. These papers were reproduced and distributed, so far as possible, prior to and during the Conference to all participants.

Of the 513 scientific and technical papers submitted for the various topical meetings, 266 were papers invited by the organizer, and 222 were volunteered by the participants. There were twenty-five background papers prepared on behalf of the United Nations and the collaborating specialized agencies, to summarize the state of knowledge on various topics in the programme and to provide a basis for discussion at the Conference. The collection of papers constituted a major contribution to scientific and technical literature relating to population questions. The text of all invited papers—a few volunteered papers, summaries of the remainder of the volunteered papers—are published in the *Proceedings* of the Conference in three volumes in English, French and Spanish.

FINANCES

The Economic and Social Council, having regard to the rules for the calling of non-governmental conferences by the Council, approved by General Assembly resolution 1838 (XVII), requested the Secretary-General to explore the possibility of seeking voluntary contributions from governments and private sources for financing the Conference. Accordingly, the Preparatory Committee (E/Conf.41/PC.1) recommended that the Secretary-General and the International Union for the Scientific Study of Population should approach governments, specialized agencies, non-governmental organizations and foundations, to seek contributions to the finances of the Conference. A special Finance Committee was established for this purpose, so as to obtain the widest participation of experts from all parts of the world, particularly from the developing countries. Almost all the funds collected by this

committee were earmarked by the donors for assistance to participants from developing countries. The Population Association of America also established a committee which collected funds for attendance of persons residing in the United States who were engaged in scholarly work on population:

STATEMENT OF FUNDS RECEIVED BY THE FINANCE COMMITTEE OF THE INTERNATIONAL UNION FOR THE SCIENTIFIC STUDY OF POPULATION

International Bank for Reconstruction and Development	\$ 8,000
The Swedish Government.....	6,000
The Brush Foundation (Cleveland, Ohio).....	1,000
The Rockefeller Foundation.....	15,000
The Population Council (on behalf of Mr. John D. Rockefeller III).....	20,300
The Population Council, Inc.....	75,000
The Japanese Government.....	1,000
Gildemeister Compañía S.A. (Lima, Peru).....	500
The Jamaican Government.....	700
The Federal Republic of Germany.....	7,000
TOTAL	<u>\$134,500</u>

Plus:

1. The Yugoslav Local Arrangements Committee covered the cost of hotel accommodation and subsistence in Belgrade for 50 participants.
2. The Simon Population Trust (London, England), £100.
3. Equivalent of \$10,000 from the Indian Government towards travel costs on Air-India.
4. Offer of the Italian Government to provide two return air tickets from Rabat and Tunis to Venice.

SOCIAL ACTIVITIES

The Government of Yugoslavia, through their Local Arrangements Committee, organized social events, excursions and other programmes for the participants and their families during the Conference's period. There were two receptions, one given by the President of the Federal Council of Yugoslavia, Mr. Petar Stambolić on 31 August, and another on 7 September, given by the President of the City Assembly of Belgrade; two concerts at the Trade Union Building on 3 September and 7 September, when the choir "Branko Kramanovic" and the Yugoslav Folk Dance Troupe gave performances for the participants. In addition, there was a joint reception on 30 August, given by the Representative of the Secretary-General of the United Nations, Mr. Philippe de Seynes, and the Chairman of the Yugoslav Arrangements Committee, Mr. Ante Novak.

The ladies' programme consisted of city tours, visits to local artists' studios, galleries and museums, a fashion show and tea party given by the president of the Conference for Social Activities of the Women of Belgrade, Mrs. Olga Nikolic, visits to a garment factory, health centres, children's homes and rehabilitation centres.

Opportunities were provided for out-of-town tours by the General Tourist Office to Dubrovnik, Bled and Oplenac, where luncheons in honor of the participants were organized.

II. PROGRAMME OF MEETINGS

Monday, 30 August 1965

1. Opening of the Conference by the representative of the Secretary-General of the United Nations.
2. Statement by His Excellency Mr. Petar Stambolić, President of the Federal Executive Council of the Federal People's Republic of Yugoslavia.
3. Statement by Mr. Philippe de Seynes, representative of the Secretary-General of the United Nations.
4. Statement by Mr. Ante Novak, Chairman of the Yugoslav Arrangements Committee.
5. Election of President.
6. Election of Vice-Presidents.
7. Acceptance statement by the President.
8. Statement by Dr. B. R. Sen, Director-General of the Food and Agriculture Organization of the United Nations.
9. Statement by Chairman of the International Union for the Scientific Study of Population.
10. Announcements by the Secretary of the Conference.

Meeting A.1. Fertility

Organizer — Mr. V. G. Valaoras, Professor of Hygiene, University of Athens, Greece.

Moderator — Mr. R. Freedman, Professor of Sociology and Director of the Population Studies Center, University of Michigan, Ann Arbor, Michigan, United States.

Rapporteur — Mr. M. El-Badry, Population Division, Bureau of Social Affairs, United Nations, New York.

Chairman — Mr. D. V. Glass, Professor of Sociology, London School of Economics and Political Science, London, United Kingdom.

TOPICS DISCUSSED:

- (a) Levels and trends of fertility.
- (b) Influence of economic and social factors on fertility, with special reference to effects on economic and social development in developing countries.
- (c) Effectiveness of policy measures aimed at influencing fertility.

Background paper:

1. Roberts, George W. — Fertility

Invited papers:

1. Adil, Enver — The use of statistical guides and measures of effectiveness in determining government policy for influencing fertility—Pakistan

2. Bourgeois-Pichat, Jean — Relation between foetal and infant mortality and fertility
3. Davtyan, L. M. — The influence of socio-economic factors on natality (as exemplified in the Armenian Soviet Socialist Republic)
4. Fagley, Richard M. — Doctrines and attitudes of major religions in regard to fertility
5. Gille, Halvor — Twentieth-century levels and trends of fertility in developing countries
6. Klinger, András — Demographic effects of abortion legislation in some European socialist countries
7. Lorimer, Frank — The economics of family formation under different conditions
8. Muramatsu, Minoru — Policy measures and social changes for fertility decline in Japan
9. Raina, B. L. — Possible effects of public policy measures on fertility in India
10. Ryder, N. B. — Fertility in developed countries during the twentieth century

Volunteered papers:

1. Darsky-Tolchinsky, L. E. — Study of women's fertility considering the number of previously born children
2. Heer, David, M. — Economic development and fertility
3. Piskunov, V. P. — The influence of disproportions in the sexes on the married state of po-

pulation and natality in the Ukrainian: Soviet Socialist Republic

4. Sadvokasova, Y. A.—Birth control measures and their influence on population replacement

5. Simeonoff, Emanouil—On one method of interpolation and on a new parameter of birth intensity
6. Vielrose, Egon—Age-specific fertility rates in Poland

Monday, 30 August 1965

Meeting B.1. Factors and patterns of fertility in areas where fertility is relatively high

Organizer—Mr. H. Rizk, Vice-President, American University of Cairo, Cairo, United Arab Republic.

Moderator—Mr. G. W. Roberts, Department of Sociology, University of West Indies, Kingston, Jamaica.

Rapporteur—Mrs. K. Dandekar, Head, Demography Section, Gokhale Institute of Politics and Economics, Poona, India.

Chairman—Miss C. Miró, Director, Regional Center for Demographic Training and Research in Latin America, Santiago, Chile.

TOPICS DISCUSSED:

(a) Fertility differentials, with special reference to their relation to current and prospective future fertility trends.

(b) Marriage and family patterns, and their relations to fertility.

(c) Attitudes and motives pertaining to fertility, and knowledge and practice of methods of fertility control.

Background paper:

1. Roberts, George W.—Fertility

Invited papers:

1. Chung, Ching San, M.D.—Evaluation of progress in fertility control in Singapore
2. Concepción, Mercedes B.—The effect of current social and economic changes in the developing countries on differential fertility
3. Das, Nitai Chandra—A note on the effect of postponement of marriage on fertility
4. Davis-Blake, Judith—Parental control, delayed marriage, and population policy
5. El-Badry, M., and Rizk, Hanna—Regional fertility differences among socio-economic groups in the United Arab Republic
6. Husein, Hasan M.—Evaluation of progress in fertility control in the United Arab Republic
7. Kirk, Dudley—Factors affecting Moslem natality
8. Kozlov, V. I.—Some causes of high fertility of the population of developing countries
9. Nag, Moni—Family type and fertility

10. Takeshita, John Y.—Birth control in some of the developing countries of the Far East

Volunteered papers:

1. Agarwala, S. N.—Effect of a rise in female marriage age on birth rate in India
2. Ahmed, Mohiuddin—Male attitudes towards family limitation in East Pakistan
3. Berrada, Abdellah—Fertility in relation to the profession of the head of the household and the age of the mother
4. Ericksen, E. Gordon—Changing virility, virginity complexes as related to fertility patterns of middle strata wives: Costa Rica
5. Fan, T. H.—Fertility level and trends in Taiwan
6. Gómez, Carlos J.—Religion, education and fertility control in Latin American societies
7. Gupta, P. B.—The problem of fertility control in India
8. Henin, Roushdi A.—Some aspects of the effects of economic development on fertility in the Sudan
9. Kim, Yun—Age at marriage and the trend of fertility in Korea
10. Mendoza, Ofelia—Cultural factors affecting fertility control in Latin America
11. Morales Vergara, Julio.—Demographic analysis of illegitimacy in Chile
12. Namboodiri, N. Krishnan—On the problem of measuring the strength of social norm concerning family size in developing areas
13. Nevett, A.—Age at marriage, parental responsibility and the size of the family
14. Prakasha, Veda—Education as preparation for fertility control
15. Raman, M. V.—Attitudes toward family size and fertility control in India—An assessment
16. Siffman, R. I.—Age at marriage as a demographic factor in conditions of high fertility
17. Talavera Goiburru, Rubén—Differential fertility levels in Chile
18. Thapar, Savitri—Fertility rates and intervals between births in a population in Delhi
19. Wuelker, Gabriele—Effects of social and family patterns on the population increase in Togo (West Africa)
20. Zikry, Abdel-Khalik M.—Fertility differentials of the United Arab Republic women

Monday, 30 August 1965

Meeting B.7. New developments in measurement and analysis of factors of population growth and structure

Organizer—Mr. J. Bourgeois-Pichat, Directeur, Institut national d'études démographiques, Paris, France.

Moderator—Mr. N. Keyfitz, Professor of Sociology, University of Chicago, Chicago, Illinois, United States.

Rapporteur—Mr. S. Kono, Institute of Population Problems, Tokyo, Japan.

Chairman—Mr. A. J. Coale, Director, Office of Population Research, Princeton University, Princeton, New Jersey, United States.

TOPICS DISCUSSED:

- (a) Utilization of models in demography.
- (b) Longitudinal studies.
- (c) Use of sample surveys.
- (d) Use of electronic computers.

Background paper:

1. Tabah, Léon—Relationships between age structure, fertility, mortality and migration. Population replacement and renewal

Invited papers:

1. Chevy, G. R.—Sampling techniques in the elaboration of demographic statistics
2. Condé, J.—Longitudinal recording of vital events (total longitudinal analysis)
3. Croze, Marcel—Method of comparing several observations relating to the same person
4. Hollingsworth, T. H.—Methods of using old documents to study population trends in the past
5. Hyrenius, Hannes—Demographic simulation models with the aid of electronic computers
6. Joshi, D. D.—Stochastic models utilized in demography
7. Ledermann, Sully—The use of population models
8. Linder, Forrest E.—The increased scope of demographic investigations through the use of sampling surveys

9. Luu-Mau-Thanh—The use of electronic machines in demographic models
10. Mahalanobis, P. C.—Some concepts of sample surveys in demographic investigations
11. Newcombe, Howard, and Kennedy, James—Demographic analysis and computer programmes
12. Vangrevelinghe, G.—Sample surveys in the checking of population censuses
13. Vincent, Paul—A cursory consideration of electronic computers and their use in demography

Volunteered papers:

1. Brackett, James W.—The electronic computer as an instrument for demographic analysis
2. Callies, J. M.—Computation of growth rate for a stable population from the age pyramid and the survival curve
3. Hamilton, C. Horace—On the difference between the Vital Statistics and the Census Survival Rate methods of estimating net migration among subclasses of the nation's population
4. Hashmi, Sultan S.—Example of the application of the analysis of variance in the study of fertility
5. Kurup, R. S.—A revision of model life tables
6. Mackensen, Rainer—Regional computer projection by demographic types of partial populations with incomplete data
7. Mihoc, Gh., and Theiler, Gh.—A mathematical model relating to the chronological evolution of a human population
8. Milco, St. M., and Caramelia, V. V.—Contributions to the preparation of a set of methods for the composite study on population
9. Mitra, S.—A few properties of the expectation of life e_x^0
10. Sheps, Mindel C., and Ridley, Jeanne Clare—Studying determinants of natality: Quantitative estimation through a simulation model
11. Sougarev, Z. T.—The renewable set—A means of population analysis
12. Stone, Leroy O.—Biases in the major estimates of net intercensal migration

Tuesday, 31 August 1965

Meeting B.2. Factors and patterns of fertility in areas where fertility is relatively low

Organizer—Mr. F. W. Notestein, President, Population Council, New York, United States.

Moderator—Mr. B. Colombo, Professor of Statistics, Istituto Universitario, Ca' Foscari,

Venice, Italy.

Rapporteur—Mr. M. Muramatsu, Institute of Public Health, Tokyo, Japan.

Chairman—Mr. A. Klinger, Hungarian Central Statistical Office, Budapest, Hungary.

TOPICS DISCUSSED:

(a) General factors associated with low fertility.

(b) Specific correlates of low fertility.

(c) Fertility regulation in modernized countries.

(d) Current patterns of fertility and their causes in low fertility countries.

Background paper:

1. Roberts, George W.—Fertility

Invited papers:

1. Acsádi, György—Demographic variables as a source of differences in the fertility of low fertility countries
2. Bergues, Hélène, and Sutter, Jean—Social and psychological factors influencing the control of fertility in Europe
3. Biraben, Jean-Noël—Prevailing fertility situation and its causes in western Europe
4. Brezník, Dušan—Female fertility in industrialized countries (Present situation, trends and future outlook)
5. Campbell, Arthur A.—Recent fertility trends in the United States and Canada
6. Coale, Ansley J.—Factors associated with the development of low fertility: an historic summary
7. Glick, Paul C.—Marriage and family variables related to fertility
8. Kimura, Masabumi—Current fertility patterns in Japan
9. Kiser, Clyde V.—Social, economic and religious factors in the differential fertility of low fertility countries

10. Safilios-Rothschild, C.—Some aspects of fertility in urban Greece
11. Uralis, B. T.—Dynamics of the birth rate in the Union of Soviet Socialist Republics and factors contributing to it
12. Vostrikova, A. M.—Female fertility and methods of studying it in the Union of Soviet Socialist Republics
13. Westoff, Charles F.—Fertility control in the United States

Volunteered papers:

1. Basavarajappa, K. G.—Trends in age-duration-specific fertility rates in Australia, 1911-1961
2. Carter, Hugh—Recent changes in remarriages of women of childbearing age in the United States
3. Day, Lincoln H.—Catholic teaching and Catholic fertility
4. Ferenbac, I.—The effect of socio-economic factors on fertility
5. Lunde, Anders S.—Some problem aspects of differential fertility measurement in the United States
6. Marx, Norbert—Possible contributions of administrative and medical departments of Social Security in France to demographic studies
7. Mehlan, K. H.—Reducing abortion rate and increasing fertility by social policy in the German Democratic Republic
8. Mertens, S.J., C.—The contribution of families to the natural growth of the Belgian population according to the number of their children
9. Mizushima, Haruo—The reproduction rate of population in Japan
10. Zimmer, Basil G., and Goldscheider, C.—A further look at Catholic fertility

Tuesday, 31 August 1965

Meeting B.6. Methods of obtaining basic demographic measures where data are lacking or defective

Organizer—Mr. F. Linder, Director, National Center for Health Statistics, Washington, D.C., United States.

Moderator—Mr. W. Brass, Reader in Medical Demography, Department of Medical Statistics and Epidemiology, London School of Hygiene and Tropical Medicine, London, United Kingdom.

Rapporteur—Mr. C. A. L. Myburgh, Director of Census and Statistics, Salisbury, Rhodesia.

Chairman—Mr. E. Omaboe, Government Statistician, Central Bureau of Statistics, Accra, Ghana.

TOPICS DISCUSSED:

- (a) Non-traditional methods of obtaining data.
- (b) Methods for handling defective data.
- (c) Improvement of traditional sources of data.

Background paper:

1. Brass, William—Methods of obtaining basic demographic measures where census and vital statistics registration systems are lacking or defective

Invited papers:

1. Arretx, G., Carmen—A method of estimating demographic rates in areas without census and vital statistics. Experimental surveys carried

- out in Guanabara (Brazil) and Cauquenes (Chile)
2. Blacker, J. G. C.—Use of sample surveys to obtain data on age structure of the population where respondents in a regular census enumeration cannot give accurate data: Some Kenya experiments
 3. Bystrova, V. A.—The anamnestic method of studying demographic processes
 4. Cataldi, Alberto—Reconstruction of the trends of population growth in Uruguay for periods prior to the 1963 census
 5. Deming, W. Edwards, and Keyfitz, Nathan—Theory of surveys to estimate total population
 6. Jain, S. P.—The Indian programme for improving basic registration
 7. Keyfitz, Nathan, and Murphy, E. M.—Criteria for data adjustment
 8. Krótki, Karol J.—The problem of estimating vital rates in Pakistan
 9. Majumdar, Murarimohan—Estimation of vital rates in the Indian National Sample Survey
 10. Powell, Nora P.—The United Nations programme for improving population and vital statistics
 11. Schubnell, Hermann—Use of sample censuses to increase scope of census subject coverage
 12. Simmons, Walt R., and Schnack, George A.—Use of current surveys as an aid in constructing post-censal population estimates
 13. Som, Ranjan Kumar—Response biases in demographic enquiries
 14. Taeuber, Conrad—New concepts in census methodology
 15. Valaoras, V. G.—Testing deficiencies and analytical adjustments of vital statistics
 16. Vukovich, G.—The United Arab Republic project for measuring vital rates in rural areas

Volunteered papers:

1. Amani, M.—Attempt to estimate the under-registration of children of less than one year in the Iranian census of 1956
2. Arriaga Eduardo E.—Method of life table construction for populations for which vital statistics are lacking

3. Barbour, K. M.—Problems of evaluating and locating census data as preliminary stages in the analysis of internal migration
4. Cantrelle, Pierre—Repeated demographic observation in a rural area in Senegal: method and first results
5. Cavanaugh, Joseph A.—Research and data collection techniques for developing areas
6. Friedlander, D., and Roshier, R. J.—A note on the use of birth place-place of residence data for estimating intercensal migration streams
7. Gutman, Robert—Non-conventional methods of obtaining data on the religious composition of the United States population: the case of Jewish population statistics
8. Lah, Ivo—A method of using census data for measurement of fertility
9. Lahiri, D. B.—Population data and the Indian National Sample Survey
10. Lauriat, Patience, and Chintakananda, A.—Techniques to measure population growth: survey of population change in Thailand
11. Mazur, Denis Peter—The graduation of age-specific fertility rates by order of birth of child
12. Oñate, Burton T.—Estimation of population and its components in a developing economy
13. Ramachandran, K. V.—An index to measure digit preference error in age data
14. Sabagh, Georges, and Scott, Christopher—An evaluation of the use of retrospective questionnaires for obtaining vital data: the experience of the Moroccan multi-purpose sample survey of 1961-1963
15. Sadek, Dawlat A.—Census data and urban planning requirements
16. Saxena, G. B.—Estimates of birth rate and expectation of life in India on the basis of quasi-stability
17. Winkler, Wilhelm—On the notions and measures of over-population and under-population
18. Zelnik, Melvin—An estimate of the birth rate in Pakistan through the application of quasi-stable population techniques

Tuesday, 31 August 1965

Meeting B.13. Studies relevant to family planning

Organizer—Mr. W. P. Mauldin, Assistant Demographic Director, Population Council, United States.

Moderator—Mr. J. Morsa, Université Libre de Bruxelles, Brussels, Belgium.

Rapporteur—Mr. You Poh Seng, University of Singapore, Singapore.

Chairman—Mr. H. M. Husein, Dean, Institute of Statistics, Cairo University, Cairo, United Arab Republic.

TOPICS DISCUSSED:

- (a) Evaluation of government-supported programmes.
- (b) Demonstration programmes.
- (c) Methodology and technology.

Invited papers:

1. Berelson, Bernard—A review of major governmental programmes

2. Brown, George, M.D., and Daly, Amor, M.D.—Evaluation of Tunisia's family planning programme
3. Chandrasekaran, C.—Problems of research design and methods in studies of effectiveness of policy measures aimed at influencing fertility
4. Chow, L. P.—Evaluation of a family planning programme in China (Taiwan)
5. Griffiths, William, Roberts, Beryl J., and Huq, Raisunnessa—Application of learning theory to a family planning programme in Dacca, East Pakistan
6. Kantner, John F., and Stephan, Frederick F.—Evaluation of programme objectives in family planning
7. Khan, Akhter Hameed, and Choldin, Harvey M.—Application of a theory of rural development to family planning in East Pakistan
8. Kim, Taek Il, M.D.—Review of the family planning action programme in the Republic of Korea
9. Kinch, Arne, M.D.—Family planning in the context of community health services in rural Ceylon
10. Marshall, John—A statistical analysis of the time of conception in relation to the rise of temperature in 5,013 cycles
11. Palmore, James A., Jr.—Hypotheses for family planning among the urban disadvantaged: United States
12. Potter, Robert G., Jr.—Application of life table techniques to measurement of contraceptive effectiveness
13. Tietze, Christopher, M.D.—Effectiveness, acceptability, and safety of modern contraceptive methods
4. Černoch, Antonín—Experiences in Czechoslovakia with the effects and consequences of legalized artificial termination of pregnancy
5. Chun, Daphne—Family planning and the population problems of Hong Kong
6. Enke, Stephen—Economic programmes to prevent births
7. Gardezi, Hassan Nawaz—Midwife as a local functionary and her rôle in family planning: some research findings
8. Goyal, R. P.—Attitude studies relating to family planning in India
9. Guttmacher, Alan F., and Polgar, Steven—An action-research project on family planning in "poverty" neighborhoods of New York City
10. Iutaka Sugiyama—Inter-generational mobility and family planning in urban Brazil
11. Jürgens, Hans W.—The planning of the family size in the different social classes according to the results of investigations in Schleswig-Holstein, Federal Republic of Germany
12. Koya, Yoshio—Some essential factors for fertility control in Japan
13. Lindström, Ulla—On technical assistance in the field of family planning
14. Mathen, K. K.—The impact of the family planning movement on the Indian population
15. Miltényi, Károly—Social and psychological factors affecting fertility in a legalized abortion system
16. Mitra, K. N., M.D.—Action-research in one-time family planning methods—Outline of a plan for West Bengal
17. Murty, D. V. R.—Estimated reductions in birth rate resulting from different combinations of sterilization and contraception programmes in India
18. Talwar, P. P.—Process of birth control
19. Venning, G. R.—The demographic effectiveness of different methods of family limitation
20. Yang, Jae Mo—Fertility and family planning in rural Korea
21. Yerushalmy, J.—Religious, educational, and socio-economic factors associated with different methods of fertility control

Volunteered papers:

1. Adriasola, G., Armijo, R., Behm, H., and Plaza, S.—Population problems in Chile and the role of the School of Public Health
2. Avendaño, Onofre, and Faundes-Latham, Aníbal—A contraceptive programme in a Latin American urban community. Policy, objectives and facts
3. Cadbury, George W.—Population planning. Some suggestions for emphasis in future research

Tuesday, 31 August 1965

Meeting B.12. Population genetics

Organizer—Mr. R. L. Kirk, Chief, Human Genetics Unit, World Health Organization, Geneva, Switzerland.

Moderator—Mr. C. Stern, Professor of Zoology and Genetics, University of California, Berkeley, California, United States.

Rapporteur—Mr. W. J. Schull, Professor of Human Genetics, University of Michigan, Ann Arbor, Michigan, United States.

Chairman—Mr. L. D. Sanghvi, Chief, Human Variation Group, Indian Cancer Research Centre, Bombay, India.

TOPICS DISCUSSED:

(a) Geographical variation in disease and genetic mechanisms.

(b) Practice of consanguineous marriage and its genetic effects.

(c) Use of routinely-collected data for population genetic studies.

(d) Epidemiological methods in population genetics.

Background paper:

1. Dobzhansky, Theodosius — An outline of the basic principles of genetics

Invited papers:

1. Cohen, Bernice H. — Some notes on the design and conduct of genetic field studies
2. Court-Brown, W. M. — The frequency of subjects with chromosome abnormalities and some implications in relation to disease
3. Freire-Maia, Newton — Practice of consanguineous marriage and its genetic effects
4. Kimura, Motoo — Recent advances in the theory of population genetics

5. Matsunaga, Ei — Measures affecting population trends and possible genetic consequences
6. Neel, James V., Yanase, Toshiyuki, and Schull, William J. — Consanguinity studies in Japan
7. Newcombe, Howard B. — Use of vital statistics
8. Reed, T. Edward — The evidence for natural selection due to blood groups
9. Sanghvi, L. D. — Inbreeding in India
10. Siniscalco, M., Bernini, L., Filippi, G., Latte, B., Meera Khan, P., Piomelli, S., and Rattazzi, M. — Population genetics of haemoglobin variants, thalassaemia and G6PD-deficiency, with particular reference to the malaria hypothesis

Volunteered papers:

1. Bodmer, Walter, and Cavalli-Sforza, L. L. — Perspectives in genetic demography
2. Bunak, V. V. — Demographic studies of small populations on the basis of family-genealogical investigations
3. Gedda, L., Parisi, P., Pace, D. P. — Intensive study on the population of an isolated country in the Latium region (Fumone) — Progress report

Wednesday, 1 September 1965

Meeting A.2. Mortality

Organizer — Mr. B. Benjamin, Chief Statistician, Statistical Branch, Ministry of Health, London, United Kingdom.

Moderator — Mr. B. Pirc, School of Public Health of the Medical Faculty, University of Zagreb, Zagreb, Yugoslavia.

Rapporteur — Mr. J. Somoza, Demographer, United Nations, Economic Commission for Latin America, Santiago, Chile.

Chairman — Mr. D. Breznik, Director, Demographic Research Center, Institute of Social Sciences, Belgrade, Yugoslavia.

TOPICS DISCUSSED:

(a) Levels and trends of mortality and their relations with patterns of age-sex specific mortality rates.

(b) Effects of public health activities and of economic and social factors upon mortality, with special reference to effects of economic and social development of developing countries.

(c) Economic and social effects of declining mortality and improving conditions of health.

Background paper:

1. Spicer, C. C. — Factors affecting health and mortality

Invited papers:

1. Freidlin, S. Y. — State measures in the field of public health and their influence on mortality among the population
2. Johnson, Gwendolyn Z. — Public health activities as factors in levels and trends of mortality and morbidity in developing countries
3. Krohn, E. F., and Weber, A. — Some characteristics of mortality in the European region
4. Kusukawa, Akira — Social and economic factors in mortality in developing countries
5. Medyanik, R. V. — Measures to reduce infant mortality in the Ukrainian Soviet Socialist Republic
6. Moriyama, Iwao M. — Infant mortality in certain countries of low mortality
7. Sarhan, A. E. — Mortality trends in the United Arab Republic
8. Soda, Takemune, M.D. — Trends of mortality in Asia and the Far East
9. Somogyi, Stefano — Changes in mortality rates in Italy from 1951 to 1962
10. Somoza, Jorge L. — Levels and trends of mortality in Latin America in terms of age
11. Spiegelman, Mortimer — Recent mortality in countries of traditionally low mortality

Volunteered papers:

1. Burch, Thomas K.—Some social implications of varying mortality
2. Holzer, Jerzy—The evolution of infant mortality in Poland
3. Liberati, Fabrizio—Infant mortality in Italy according to the profession of the father
4. Maraviglia, Maria Nydia—Infant mortality trends in Latin America
5. Merkov, A. M.—Evaluation of the health aspects of population replacement in the Soviet Union and in several economically developed capitalist countries
6. Michalup, Erich—The mortality trend in Venezuela during the last twenty years
7. Myers, Robert J.—The effect of declining mortality on old-age pension systems
8. Peritz, E.—Infant mortality in Israel, 1960-1961; a study based on matched birth and death records
9. Schmelz, O.—Reduction in child mortality of new immigrants in Israel
10. Stolnitz, George J.—Recent mortality declines in Latin America, Asia and Africa: review and some perspectives
11. Wiesler, H.—Mortality in South-East Asia

Wednesday, 1 September 1965

Meeting B.9. International migration as related to economic and demographic problems of developing countries

Organizer—Mr. K. T. de Graft-Johnson, Head, Demographic and Social Statistics Studies, Census Office, Accra, Ghana.

Moderator—Mr. W. D. Borrie, Professor of Demography, Australian National University, Canberra, Australia.

Rapporteur—Mr. A. Oblath, Manpower Division, International Labour Organisation, Geneva, Switzerland.

Chairman—Mr. N. Ahmed, Director General, Central Statistical Office, 63 Muslinabad, Karachi, Pakistan.

TOPICS DISCUSSED:

(a) Possible effects of immigration and emigration on the growth and structure of population.

(b) Immigration as a means of obtaining needed skills and stimulating economic and social advancement.

(c) The economics of immigration and emigration.

Background paper:

1. Borrie, W. D.—Trends and patterns in international migration since 1945

Invited papers:

1. Appleyard, R. T.—The economics of immigration into Australia
2. Ghansah, D. K., and Aryee, A. F.—The demographic and social effects of migration in Ghana

3. Gil, B.—Immigration into Ghana and its contribution in skill
4. Jones, Frank E.—Some social consequences of immigration for Canada
5. De Lattes, Zulma L. Recchini—Demographic consequences of international migratory movements in the Argentine Republic, 1870-1960
6. Myburgh, C. A. L.—Migration in relationship to the economic development of Rhodesia, Zambia and Malawi
7. Parenti, Giuseppe—The role of emigrants remittances in the economic development of European countries
8. Pletnev, E. P.—Economic development and international migration of labour
9. Siron, M.—The economics of immigration to Israel (1948-1963)
10. Southall, Aidan—The demographic and social effects of migration on the populations of East Africa
11. Taeuber, Irene B.—International migration and population dynamics in the Far East
12. Triantis, S. G.—Population, emigration and economic development

Volunteered papers:

1. Besterman, W. M.—Immigration as a means of obtaining needed skills and stimulating economic and social advancement
2. Mayer, Kurt B.—Post-war migration from Italy to Switzerland

Wednesday, 1 September 1965

Meeting B.3. Mortality, morbidity and causes of death

Organizer—Dr. W. P. D. Logan, Director, Division of Health Statistics, World Health Organization, Geneva, Switzerland.

Moderator—Dr. M. J. Aubenque, Chef de la Division de statistiques sanitaires. Institut national de la statistique et des

études économiques, Paris, France.

Rapporteur — Mr. Tye Cho Yook, Senior Lecturer in Medical Statistics, Department of Social Medicine and Public Health, University of Singapore, Singapore.

Chairman — Mr. H. Behm Rosas, Professor of Biostatistics, Escuela de Salubridad, Universidad de Chile, Santiago, Chile.

TOPICS DISCUSSED:

(a) Patterns of causes of death and their relation to levels and trends of mortality.

(b) Conditions and trends of morbidity and their relation to levels and trends of mortality.

Background paper:

1. Spicer, C. C. — Factors affecting health and mortality

Invited papers:

1. Behm, Hugo, and Gutiérrez, Héctor — Structure of causes of death and level of mortality: an experience in Latin America
2. Brushlinskaya, L. A. — The importance of morbidity statistics in the evaluation of public health
3. Heasman, M. A. — Population morbidity as indicated by hospital statistics
4. Ovcharov, V. K. — Morbidity factors and trends and their connexion with the level of mortality in the Union of Soviet Socialist Republics
5. Puffer, Ruth R., and Griffith, G. Wynne — The inter-American investigation of mortality
6. Smith, Alwyn — The social implications of morbidity in the United Kingdom
7. Strömberg, Erik — Relation of population problems to mental health
8. Vacek, Miloš — The influence of changing morbidity upon the productive capacity of the labour force
9. Woolsey, Theodore D. — Classification of population in terms of disability

Volunteered papers:

1. Burkhardt, Felix, and Osadnik, Lucie — Trends of mortality by the aid of differential equations with parameters of urbanization and industrialization
2. Burnight, Robert G. — Socio-economic characteristics related to chronic morbidity among older urban males
3. Chandrasekhar, S. — Infant mortality in Madras city
4. Federici, Nora — Incidence of mortality from cardiovascular diseases in the Italian regions, by sex and age
5. Guralnick, Lillian — Multiple causes of death, United States 1955
6. Hopkins, L. G. — Development of peri-natal mortality statistics in Australia
7. Lee, Everett S. — Migration and the convergence of white and Negro rates of mental disease
8. Légaré, Jacques — Mortality at age 45 and over: recent trends in Norway and other countries with low mortality levels
9. McMahan, C. A. — Some aspects of the problem of obtaining research leads on atherosclerotic heart disease from reported mortality data
10. Reginster-Haneuse, G., M.D. — Mortality trends and causes of death in Belgium
11. Sandu, I., and Mureşan, P. — Structural changes in mortality by cause, sex and age group in the Romanian People's Republic over the last three decades.
12. Striteský, J., Šantrůček, M., and Vacek, M. — The train of morbid events leading directly to death — a practical and methodological problem
13. Taylor, Wallis — Measurement and projection of mortality by cause of death in developing countries

Thursday, 2 September 1965

Meeting A.3. Internal migration, with special reference to rural-urban movement

Organizer — Mr. A. Neiva, Professor of Demography, Escola de Sociologia e Política, Pontifícia Universidade Católica, Rio de Janeiro, Brazil.

Moderator — Mr. D. J. Bogue, Director, Community and Family Study Centre, University of Chicago, Chicago, Illinois, United States.

Rapporteur — Mr. K. C. Zachariah, Demographer, Demographic Training Centre, Chembur, Bombay, India.

Chairman — Miss D. S. Thomas, Research Professor of Sociology, University of Pennsylvania, Philadelphia, Pennsylvania, United States.

TOPICS DISCUSSED:

(a) Volume and trends of migration between rural and urban areas and relation of migration to natural increase of population in rural and urban areas.

(b) Factors affecting rural-urban migration, with special reference to the influence of eco-

conomic and social conditions in rural and urban areas of developing countries.

(c) Characteristics of rural-urban migrants and effects of their movements upon composition of population in rural and urban areas.

(d) Other aspects of internal migration.

Background paper:

1. Bogue, Donald J., and Hauser, Philip M. — Population distribution, urbanism and internal migration

Invited papers:

1. Agapitidis, Sortiris — Internal migration in Greece and Turkey
2. Bose, Ashish — Internal migration in India, Pakistan and Ceylon
3. Daragan, M. V. — Economic development and internal migration
4. Diégues, Manuel, Jr. — Internal migration in Brazil
5. Horstmann, Kurt — Rural-urban migration in the European Economic Community
6. Kuroda, Toshio — Internal migration; an overview of problems and studies
7. Mortara, Giorgio — Factors affecting rural-urban migration in Latin America: Influence of economic and social conditions in these two areas
8. Perevedentsev, V. I. — Relationship between population migration and ethnic convergence in the Soviet Union of today
9. Prothero, Mansell — Characteristics of rural/urban migration and the effects of their movements upon the composition of population in rural and urban areas in sub-Saharan Africa
10. Thirring, Louis Lajos — Internal migration in Hungary and some central and east European countries
11. Thomas, Dorothy Swaine — Internal migration in the United States: 1870-1960

Volunteered papers:

1. Bachi, Roberto — Analysis of geographical data of internal migration
2. Beijer, G. — Demographic, social and economic aspects of internal migration in some European countries
3. Borowski, Stanislaus — New forms and factors affecting rural-urban migration in Poland
4. Eldridge, Hope T. — Patterns of dominance in internal migration, United States, 1955-1960

5. Ghosh, A. — Immigration from rural areas into Calcutta metropolitan region: analysis and projection
6. Goldstein, Sidney — Rural-suburban-urban population redistribution in Denmark
7. Kasahara, Yoshiko — Internal migration and the family life cycle: Canadian experience over the 1956-1961 period
8. Konstantinov, O. A. — Rural-urban migration as a factor of economic development and adjustment of the ratio of urban-rural population to the general level of productive forces
9. Lungwitz, Kurt — On the influence exerted by inland migration on the changes in the age structure of the urban and rural population and on the consequences resulting herefrom for the labour situation in the country
10. Miller, Ann R. — Migration differentials among occupation groups: United States, 1960
11. Myers, George C. — Migration and modernization: the case of Puerto Rico, 1950-1960
12. Natale, Marcello — The influence on some socio-economic characters over the differences between resident and present population in the Italian censuses
13. Ponsioen, J. A. — An analysis of — and a policy regarding — rural migration in developing countries
14. Ravar, I. — Investments and the internal migration trends of manpower in the Romanian People's Republic
15. Schwarz, Karl — The influence of internal migration in the Federal Republic of Germany on the population trend in urban agglomerations
16. Senior, Clarence — Integration problems of recent rural migrants to United States cities
17. Smith, T. Lynn — The role of internal migration in population redistribution in Brazil
18. Sonnino, Eugenio — Structure and directions of the migratory movements affecting the commune of Rome
19. Stefanov, Ivan — Characteristics of the main internal migration flows in the People's Republic of Bulgaria
20. Tekse, Kálmán — On some interrelationships between occupational mobility and migration to Budapest
21. Ueda, Masao — Internal migration affecting age composition and fertility with reference to Japan
22. Vamathevan, S. — Some aspects of internal migration in Ceylon

Thursday, 2 September 1965

Meeting A.8. Demographic aspects of urban development and housing

Organizer — Mr. P. George, Professor, Université de Paris, Paris, France.

Moderator — Mr. N. V. Sovani, Joint

Director, Gokhale Institute of Politics and Economics, Poona, India.

Rapporteur — Mrs. H. Eldridge, Research

Associate, Population Studies Center, University of Pennsylvania, Philadelphia, Pennsylvania, United States.

Chairman — Mr. A. Mitra, Joint Secretary, Planning Commission, Government of India, New Delhi, India.

TOPICS DISCUSSED:

(a) Effects of movements of rural population on the growth of cities.

(b) Demographic factors affecting housing needs.

(c) Demographic factors affecting needs for urban development, other than housing (utilities, social services, urban development opportunities, etc.).

(d) Effects of urban development and housing programmes upon rural-urban migration and urban population growth.

(e) Demographic considerations in urban development and housing policies and their relation to national policies of economic and social development.

Background paper:

1. El-Badry, Mohammed — Housing, households and families

Invited papers:

1. Angenot, L. H. J. — Age structure and number of dwellings in the Netherlands
2. Bourlin, V. F. — Demographic aspects of city planning and housing construction
3. Camisa, Zulma Carmen — Effects of migration on the growth and structure of population in the cities of Latin America
4. Carrère, Paul — Induction effects in the growth of large agglomerations
5. Kosiński, Leszek — The demographic distinctiveness of recently settled areas as exemplified by the Polish western and northern territories
6. Lacoste, Yves — A new type of urban housing in France: "The large housing projects"
7. Rochefort, Michel — Relationship between urban commercial, banking, cultural and health services and the total population of the agglomeration
8. Wander, Hilde — Demographic aspects of housing conditions in the Federal Republic of Germany
9. Weissmann, Ernest — Population, urban growth and regional development
10. Wolfe, Marshall — Some implications of recent changes in urban and rural settlement patterns in Latin America

Volunteered papers:

1. Andrianov, B. V. — Urbanization in Africa and its influences on the ethnic processes
2. Andrzejewski, Adam — Demographic development, urbanization and housing needs based on the experience of Poland and some other socialist countries
3. Beér, Jean, and Kovacsics, Joseph — The consequences of changes in population upon administration and supply and the reasonable development of settlement
4. Dia, Oumar — The urban growth of Cap-Vert, Dakar
5. Dux, Katharine — A complex analysis of the standard of development of towns
6. Eversley, D. E. C., and Jackson, Valerie — Problems encountered in forecasting housing demand in an area of high economic activity: headship rates in relation to age structure, fertility, education and socio-economic groups
7. Golini, Antonio — Population concentration in Italy and its variations from 1861 to 1961
8. Gottlieb, Manuel — Fluctuations in marriage and migration experience in long swings in economic growth
9. Magda, Teodor — Statistical study of daily commuting to other localities
10. van Mechelen, Frans — Qualitative aspects associated with inward and outward migration towards and from a large urbanized area
11. Meerdink, J. — Development of resident population and economic activities in a number of concentrically situated Amsterdam wards
12. Ozok, Kemal — Urbanization and internal migration in Turkey
13. Páez Celis, Julio — Housing needs in Latin America
14. Perpiñá, Román — Geographical distribution of population, urban-rural distribution and its development
15. Platonov, G. D. — Demographic indicators helping to determine the demand for housing and their practical use
16. Siampos, George S. — The trend of urbanization in Greece (demographic aspect)
17. Srb, Vladimír, and Kučera, Milan — Urbanization of population in Czechoslovakia
18. Taeuber, Karl E. — Perspectives on the urbanization of the Negro population in the United States
19. Tamrazian, Seza — Some demographic and sociological characteristics of a fast expanding city: Teheran
20. Thein, U Aung — Some aspects of urban explosions in developing countries
21. van Arsdol, Maurice D., Jr. — Metropolitan growth and environmental hazards: an illustrative case
22. Wunsch, Guillaume — Some features of urbanization in North America since 1920

Thursday, 2 September 1965

Meeting B.8. Promotion of demographic research and training in developing countries

Organizer — Mr. C. Chandrasekaran, Director, Demographic Training and Research Centre, Chembur, Bombay, India.

Moderators — Mr. A. T. Boyarsky, Doctor of Economic Sciences, Moscow State University, Moscow, Union of Soviet Socialist Republics; Mr. D. Kirk, Demographic Director, Population Council, New York, United States.

Rapporteur — Mr. T. Montenegro, Secretary-General, Inter-American Statistical Institute, Washington, D.C., United States.

Chairman — Mr. A. N. El-Shafei, Director, North African Demographic Centre, Cairo, United Arab Republic.

TOPICS DISCUSSED:

(a) Recruitment and training of personnel for demographic research and training.

(b) Organization and establishment of institutions for demographic research and training.

(c) International co-operation in demographic research and training.

Background papers:

1. Chandrasekaran, C. — Demographic research and training in ECAFE region
2. Eldridge, Hope T. — Demographic research and training in the more developed countries: a survey of trends since 1954
3. El-Shafei, A. M. N. — Promotion of demographic research and training in developing countries with respect to the Arab countries
4. Miró, Carmen A. — Experience and problems in the promotion of demographic training and research in developing countries: The case of Latin America

Invited papers:

1. Caldwell, J. C. — Demographic training and research in tropical African universities which employ English as the medium of instruction
2. Chasteland, Jean-Claude, and Behnam, A. M. Djamchid — Status and problems of demographic teaching and research in Iran
3. Dilwali, Charat K., and Hines, Joyce — United Nations programmes for promotion of demographic research and training
4. George, A. — The teaching of demography in Indian universities
5. Khan, Muhammad Khalid Hayat — Problems of recruitment and training of personnel for demographic training and research in Pakistan
6. Khodary, M. S. — International co-operation in the setting up of the Regional Centre for Demographic Training and Research, Cairo
7. Miró, Carmen A. — The Latin American Demographic Centre: An experience in international co-operation for training, research and technical assistance in demography
8. Paillat, Paul — Demography and social sciences
9. Whitney, Vincent H. — The recruitment of personnel for training in demography
10. Zachariah, K. C. — Experience of the Chembur Demographic Training and Research Centre in international co-operation

Volunteered papers:

1. Groenman, S.J., and Heeren, H. J. — The development of demography and demographic research in the Netherlands
2. Moezi, Asdolah — Translation of the multilingual demographic dictionary of the United Nations into Persian

Friday, 3 September 1965

Meeting A.4. Future population trends and prospects

Organizer — Mr. M. Tachi, Director, Institute of Population Studies, Ministry of Health and Welfare, Tokyo, Japan.

Moderator — Mrs. I. B. Taeuber, Senior Research Demographer, Princeton University, Princeton, New Jersey, United States.

Rapporteur — Mr. R. Bachi, Professor of Statistics, Hebrew University, Jerusalem, Israel.

Chairman — Mr. R. Pressat, chargé de recherche, Institut national d'études démographiques, Paris, France.

TOPICS DISCUSSED:

(a) World population prospects.

(b) Future growth of population and changes in population composition: measurement, dynamics and projections.

(c) Migration in relation to future growth of population and its distribution.

Background paper:

1. Taeuber, Irene B. — Future population trends

Invited papers:

1. Arévalo, Jorge V.—Future population of the Argentine Republic
2. Boyarsky, A. Y.—A contribution to the problem of the world population in the year 2000
3. Das Gupta, Ajit, and Sen Gupta, Suranjan—Population projections for Thailand and a study of the elements and criteria
4. Obradović, Sava—Influence of economic development on migration in Yugoslavia
5. Okazaki, Yoichi—Migration in relation to future growth of population and its distribution; internal migration and population distribution—Japan
6. Pressat, Roland—The present and future demographic situation in China
7. Smulevich, B. Y.—Present and future patterns of population replacement
8. Sovani, N. V.—Internal migration and the future trend of population in India
9. van de Walle, E.—Future growth of population and changes in population composition: Tropical Africa
10. Vávra, Zdeněk—Projection of world population (distinguishing more developed and less developed areas at present)

Volunteered papers:

1. Benítez Zenteno, R., and Cabrera Acevedo, G.—The future population of Mexico: total, rural and urban
2. Blanc, Robert—Population forecasts: Practical problems of making such forecasts in the developing countries
3. Dürand, J. D.—World population estimates, 1750-2000
4. Madigan, Francis C.—Estimated trends of fertility, mortality and natural increase in the north Mindanao region of the Philippine Islands, 1960-1970
5. Miner, Jerry—Alternative population projections and first-level school enrolments
6. Oblath, Attilio—Recent developments and prospects of migration in Europe
7. von Ungern-Sternberg, Roderich—Future consequences of the differences in population growth in Europe, Asia—particularly China—and North Africa
8. Witthauer, Kurt—Demographical comparative and flow diagrams

Friday, 3 September 1965

Meeting A.6. Demographic aspects of educational development

Organizer—Mr. J. Arias, Rector de la Universidad de San Carlos, San Carlos, Guatemala.

Moderator—Mr. P. J. Idenburg, Director-General of Statistics, Central Bureau of Statistics, The Hague, Netherlands.

Rapporteur—Mr. E. Solomon, Statistics Division, United Nations Educational, Scientific and Cultural Organization, Paris, France.

Chairman—Mr. B. A. Liu, Associate Professor, City College of New York, New York, United States.

TOPICS DISCUSSED:

(a) Demographic factors affecting provision of educational facilities and services.

(b) Effects of educational development upon trends of fertility, mortality and internal migration.

(c) Demographic considerations in integrated planning of educational development.

(d) Supply and distribution of skilled personnel in relation to economic and social development.

Background paper:

1. Idenburg, Philip J.—Educational consequences and determinants of population trends

Invited papers:

1. Bzhilyansky, Y. A.—Training and distribution of qualified personnel in the Soviet Union
2. Carleton, Robert O.—The effect of educational improvement on fertility trends in Latin America
3. Dandekar, Kumudini—Effect of education on fertility
4. Hereford, Karl T.—Some demographic and economic aspects of Central American education and their implications for the public administration of education
5. Jacoby, E. G.—An educational growth index as an instrument in measuring and planning education development
6. Liu, Bangnee Alfred—Some demographic factors associated with the development of school enrolment
7. Phillips, H. M.—Demographic considerations in integrated planning of education
8. Ramírez Arias, Mariano—Educational aspects of the labour force in relation to the economic and social development of Central America

9. Sadie, Jan L.—The demographic factors involved in the provision of educational facilities in the Transkei
10. Stycos, J. Mayone—Education and fertility in Puerto Rico
11. Vaizey, J. E.—Demographic considerations in integrated planning of educational levels

Volunteered papers:

1. Dinkel, Robert M.—Education and fertility in the United States
2. Girard, Alain—Population growth and growth of education in France
3. Nam, Charles B.—Factors associated with the

historical decline of illiteracy in the United States

4. Price, Daniel O.—Effects of out-migration on educational level of Negro males in Southern United States
5. Schmid, Calvin F.—Logic, techniques, interpretations, applications and limitations of enrolment forecasts
6. Serdar, Vladimir—Repercussions of various rates of natural population increase on the educational level of the population of Yugoslavia
7. Tien, H. Yuan—Educational expansion, deployment of educated personnel and economic development in China

Monday, 6 September 1965

Meeting A.5. Demographic aspects of labour supply and employment

Organizer—Mr. Francis Blanchard, Deputy Director-General, International Labour Organisation, Geneva, Switzerland.

Moderator—Mr. Jan L. Sadie, Professor of Economics, University of Stellenbosch, Stellenbosch, South Africa.

Rapporteur—Mr. Jack Harewood, Director, Central Statistical Service, Port of Spain, Trinidad.

Chairman—Mr. P. F. Myers, Chief, Foreign Demographic Analysis Division, United States Bureau of Census, Washington, D.C., United States.

TOPICS DISCUSSED:

(a) Patterns and trends of rates of participation in economic activities and dependency ratios, and factors affecting them.

(b) Demographic considerations in manpower and employment policy.

(c) Demographic aspects of unemployment and underemployment problems.

Background paper:

1. Sadie, Jan L.—Demographic aspects of labour supply and employment

Invited papers:

1. dell'Angelo, Gian Giacomo—Regional aspects of employment and underemployment in Italian agriculture
2. Aromin, Basilio B.—Population and labour force growth in selected countries of Asia and the Far East
3. van den Boomen, J.—Population and labour force growth in selected Latin American countries

4. Elizaga, Juan C.—The demographic aspects of unemployment and underemployment in Latin America

5. El-Shafei, A. M. N.—Past trends and future prospects of changes in structure of population and labour force in the Middle East

6. El-Tawil, Bahgat, and Tabbarah, Riad—Population and labour force growth in selected African countries

7. Garfinkle, Stuart—The lengthening of working life and its implications

8. Gendell, Murray—The influence of family-building activity on women's rate of economic activity

9. Hauser, Philip M.—Interrelationships of manpower policy and population policy

10. Herberger, Lothar—Demographic changes and manpower problems in the Common Market countries of Europe

11. Hovne, Avner—Demographic aspects of employment and underemployment in Israel

12. Ilyina, K. G.—The participation of women in economic activities in the Soviet Union

13. Litvyakov, P. P.—Economic and social factors in ensuring full employment (experience of the Soviet Union)

14. Olin, Ulla—Population growth and problems of employment in Asia and the Far East

15. Penniment, K. J.—The influence of cultural and socio-economic factors on labour force participation rates

16. Stewart, C. M.—Degree of urbanization and patterns of labour force participation

Volunteered papers:

1. Bui-Dang-Ha Doan, J.—Demographic studies on occupation in France

2. Datar, B. N.—Demographic aspects of unemployment and underemployment with particular reference to India
3. Gnanasekaran, K. S.—Manpower structure in relation to economic growth
4. Gravogl, Josef—Demographic influences on labour force in Austria
5. Nultsch, Gerhard—The planned distribution of manpower on the industrial focal points of socialist construction in the German Democratic Republic, represented as the latest results of public education and internal migration statistics
6. Paskhaver, I. S.—The rational utilization of rural manpower in the Soviet Union
7. Revankar, G. S.—An aspect of global view of labour force growth
8. Saïdi, Salama—Demographic aspects of labour and employment
9. Saw, Swee-Hock—Uses of working life tables in Malaya
10. Sinha, J. N.—Dynamics of female participation in economic activity in a developing economy
11. Szabady, Egon—Demographic aspects of the changes in the structure of the population by economic activity in Hungary
12. Yagodkin, V. N.—Technical progress and employment in the Soviet Union
13. Zimmerman, Anthony—A proposed mass technique to promote fuller utilization of human resources in developing countries

Monday, 6 September 1965

Meeting B.11. Definition and measurement of economically active population, employment, unemployment and underemployment

Organizer—Mr. Miloš Macura, Director, Federal Statistical Institute, Belgrade, Yugoslavia.

Moderator—Mr. A. Das Gupta, consultant, Calcutta, India.

Rapporteur—Mr. L. Herberger, Statistisches Bundesamt, Wiesbaden, Federal Republic of Germany.

Chairman—Mr. H. E. Riley, Chief Statistician, Statistical Division, International Labour Organisation, Geneva, Switzerland.

TOPICS DISCUSSED:

(a) Recent experiences concerning definition and measurement of economically active population.

(b) Recent experiences concerning definition and measurement of employment and unemployment.

(c) Problems of defining and measuring economically active population, employment and unemployment in non-monetary sectors of the economy with particular reference to less developed areas.

(d) Definition, measurement techniques and procedures in obtaining data on underemployment.

Invited papers:

1. Albricht, Leland S.—Recent developments in statistical standards concerning the economi-

cally active population as exemplified in European censuses of population

2. Ban, M.—Family workers and the definition of economically active population
3. Doctor, Kailas C.—Recent progress in underemployment statistics and analysis
4. Harewood, Rupert J.—Some views on the collection, analysis and utilization of current employment statistics in an economically less developed country
5. Jaffe, A. J., and Quesada, L. E.—Assessment of underemployment in non-agricultural industries of the less developed countries
6. Lacroix, Henri P.—Labour force statistics
7. Mitra, Asok—Indian experience in recording economically active population: 1961 population census
8. Miura, Yuki—A comparative analysis of operational definitions of the economically active population in African and Asian statistics
9. Rodzyalovskaya, V. V.—The range and limitations of the standard definition of active and non-active population and of partial employment in Soviet statistics
10. Sauvy, Alfred—Definition of the working population
11. Stanev, Stéfan—Socio-economic characteristics of the economically active population

Volunteered papers:

1. Pavlík, Zdeněk—Definition of, and research on, economically active population
2. Theodore, G.—Attempt at research into the outside activities of members of farm households

Monday, 6 September 1965

Meeting B.4. Projections of population size and age-sex structure

Organiser — Mr. H. Hyrenius, Director, Department of Statistics, Demographic Institute, Göteborg, Sweden.

Moderator — Mr. H. S. Shryock, Assistant-Chief for Programme Development, Population Division, United States Bureau of the Census, Washington, D.C., United States.

Rapporteur — Mr. P. R. Cox, Deputy Government Actuary, Caxton House East, London, United Kingdom.

Chairman — Mr. V. Urquidí, Research Advisor, Centro de Estudios Económicos y Demográficos, Colegio de México, Mexico City, Mexico.

TOPICS DISCUSSED:

(a) Methods and problems of projections of population size and sex-age structure.

(b) Degree of success of efforts to forecast population growth during the 1950's and sources of errors.

(c) Types of data and studies required to improve the basis for projections of population size and sex-age structure.

Background paper:

1. Shryock, Henry S. — Projections of total population and of age-sex structure

Invited papers:

1. Adams, Edith, and Menon, P. Sankar — Types of data and studies needed to improve the basis for population projections in tropical Africa

2. Bendiksen, Bjørnulf — Schematized local projections in connexion with a population census
3. Grauman, John V. — Success and failure in population forecasts of the 1950's; a general appraisal
4. Kono, Shigemi — Forecasts in some Asian areas during recent years: Criticism and suggestions
5. Muhsam, H. V. — The use of cost functions in making assumptions for population forecasts
6. Peláez, César A. — The degree of success achieved in the population projections for Latin America made since 1950. Sources of error. Data and studies needed in order to improve the basis for calculating projections
7. Pobedina, A. F. — The use of electronic computers for population projections
8. Romaniuk, A. — Projection basis for populations of Tropical Africa: A general discussion
9. Visaria, Pravin M. — Population projections for countries of Middle South Asia during the 1950's
10. Yamaguchi, J. Tohr — Under-enumeration of the initial population and under-registration of the births as sources of errors in population projections

Volunteered papers:

1. Castellano, Vittorio — Methods of analysing interrelationships between demographic phenomena and social and economic phenomena
2. Maroufi-Bozorgi, Nasser — Population projection for Iran 1956-1976
3. Törnqvist, Leo — The post-war population development of Finland compared with predictions made after the war

Tuesday, 7 September 1965

Meeting B.10. Population and natural resources

Organizer — Mr. H. L. Keenleyside, Chairman, British Columbia Hydroelectric and Power Authority, Vancouver, British Columbia, Canada.

Moderator — Mr. E. Ackerman, Executive Officer, Carnegie Institution of Washington, D.C., United States.

Rapporteur — Mr. Stjepan Han, Samoštalni Savetnik, Savenog Izvrnog Vecá, Visokog Stevana 31/1, Belgrade, Yugoslavia.

Chairman — Mr. D. Valentei, Chairman, Council of Population Problems, Ministry of High and Secondary Specialized Education, Moscow, Soviet Union.

TOPICS DISCUSSED:

- (a) Mineral resources.
- (b) Energy and fuel resources.
- (c) Resources of wood and fibres.
- (d) Water resources and the population problem.
- (e) Creatable resources and the possibilities of substitution.
- (f) Resources, population and trade.
- (g) Significance of administrative practices in resource utilization.

Background paper:

1. Spengler, Joseph — Population and natural resources

Invited papers:

1. Bass, Lawrence W., and Langley, S. J. — Utilization of renewable resources as a stimulus for socio-economic development
2. Fisher, Joseph L. — The relationship of material resources and population to economic and social development
3. Hubbert, King — Mineral resources and rates of consumption
4. Jukes, J. A. — Nuclear energy and other recent developments in the generation and distribution of energy

5. Kahana, Yona — Conservation and repeated use of water
6. Murgesco, Costin — Can natural resources and manpower be used more efficiently? The outline of an answer based on Romania's experience
7. Sawaf, Zafer A. — Minerals and living standards in the developing countries
8. Zhavoronkov, N. M. — Chemistry and the vital resources of mankind (The use of substitutes and their industrial and economic significance)

Volunteered papers:

1. Ebeid, F. M., and Rihan, T. I. — World energy and energy resources in the United Arab Republic
2. Lisichkin, S. M. — Population growth and power resources

Tuesday, 7 September 1965

Meeting B.5. Projections of urban and rural population, economically active population, households and families

Organizer — Mr. B. Bendiksen, Head, Population and Census Division, Central Bureau of Statistics, Oslo, Norway.

Moderator — Mr. H. V. Muhsam, Associate Professor of Statistics, Hebrew University, Jerusalem, Israel.

Rapporteur — Mr. P. C. Glick, Assistant Chief, Population Division, United States Bureau of the Census, Washington, D.C., United States of America.

Chairman — Mr. V. Bourlin, Deputy Director, Central Statistical Administration of the Ukrainian Soviet Socialist Republic, Kiev, Soviet Union.

TOPICS DISCUSSED:

- (a) Projections of economically active population.
- (b) Projections of households and families.
- (c) Projections of urban-rural distribution.
- (d) Projections in the developing countries.

Background paper:

1. Siegel, Jacob S. — Projections of urban and rural population and other socio-economic characteristics

Invited papers:

1. Araica A., Hildebrando — Some factors limiting the study and calculation of households in Latin America
2. Davis, Kingsley — Conceptual aspects of urban projections in developing countries

3. von Hofsten, Erland — Projections of the economically active population
4. Mehta, Surinder K. — Some views on the needs and problems of school-age population projections in the developing countries
5. Parke, Jr., Robert — The choice of assumptions in households and family projections
6. Podyachikh, P. G. — Population projections in which allowance is made for migration
7. Siegel, Jacob S. — Some principles and methods of projections of urban-rural population by age and sex
8. Volkov, A. G. — An analysis of family structure in projecting the number and composition of families
9. de Wolff, P. — Employment forecasting by professions
10. Zitter, Meyer — Forecasting school enrolment

Volunteered papers:

1. Hansluwka, Harald — A projection of the Austrian labour force until 1980
2. Józefowicz, Adam — Notes on the methods of the manpower projections
3. MacDonald, John Stuart — Anticipating city growth population projections for urban development planning
4. Tamásy, József — Projections of families in Hungary. Method and some preliminary results
5. Tilak, V. R. K. — Some problems in projecting the economically active population
6. Ulyanova, A. F. — The methods of drawing up the current and planned balances of labour resources in the Union of Soviet Socialist Republics

Tuesday, 7 September 1965

Meeting A.7. Demographic aspects of agricultural development and food supply

Organizer — Mr. P. V. Sukhatme, Director, Statistics Division, Department of Economic and Social Affairs, Food and Agriculture Organization, Rome, Italy.

Moderator — Mr. C. Taeuber, Assistant Director, United States Bureau of the Census, Washington, D.C., United States.

Rapporteur — Mr. B. Bantegui, Director, Office of Statistical Coordination and Standards, National Economic Council, Manila, Philippines.

Chairman — Mr. V. E. Ovsienko, Head, Department of Statistics, Moscow Institute of Economics and Statistics, Moscow, Soviet Union.

TOPICS DISCUSSED:

(a) Demographic factors affecting magnitude and distribution of food requirements and production.

(b) Interrelations of economic growth, agricultural productivity, and demographic factors.

(c) Population and agricultural resources.

Background paper:

1. Sukhatme, P. V., Schulte, W., and Ahmad, Z. M. — Demographic factors affecting food supplies and agricultural development

Invited papers:

1. Cépède, Michel — Relationship between population pressure (or growth) and systems of land tenure, the fragmentation of holdings, and customs affecting fertility in rural areas
2. Dandekar, V. M. — Role of food aid under conditions of rapid population growth
3. Ducoff, Louis J. — Population growth in relation to the agricultural labour force in developed and some developing American countries
4. Fischnich, O. E. — The possibilities of expanding food production by 1980

5. Herer, Victor — The relationship between the volume of agricultural investment and the rate of population increase
6. Hsieh, S. C., and Lee, T. H. — The effect of population pressure and seasonal labour surplus on the pattern and intensity of agriculture in Taiwan
7. Malin, K. M. — Food resources of the earth
8. de Medina, Carlos Alberto — Urbanization, industrialization and food production in Brazil
9. Omaboe, E. N. — The population pressure and the development of new areas
10. Panse, V. G., and Amble, V. N. — The future of the population and the food supply of India
11. Sen, S. R. — Population, land resources and agricultural growth
12. Sokolov, M. M. — Prospects of agricultural development in connexion with population growth
13. Sukhatme, P. V., and Schulte, W. — Forecasts of nutritional requirements and the expected levels of demand for food
14. de Vries, E. — Historical evidence concerning the effect of population pressure and growth on technical progress in agriculture
15. Yajima, T. — The effect of population pressure and seasonal labour surplus on the pattern and intensity of agriculture

Volunteered papers:

1. Boserup, Ester — The interrelation between population trends and agricultural methods
2. Krasovec, Stane I. — Role of peasant-workers in economic development under conditions of population pressure
3. Mashbitz, Y. G. — Population growth and the food problem in Latin America
4. Phillips, Ralph W. — Interrelationships among population trends, land availabilities and food supplies
5. Sarkar, N. K. — The influence of population trend in the plans of developing countries

Wednesday, 8 September 1965

Meeting A.9. Demographic aspects of savings, investments, technological development and industrialization

Organizer — Mr. J. H. Adler, Director, Economic Development Institute, International Bank for Reconstruction and Development, Washington, D.C., United States.

Moderator — Mr. J. Faaland, Director of Research and Fellow of the Christian Michelsen Institute, Bergen, Norway.

Rapporteur — Mr. H. Correa, International Institute for Educational Planning, United Nations Educational, Scientific and Cultural Organization, Paris, France.

Chairman — Mr. H. Leibenstein, Department of Economics, University of California, Berkeley, California, United States.

TOPICS DISCUSSED:

(a) Demographic factors affecting capital requirements, rate of savings, industrialization and flexibility of the economy.

(b) Demographic considerations in the strategy of investments and technological development.

Background paper:

1. Demeny, Paul—Demographic aspects of saving, investment, employment and productivity

Invited papers:

1. Choudhry, N. K., and Kotowitz, Y.—Some simple economic-demographic relationships—The Canadian experience
2. Leibenstein, Harvey—The impact of population growth on "non-economic" determinants of economic growth
3. Macura, Miloš—Relation between demographic

projections and formulation of a development programme

4. Martin, Cyril J.—Demographic aspects of capital formation in economies with large subsistence sectors (Africa)
5. Mitra, Ashok—The demographic aspects of capital formation. Differences between urban and rural populations
6. Rabinovitz, P. M.—Influence of economic cycles on the movement of population
7. Sayigh, Yusif A.—Population growth, capital formation and economic growth in the Middle East
8. Urquidi, Víctor L.—Population growth and economic development in Latin America

Volunteered paper:

1. Bjerke, Kjeld—The decrease in the Danish agricultural labour force, the increase in the real capital and the effects on productivity

Wednesday, 8 September 1965

Meeting A.10. Demographic aspects of economic growth

Organiser—Mr. A. Sauvy, professeur au Collège de France, Paris, France.

Moderator—Mr. S. Kuznets, Professor of Economics, Harvard University, Cambridge, Massachusetts, United States.

Rapporteur—Mr. D. Benham, professeur de démographie, Université de Téhéran, Téhéran, Iran.

Chairman—Mr. T. V. Ryabushkin, Deputy Director, Institute of the Economics of the World Socialist System, Moscow, Soviet Union.

TOPICS DISCUSSED:

(a) Effects of rate of population growth and structure of population on output per head and on possibilities of economic development in the economic and demographic circumstances of particular countries.

(b) Problems involved in efforts to overcome demographic obstacles to achievement of economic development goals; institutional and organizational factors; possibilities of success of such efforts in the circumstances of particular countries.

Background paper:

1. Kuznets, Simon—Demographic aspects of modern economic growth

Invited papers:

1. Agblemagnon, F. N'Sougan—Demographic aspects of economic growth: The case of Togo

2. Assouline, Albert—Natural increase in population and economic development in Morocco
3. Benko, François—Economic progress, investment and population growth in the developing countries
4. Berent, Jerzy—The impact of changes in the employment structure on the rate of economic growth, illustrated by post-war trends in Europe
5. Bickel, Wilhelm—Foreign workers and economic growth in Switzerland
6. Clark, Colin—The first stages of economic growth
7. Fourastié, Jean—Economic growth and the working population in France since 1950
8. Mayobre, José Antonio—Economic development and population growth in Latin America
9. Nazarevsky, O. R., and Tchumichev, D. A.—Demographic processes and their relationship with the processes of social and economic progress in the Soviet Republics of Central Asia
10. N'Diaye, Amadou Lamine—The difficulties of rapid population growth in an under-populated country. An example: Senegal
11. Ovsienko, V. E.—Influence of social and economic factors on demographic characteristics
12. Rao, V. K. R. V.—Manpower planning and economic growth with special reference to less developed countries
13. Romaniuk, Kazimierz—The demographic aspects of economic growth in Poland
14. Seklani, Mahmoud—The cost of population growth under the Tunisian Development Plan (1962-1971)

15. Spengler, Joseph J.—Points of contact between the growth of population and the growth of national product
16. Tabah, Léon—Capital requirements of the developing countries: A comparison of evaluations
17. Tagliacarne, G.—Repercussions of the economic situation on demographic movements in Italy
18. Zhdanko, T. A., and Vasilyeva, G. P.—The influence of industrialization and urbanization on the way of living of the peoples of Central Asia and Kazakhstan
5. Easterlin, Richard A.—On swings in demographic and economic growth
6. Garzouzi, Eva—The effect of industrialization on population growth
7. Guzevaty, Y. N.—Modern Malthusianism and problems of social development of liberated countries
8. Horváth, Robert—Kossuth's views on the interrelation of economic growth and demographic factors in his lectures at London University
9. Igun, Adenola A.—Demographic approach to the problems of social and economic development in Africa
10. Nagda, Sohanlal—Population growth and economic development in ECAFE region
11. Ros-Jimeno, José—Population and economic development in Spain
12. Ryabushkin, T. V.—Social and economic development and demographic processes in European socialist countries
13. Slesarev, G. A.—Demographic changes in an industrial area and their social significance
14. Wertheim, W. F.—Recent trends in China's population policy

Volunteered papers:

1. Billig, Wilhelm—Population trends in the socialist countries
2. Boserup, Mogens—The economic problem of the demographic explosion. Some general reflections
3. Braginsky, B. I.—Demographic factors in connexion with planning economic development
4. Brand, Willem—Some observations on the relationship between population increase and economic growth

Thursday, 9 September 1965

Meeting A.11. Summary and discussion of principal results of topical meetings: A.1, A.2, A.3, A.4, B.1, B.2, B.3, B.4, B.5, B.6, B.7, B.8, B.9, B.12

Organizing Chairman—Mr. J. Mertens de Wilmars, professeur à l'Université catholique de Louvain, Louvain, Belgium.

Rapporteur: United Nations staff.

Friday, 10 September 1965

Meeting A.12. Summary and discussion of principal results of topical meetings: A.5, A.6, A.7, A.8, A.9, A.10, B.10, B.11, B.13

Organizing Chairman—Mr. P. G. Podyachikh, Head, Population Census Department, Central Statistical Administration of the Soviet Union, Moscow, Soviet Union.

Rapporteur—United Nations staff.

Closing of the Conference

III. SUMMARY REPORTS OF MEETINGS

OPENING SESSION

Report on the meeting prepared by the United Nations Secretariat

The first plenary meeting of the World Population Conference, 1965, was opened on behalf of the Secretary-General of the United Nations by Mr. Philippe de Seynes, Under-Secretary, Department of Economic and Social Affairs. This and subsequent meetings were held at the Trade Union Building, Trg Marksa i Engelsa 1, Belgrade.

The programme of the inaugural meeting commenced with an address by H.E. Mr. Petar Stambolić, President of the Federal Executive Council of the Federal People's Republic of Yugoslavia.

STATEMENT BY H.E. MR. PETAR STAMBOLIĆ

"Mr. President, Ladies and Gentlemen, Comrades:

"Allow me to greet you on behalf of the President of the Socialist Federal Republic of Yugoslavia, on behalf of the Federal Executive Council and on my own behalf, to express the hope that your work will be crowned with success and to wish you a pleasant stay among us. I should also like to say how much we appreciate the fact that the honour of being host country to the Second World Population Conference has fallen to Yugoslavia.

"There are two reasons why we are particularly glad that this Conference should be taking place in our country. The first is that Yugoslavia, the regions of which have advanced to different stages, is undergoing extremely vigorous economic and social development. This obviously has a great effect on the changes occurring in the population, whence arise very special problems which are receiving our constant attention. Those problems will also be considered by your Conference, and I hope its results will appreciably benefit our country itself.

"The second reason is that the questions that will be considered at this Conference constitute an integral part of the complex of problems relating to the acceleration of the

developing countries' economic and social development. Yugoslavia is consistently striving, both within the United Nations and by means of direct co-operation with other countries, to secure the speedy adoption of measures to solve the problems and difficulties which are increasingly arising in relations between the highly industrialised and the developing countries. It is for that reason that Yugoslavia, together with all the developing countries, is actively participating in the work of the United Nations Conference on Trade and Development, and why it is also supporting other measures undertaken by the United Nations to the same end.

"The worsening of the international situation during the past year may be seen as the result of the existence of a number of open questions in international relations, of the inadequate solution of critical problems, and of resistance to endeavours to establish international relations on a basis of equality, justice and friendly co-operation. Among the open world questions, economic and social problems, being at the same time key problems in themselves, are obviously very closely related to those this Conference will be considering. In pursuance of a policy of peace and guided by the principles of active coexistence, Yugoslavia regards as beneficial any international action that leads to better understanding among the nations and their mutual reconciliation, that creates favourable conditions for the solution of present problems, and contributes towards peace and the fulfilment of mankind's aspiration to progress. In this world, in which there are many factors of disunity, science and scientific co-operation can undoubtedly contribute towards those ends. The scientific treatment of important questions such as those on the agenda of your Conference opens the way to the exchange of scientific results and experience, the discovery of common interests and the search for solutions. This can help to strengthen mutual trust, which is most important for the solution of the problems of the present day world.

"Population problems, in the widest sense of the term, are now among the most important of world problems. This is more particularly the case since they are intimately bound up with the advance of mankind in general, and in particular with one of the key problems of the present time, the developing countries' economic development. At the heart of all these problems, clearly, stands the human being, and his prospects of a better future.

"It is a well-known fact that many adverse demographic events are taking place mainly in the economically undeveloped regions, where, for historical reasons, production is very scanty and the standard of living very low. The well-known lack of proportion in the distribution of world wealth, of population, production and consumption, is so great that it is difficult to see in it any traces of the rationality and humanity to which modern man aspires. A solution to this problem is in the interests of all, of the developed countries as well as of those in course of development. Your Conference has before it the complex task of analyzing present trends and of indicating changes in the demographic processes in reciprocal relationship with economic and social development. This problem is rendered still more complex by the fact that modern science cannot simply confine itself to establishing facts, but has also to indicate solutions. This Conference's responsibility is consequently increased by the fact that it is taking place in the middle of the United Nations Development Decade, the purpose of which is to accelerate the economic and social development of the developing countries and to open the way for the progressive decrease of differences in the world.

"Your Conference cannot, presumably, fail to take into account existing national experience. Many countries, while intensifying their economy's development, are opening the way for changes in the population's traditional structure, by industrial, educational, urban and other progressive means, and creating conditions for more rational and more humane reproduction. It goes without saying that the choice of a population policy is a matter for sovereign decision on the part of each country. That, however, does not exclude the possibility of, and the need for, seeking in a meeting such as yours, the best possible solutions arising out of scientific discussions, both from a national and a world point of view. It is a fact that we are living in an indivisible world, although it is so badly torn by contradictions, and solutions to its fundamental problems have to be sought

on a world-wide scale and through international co-operation.

"The disproportionate development of certain regions of Yugoslavia in the past has led to demographic manifestations of a varied and often very disadvantageous character. It was not possible to eliminate them in the short time between the two wars on account of the unsatisfactory economic, social and political circumstances that prevailed at the time.

"Twenty years previously, in the early stages of the socialist transformation of this society we found ourselves faced by disproportionate and unpropitious demographic movements. Our policy, viewed in the long term, is directed towards a rapid and intensive development, the building up of socialist relations and the strengthening of the system of self-management. This policy also includes the improvement of public health, public education and the public services generally, in short, the creation of circumstances in which production and the standard of living would rise while at the same time the citizen would be able to develop his physical, intellectual and moral qualities in all freedom.

"The realization of this policy inevitably resulted in a massive emigration of the population from agricultural pursuits towards industry and other non-agricultural activities. The consequences of this state of affairs are many and varied. Those which relate to the changes in the structure and reproduction of the population will be of particular interest to demographic science. Our experience during the last twenty years has shown that the changes in the economic and social structure of the country have had a direct influence on demographic movements. The interdependence of economic, social and demographic developments in our less developed regions is particularly interesting, for it shows us that the transformation of men and of the population takes place parallel with the general development. It is obvious that we are confronted today with many demographic problems, still unsolved, a situation similar to that in other countries. Nevertheless, we hope to be able to solve many of them, and in particular those which are particularly unfavourable, whilst bringing about the continued economic, social and cultural development of the country.

"I cannot speak of all these questions without stressing the great merits of the United Nations, the specialized agencies and the International Union for the Scientific Study of Population in having brought these matters before world public opinion. The United Na-

tions has drawn the attention of the whole world to these demographic questions as is proved by this great international assembly. We trust that the population situation will henceforth be allotted a more important place in the activities of the world Organization, a place which these subjects deserve in the general efforts being made to render the life of mankind and the nations better and happier.

"At this moment, when the work of the Second World Population Conference is beginning, we turn our thoughts to those millions which constitute the population of the world: to those who in spite of many differences are bound by a common desire for progress, for economic and cultural improvement and for world peace, which is one of the essential guarantees for the realization of their hopes. It is in that spirit that I wish you once again a fruitful session that will be crowned with success for the welfare of all mankind, all nations and the entire world community."

In the opening session, Mr. Philippe de Seynes, representative of the Secretary-General of the United Nations, made the following statement.

STATEMENT BY MR. PHILIPPE DE SEYNES

"The interest, indeed the disquiet, aroused by the population problem is not new. Demography is not a new discipline; probably none of the social sciences can claim seniority over it. It goes back at least to the seventeenth century, and according to Mr. Keyfitz, at that period, it was already referring to antecedents which could be traced to the earliest times. Nor is it anything new for demographic research to look towards concrete action. From its early days and throughout its history 'political arithmetic', as it was once called was very largely dominated by a concern for the satisfaction of economic needs, although in the past as at present, considerations of national power have at times influenced its approach and conclusions.

"What is it then that makes us feel, in opening this Conference—ostensibly a technical Conference—that we are taking part in an exceptional occurrence, with a political dimension and, for those of us whose careers are in international life, an event as great in scope as those major confrontations which have taken place over the past two years under the auspices of the United Nations, on science and technology, on trade and development? Doubtlessly, the phenomenon of accelerated growth on an unprecedented scale which the expression 'population explosion' conjures up for us

though it does not elucidate it, a phenomenon that has now reached a point where its dramatic and even threatening character might well become a real obsession; the fact also that the spotlight of public opinion is now focused on this third world where the phenomenon is seen at its most intense, where in some countries the annual growth rate exceeds 3 per cent, a rate high enough to double their population in less than twenty-five years and set at nought their hopes of a higher standard of living; the paradox, to many people more and more difficult to account for, that, while mortality rates are increasingly subject to the effects of modern science, birth rates continue to be almost exclusively governed by traditional values; the more and more widespread refusal of the human race to leave its destiny to the whim of chance and the presence of economic planners—by whatever name they may be called, in a large and compact band, interjecting their challenging queries concerning all demographic trends.

"In the face of a situation which in so many respects is so pressing, the present state of demography is not wholly satisfactory. This confession, and the act of contrition that goes with it, seem to me to be the indispensable premises underlying this Conference which we all hope will provide, first and foremost, a new impetus in the field of research and training. As far as the United Nations is concerned, I can assure you that under the stimulus of the event, we have examined our conscience; and at its recent session this very summer, the Economic and Social Council committed itself to new and greater efforts.

"There has developed an imbalance, to the detriment of population studies, in the course of the great blossoming of the social sciences during the first part of the twentieth century. The causes are rather obscure. It is possible that certain cultural factors, certain mental attitudes, helped to cause this gap; that a kind of inhibition grew up with regard to demographic studies such as is not unknown in the history of thought; that reluctance to go into certain aspects of the problem of fertility which call into question deep-rooted philosophical or religious beliefs has more or less unconsciously discouraged investigation of the whole of the much broader field of demography. At any rate demographic research has apparently never received from international debate—always somewhat circumspect—the impulse which has proved so beneficial to other disciplines. If this is true, this drawback would certainly have disappeared today. A recon-

sideration of positions, perhaps a re-assessment of values, is taking place within the very groups which in the past showed themselves to be the most concerned about possible conflicts with transcendental principles. The pursuit of more knowledge is recognized as an urgent task, whatever conclusions different communities may wish to draw from it in the light of their cultures or traditions.

"We do not have enough facts at our disposal to serve as a basis for a reliable system of causality and reciprocal relationships, and in our eagerness for conclusions we make hasty generalizations. The degree of doctrinal acceptance which some sectors of economic and social thought have achieved does not yet exist in the demographic fields. We are passing through a dangerous phase where the overriding need for factual data and findings seems to encourage, or in any case to condone, a certain measure of licence, certain leaps of the deductive mind which would be denounced forthwith in other spheres. Few fields are at the present time so wide open to misleading simplifications.

"Prediction is one of the primary aims of science, and the social sciences, like the other sciences, are striving in that direction, whatever the difficulties encountered. Greater accuracy in forecasting population trends is one of the essential services that statesmen ask of demographers, and an effort, probably a massive effort, is needed to give these forecasts a more solid basis. It is not merely a matter of improving and developing forecasting techniques of greater precision, but first of deepening and extending our knowledge of the ways in which the various aspects of demographic trends and the changing material and cultural conditions of the economic and social environment may interact on each other. This is a field of unstable relationships and we are insufficiently equipped with the factual data needed to work out the complex models which are called for. Yet we cannot analyze demographic trends as if the conditions observed in the past were likely to be perpetuated under a laissez-faire policy; as if changes such as are continually occurring in the economic and social factors, were not going to operate in the period covered by our forecasts. We should not use concepts such as over-population, under-population, or demographic optimum, on the basis of a system of interrelationships which is too mechanistic and static. Failing a rapid improvement in our knowledge, we will be more and more tempted to extrapolate without taking

into account the specific nature of the few situations which we have studied in depth.

"The documents submitted to your Conference provide an illustration of the wide divergence of interpretation which prevails in connexion with such questions as the impact of population on the formation of savings or on rural underemployment. With regard to education, we can doubtless foresee the direction in which it influences population, but we are quite unable to predict the scale of that effect. And I am not referring to the variations now being written on the Malthusian theme of population pressure on available land. As Mr. Mogens Boserup so rightly remarks in his excellent paper, an over-simple identification of population pressures with food shortages is frequently alluded to in order to justify various kinds of agricultural and commercial policies, as we were able to witness during the United Nations Conference on Trade and Development.

"In all these fields, demographers cannot advise Governments on the basis of general formulae which have not been sufficiently tested. They can only do so on the strength of concrete and specific research into each individual situation. That is a considerable undertaking, for which we shall require large numbers of staff rigorously trained in the most up-to-date methods. It is gratifying to note that able young people are today being attracted in greater numbers to the study of demography, but we cannot help fearing that the present expansion may still not be enough at a time when we should very rapidly make up for past delays in order to meet a demand which has suddenly rocketed.

"One of the aspects of the subject on which our knowledge is most deficient is that of rural-urban migration. This is a burning problem, a phenomenon which threatens the very equilibrium of new States, and yet we have not up to now managed to assess even roughly its constituent elements. We do not know much about the economic and social factors which condition such migratory movements or about the type of action which could effectively modify their direction or their intensity. Efforts made recently by the Secretariat to produce a rough estimate of the changes which have occurred in urban and rural populations during recent decades have shown how weak is the statistical basis for such studies and how insufficient are the concepts and classifications used in population censuses.

"We shall, I trust, be able to learn from this Conference some lessons about the nature and

scale of the effort needed to provide both national communities and international organizations with the factual data and the analytical tools required for the execution of economic and social policies taking demographic factors fully into account. But at this precise point in history, we are expecting from such an important event something more than the hope of becoming better acquainted with the mechanisms which govern our social systems. We expect a more precise awareness of our most immediate responsibilities.

"We cannot fail to mention the fact that some Governments, representing a considerable proportion of the world's population, are now engaged by means of birth control methods in trying to curb a population growth which has acquired an alarming momentum. They have reached the conclusion, in some cases after much hesitation and heart-searching, that at the present rate of their population growth, too great a part of their total product is inevitably channelled toward the needs of the most elementary consumption, and that capital formation is dangerously slowed down; in some instances, the problem is even seen in terms of sheer survival.

"Action along these lines has in the past provoked vivid controversies in international organizations. On such matters, the United Nations organs maintain the neutral attitude which has traditionally been theirs. Respect for all beliefs commits us to this course. Moreover, in the present state of our knowledge, there could be no question of attempting to define a United Nations doctrine on the subject of birth-control. But we are ready to respond to all requests for assistance from any country which, on the basis of its own assessment of the situation, has decided to embark on such a policy or to explore its possibilities. We have recently had the privilege of doing so in India, and in case there were any doubts lingering in the minds of some, the legitimacy of this action has recently been confirmed by the Economic and Social Council. Once the decision is made to adopt a policy, it is surely desirable to elucidate the infinitely complex conditions of its success and there are real advantages to be derived from intervention by international organizations, in view of the variety of experiences on which they can draw in a field which embraces disciplines as diverse as biology, medicine and social psychology.

"But there is more: the population problem cannot be considered in isolation. It is a prism, through which we see the whole great contemporary drama of the development of the

third world, and we do not attend this gathering with the detachment of the historian or the sociologist. We cannot help but situate the work of this Conference in the context of the Development Decade, the results of which have up to now been so disappointing, as was just recognized by the Economic and Social Council. Thus your debate acquires a very grave resonance. In nearly all fields the results fall short of the targets which were formulated or implied. The problems have proved to be both broader and deeper than had been suspected. The efforts of solidarity by the rich countries not only lack the necessary drive, but are in fact showing signs of a disquieting relaxation. The mobilization of expert know-how in the service of development is not proceeding with the requisite vigor. The curve of financial aid no longer runs parallel to that of national income or even State budgets. In fact, during the past two years, it has flattened out. New and serious problems are looming on the horizon of the affluent societies which may claim part of the resources which might have been devoted to the third world.

"If we are not to fall hopelessly behind our goals, there must be a new commitment, of the Governments and of the people. This Conference, taking place at mid-term of the Development Decade, in which such fervent hopes were invested, offers an opportunity for such a commitment, and it is in this spirit that I offer all participants the wholehearted wishes of the organization of the United Nations."

Mr. Ante Novak, Chairman of the Yugoslav Arrangements Committee, also spoke, welcoming the delegates, participants, observers and others to the Conference. Thereafter the Conference proceeded to elect unanimously the following officers.

President:

Professor Dolfe Vogeltnik (Yugoslavia).

Vice-Presidents:

Dr. M. Tachi (Japan),
Mr. Thomas Curtis (Guinea),
Professor Victor Urquidi (Mexico),
Mrs. Irene Taeuber (United States of America),
Dr. V. E. Ovsienko (Union of Soviet Socialist Republics),
Professor S. Somogyi (Italy).

Professor Vogeltnik, the President of the Conference, made an acceptance speech, after which the Conference heard an address by Dr. B. R. Sen, Director-General of the Food and Agriculture Organization of the United Nations.

STATEMENT BY DR. B. R. SEN

"Mr. President, Distinguished Delegates,
Ladies and Gentlemen:

"It is a signal honour for me to have the opportunity to address this world conference convened under the auspices of the United Nations and in co-operation with the specialized agencies to consider demographic questions in relation to the problems of economic and social development. This conference has been called not a day too soon, and its purpose reflects the growing awareness among nations of the implications of an unprecedented rate of population growth for the future well-being of mankind. The first World Population Conference, which was held in Rome over ten years ago, concerned itself mainly with the promotion of genetic research and the collection and co-ordination of demographic statistics, and made a valuable contribution to the international understanding of these aspects of the population problem. During the decade that has elapsed since then, the study of population growth has assumed critical importance as a major factor in determining the pace of economic and social progress in the developing countries. Nevertheless, it has to be admitted that, while the consequences of the continuation of the current situation have not escaped the attention of individual scientists, historians and sociologists, international intergovernmental organizations, including the United Nations, had to observe great caution—'neutrality', as the representative of the Secretary-General said this morning—in discussing matters of population policy, specially those relating to population stabilization, in order to avoid hurting the susceptibilities of Member Nations. The present Conference therefore initiates a welcome departure from the approach that has so far marked the consideration of population problems under the auspices of the United Nations.

"It would, I believe, be correct to say that among the international organizations which have consciously, deliberately, progressively approached the subject with an open mind and have tried to set the problem of population growth in a proper and realistic perspective in terms of their goals is FAO, which I have the honour to represent here today. FAO's primary tasks, as laid down in its Constitution, are to assist member nations to raise the nutritional levels of their peoples through improved production and distribution of food, to raise the living standards of rural populations and to contribute to an expanding world trade in agricultural products. In carrying out all these

tasks the question of population growth comes inescapably into play as a basic factor, though the actual implementation of a policy of population stabilization is not one of FAO's Charter responsibilities. Ever since I came to FAO at the end of 1956, I proceeded step by step to draw the attention of member nations to this factor affecting the whole range of our work and objectives.

"The first opportunity we had to have the problem presented authoritatively to our member governments was in 1959 when Professor Arnold Toynbee, the eminent historian, accepted our invitation to deliver the first McDougall Memorial Lecture at the tenth session of the FAO Conference. In his address he raised the moral issue 'What is the true end of Man', and answered it by saying that 'living human beings, whatever their number, shall develop the highest capacities of their nature, and what we should aim at is the optimum size of population for this purpose in the economic and social circumstances of each successive generation'. Professor Toynbee's address made an immediate impact, but it was clear from the reactions of the delegates present that world public opinion was not yet ready to face the issue and discuss the implications.

"Two years later, at the next FAO biennial Conference in 1961, we invited Mr. John D. Rockefeller III, who devoted most of his McDougall Memorial Lecture to the theme of population and food supplies. He said: 'The grim fact of population growth cuts across all the basic needs of mankind and, more than any other single factor, frustrates man's achievement of his higher needs.' From the reactions to Mr. Rockefeller's address it appeared that the subject was no longer anathema and that there was a possibility for the problem to be discussed more freely than before.

"At the Economic and Social Council in 1957, and again in 1958, I had raised the problem of hunger and want as a reflection of underproductivity and pleaded for concerted action by the United Nations family. In November 1959 the FAO Conference approved my proposal to launch the Freedom from Hunger Campaign in order to create a world-wide awareness of the perilous dimensions of hunger and malnutrition and of the urgency of taking timely action to avert a deepening crisis. The wide support that the campaign received from its very inception was a proof of the growing anxiety concerning the problem and the impetus it gave has been growing ever since.

"The year 1962 was marked by the historic pronouncements of Pope John XXIII. In his encyclical 'Pacem in Terris' Pope John dwelt at some length on man's rights and duties in a changing world. The great good man did not live to see how profoundly he had stirred the conscience and thinking of mankind, nor to follow up the implications of the great encyclical. The encyclical states that any human society, if it is to be well-ordered and productive, must lay down as a foundation the principle that every human being is a person; meaning that his nature is endowed with intelligence and free will, and that, by virtue of this, he has 'rights and duties of his own, flowing direct and simultaneously from his very nature, which are therefore universal, inviolable, and inalienable'. The first of these 'universal, inviolable, and inalienable rights' is defined as 'the right to life and a worthy standard of living', comprising 'the right to the means which are necessary and suitable for the proper development of life', including primarily food and other necessary goods and services. Thus, this first of the 'universal, inviolable, and inalienable rights' is defined as a *dual* right, that is, not merely the right to life but also the right to a worthy standard of living. The text of the encyclical does not itself comment on the implications of the stipulation of this dual right, affecting, as it does, the issue of the rapid rate of world population growth.

"The problem before mankind is that whatever practical new measures be taken nationally and internationally, now or in the future, aiming at the accelerating expansion of productive capacity for the provision of food and other means of livelihood, a continuation of present trends of population growth may well lead to a situation when 'the right to life' of those not yet living, that is of larger and larger numbers of future generations, will no longer be a right parallel to, but will be in conflict with, 'the right to a worthy standard of living'.

"In 1962 FAO launched a number of basic studies relating to its major fields of work in preparation for the World Food Congress which was held in 1963. One of these studies, *The Third World Food Survey*, clearly showed that 10 to 15 per cent of the world population are under-nourished, and up to half suffer from hunger or malnutrition or both. This survey also formulated food supply targets, both short-term and long-term, taking into consideration population projections and the need to eliminate under-nutrition and provide a modest improvement in the nutritional quality of the diet. To reach the short-term target by 1975 it would

be necessary to obtain an annual growth rate of 4 per cent in food supplies in the developing countries. This increased rate of food supplies has not been reached so far in the developing regions; in fact, the average annual rate of increase in food supplies during the last five years has not exceeded 2.5 per cent.

"It is against these developments that at the Thirty-eighth International Eucharistic Congress held in Bombay last year, as head of one of the members of the United Nations family, for the first time I spoke candidly on the urgent need to face the question of population stabilization. I said:

"The important factor to watch is that the development of available resources and the production of goods and services keep pace with population growth. Where there is maladjustment between the two, famine, pestilence, wars have in the past intervened to restore the balance. Can mankind reconcile itself to this kind of remedy in this age of science which has opened up almost unlimited possibilities for satisfying basic human needs? Can we any more turn our faces away from the concept of family planning when the alternative is starvation and death?"

"The Manifesto on Man's Right to Freedom from Hunger issued in 1963 by a group of statesmen and leaders in the arts and sciences, who had gathered in Rome at my invitation, and the Declaration of the World Food Congress inaugurated by the late President Kennedy the same year added to the profound impact on the social thinking of our day. Other important supporting developments have followed since. The Third Committee of the United Nations General Assembly accepted my plea for the inclusion of the right to freedom from hunger in the draft Covenant on Economic, Social and Cultural Rights which was being considered as part of the fifteenth anniversary of the Universal Declaration of Human Rights. The draft covenant will come up before the United Nations General Assembly later this year for adoption. The FAO Council, following this initiative, also has recommended an amendment to the preamble to the FAO Constitution in order to include in its objectives the achievement of man's right to freedom from hunger. This recommendation comes up before the thirteenth session of the FAO Conference in November this year. The resolution of the Assembly of the World Health Organization in May this year authorizing the Organization 'to provide, on request, technical advice on birth control methods to its member governments' is another important step forward.

"Earlier this year in New York I had the privilege to address the United Nations Population Commission. In my address I analysed the situation relating to population growth and food supplies in all its relevant aspects, and said that the prospect seemed dark indeed unless there was a combined world-wide effort to raise agricultural productivity in the developing countries along with determined measures to control population growth. The majority of the Commission felt that the social and economic development of the developing countries would be considerably accelerated by population stabilization measures and were definitely in favour of public action. Others, however, expressed the opinion that the difficulties inherent in the rapid population growth could be overcome by vigorous and well-planned measures to promote economic development and not by attempting the promotion of family planning. They would rely heavily on the social and cultural checks resulting from industrialisation and urban development. But what is the real issue? Is it what might be the ideal solution in the long run, or is it whether in the circumstances of the developing countries today the growth rate in agricultural productivity can be increased fast enough to meet the essential food needs of the immediate future?

"It is now less than seven years since there was any appreciable increase in food production per head of the world's population, seven very lean years for the developing countries. In two regions in particular, the Far East and Latin America, per capita production is still less than it was before the war, more than a quarter of a century ago. Many countries in these regions have been able to maintain their wholly inadequate dietary levels only by reducing exports, or by increasing imports of food, including in some cases a very heavy dependence on food aid.

"Apart from its social and nutritional aspects, this stagnation of food production is facing the governments of many developing countries with serious economic problems. The market demand for food is rising fast, not only because of the growth of population but also because of rapid urbanization and gradually rising incomes. Where this increased demand is not matched by a corresponding increase in supplies, food prices increase rapidly. This has a particularly serious inflationary effect, for in developing countries food represents much the largest part of total consumer expenditures. Such has been the case in India, where rising food prices are causing great hardship to consumers.

"The general outlook is indeed alarming. In some of the most heavily populated areas the outbreak of serious famines within the next five to ten years cannot be excluded. And it is a simple arithmetical conclusion that, if food output everywhere just kept pace with population growth at the present level of consumption, by the end of this century the number of people who would be subject to hunger and malnutrition would be double what it is today.

"The situation clearly requires specific production targets on the basis of realistic figures of population growth; and this again means working for a much higher rate of agricultural productivity in the developing countries rather than attempting, at least in the foreseeable future, any significant extension of cultivable land. We have calculated that a sustained increase of 4 per cent per annum in food production, as against the present average of 2.5 per cent in population increase, over the next fifteen years, would be necessary to avoid any serious breakdown of the current precarious balance between population and food supplies. The question is: Can this rate be achieved by the developing countries?

"There can be no doubt that in most of the developing countries it should be possible to increase crop yields per acre significantly by judicious investment of resources in land improvement, application of fertilizers, use of more efficient tools and machinery, improved crop varieties and seeds, and in plant disease control. To start with, they will have the advantage of under-development itself as a factor favouring a rapid rate of progress. It is true that our knowledge of the basic factors for improving tropical agriculture is still very inadequate. But we know that there is enough scientific and technical knowledge available from temperate zone research for revolutionizing backward agricultural practices in most parts of the world; in the initial stages all that is necessary is to adapt this knowledge to local conditions.

"The greatest impediments to progress, however, lie in social and institutional factors. The farmer, who for the past centuries has remained static, largely due to lack of incentives and to general neglect, must now be assisted to step into the market economy with the hope of a better return for his labour. He must be given price and other incentives and also, what is equally important, adequate marketing facilities for his produce. Special attention will have to be given to provide basic education to the farmer to make him receptive to new ideas. He must be given proper rights

in his land so that he feels that he can improve his conditions by the fruits of his labour. All this will also need massive investment for which the domestic savings of these countries will be inadequate. We calculate that to enable them to achieve a rate of growth of 5 per cent per annum in national income, the amount of foreign capital inflow by 1975 should reach about 50,000 million dollars (at 1960 prices), as against the current, almost stagnant, rate of about 7,500 million dollars. Much will also depend on the expansion of export markets for the products of developing countries, since the bulk of foreign exchange receipts of these countries—at present about 75 per cent—are provided by commodity exports.

“Having in view the urgency of stepping up production FAO is now working on an ‘Indicative World Plan for Agricultural Development’. The plan is designed to provide an international frame of reference for our member nations in their national planning and within which donors and recipients can see more clearly the priorities in respect of agricultural development in developing countries. This study will attempt to bring under a single focus the inter-relationships between production and consumption trends, national plan targets, trade projections, bilateral and multilateral aid programs, and other relevant factors. It is my hope that this indicative plan, when completed, will fill many gaps in our present knowledge of the economic realities in the developing countries and provide answers to numerous related questions that are not available today. It will not, I would add, be a set of projections and targets only, but will provide a reasoned guide to action by governments. As we know, development policies are determined and implemented by national governments, acting either unilaterally or in concert with other governments in regional or other groupings, or as members of world bodies which influence international policies. The indicative world plan will not imply any departure from this fundamental principle of national and international action for development. It will exert an influence to the extent that its analyses and recommendations enjoy the confidence of governments and of the bilateral and multilateral agencies dispensing aid. The success of the plan will of course depend on the co-operation and participation of all concerned in its formulation and application.

“What then is the answer to the question I have posed? Taking all relevant factors into account, can we expect the growth rate in

agricultural productivity in developing countries to keep pace with the population growing at the present rate? If we go by the experience of some countries who have gone through this process of development, the prospect is by no means reassuring. It took Japan, beginning from the third quarter of the last century, more than forty years to double her agricultural production—the average annual rate of increase did not exceed 2 per cent. The population growth during this period was below 1 per cent per annum. There was also a parallel growth of industrialization which relieved the land of the population pressure. The experience of the Soviet Union, which started with the advantage of vast unused and under-used physical resources, has not been any better. I can therefore only repeat what I said to the United Nations Population Commission: ‘One is left wondering whether the large increases can in fact be achieved over a decade or so. Doubts arise because the necessary effort to reach the targets may not be made. The financial resources required may not be forthcoming. A sustained effort to expand production may be lost in a feeling of despair.’

“The question of population stabilization, with which I believe the present Conference will concern itself, must therefore be viewed against this background. The eminent demographers gathered here will tell us that for the next twenty or twenty-five years the current pattern of short-run growth is likely to continue more or less unchanged. Despite all the so-called food ‘surpluses’ that we can possibly muster, the hard possibilities are that we may not be able to forestall and avoid some large-scale breakdowns in the next few decades, at least in some parts of the world. The greatest danger in that respect lies in the Far East. Yet, if such large-scale breakdowns are to be brought within a measure of control, then, side by side with a concerted effort to increase productivity of agriculture in the developing countries, population stabilization must be undertaken simultaneously as a social policy of urgent priority without further delay. It should be undertaken nationally under the moral leadership of national leaders on as wide a scale as possible, supported internationally, not only through provision of scientific information but also with the necessary equipment and trained staff as well as finance. The statement made by President Johnson at the twentieth anniversary celebration of the United Nations in San Francisco in this context is worth remembering.

"Mr. President, the next two or three decades will be a critical period in man's history, and will either see the beginning of mankind as a whole taking responsibility for its destiny or the drift towards disaster. But inaction will be a counsel of despair. Man with his inexhaustible resources of intelligence and inventiveness is capable of meeting the challenge. What is necessary is to put moral ardour and unbending will into the heart of this intelli-

gence. Only thus will human fellowship and human rights acquire their true meaning."

The Chairman of the International Union for the Scientific Study of Population, Professor D. V. Glass, also made a brief statement and then, after certain announcements by the Secretary of the Conference, the Conference adjourned for fifteen minutes before proceeding with the regular business.

MEETING A.1

Fertility

The meeting first heard a statement by Miss Julia Henderson, Director, Bureau of Social Affairs, United Nations.

EXCERPTS FROM THE STATEMENT OF MISS JULIA HENDERSON

"Few of those present who belong, shall I say, to the senior cohorts in the population of demographers will need to be reminded that this is the second World Population Conference organized under the auspices of the United Nations; the first was held in 1954 in Rome, with the co-operation, as in the present Conference, of several specialized agencies and the International Union for the Scientific Study of Population. We believe that the Rome conference made an important contribution to the growth of world-wide understanding and appreciation of the importance of population problems and that it contributed valuable stimulus and orientation for demographic research and data-collecting work in the years that followed. We hope that the present Conference will be even more fruitful, although the purposes which it is expected to serve are not exactly the same.

"There is no longer the need that there was, at the time of the 1954 Conference, to insist on the existence of important problems connected with the size, growth, structure and distribution of population in various parts of the world. There is now a wide consensus among scholars, statesmen, religious leaders and the informed public in many countries, particularly in regard to the importance of the problems involved in rapid growth of population in the developing countries, and its impact on their struggle to raise standards of living for their people. The world no longer needs a great conference of experts to bring population problems to notice. The concern now is with what can be done and what should be done to cope with these problems, and it is on this question that the world is looking to the present conference for enlightenment.

"To be sure, prescribing solutions for population problems is not part of the terms of reference of this assembly of experts. On the contrary, when the Economic and Social Coun-

cil authorized the Conference to be held under United Nations auspices, it stipulated that the purpose should be an exchange of views and experience among experts and that no recommendations or resolutions were to be adopted. Nevertheless, the expectation is that out of the documentation that has been contributed and out of the discussions during the meetings will come light on the diverse forms of population problems now posed in different parts of the world, and light on the paths of policy and action. This expectation has been voiced repeatedly by the delegations of various countries at recent sessions of United Nations bodies. I may add that we in the Secretariat and our colleagues in the specialized agencies are also looking to the Conference for guidelines for our work in this field.

"Above all, the Governments and the international public are interested in the light which the Conference can throw on the questions to be discussed at this first meeting, and the meetings scheduled for the next two days, on fertility, the factors which influence it, and the means and possibilities of controlling it. The fact that more meetings are scheduled for the discussion of fertility than of any other topic of the Conference, and the selection of aspects of this topic to be discussed, bear witness to the preoccupation of the sponsoring agencies with questions of direct interest to policymakers and architects of social and economic policy as well as to research workers and technicians. According to recent decisions of the United Nations Population Commission and the Economic and Social Council, research on fertility is to have a prominent place in the work of the United Nations and the specialized agencies in the future, and assistance is to be made available to Governments upon request in national programmes of action aimed at moderating fertility, as well as in other population policy programmes. It is the first time the Economic and Social Council has given the Secretary-General so clear a mandate in this field. We of the Secretariat and our colleagues in the specialized agencies will therefore take a special interest in the results of the discussions at the meetings devoted to fertility and family planning."

Statement by the Moderator: Mr. Ronald FREEDMAN

Professor of Sociology and Director of the Population Studies Centre, University of Michigan, Ann Arbor, Michigan, United States of America

Fertility is now the most problematic and, potentially, the most dynamic factor in demographic change. Mortality is either very low or falling rapidly all over the world. Technical means are available for reducing mortality to very low levels almost everywhere, and it is likely that this will be done. In the case of fertility, there is both less knowledge and less consensus on policy, although this, too, is in the process of change. Given the high probability that mortality will continue to decline rapidly on a world-wide basis, fertility will be the problematic factor for population growth rates. The importance of fertility is further enhanced by the rather recent knowledge that age structures depend much more on fertility rates than on mortality rates. Since age structures are of profound demographic and social significance, this makes knowledge of fertility dynamics even more important.

The countries of the world are now divided into two distinct high and low fertility groups. The high-fertility, developing countries, including about two thirds of the world's population, have gross reproduction rates above 200 and birth rates usually well above 30. The other group of more developed countries has birth rates usually well below 30 and gross reproduction rates well below 200. A study by the United Nations¹ finds that fertility divides the developing from the more developed countries more consistently and more completely than any other single available indicator. This division into the high-fertility and low-fertility groups involves quite a sharp distinction at present. The fertility rates do not form a continuous distribution at all. (See tables 1-3.)

As pointed out in the paper by N. B. Ryder,² all the low-fertility countries were in the high-fertility range relatively recently and, in most cases, no more than fifty to seventy-five years ago. The existence of a group of low-fertility countries is a recent phenomenon in human history.

While the two groups of countries are most clearly differentiated from each other, there are considerable variations internally within the two groups. High-fertility countries are not at some uniform level of maximum fecundity. Few societies ever have approximated the bio-

logical maximum. There is now, and probably always has been, a considerable variation from moderately high to very high fertility levels in these countries, associated with biological, social and cultural differentials. The more developed countries are more homogeneous and are now converging towards rather similar fertility patterns, but considerable variation still remains among them.

The opportunity to study existing and past fertility differentials and to observe those now emerging presents a great challenge to demographers. Much more information is needed about the factors accounting for the distinctive low fertility of the more developed countries. What accounts for their decline to lower levels distinctive from the rest of the world? What accounts for the internal variation in fertility among important strata within various countries, and are there any general principles that govern these variations for many countries? Finally, what are the prospects for fertility decline in the developing countries, and what role do organized family planning programmes and general development programmes play in such fertility declines?

While the papers presented at this Conference make many contributions to our understanding of such questions, our knowledge is still rather limited. This paper cannot hope to summarize all the findings of the papers on fertility, nor can it provide systematic answers to all the questions raised, since the complete data for the answers do not yet exist. It must, therefore, be largely confined to stating plausible general hypotheses consistent with existing knowledge but requiring further investigation. Fortunately, most of these problems can be investigated empirically, now and in the future.

Attempts to explain variations in fertility are made difficult by the large number of factors operating at different levels to affect fertility. One broad scheme for classifying the important sets of variables, which may serve as a frame of reference, is shown in figure I.³ Fertility is taken as the end point (measured either on a cohort or a period basis).

³ See Ronald Freedman, "The sociology of human fertility", *Current Sociology*, Vols. X/XI (1961-1962), pp. 35-121; "Norms for family size in under-developed areas", *Proceedings of the Royal Society, B.*, Vol. CLIX (1963), pp. 220-245; "The transition from high to low fertility; a challenge to demographers", *Population Index*, vol. XXX (1964).

¹ United Nations, *Population Bulletin*, No. 7 (United Nations publication, Sales No.: 64.XIII.2).

² N. B. Ryder, "Fertility in developed countries during the twentieth century", *Proceedings*, vol. II.

A. *There is a limited set of variables through which any social or environmental variables must act to affect fertility* (termed by K. and J. B. Davis "intermediate variables"⁴). Any explanation of fertility trends and variations must include as a final step in the causal sequence changes in one or more of the following intermediate variables:

1. Factors affecting exposure to intercourse (Intercourse variables):

(a) Those governing the formation and dissolution of unions in the reproductive period:

- (i) Age of entry into sexual unions.
- (ii) Permanent celibacy: proportion of women never entering sexual unions.
- (iii) Amount of reproductive period spent after or between unions:
 - a. When unions are broken by divorce, separation, or desertion;
 - b. When unions are broken by death of husband.

(b) Those governing the exposure to intercourse within unions:

- (i) Voluntary abstinence.
- (ii) Involuntary abstinence (from impotence, illness, unavoidable but temporary separations).
- (iii) Coital frequency (excluding periods of abstinence).

2. Factors affecting exposure to conception (Conception variables):

- (a) Fecundity or infecundity, as affected by involuntary causes.
- (b) Use or non-use of contraception:
 - (i) By mechanical and chemical means;
 - (ii) By other means.
- (c) Fecundity or infecundity, as affected by voluntary causes (sterilization, subincision, medical treatment etc.).

3. Factors affecting gestation and successful parturition (Gestation variables)

- (a) Foetal mortality from involuntary causes.
- (b) Foetal mortality from voluntary causes.

B. *Social norms exist in every society about what fertility ought to be, about child-spacing, the age at marriage, and the other important intermediate variables.* These norms have an influence on the intermediate variables and through them on fertility. Presumably, the norms are deeply influenced by the social and environmental setting of the society.

C. *The social and economic structure of the society is certain to have profound effects on the other sets of variables.* How many children are considered desirable in a society and what is done about marriage and family building are questions affecting profoundly so many aspects of the society that it would be a sociological and logical paradox, if reproductive patterns were not closely related to the nature of the society and its values.

D. *Mortality affects fertility in various ways.* Perhaps the most important of these is by determining how many children must be born on the average, if a family is to have any given number survive.

With this framework in mind, let us first consider factors associated with the unprecedented modern fertility decline in the more developed countries. Since this is relatively recent, it should also provide clues as to the basis for the differences between the low and the high-fertility countries.

FERTILITY TRENDS AND DIFFERENTIALS IN THE MORE DEVELOPED SOCIETIES

The practices of contraception and induced abortion are probably the major factors responsible for the fertility decline in the more developed countries. Since the historical data on the various "intermediate variables" are scanty, it is not possible to be more definite, but most scholars would probably agree that the increasing use of contraception and abortion has produced the modern fertility decline. In only one or two countries has a higher age at marriage been responsible. There is no evidence that variations in the other intermediate variables have played a major role, although such factors as age at marriage may be important in differentiating particular low fertility countries from each other.

There is scattered evidence of the importance of illegal induced abortion in the early stages of the fertility decline in countries of Western European tradition.⁵ Abortion appears to become important to some extent in almost every country in the period of transition from high

⁴ Kingsley Davis and Judith Blake Davis, "Social structure and fertility: an analytic framework", *Economic Development and Cultural Change*, Vol. IV (1956), pp. 211-235.

⁵ Kingsley Davis, "The theory of change and response in modern demographic history", *Population Index*, Vol. XXIX (1963), pp. 345-366.

to low fertility levels, when mortality declines and families face the problems of providing rising standards of living for an increasing number of surviving children, just when the role of children in economic production is decreasing. Our knowledge of this situation is unfortunately limited. The first really systematic data on the role of abortion in different strata of the population is coming from those countries which have legalized induced abortion, and especially out of recent research from Hungary and Czechoslovakia.⁶ The paper by A. Klinger demonstrates the profound effect which abortion has had under the influence of abortion legislation in European socialist countries. Unfortunately, we know little about the character, volume, and correlates of the prior, clandestine and illegal abortion which seems to characterize every country in the transition from high to lower fertility levels.

In most countries in the Western European tradition an increasing use of contraception was associated with and probably accounts for the major declines in fertility.⁷ Contraception is also being practised fairly widely in the countries which have legalized abortion, and in every case the policy appears to be to encourage a shift from abortion to contraception. It is likely that there continues to be a very considerable number of illegal induced abortions in some of the European countries in which both abortion and contraception are illegal. It is otherwise difficult to account for the very low birth rates prevailing in some of these countries, in which sample surveys indicate relatively little use of the more effective contraceptives.

The fertility declines have generally occurred first among the women over 30 years of age and then spread to younger wives. This is well illustrated in the paper by E. Vielrose,⁸ indicating such age patterns in both rural and urban areas of Poland, although with larger declines first in the urban areas. This age pattern may be expected everywhere if, as a result

of lower mortality and rising living standards, women by age 30 or so find that almost all their children survive and seek some means to limit further family growth in view of rising standards of living.

None of the major fertility declines has resulted primarily from an organized or deliberate programme by governmental or private agencies. The earlier declines in Western Europe and the United States resulted from individual decisions by millions of couples in response to pressing problems arising in the process of modernization.⁹ It is true that more recently birth rates have fallen very rapidly in a number of countries following governmental legalization of induced abortion. However, in every case these events seem to have been a response to already existing popular demand and pressure, and an attempt to transfer an already existing large volume of illegal induced abortions to medically safer institutions. Such a general view is presented by Y. A. Sadvokasova and M. Muramatsu.¹⁰ To be sure, the fertility decline was much more rapid following the organization of the legal system for induced abortion. However, it is generally agreed that this system was not initially developed by the governments concerned in order to reduce birth rates or even to provide family limitation services to a population previously unwilling or unmotivated.

To say that past fertility declines have not been primarily a result of an organized public policy does not mean logically that such a public policy cannot succeed. History does not tell us that such policies have been tried and failed. It only tells us that such policies have not been tried and that declines can occur without them under proper circumstances.

What social and environmental causes led to the use of abortion and contraception for limiting family size and thus to declining birth rates? There seems to be wide agreement that the crucial forces were declining mortality and a complex of factors making for social and economic development.¹¹

⁶ Among papers for this conference, see Karóly Miltényi, "Social and psychological factors affecting fertility in a legalized abortion system", *Proceedings*, Vol. II, and András Klinger, "Demographic effects of abortion legislation in some European socialist countries", *Proceedings*, vol. II.

⁷ Even on this point the evidence is weak. There are no data for most low-fertility countries on the proportion of couples in various demographic and social strata who use various methods of family limitation. For a fairly recent review, see D. V. Glass, "Family limitation in Europe: a survey of recent studies", *Research in Family Planning*, Clyde Kiser, ed. (Princeton University Press, 1962).

⁸ Egon Vielrose, "Age-specific fertility rates in Poland", *Proceedings*, vol. II.

⁹ Current reassessments of the role of private organizations in providing contraceptive information and services during the period of early decline of the birth rate in Western Europe may require some modification of this generalization.

¹⁰ Minoru Muramatsu, "Policy measures and social changes for fertility decline in Japan", *Proceedings*, vol. II; E. A. Sadvokasova, "Birth control measures and their influence on population replacement", *Proceedings*, vol. II.

¹¹ There are exceptions to these broad generalizations. See Ansley J. Coale, "Factors associated with the development of low fertility: an historic sum-

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A lower mortality rate is plausibly a cause of a lower fertility level since if fewer children die, fewer need to be born in order to have any desired number survive. When the mortality rate falls, and especially if it falls quickly, there is likely to be increasing pressure in individual families on traditional housing, familial and other arrangements, developed over long periods of time as an adaptation to high mortality. The developing countries have generally had much higher mortality than the more developed ones, and mortality decline has usually preceded fertility decline, sometimes by quite a number of years. However, there are instances in which fertility declined prior to or simultaneously with mortality decline. A legitimate question for research is whether planned family planning programmes can produce fertility declines prior to, or at least simultaneously with, mortality declines. It is possible, while advocating vigorous action to reduce mortality, also to argue for simultaneous programmes of family planning. The papers by E. Adil and B. L. Raina¹² describe the two largest governmental programmes for family limitation—those of Pakistan and India. It may be desirable to make family planning available early in the development process in order to reduce the lag between the decline in mortality and the decline of fertility. It may be doubted whether such a programme can be very effective until significant numbers of married couples feel reasonably certain that the number of living children they want will survive, if born, and until they observe about them and experience for themselves the problems caused by excess fertility, when mortality is low.

This view may, of course, be wrong, and the consequences are serious. It is desirable to minimize the amount of individual suffering and the social costs of the transitional period. Since mortality now falls so much more rapidly

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mary", *Proceedings*, vol. II. Fertility fell in Bulgaria, Spain, and some other southern and eastern European countries while mortality was still high. Coale reports that a major decline in fertility has already occurred in every nation in the world today in which no more than 45 per cent of the labour force is engaged in extractive industry, in which at least 90 per cent of the children of primary school age attend school, and which is at least 50 per cent urban. He also reports, however, that France reduced its fertility before attaining any of these characteristics and England had most of them before its marital fertility fell at all.

¹² Enver Adil, "The use of statistical guides and measures of effectiveness in determining government policy for influencing fertility—Pakistan", *Proceedings*, vol. II; B. L. Raina, "Possible effects of public policy measures on fertility in India", *Proceedings*, vol. II.

than formerly, and so much more is known about family planning, the possible courses of action may be different. It might, therefore, be desirable to conduct experimental tests, seeking to use the best family planning programmes in field organizations under the varying mortality conditions that now exist or are developing. This does not mean any retardation of efforts to reduce mortality but only taking advantage, in empirical studies, of existing variations and changes in mortality levels.

Most scholars also seem to agree that the large modern fertility declines have been associated with various types of modernization and development. The United Nations has recently completed an impressive review of the way in which current fertility rates are related to various development measures.¹³ It reports that a large variety of measures of development sharply distinguish the high from the low fertility countries, but that there is practically no correlation between the development and fertility measures within each of these two groups of countries. The United Nations offers the interpretation that a combination of development measures must pass a minimum threshold level to make low fertility levels possible under historically observed conditions. This is plausible. However, we have no firm knowledge of how much change in which development variables is needed to make one or other rate of fertility decline. Further, not much is known about why changes in particular combinations of variables should affect fertility.

Many variables have been mentioned in the various papers of the conference as linking development to fertility decline. They include urbanization, industrialization, more complex technology, higher living standards, income growth, better health, greater participation of women in the labour force, increase in mass communications, higher education and literacy levels, and many more. It is not possible to discuss each of these possibilities. Instead, some broad hypotheses will be presented placing the specific variables in a more general context, and some of the important development measures mentioned in conference papers will be discussed.

As far as fertility decline is concerned, what seems to be essential in the development process everywhere is the shift from major dependence on relatively self-contained local institutions to dependence on larger social, economic and political units. An essential aspect

¹³ United Nations, *Population Bulletin*, No. 7 (United Nations publication, Sales No.: 64.XIII.2).

of the development of modern industrial society is an expansion of the size of the effective units of interchange and interaction of all kinds. Such a change implies a change in the division of labour—both social and economic—from one in which the kinship unit is necessarily central to a larger complex in which such local units as family and village give up many functions to larger non-familial specialized units. The developing, high-fertility societies are distinguished historically from the low-fertility ones, more developed societies by the extent to which the things considered worth having are derived from local kinship-based institutions and especially from children. A suggested hypothesis is that the threshold combination of development changes necessary for fertility decline is that which will produce both low mortality levels and a sufficient erosion of the importance of kinship and the local community to make important aspirations attainable in ways for which a high fertility level is irrelevant or burdensome.

Let us turn to some specific variables. Increasing participation of wives in the labour force has been noted in the papers by Y. A. Sadvokasova and L. M. Davtyan¹⁴ and many other studies as being associated with lower fertility rates. Of course, women work in the fields and elsewhere in the high fertility countries also. What is distinctive now is that women are increasingly engaged in work and other organizations and situations which are not based on familial ties. Although they are usually working for the welfare of their children and families, more than a limited number of children is likely to be an impediment to women's work and other new activities. The children have no role in the economic enterprise in which the wives or their husbands are employed. In one sense, the recent increase in labour force participation by wives only accentuates the earlier effect of the shift of the male labour force from family-based economic units to factories and other economic units organized on other bases. Generally, both working wives and husbands have lost any incentive to have children in order to staff a familial economic unit.

Many papers refer to the role of education, literacy and mass media communications in reducing fertility. What is the causal connexion? One plausible explanation suggested

by D. M. Heer¹⁵ and others is that those who are literate and in active networks of communication are able to receive information about the ideas and means of family limitation. This is very probably correct, but the role of education, literacy and communication may be more basic. With increased education and literacy, the population tends to become involved with the ideas and institutions of a larger modern culture. If the individual is, or believes he is, part of a larger non-familial system, he begins to find rewards in social relationships for which large numbers of children may be irrelevant. If this thesis is correct, major expenditures for education in a development programme are justified not only in order to develop worker skills, but also for their potential effect on the fertility level, if lower fertility is a social objective.

It is pertinent that in every country for which we have empirical evidence so far, the spread of family planning practices to attain a smaller family has been associated with a literate audience influenced by the mass media and by a person-to-person communication of the message that transcends local boundaries.

Such family planning programmes as those described by E. Adil and B. L. Raina are now being begun in many other developing countries in which literacy is still relatively low. In each case, while increasing literacy is a national objective, the aim is to lead the population to practise family planning even before high literacy rates are established, if possible. The degree to which this is possible and the circumstances under which it is possible are important questions for research.

It seems unlikely that education about fertility and family planning alone, completely in advance of other changes in the society, can be very effective in changing fertility norms and behaviour. Such a single specialized educational programme does not bring about linkage of the local population to larger units in that broad and continuing way which can lead to the growing dependence on non-local and non-familial institutions that is required. General education and literacy are probably needed for this.

High fertility norms and behaviour may be too deeply embedded in traditional, emotionally-supported institutions—especially familial ones—to be affected much by education or informational programmes centred on fertility alone. This is not to deny the potential importance of such programmes, once development

¹⁴ Y. A. Sadvokasova, "Birth control measures and their influence on population replacement", *Proceedings*, vol. II; L. M. Davtyan, "The influence of socio-economic factors on natality (as exemplified in the Armenian Soviet Socialist Republic)", *Proceedings*, vol. II.

¹⁵ David M. Heer, "Economic development and fertility", *Proceedings*, vol. II.

is under way. Probably, reduced mortality sets the stage, providing the minimal threshold level required before the fertility level will drop. But, in addition, there must be at least minimal changes in the institutions which motivate high fertility rates by rewarding the parents of relatively large numbers of children. Parents must have reason to believe that those who have smaller families can meet their needs in ways differing from the traditional patterns.

This view does not preclude the possibility that broad gains in literacy and education can facilitate lower fertility levels in advance of some other changes in the society. The extent to which this is possible and the associated changes that are required are still open questions. Significant studies with careful controls could be carried out in some of the countries now introducing family planning, to test whether particular levels of literacy or of other development indices are a necessary threshold to a fertility decline.

Obviously, changes in literacy, education and communications networks are related to many other aspects of development. Changes in all of them are probably related in interaction to fertility decline. However, it is unnecessary to assume that all aspects of development must move together. We know that there have been uneven rates of movement in the past. From a policy point of view, it is desirable to look for some elements subject to social control which might lead the development process and decrease the time-gap between mortality and fertility decline. Education is emphasized because it might be such a leading variable.

D. M. Heer provides some interesting data to support the hypothesis that when other things are equal, countries with higher *per capita* income will have higher fertility rates than those with lower income. There is other evidence supporting this view in studies within some of the industrial countries.¹⁶ Heer suggests that increase in income may, in some circumstances, result in higher rather than lower fertility levels. There is some evidence of rising fertility levels in the early development stages in some countries.¹⁷ While it is dangerous to generalize from cross-section data

to changes over time, the hypothesis is worthy of further investigation.

Urbanization is also frequently mentioned in the papers as an important factor in reducing fertility in a variety of countries. However, there is also some evidence that in some developing countries there may be no urban-rural fertility differentials.¹⁸ Living in large population concentrations, in these cases, does not necessarily make for lower fertility. This raises the question as to what character urbanization must have to be associated with lower fertility rates. In terms of the earlier general hypothesis, it could be suggested that urbanization leads to lower fertility rates only if it involves a change in social arrangements toward lesser dependence on traditional familial units and greater dependence on new, modern, non-familial institutions. Some fairly large cities in developing countries are simply large collections of traditional familial and other village-community units. Sometimes, large numbers of people are still living on family farms within the city limits or are engaged in other small family enterprises in which the wife works. In such cases, her participation in the labour force is least likely to lead to lower fertility. In short, urbanization can be expected to be associated with a lower fertility level only if it involves the population in modern, non-familial, social institutions.

Once a population has been completely urbanized for a generation, we must expect different fertility patterns from those observed during the transition to urbanization. For example, during the process of urbanization, the poorly educated and those with low income in cities are likely to consist in large numbers of migrants from the farms. Their characteristic higher fertility may be a function of their rural background rather than of their lower social status. A number of studies in the United States¹⁹ have shown that the negative relationship of fertility and education or income disappears if we consider only those who have lived in cities for a generation. Further, as the process of urbanization reaches completion, even the small minority of the population remaining on farms has urban characteristics since it is involved with the institutions centred in the cities. In short, patterns of fertility during the process of urbanization still in progress in many countries are likely to be

¹⁶ See, for example, United Nations, Department of Economic and Social Affairs, *Recent trends in fertility in industrialized countries* (United Nations publication, Sales No.: 57.XIII.2); also D. S. Freedman, "The relation of economic status to fertility", *American Economic Review* (1963), pp. 414-426.

¹⁷ See, for example, H. J. Habbakuk, "Family structure and economic change in nineteenth-century Europe", *Journal of Economic History*, vol. XV (1955), pp. 1-12.

¹⁸ See, for example, W. C. Robinson, "Urban-rural differentials in Indian fertility", *Population Studies*, vol. XIV (1961), pp. 218-234.

¹⁹ See, for example, O. D. Duncan, "Farm background and differential fertility", *Demography*, vol. II (1965), pp. 240-249.

different from those which will prevail when urbanization is complete.

N. B. Ryder points out in his paper that there is now a remarkable convergence in fertility patterns among the more developed countries. All appear to be moving towards a situation in which almost everyone marries at a relatively young age and completes a small family rather early in married life. The fact that marriage is virtually universal and childlessness is rare, even with low fertility levels, suggests that family life continues to be a very important part of the society. Apparently, it is not a dissolution, but a reorganization of family life which occurs during the transition to lower fertility.

In a large variety of more developed countries there is also a striking convergence in the evidence of similar relationships between fertility levels and specific social and economic factors. In the transition to low fertility rates, the effect on fertility of such factors as income, wife's labour force status, housing conditions, education, and rural background appear to be similar in Western and Eastern European countries. This emerges, for example, from the paper on Poland by E. Vielrose and the paper on the Armenian Socialist Soviet Republic by L. M. Davtyan.²⁰ Purely political-ideological factors seem to be much less important in determining fertility levels and patterns than the socio-economic situation in which families find themselves. Whether a country has a "socialist" or "capitalist" economic system appears to be less important in relation to fertility than its degree of industrialization and modernization in the sense discussed earlier. Since the end of the Second World War, there has been a convergence of the fertility patterns of Eastern and Southern Europe with those of Northwestern Europe, irrespective of whether the countries are "socialist" or "capitalist" or some mixture of the two.

Y. A. Sadvokasova in her paper advances the interesting hypothesis that, in Western "capitalistic" countries, the fertility level is low because the population feels more insecure than the population in "socialist" countries. There are some difficulties for this hypothesis in the fact that the fertility level is lower in several of the socialist countries of Europe than in Western countries regarded as capitalistic. Moreover, the little empirical data

available does not indicate that workers who are unemployed or who have feelings of insecurity have especially low fertility.²¹ Further, although the often-made assertion that there is no unemployment in the Soviet Union may be technically correct, it seems at least possible that, as in all other countries, there also many young people may experience some difficulty in finding the particular position they want, or feel they deserve, at a particular time and place. This may have a very significant effect on the fertility rate and would affect more people than unemployment itself. If the quotation of a recent report from a Soviet journal about studies in Novosibirsk is correct,²² it seems likely that in the Soviet Union as in other countries, the approaching large increase in young entrants into the labour force (resulting from the early post-war fertility rise) may produce at least transitional problems of satisfaction with employment. This is only to say that in all growing, complex industrial societies with considerable population mobility, there are likely to be dislocations and problems resulting from sharp increases in the numbers in particular age groups, particularly as regards the start of employment and family life.

The crucial demographic aspect of the process of economic and social development seems to be similar whether it occurs under a socialist or a capitalist system. In each case there is a decrease of mortality, a decrease of dependence on familial and local traditional institutions, and a growth of interdependence in larger urban-centred social and economic units with an elaborate division of labour. These developments are apparently followed by a reduction of fertility in a roughly similar relationship to the characteristics of the families defining their involvement in the new modern institutions. The declines in fertility are likely to begin in later ages and move downward in the age structure. The age structure itself moves

²¹ For example, in the data from the 1960 United States Census, while fertility differentials are not great as between different income groups or occupational groups, fertility tends to be higher (not lower) among groups in which unemployment rates are relatively high. In a fertility survey in Indianapolis in the early 1940's, it was found that fertility was highest and family planning least effective among those who expressed feelings of insecurity. See C. V. Kiser and P. K. Whelpton, "Fertility, planning, and feelings of economic security", *Social and Psychological Factors affecting Fertility*, vol. III (1952), pp. 467-548.

²² *New York Times*, 30 June 1965. If the report is correct, it would appear that these results are not dissimilar from those found in other industrialized countries when a considerable increase in the young adult age group occurs in a changing economy.

²⁰ Egon Vielrose, "Age-specific fertility rates in Poland", *Proceedings*, vol. II: L. M. Davtyan, "The influence of socio-economic factors on natality (as exemplified in the Armenian Soviet Socialist Republic)", *Proceedings*, vol. II.

toward an "older" population, as fertility rates decline. All these changes seem to be found in a wide variety of political and ideological circumstances.

There remain, of course, variations in fertility among the more developed countries, as Ryder points out. The overseas countries of Western European background (Australia, New Zealand, Canada, the United States) have higher fertility levels than most of the other developed countries. The fertility level of the Soviet Union is at an intermediate level among the more developed countries, but is difficult to evaluate because, as indicated in the paper by V. P. Piskunov,²³ it is affected by an extreme distortion of the sex-ratio resulting from the Second World War. It seems reasonable, nevertheless, to expect that fertility levels will decline in the Soviet Union towards the levels of Europe generally, as the proportion of the population engaged in agriculture declines. If such urbanization is rapid, fertility rates are likely to be further affected by the fact that it always is difficult to provide adequate housing in cities for a mass migration from rural areas. It would be of great value to have some comments from Piskunov and other Soviet scholars on their best estimate of the way in which correction of the temporary sex-ratio distortion may be balanced in its effect on fertility rates by such other trends as urbanization and rising standards of consumption.

R. M. Fagley's review of the role of religion in relation to fertility in the more developed countries²⁴ is consistent with a view that religious organizations and beliefs are likely to have followed rather than led the way in the fertility declines in the modern world. On a cross-national basis, there seems to be little correlation between formal differences in religious classification at least and the timing of the fertility decline, with Catholic countries, for example, appearing both first and last in a ranking by the time of the fertility decline. Nevertheless, within certain developed countries (e.g., the United States and the Netherlands) there are significant and persistent differentials in fertility patterns by religious groupings which do not appear to be a function of the social or economic position, or the urbanization, of the members of those group-

ings.²⁵ Fagley stresses the necessity for distinguishing between formal doctrine, actual belief and actual behaviour of various religious groups.

More research is needed to explain the remaining differentials among the more developed countries. The papers for this conference give increasing evidence that we can obtain from developed countries with widely differing political organizations comparable evidence on the way in which specific situational factors affect fertility and the family-building cycle. It seems likely that variations in family allowance systems, maternal care and various social security provisions may well have some effect on fertility rates. More discussion on the evidence is needed, and more research on the way in which such differences between countries affect the fertility of couples of similar educational and economic positions.

In discussing fertility in either the developed or the developing countries, problems of measurement are of great importance. The paper by L. E. Darsky-Tolchinsky²⁶ reminds us that the cross-section period measures most frequently used may be misleading and are certainly incomplete. He suggests that parity-specific birth probabilities, mortality and marriage data can be combined in relation to stable population models.

J. Bourgeois-Pichat, in the course of dealing with the effect of foetal mortality or fertility, has presented a model and a set of illustrative data for estimating birth spacing and reproductive levels when family limitation is not practised.²⁷ Even under these simplified conditions, data are required for estimating separately for each age group the level and timing of foetal mortality, the period of amenorrhea and the mean conception delay. As Bourgeois-Pichat indicates, his model was tested with fragmentary data pieced together from various places, because nothing more is available. Research under various conditions to determine these and other basic fertility parameters is now possible and would seem to deserve high priority, if we are to understand the basic mechanisms of the various radical shifts in

²³ See, for example, C. F. Westoff, R. G. Potter, Jr., P. C. Sagi and E. Mishler, *Family Growth in Metropolitan America* (Princeton University Press, 1961); F. Van Heek, "Roman Catholicism and fertility in the Netherlands: demographic aspects of minority status", *Population Studies*, vol. X (1956), pp. 125-138.

²⁶ L. E. Darsky-Tolchinsky, "Study of women's fertility considering the number of previously born children", *Proceedings*, vol. II.

²⁷ Jean Bourgeois-Pichat, "Relation between foetal and infant mortality and fertility", *Proceedings*, vol. II.

²³ V. P. Piskunov, "The influence of disproportions in the sexes on the married state of population and natality in the Ukrainian Soviet Socialist Republic", *Proceedings*, vol. II.

²⁴ Richard M. Fagley, "Doctrines and attitudes of major religions in regard to fertility", *Proceedings*, vol. II.

fertility now under way and to be expected. Even in high fertility countries, however, these parameters are not likely to be observed in a "natural" state. They are affected almost everywhere by various practices that affect fertility, quite apart from contraception.

The proposals by E. Adil for evaluating family planning programmes raise many interesting measurement problems. Particularly useful may be the suggestion of measuring for itself and as an exposure base the number of months since last birth. There is evidence that the interval since last birth—the "open interval"—will lengthen first in developing countries and will differentiate the more modern from the less modern strata.

FERTILITY TRENDS IN DEVELOPING COUNTRIES

While the fertility level is high in developing countries, it is by no means at a uniform level approaching the biological maximum. Fertility varies from moderately high to very high, and the recent United Nations report on fertility shows a considerable variation in fertility rates among these countries. It also finds no correlation among them between measures of development and fertility levels. For particular countries, it is possible to say that specific intermediate variables make fertility rates relatively high or low. However, we have no systematic evidence for most countries on the levels of these intermediate variables and even less on how they are related to social and economic factors.

Accelerating fertility decline as early as possible in the development process is advocated by many, not as a substitute for general development efforts but as an aid to them. A cogent and widely known statement of this view by A. J. Coale and E. M. Hoover²⁸ develops the argument that savings rates, investment and improvements in per capita income and production will be greater if fertility declines at an early point in the development process. The argument is not necessarily that development will not occur without a fertility decline, but that it will be accelerated and that individual suffering during the transitional period can be minimized, if fertility declines at an early point in the process. The paper by F. Lorimer²⁹ also attempts to show that, theoretically, lower fertility and later child-bearing

will produce more favorable consumption-production relationships. The author also indicates, however, that under high mortality conditions, a high fertility level does not necessarily have such effects.

Even if the thesis that an early fertility decline is a desirable aid to development is accepted, it does not necessarily follow that this is possible. In assessing the possibility of fertility decline in the developing countries, an important but complex question is whether general social and economic development will itself produce fertility declines without organized family planning programmes. Can organized family planning programmes have an effect prior to certain amounts or kinds of social and economic change? If not, can such programmes at least shorten the time lag between the decline of mortality and the decline of fertility?

Y. A. Sadvokasova advances the view that the fertility level will decline only after lower mortality rates and social and economic development bring the mass of married couples to a situation in which they want to limit family size and so adopt the practice for themselves, without significant social programmes for this purpose. She bases her view partly on the history of fertility declines in European populations and in Japan. It seems likely that in none of these historical cases was an organized family planning programme primarily responsible for the decline in fertility which occurred. Nevertheless, none of this evidence tells us what would have happened in the European countries or in Japan if there had been organized family planning programmes at earlier points in their histories. Once urbanization and industrialization were well under way and mortality rates fell, there was a period of considerable individual distress and dissatisfaction as regards family problems in all countries, whether socialist or not. This is evident from the fact of a considerable rise in the number of illegal abortions, poor contraceptive practices and other evidence that many families were trying rather desperately to solve their new problems in their new social situation. Is it not likely that if an organized and rational family planning programme had been available at a somewhat earlier time, much individual family suffering would have been avoided and birth rates might have fallen somewhat sooner? The fact that fertility rates have fallen so rapidly after official government approval of legal induced abortion programmes in Japan and a number of European countries certainly suggests that the social and economic changes

²⁸ A. J. Coale and E. M. Hoover, Jr., *Population Growth and Economic Development in Low-Income Countries* (Princeton, Princeton University Press, 1958).

²⁹ Frank Lorimer, "The economics of family formation under different conditions", *Proceedings*, vol. II.

had made many families ready for family limitation at an earlier period, but that the necessary information and services were not yet readily available. In the developing countries, mortality rates fall so much more rapidly than before that the problems of rapid family growth in the transition become acute much more quickly than was formerly the case.

It would probably be generally agreed, by people concerned with policy issues, that family planning programmes are not a substitute for basic general development programmes, which should be pressed forward vigorously if higher living standards are desired. The point in question is at what stage of development such family planning programmes can be effective and useful. One extreme view is that high fertility countries have always been ready for family limitation, but that they failed to practise it because they lacked the necessary information or the means. Not many hold this point of view now, since there is evidence to indicate that simply making contraceptives available to very traditional village populations in developing countries does not lead to large-scale effective use. Most scholars would probably agree that a certain amount of social and economic development is necessary before there will be widespread adoption of family limitation, either as a result of a government programme or of individual action. But the question of how much development is needed, and what specific kinds are needed, is still controversial and can only be settled finally empirically.

It has been suggested that most peasant populations are ready now to adopt family planning or other innovations, because the essential social change has already occurred.³⁰ The argument is that increases in mass communications and similar changes have stirred rising aspirations and readiness for change, even in population in which the objective social and economic changes, literacy, etc., are not very advanced. These views can be tested by experimental studies in connexion with the new programmes being developed in many countries. Are changes in the way in which people perceive themselves and their world a sufficient basis for fertility decline prior to substantive changes in their objective social and economic situation? For example, suppose that the members of a peasant population are linked to the wider world through the mass media or education. Suppose that they begin

to identify themselves with institutions and ideas and social roles outside the local, the familial and the traditional context. Does this provide a basis for fertility decline before the institutions in which they actually live are changed? These are questions which can and should be tested empirically in some of the new national family planning programmes.

My own speculative hypothesis is that family planning is unlikely to be widely adopted in any country until there has been a significant mortality decline and until there has been enough social and economic development to lessen dependence on local and familial institutions and make smaller families more rewarding than larger families. I do not think we know how much development, and in what specific variables, is necessary, although I would grant educational and communications developments considerable importance. Once a threshold stage of development is reached, I would expect that well organized programmes, especially those using the newer, effective and easily used contraceptives, could spread family planning fairly rapidly and shorten the transitional period of confusion and trouble.

It is difficult to discuss systematically actual recent trends in fertility for the less developed countries, since comparable data over time are often not available for many countries. However, the data presented in the paper by H. Gille³¹ make it seem likely that there have not been major changes for most of these countries.

There is some evidence that fertility has increased somewhat in some of the developing countries. There is a potential for such increases in other countries, too, in health and nutritional improvements which may reduce foetal mortality and subfecundity. Such temporary increases in fertility might also result from modernization which changes traditional practices such as the prohibition of the remarriage of widows or ritual periods of abstinence.

There is also evidence of the beginning of fertility decline in some of the developing areas which will come eventually in many other places. The decline is probably best documented for Taiwan where birth rates have fallen 17 per cent, from 42 in 1958 to 35 in 1964.³² In

³¹ Halvor Gille, "Twentieth-century levels and trends of fertility in developing countries", *Proceedings*, vol. II.

³² For information on demographic trends and family planning in Taiwan, see especially various mimeographed reports of the Taiwan Population Studies Centre, by L. P. Chow and his colleagues. See also R. Freedman, J. Y. Takeshita and T. H. Sun, "Fer-

(foot-note continued on following page)

³⁰ See, for example, D. J. Bogue, "The demographic breakthrough; from projection to control", *Population Index*, vol. XXX (1964), pp. 449-543.

Hong Kong in 1964, birth rates fell below 30 for the first time, from 32 in 1963 and 38 in 1958. In Singapore, birth rates have fallen from 44 in 1956 to 35 in 1962. A recorded decline in Puerto Rican birth rates from 41 in 1945-1949 to 31 in 1963 is difficult to interpret because of the effects of migration, but it is likely that a genuine fertility decline has occurred there also. We cannot document a fertility decline in the Republic of Korea directly from the vital statistics, which are sadly deficient as in most high-fertility countries. Nevertheless, on the basis of evidence about abortion and other family limitation practices, it is highly probable that the birth rate has begun to decline there. A remarkable beginning has been made in the government family planning programme.³³ In large-scale national family planning programmes in both Taiwan and the Republic of Korea, very large numbers of couples are adopting the new intra-uterine contraceptive devices. Many of those adopting such methods in the organized programmes are those who formerly used abortion to solve their family limitation problems. Thus, initial behaviour in the transition period was very similar to that formerly experienced in countries now having low fertility levels.

For several of the areas in which the fertility decline has begun already—particularly Taiwan, Hong Kong and the Republic of Korea—we may venture to predict an acceleration of the decline within the next five years to levels of perhaps 20-25 births per 1,000. These predictions are presented merely as a basis for discussion. The assumptions on which they are based are outlined below, not because they are necessarily correct, but because testing such assumptions is an important part of the future research that is needed. The assumptions are

that fertility rates ought to decline first and most rapidly under the following conditions:

- (a) where significant social development has already occurred;
- (b) where mortality has been relatively low for some time;
- (c) where there is evidence that many people, wanting moderate-sized families, are beginning to try to limit family size;
- (d) where there are effective social networks, transcending local communities, through which family planning ideas and services and other modernizing influences can be disseminated;
- (e) where there are large-scale, effective organized efforts to disseminate family planning ideas and information;
- (f) where such new contraceptives as the intra-uterine devices or contraceptive pills are effectively available.

It is not necessary to assert that all of these are necessary preconditions for any fertility decline. I do not know what combination is needed to begin or to accelerate fertility decline. That precisely is one of the important general questions on which we need discussion and research. Obviously, the first four conditions are relevant both to the past and to current situations. The last two—organized programmes and the new contraceptives—introduce new elements for which history provides no specific guide-lines.

It is not possible in the limited time available either to elaborate these assumptions or to discuss their possible application to each major area of the world. I believe that the favorable situation with respect to most of these variables is responsible for the fertility declines noted above in a few countries. Whether the particular predictions are right or wrong, it is very likely that fertility changes will be occurring in many countries, at various rates and under varying conditions, in the next few decades. There should be increasing opportunities to study the social and demographic correlates of fertility change. There must be international co-operation for this purpose, so that the kinds of research presented at this conference can cover more variables in comparative studies, with a wider range of the essential data and with some consensus on one or more general conceptual frameworks.

(foot-note continued from previous page)

tivity and family planning in Taiwan: a case study of the demographic transition", *American Journal of Sociology*, vol. LXX (1964), pp. 16-27.

³³ See, for example, T. I. Kim, F. H. Choe, K. S. Lee and R. Koh, *The Early Stage of Family Planning in Korea* (Seoul, 1964); also, among papers for the conference, Taik Il Kim, "Review of the Korean family planning action programme in the Republic of Korea", *Proceedings*, vol. II. Important data on the rise in abortion rates in Seoul, Korea, appear in an unpublished study by Sung-Bong Hong of Sudo University. There are also important data on the family planning experimental programme in *Seoul National University Sundong Gu Action-Research Project on Family Planning: A Progress Report* (Seoul, National University, 1965).

Table 1. Estimated crude birth rates and gross reproduction rates for the regions of the world

(Weighted averages of rates for 1960 or most recent dates of available data for countries within each region)

<i>Region</i>	<i>Crude birth rate</i>	<i>Gross reproduction rate</i>
WORLD TOTAL	35-36 ^a	2.25-2.31 ^a
<i>Developing regions</i>	41-42 ^a	2.6-2.7 ^a
Africa	48	3.0
North Africa	46	2.9
West Africa	54	3.4
South and East Africa	45	2.7
Asia (excluding USSR)	40-41 ^a	2.5-2.6 ^a
South West Asia	45	3.0
South Central Asia	44	2.9
South East Asia	49	2.9
East Asia	35-37 ^a	2.1-2.3 ^a
Middle and South America	41	2.8
Middle America	45	3.0
South America	40	2.7
<i>More developed regions</i>	22	1.4
Northern America	24	1.8
Europe	19	1.3
Northern and Western Europe	18	1.3
Central Europe	18	1.2
Southern Europe	21	1.3
Oceania	24	1.8
USSR	25	1.4

SOURCE: United Nations, *Population Bulletin*, No. 7 (United Nations publication, Sales No.: 64.XIII.2), p. 1.

^a Range of estimated values corresponding to alternative estimates for China (mainland).

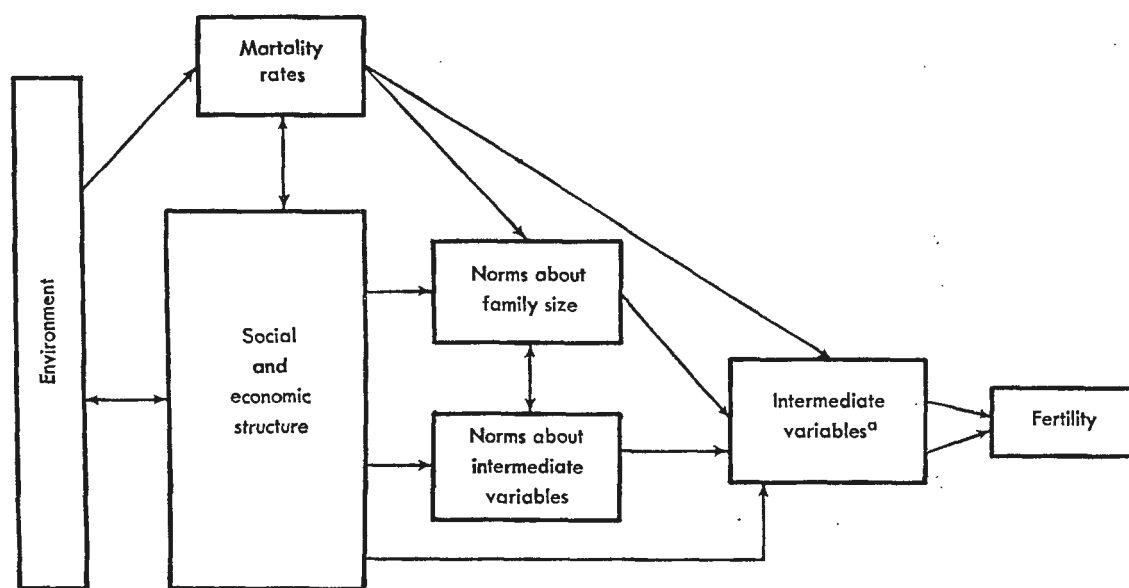


Figure I

^a These are listed in detail in the paper.

Table 2. Distribution of countries by level of crude birth rate

(Excluding countries having fewer than 250,000 inhabitants in 1960 and those having no satisfactory data. Countries are classified according to levels of crude birth rates in 1960 or at the most recent dates of available data)

Crude birth rate per 1,000 population	World total	Less developed regions	More developed regions	Africa	Asia (excluding USSR)	Middle and South America	Europe (excluding USSR)	Northern America	Oceania	USSR
TOTAL	123	88	35	37	24	27	29	2	3	1
Under 15	3	—	3	—	—	—	3	—	—	—
15.0-19.9	18	1	17	—	1	—	17	—	—	—
20.0-24.9	14	4	10	—	2	2	7	1	1	1
25.0-29.9	4	1	3	—	1	—	1	1	1	—
30.0-34.9	3	3	—	—	1	2	—	—	—	—
35.0-39.9	11	11	—	3	4	4	—	—	—	—
40.0-44.9	22	21	1	9	3	9	1	—	—	—
45.0-49.9	29	28	1	13	7	8	—	—	1	—
50.0-54.9	12	12	—	5	5	2	—	—	—	—
55.0-59.9	5	5	—	5	—	—	—	—	—	—
60.0 and over ..	2	2	—	2	—	—	—	—	—	—

SOURCE: United Nations, *Population Bulletin*, No. 7 (United Nations publication, Sales No.: 64.XIII.2), p. 2.

Table 3. Distribution of countries by level of gross reproduction rate (GRR)

(Excluding countries having fewer than 250,000 inhabitants in 1960 and those having no satisfactory data. Countries are classified according to levels of GRR in 1960 or at the most recent dates of available data)

Level of gross reproduction rate	World total	Less developed regions	More developed regions	Africa	Asia (excluding USSR)	Middle and South America	Europe (excluding USSR)	Northern America	Oceania	USSR
TOTAL	122	87	35	37	24	26	29	2	3	1
Under 1.0	1	—	1	—	—	—	1	—	—	—
1.0-1.2	14	1	13	—	1	—	13	—	—	—
1.3-1.5	13	2	11	—	—	2	10	—	—	1
1.6-1.9	10	3	7	—	3	—	4	2	1	—
2.0-2.3	7	6	1	3	—	3	—	—	1	—
2.4-2.6	12	12	—	8	4	—	—	—	—	—
2.7-2.9	24	24	—	9	6	9	—	—	—	—
3.0-3.2	19	19	—	8	3	8	—	—	—	—
3.3-3.5	20	18	2	8	7	3	1	—	1	—
3.6 and over ..	2	2	—	1	—	1	—	—	—	—

SOURCE: United Nations, *Population Bulletin*, No. 7 (United Nations publication, Sales No.: 64.XIII.2), p. 2.

Statement by the Rapporteur: Mr. M. EL-BADRY

Population Division, Bureau of Social Affairs, United Nations, New York

The meeting on fertility derived its importance from the great concern felt by the developing countries over the recent dramatic increases in their rates of population growth. These had resulted from recent mortality declines which had taken place while fertility remained unchanged. The importance was demonstrated by the large number of valuable papers contributed, the important contribution of the Moderator, the large number of speakers and the heavy attendance.

The papers and interventions dealt mainly with the following aspects of the general subject:

- (a) levels and trends of fertility;
- (b) influence of economic and social factors on fertility;
- (c) effectiveness of policy measures aimed at influencing fertility.

During the deliberations the need was repeatedly pointed out for reliable statistical information concerning fertility in developing countries. Thus, while some information exists in many of these countries regarding the present fertility level, it is far more difficult to obtain data on fertility trends. Even the data on present levels may be influenced by various sources of error, and they are not usually detailed enough to permit the derivation of detailed measures of fertility.

In this connexion, the discussions repeatedly emphasized the usefulness of sample surveys as an effective means of securing valuable information on levels and trends in areas where registration and census information are lacking. Nevertheless, it was pointed out by several speakers that caution must be exercised to guard against errors, sampling errors as well as response errors, before interpreting sample results.

Available data show that the fertility level in developing countries has been fairly stable at a high level, with the birth rate in most of these countries in the range of forty to fifty births per 1,000 population and the gross reproduction rate usually well above 2. Information also indicates that the developing countries which have shown significant decrease below the level of thirty births per 1,000 population and a gross reproduction rate of 2, are already on their way to industrialization and urbanization. In fact, this level marks a sharp division between developed and developing countries.

The birth rate in most developed countries is now in the range of 15 to 25 per 1,000. It has been brought down, by individual initiative, in the course of socio-economic development, and the trend has gained more and more momentum with time, in such a manner that the bulk of the decrease has taken place in most

cases during the last fifty to seventy-five years. It was noted that now such low fertility levels have been attained in these developed countries, the ability of individuals to control their reproduction has enabled them to marry at an earlier age than before, and to modify the timing of their births in such a way as to have their children at younger ages. It was further remarked in this connexion that with fertility well under control in these countries, the negative correlation between fertility and the particular advance attained in economic development is weaker now than it was before the considerable reduction in fertility took place. Nevertheless, a striking fact about fertility in the developed nations today is that differences are dwarfed by similarities, and that within narrowing limits the general character of socio-economic development seems to have prescribed a single modern fertility pattern.

Though more detailed information is needed about the factors that have led to fertility decrease in developed countries, it was generally felt that contraception and the practice of induced abortion were probably the major factors responsible for decline. Age at marriage was generally of minor importance, although it was the main factor in one or two countries. Systematic data on the important role which abortion has been playing in the transition from high to low fertility are very limited, but a significant contribution to our knowledge of this role in some countries where induced abortion is not legally prohibited was made in one of the papers received. The paper demonstrates the profound effect which abortion has had in these countries. However, the need was expressed for more knowledge about the character, volume and correlates of the illegal abortion which seems to characterize the transitional stage in all other countries.

Even as regards contraception, which probably accounts for the major decline in some Western countries, and to which a shift appears to be under way in those developed countries where abortion has not been illegal, information is still weak. Data are still lacking for most low fertility countries on the proportion of couples in various demographic and social strata who use various contraceptive methods.

In the general field of fertility measurement, the meeting discussed various topics ranging from the effect of foetal deaths on fertility to the formulation of probabilities of birth. Local studies were also presented. Thus, a communication was presented which dealt, on the basis of local data, with the influence of sex disproportions on marital status and fertility.

Another paper studied the local age pattern of fertility decrease and confirmed the observation that this decrease starts among mothers above the age of thirty who find, as a result of lower mortality and rising living standards, that almost all of their children survive, and consequently seek some means of limiting further increase in their families.

In the course of the study of measurement, the effect of foetal deaths on fertility was taken up. Through the application of a simple model to a small amount of information, a communication to the meeting estimated that, as an average, about 30 per cent of pregnancies terminate in foetal deaths and that the absence of such deaths would raise the gross reproduction rate by about 14 per cent. The paper pointed out, however, that more information was needed for a better understanding of the phenomenon: information on the level and timing of foetal deaths in each age group of the mother and on the period of temporary infertility which follows each birth or miscarriage in each of these ages. There was also need to supplement the existing information on the delay of conception after the termination of amenorrhoea, by mother's age. As pointed out during the meeting, the information should be collected under various social circumstances, and should take into consideration the relevant factors influencing fertility. It was also indicated that the study of this important subject would be enhanced by more information on the effect of the frequency of sexual intercourse on fertility by mother's age.

Another contribution was a methodological construction of an orderly system of fertility indices for a hypothetical cohort, similar to the life-table system of mortality measures. This work is based on a fertility function which is the probability for a woman of a certain age and a certain number of children to give birth to one more child before she becomes one year older. This proposed function is calculated from census and registration data and it was suggested that these age- and parity-specific birth probabilities could be combined with mortality and nuptiality data for purposes of demographic analysis.

The need was also expressed, in the course of the discussion on measurements, for methods which are sensitive enough to measure relatively small changes in fertility levels induced by family planning, particularly in areas where fertility was declining before the programme began.

In the process of historical socio-economic development, fertility has undergone an evolu-

tion from a primarily biological phenomenon into a socio-economic-biological phenomenon. The role of socio-economic factors in influencing fertility was given great attention at the meeting. In a partial correlation analysis of data from forty-three countries, a study presented to the meeting showed that the birth rate was directly associated with economic level when control was effected for the levels of communications flow and of infant mortality. The analysis also showed that, controlling for the economic level, the level of fertility varied inversely with that of communications flow and directly with infant mortality level. The study suggested that it might be a mistake to rely too exclusively on economic development to reduce fertility, and that it would be essential to include large expenditures on education in the development process, so that the flow of communication could increase.

The paper asked for caution in interpretation because of the small sample size. As was pointed out in the discussion, there is need to carry this analysis a step further by stratifying countries according to social and economic structure. It is known, for instance, that in developed countries the negative correlation between fertility and economic level is not now so strong. This latter observation was made in a paper submitted to the meeting and also in a number of other works. In fact, there is also need for an analysis which takes into consideration the various relevant social and psychological factors.

In another study of the same subject, it was pointed out that an analysis of the relationship between fertility and income would be complete only if it took into consideration the free services provided by governments, such as education, medical care, etc., since the amount of such services was directly related to the number of children. This more complete analysis may show the influence of income on fertility to be less decisive than the factor of whether or not the wife is participating in the labour force, or the influence of education, not only in postponing the age of marriage or in disseminating knowledge about contraceptives, but also in enhancing the determination of individuals to spend more time on the satisfaction of their cultural aspirations and to bring up their children to correspondingly higher standards.

In this connexion, the question of religious doctrines and attitudes in regard to fertility was taken up. It was remarked that these attitudes and practices are in transition now in many parts of the world, that attitudes more

favourable to family planning are found in more developed societies and sectors, and that in well developed areas religious differences in regard to fertility are narrowing as concern for a smaller number of better-brought-up children continues to spread. It was concluded that the role of religion in this respect is consistent with the view that religious beliefs are likely to have followed, rather than led, the course of fertility declines in the modern world.

In a study of the economics of family formation, it was shown that in a traditional agrarian society the consumption needs of a large family place only a relatively light strain on its resources, and this is balanced by the assurance of security in the later phase of the family cycle. This situation is conducive to large families as a social norm. A change in economic structure that involves lower mortality, a devaluation of child labour and new requirements for schooling immediately augments the economic burden, often without corresponding benefits to the security of the family. This pressure was originally met in developed countries by severe measures such as induced abortion carried out by crude and dangerous methods, postponement of marriage for long periods and overseas emigration.

The lack of comparable response to population pressures in many of the less developed countries today severely complicates their economic situation. Perhaps new types of response may be facilitated by the availability of less drastic and more effective means of regulating fertility. This is the reason which motivates the great attention which has been given or is now being given in an increasing number of countries to the facilitation or inducement of fertility decline through public policy measures.

Thus, abortion is already legalized in several countries as a necessary social measure for the protection of a woman's health and for maintaining her right to determine whether and when she desires to have a baby. This right, in some instances, is conditional upon personal and family circumstances. Nevertheless, the fact that, within the countries which do not prohibit abortion, women apply this measure to a varying extent, and that its impact on fertility differs considerably, proves that abortion is only one of the measures of fertility control. In fact, policies in this respect are now designed to encourage a shift from abortion to contraception.

The experience of Japan in this regard was cited. There, the basic motivation towards the small family pattern already existed as a result of developing social, economic, cultural and

psychological factors, while at the same time the country was suffering from the pressure of population on inadequate resources. Thus, the people, with the active participation of the mass communications media, reacted strongly in favour of birth limitation. A greatly liberalized attitude towards induced abortion was adopted by the Government, primarily to meet this public demand. Some years later, the Government, alarmed by the very rapid increase in the number of induced abortions, decided to replace induced abortion by the use of contraceptives through educational programmes and the provision of contraceptives, until eventually the number of abortions started slowly to decrease. An important observation in this respect is that public programmes were not directed mainly towards motivation but rather towards enabling the people to accomplish their desires.

It is generally conceded that a certain amount of social and economic development is necessary before there will be widespread adoption of family limitation, even with government sponsored programmes. But the question of how much development is needed, and in which specific variables, is still controversial and can only be finally settled empirically. It is felt that family planning is unlikely to materialize on a large scale in any country until, besides a mortality decline, there has been enough socio-economic development, particularly in education and mass communications, to lessen dependence on local and familial institutions and to make smaller families more rewarding to individuals than large families.

Once a threshold stage of development is reached and individuals start to realize the disadvantages of large families, the stage is set for fertility decline. Well organized pro-

grammes, both public and private, and particularly those using the modern effective and acceptable contraceptives, can then act towards expediting the spread of family planning and shortening the period of grave social and economic difficulties. It was noted that a remarkable beginning has already been made in the government family planning programmes in Taiwan and the Republic of Korea, where very large numbers of couples are adopting the new intra-uterine contraceptive devices. Acceleration of fertility decline can be expected for these and similar countries in the near future.

Finally, reports were given on family planning in India and Pakistan—two large developing countries in which, along with social and economic development, and mortality decline, government sponsored programmes aiming at spreading education in family planning and providing contraceptives are already under way and are gaining momentum from one five-year plan to the next. It can be argued, in the light of the past experience of developed countries, that fertility declines will materialize as a consequence of various aspects of the social and economic development which is already under way in these and other developing countries. The question which these two large experiments and others will answer is how much of the distress of population pressure can be saved, and how far the development itself will be expedited, by family planning programmes. Hence, these experiments are of extreme importance to humanity and, as was said several times during the meeting, the world will look forward to hearing much more about the success of these and similar programmes at the next World Population Conference.

MEETING B.1

Factors and patterns of fertility in areas where fertility is relatively high

Statement by the Moderator: Mr. G. W. ROBERTS

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I

For convenience in discussion, the twenty-nine papers prepared for this meeting may be treated as falling into five broad groups, according to the particular aspect of fertility with which they are mainly concerned. These do not, of course constitute water-tight compartments; several papers deal, at least in part, with two or more of the aspects distinguished here. Nevertheless, each one seems to emphasize one of the five aspects indicated. It is significant that the largest group, consisting of ten papers, is that covering the several aspects of fertility control. Another large group, to which six papers have been contributed, deals with age at marriage and its relation to fertility. Fertility levels and fertility differentials form the theme of a group of seven papers. Discussions of family types and the general relationship between such types and the levels of fertility are covered in two papers, including one devoted almost entirely to the comparison of legitimate and illegitimate fertility rates. Two papers seek to assess the role of two of the world's great religions on the level of fertility. One author deals explicitly with the relationship between economic development and fertility levels, a subject touched on also by others who are engaged in developing other lines of analysis. It cannot be claimed that these papers cover all the themes relevant to this meeting; for instance, there is no comprehensive treatment of mating in any high fertility country. Nevertheless, the collection emphasizes the major issues of fertility within the relevant societies.

Of interest also is the geographical coverage achieved by this meeting. With the exception of one, which draws on the experience of the Soviet Union in analysing declines in fertility,¹

all the papers concentrate on the experience of the populations of high fertility. By far the largest number (nine) focus on India and Pakistan. Four each are devoted to Latin America and the Far East, and three each to Africa and the United Arab Republic. Four of the papers consider fertility patterns in a general way, that is without reference to a particular country.

II

The importance of age at marriage as a determinant of the level of fertility is stressed in all six papers dealing explicitly with the ways in which nuptiality influences fertility in general, and others which have a somewhat different centre of interest also refer to it. In her general discussion, J. Blake acknowledges the factors making for early marriage at work in many societies, such as prestige, children, legitimate sexual access and sexual division of labour, but argues that there are forces at work making for the postponement of marriage.² This postponement, it is claimed, is of special advantage to parents, and a latent desire to delay their children's marriage seems to operate in some societies. Despite the notion that tradition in many societies tends to result in most of their people marrying early, there is historical evidence that relatively late marriage has characterized many societies. The author, however, does not link her argument to the implications and consequences of the falls in age at marriage noted in some European countries in recent years.

A. Nevett's discussion of age at marriage and parental responsibility in India poses issues parallel to those raised by J. Blake.³ Here the practice of early marriage is shown to have

¹ V. I. Kozlov, "Some causes of the high fertility of the population of developing countries", *Proceedings*, vol. II.

² Judith Davis-Blake, "Parental control, delayed marriage and population policy", *Proceedings*, vol. II.

³ A. Nevett, "Age at marriage, parental responsibility and the size of the family", *Proceedings*, vol. II.

a very long history, and to be linked with the respect accorded to women in virtue of the number of children, especially sons, that they bear. Male dominance is shown to be strong and contrary to Blake's position, Nevett claims that the influence of the parents makes for early marriage of their children. Because the partners have to be of the same caste, sub-caste and corresponding horoscopes, the choice is greatly limited and a suitable marriage has to be arranged at a very early age. Nevett does not seem to envisage a rise in the average age at marriage, which Blake envisages on the basis of the latent desire of parents to delay their children's marriage, and the existence of which is demonstrated statistically by some contributors, notably Yun Kim and S. N. Agarwala.

S. N. Agarwala's analysis shows that women who marry at ages over 19 years tend to have smaller numbers of children than those who marry before then.⁴ He estimates the amount by which fertility levels may be expected to decline in India as a consequence of the rise in the average age at marriage to 19-20 years. Using certain age-schedules of currently married females and age-specific fertility rates, he calculates what the effects on fertility will be if the present average age at marriage of 15.6 years is raised to 19-20 years in the course of a thirty-year period. He finds that the female birth rate of about 48 per 1,000 will be reduced to 31, that is by about 27 per cent, on the basis of one kind of calculation. Another approach shows a rate of decline of 30 per cent. The general conclusion from this analysis is that a rise in the average age at marriage will be accompanied by a fall in the level of fertility.

Yun Kim's investigation of the relationship between age at marriage and fertility in Korea leads to a conclusion essentially similar to that of Agarwala.⁵ There is evidence of a rise in the age at marriage from the registration records as well as from census data. Prior to 1945, the mean age at marriage was about 22.9 years for males and 19.8 for females, and by 1960 these had increased to 28.7 and 24.0 years respectively. The major factor contributing to this rise was the surplus of females at the customary age of marriage. There were only 62 single males aged 20-34 years per 100 single females aged 15-29 years in 1955, as compared with 102 per 100 single females in 1935. The larger proportions of women working and undergoing higher education

might also have contributed to the comparatively large proportion of unmarried females.

It is argued that because of the changes in marriage schedules of females, equivalent to a 26 per cent increase in the singulate mean age at marriage between 1935 and 1960, total fertility rates declined by about 16 per cent between 1935 and 1960. Among the lower age groups, declines of as much as 87 per cent are recorded, while, on the other hand, increases of the order of 59 per cent are observed at higher ages.

The change in marriage patterns was not accompanied by changes in age-duration-specific fertility rates, and from this the author concludes: (1) that there has been a 12 per cent increase in the average age at child-bearing from 25.1 to 28.1 years; (2) that there has been a 16 per cent fall in the gross reproduction rate; (3) that there has been a 19 per cent decline in the crude birth rate; and (4) that there has been a decline of about 18 per cent in the net reproduction rate, when mortality is held constant. When the changes in marriage patterns and in mortality are considered simultaneously, the net reproduction rate has increased by about 8 per cent from 2.82 to 3.04.

Probably, the mean age at marriage in Korea, which by world standards still remains low, will increase in future years. The author estimates that if the singulate mean age at marriage increases so that the average age at child-bearing reaches 30 years, the rate of population growth in the country will decline by 7.7 per cent, from 27.9 to 26.1 per 1,000 population. Clearly, still further reductions can be envisaged through the spread of family planning operations.

R. A. Henin's paper, which because it deals explicitly with the effects of economic change on fertility is considered separately, also suggests that in the Sudan the markedly lower fertility among nomadic peoples, as compared with their settled counterparts, may stem from the smaller proportions of nomads ever married, as well as from the differences in average age at marriage.

N. Chandra Das's analysis of the position in India apparently does not agree with the conclusion of S. N. Agarwala and Yun Kim that fertility and the average age at marriage are closely linked.⁶ Das argues that in India the fertility and birth rate has not been reduced by the postponement of marriage. "The hypothesis that the postponement of marriage leads

⁴ S. N. Agarwala, "Effect of a rise in female marriage age on birth rate in India", *Proceedings*, vol. II.

⁵ Yun Kim, "Age at marriage and the trend of fertility in Korea", *Proceedings*, vol. II.

⁶ Nitai Chandra Das, "A note on the effect of postponement of marriage on fertility", *Proceedings*, vol. II.

to a reduction in fertility appears not to be so simple or straightforward, at least for a limited rise in age at marriage."

R. I. Siffman reports on studies of fertility in the Soviet Union, which showed extremely high rates of fertility in Azerbaijan and Armenia.⁷ In the former, women showed on the average 8.5 births, while the corresponding figure for the latter was 9.1, during the fifteen years before the Second World War. The average age at marriage was very low, 17 years. There is no evidence that the very low age at marriage is associated with a very low age at menarche, but clearly such a low age at marriage contributed materially to the extremely high birth rates. Recent campaigns to raise the average age at marriage have contributed to declines in fertility.

III

Next there is a group of papers dealing with fertility levels and differentials, in which the authors draw on the experience of the Sudan, the United Arab Republic, India and Morocco in preparing their contributions. Another paper takes the form of a survey of the experience of several developing societies.

R. A. Henin's paper considers an aspect of fertility important to the developing countries, the possible effects of economic change on fertility patterns and levels.⁸ This is studied by reference to the Gezira scheme in the Sudan, where irrigation schemes have evidently led to "a ruralization rather than an urbanization movement". By comparing the fertility experience of groups of people settled in the Gezira scheme with groups which are still nomadic, the author attempts to estimate the effects of economic change on fertility.

There is very little difference between the two groups of women in respect of average size of completed family. In terms of general fertility rates, however, the settled group has an advantage of 80 per cent over the nomadic. Both groups are Moslem and do not practise birth control. It seems, however, that per capita income is higher among the Gezira farmers than among the nomadic group.

An analysis of the census data suggests that 14.8 per cent of the females of the settled group were single or widowed and thus not contributing to reproduction, whereas the corre-

sponding proportion among nomads was 27.9 per cent. It is also possible that the age at marriage was higher among nomadic women. Similar differentials are observed among the males.

Health factors may also play an important part in establishing the differentials noted. For instance venereal disease is widespread amongst the nomads, and this may induce a high rate of sterility and sub-fertility, while the prevalence of malaria among them may result in high rates of abortion.

This aspect of economic development, i.e. the higher rate of population growth associated with settlement of nomadic groups, in the words of the author "creates extra burdens for a developing country".

M. El-Badry and H. Rizk examine fertility differentials in the United Arab Republic, shedding still further interesting light on fertility in developing societies, on the basis of census and survey material.⁹ In non-urban areas, illiterate women show a fertility lower than that of women who can just read and write. Fertility of women with secondary school certificates is lower than that of women who can just read and write, and with few exceptions also lower than that of the illiterates. There is generally little difference between women with an elementary education, and those who can just read and write. The non-urban pattern is therefore unimodal, with a peak among women who can just read and write or who had an elementary education. By contrast, the pattern in the urban areas displays a steady decline as the level of education rises. The exception to this pattern which emerges from the rural experience, with the illiterates showing a relatively low fertility, may be due to the poor environmental conditions with which they have to contend.

In terms of occupation of father, it appears that the professional and administrative groups show the lowest fertility in urban areas, while the clerical class occupies the second highest level. On the other hand, in the rural areas it is the professional and administrative classes that have the highest fertility. It is noteworthy that in the rural areas the farmers show the lowest fertility.

Apparently there has been a small rise in the average age at marriage, but it is doubtful whether this has in any way been involved in the differentials noted.

⁷ R. I. Siffman, "Age at marriage as a demographic factor in conditions of high fertility", *Proceedings*, vol. II.

⁸ Roushdi A. Henin, "Some aspects of the effects of economic development on fertility in the Sudan", *Proceedings*, vol. II.

⁹ M. El-Badry and Hanna Rizk, "Regional fertility differences between socio-economic groups in the United Arab Republic", *Proceedings*, vol. II.

H. Rizk's survey data showed that no fertility control practices were admitted by women in rural areas. The frequency of the use of contraception increases with the level of education in both urban and semi-urban areas; in each educational group, the proportion of controllers is larger in urban than in semi-urban regions.

A. K. M. Zikry's study of differentials in the United Arab Republic shows that fertility in the urban areas is higher than in the rural.¹⁰ In the author's view, this "indicates that urbanization in the United Arab Republic is proceeding along different lines from the course followed by industrial countries during their demographic transitional change when urban fertility led the way towards lower rates and smaller size of family".

As far as religion is concerned, there is a wide difference between adherents of the two major religions, Moslem and Christian, in the urban centres, but this does not extend to the rural districts. In urban areas, Moslem fertility appreciably exceeds that of Christians. Urban Christians have higher education and socio-economic status than their Moslem counterparts and may therefore be more strongly motivated to practise birth control.

The differentials by education and by occupation of male partner arrived at by Zikry are similar to those presented by El-Badry and Rizk.

S. Thapar's analysis of a sample in Delhi establishes the very high level of fertility prevailing there, and shows the comparatively low age at which many of the women cease child-bearing.¹¹ (This characteristic, it should be noted, is paralleled by experience among Indian females in the Caribbean.) A comparison between the Delhi data and data for Taiwan indicates that the average age at marriage is lower among the former, but that the mean fertility as well as the birth intervals are similar.

One problem to which the author addresses herself seems highly important to the future course of fertility in India. This is the possibility of a decline in the rate of onset of sterility among females as health conditions improve. Despite the spread of contraceptive practices, it is possible that better health may

prolong the period of effective child-bearing and thus tend to offset the effects of such developments as a rise in the age at marriage and the increased use of contraceptives.

Despite the very high level of fertility in Morocco, there is, as A. Berrada shows, a well-defined differential in terms of occupation of husband.¹² Fertility is highest among merchants and vendors, whose wives show a completed fertility of 6.18. The second highest level (6.11) is found among wives of quarrymen and miners, who constitute the largest occupational class in the country. The economically inactive group, largely of impoverished nobles, contributes the third highest level; here completed fertility averages 5.78. Wives of men engaged in agriculture and forestry come next (5.49), followed by those of clerks and typists (5.25). At the lowest point come the intellectual group, the professionals, who have a completed fertility of 5.02.

G. Wuelker shows that fertility in Togo (West Africa) is very high.¹³ A birth rate of 55 per 1,000 is estimated from the census of 1958-1960, while the number of births per woman aged 15-45 has been estimated at between four and six. Polygamy is practised by sections of the population, but it is not possible to give firm differentials between polygamous and non-polygamous females. The author concludes that there is little chance of a change in attitudes to child-bearing, while the prospects of shifting from an essentially agrarian economy also seem dim.

M. Concepción, in a survey covering many societies,¹⁴ considers to what extent urbanization, improvements in health, education, economic status and other characteristics are associated with fertility differentials. Many of the differentials associated with the advanced societies have their parallels in the developing nations, especially widespread being rural-urban differentials and differentials by education. Nevertheless, there are some patterns of fertility which differ essentially from those usually observed in European populations. An interesting instance of this is the fact that fertility is higher in urban than in rural areas in the Congo. The author concludes that in the short

¹² Abdellah Berrada, "Fertility in relation to the profession of the head of the household and the age of the mother", *Proceedings*, vol. II.

¹³ Gabriele Wuelker, "Effects of social and family patterns on the population increase in Togo (West Africa)", *Proceedings*, vol. II.

¹⁴ Mercedes Concepción, "The effect of current social and economic changes in the developing countries on differential fertility", *Proceedings*, vol. II.

¹⁰ Abdel-Khalik M. Zikry, "Fertility differentials of the United Arab Republic women", *Proceedings*, vol. II.

¹¹ Savitri Thapar, "Fertility rates and intervals between births in a population in Delhi", *Proceedings*, vol. II.

run certain sub-groups may experience rises in fertility with increasing modernization, while the spread of education may not necessarily bring about reductions in fertility.

IV

Two papers deal with fertility from a somewhat different standpoint, that is from the standpoint of particular types of families identified. Implicitly this approach assumes that the nature of the family type, including age at entry, stability and possibly intensity of sexual relationships, influences rates of fertility. The types of family identified vary from one study to another. In the papers under review only very simple divisions are recognized.

M. Nag compares the fertility of the joint families and that of the single families in India, using data from a sample of seven villages.¹⁵ Fertility is lower among joint families for the several socio-economic groups identified. There is a strong possibility that this differential may be associated with differences in coital frequency. Difficulties of ensuring privacy in joint households results in lower frequencies of coitus and stricter observance of traditional taboos on sexual intercourse on particular days. Further, restrictions against re-marriage of widows may be more strictly enforced among women living in joint families than among those in single families. The author, however, does not claim that the experience of joint families constitutes a decisive influence on birth rates throughout the country.

J. M. Vergara analyses illegitimacy in Chile, comparing the fertility rates for married and unmarried females.¹⁶ He emphasises the basic difference between the distributions of mothers of legitimate children and mothers of illegitimate children. The latter are concentrated in the younger ages to a much greater extent than are the former. Moreover, the proportion of first births is much higher among illegitimate than among legitimate births.

Although there has been a marked downward trend in the proportion of illegitimate births since 1920, there has apparently been no complementary change in illegitimate age-specific fertility rates. Such rates computed by the author are well below the corresponding legitimate rates; but it should be noted that the relation of illegitimate births to all non-married females tends to understate the age-specific rates of fertility of unmarried women.

¹⁵ Moni Nag, "Family type and fertility", *Proceedings*, vol. II.

¹⁶ Julio Morales Vergara, "Demographic analysis of illegitimacy in Chile", *Proceedings*, vol. II.

V

The ways in which two of the great religions of the world contribute to fertility differentials and levels form the subject of two papers.

D. Kirk deals with the extremely high fertility characteristic of all peoples of the Moslem faith.¹⁷ This religion is a strongly conservative force and, like many other religions, enjoins its adherents to marry early and to multiply. These injunctions and the belief that children are the greatest blessings of Allah exert a strong influence on all Moslems. Moreover, these societies usually show low indices of material development and low educational standards.

In addition to the foregoing, the marriage institutions of the society, i.e. early unions and strong injunctions for re-marriage of widows and divorced women, conduce to the high level of child-bearing. The absence of any restrictions against sexual intercourse is a firm feature of the Moslem culture. Unlike Christianity and Hinduism, no value is placed on sexual asceticism. A permanent state of celibacy is abnormal for men and unthinkable for women. The woman also holds a very low position in the society which contributes to her high exposure to the risk of child-bearing.

The effect of religion on fertility is the subject of another study, by C. J. Gómez, who deals with a society, that of El Salvador, which differs considerably from the Islamic community.¹⁸ El Salvador is a predominantly Catholic country, and the question examined is the effect of the intensity of religious devotion on levels of fertility. There is not much difference in size of family among the women in terms of intensity of religious practices. The introduction of level of education into the analysis, however, shows that among the highly educated it is the more devout who show a lower fertility. However, the reverse is the case with women of low educational status; these have a higher fertility when they are more devout. It appears, in fact, that religion is not as important a factor as education in determining fertility levels. This is further reflected in the use of contraception. Among the more highly educated females, the use of birth control practices is most frequently found within the ranks of the devout.

¹⁷ Dudley Kirk, "Factors affecting Moslem natality", *Proceedings*, vol. II.

¹⁸ Carlos J. Gómez, "Religion, education and fertility control in Latin American societies", *Proceedings*, vol. II.

VI

A number of important topics relevant to family planning are touched on in the papers devoted to fertility control, and several significant questions are raised, especially in relation to the weight to be given to the declared family size preference in surveys conducted in India.

H. M. Husein surveys the progress in the spread of birth control in the United Arab Republic.¹⁹ He notes that, with the emergence of the Revolutionary Government in 1952, "the scientific attitude started to prevail in the major national affairs". In 1962 the Charter of the Republic announced by the President called on every citizen to consider planning his family. Family-planning clinics were first established in 1955, four in Cairo and four in Alexandria. These were "not meant to give service as much as to afford the means for scientific experimentation and supply of data in both fields of birth control and sterility treatment". The number of new cases attending the clinics increased somewhat irregularly, but there has been a marked upswing since 1964.

Part of the function of the clinics was to assess the applicability and success of different methods of contraception. The vaginal diaphragm and jelly was used regularly in only a small percentage of cases, although it has been the most widely dispensed method. Vaginal foam tablets are mainly favoured by illiterate women, especially in rural areas, largely because of their simplicity. Jellies and creams proved popular, but had a high failure rate. Oral contraceptive pills and intra-uterine contraceptive devices are very recent introductions, and their popularity and effectiveness under local conditions cannot as yet be assessed.

In another paper, C. S. Chung, after surveying the very high levels of fertility prevailing in Singapore, outlines the work of the Singapore Family Planning Association.²⁰ Attendance at the association's clinics has risen sharply, with the total visits of all kinds in 1963 exceeding 60,000. All the important ethnic groups—Chinese, Malaysians, Indians and others—are represented in the clinic population, although the great majority are Chinese. Of special importance has been the recent increase in attendance by Malaysians. The author suggests that the work of the clinics has contributed to recent declines in fertility in Singapore.

¹⁹ Hasan M. Husein, "Evaluation of progress in fertility control in the United Arab Republic", *Proceedings*, vol. II.

²⁰ Ching San Chung, "Evaluation of progress in fertility control in Singapore", *Proceedings*, vol. II.

In his survey of the problems of controlling fertility in India, P. B. Gupta notes that there is general acceptance of the view that a state policy for promoting birth control is the best means of achieving fertility declines.²¹ But he raises the question whether "a possible control of some variable, on which fertility is known to depend, would not be a more scientific approach, capable of producing better results in Indian conditions".

The prospects of success of Government policies aimed at lowering fertility seem dim because of the high proportion of the population that is illiterate and the low living standards in rural areas. Although the Government's family planning programme was introduced during the First Five-Year Plan, not much headway has been made. It is reported that only about 6 per cent of married couples practise contraception other than by abstinence. If there has actually been a fall in the rural birth rate, it has not been due to Government policy. Probably such evidence of low fertility as is available is confined wholly to small groups of urban, highly educated people.

Sterilization has also been vigorously supported as a means of controlling fertility, while claims have been put forward that with seven sterilizations per 1,000 population per year the birth rate would fall by 50 per cent in ten years. Gupta argues that the fall would be more likely to be about 20 per cent. Indeed, on the basis of official figures of numbers so far sterilized, a fall in the birth rate of 6 per cent is all that can be counted on in the next ten years.

A consideration of patterns of marriage and fertility over the whole country leads Gupta to conclude that the attainment of a critical level of living is essential for the reduction of fertility. Rises in educational levels and in the level of living should therefore be the main instruments for achieving fertility declines. This improvement should be directed above all towards the rural sections of the economy.

J. Y. Takeshita surveys the progress made in controlling fertility in Japan, Taiwan and Korea, in all of which the status among the inhabitants of birth control knowledge, attitudes and practices is fairly well documented.²² Japan shows little evidence of dependence on children in old age, while the desire to have sons instead of daughters is rapidly disap-

²¹ P. B. Gupta, "The problem of fertility control in India", *Proceedings*, vol. II.

²² John Y. Takeshita, "Birth control in some of the developing countries of the Far East", *Proceedings*, vol. II.

pearing. In Taiwan, however, there is still some special desire for sons and reliance on children in general as aids to old age.

In most Far Eastern countries, the preference now is for medium-size families of two to four children. Few women want to remain childless or to have very large families, and few now consider family size a matter subject to fate, god or nature. Large proportions of these women are now familiar with contraceptive devices and approve of their use. Thus, 95 per cent of the married women aged 20-44 years in a survey in Seoul and 92 per cent of the married women aged 20-39 years in Taichung approved of birth control, but the percentages are much lower in the rural areas.

In these countries, of the three forms of birth control—contraception, induced abortion and sterilization—the first is very widespread in Japan. About 68 per cent of the married couples used it in 1961, while 41 per cent had had at least one abortion. Contraception and induced abortion were practised on a much smaller scale in Korea and Taiwan, but some sterilization was also reported.

Resort to these methods tends to take place after age 30 years and after about ten years of marriage, or after the birth of three or four children. Many couples also resort to induced abortion before they are introduced to contraception, although both in Korea and Taiwan induced abortion is illegal. In Japan the condom and the rhythm method are the most popular. In Korea the foam tablet is highly favoured, while in Taiwan the Ota ring and tubal ligation are most often resorted to.

M. Ahmed's analysis of male attitudes towards family limitation is confined to the population of East Pakistan.²³ Those desiring no more children had a mean age of 38.1 years and a mean marriage duration of sixteen years, while on the average each had had 5.5 children. Those desiring more offspring were younger, with an average age of 29.3 years, a mean marriage duration of 6.6 years and a family of 2.2 children. In many cases, the desire for more children was in fact a desire for more sons. The desire for more children was stronger among comparatively higher income groups. Again, the desire for additional offspring increased considerably with the level of education, "a phenomenon quite contrary to the belief that the desire for additional offspring in the family tends to decrease with educational betterment". It is also of interest that

the proportion desiring no more children was higher among labourers and agriculturists than among teachers.

About 73 per cent of the men interviewed showed favourable attitudes towards birth control, while 52 per cent were opposed to its use. The higher the educational status, the greater the extent to which birth control was acceptable; even among the illiterate group 53 per cent were favourably inclined towards family planning. Acceptance of birth control increased with the rise in occupational status, as well as with the level of income.

V. Prakasha argues in favour of reliance on formal education as a means of spreading contraception.²⁴ The writer maintains that education along the lines of fertility control has been neglected in programmes of adult education in developing societies. "There is no good reason why family planning should not be used as a major focus in the learning experiences and activities of the illiterate adults." Adult education for family planning also offers opportunities for partnership between organizations in education, community development, public health and family planning. The main problem, it is urged, is the integration into teaching policies and programmes of appropriate material which will induce the spread of knowledge about birth control.

Measuring the strength of social norms concerning family size is the subject of the paper by N. K. Namboodiri.²⁵ Probably, high fertility patterns in the developing countries are rooted in the normative pressures to have large families, although many persons in such societies are motivated to practise birth control. He postulates a transitional "anomic situation" preceding the full acceptance of the small family ideal, during which small family preferences are spreading but when no firm commitments to limitation of the family size are in operation.

Admittedly, the general preference for small families obtained in surveys suggests that the data obtained are not meaningless, "but whether they indicate a crystallized small-family-mindedness is a debatable point". The uniformity to the answers may be "largely ascribable to the uniformity of conditions specified in the frame of reference of the questions". It is argued that all interview questions used to measure preferences "contain implicitly

²⁴ Veda Prakasha, "Education as preparation for fertility control", *Proceedings*, vol. II.

²⁵ N. Krishnan Namboodiri, "On the problem of measuring the strength of social norm concerning family size in developing areas", *Proceedings*, vol. II.

²³ Mohiuddin Ahmed, "Male attitudes towards family limitation in East Pakistan", *Proceedings*, vol. II.

or explicitly the clause that the respondent should consider it possible to have just the number of children preferred or considered ideal". Responses tend to be stereotyped answers rather than opinions given from a practical perspective. "Simple statements of family size preference should not be taken to be indicative of crystallized attitudes towards family size." Nor do statements on ideals reveal the intensity of desire on the part of the respondents to achieve the preferred choice.

M. V. Raman's review of studies of attitudes towards family size in India questions the frequently accepted notion that religion is not against the adoption of fertility control.²⁶ In his words, "there are substantial indications of religious sanctions and encouragement for larger families". On the other hand, there are injunctions, such as those against re-marriage, which tend to lower fertility. He shares N. K. Namboodiri's doubts as to whether declared preferences for small families indicate firm motivations to effect reductions in fertility. The fact that a study in Calcutta showed that under existing conditions women preferred two children, but claimed that under ideal conditions their preference would be for four, emphasizes that much more careful study of preference of family size is called for.

There is also evidence of conflicting attitudes toward birth control. A woman's acceptance of contraceptive supplies does not mean that she is prepared to use them. After ten years of exposure to family planning programmes, there still remain substantial proportions of the population lukewarm to contraception or wholly opposed to it.

E. G. Ericksen raises the question whether "emerging variegations in life styles" do not indicate some change in attitudes towards family limitation in Costa Rica.²⁷ He orientates

his argument towards three hypotheses: that there is a "genteel revolution" in the female population of middle strata, urban Costa Rica; that sex morality is increasingly situational; and that the maintenance of high fertility is to be accounted for by "the absence of alternatives suited to human interests, organization schemes, and not by the fix of tradition".

VII

From these papers, a few broad issues seem to emerge. The first is that, although there are important fertility differentials in many of the populations covered, these do not always conform to the types associated with the advanced countries, and it is also possible that in many cases health conditions (which themselves are related to social and economic conditions) may play a decisive role in establishing some of these differentials.

Again, while there have been many studies of attitudes towards the use of birth control methods in these societies, it is clear that some demographers now have doubts as to the precise interpretation of the indicated presence of such attitudes. Similarly, the declared preferences for smaller families may not be as important as is sometimes argued. In fact, one writer considers indications of expected family size a much more fruitful line of study.

Of the institutional and other factors which may influence fertility levels, one important aspect centres on the effect of economic changes in general. The indications from the Sudan suggest that economic advance, with the better health and social conditions that higher standards of living bring, may in fact, induce a rise in fertility. From the experience of India, however, another writer concludes that economic advances, especially in the rural areas, are crucial to a development of declines in fertility. The statistical evidence from India, Korea and the Soviet Union is that a rise in the age at marriage should result in a lowering of fertility, while from a general standpoint a case has been made out for a tendency on the part of parents to favour postponement of marriage.

²⁶ M. V. Raman, "Attitudes towards family size and fertility control in India—An assessment", *Proceedings*, vol. II.

²⁷ E. Gordon Ericksen, "Changing virility, virginity complexes as related to fertility patterns of middle strata wives: Costa Rica", *Proceedings*, vol. II.

Statement by the Rapporteur: Mrs. K. DANDEKAR

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The meeting opened with a brief statement by the Organizer, calling attention to the importance of studies of high fertility regions at the present time and noting that the unprecedented rates of population growth in many of the developing countries were cancelling out the gains achieved through developmental effort. Realizing this, some of these countries had already embarked on policies of population control.

After the Organizer's statement, the Moderator presented his summary of the twenty-seven papers presented for discussion at the meeting.

The discussion opened with some general remarks regarding the growth of population that had followed the recent successes in the struggle against the oldest enemy of mankind, death. The speaker felt that in studying fertility, a distinction should be drawn between voluntary factors and those involved in what one scholar termed "infertility" (non-marriage, separation of women from their husbands, amenorrhoea following conception, etc.). Voluntary factors, or in other words the attitude towards child-bearing, had become all-important. There were very few sterile women nowadays and natural fecundity had grown superabundant. It was impossible, therefore, to discuss fertility without referring to birth control, but since there was to be a special meeting on that topic he would not enter into it in detail.

He felt that the level of fertility in the high-fertility regions would not be raised by the institution of family allowances, with the general raising of the socio-economic level that would ensue, since the rate was already at its maximum. Such action would rather help to foster that self-awareness which must come before any change in the attitude towards fertility. He had been impressed by the communications on Singapore and Taiwan, signalling a beginning of fertility decline in those countries. A close scientific examination of the reasons for that decline could be of great value to the other high fertility areas.

A paper on factors affecting Moslem natality brought comment from another speaker. He noted that in Moslem, and perhaps other societies, divorce often resulted from the failure of the wife to bear children. Such divorce had little effect on fertility if one of the partners was sterile, since even if both married again immediately, the sterile partner would make no contribution to reproduction. However, if

sterility or sub-fertility had arisen because the partners were incompatible, their remarriage after divorce could raise fertility. The number of childless couples was smaller among Moslems because of the frequency of this kind of divorce. Not much was known about the incidence of incompatibility among couples. However, experiments with artificial insemination from apparently sub-fertile donors had resulted in reproduction in many cases, from which it might appear that sterility was often due to incompatibility. The Moslem system of divorce and rapid remarriage could be regarded as a very efficient method of match-making from the point of view of full exploitation of the reproductive power of the population.

A number of methodological points were raised in regard to certain papers by the next speaker. He noted that in a paper on religion, education and fertility control in Latin America, a table was given purporting to show the percentages of women from a sample survey who were using or had used certain birth-control methods. It was not clear whether the second category included those who had ever used a given method, or whether the two groups should be added together to show the total of those who had ever used the method concerned. He also wondered why the percentage of sterilized persons was in most cases smaller than the percentage reported as currently being sterilized, since the process was at present irreversible. In regard to a paper on fertility differentials among women in the United Arab Republic, he suggested that more information should be obtained about the occupational category "Managerial-Executive" in rural areas, since it showed very high fertility as a group. In regard to a paper on the effect of a rise in female age at marriage on fertility in India, he noted that in one part of the paper the author had estimated that thirty years would be needed to raise the average age at marriage of Indian women from 15 to 19/20 years. In a model described by the author, the increase appeared to take place in only five years. That was presumably how the author had arrived at such a large drop in the birth rate over so short a period of time. From a paper on family type and fertility, he noted that coital frequency for women in their teens in India was substantially lower than for women in their twenties, which was contrary to Kinsey's findings in the United States.

From correspondence with the author, however, he had gathered that very young wives often lived in joint families where there was a consequent lack of privacy and where they were obliged to adhere more closely to religious customs calling for abstinence from intercourse during certain periods.

The next speaker drew attention to two points, namely the relationship between social status and fertility and the concept of what he called "social fertility". In his view, the papers for the Conference reproduced widespread evidence of the association of lower fertility with higher levels of education and socio-economic status. It was important, however, to diagnose the cases in which the opposite was true. According to the speaker, in the early stages of economic improvement, better diet, health and general standard of living affected only those of relatively higher socio-economic status, who might still be wedded to high fertility values. He cited as an example a recent study on Monrovia as well as the experience of his own studies in Africa. Because an enormous change had been compressed into such a short period in Africa, population control might be difficult to introduce, particularly when the ruling classes were still close to the ideal of large families. According to the speaker, many demographic experts from Ghana, Nigeria, and Sudan, present at the Conference, were agreed on that point. Such situations needed careful analysis from the point of view of their likely duration. Regard for large families was likely to be greater in Africa than in Far Eastern cultures, as the leaders there were only one or two generations removed from the large family ideal of subsistence economics. Nevertheless, they were conscious of the rising cost of living and of educating their children. The speaker also referred to a custom in Africa of sending children to families of high socio-economic status to be brought up. That could mean that the children picked up the values of the higher-class families, which might in turn mean valuing the large family ideal—or what the speaker called social fertility. He made a plea for such micro-social factors to be given adequate consideration in future research and in the formulation of population policies for Africa.

The paper on family type and fertility brought comment also from other speakers. One expressed doubt concerning the validity of statements in the paper concerning sexual taboos prevailing among Moslems in West Bengal. Another speaker noted that the paper

showed the fertility level of women living in joint families to be lower than that of women living in nuclear families. However, the differences in the fertility levels of ever-married women in the two types of families could be partly explained by differences in their age distribution. Females in India generally passed through three stages, living in the husband's family in the earlier years of married life, emerging as members of single families as the joint family broke up with the death or migration of the parents-in-law or other elderly family members, and then living in joint families again as their sons brought wives home. The majority of women were therefore subjected to these different degrees of socio-family control for approximately equal periods. The average number of children born to women of completed fertility could be expected to be similar in both types of family. As proof, the speaker offered evidence from the data regarding women of completed fertility presented in the paper itself. He also pointed out the possibility of under-enumeration of children, particularly for women aged 45 years and over.

The same speaker noted that in a paper on some aspects of the effects of economic development on fertility in the Sudan an assumption was made for methodological purposes that the mortality level was the same among the nomadic and the settled groups. That assumption contradicted statements by the author himself regarding the greater prevalence of epidemic diseases among the nomads and the availability of better medical facilities to the settled population.

He noted further that in a paper on fertility rates and intervals between births in a population in Delhi the term "sterility" was not properly used. The term could not be used of women who had completed their reproductive life earlier than other non-contraceptor women, because this did not necessarily involve physiological sterility but might be due to the observance of religious obligations, which could affect the sexual potency of males as well. In regard to a paper on regional fertility differences between socio-economic groups in the United Arab Republic, he pointed out that women married to farmers were observed to be less fertile than those in other occupational groups. A study of the age distribution at marriage of women with husbands in various occupations would have been of use in trying to find out the reasons for low fertility among farmers. Certain groups reached physiological sterility after shorter periods of marriage than others. If the age of the husband was higher,

there would be greater intervals between sexual relations and hence between pregnancies. Nevertheless, he agreed that the lower fertility among farmers could also be due to poor health and environmental conditions, which could also result in a higher incidence of abortion.

In regard to a paper assessing attitudes towards family size and control in India, the same speaker said that the statements by women in some surveys in Calcutta that under ideal conditions they would prefer larger families did not contradict the findings in other parts of India where women expressed a preference for smaller families as socio-economic conditions improved. In ideal conditions, he believed, their scale of values would also change. Similarly, the author's fear that Hindu women might not practice contraception because where means were available more of them expressed willingness to practise than actually did so, seemed unwarranted. Such pessimistic views might hinder a successful contraceptive programme.

Some of the questions raised on the various papers were answered by the authors. With regard to the comments on the paper on family type and fertility, the author said that coital frequency among Bengali women in their teens was small because of the curbing influence of the elders in the traditional joint family. An examination of coital frequency in other parts of India had shown similar results. As for the suggestion that differences in the age structures of women in the two types of families might account for differences in fertility, since he had compared the average number of children for each group separately, the differences in the age structures did not vitiate his comparisons of the average number of children of ever-married women. The author of the paper on the effect of a rise in female age at marriage on the birth rate in India said that a rise above the age of nineteen could be regarded as critical since it was after that age that a rise in age at marriage effected a reduction in births.

One speaker expressed the general view that many of the papers contributed to the meeting repeated the Malthusian theory. He drew attention to the experience of the more developed countries in regard to fertility, particularly the Soviet Union. The effective utilization of contraceptive devices depended upon complete equality for women in economic, political and cultural life, and upon the elimination of illiteracy and the general raising of the educational level. In his view, widespread participation of women in social and economic

activity helped to reduce fertility. In order to allow women to pursue professions, society must provide facilities for the care of children. He believed that it was useless to try to introduce women in low educational categories in the less developed countries to the practice of contraception. They would adopt it only after they had reached a higher cultural and socio-economic level. This view was echoed by another speaker, who expressed the belief that the newly independent countries would only be able to achieve a decline in their birth rate through general economic and cultural development. A third speaker agreed that until a critical level of living was attained, motivational factors were likely to work very slowly.

The same speaker went on to express gratification at the kind and variety of data presented on differential fertility or special factors affecting fertility. He felt, however, that not enough attention was being paid to studies of biological factors affecting fertility. For example, lactation, or amenorrhoea, which lasted a much shorter time in Western countries than in countries like India, ought to be taken into account in considering differential fertility. He also noted that government family planning programmes were directed at and were reaching both literates and illiterates. This might lead to a gradual reduction of fertility differences between various educational categories.

Another speaker noted that in Korea and Thailand both literates and illiterates were participating in the intra-uterine contraceptive device programmes. He also praised the high technical standard of most of the surveys of attitudes and motives pertaining to fertility and family planning that had been carried out in various Asian and Latin American countries, as well as the countries of Eastern Europe. He was particularly interested in the responses to questions on "expected" and "desired" family size. If the number of children desired was compared with the number of actual children, definite patterns seemed to emerge. In general, in the developing countries the desired number was smaller than the actual number, while in the developed countries the opposite was true.

Most of the twelve speakers who took part in the discussion referred to the necessity of raising levels of living in the high-fertility areas, or of raising the social status of women, before a decline in the birth rate could be expected. A point worth mentioning is the gap felt at the absence of any document on main-

land China, which harbours so large a proportion of the world's population. Another gap seemed to be the absence of surveys designed to find out why the level of motivation towards contraception is low, although many papers

emphasized the fact of low motivation. None of the papers used very refined statistical techniques to arrive at quantitative measurements, but this may have been due to the restrictions on the length of papers.

MEETING B.7

New developments in measurement and analysis of factors of population growth and structure

Statement by the Moderator: Mr. N. KEYFITZ

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The papers which have been written for meeting B.7 of the World Population Conference are expository, summaries of past research rather than announcements of the results of new research. Presumably, this accords with the objectives of the Conference, which leaves the announcement of new results to meetings of societies taking place at more frequent intervals. Hence, the Moderator is required to summarize summaries; the twofold condensation necessarily entails a high loss of information.

Perhaps the best place to start is with the background paper discussing the oldest of demographic models, the life table, and its extension, the stable population.¹ Léon Tabah, the author, takes us over this ground with adroitness, beginning with Malthusian populations—the now somewhat odd-sounding name given by Lotka to the case where the initial age distribution and the life table are fixed, and in which the other principal elements are to be inferred. Thus, if we are told the age distribution and the life table which a population follows, we can infer its birth rate, which must be the population age 0 divided by the total; applying the force of mortality from the life table to the age distribution, we can ascertain the death rate; the difference between birth and death rates is the rate of natural increase. Tabah goes lucidly through the range of population mathematics—the matrix expression of a population trajectory due to Leslie; the probability formulation due to Feller, Kendall, Goodman and others; its extension to multiple populations in interaction. If there is a gap in his outline, it is in the insufficient recognition accorded to computation. No one

would fit a logistic by the three point method, as suggested, now that methods of steepest descent permit curves in which the constants enter non-linearly to be fitted by least squares.

S. Mitra, in his paper, adds to the extensive material on the graduation of life table functions by fitting a quadratic equation to $\log e_x^0$.² It is difficult to judge such work without comparison of the author's preferred function with some rivals. Again, the advent of machine computation permits the fitting of considerable numbers of curves and, hence, the making of more conscious choices. Mitra's elucidation of the point that any column of the life table can be calculated from any other is helpful; it opens the question of whether a relatively insensitive column such as e_x or a highly sensitive column such as q_x is preferable for the graduation, as resulting in better smoothness and fidelity to the data in all columns.

R. S. Kurup complains in his paper that the United Nations model life tables do not take account of the pattern of mortality in different populations having the same expectation of life.³ He divides the countries of the world into five groups with from fourteen to twenty-eight countries in each, and for each establishes a sequence of age patterns of mortality. Instead of the United Nations single series of model tables, he has multiple series, which are a feature also of the Princeton model mortality tables soon to be published.

The paper by Sully Ledermann⁴ on the use of population models brings us graduation in relation to model mortality tables. Studying 154 real tables, he finds a linear relationship

² S. Mitra, "A few properties of the expectation of life e_x^0 ," *Proceedings*, vol. III.

³ R. S. Kurup, "A revision of model life tables", *Proceedings*, vol. III.

⁴ Sully Ledermann, "The use of population models", *Proceedings*, vol. III.

¹ Léon Tabah, "Relationships between age structure, fertility, mortality and migration. Population replacement and renewal," 1965 *World Population Conference*, background paper B.7/15/E/476.

between the logarithms of the probabilities of dying at different ages:

$$\log 5^{\circ}10 = -0.9058 + 0.90356 \log 5^{\circ}0 + 0.125e$$

where e is a normal variable with 0 mean and unit variance. He devotes much attention to the nature of this relation; it is evidently not a causal one in either direction, having been obtained by simple correlation in empirically given tables; on the other hand, it is not reversible, and means something quite different if used for "prediction" of $\log 5^{\circ}0$ from $5^{\circ}10$. It would appear that there is a difference between this model and the one in which Ledermann suggests fitting $f = (1-p)^n$ to the proportion of women who, at the end of n months, have not yet conceived, p being the probability of conceiving in a given month. In this latter there is an attempt, however primitive, to formulate the model according to the logic of what is being predicted; in the prediction of the probability of dying at one age from that at another by simple regression, there is less concern that the logic of the model should match that of the reality being portrayed.

The familiar stable population is the subject of a fitting by J. M. Callies in his paper on the computation of growth rate;⁵ his criterion of fit is the minimum non-overlapping area of the actual age distribution and the fitted one when they are laid out on the same scale. The author says that when he tried the method, it gave the same value as Lotka's rate. Presumably his word has to be taken for this, as no data, calculations, programmes or results are contained in his paper. Nor is there any bibliography, although similar methods have been used on a number of occasions in recent years.

Three papers discuss the obtaining of more detailed statistics than usual from the subjects of official compilations. J. Condé points out in his paper⁶ that events happen both in calendar time recognized by official statistics and in a time pertinent to the individual. It is of importance to record births not only by calendar year, but by age of mother, by duration of marriage, by time since the preceding birth. St. M. Milco and V. V. Caramelia discuss in their paper⁷ interdisciplinary collaboration

among physical anthropologists, sociologists, and demographers, from which would emerge facts of family relationship and descent bearing on genetics and other phases of biology on the one hand, and society on the other.

The paper by T. H. Hollingsworth,⁸ a scholar who combines in himself the historian, the demographer and the statistician, calls less for collaboration than for hard, detailed work. The author shows how old documents may be used to study past population trends. He cites the work of Henry, Henripin and others in the too-little-cultivated field of historical demography.

The paper by C. H. Hamilton⁹ on the difference between the VS and CSR methods of estimating net migration among sub-classes of the nation's population explores in some depth the two methods of estimating migration, known as the "vital statistics" and the "census survival rates" methods. The higher estimates of net internal migration found by the vital statistics method for the United States between 1950 and 1960 could be due to a more complete enumeration in the 1960 Census. His conclusion favors the census survival method.

L. O. Stone is also concerned with data, but his paper is confined to the theory of how it can be obtained for the inferring of migration.¹⁰ He specifies the methods known as vital statistics, survival ratio, birth-residence, and adjusted birth-residence estimates and discusses their respective advantages and defects.

Four papers have the word "sampling" in their titles and deal with it in various ways. The paper by F. Linder,¹¹ on "the increased scope of demographic investigations through the use of sampling surveys", gives an over-all statement, oriented towards under-developed countries and concerned with the measure of employment, unemployment, and under-employment. Modern surveys are at least potentially superior to those of the past in having at their disposal improved sampling theory and design, computers which make more efficient estimates, methods of evaluating the quality of response, field control and technological developments in data processing.

⁸ T. H. Hollingsworth, "Methods of using old documents to study population trends in the past", *Proceedings*, vol. III.

⁹ C. Horace Hamilton, "On the difference between the 'vital statistics' and the 'census survival rate' methods of estimating net migration among subclasses of the nation's population", *Proceedings*, vol. III.

¹⁰ Leroy O. Stone, "Biases in the major estimates of net inter-censal migration", *Proceedings*, vol. III.

¹¹ Forrest E. Linder, "The increased scope of demographic investigations through the use of sampling surveys", *Proceedings*, vol. III.

⁵ J. M. Callies, "Computation of growth rate for a stable population from the age pyramid and the survival curve", *Proceedings*, vol. III.

⁶ J. Condé, "Longitudinal recording of vital events (total longitudinal analysis)", *Proceedings*, vol. III.

⁷ St. M. Milco and V. V. Caramelia, "Contributions to the preparation of a set of methods for the composite study on population", *Proceedings*, vol. III.

G. Vangrevelinghe, in his paper on the use of sample surveys in checking population censuses,¹² describes the way in which sampling was used to check the 1962 Census of France. Each individual in the post-enumeration survey sample was asked in what different places he might have been found at the time of the census: at home, in a secondary dwelling, in a hospital, etc. The sample was then classified according to the number and type of such places reported. In the second phase of the post-enumeration survey, each of these individuals was searched for in the census records corresponding to the several places in which he said he might have been at census time, and it was noted whether he was enumerated 0, 1, 2, or more times. The results were tabulated by categories of the population, and each category was given a weighting inversely proportional to the number of times its members were found to have been enumerated on the average. This would estimate the true population of the country, at least to the level of completeness reached in the post-enumeration survey. Considerably broader definitions of residence than those which were practicable in the Census encourage the thought that the post-enumeration survey may be relatively complete.

The paper by G. R. Chevy on the use of sampling techniques in the preparation of demographic statistics¹³ discusses the advantages and disadvantages of sampling, touching on such matters as place of residence of mother for births to supplement the place of birth required by French law.

P. C. Mahalanobis reviews in his paper some of the methods which he has developed over his long career in sampling.¹⁴ His interpenetrating networks, by which it is possible to make orthogonal comparisons to ascertain the effect of different factors, are illustrated with 1955 data from the National Sample Survey of India which he himself set up. One of the matters which the NSS has investigated is literacy. The question was whether literacy in the several states had been properly reported. The survey was carried out in each state by two parties of investigators, each with a separate organization, line of authority and ladder of instruction up to the state level,

although not much is said about the methods used to ensure independence. Given the independence, then, the evidence of statistical control is argued. Each of the parties did its work in two periods of three months each; in only one state was there a significant difference between periods. Differences between states are significant, but neither of the interactions, party by state or period by state, is significant.

The paper by S. S. Hashmi¹⁵ also uses sample survey data. The author is concerned to test differences of fertility associated with the nuclear and the extended family, and finds that the nuclear family, which lives apart from relatives, is the more prolific. This may be due to higher income, better medical attention, etc., but nevertheless, as Hashmi says, it is not encouraging for the prospects of underdeveloped countries that the more advanced and better-off families should have more, not fewer, children.

Any session on contemporary demography must contain references to machine computation, and papers have been contributed to this meeting covering the several different ways in which computers may be used. The paper by J. W. Brackett¹⁶ is concerned with population projections and stresses that the variety of hypotheses which can be numerically worked out on the computer is very much greater than when one works by hand. Admittedly, the problem of ascertaining which hypotheses make sense of that dogged hand work on projections still remains, and is not necessarily solved by examining hundreds of numerical answers in order to find which one looks like the most reasonable estimate of the population in the year 2000. But, as Brackett says, the computer is useful for filtering data, comparing different elements of data bearing on a single point, and ensuring that the user has extracted all information bearing on his subject. Irrespective of whether primary sources are improved or not, it is an advantage to the demographer to have a means of extracting the maximum that is contained in any given set. It is unfortunate that Brackett did not give more details of the interesting work going on in the Bureau of the Census, which has led the world in the application of machine computation to all fields of statistics.

¹² G. Vangrevelinghe, "Sample surveys in the checking of population censuses", *Proceedings*, vol. III.

¹³ G. R. Chevy, "Sampling techniques in the elaboration of demographic statistics", *Proceedings*, vol. III.

¹⁴ P. C. Mahalanobis, "Some concepts of sample surveys in demographic investigations", *Proceedings*, vol. III.

¹⁵ Sultan S. Hashmi, "Example of the application of the analysis of variance in the study of fertility", *Proceedings*, vol. III.

¹⁶ James W. Brackett, "The electronic computer as an instrument for demographic analysis", *Proceedings*, vol. III.

Projection on the computer is also the subject of one paper by Mackensen.¹⁷ A factor analysis was used to classify the possible birth and death rates so that a choice of model rates of birth and death could be made along the directions of the principal components.

H. Newcombe and J. M. Kennedy are natural scientists concerned with problems of genetics and of computation, but in pursuing their interests they have made contributions to demography. They describe in their paper on demographic analysis and computer programmes¹⁸ the hierarchy of languages which leads up from machine language through intermediate forms to FORTRAN, COBOL, and others, and they show how it is a part of the work of the machine, through what is known as a compiler, to reduce statements made in highly condensed symbolic languages into terms which are operative for the machine. After showing how this simplifies the work for the humans concerned, the authors go on to contend, arguably perhaps, that demographers will have to have professional programmers to do their work. Class-room work with students unselected for any mathematical or electronic talent has shown that the slowest can get usable calculations off the computer within three weeks, and the quickest within one. The utterly tireless and unemotional way in which the machine rejects incorrect programmes is more effective than the strictest of human disciplinarians, and students eagerly learn how to gain its response and approval.

M. Croze, like Newcombe and Kennedy, is interested not only in computation but in collation of materials concerning an individual.¹⁹ The diverse sources of information on the several points of a person's life at which he becomes a subject of statistics—his birth, entrance into school, first job, marriage, retirement, and death—are very much less useful in separation than they would be together. To bring them together, one thinks first of collating the several statistical lists through names. But names are typically variable and misspelled—in two large files, containing identical individuals, as many as one third may not be identifiable from one list to the other. Newcombe and Kennedy found that with one item of information additional to those usually given

—maiden name of mother—the proportion unidentified is greatly reduced. The power of the computer to apply rules to overcome errors of spelling and other impediments to identification is a challenge to ingenuity in devising such rules as will maximize the number of correct matches and minimize the matchings of names which do not refer to the same person. Kennedy and Newcombe envision the gathering of great amounts of information on pedigree, not for genealogical or antiquarian purposes but for genetics, once files of whole populations are available in order of husband-wife pairs, coded phonetically to minimize the effect of spelling errors.

Various phases of computation are reviewed in P. Vincent's brief consideration of the use of electronic computers in demography.²⁰ Like Newcombe and Kennedy, he considers the difficulties to be such that they can only be entrusted to professional programmers once they get beyond library programmes. To the remarks made above about the capacity of students as programmers, it may be added that a great deal of time is wasted trying to get results out of imperfect library programmes. Vincent, who has done much work on the computational as well as on the mathematical side of demography, goes on to distinguish between the processing of data and scientific computation; the demographer, in one capacity or another, needs both, and it is not always clear that he can get the most economical results out of a single machine. A variety of issues concerning machine computation are mentioned in the paper by Luu-Mau-Thanh²¹ on the use of computers in demographic models. He too is optimistic about the usefulness of borrowed programmes, but does admit that it is desirable that the researcher have some ideas about the machines and the lines along which programming solutions might be sought.

Four papers look on death and birth in human populations as a stochastic process. Hannes Hyrenius, in his paper on demographic simulation models with the aid of electronic computers,²² makes the distinction, owed to Guy Orcutt, between micro- and macro-models. The former assign probabilities to individuals and then trace out the consequences when the members of a population are correctly put

¹⁷ Rainer Mackensen, "Regional computer projection by demographic types of partial populations with incomplete data", *Proceedings*, vol. III.

¹⁸ Howard B. Newcombe and James M. Kennedy, "Demographic analysis and computer programmes", *Proceedings*, vol. III.

¹⁹ Marcel Croze, "Method of comparing several observations relating to the same person", *Proceedings*, vol. III.

²⁰ Paul Vincent, "A cursory consideration of electronic computers and their use in demography", *Proceedings*, vol. III.

²¹ Luu-Mau-Thanh, "The use of electronic machines in demographic models", *Proceedings*, vol. III.

²² Hannes Hyrenius, "Demographic simulation models with the aid of electronic computers", *Proceedings*, vol. III.

through successive periods of exposure to these probabilities. Computation is of course very much heavier than with the use of deterministic models such as the ordinary life tables where one is satisfied with expected values. Moreover, unlike the macromodel giving expected values, a single calculation for the micro-model has little meaning since it is an expression of chance elements; a considerable number of replications is required. From these replications, means, variances, and higher moments, if required, may be found.

A good example of simulation is provided in the paper by M. C. Sheps and J. C. Ridley,²³ who seek to explain statistics referring to populations by reference to probability mechanisms involving individuals. A woman starts at age fifteen, say, with a certain probability of marriage year by year; once she is married, she has a certain probability of conception month by month; after conception she undergoes a period of pregnancy in which conception cannot occur, and which may be terminated with given probabilities by foetal death, live birth, etc. There is a certain probability that at some point in her married life a woman may apply contraception of one kind or another which drastically reduces her month-by-month probability of conception. The model seems a useful one, even though probabilities based on exact data are not to be had for many of its components; there are circumstances in which carrying out such simulation with hypothetical data is instructive.

²³ Mindel C. Sheps and Jeanne Clare Ridley, "Studying determinants of natality. Quantitative estimation through a simulation model", *Proceedings*, vol. III.

The paper by Gh. Mihoc and Gh. Theiler²⁴ discusses the theory of a death model in which the probabilities of leaving the population vary by age. The authors develop a generating function from which they are able to extract a solution, and then go on to a birth and death model. They show how the model may be extended to invalidism as well as death, the former being different in that the departing individuals have a finite probability of returning to the population.

A more extended review of the literature is offered by D. D. Joshi, whose paper is a remarkably clear statement despite its condensed form.²⁵ The subject of stochastic processes divides itself into four parts, according to the mathematical techniques used, and all four are represented in demography. Thus, the number of individuals in the successive generations is a discrete variable (individuals) in discrete time (the first, second generation, etc.). The number of children born to a woman up to a certain age is a discrete variable (number of children) in continuous time (her age). The interval (a continuous variable) between the t th and the $t+1$ st child (a discrete measure of time) constitutes the third case. The fourth is the relative frequency (continuous variable) of a particular gene at a particular time (continuous time). The subject-matter in Joshi's paper includes human fecundity and reproduction, migration, population growth and genetical evolution.

²⁴ Gh. Mihoc and Gh. Theiler, "A mathematical model relating to the chronological evolution of a human population", *Proceedings*, vol. III.

²⁵ D. D. Joshi, "Stochastic models utilized in demography", *Proceedings*, vol. III.

Statement by the Rapporteur: Mr. S. KONO

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The subject assigned to meeting B.7 was new developments in measurement and analysis of factors of population growth and structure. The meeting actually covered very diversified subjects of formal demography which the Organizer grouped into four categories: (a) utilization of models in demography, (b) longitudinal studies, (c) use of sample surveys, and (d) use of electronic computers. Remarkable developments in demographic research and analysis have taken place since the last World Population Conference and the essence of these was brought out either in the papers contributed to the Conference or in the discussion at the meeting. Keeping to the order of the

above subsections, the following is an attempt to present a brief summary of the discussion in relation to the contents of the papers.

A. UTILIZATION OF MODELS IN DEMOGRAPHY

Theoretical models of the dynamics of population growth in combination with its components and factors, that is, sex-age structure, fertility, mortality and migration, were so skillfully elucidated in the background paper for meeting B.7 that there seemed little room for the discussion to add anything new on the use of theoretical models in demographic research. The background paper for meeting B.6 also contributed considerably to this sub-section, by

referring to the more practical aspects of the use of models.

One of the greatest concerns in this field in recent years, however, has been the development of demographic models and methods suitable for conditions in the developing countries. In view of, and in response to, the recent efforts of some Governments in the developing countries to slow down the rapid population increase by controlling fertility, attention has been particularly directed to the field of fertility. Emphasis was laid on the need to develop fertility models for the developing countries duly taking into account the types of policy action and the degree of spread of family planning measures. Some fertility models, such as those constructed by Mindel Sheps, were referred to as being useful for such a purpose.

A somewhat different approach discussed was the utilization of models for practical purposes of data adjustment of inadequate data in the developing countries. One such model is the so-called demographic growth-survivorship model. A growth-survivorship model was presented in the meeting, as follows:

$$P_{x+1}e^g = P_x s_x \quad (1)$$

$$\log P_x = A + BX + CX^2 \quad (2)$$

where P is population, X is age, g is growth rate and s is survivorship. Statistical tests have shown that a second degree curve should give a good fit to the logarithms of population at younger ages. The model itself was used to adjust for the defective reporting of infants and young children in the census of Thailand. Since it does not require any assumptions as to the actual levels of fertility and mortality, this model was noted to have wide applicability among developing countries without adequate data.

Gaps have been found to be still wide in intellectual communication and mutual recognition of scientific works between different countries where language barriers are substantial and where back numbers of volumes published in the pre-war periods and during the war are difficult of access. Thus, for example, studies on demographic models and methodology conducted in the German-speaking countries may not necessarily be well known to other countries. It was strongly recommended, therefore, that the informational gaps between demographers in different regions of the world should be filled by increasing the density of scientific communication and by conducting internationally comparative studies of similar models worked out in various regions.

Demography has been considerably enriched in recent years by contact with other social and natural sciences. It is correct to say that many of the new models in demographic analysis have developed out of advances in other sciences. Criticism was expressed during the meeting that developments in demography were often due to ideas borrowed from other sciences but the adaptation was often uncritical and imbalanced. This is often true of any science which possesses an inter-disciplinary character and which has acquired disciplinary citizenship relatively recently. Although we should not unduly underestimate the fact that demography has been progressively producing more refined, more sophisticated and better organized work than ever before, in increasing abundance, at the same time, this kind of self-analysis is always necessary for demographers to clarify their concepts, to sharpen their techniques and methods, and thus to consolidate their scientific gains.

B. LONGITUDINAL STUDIES

One of the most outstanding developments in demography in recent years is the longitudinal approach to demographic phenomena. The emergence of the concepts of "cohort", "generation" or "genealogy" has substantially changed the frame of reference in demography as regards the course of fertility, mortality and migration and the factors affecting them. During the meeting an important intervention presented a general review of the transformation in demographic conceptual schemes and approaches and stressed the merits of the longitudinal approach. It was said that a silent revolution had started out some 20 years ago in demographic analysis, with the change from the transversal to the longitudinal approach which connects and throws new light on chains of demographic events which would otherwise have been isolated. At the same time, in recent years, substantially more attention has been paid to the importance of the nominative rather than the anonymous approach for reconstructing the history of the same individual or people in the same group, by making use of historical and genealogical records or of specially maintained population registers. References were made to the studies of Croze and Hollingsworth in this connexion and the recent development of historical demography was regarded as a welcome and promising enterprise in this line of thought.

Another merit of the longitudinal approach which was cited was that it refers to the experience of real people and depends little upon assumptions. A longitudinal analysis of

migration made in the United Kingdom was cited as an example. The aim was to measure the extent to which return migration is actually a component of internal migration.

In order to enable the above-mentioned longitudinal or historical studies to perform effectively, long and continuous series of data must be available, possibly through a well-organized and well-maintained system of population registers. For such purposes, the Swedish experience is most useful in providing a guideline for less developed countries in this regard, since Sweden affords an excellent example of the use of the population register, among other things as a device for obtaining demographic information, both cross-sectional and longitudinal.

In Sweden, a nine-digit identification number is assigned to each individual, which stays with him throughout his life. To make the system absolutely secure, an additional check-number digit is introduced. By making use of this system, studies were made in Sweden, for example, of occupational mortality, in which the deaths were identified in the census where the occupations were given.

C. USE OF SAMPLE SURVEYS

New and continuing advances in sample survey design have supplied demography with a powerful research tool. As mentioned in a paper to the Conference, modern survey design is generally sophisticated, and more efficient and more complex methods of estimation have accompanied the development of more elaborate survey designs with the aid of electronic computers. However, even with well-planned sample surveys, non-theoretical errors inevitably creep in. This is even more true of developing countries. Thus, in India and elsewhere, the existence of so large a degree of response errors has been detected in many sampling surveys as to render sampling errors practically unimportant. It was emphasized that collective efforts should be made to improve questionnaire designs. Several speakers joined in stressing this type of difficulty and calling for further study in this direction.

Several speakers made critical comments on Mahalanobis's well-known "inter-penetrating network of sub-samples", which attempts to allocate errors to sampling errors and non-sampling errors. In general, the speaker felt that there were many sources of common bias among enumerators and that all subsamples might be affected by constant bias; that certainly did not mean that enumerator error was under control. Also, the method was costly as

regards travel, and troublesome as regards the organization of field forces. In Africa particularly, the number of enumerators was generally so small that only a very large between-interview variance would be detectable as statistically significant. Finally, inter-penetrating samples were affected by independent random error which made close checking difficult.

On the other hand, they found the method useful for estimating sampling errors in a very simple manner without heavy computation, and recognized that the chief merit of inter-penetrating samples lay in the estimates of variability, apart from the operational control, which a system of such samples could readily provide.

Finally in this sub-section on the use of sample surveys, a reference was made to another use of sample surveys, described in a paper on the application of the analysis of variance in the study of fertility. It was remarked that the application of analysis of variance to gross reproduction rates would be subject to serious limitations, and that it would be useful to explore the problem further. The use of some non-parametric tests was suggested.

D. USE OF ELECTRONIC COMPUTERS

The last topic, the use of electronic computers, provoked the largest number of interventions, although some of the observations were closely related to other topics, particularly the utilization of demographic models, and the dividing line is purely arbitrary. The use of computers is known to be probably the fastest developing area in the field of technical demography, and the computer has been proved to be a most useful and powerful tool for data-processing, numerical calculation and population projections. The advent of the extensive use of computers opens up new dimensions and a new outlook for demographic analysis.

As the Moderator indicated in his statement, the papers contributed to meeting B.7 spanned the several different ways of using computers. In the meeting, several different models presented in contributed papers were discussed from the point of view of whether they had common elements of methodology. References were made particularly to two papers on simulation models. Both models were of a micro-type in contradistinction to a macro-type, used a cohort approach and looked on demographic events in the fertility history of each individual woman as a multiple stochastic process. It was noted that the models included the cohort approach whose concepts were not

entirely new, owing much to the work of Whelpton, Vincent, Henry and others. It was emphasized in one paper that besides several well-known merits of the computer such as speed and efficiency in handling an enormous amount of numerical data and a complex set of variables, the computer also had the ability to alter experimentally the included factors, individually and in combination, in order to permit quantitative estimates of their effects and interactions. However, it was admitted that there were, at least at the present stage, some difficulties in the use of computers such as the lack of suitable data for many of the components of the model and the question of how to transform or relate cohort data to cross-sectional data. This first point was also commented on in some of the papers contributed and it seems to become a general problem when demographic models grow more complex and attempt to include more variables.

Some speakers gave interesting illustrations from their own experience in the use of electronic computers. In the case of the German Democratic Republic, electronic computers are used for projections of population size and sex-age structure. This was first done on the basis of the 1964 census and was extended to include projections by sub-areas within East Germany.

An interesting suggestion was made out of another kind of experience with machines in the field of historical demography in the United Kingdom, namely that it is sometimes advisable to use an old type of machine and programme under special circumstances, since the speed of model change in computers may be fast but the development of programming suited to demographic analysis lags behind. This is related to the point made in some of the papers that there are generally gaps between the demographer's professional capacity and his mathematical or electronic capacity, and that a great deal of frustration and waste of time is often caused by the present imperfect stock of library programmes. Another interesting suggestion, regarding the application of machines again from the side of historical demography, was that as a future study project it might be worthwhile to run the machine backwards to estimate the population in the past.

Finally, a warning was uttered against the uncritical use of the electronic computer, though the great potentiality of its use for the development of demography in the future was fully admitted. According to the speaker, without valid methodological principles and a tenable frame of reference, the blind use of electronic computers may be of little value in deriving

meaningful results. Certainly, as was indicated, all the sectors of demography should be developed in good balance with each other. If the utilization of electronic computers runs well ahead of developments in other sectors without appropriate supporting theories, it will be a very dangerous state for demography. It was pointed out that some demographic theories at the present stage are still premature and that more effort should be made to strengthen the body of theory by accumulating more empirical knowledge and analyses, and systematizing them by the help of valid mathematical techniques for handling demographic variables.

The following remarks are presented as conclusions arising out of the discussion outlined above.

1. The topics discussed were so wide and diversified that the discussion in the meeting was inevitably spread thin, yet a large area of agreement emerged with respect to the studies which need to be made in the future in the field of demographic theory and methodology. Some points on which there was agreement may be recapitulated as follows:

- (a) The emergence of great concern in recent years over the population growth potential and sustained high fertility of the developing areas has encouraged demographers to apply existing theories to situations there and to construct suitable population growth models and fertility models for conditions in the developing areas. The refinement of these models, for purposes of practical policy and action programmes, should be the task of future development.

- (b) Longitudinal studies, particularly those taking into account individual and cohort passage through demographic events, should be further encouraged. Historical demography or the historical approach to demography was singled out as a promising field.

- (c) There are urgent requirements for further exploration of problems of validation and measurement of response errors and means of reducing such errors in sample surveys.

- (d) It was also agreed that it is essential to provide more appropriate and widely applicable theoretical models by which the use of computers can be maximized in regard to the time and cost involved. Actually, good work in building operational models has been done to date in the United States, Europe, and elsewhere, but it is advisable to make international comparisons between them now at this stage and possibly to co-ordinate and rectify them so as to obtain more generalized models.

2. In the course of the meeting relatively little was said about the use of demographic models. In demography, the study of population growth, structure and movements, the elements of internal migration by regions, has not yet been theoretically integrated with the model of population growth and replacement developed chiefly by Lotka. In this connexion, Tabah's background paper concurs that it seems desirable to construct new numerical models of population and internal migration (which would be based on observation and into which many sets of variables and hypotheses would be introduced), concerning open population into and out of which there are migratory flows.

3. At the same time, the application of the concept of stochastic processes to theoretical

models creates a new perspective for demography, and in fact has proved itself to be useful tool for demographic research, particularly in the field of population projections and special population analysis by use of electronic simulation, in determining the impact of a new programme upon the total system. There was at least a tacit agreement that efforts in this direction should be further encouraged with a view to estimating complex demographic behaviour, in conjunction with appropriate theories and frames of reference.

The following speakers took part in the discussion: Akers, Boyarsky, Brass, Das Gupta, Henry, Hollingsworth, Jain, Panse, Scott, Sheps, Som, Strohbach, Von Hofsten, Winkler.

MEETING B.2

Factors and patterns of fertility in areas where fertility is relatively low

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I. GENERAL FACTORS ASSOCIATED WITH LOW FERTILITY

For decades, demographers, sociologists and other social scientists have focused attention on the so-called causes and various aspects of the decline of the birth rate in many countries. A considerable body of literature has grown up from their studies, particularly between the two world wars. Explanation of the causes of the facts ascertained vary from time to time and from scholar to scholar, with the emphasis shifting among the various characteristics of the society concerned or of its sub-groups, depending on the approach adopted on the particular society under investigation, on such external factors as the availability of necessary data, and so on. A list of the factors involved could include:

(a) diminishing mortality (especially infant mortality) requiring fewer births for the same number of grown-up children;

(b) industrialization and the division of labour, which generate a much more complex social structure, with completely new opportunities for social promotion and movement;

(c) growing urbanization, with increasing facilities for communication and exchange, and differential penalties of various kinds for large families;

(d) shift of functions from the family unit to other institutions;

(e) increasing participation of women in professional activities;

(f) development of secular, rational attitudes, or of a new kind of hedonism;

(g) availability of contraceptives;

(h) the possible lessening of biological potentialities, etc.

The list could be long, but what is lacking is an accepted order of priority of the relative

importance of the various items as determinants of observed phenomena, and a suitable system of measurement for meaningful comparisons and the assessment of the quantitative impact. One consequence of this situation is the difficulty of verifying, proving or disproving any hypothesis. Another is that the predictive value of the conclusions asserted often leaves much to be desired, as exemplified by the failure to foresee the recovery of fertility in many countries towards the end of the war, or, as we now see, the difficulty of assessing the probable dynamics of demographic events in developing areas, while still trying to be precise on the future numbers of births in modernized countries. If accurate prediction is a gauge of scientific achievement, it is clear that there is much room for progress in the demographic field.

The paper by A. J. Coale¹ gives us a set of indexes useful as a concise instrument for comparing different levels of fertility at various times and places and for ascertaining the so called Malthusian and neo-Malthusian factors responsible for the variations. The former consist of changes in the proportions married through avoidance of postponement of marriage, and the latter of voluntary restrictions on fertility within married life. These indexes, one of overall fertility, one of marital fertility and one of the proportion married, belong to the class of methods of elimination and use as a standard of comparison the age-specific marital fertility rates of Hutterite women during 1921-1930. The calculations performed at thirty-year intervals from 1870 to 1960, for a group of developed or developing countries, provide in a compact form an historical sketch of fertility decline in various parts of the world and of the determinant part played by the voluntary limitation of births. They underline also the significant increase (except for Ireland)

¹ Ansley J. Coale, "Factors associated with the development of low fertility: an historic summary", *Proceedings*, vol. II.

of the proportions married during recent decades, even in India, where the decline of mortality has brought about a decreased incidence of widowhood.

While it is not possible here to register all the observations suggested by the presentation or to comment on methodological aspects of the proposed measures, it should be added that Coale deals briefly with the discussion in the literature on the development of factors associated with fertility reduction. In rebuttal of generalizations about the circumstances under which neo-Malthusian control of fertility occurs, he cites a corresponding series of counter-examples which weaken their validity. Coale suggests that more systematic research, by geographic units smaller than nations might perhaps make possible more conclusive generalizations about causes of the fertility decline.

The paper by D. Breznik² expands the preceding one in the sense that it extends to more countries and reports in more detail on the recent situation in developed areas. Current age-specific rates, compared with a set of rates of a type of high fertility, show important differences in the higher ages. But the distribution of births over the ages is far from uniform in all these countries, owing both to differences in marriage habits and in the timing of births during married life. The coefficient of variation in rates among twenty-nine different countries is fairly high at every age, with maximum variation found at both extremes of the reproductive span. Breznik also enlarges somewhat the picture drawn by Coale of suggested causes of the decline, and states that in order to make realistic hypotheses about the future course of fertility in these countries it will be necessary to analyse the interaction between demographic phenomena and socio-economic factors, and to examine the intentions and desires of young couples.

The paper by G. Acsádi³ contains a careful consideration of demographic variables which influence fertility. First, the author underlines the impact of changes in mortality: through the lengthening of the period of fertility and the increased survival of children, through variation in the rate of population growth and the adjustment of the society to the new situation, through the age-sex composition of the population and the related possibilities of marriage, especially under some exceptional cir-

cumstances. This last point involves migratory movements, with their selective characteristics, and the development of the birth rate itself. Attention is then given to the connexion between the marriage and fertility age-patterns. It is observed that, on the basis of 1961 data for one Asian and twenty-two European countries of relatively low fertility, no apparent connexion obtains between the average marrying age of brides and the general fertility rate. A closer look, however, shows very different situations in the various countries with regard to the behaviour of the two age groups playing the greatest role in fertility, the 20-24 and the 25-29 age groups: differences which arise mainly from variations in the proportions marrying young. Accurate comparisons allow the author to distinguish three different types of age-patterns of fertility in the countries under review and to show how they are influenced by the age of marriage. (These results indicate the reason for the variation of age-specific fertility levels found by the calculations of Breznik.) Acsádi concludes his paper by observing that parallel differences from country to country prevail also with respect to other aspects of fertility, such as birth order, interval between births, etc.

The paper by C. V. Kiser⁴ undertakes to describe the principal differences arising in low-fertility countries in connexion with such factors as residence, occupation, education and religion, thus making a bridge toward the subject of the following section.

The countries considered by Kiser include those of Europe, the Soviet Union, Australia, Japan, Canada and the United States, and the documentation collected comes from the most recent sources. The lessening of class differences in fertility in Europe in recent years has been widely noted, together with a growing uniformity of fertility behaviour among different geographic, ethnic and other groups. In certain cases, previous differentials have even been reversed, as in the case of the agricultural versus the non-agricultural sector of the population in Hungary. However, differentials by labour force status and religion tend to persist. In the case of the Soviet Union, for example, fertility rates appear "lower for town dwellers than for those living in rural areas, lower for women in towns who work than for household women, and lower for families in urban settlements who have medium size or higher income than for those who have smallest income". The substantial reduction in fertility differentials

² Dušan Breznik, "Female fertility in industrialized countries (Present situation, trends and future outlook)", *Proceedings*, vol. II.

³ György Acsádi, "Demographic variables as a source of differences in the fertility of low-fertility countries", *Proceedings*, vol. II.

⁴ Clyde V. Kiser, "Social, economic and religious factors in the differential fertility of low-fertility countries", *Proceedings*, vol. II.

has not cancelled out, in Japan, differences according to occupational and educational attainment. As for the United States, a variety of sources shows that the differentials in fertility during the decade 1950-1960 become wider by colour and religion and narrower by residence and socio-economic status. Differentials according to the level of education, though lessening somewhat, were still strong in 1960. Coming to the "broad significance of the closing of differentials", Kiser concludes that "one possibility is that the classes are becoming more similar themselves".

It seems appropriate at this point to comment briefly on two papers, both of which, from different angles, consider the question of Catholic fertility.

The first paper, by B. Zimmer and Calvin Goldscheider,⁵ while taking note of the somewhat higher fertility in the United States among Catholics as compared with Protestants and Jews—a fact which the paper itself supports with its own material—is intended to examine to what extent the suburban movement has influenced traditional fertility differences. The hypothesis is made that "... the suburbanization movement has served to decrease the religious differentials since in the more advanced stages of urbanism, which is reflected in the movement to the suburbs, the Catholic population is likely to adopt the fertility patterns of the larger and more secularized and materialistic society". The data used for the verification of the stated hypothesis come from a sample of households in six metropolitan areas in three different population size classes, and provide various indexes of the fertility of both Catholics and Protestants in the suburbs versus the central cities. The evidence consistently seems to show that both Catholics and Protestants living in the suburbs differ in their behaviour with regard to fertility from people of the same faith living in the central sector. The phenomena observed can perhaps be attributed to a process of selection which all those participating in the suburbanization movement undergo.

The paper by L. H. Day,⁶ after quoting the evidence available from various sources concerning differential Catholic fertility, reports "... on some observations from census-type materials that seem pertinent to an understanding of Catholic-Protestant fertility differentials". While certain writers have suggested the likelihood of a Catholic subculture

productive of higher levels of fertility, in Day's opinion, if such a thing exists at all, "the higher fertility supposedly resulting from it is seen only under certain conditions with respect to income and the proportionate representation of Catholics in the total population". Day points as necessary conditions:

(a) that there should be a high level of economic development and

(b) that Catholics should constitute a numerically and politically important but not dominant, minority of the population.

The author concludes that in these cases the question remains "... to what extent is the factor of Catholicism, so far as it relates at all to fertility, essentially religious in nature, and to what extent is it ethnic".

II. SPECIFIC CORRELATES OF LOW FERTILITY

Many characteristics of various kinds, demographic, economic, social, anthropological, biological, etc., have been presented in the literature as being correlated with fertility. One goes from stratification by income, occupation, education, or other indexes of social status or combinations of them, through social and geographic mobility, to the kinship system, preference for children of a given sex, etc. Some of these phenomena have been discussed, if not as main causes of the fertility decline, at least as typical channels through which the factors at work exert their influence on ever growing sectors of the society. Most of the empirical work, in fact, is concerned with types of intra-societal differences, which however—in the words of Ronald Freedman—"... cannot be assumed to substitute for intersocietal comparisons", which have to be conducted using whole societies as units. This appears to be true for comparisons in space as in time, should one try to explain, for instance, the reason for the change in the incidence of childlessness among American couples or different behaviour as regards patterns of family size in different modernized countries.

In order to avoid repetition we shall include in this section only a small number of contributions, although most of the papers, especially these devoted to the recent situation within specific countries, contain material which is also of interest for this part of the programme.

The paper by P. C. Glick⁷ examines current hypotheses and research findings on some variables helpful in explaining patterns of human fertility. The data used come mostly

⁵ Basil G. Zimmer and C. Goldscheider, "A further look at Catholic fertility", *Proceedings*, vol. II.

⁶ Lincoln H. Day, "Catholic teaching and Catholic fertility", *Proceedings*, vol. II.

⁷ Paul C. Glick, "Marriage and family variables related to fertility", *Proceedings*, vol. II.

from the United States census of population for 1960, but also from other sources. The first hypothesis is that family size tends to be similar in the current and parental generations. Some relation has in fact been found between the two, especially when the comparison is made with the wife's family of origin, but very little of the variation in fertility of the younger generation is attributable to this factor.

Early marriage and stability of marriage appear in the United States to be associated with somewhat higher fertility, while a sharp reduction in childlessness has been one of the most striking changes in that country since 1940. Also, a decline in spinsterhood has been recently associated with the rise in fertility, so that, when the various factors are combined "... the far-reaching expansion in the participation of women in the child-bearing process during this period becomes impressively evident". Further, a shorter spacing of the first child after the marriage is characteristic of recent experience, while the interval from marriage to the birth of the last child appears until recently to be roughly correlated with the changing pattern of completed fertility. A consideration of the ages of spouses supports the thesis that homogamous marriages are more fertile, and the same appears to obtain when the level of education of the spouses is considered.

Completed fertility rates vary inversely with the education of both the wife and the husband, but in this matter, as in the relation between fertility and income, a detailed examination by subgroups necessitates many qualifications. Lower fertility for women working outside the home, with the length of employment varying inversely with fertility, is also a common experience but obviously it must not be forgotten that this relationship works both ways.

The paper by H. Carter⁸ aims at documenting the incidence of re-marriage of women of child-bearing age in the United States. Growing remarriage rates and early remarriage of divorced women are recent characteristics of United States society. In guessing the trends of family information, in this situation one has to take note of the fact that one fourth of the marriages in the United States in 1960 were remarriages, and three fourths of the females who remarried were divorced.

Since low fertility is associated also with involuntary sterility and subfecundity, there is

⁸ Hugh Carter, "Recent changes in remarriages of women of child-bearing age in the United States", *Proceedings*, vol. II.

interest in some of the data quoted in the paper by N. Marx⁹ from material collected for other than demographic purposes by such institutions as health insurance agencies. Using data assembled by the "Caisse primaire centrale de sécurité sociale de la région parisienne" for 1962-1963, the number of declarations of pregnancy—made during the first three months—is compared with the number of confinements taking place a due time later, and an estimate is made of the proportion of supposedly spontaneous abortions (just under 19 per 100). Unfortunately, the precise timing of the initial declaration, which obviously has an important impact on the frequency of miscarriages, is not given. Moreover, the fundamental hypothesis that all the cases calculated are spontaneous in character seems rather questionable.

The paper by C. Mertens¹⁰ is an example of a study of the effects of different levels of fertility on other aspects of the society. The literature contains much on this matter, though certain important problems, such as the connexion between fertility and economic growth, have received far from satisfactory answers. In other papers contributed to this meeting there are some observations on the consequences of different fertility patterns, but the paper by Mertens is the only one specifically dedicated to this line of study.

Through the use of census data, it is shown that in Belgium after the war the proportion of children born in families of more than three children amounted to almost half the total of newborn babies. This proportion declined between 1947 and 1961 and is very different in the various areas, appearing lower where the limitation of births is stronger. To implement sound social policy and take care of the qualitative aspects of the growth of the population, it is important for scientists and politicians to study the effects on social dynamics of the characteristics of the population produced by so large a renewal from a small and perhaps disadvantaged proportion of the actual population. A further conclusion of the paper, the results of which are confirmed by an analysis of recent vital statistics, is that efforts should be directed towards families with only one or two children, when a revival in the birth rate appears desirable.

⁹ Norbert Marx, "Possible contributions of administrative and medical departments of Social Security in France to demographic studies", *Proceedings*, vol. II.

¹⁰ C. Mertens, S. J., "The contribution of families to the natural growth of the Belgian population according to the number of their children", *Proceedings*, vol. II.

III. FERTILITY REGULATION IN MODERNIZED COUNTRIES

The third topic of the meeting is concerned with research and research results specifically related to reproductive norms, attitudes toward family and sexual behaviour, personal aspirations, personality characteristics and other social and psychological variables which may affect fertility. Many variables are thought to have relevance in this respect, in the field of social psychology and psychology, of family structures and non-familial institutions, from the feeling of insecurity of individuals to the models of dominance within the family unit, from the action of the State to that of organizations for family planning, from ethnic components to attitudes of apathy and fatalism, etc. The evidence on such phenomena, though always growing, is not very abundant and is particularly scanty in the field of psychological components, where, moreover, such evidence as does exist appears not to be very conclusive.

Only two contributions seem to belong properly to this section, a joint paper by J. Sutter and H. Bergues, dealing mostly with European, and particularly French, data and studies, and one by E. F. Westoff, focused on the experience of the United States. Both include so many observations that no brief summary can present them adequately and, as in other cases, the interested reader should refer to the original text for a fuller understanding.

The paper by J. Sutter and H. Bergues¹¹ uses the results of an analytical study on the fertility of European countries by Biraben and others to underline the concept that the pattern of distribution of areas of different levels of fertility clearly shows that social psychology data are essential for understanding and evaluating individual behaviour toward the various problems of reproduction. After defining social status and role, the authors state that the individuals, families, small groups and different strata which go to make up a modern nation have different reactions to the problems of fertility and reproduction according to their different statuses and roles. Thus it can be concluded *a priori* that age, sex, occupation, level of education, religion, practised or not, the whole social context in which the individual lives, will have an influence on his behaviour or on that of the couple in the marriage.

The surveys that have been conducted in a few European countries demonstrate that

different types of behaviour prevail according to three sets of factors:

- (a) biological (sex, age, psychic state);
- (b) socio-economic (occupation, income, wages, housing facilities); and
- (c) cultural (level of education, religion, ethnic group).

While all these factors exercise an influence, others also—such as collective information—have an impact on individual reactions pertaining to status. Various examples are given, supported by evidence from the most recent literature: men show reactions differing from those of women; age exercises many influences on the number of desired and actual children, on contraception, abortion, sterilization, etc.; the role of occupation has already been underlined in other papers; insufficient wages and bad housing are often quoted as causes of induced abortions; sophistication in the use of contraceptives increases with the level of education; occupational mobility, religion, the language spoken—as an element characterizing membership of an ethnic group—are also at work. The authors believe that more inquiries into opinions and motivations, besides studies based on official documentation, could throw valuable light on this very complex field.

The paper by C. F. Westoff¹² concentrates on two objectives: a report of the extent of family planning in the United States today, and a description of the factors affecting the use of methods of fertility control and the effectiveness with which they are practised. The main generalization drawn from the evidence quoted on the extent of family planning is that American couples "... are almost universally in favour of family planning". There appears to be, however, "considerable room for variation in the period of marriage and age at which contraception is first used, and in the regularity of use". Surgical sterilization plays a minor but perhaps increasing role, while estimates regarding the incidence of induced abortions vary from 5 to 30 per cent of live births. The recent discovery of oral contraceptives—used by an estimated 3 to 4 million women, that is between 12 per cent and 15 per cent of all married women in the United States—makes obsolete all the available knowledge on the distribution of contraceptive methods used.

As to the relation between desired and expressed intentions, on the one hand, and achievements on the other, Westoff indicates that, while most pregnancies in the United

¹¹ Hélène Bergues and Jean Sutter, "Social and psychological factors influencing the control of fertility in Europe", *Proceedings*, vol. II.

¹² Charles F. Westoff, "Fertility control in the United States", *Proceedings*, vol. II.

States appear to be unplanned, most couples seem to have the number of children they want. This apparent paradox is explained by the finding of a Princeton study that "... the effectiveness with which contraception is practised and the proportion practising contraception increase dramatically as desired family size is approached and achieved". Another implication of the findings of this study is that the use-effectiveness of particular contraceptive methods must be evaluated in terms of the number of children desired, since, independently of method, the chief mechanism through which improved control is obtained appears to be an increase in the regularity of contraceptive practice. The paper comments also on the importance of another component of fertility, impairments of fecundity. As to social factors particular attention is given in the paper to religious differentials. The theory is presented that "... religion affects the practice of family limitation (and thus fertility) primarily through its influence on the number of children desired".

IV. CURRENT PATTERNS OF FERTILITY AND THEIR CAUSES IN LOW-FERTILITY COUNTRIES

After this general consideration of a variety of problems common to countries in which fertility is low, it seems appropriate to consider the situation in specific areas, both as regards prevailing trends and specific directions of research. This geographical particularization, besides giving due weight to local peculiarities, can provide a better understanding of apparent similarities.

The paper contributed by J.-N. Biraben¹³ surveys the situation in Western Europe, by means of a rapid historical sketch and a more detailed analysis since 1950. A growing divergence among birth rates of specific regions up to 1933 is followed by a very rapid convergence to a mode of 19-20 per 1,000. Taking into consideration a more refined analysis of administrative units within each country, homogeneous distribution of the rates is apparent in almost all cases, with the exception of the four most Southern units, where a bi-modal form arises as a consequence of the discrepancies between the northern and the southern parts of the country concerned. Though precise data are lacking, it seems certain that almost everywhere the proportion of definitively never married is decreasing, as is the age at marriage.

Legitimate fertility shows a general trend toward an average goal of 2.5 or 2.6 children

¹³ Jean-Noël Biraben, "Prevailing fertility situation and its causes in Western Europe", *Proceedings*, vol. II.

per family, which will be reached in a decade almost everywhere if the tendencies of the recent past continue. A closer look at four countries shows a strong movement towards families of 2-3 children. After dealing briefly with the causes of the decline of fertility, Biraben refers to some results of recent studies and inquiries. He notes, *inter alia*, that should fertile families in France have the possibility of strictly limiting their offspring to the number desired, replacement level would no longer be assured; that it is possible, in the near future, that almost all births will come from families with a maximum of two children, with the possible consequence of higher sensitivity to conjunctural factors or to movements of opinion; and that it would seem, ideally, that aid to families should be directed towards reducing the difference between ideal family sizes in specific social milieus and the general ideal, in so far as this difference arises from material difficulties.

The paper by C. Safilios-Rothschild¹⁴ deals with the case of Greece and contains information founded on results of sample surveys conducted in 1963 and 1964 by the Athens Institute for Research in Communication. A great majority of married couples favoured family planning, though the intensity varied according to the age of the respondents. More than half of the respondents thought that the final decision as regards the desired number of children should be a joint one, though more women than men felt that the wife's influence should predominate. In this respect, it is worth noting that "... the wife's employment does not contribute towards more equalitarian decision-making", a finding for which the author offers two explanations. A cross-tabulation of results regarding the desired and actual number of children "... suggests that a social norm may exist with respect to the socially 'acceptable' number of children for urban Greeks". This norm of one to three children puts the country in the same category as most of Western Europe.

Two of the papers contributed contain information relating to the Soviet Union. Omitting, for economy of space, the historical synthesis offered by both of the dynamics of the Soviet birth rate, let us concentrate, taking them in turn, on the situation prevailing since the war. Two other papers, concerning Romania and Eastern Germany respectively, complete our survey of socialist countries, which are characterized, in general, by a sharp

¹⁴ C. Safilios-Rothschild, "Some aspects of fertility in urban Greece", *Proceedings*, vol. II.

reduction of the birth rate during the last ten to fifteen years, second only to that observed in Japan.

B. T. Urlanis's paper¹⁵ observes that after the war there was no great wave of births in the Soviet Union to compensate for the drop of the birth rate during the war, owing to the fact that demobilization was spread over a considerable period of time. After its maximum of 27.0 per 1,000 reached in 1951, the rate continued to decline to 21.2 in 1963. The gross reproduction rate for 1960-1961 is 1.36, a level observed at the same date in many countries of Western Europe, including for instance, France and England and Wales. Urlanis also gives interesting estimates, obtained indirectly, of age-specific rates of marital fertility for 1958-1959, and compares them with analogous rates for 1938-1939. The resulting picture is the familiar one of an increasing decline with rising ages. Another interesting observation is the extreme variation of the birth rate in various parts of the Soviet Union. "For example, in 1962 the birth rate in the Azerbaijan and Turkmen Union Republics was over 40 per 1,000 while in the Baltic Republics (Latvian and Estonian) it was 2.5 times lower". The reason for this lies in the maintenance of "... distinctive national peculiarities" since the Revolution.

Among the factors determining the observed phenomena, the author mentions the following: the changing social status of women and their participation in professional activities; the level of material and cultural satisfactions, especially with regard to assistance for mothers and children; the cultural standards of parents and the level of their sanitary education; confidence in the future and absence of unemployment, especially the great trend toward ever increasing urbanization; the legalization of abortion and the availability of contraceptives, etc. Attention is also called to the changes in age at marriage which—at variance with most Western experience—has risen notably, since 1910. Finally, in assessing the dynamics of fertility in the Soviet Union for projections of the near future, the greatest attention must be paid to the enduring vast consequences of the Second World War on the sex-age structure of the population.

The paper by A. M. Vostrikova¹⁶ describes the data available and the methods of studying

¹⁵ B. T. Urlanis, "Dynamics of the birth rate in the Union of Soviet Socialist Republics and factors contributing to it", *Proceedings*, vol. II.

¹⁶ A. M. Vostrikova, "Female fertility and methods of studying it in the Union of Soviet Socialist Republics", *Proceedings*, vol. II.

the phenomena under examination in the Soviet Union, and gives a brief outline of the results of these studies, "... which show the changes in the general pattern of natality and fertility in connexion with the socio-economic conditions". The picture confirms that already presented by Urlanis. In addition, Vostrikova gives a detailed account of the possible analysis for various subgroups of the society based on the last census. Age-specific fertility rates for females are calculated up to 1962-1963, showing at the most recent date the already noted trend towards decline of fertility with increasing age, with a reduction also in the total fertility rate with respect to 1960-1961. A considerable reduction in the armed forces of the Soviet Union in 1959-1960 is put forward as an explanation for a somewhat greater fertility of women under 25 in 1960-1961. For 1958-1959, age-specific rates are also presented for women subdivided into workers and office employees, and collective farmers. The first category shows a definitely lower fertility except for the class under 25 years of age. Further data taken from a large sample survey conducted in 1960 show that the reduction in fertility is highest for women with the longest record of work outside home.

Rural versus urban differentials in fertility, already documented by the preceding paper, are underlined also in this contribution. Probability samples, of which the most recent has already been mentioned, provide data on the relation between fertility and other characteristics, such as income and housing conditions.

The paper by I. Ferenbac,¹⁷ after briefly describing the changes in Romania since the war, states that general fertility rate for women of 15 to 49 years of age in 1963 was 62 per 1,000, a drastic decline from the 90 of 1956 and 108 of 1938. As usual, the reduction is heavier among women of 30 years and over and increases with age, and moreover, the tendency to limit the number of births reached the rural population, which still constitutes the highest percentage of the labour force. Industrialization, cooperativism in agriculture, urbanization, the higher participation of women in activities outside the home and education are among the factors stated to be responsible for the complex phenomenon of diminishing fertility.

Also in Romania the prolongation of compulsory schooling and the expansion of educational facilities has had a notable influence on the age at marriage.

¹⁷ I. Ferenbac, "The effect of socio-economic factors on fertility", *Proceedings*, vol. II.

Eastern Germany constitutes an exception among Eastern European countries, in having experienced a slight growth of total fertility during the recent past, though—as we see from the data reported in the paper by K. H. Mehlan¹⁸—this has been accompanied by a reduction in the case of women 30 years old and over. Another characteristic peculiar to this region is the "... steady increase of early marriages in the group 18-21 years of age". In the last ten years there has also been an absolute and relative increase of births with higher birth ranks, while the frequency of legal abortions—another special feature—has been kept down to very low levels. Besides giving this interesting information, Mehlan deals at length with the results of surveys made since 1946 in a growing number of hospitals by the Institute for Hygiene in Rostock, in the field of abortions carried out in hospitals. Among the observations suggested by the documentation offered, the following are of interest: a steady increase of the ratio of abortions to births with increasing age; a shifting of abortion to younger and childless women and to those with a small number of children, during the recent period; significant differences between large and small towns, etc.

The paper by A. A. Campbell¹⁹ gives a unified picture of recent fertility trends in the United States and Canada, since their paths have been similar for the past four decades, though possibly with ampler variations in the first country than in the second. Characteristics of the post-war period are more frequent and earlier marriages, a rise in completed fertility, a retreat from childlessness and the one-child family, and the greatest increases in the proportion of women with three or four children. Data from the 1960 census of the United States are analysed for relations between fertility and educational attainment. An interesting point is made in this respect, regarding possible selection effects when similar sub-groups are compared in different periods of time, owing to the great expansion of educational facilities.

As to the social and economic factors affecting fertility, the author is of the opinion that, although economic conditions may influence current rather than completed fertility, it is possible that some aspect of the changing economy of these countries has affected couples' desires for children. "Obviously, the shift away from childless and one-child families is strong

and widespread. It must be related to some equally impressive changes in our culture, and these changes may well be economic in nature even though they are not measured by the commonly used indexes of economic conditions. However, we have not yet established what they are." Finally, the author states that the experience of the United States and Canada shows how "... it is possible, in populations where family planning is widespread, for fertility to rise or fall rapidly over a relatively short time".

Some aspects of differential fertility in the United States are touched upon in the paper by A. S. Lunde.²⁰ He notes, among others, differences between the urbanized and industrialized Northeast, where fertility is lowest, and the South where it is highest, and differences between whites (low) and non-whites (high). The author discusses the problems of reliability that arise in fitting the vital statistics data to the appropriate population bases provided by the Bureau of the Census for the calculation of rates by detailed administrative areas. He also discusses at length, the classification of births according to race. Problems also arise in matching information as regards father's occupation from the census and from birth certificates. The author concludes with a brief description of the current annual sample surveys started in 1962 by the National Centre for Health Statistics in order to provide a basis for a more comprehensive analysis of fertility than is possible under the standard procedure.

Japan has been described as a case study which can offer a deeper insight into what can happen, and the conditions under which it may happen. The paper by M. Kimura²¹ gives a synthetic and comprehensive picture of the dynamics of fertility in that country since the war. It recalls dramatic change that has taken place in a few years with the net reproduction rate falling slightly below replacement. Low fertility is the rule in all the prefectures, regardless of their economic setting, and there has been a particularly substantial decline, as seen in various other cases, among women over 30. Age at marriage continues to increase, and this in part explains the marked difference in fertility between Japanese and American women in the youngest age groups. First births amount to 45 per cent of all births, while births of fifth or higher order constitute only about 3 per cent. Differentials by occupational groups

¹⁸ K. H. Mehlan, "Reducing abortion rate and increasing fertility by social policy in the German Democratic Republic", *Proceedings*, vol. II.

¹⁹ Arthur A. Campbell, "Recent fertility trends in the United States and Canada", *Proceedings*, vol. II.

²⁰ Anders S. Lunde, "Some problem aspects of differential fertility measurement in the United States", *Proceedings*, vol. II.

²¹ Masabumi Kimura, "Current fertility patterns in Japan", *Proceedings*, vol. II.

are narrowing and differences in age at marriage may explain to a large extent these urban-rural differentials which still persist with completed fertility converging towards a similar goal. One effect that underscores the rapidity of change in the Japanese society is the marked fall in a very few years of the percentage of children born to fathers whose occupation is in agriculture or fishing: from 38 to 22 per cent of total births in seven years. This implies a drastic change in current and prospective social life.

The paper by H. Mizushima²² gives further details about the reproduction rate of the Japanese population and sketches its future course. This author believes that the decisive factor in the fertility differentials which still exist between some prefectures is the fertility of married women, not the average age at first marriage or the percentage of married women. Among the causes of the decline in fertility, Mizushima cites the rising cost of the upbringing and education of children, the postponement of marriage, the shortage of housing and the consequent overcrowding, urbanization, the increasing employment of females, and lastly, and most significantly, the widespread knowledge and use of facile means of birth restriction. He stresses the necessity for reform of the Eugenic-Protection Law which he claims has been widely abused.

Finally we come to Australia, with the paper by K. G. Basavarajappa²³ containing a synthesis of results discussed in greater detail. This author, by recourse to the unique series of tables of nuptial confinements, cross-classified by age of the mother and by duration of existing marriage available for that country since 1911, and interrupted only in the years 1939-1942, is able to give a detailed account of the dynamics, during four decades, of legitimate fertility rates specific according to the two variables. It is not possible here to follow the author through his analysis, in which various special features of the country's demographic history during this period are given a plausible explanation. His main conclusion is that family planning in Australia has not only been adopted in increasing measure in recent years at higher ages and higher durations, but also early in married life.

CONCLUSION

The ample and varied picture provided by

²² Haruo Mizushima, "The reproduction rate of population in Japan", *Proceedings*, vol. II.

²³ K. G. Basavarajappa, "Trends in age-duration-specific fertility rates in Australia, 1911-1961", *Proceedings*, vol. II.

the contributed papers shows a number of similarities in phenomena at different times, and in different nations, sub-groups of societies, and familial units. The papers have also brought out differences that call for comprehensive and persuasive explanations. Absence or low reliability of data, or insufficient uniformity in the available documentation, do not lighten the task of the demographers and other scientists who wish to enter this complex field.

The widespread use of family planning, motivated apparently more by considerations of family size than purposes of birth spacing, and more by limitation of fertility within marriage than by a change in marriage habits is what we have generally observed in these societies. However, we have also noticed important differences from one case to another, as regards the frequency of childlessness, for instance, or the normal size of families, or changes in age at marriage, and so on.

A major task for future research work, and a point that seems worth debating in this meeting therefore, seems to be the need for more intersocietal comparisons within countries of low fertility. The specific purposes which they could serve, the kind of material, official or from special surveys, on which they would be based, and the methodological lines which they would follow, all appear to be matters open to discussion. In this respect, Coale's suggestion of studies conducted more systematically and by geographical units smaller than nations deserves careful consideration.

Another feature emerging both from the literature and the contributions to this meeting appears to be the very imperfect state of knowledge regarding the profound motivations of specific behaviours with regard to fertility. The scarcity and relative inconsistency of psychological explanations, in particular, have been stressed. What are, at this point, the possibilities and best methods overcoming this deficiency? What is the degree of validity and reliability attainable for these purposes from various sources and methods of information? These and similar questions may perhaps appropriately stimulate our interest.

Another matter that appears worthy of more study and discussion is the effect of family planning on personal and social variables, such as communication between spouses, the parent-child relationship, and so on.

Above all there is the demonstrated need for a unified theory which could explain all the various behaviours and tendencies observed, an effort at a unified treatment which should also, however, take into account the hetero-

geneity of human societies and the corresponding necessity of a sensible choice of the

methodological instruments appropriate for each particular purpose.

Statement by the Rapporteur: Mr. M. MURAMATSU

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Although four major topics were listed for meeting B.2, the discussion did not always follow the guideline thus provided. Indeed, some of the remarks could have been more appropriately presented at other meetings. In the following, however, an attempt is made to arrange the topics brought up in the meeting according to an appropriate classification.

1. BACKGROUND PAPER ON FERTILITY

While not criticizing the paper at all strongly, one speaker noted certain deficiencies in the data used in the document, particularly with reference to the countries in Middle Europe. He regretted that the data for Hungary, Czechoslovakia, Poland, Yugoslavia, Bulgaria and Romania were missing from tables 1 and 2. The declining fertility caused by socio-economic progress in those countries should have been recorded. The causes of such fertility decline were: rapid industrialization, social re-stratification, employment of women, intensive social mobility, migration from rural to urban areas, rise in the cultural level, rise in the level of living and desire for an even higher level. The low age at marriage in those countries should be noted particularly.

2. SPECIFIC CONDITIONS AND CHARACTERISTICS INFLUENCING FERTILITY BEHAVIOUR IN VARIOUS COUNTRIES WHERE FERTILITY IS LOW

Referring to a paper on fertility in the Soviet Union, one speaker was especially interested in differential fertility between working and non-working women, which seems to prevail in many other developed countries. According to the author of the paper, the public ought to see to it that conditions were created in which women could combine happy motherhood and participation in work; such conditions might include, for example, the extensive provision of creches for children of working women at their places of work. The speaker asked whether there had been any inquiry in the Soviet Union to determine whether the provision of creches had actually brought about higher fertility as compared with cases where no such provision was made, thus meeting the expected goal of some increase in the birth rate or at least a slowing down of the further decline in fertility.

With regard to differential fertility by religion, mention was made of the Jews living in Israel and in other places. According to results of extensive research, Jewish fertility varies greatly with the country of habitation, with completed family size ranging from over seven children per woman in certain Asian and African communities to less than two in certain central European communities. Within Israel, the first generation immigrants showed similar differences. Today, in the second and third generations, the differentials have diminished owing to the impact of common environmental factors. No difference is found in fertility, use of contraceptives and induced abortion between Jewish women declaring themselves religious and those declaring themselves non-religious. On the other hand, those women who are really observant of religious norms (in particular, the ritual bath at the end of menstruation) have higher fertility and make less use of contraception and abortion, when other factors are kept constant. In a word, a simple classification by religious affiliation does not reveal the actual influence of religion on fertility. A very deep analysis, even deeper than reliance on the declared religious attitude, is required. On the other hand, in Hungary, differences in fertility by occupation, social strata and cultural level were said to have been observed, but no differences by religion.

With regard to fertility in Ireland, one discussant took issue with what he termed incorrect and superficial statements found in some of the contributed papers. He thought that no consideration of fertility, or indeed, of any social problem in Ireland, could ignore the persistent influence on the psychology, the folk memory and the social structure of Ireland of the effect of the Great Famine of the mid 1840's. In less than five years, out of a community of 8 million, there had been between half a million and a million deaths from starvation and a mass exodus of 2.5 million people. This had left an indelible imprint on the social and economic structure of the community. A serious distrust of their economic environment was created among Irishmen. Since then almost every young person made a deliberate choice whether to emigrate or not. Of those who stayed, a large proportion never

married, and those who married did so later than was normal in Western Europe. Fertility within marriages remained high and had changed little from the pre-famine era as was witnessed by a comparison of the data from the first fertility census in 1841 with those of the present day. In the last decade or so, there had been evidence of a striking change in marriage habits which paralleled a change in national psychology. The marriage rate per 1,000 unmarried in the 20-29 age group had gone up by 50 per cent. The average marriage age for men had dropped by 3.5 years. There had been no decline in fertility in recent years, though it was not known how it would go in the future. As regards marital fertility, religion was the only factor which really produced a striking differential. The fertility rate for Catholics, who comprised 95 per cent of the population, was almost 50 per cent above that of the rest of the community when standardized for age, duration of marriage and social group.

It was reported that in Romania industrialization has developed rapidly, together with a general tendency towards urbanization. The participation of women in productive work has also progressed rapidly. Public education has also developed, which requires more years to be spent in school, and there has been a rise in the material and cultural level of living among rural inhabitants. All these factors have greatly influenced fertility behaviour and marriage patterns among Romanian women.

With regard to the fertility trends observed in the Ukrainian Soviet Socialist Republic, it was stated that fertility had been very high before the socialist revolution in 1917. After 1917, the fundamental changes in the social structure exerted a significant influence on demographic trends. The highest fertility was recorded in 1925-1926, when the average number of children per woman in the child-bearing age was 5.4. Since that time, fertility has assumed a downward trend, concomitant with accelerated industrialization, modernization of agriculture, participation of women in economic activity and decline in mortality, especially infant mortality. In 1938-1939, the number of children per woman in the child-bearing age was 3.9.

Since the Second World War, the highest point reached by the same index was in 1949 when it was 2.6 children per woman. Since then, fertility has continued to decline, reaching the level of 2.2 children per woman in 1964. More recently, fertility has increased substantially in the age group under 20 years and a little less in the age group 20-24. Children born

as first-born are increasing and the number of couples without children has been substantially reduced. In general, the tendency in fertility appears to be more or less stable in recent years.

It was reported that in the United States the trend towards narrowing of differentials in fertility by socio-economic status has been accompanied by a rise in the socio-economic status of the people. For instance, in that country there is at once a trend towards contraction of fertility differentials by education of the wife or husband and a trend towards increase in the proportions in the higher educational classes.

Also in the United States, although absolute differences in fertility did not change greatly with age as white women of the birth cohorts of 1915-1919 passed through life, there was a rather marked contraction of the relative spread of their fertility rates by education as they passed from ages 20-24 in 1940 to ages 30-34 in 1950. There was not much further change in the spread of the rates as they progressed to ages 40-44 in 1960. These findings suggest that the rather sharp inverse relation of fertility to educational attainment observed for ever-married white women 20-24 years of age in 1960 may represent in large part differentials in timing of births and in the building of the family rather than differentials in completed fertility.

A third observation made with regard to the United States was that there are sharper differentials in fertility by educational attainment among the non-whites than among the whites. Among ever-married women who have completed four years of college, the fertility of non-whites is much lower than that of whites. Among women of low educational attainment, the fertility of non-whites is much higher than that of whites.

An observation was submitted by another speaker with regard to the achievement of ideal family size in the United States and Belgium. Analysis of data obtained in surveys carried out in the cities of Detroit (United States) and Louvain (Belgium) revealed a marked tendency to under-achieve expressed ideal family size. *Post facto* explanations suggest that, among successful planners, risk-taking may be greater early in marriage, when the pattern of birth intervals is set. There may also be a revision of family size ideals over the duration of the marriage.

3. INDEX TO MEASURE THE REPLACEMENT OF POPULATION

Special reference was made to a paper in

which the view was expressed that the population of Japan would diminish on the basis of calculated net reproduction rates for Japan, which have continued to be below unity for the past several years. A speaker questioned the validity of the assumption that Japanese fertility rates will remain unchanged in future years, resulting in a decline in population. His argument was based on observations of conditions in the United Kingdom. About ten years ago, the net reproduction rate in the United Kingdom had begun, unexpectedly, to increase and had gone on increasing up to last year. A partial explanation for this was found to be a decline in the average age at marriage, at a rate of one year in every ten years. The average age at parenthood has declined, the fertility rates at the younger ages have increased and the net reproduction rate has been inflated. Thus, the net reproduction rate in the United Kingdom at present overstates the rate of replacement. On the other hand, the average age at marriage in Japan has been increasing in the past several years. Therefore, the net reproduction rate in Japan at present tends to understate the rate of replacement. Although the real course of events in the future was highly conjectural, the speaker indicated his doubts about the adequacy and efficiency of the net reproduction rate as an index to measure the replacement of population under these circumstances. He further suggested the necessity of conducting sample surveys to investigate the intentions of young people in Japan with regard to their reproductive performance.

Another speaker also drew attention to the inadequacy of the net reproduction rate as a measure of population replacement. In the case of Ireland, the net reproduction rate, which does not take into account the large emigration of young people, could be highly misleading. For example, the gross reproduction rate calculated in the usual manner for Ireland in recent years is 1.7, and the net reproduction rate 1.6, while the "net-net" reproduction rate, that is, allowing for emigration on the basis of estimated age-specific emigration rates, is found to be 0.8. Thus, in the face of a substantial emigration, the net reproduction rate is defective as an index to measure the replacement of population and more study is required of the effects of emigration on population replacement.

A third speaker stressed the need to take into account the effect of immigration as well as that of emigration, for more accurate prediction of future fertility of a country. It was suggested that the unexpected rise in fertility in the United Kingdom during the last decade might be due to heavy immigration into the

United Kingdom from parts of the Commonwealth and the Irish Republic which have high fertility rates. Immigration not only brings in people but also distorts the pattern of future fertility in the country concerned. The use of reproduction rates that ignore the effect of immigration does not reflect the true situation.

In response to the question raised about the net reproduction rate in Japan and its interpretation, a Japanese participant admitted that the rate is, in a sense, a hypothetical index and needs some refinement in order to make it possible to draw more realistic implications from it. He added that there was a fear of depopulation in some quarters in Japan and that the possibility of legal action to restrict the performance of induced abortion had at one time been considered by a certain group in Japan.

4. RESEARCH IN FERTILITY—PLANS AND ACHIEVEMENTS

Mention was made of several new types of studies of fertility being made by the United States Bureau of the Census. The largest of these is a study of child spacing which is now being tabulated from the 1960 census 5 per cent sample data. Child spacing is measured both in terms of interval between marriage and the birth of each successive child and in terms of interval between the birth of the succeeding children. Spacing intervals are being shown in relation to age at census, age at marriage, duration of marriage, parity, and various social and economic characteristics. For women near the end of child-bearing, the eventual size of family will have been virtually reached, hence for these women the important factor of eventual size of family will be largely controlled. The results of the studies will provide parameters for making population projections using a demographic model developed for tabulation by electronic computer. Statistics on cumulative fertility (in terms of children ever born per 1,000 women) by a newly developed index of socio-economic status will be published in another report. This study is also based on a tabulation of 5 per cent sample data from the 1960 census. The index of socio-economic status of the women will consist of the average of three values—the score value (from 0 to 99) on educational attainment of the chief income recipient in the family, the score value on family income and the score value on occupation for the chief income recipient in the family. Another tabulation in process of being planned will show current fertility (children under 5 years old per 1,000 women) by neighbourhood characteristics, cross-classified by such

family characteristics as education of woman and occupation of husband. The neighbourhood characteristics include average educational level of adults and average family income for the census tract in which the woman was living at the time of the census. This study will throw light on the relationship between fertility and place of residence, in terms of whether the woman's family is of about the same socio-economic status as other families in her neighbourhood or is higher or lower. Lastly, a longitudinal study of family building is being planned in which such subjects would be featured as the history of changes in marital status of the woman and the concurrent changes throughout her married life in the economic status and residential changes (from farm to city movement) of her family. This study, if made, will be based on data from the Current Population Survey, which has a sample base of about 35,000 households. The results will add historical perspective to the parameters for population projections mentioned above. Also, the findings should throw light on the effect of broken marriage on the eventual size of family for those who subsequently remarry after varying lengths of time.

5. NEW CONTRACEPTIVE METHODS

In Australia, age-specific fertility rates have shown an abrupt decline since 1961 in all age groups from 15 to 44 years. In the age groups 20-24 and 25-29, the decline has been striking, following a previous period of steady increase. This change in fertility pattern has coincided with increasing and widespread use of oral contraceptives. Owing to the virtually 100 per cent effectiveness of oral contraceptives and the relatively high frequency of failure with previous methods, there can hardly be any doubt that this change in contraception practice reduces the incidence of unwanted pregnancy. Many of the unwanted pregnancies were previously terminated by induced abortion. Thus, the use of oral contraception can be expected to result in a short-term decline in age-specific birth rates, in addition to a major decline in the incidence of induced abortion.

In New Zealand, the crude birth rate fell from 27 per 1,000 population in 1961 to 23 in 1965. The contribution to this fall from a decline in the proportion of women in the various childbearing age groups was insignificant. Increased proportions married in these age groups would have raised birth rates 1 per 1,000 population, all other things being equal. Thus, a fall of 5 per 1,000 population is not accounted for by these influences. Over the

same period, the regular use of oral contraception increased from nil to 20 per cent of all women exposed to the risk of pregnancy. A theoretical model suggests that this would lead to a fall in the birth rate by 4 per 1,000. It would be less if it is assumed that the pill substitutes for the more effective previous birth control methods, or higher if it is assumed that it is used by a cross-section of women. If there is a cause-and-effect relationship of this order, a further fall in the birth rate of about 4 per 1,000 population can be expected in 1966 because of the known increase in regular users of the pill. There are two reservations to the above statement depending upon whether the initial use of the pill is concentrated among women who already have families, and the number of children women will eventually decide to have, given complete freedom of choice through the availability of the pill. In any event, the use of the oral pill appears to have a significant influence on fertility.

An opinion was expressed as to the advisability of making the newer methods of contraception, intra-uterine devices and oral pills, freely available. According to the discussant, these modern means of fertility regulation should be given official sanction under medical supervision by governments in the developed countries so that people can have free access to them, thus enabling them to have complete freedom from unwanted pregnancy.

The same speaker added that the use of modern contraceptives would have certain consequences on demographic and social trends, such as decline in the birth rate as recently observed in the United States and Australia, decline in premarital and extramarital conceptions, which cause an important problem in some countries (for example, in Czechoslovakia, one third of the first children born to married couples are born less than nine months after marriage), change in age at marriage and change in marriage habits, decrease in the incidence of induced abortion, legal and illegal, and better efficiency in planning family size.

Another speaker on this subject, however, was of a different opinion. He warned against over-estimating the impact of oral pills on recent declines in the birth rate. According to a study carried out in the United States in 1955, about one fourth of pregnancies resulted from contraceptive failure. It is currently estimated that about one fourth of contraceptive practice in the United States reflects the use of oral pills. If it is assumed that users of oral contraception have 100 per cent success, about one sixteenth of annual births would be wiped

out, that is, about 1.5 per 1,000 population. If many users of pills were previous non-contraceptors, this approximation could be modified upwards. On the other hand, many couples use oral pills for the purpose of spacing; their success will result in spacing birth intervals rather than discontinuation of childbirth. Thus, it is important to study the demographic variables involved in the recent decline in the birth rate in the United States, including changes in age distribution, timing of marriages and births, past success in achieving desired family size, and changes in the desired number of children.

While the previous discussant favoured the use of new contraceptive methods, another expressed misgivings as to the effects of the discovery of such methods on the future course of human reproduction. In his view, recent fertility trends in certain countries were cause for concern over the inevitable effects of near-perfect contraceptive methods on human fertility. He considered that this condition might be counteracted by instituting certain social measures that would ameliorate, if not remove, the dissatisfaction and inconvenience associated with child-bearing.

6. INDUCED ABORTION IN CZECHOSLOVAKIA

In Czechoslovakia induced abortion was legalized in 1958. The major objective of this legal action was to eliminate the adverse effects caused by illegally performed induced abortions. This legalization has brought about some decline in the birth rate, but not a very sub-

stantial one. The frequency of complications associated with abortion is much lower in the case of legal abortions than in the case of criminal abortions. Nevertheless, certain untoward conditions are still created by the operation. It has been found that induced abortion has adverse effects on the course of subsequent pregnancy and delivery. Among the effects encountered are: a high incidence of prematurity (nearly three times greater than normal), and greater frequency of *placenta praevia*, premature detachment of the placenta, foetal death, insufficiency of the cervical support and sterility.

The public health services and the entire community in Czechoslovakia are trying to decrease the incidence and complications of induced abortion. Two kinds of measures are being taken. On the one hand, contraception is being promoted through general education and the provision of a sufficient supply of contraceptive materials. On the other hand, attempts are being made to improve socioeconomic conditions, particularly for young people, so as to minimize the difficulties associated with pregnancy, childbirth and family building. The provision of longer maternity leave and the re-arrangement of working places for pregnant women in order to relieve their physical burden are also being considered.

The following speakers took part in the discussion: Acsádi, Bachi, Baker, Ferenbac, Frejka, Glick, Hill, Hollingsworth, Josif, Kimura, Kiser, McCarthy, Spencer, Steshenko, Stewart, Stolova, Tietze, Venning.

MEETING B.6

Methods of obtaining basic demographic measures where data are lacking or defective

Statement by the Moderator: Mr. W. BRASS

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A large number of papers have been contributed to this session; their scope, of theory and applications, is wide and many sound and novel points of detail are made. It would thus be impossible to do the papers justice, in the time available, by summarizing their contents. It is, therefore, proposed to consider a few themes which are common to several papers or which seem particularly suitable for discussion. It would not be profitable to duplicate points already raised in the background paper¹ and matters covered there will only be re-introduced where necessary for the clarification of further issues. There are important topics within the scope of the session not mentioned in the introduction, perhaps particularly with reference to non-traditional methods of collecting data in the economically developed countries. It is hoped that these deficiencies will be remedied in the discussion.

Three topics were assigned for discussion at the meeting:

- (a) non-traditional methods of obtaining data;
- (b) methods for handling defective data;
- (c) improvements of traditional sources of data.

Although several contributions cannot be uniquely allocated to these categories, the approximate division of the papers gives a useful indication of interests and developments. About half come into the first category and, of these, the largest block are concerned with surveys to estimate vital rates in less developed areas. There is a notable emphasis on field work in progress and the lessons of past experience

rather than hypothetical possibilities for the future.

The contributions on the handling of defective data are more equally divided between theory and practice but even in the former group much weight is given to the restraints which limited and erratic observations impose in applications. A wide range of theoretical techniques (outlined in the background paper) have been suggested for the analysis of such data. It is becoming clear that the search for "universal" methods which apply in all situations is not productive; the need for keying the procedures to the particular problem and records is well exemplified in the papers.

In contrast to the popularity of the first two categories, few contributions are concerned with the improvement of traditional sources of data. It would seem that these are not expected to bring quick demographic returns in the developing countries. On the other hand, in the more developed regions the traditional methods are well established; improvements are gradual rather than dramatic and in some cases stem from the supplementary use of non-traditional techniques. There appears to be great need for research, which would be immediately useful, into census procedures (framing of questions, field organization, checking and adjustment of responses, etc.) among less-literate populations; despite much discussion, firm evidence from experiment and observation is very limited. More reports on such studies would have been welcomed.

FUNCTION OF NON-TRADITIONAL METHODS

A striking feature of many of the papers is the stress on the positive advantages of non-traditional methods. They are no longer regarded only as make-shift procedures for obtaining data which should be collected by

¹ William Brass, "Methods of obtaining basic demographic measures where census and vital statistics registration systems are lacking or defective", 1965 *World Population Conference*, background paper B.6/3/E/409.

census or registration. To an increasing extent it is being realized that other ways of gathering information may give greater scope for the study of demographic interrelations and for the linking of population features to social and economic characteristics.

V. A. Bystrova's paper² draws attention to the value of maternity histories obtained from retrospective questioning of mothers. If records are made of the occurrence and date of all vital events, it is possible to make a detailed investigation of births, foetal wastage and child mortality in relation to such factors as birth spacing and family structure. In practice, there are difficulties due to memory failures, incomplete co-operation and particularly, in many less literate communities, vagueness about dates and ages. These, however, may be easier to overcome than the immense problems of making such a study by linking the registration or enumeration of individual events and characteristics, over a long interval of time.

Even in surveys to record vital events, where the main aim would seem to be the establishment of a substitute for registration, attention is drawn to the scope of the methods. Thus, in the National Sample Survey of India, the collection of information on births and deaths is only a small part of an extensive programme in which economic and social data on consumption, labour, education, agriculture, etc., are also obtained. D. B. Lahiri lays great weight on the value of this integrated approach.³ The relating of records of vital events with fertility histories of women obtained in the same survey can also extend the range and value of the possible analyses, as in the United Arab Republic project for measuring vital rates in rural areas described in the paper by G. Vukovich.⁴ On the other hand, as pointed out in the paper by C. Arretx G.,⁵ large samples are required if the effects of random variation on estimates of birth, death and (particularly) growth rates are to be reduced to acceptable levels. If resources are limited, it may be better to concentrate on the primary purpose of recording basic demographic data,

as in the Thailand survey described by P. Lauriat and A. Chintakananda.⁶

In the economically developed countries which have highly accurate census and registration systems, the need for further surveys using non-traditional methods has certainly not been eliminated. For example, the national statistics often fail to give separate data for classes in the population which deserve special study such as migrants, minority groups, etc. In the past, useful demographic insights have been obtained by the study of religious communities, e.g. Hutterites, Mormons. R. Gutman's paper⁷ examines the sources of information on the Jewish population of the United States. It would probably be practicable and useful even in developing countries to study the demography of special communities for which observations more accurate than those for the general population could be obtained.

The demand for extensive and up-to-date population data is now so pressing in many countries that the traditional censuses at ten yearly intervals are inadequate both in the scope of the questions and the frequency of the results. The paper by H. Schubnell⁸ reports how this problem has been overcome in the Federal Republic of Germany by the institution of the "Microcensus", a quarterly sample survey, which includes a basic programme of questions on population and economic life and supplementary studies, which vary with the "rounds" of the survey. The existence of the "Microcensus" makes it possible to remove from the full census the collection of data which are not required for detailed regional breakdowns. The results are also used to obtain current estimates of the population. B. T. Oñate emphasizes in his paper the need for timely, complete and accurate population statistics as a basis for planning in a developing economy.⁹ He describes how these requirements are met by the Philippine Statistical Survey of Households in which sample households are investigated twice yearly; estimates with moderate sampling errors are obtained of population components such as the divisions of the labour force. Improvements in the sample scheme

² V. A. Bystrova, "The anamnestic method of studying demographic processes", *Proceedings*, vol. III.

³ D. B. Lahiri, "Population data and the Indian National Sample Survey", *Proceedings*, vol. III.

⁴ G. Vukovich, "The United Arab Republic project for measuring vital rates in rural areas", *Proceedings*, vol. III.

⁵ Carmen Arretx G., "A method of estimating demographic rates in areas without census and vital statistics: Experimental surveys carried out in Guanabara (Brazil) and Cauquenes (Chile)", *Proceedings*, vol. III.

⁶ Patience Lauriat and A. Chintakananda, "Techniques to measure population growth: survey of population change in Thailand", *Proceedings*, vol. III.

⁷ Robert Gutman, "Non-conventional methods of obtaining data on the religious composition of the United States population: The case of Jewish population statistics", *Proceedings*, vol. III.

⁸ Hermann Schubnell, "Use of sample censuses to increase scope of census subject coverage", *Proceedings*, vol. III.

⁹ Burton T. Oñate, "Estimation of population and its components in a developing economy", *Proceedings*, vol. III.

which will give more accurate estimates for regions are being introduced in 1965. W. R. Simmons and G. A. Schnack point out in their paper¹⁰ that current estimates can be made with the help of materials from surveys undertaken for other purposes, e.g. in the United States, the Health Interview and Current Population Surveys.

SAMPLE TECHNIQUES

The crucial importance of sampling in demographic studies is now universally recognized and need not be elaborated. There are many books on standard theory and practice. Nevertheless, the papers for this meeting raise a number of issues about applications in population studies which are novel or which have not been adequately considered. Although the idea of collecting basic statistics by sampling is so well established, the many uses of the procedure in other aspects of the recording and analysis of data have until recently been less widely explored in practice as opposed to theory. C. Taeuber, in a brief outline of these,¹¹ mentions pretesting of methods, supplementation of complete censuses, quality control of all the steps in collection and analysis, preliminary tabulation, retention of returns for later detailed studies, and evaluation by re-enumeration. J. A. Cavanaugh also stresses the great value of sampling for tabulation and quality control programmes.¹² It is clear that the systematic use of the device as a means for controlling and checking the stages of recording, processing and presentation needs to be further developed.

There are special problems in demographic sample surveys of less developed areas which have been too little considered. There seem to be three main factors whose importance has not been given due weight: (a) the overwhelming need is for designs which minimize errors of bias and response and not only sampling variation; (b) the aim is usually not the estimation of a single characteristic but many, often with the main emphasis on the relations between these; (c) the process of selection and measurement may modify the characteristics examined. These factors are touched upon in various ways in the papers. R. K. Som reviews some of the types of response bias and methods

for detecting and correcting them by design and analysis methods.¹³ The need for community units, e.g. villages, in surveys to establish vital rates accurately by the matching of individual events, registered and enumerated, is pointed out by Lauriat and Chintakananda.¹⁴ The use of a sample unit smaller than the registration one would lead to great practical difficulties. D. B. Lahiri, in stressing the importance of the study of inter-relations, emphasizes the value of the household as a sample unit in less developed areas because a large part of the economic activity is centred there.¹⁵ Oñate reports that the sample for the Philippine Statistical Survey of Households is also used for food consumption surveys and studies can then be made of the interactions of demographic, social and economic characteristics.¹⁶ In the review of the United Nations programme for improving population and vital statistics by N. P. Powell,¹⁷ a section is concerned with household survey statistics. The value of this approach for the collection of demographic data is being increasingly recognized, and its uses will be thoroughly explored in a project of the United Nations Statistical Office for the study of demographic sample survey methods. Cavanaugh describes a Peruvian experiment to improve vital statistics in randomly selected areas and also suggests the possibility of a national master sample survey design.¹⁸ The danger that the activities associated with any continuous sample survey, propaganda, education through contacts, advice and encouragement, will destroy the representativeness of the units (particularly in vital statistics) is a real one, and ways of minimizing it have been too little examined.

A specific instance of a problem which requires investigation is the choice of a sub-sample of women whose maternity histories are to be recorded in a survey to determine vital rates. Because one mother supplies information on multiple events and the extraction of maternity histories takes a long time, it

¹³ Ranjan Kumar Som, "Response biases in demographic enquiries", *Proceedings*, vol. III.

¹⁴ Patience Lauriat and A. Chintakananda, "Techniques to measure population growth: survey of population change in Thailand", *Proceedings*, vol. III.

¹⁵ D. B. Lahiri, "Population data and the Indian National Sample Survey", *Proceedings*, vol. III.

¹⁶ Burton T. Oñate, "Estimation of population and its components in a developing economy", *Proceedings*, vol. III.

¹⁷ Nora P. Powell, "The United Nations programme for improving population and vital statistics", *Proceedings*, vol. III.

¹⁸ Joseph A. Cavanaugh, "Research and data collection techniques for developing areas", *Proceedings*, vol. III.

¹⁰ Walt R. Simmons and George A. Schnack, "Use of current surveys as an aid in constructing post-censal population estimates", *Proceedings*, vol. III.

¹¹ Conrad Taeuber, "New concepts in census methodology", *Proceedings*, vol. III.

¹² Joseph A. Cavanaugh, "Research and data collection techniques for developing areas", *Proceedings*, vol. III.

would seem uneconomic to investigate the full sample. In the United Arab Republic survey described by Vukovich¹⁹ the plan is to include all women who give birth to a child in the registration period, but there may be a danger of substantial bias if these are taken to be a representative sample of mothers in the population. An examination of systematic and random variation in the number of vital events per woman up to different ages, in relation to procedures for analysing the data, is needed for guidance on this problem.

Two papers examine new techniques which could be valuable in obtaining results by the use of sample surveys. W. E. Deming and N. Keyfitz make a distinction between two kinds of situation, namely that in which each member of the population is attached to a fixed location, usually a dwelling unit, and that in which the population is mobile.²⁰ In the first case there is no conceptual difficulty in constructing a frame and making estimates of totals from the sample. In the second situation, Deming and Keyfitz suggest that enumerators should be placed at a random sample of points. In the first round they enumerate the persons encountered and give them an indentifying mark. In a second round the procedure is repeated with another set of points, and note is taken not only of the persons seen but whether they were enumerated at the first round. The ratio of the persons seen in both rounds to the total in the second gives an estimate of the proportion of the population sampled, and its inverse the raising factor to apply to the first round total. The procedure can be extended by the addition of further rounds. Similar techniques have been used in the study of animal populations (where they are known as capture-recapture methods) and there is an extensive literature on the theory. The paper suggests that a combination of area and point sampling might be used to cancel out biases. The major difficulty of the technique is that, in general, the sampling error is large but, in some circumstances, e.g. with nomadic populations following regular routes, there might be a reduction by good stratification.

Simmons and Schnack present a method of estimating post-censal population levels by combining sample survey results with conventional "balance" totals found from the net

effects of births, deaths and migration.²¹ The conventional totals are subject to bias, increasing with interval from the census, because of deficiencies in the "balance" data, but the sample results have a random error. The combined estimate retains some of the advantage of the smooth trend of the conventional results and is gradually adjusted towards the sample levels.

SURVEYS TO ESTIMATE VITAL RATES

It might have been more logical to deal with other general issues before reviewing the papers on specific surveys to estimate vital rates, but their importance seems to justify special attention. Although some of the techniques for such surveys were suggested a considerable time ago, and discussion has been widespread, it is only now that extensive experimental evidence is being obtained. In the background paper a distinction was made between "periodical" surveys, in which statistics are recorded largely by questions about changes in household composition and vital events in a preceding interval, and "continuous observation" surveys which include resident observers and frequent enumerations; in the second type of survey there would be more emphasis on research. The distinction is one of exposition and is not convenient in examining the practice of the surveys described, where various combinations of techniques were used.

The longest experience of surveys to obtain vital statistics is that of the National Sample Survey of India, although this is only a part of its function. A general account of the Survey is given by Lahiri, and a description of its work on vital rates by M. Majumdar.²² The information is obtained by periodical visits to villages, at yearly or shorter intervals, in which the inhabitants are questioned about demographic events. Notable features of the work are the emphasis on built-in checks, particularly in the detection of and adjustment for recall lapse. The allocation of events to month of occurrence, and the overlapping of recall periods by surveys at yearly intervals covering happenings in the preceding two years, makes it possible to estimate the number of omissions. An outline of methods for analysing the observations is included in the paper by R. Som.²³

²¹ Walt R. Simmons and George A. Schnack, "Use of current surveys as aid to constructing post-censal population estimates", *Proceedings*, vol. III.

²² Murarimohan Majumdar, "Estimation of vital rates in the Indian National Sample Survey", *Proceedings*, vol. III.

²³ Ranjan Kumar Som, "Response biases in demographic enquiries", *Proceedings*, vol. III.

¹⁹ G. Vukovich, "The United Arab Republic project for measuring vital rates in rural areas", *Proceedings*, vol. III.

²⁰ W. Edwards Deming and Nathan Keyfitz, "Theory of surveys to estimate total population", *Proceedings*, vol. III.

The surveys described by Krótki (Pakistan), Vukovich (United Arab Republic), Sabagh and Scott (Morocco), Cantrelle (Senegal), Lauriat and Chintakananda (Thailand) and Arretx G. (Brazil and Chile) will be discussed in terms of the various procedures used. In four of these projects, registration of vital events is incorporated (the exceptions are the schemes examined in the Sabagh and Scott and the Arretx G. papers). The official registers used in the Thailand survey were estimated at the outset to be 25 per cent incomplete for births and 40 per cent for deaths; an investigation of preliminary results has suggested that each of these is 5 per cent too low.²⁴ In the Senegal study, the registration data examined were those of the established Civil Estate Administrative Bureau; only a small proportion of events were recorded.²⁵ Special reports submitted by the village chiefs gave better results but only about half the births and deaths were noted. In the Pakistan Population Growth Estimation experiment, special full-time registrars were appointed; with close supervision and the effects of intensive demographic work in the areas, about 85-90 per cent of the births and deaths were registered.²⁶ The United Arab Republic project will also use special registrars and emphasis is placed on their active role in the noting of events.²⁷ It seems clear that in such surveys the positive functions of the registrar in detecting births and deaths must be systematically organized in order that he does not end up by simply entering what is presented to him.

In the Pakistan, Senegal and Thailand experiments, vital events are also recorded by the visits of enumerators at quarterly intervals to question the inhabitants. The noting of a full year's experience in the former study provides a fourfold enumeration of each occurrence for cross-checking and comparison with other evidence. The results from Senegal indicate fairly large omissions of at least 10 per cent of births, and a larger proportion of deaths, although there is variation between the two areas studied. Preliminary analysis of the Thailand returns, followed by checks of the

reasons why events registered but not enumerated were omitted, suggests that about one sixth of both the births and deaths failed to be reported at the quarterly visits.

All surveys make provision for re-enumerations of the population in which changes in the individuals composing it are noted. Arretx G. emphasizes particularly the value of this for determining the true population at risk for calculating rates.²⁸ By establishing the reasons for the changes and ascertaining whether occurrences have already been noted in the appropriate place, checks on the recording of vital events by registration or visiting enumerators are applied. Final totals for births, deaths and migration are thus arrived at. Although there are still possibilities of error in these totals, e.g. in classification between migration and other events, they are clearly more complete than can be obtained by procedures in which the detailed checks are not applied. One of the main residual sources of error would seem to arise from births which are followed very quickly by the death of the child. These are very unlikely to show up as changes in household composition, but attempts to check by the listing of pregnant women, as in the Thailand survey, may be profitable.

In the Population Growth Estimation experiment in Pakistan, great importance is attached to the independence of the parts of the survey which undertake the registration and the collection of vital events by periodic visits respectively. The individual occurrences in the two records are then matched and the theory of Chandrasekaran and Deming²⁹ applied. In this instance the main value of the procedure seems to be in the detection of events which are recorded by only one of the two methods; the correction for omissions from both is small. On the other hand, the matching of events registered and enumerated in the Thailand scheme suggested that about 8 per cent of births and 16 per cent of deaths might fail to be recorded by either procedure. The size of these percentages is substantial mainly because the official registration is so far from complete. Because of the particular doubts about omissions of births and deaths when children die very young, separate analyses for these categories of events would have been desirable.

²⁴ Patience Lauriat and A. Chintakananda, "Techniques to measure population growth: Survey of population change in Thailand", *Proceedings*, vol. III.

²⁵ Pierre Cantrelle, "Repeated demographic observation in a rural area in Senegal: Method and first results", *Proceedings*, vol. III.

²⁶ Karol J. Krótki, "The problem of estimating vital rates in Pakistan", *Proceedings*, vol. III.

²⁷ G. Vukovich, "The United Arab Republic project for measuring vital rates in rural areas", *Proceedings*, vol. III.

²⁸ Carmen Arretx G., "A method of estimating demographic rates in areas without census and vital statistics: Experimental surveys carried out in Guanabara (Brazil) and Cauquenes (Chile)", *Proceedings*, vol. III.

²⁹ See William Brass, *op. cit.*, para. 24.

A main purpose of the papers by G. Sabagh and C. Scott³⁰ and by P. Cantrelle³¹ is the study of the value of different methods of collecting the data. In the former project, re-enumeration and retrospective reports were used in conjunction at an interval of six to seven months. By detailed individual checking, a corrected list of events plus an estimate of occurrences omitted from all records was established as a standard. The use of only a retrospective questionnaire gave large gross errors, although the net effects were much smaller at 3 per cent over-enumeration for births and 10 per cent for deaths. The addition of re-enumeration and the use of questionnaires at both rounds reduced the gross error but led to net under-enumeration only a little smaller than these percentages. Although the level of these results can not be generalized to other surveys, the structure of error is illuminating.

Cantrelle shows that results obtained by retrospective inquiries in the same regions gave, in general, substantially lower fertility and mortality than his "continuous observation" study. These are uncorrected results. It would have been of great interest to make comparisons with measures adjusted by some of the procedures described in the background paper.

A major aim of this type of study must be the search for methods which are sufficiently simple and cheap to be used on a wide scale in poor countries. The attainment of the highest accuracy clearly requires a great expenditure of skill and effort. These papers throw much light on the problem, but more study is needed of the value of different techniques for correcting the imperfect data collected at one-round censuses or surveys, and of the supplementary information required for such adjustments.

QUESTIONS AND RESPONSE

The formulation of questions, their presentation and ordering to produce the most accurate response is a subject on which there is much valuable experience but, unfortunately, little of it seems to be published with the detailed specific analyses which would be most helpful in the design of surveys. The papers for this session are no exception since, although references to these points are made, they are not elaborated. Som mentions very briefly the

³⁰ Georges Sabagh and Christopher Scott, "An evaluation of the use of retrospective questionnaires for obtaining vital data: The experience of the Moroccan multi-purpose sample survey of 1961-1963", *Proceedings*, vol. III.

³¹ Pierre Cantrelle, "Repeated demographic observation in a rural area in Senegal: Method and first results", *Proceedings*, vol. III.

need for screening questions, cross-checks and probes and the problems of differentials between proxy and self-interviewers.³² Taeuber notes the increasing emphasis on questions which are objective, recognize the possibility of erroneous response and are not embarrassing.³³ Cavanaugh refers to defects such as ambiguity, poor arrangement, unnecessary demands and also to the importance of simple forms which can be completed accurately with the resources available.³⁴ The only contribution which is primarily concerned with a particular aspect of this field is that of J. G. C. Blacker.³⁵ He reports some experiments to obtain accurate age statistics of Africans in Kenya by asking questions not in terms of years but of age grades. These are status classifications of the population, established at the initiation rites of puberty, and therefore very closely linked to chronological age. Unlike the latter, the grades are known and can easily be recorded. The age distributions obtained by this method were more satisfactory than those of the 1962 census. The difficulty of the approach is that the grading system is not national but varies from area to area. Accurate age distributions are so crucial in the determination of demographic measures, and results found by traditional methods so bad in Africa and elsewhere, that any method which improves the returns deserves attention. An important use could be in research to establish the typical errors in the statements of chronological age. In addition, the principle of using the knowledge of social customs to improve the design of questions is an admirable one which has not always been sufficiently needed.

DETECTION OF ERRORS AND ADJUSTMENT BY COMPARATIVE CHECKS

Because of the interrelations of demographic characteristics and the consistent features of the underlying biological processes, much can be done to detect and adjust errors in data by simple comparative checks. The paper by V. G. Valaoras³⁶ gives an account of the appli-

³² Ranjan Kumar Som, "Response biases in demographic enquiries", *Proceedings*, vol. III.

³³ Conrad Taeuber, "New concepts in census methodology", *Proceedings*, vol. III.

³⁴ Joseph A. Cavanaugh, "Research and data collection techniques for developing areas", *Proceedings*, vol. III.

³⁵ J. G. C. Blacker, "Use of sample surveys to obtain data of age structure of the population where respondents in a regular census enumeration cannot give accurate data: Some Kenya experiments", *Proceedings*, vol. III.

³⁶ V. G. Valaoras, "Testing deficiencies and analytical adjustments of vital statistics", *Proceedings*, vol. III.

cation of several such checks to the vital statistics of Greece. Seasonal, delayed birth registration is examined by the graduation of monthly totals; differentials reported in still-birth rates and sex ratios of births between rural and urban areas are used to make estimates of omissions in the records for the former section of the population; comparisons between registration and census returns of young children throw further light on the problem. International experience of the distribution of deaths over the first year of life in relation to the infant mortality rate is systematized and used as a standard for estimating the substantial omissions from the Greek registration records of births and deaths of children dying very young. As Valaoras points out, the detection and correction procedures must be fitted to the origin and nature of the errors. This requires skill, judgement and a thorough knowledge of the materials. No two sets of data have exactly the same pattern of defects and it is dangerous to apply a routine adjustment on such an assumption.

The paper by M. Amani³⁷ examines the under-enumeration of infants under one year in the 1956 census of Iran by comparing the numbers with one quarter of the children recorded at ages 1-4 years; approximate allowances are made for the increase in births with population growth and the mortality occurring between the under one and 1-4 age groups. He calculates the index of enumeration of infants under one year as 66 per cent. It should be noted that the method accepts the records at ages 1-4 years as approximately correct, which is certainly not true for all developing countries.

The paper by A. Cataldi³⁸ describes the methods applied to reconstruct the size and the sex-age structure of the population of Uruguay from 1908-1962 and to make projections up to 1982. Data from the defective National Register of Inhabitants in 1957 were used to correct the migration component in the estimates, derived from the 1908 census and records of vital events and population movements. The total population arrived at for 1957 was 12 per cent less than the official estimate. The numbers at under 20 years were calculated from registered births and deaths; further checks and adjustments were made at ages over 20 with the aid of the registered vital

events and the United Nations model life tables. The census of 1963 gave a population size and sex-age distribution in close agreement with the new estimates.

The study of digit preference is an old one, but the paper by K. V. Ramachandran³⁹ shows that the topic is not exhausted. He points out that, if the force of preference varies with age, the indices normally used for measuring the error may be misleading for comparative purposes since they will be influenced by the age distribution of the population. He develops an age standardized index and shows that it gives more reasonable results than other measures for comparing digit preference of males and females in Bombay (Census of India, 1961).

REPRESENTATIVE MODELS

This heading covers a wide variety of techniques in which patterns of demographic rates and relations, constructed from hypotheses or systematically derived from populations with accurate records, are used to adjust and supplement inadequate or defective observations. A review covering a number of applications is given in section IV of the background paper. Although the contribution by W. Winkler⁴⁰ falls only marginally into this category, it is mentioned first because it deals with a very general theoretical concept, namely what is meant by over-population and under-population, in terms of aggregate measurements of total numbers, national resources and standard of living. The statistics from which such measurements can be made for less developed territories are not adequate, but the consideration of the theory throws light on the population problems of such areas.

The papers by Arriaga, Saxena and Zelnik are concerned with quasi-stable population theory.⁴¹ The first describes a technique for constructing a life table from the proportional age distribution of the population and an estimate of the annual growth rate.⁴² The numbers in each group are adjusted for the trend in births with time by a factor derived from the growth rate; the resulting values are proportional to the numbers in a stationary population. The constant of proportionality

³⁹ K. V. Ramachandran, "An index to measure digit preference error in age data", *Proceedings*, vol. III.

⁴⁰ Wilhelm Winkler, "On the notions and measures of over-population and under-population", *Proceedings*, vol. III.

⁴¹ See William Brass, op. cit., paras. 52-58.

⁴² Eduardo E. Arriaga, "Method of life table construction for populations for which vital statistics are lacking", *Proceedings*, vol. III.

³⁷ M. Amani, "Attempt to estimate the under-registration of children of less than one year in the Iranian census of 1956", *Proceedings*, vol. III.

³⁸ Alberto Cataldi, "Reconstruction of the trends of population growth in Uruguay for periods prior to the 1963 census", *Proceedings*, vol. III.

(which is the birth rate) can be estimated with the help of the United Nations Model Life Tables.

G. B. Saxena⁴³ and M. Zelnik⁴⁴ apply quasi-stable population techniques to the age distributions from the Indian censuses and the Pakistan Population Growth Estimation Surveys respectively. Both use as the characteristic measures, from which the quasi-stable populations are determined, the observed growth rates in a recent period and the proportions under different "round" ages from childhood to middle adult years. The novel feature in both studies is the attention paid to the possible errors arising in the use of the technique; in previous applications, the theory has often been imposed in a routine way with no realization that in some circumstances the results can be badly wrong. The main mistakes arise from three sources: (1) use of an unsuitable mortality pattern as a model; (2) deviations from the quasi-stable conditions of constant fertility and only modest change in mortality; (3) errors in basic data. Although, in both studies, the Coale-Demeny Regional Model Life Tables⁴⁵ which make investigations of the effects of different mortality patterns possible, were used, no reports on this aspect are given. However, corrections, far from negligible, are made for the effects of declining mortality on the estimates of birth rates and checks of the assumptions on which the calculations are based applied by reference to data from earlier censuses. The examination of the estimates made from the proportion of persons under different ages makes it possible to assess the influence of errors in age distributions. That this is necessary is shown by the great variation in the results which are obtained from the different age ranges. It is worth noting here that there are no "universal" patterns of age misstatement which can be used for standard corrections. The same types of misreporting may occur where similar surveys are made in related conditions, but there must be reservations about the extent of the likeness and the size of the distortions. As Zelnik points out, although the estimate of the birth rate arrived at by the use of the quasi-stable theory in this way is not sensitive to the assumed rate of growth, the derived death rate is directly determined by it and is not independent.

The study of methods for the graduation of mortality observations has a long and busy history. On the other hand, it is only recently that attention has begun to be paid to the same topic in relation to fertility. I. Lah develops a procedure for graduating the cumulated births per woman by age, obtained at a census or survey, by an exponential in powers of a function of age and the start and end of the reproductive period.⁴⁶ The use of only three parameters in the graduating formula gave a good fit to observations from the 1948 census of Yugoslavia. Age-specific rates can be derived from the graduated curve on the assumption that the data are accurate and fertility constant. In applications to less developed countries the commonly occurring, progressive omission of births by the older women and distortions due to age errors would have to be guarded against. Lah suggests that similar techniques could profitably be applied in the study of marriage and divorce rates, etc. D. P. Mazur presents a method for graduating birth order age-specific fertility rates, also by exponential functions and dependent on three parameters.⁴⁷ These are most conveniently specified as the initial, modal and terminal ages of fertility for the particular birth order. Tests of the method on rates for Guatemala have given satisfactory agreement of the fitted and observed values. Several techniques for graduating fertility distributions with parameters from zero upwards have been proposed. We now need to know more about the relative merits of the procedures in the analysis of materials of diverse types and with different deficiencies.

The use of a representational model is an important part of the research described by Friedlander and Roshier.⁴⁸ Their aim is to extract information on migration between counties in England and Wales from census data on place of birth and enumeration. Only net effects at successive censuses can be established by the observations and a key part of the investigation is the exact and detailed definition of what is to be measured. The calculation of the migration streams requires estimates of the mortality of lifetime migrants. Without direct statistics or information on distributions of the relevant sub-populations by age, occupation, etc., such estimates must be very speculative.

⁴⁶ Ivo Lah, "A method of using census data for measurement of fertility", *Proceedings*, vol. III.

⁴⁷ Denis Peter Mazur, "The graduation of age-specific fertility rates by order of birth of child", *Proceedings*, vol. III.

⁴⁸ D. Friedlander and R. J. Roshier, "A note on the use of birthplace-place of residence data for estimating intercensal migration streams", *Proceedings*, vol. III.

⁴³ G. B. Saxena, "Estimates of birth rate and expectation of life in India on the basis of quasi-stability", *Proceedings*, vol. III.

⁴⁴ Melvin Zelnik, "An estimate of the birth rate in Pakistan through the application of quasi-stable population techniques", *Proceedings*, vol. III.

⁴⁵ See William Brass, *op. cit.*, para. 48.

Friedlander and Roshier propose a consistent procedure to allow for the effects of age in which it is assumed that the age distribution of the migrants at their move is constant and known, and that the same survival rates can be applied, irrespective of origin and destination, in a given intercensal period. An initial age structure for lifetime migrants has also to be roughly estimated. The validity of these assumptions is discussed; the method has been tested on the census records of England and Wales, 1851-1911, and gives satisfactory results. Knowledge of internal migration is of great importance, particularly in rapidly developing territories, and the materials for study very inadequate. The attempt to collect statistics by suitable questions at censuses and surveys has met with many difficulties of interpretation and analysis. The methodology of such attempts has received far too little attention and the approach of this paper deserves study.

CRITERIA FOR DATA ADJUSTMENT

Paragraph 59 of the background paper considers the problem of how to select from a set of demographic models the one which best fits the observations and states that there has been little discussion of methods and principles to this end. The general remarks in the paragraph also apply to the wider problem of deciding, among conflicting observations and estimates, whether or not representational models are used. N. Keyfitz and E. M. Murphy devise a set of concepts for the examination of "criteria for data adjustment", illustrated by the search for a consistent numerical description of the demographic evolution of a country through time, using sex-age data on population totals, births, deaths and migration.⁴⁹ Their closely argued paper, presented in terms of matrix algebra, cannot be adequately summarized in a few sentences. A general principle announced is the need to make assumptions which are as weak as possible, typically by the specification of the form of relationships rather than absolute values and the reliance on parts of the demographic structure which experience suggests are accurate. The point is made that component measures in the over-all pattern of relationships will be nearly "non-identifiable" if a wide range of values can lead to nearly the same observations. By the introduction of assumptions the number of unknown coefficients (parameters) is reduced below the equations which fix the values. There are thus a multiplicity of possible estimates which obey

the conditions established. Although the authors state that the choice of criteria is not easy, they make two important points, (a) that in many cases the choice of an extreme rather than a "central" estimate is justified because chances of under-enumeration and over-enumeration are far from equal, and (b) since the various components in the problem are not independent, a simplification might be achieved by the estimation only of those factors which dominate the main demographic features studied. Different assumptions will lead to estimates of different sets of rates. It is suggested that these should be combined on a weighting system which depends on the size and direction of divergences from the original observations.

It may be helpful to classify the principles upon which the estimates can be made into three broad categories: (1) certain observations or relations can be accepted as correct from *a priori* reasoning, (2) the consequences of errors in estimating particular features selected as important can be minimized on some criterion, (3) central values can be chosen so that errors are small on average over a wide range of rates and their uses. All these ideas are included in the Keyfitz and Murphy system. The part that each should play will vary with the type of data and estimates but everything is to be gained by a clear and explicit recognition of the nature of the choice.

IMPROVEMENT OF TRADITIONAL SOURCES OF DATA

The number of papers primarily concerned with this topic is small but it is not possible to make a clear-cut distinction between methods for improving the collection of traditional and non-traditional data. Thus, there are many suggestions in papers about the latter type of activity which are relevant to the former and *vice versa*. Improvements in systems and organization very largely depend on close attention to detail. It is impracticable, here, to summarize the many points discussed in the papers. Attention can be drawn only to a few broad features.

It is appropriate to refer first to the work of the United Nations as outlined by N. P. Powell.⁵⁰ Although her review is not confined to traditional methods, it lays heavy emphasis on the part they must play in any system for the collection of national population statistics to serve as a basis for economic and social planning. Complete censuses at regular inter-

⁴⁹ Keyfitz and E. M. Murphy, "Criteria for data adjustment", *Proceedings*, vol. III.

⁵⁰ Nora P. Powell, "The United Nations programme for improving population and vital statistics", *Proceedings*, vol. III.

vals and country-wide civil registration are essential to provide basic statistics for small areas. On such a framework a structure of further demographic surveys can be built. A major effort of the United Nations will be devoted to the "1970 World Population and Housing Census Programme". The programme includes the provision of international and regional recommendations on the kinds of population data which will be useful, the publication of handbooks and manuals, assistance in training, expert advice, and the compilation and dissemination of census results. The work of the United Nations and other organizations in the promotion of censuses and international comparability of definitions, tabulations, etc., is also discussed by C. Taeuber.⁵¹ The improvement of civil registration requires a steady, continuous effort rather than a periodic drive and in the interim, until adequate coverage is achieved, vital rates can only be obtained by non-traditional methods. The United Nations is encouraging development by surveying the stages reached by different countries, holding regional seminars, promoting experiments in which registration is initiated in sample areas and checked by periodic surveys, supporting the establishment of associations of civil registration officers, and highlighting deficiencies by the publication of statistical series in the *Demographic Yearbook*.

The papers by Taeuber, Jain, Cavanaugh and Sadek all suggest methods by which the organization of the collection of data and the extraction of statistics is being or could be improved. Taeuber reviews the development of census methodology but many of his comments are applicable to all forms of data recording. He sees the new elements in the conduct of censuses as largely a matter of philosophy and emphasis, including a more scientific attitude to the entire task, the critical evaluation of all phases of the operation and the relating of aims to resources with the maximum efficiency. Thus, advances in social science, statistical procedures and equipment are all called upon for aid. In each stage of the census there is a need to control and evaluate the quality of the data, in the preparation of lists, field enumeration, processing, testing and presentation. An important item in such a scheme is the training of enumerators and other staff; here programmed learning might be valuable. Both Taeuber and Cavanaugh comment on the need to keep the public informed in order that fears and mistrust may be dispelled and co-operation

obtained. Tools of great power are now at hand. In particular, Taeuber describes the potential of electronic computers in reducing the demands for staff and training, increasing uniformity, editing, simplifying sampling, eliminating intermediate processing errors, presenting tables and speeding up publication. Easy access to computers and the knowledge of how to use them could revolutionize the processing of population statistics for less developed territories; Powell indicates that the United Nations is examining means to attain these ends. Cavanaugh suggests that time-cost studies of the use of machines and equipment are necessary for the optimum allocation of resources. D. A. Sadek discusses the defects in the population statistics of Egypt from the point of view of urban planning requirements and suggests what further types of information are needed.⁵²

A number of issues more specifically concerned with administrative organization are discussed. Cavanaugh believes that a high level coordinating committee, to avoid duplication in the collection of data and in research by Government agencies, is required in some developing countries. The need for a permanent statistical organization for the collection and analysis of population data is stated or implied by Taeuber, Jain, Cavanaugh and Lahiri. The latter emphasizes the growth of experience and higher level of training which has resulted from the continuity of the Indian National Sample Survey. Cavanaugh stresses that job classification and rating of staff should be applied in order to raise quality. An outline of the programme for improving basic registration in India is given by S. P. Jain.⁵³ The aim is to strengthen the administration of the existing system rather than initiate a new scheme. The recording will be done part time by staff of the local administration who will actively seek out, rather than passively note, events. The District Health Officer, who will act as District Registrar, will stimulate and develop good registration and returns with a small specialist staff and the assistance of the existing health and other field workers. Statistical units in State offices are to be established (in towns strengthened) under an officer of sufficient authority to be able to procure co-operation from other departments towards the setting up of an efficient working system. The programme is further supported by the passing of a Central Registration Act which gives the

⁵¹ Conrad Taeuber, "New concepts in census methodology", *Proceedings*, vol. III.

⁵² Dawlat A. Sadek, "Census data and urban planning requirements", *Proceedings*, vol. III.

⁵³ S. P. Jain, "The Indian programme for improving basic registration", *Proceedings*, vol. III.

Government powers to direct States and thus achieve a uniform system.

Statistics of population by sub-regions of a country can only be fully utilized for research if they can be related to geographical areas. K. M. Barbour points out that this is difficult in many less developed territories because maps are deficient showing the location of settlements.⁵⁴ Often the level of correspondence is only for very large regions. There is not the

⁵⁴ K. M. Barbour, "Problems of evaluating and locating census data as preliminary stages in the analysis of internal migration", *Proceedings*, vol. III.

detail necessary for studies of the density of population in relation to soils, water supply, etc. and of migration by examination of sex-age distributions, e.g. according to the distance of areas from towns. He describes how geographers have helped to improve basic information by prior co-operation with the census authorities in the choice of enumeration areas and by subsequent work on the collation of village lists with administrative units. The importance of carefully constructed maps of population locations in ensuring that census coverage is complete is also noted.

Statement by the Rapporteur: Mr. C. A. L. MYBURGH

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Following the Moderator's introductory statement and general review of the papers submitted for this meeting, sixteen delegates made further statements on the subjects under consideration. Because of the close interrelationships of the three groups of topics on the programme many of the remarks were related to two if not all three aspects. However, as far as practicable, the interventions are here summarized under the three headings listed in the programme.

A. NON-TRADITIONAL METHODS OF OBTAINING DATA

From the point of view of the interventions at the meeting, this topic may be sub-divided into four parts, namely:

1. Anamnesis studies;
2. Multi-purpose surveys;
3. Surveys confined to vital rates;
4. Inter-penetrating samples.

1. *Anamnesis studies*

The discussion was opened by two speakers who referred to the long-term retrospective form of enquiry outlined in a paper on the study of demographic processes using the method of anamnesis. This retrospective genealogical type of study had been used successfully in the Soviet Union in the 1920's for the estimation of fertility and infant mortality in districts where, at the time, there were no registration particulars. It was now being used in special studies of certain groups of people whose full registration history was spread over seasonal archives and not easy to extract quickly. Among the advantages of this method of approach was the fact that the detailed fertility history of two or three generations

could be obtained in one survey and examined against the full family background, taking into consideration changes in family income, the dates on which members of the family started work, their educational level, etc. In two recent studies of marriage fertility, farm workers' income, dwelling conditions, and certain other factors had been taken into consideration. Another advantage was the fact that the particulars could be reduced to man-year units.

2. *Multi-purpose surveys*

The next speaker took up the question of multi-purpose household surveys in India which, though related to a short time period, covered a wide range of subjects such as agricultural and economic data as well as demographic characteristics and vital statistics. This type of survey had been recommended to developing countries because of their limited resources of trained personnel and funds, the alternative being to carry out several single topic surveys requiring more money and more staff. However, there were two objections to such multi-purpose surveys.

First, when a wide range of subjects was covered in a single survey it was impossible to give the enumerators the specialized training required to enable them to obtain accurate data on all the subjects under consideration. Consequently, some of the results obtained were of doubtful reliability, as for example in the Indian National Sample Survey. Secondly, the sampling errors could not be controlled and those for important items which occurred in relatively few households were so large that the numerical values obtained from the survey became worthless.

It was suggested as an alternative that the

surveys should be confined to a group of closely interrelated items, as is done in the National Health Surveys in the United States. The enumerators could then be given adequate specialized training in the single field under consideration. Even then, a single sample was not desirable but rather a type of concentric or staggered system of sampling so that items with small errors could be enumerated in a small sample, while items with large errors could be covered by enlarged samples.

Because of their defects, multi-purpose surveys often, in fact, proved costly and wasteful. A more profitable approach would be to concentrate first on collecting data on items with the highest national priority and then gradually to expand the sample surveys to other items of lower priority as more funds and specialists became available.

In this context, attention was drawn to the urgent need for basic data on births and deaths, particularly infant deaths (which account for 50 to 70 per cent of all deaths), and also maternal mortality. This information was essential for planning a realistic public health and socio-economic policy. Furthermore, it should not be forgotten that the number of births and deaths was changing all the time, as a result, for example, of malaria eradication. In the analysis of data, a medical approach was as essential as the demographic and sociological aspects, to prevent misinterpretations.

3. *Surveys confined to vital rates*

The author of a paper on recent work on birth and death statistics in Senegal, where the same group of people is visited annually to obtain retrospective details of births and deaths which occurred during the previous twelve months, gave the meeting some further details in that regard.

A second set of figures, not yet published, confirmed those given in the paper and confirmed the view expressed there that repeated annual visits to the same people produced better results than a single retrospective enquiry. There was still the possibility of some error in this form of enquiry in that some of the children born and dying between the visits might be missed. However, this was reduced to a minimum by recording visible or reported pregnancies and ascertaining the outcome of these a year later. In addition, at each visit all women aged 15 to 45 were asked whether they had had another confinement since their last recorded birth.

It had been found that these surveys recorded a rather high proportion of deaths (66 per

cent) in the 0-5 age group. The reliability of this unusually high proportion was being studied by following each cohort of children through the successive surveys until they reached 5 years of age. This would also provide information on the intervals between the date of marriage and the first birth, the interval between births, and the relationship between fertility and infant mortality.

The next speaker gave a further explanation of his paper on the Indian programme for improving birth and death registrations. The project aims at registering births and deaths as they occur in a randomly selected sample of villages and wards of towns so that reliable estimates of State and national vital rates will become available. Because of the limited education of the registrars and the people concerned, the emphasis is on the basic recording of births and deaths. Other items of interest such as parity, birth interval and age of marriage will be collected by better equipped investigators.

Apart from encouraging householders to report their births and deaths, the registrar is also required to make regular contact with people who are socially integrated in the life of the community such as washerwomen, barbers, midwives and priests. Independently of this approach to the continuous registration of births and deaths, a separate organization will undertake periodic surveys to ascertain the size of the population and also to obtain a second record of the births and deaths. The two sets of results are to be matched and discrepancies will be investigated.

Pilot studies have been completed in six States with a view to working out machinery for ensuring that all births and deaths are duly recorded by the locally resident registrar. The pilot studies have given encouraging results and it is intended to launch full-scale schemes in a few States in the near future and to extend the coverage gradually, in order to obtain the national rates.

It is appropriate here to mention the view of the Moderator regarding the danger that activities associated with any continuous sample survey, such as propaganda, education through contacts, advice and encouragement may destroy the representativeness of the units. A speaker pointed out that, although the undesirability of repeated interviews which have the effect of changing the sampling unit must be recognized, this did not necessarily mean rejecting the methods which had been developed for attaining most of the benefits of interviews while avoiding most of the disadvantages of

introducing serious distortions by the interviewing process.

Another speaker emphasized the difficulties which may be encountered in comparing two sets of figures obtained either from the same group of people at different points in time or from different samples taken at the same time. It was inevitable that there would be some discrepancies between the two sets and it was most difficult, if not impossible, to establish which were the correct figures.

4. *Inter-penetrating samples*

Opening the discussion on inter-penetrating samples, the next speaker expanded on the views already expressed in his paper on that topic. He pointed out that an additional advantage of this approach was that it could also provide advance estimates as in some of the Indian surveys, and in an agricultural survey in Latin America sponsored by FAO.

The technique did entail some additional expense. A suggestion had been made for a theoretical formulation of this and it was estimated by another writer that the increase would be about 10 per cent in large scale surveys such as the Indian National Sample Survey. However, actual calculations on the Indian data for 1954-1955 showed that the extra cost was only 3.5 per cent.

A constant bias common to all enumerators, or all methods of data collection etc., passed undetected by the technique. However, this was not a sampling problem *per se*. Special techniques were required to detect and adjust for such constant biases, some of which were presented in papers prepared for the meeting. However, even if the additional cost of taking an inter-penetrating sample enquiry was small, it was still not justified as the bias passed undetected.

Another speaker also argued that this approach to sampling was not generally useful for clustered national samples. There were objections to it on grounds other than cost. If the number of replications was small, say 2 to 4, the coefficient of variation of the standard error, as given by the formula $[2(K-1)] - 1/2$, was substantial. For example, for $K=3$ replications, it was 50 per cent. On the other hand, when K was large a great deal of the simplicity of the method, its chief virtue, and the common demands for adequate stratification must be sacrificed.

However, the advantages of replication could be had with a basic model of two selections per stratum. This method and its modifications had been used widely for national samples.

The error computations could be made simple and designs for non-sampling errors could be incorporated. Each stratum provided a degree of freedom; 100 selections yielded a coefficient of variation of 10 per cent for estimating the standard error.

A further speaker suggested that much of the confusion about inter-penetrating samples stemmed from the fact that some people considered variances in isolation while others considered biases in isolation. The goal should be to minimize the combined effects of biases and sampling variances.

B. METHODS FOR HANDLING DEFECTIVE DATA

The discussion on this topic of the meeting may conveniently be divided into two sub-items:

1. Detection of errors and adjustment by comparative checks;
2. Use of representative models.

1. *Detection of errors and adjustment by comparative checks*

The author of a paper on response biases in demographic enquiries expanded that section of it dealing with recall lapse in retrospective enquiries by a reference to recent work on data relating to Chad and Upper Volta released by the Institut national de la statistique et des études économiques. These showed the same features observed previously for births and deaths in India and Pakistan, namely a regular decrease in the number of events reported with the increase in the length of the recall period.

For the birth data of Chad, tabulations had also been made for the different age groups of mothers. Although the analysis had not yet been made, it was likely that the slope of the recall curve and hence the adjustment factor might be different for the different age groups of mothers. This would depend on infant mortality and other factors.

However, the data on births and deaths for Upper Volta, like that for births in India in 1958-1959, showed a slight heaping up of the number of events reported for the sixth month before the date of interview. A plausible explanation of this was that when an event was ascertained to have occurred within the preceding twelve months, but the exact date was not known, the enumerator assumed it to have occurred in the middle of the period. On the other hand, in Chad, such items were shown as a separate item and no heaping was evident. The Chad approach was preferable since field adjustments of data made analysis less easy.

The speaker also referred to recent work by Das on the effect of recall lapse, screening questions and probes, proxy and self-interviews, medical attendance, etc., in a special study of morbidity prepared at the Indian Statistical Institute. The results were similar to those obtained for the United States by Linder and for India by Das and Som.

Another speaker cited a method used in the 1960 census of Thailand for the correction of data relating to the total number of children ever born, analyzed by age of mother. The raw data showed a decline in the number of children for women over the age of 50. This tail end was adjusted upwards, on the assumption that recall lapse increased progressively from the age of 15. Adjustments were also made for the figures relating to the ages 15 to 49.

The next speaker drew attention to a possible error in the adjustment proposed for under-reporting in ages under 1 year in a paper describing an attempt to estimate such under-registration in the Iranian census of 1956. The adjustment assumed that records for ages 1-4 were approximately correct, but the Moderator had already pointed out in his statement that this was not the case for all developing countries. The speaker suggested that the numbers for the 1-4 age group should first of all be adjusted in the light of the data for ages 5-9.

Another speaker made a general comment on the dangers of making broad assumptions without investigation. In working on material for developing areas, it was often necessary to make some general assumptions such as that the age of the mother had no effect on recall lapse when she was asked for details in respect of the recent past. However, if at all possible, each such assumption should be investigated to find out whether the final estimates were biased by them.

A last speaker added a word of warning on the possibility of high variances in demographic analysis particularly in the case of small groups or very detailed analyses. If care was not exercised, gaps in knowledge might be filled by a large collection of information with such a high rate of variance as to be completely misleading.

2. Representative models

Several speakers drew attention to the need for caution in the use of models.

The first referred to a paper on estimating inter-censal migration streams, in which the authors found a very great regularity in the age structure of current migrants in the United

Kingdom over a long period. Workers in developing countries were forced to use such regularities to fill the gaps in their data, but instead of generalizing for all cases they should restrict themselves to generalizing for similar cases. The age structure of migrants varied from country to country and had varied over time. The possibility of foreseeing differences or changes was of great importance to development programming including city planning.

The speaker quoted as an example an estimate of future elementary school-age population which he had been asked to make for a new city, Ciudad Guayana, in Venezuela. Age and sex figures for the 1961 census had been available, but the city was then very new and had a high proportion of young working males. As the work of construction projects was coming to an end, it would have been unrealistic to assume that the future immigrants would have the same sex and age structure as the earlier ones. Nor could it be assumed that new immigrants would have the composition shown for all urban areas in Venezuela taken as a whole. It was assumed that the new immigrants into Ciudad Guayana would adjust the city's age structure to that of Maracaibo and the urban areas of Zulia State which had grown rapidly in the 1920's after the development of the oil industry.

Another speaker had reservations about the formulae for the measurement of fertility contained in a paper on a method of using census data to that effect. The consolidated treatment of married and single women could lead to error since there might well be two unhomogeneous components in the universe.

In arriving at the figures for formula (2) from formula (1) it was assumed that successive generations of women in the same household followed a common pattern of fertility. This rarely happened.

In formula (7) the author assumed a modified hyperbolic decrease of the force of fertility from age 15 to age 50. It was doubtful whether that assumption was a valid one even if fertility was regarded as a purely physiological function. In any case, it had to be borne in mind that there were also sociological factors involved and a general tendency for fertility rates to rise to a peak some time after the age of 20 and to fall gradually thereafter.

Another speaker emphasized the importance of the newly emerging non-traditional models or techniques which did not rely on unnecessarily rigorous assumptions or assume constancy or near constancy of the component parts over several generations. As an example,

he cited the application of the technique of age distribution of deaths to estimate the level of the death rate in Thailand.

In earlier work, Bourgeois-Pichat had used a series of stable age structures. On the other hand, the speaker and his colleagues had applied a set of model life tables to the actual age structures. This had given a single set of estimations whereas the earlier method had given a double set.

A last speaker on the subject of models drew attention to the fact that Brass and other demographers used the term "model" in a much broader sense than had been the case in meeting B.7. He was concerned lest this practice should lead to confusion and misunderstanding and suggested that the term "model" should not be used in the sense of estimates or checks based on data borrowed from other countries.

C. IMPROVEMENT OF TRADITIONAL SOURCES OF DATA

Only one of the interventions at the meeting was primarily concerned with this topic, although, as mentioned at the beginning of the report, portions of the discussions on the other

two topics also had some bearing on means of improving or extending traditional sources of data.

The speaker noted that preparatory work had already started on plans for the 1970 censuses, making increased use of computers, and expressed concern that there might not be a sufficient number of experts available to make adequate use of the vast amount of information likely to be available in the future. He suggested that new ways should be developed to ensure much closer collaboration between all the parties concerned, particularly between statisticians, demographers, sociologists, economists and those concerned with the health and education services. More inter-disciplinary discussion and advance planning should lead to improvement in census methodology, a general increase in the efficiency of the census and maximum utilization of the material available. There was a need for early action in this direction as much time was needed to prepare the computer programmes.

The following speakers took part in the discussion: Arriaga, Bunak, Cantrelle, Das Gupta, De Haas, Henry, Jain, Kish, Macdonald, Marks, Muhsam, Panse, Schubnell, Som, Voikov, Winkler.

MEETING B.13

Studies relevant to family planning

Statement by the Moderator: Mr. Jean MORSA

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During recent years family-planning programmes have aroused increasing interest. A considerable literature has been devoted to the subject. Indeed, it may be said to have become one of the main channels of contemporary research as regards demography and the sociology of the population.

The very fact that the United Nations has taken the opportunity offered by this Conference to set aside a special meeting for a study of this subject is proof that it is one of the significant sectors of contemporary discipline. It is also a proof that the misunderstandings which the movement encountered at its beginning are now tending to diminish.

Certain governments have already decided to take action. India was the first to tread this path, some ten years ago, followed in 1960 by Pakistan tentatively at first with hesitating steps but today in a more resolute manner. South Korea launched a programme which was energetic from the outset and has obtained some remarkable successes. Tunisia in 1964 took the same direction, followed by Turkey in 1965. In some areas, such as Taiwan in 1961 and Hong Kong, these programmes have received massive Government support, while in many other countries measures of a limited character are being applied with the help of the Government concerned (Ceylon, Egypt, Indonesia, Fiji Islands, Malaysia, Chile, Venezuela, Jamaica, Puerto Rico, Nigeria, Ghana, South Rhodesia).¹

What is the reason for this interest and the decisions that have been taken?

While not attempting a detailed survey of the question, it will be useful to give a brief account, in order to place the subject in its proper context.

The problem which these programmes are intended to solve derives from the comparison

of two movements of growth: that of the population and that of economic development (see, for example, the reports on Korea and Tunisia).² Clearly, the rate of demographic growth is or is likely to become more rapid than that of economic development. Therefore, whatever efforts may be made on behalf of economic development, it is to be feared that they will have no effect on the level of living of the population making them. If the population grows more quickly than is allowed for by the rate of economic development, a lowering of the general level of living will necessarily ensue.³

Sauvy proposes that a distinction should be made between "demographic" investments and "economic" investments. By "demographic" investments he means those which are necessary to maintain the level of living at its present level: that is to say, investments the sole purpose of which is to meet the growth of the population. By "economic" investments he means those which permit an improvement in the level of living of the population. Put in these terms, it is to be feared that the demographic investment may absorb the totality of the resources available for investment.

Nobody talks any more of "over-population", a static term which implies that somewhere there are too many human beings. It would certainly be possible for the earth to provide subsistence for a much greater number of human beings than it does today. That is not the question. The question is: How much time would be necessary to put it into effect and

² Taik Il Kim, M.D. "Review of the family planning action programme in the Republic of Korea", *Proceedings*, vol. II; George Brown, M.D., and Amor Daly, M.D., "Evaluation of Tunisia's family planning programme", *Proceedings*, vol. II.

³ Alfred Sauvy, *Théorie générale de la population*, 2 vols. (Paris, 1952-1954). The first volume has been issued in a separate edition considerably revised. See also A. Sauvy, *De Malthus à Mao Tse Tung* (Paris, 1958), pp. 113 *et seq.*

¹ See Bernard Berelson, "A review of major governmental programmes", *Proceedings*, vol. II.

could it be done at a faster rate than that of population growth?

Nobody maintains, moreover, that a family planning programme is in itself a remedy, whether universal or particular, for every situation encountered in a developing country. It would be absurd to equate family planning and economic development: the former is not a substitute for the latter. To see things in that light is again to adopt a "static" view, to act as if the problem of poverty in the world should be solved not by energetic action in the sense of economic development but by an attempt to bring population figures down to a point below that which the present level of development would allow. To apply a family planning programme does not, therefore, mean renouncing decisive and energetic action with a view to economic development. On the contrary, economic development remains the primary objective and demographic action is complementary to it.

Furthermore, with the exception of certain experimental cases on a reduced scale, family planning can only be conceived of as one measure among many, all of which are intended to overturn the old social and economic structures. Without such an upheaval, a family planning programme would have no chance of success. A programme of this kind could only be adopted by a population in the midst of experiencing the veritable intellectual revolution which is of necessity associated with profound economic and social change.

Contraceptive practices are only disseminated in a society at a time when a new idea of existence is being entertained: man must become aware of what he can do with regard to his own fate. He must develop a rationalist and voluntarist conception of his destiny. Ariès says, with respect to the Western situation, that the emphasis has been moved from the conservation of the world and of mankind in the world to the mobilization of the world for the benefit of man.⁴

More specifically, man must include himself in his field of observation and consider himself as a means of achieving the goal which he has set for himself.

This is a prodigious revolution, which must be supported by an upheaval of the social structures, in particular the family. The old mental inertias correspond to social structures which have become petrified.

⁴ Ph. Ariès, *Histoire des populations françaises et de leurs attitudes devant la vie et la mort, depuis le XVIII^e siècle* (Paris, 1948), pp. 547 et seq.

The mutation of these social structures is in process in the developing countries, although not to an equal extent in all, and the signs of modernization are appearing everywhere. Lethargy is ending, and there are also the rationalist and voluntarist positions which give rise to the desire to take action regarding the number of children people care to have.

Of course, the lessons to be drawn from the succession of events in the Western countries cannot be applied *ipso facto* to the developing countries. In the former, the reduction in mortality was brought about slowly. It could not, in fact, have occurred more rapidly since it depended on complicated scientific developments. The lengthening of the life-span was therefore parallel with the rise in the level of living.

In the developing countries, on the other hand, where modern techniques have been borrowed and applied, mortality has collapsed suddenly, too suddenly for a simultaneous rise in the level of living.

Thus, the developing countries show the following special features:⁵

- (a) A high birth-rate (higher than in Europe at the beginning of the modern era);
- (b) A mortality rate sometimes lower than that of the more developed countries;
- (c) An increase in the length of life not related to the evolution of the level of living.⁶

To ignore or deny the problems which derive from the above would be blind indeed.

Nobody will dispute that, with or without a family-planning programme, the birth rate will end in spontaneous reduction. Here, the Western lesson has been well learnt. The question is whether this evolution can be hastened.

If the duration of life has been lengthened to so considerable an extent, if modern tech-

⁵ See A. Sauvy, *Théorie générale de la population*, 2 vols. (Paris, 1952-1954). The consequences of this state of affairs on the structure of the population according to age, on the actively employed population, on housing needs, educational establishments, etc., have been widely studied by Coale, Tabah, Sauvy and many others.

⁶ See V. E. Ovsienko, "Influence of social and economic factors on demographic characteristics", *Proceedings*, vol. IV, for meeting A.10, "Demographic aspects of economic growth". This author, while admitting that the limitation of births is inevitable in the long run, thinks that priority should be given to economic development. It is among the consequences of the latter that he places the voluntary limitation of births, the rise of the level of living and the lengthening of the life span. This is true of the industrialized countries (Western and Soviet), but in the developing countries the lengthening of the life span has preceded the rise in the level of living.

niques have been adopted, is it not possible to help the level of living to rise by shortening the interval between the reduction of the death rate and that of the birth rate?

It must be repeated that this cannot happen unless the mutation of the social structures is sufficiently advanced to give rise to a new state of mind. A family planning programme cannot be drawn up in the abstract; it must be based upon a pre-existing desire in the population. Perhaps the population itself is unable to find the solution it is seeking,⁷ or perhaps the practices which it adopts are ineffective, or, again, it uses them in an ineffective manner; these are the aims which the programme is intended to meet. Everybody knows how long it took in Europe to disseminate effective practices among the population as a whole, and in certain respects this diffusion is not even yet completed in the most developed countries.

In this sense, the programme is a relay stage which will allow the population to indulge in anticipatory hopes.

From this point of view, different factors intervene to counteract the analogies which may be deduced from Western history. First of all, there is the disappearance of the colonial empires. Within a very short period of time, a large number of countries have achieved political independence. This, without any doubt, constitutes a powerful ferment; apart from the intrinsic value to be attributed to political independence, it creates an opportunity for a powerful concentration of energy and the feeling of a new start in life. As regards demographic matters in particular, this opens the way for concerted and rational action.⁸

On the other hand, the decrease in mortality and infant mortality in particular is a favourable factor for the dissemination of contraceptive practices. It would in any case be

⁷ The communications of various authors (e.g. Yoshio Koya, "Some essential factors for fertility control in Japan", *Proceedings*, vol. II; G. Adriasola, R. Armijo, H. Behm and S. Plaza, "Population problems in Chile, and the role of the School of Public Health", *Proceedings*, vol. II; Károly Miltényi, "Social and psychological factors affecting fertility in a legalized abortion system", *Proceedings*, vol. II, Antonín Černoch, "Experiences in Czechoslovakia with the effects and consequences of legalized artificial termination of pregnancy", *Proceedings*, vol. II) show that recourse to voluntary abortion, even criminal, is sometimes a consequence of the impossibility of finding an effective solution. This may occur to such an extent that it may be necessary to legalize abortion or, as the report on Hungary notes, seek to disseminate effective contraceptive practices.

⁸ Number provides the first movement of national pride. Later, a keener awareness of what number implies becomes apparent.

astonishing for any society to fail to ensure a certain proportion between births and deaths.⁹ It is therefore rare for any action relating to birth to precede a control of mortality. In the case of France, where contraceptive practices appeared earlier in the modern era, mention has been made of simultaneous action with regard to births and deaths, the reflection of a common mentality.¹⁰

Another favourable factor is the considerable efforts being made with regard to education. In that respect, not all developing countries find themselves in the privileged situation of Korea, but all are trying to generalize elementary education. For example, in Tunisia there has been a striking increase in the proportion of the population, from age to age, that has attended school.

Similarly, endeavours are being made to change the status of women which call into question the very structure of the family.

Lastly, another eminently favourable factor is the progress of contraceptive technology. This is something quite new. Formerly, certain authors (in particular, Ogburn) stressed the influence of technical progress on the dissemination of contraception, their arguments were not unduly convincing. It was not immediately evident that certain technological discoveries would favour the dissemination of contraceptive practices.

The most recent techniques, however, provide entirely new elements. The arrival on the market in 1960 of the oral contraceptive, followed in 1962 by the renewal of intra-uterine devices, have permitted the temporary dissociation of contraception and the sexual act.

This is a separation which entails considerable consequences. Formerly, contraception required a perseverance which could never be relaxed. Even in the case of couples who were in favour of family limitation, certain psychological or sociological conditions (family, housing, environment, etc.) might constitute obstacles to their will.

The new techniques have removed a large number of these difficulties. This, doubtless, is one of the reasons for their popularity. Married couples who desire to limit the number of their descendants can do so without subjecting themselves to the same restrictions as formerly.

Many of the reports submitted to the meeting throw into relief, in any case, the relative failure of the older practices. Not only did

⁹ See R. Freedman, "Sociology of Human Fertility", *Current Sociology*, X/XI, No. 2 (1961-1962), pp. 49 *et seq.*

¹⁰ See Ariès, *op. cit.*

many couples to whom these practices were offered fail to use them regularly, but, further, all of them, even the oral contraceptive, are abandoned, in favour of the intra-uterine device so soon as the choice is given. Yet, is this the universal solution? First of all, an efficacy of similar dimensions can be obtained by other means.¹¹ A proportion of women, by no means negligible, cannot endure these devices (20 per cent, according to Chow).¹² There is also a risk of expulsion (about 10 per cent of cases, according to Tietze). Re-expulsion after re-insertion is still more frequent. Finally, their utilization brings about certain ill-effects (pelvic inflammatory disease, 2-3 per cent). The method of action of these devices is not known. Once in place, they may remain in the uterus for an indefinite period.

Oral contraceptives, at the beginning very popular, are more efficacious, do not appear to present any danger and are certainly more easily accepted than the more traditional contraceptives. However, the rate of abandonment is higher than for the intra-uterine devices.

Parallel with this, of course, other research work is being carried out, but it is still in the laboratory stage. Attempts are being made to perfect temporary sterilization by means of inoculation. At the same time, the reversibility of present sterilization processes will no doubt be improved.

It is known, however, that certain forms of contraception have met with various obstacles, in particular, religious difficulties.¹³ Other researches are attempting to throw some light on the relation between ovulation and elevation of the basal temperature. It would appear that conception is rare if sexual relations take place after three high temperatures have been registered. Conception may, however, occur when sexual relations have taken place several days before the rise in temperature. It is the daily probability of conceiving which is being studied at present. It is obviously essential for this factor to be known if this method is to be used for the control of fertility.¹⁴

Another consequence of the most recent techniques may be of quite a different kind: it may modify completely the content and direction of

present programmes, as for example in Taiwan. Let us consider this at greater length.

The objectives of these programmes may appear ambitious. For instance, in China (Taiwan) it is planned to bring down the crude birth rate from 36.2 per 1,000 in 1963 to 24.1 per 1,000 in 1973. This means a reduction of one third. The rate of natural increase would thus drop from 3 per cent to about 1.9 per cent. In South Korea, it is also hoped to bring the rate of natural increase to below 2 per cent by 1971. In Hong Kong, it is hoped to reduce the birth rate from 30 per 1,000 in 1963 to 20 per 1,000 by 1970. Bringing the natural rate of growth down to 2 per cent is a fairly general objective.

What is the situation? The success of the intra-uterine devices must mean that an important part of the population of the countries in question accepts the voluntary limitation of births. In this respect also, an important innovation must be pointed out: direct enquiries have been multiplied and there is no longer any hesitation in interrogating couples on their opinions regarding the size of their families, their knowledge of contraception or the practices which they use for contraceptive purposes. In this regard, the brilliant enquiries carried out by Freedman, Whelpton and Campbell in 1955 marked a new stage.¹⁵ This is the first enquiry carried out at the national level and based on a representative sample. Many others have been undertaken since then, in all, in about thirty countries. Doubtless, and this is a delicate point deserving discussion, the significance of the replies received is not always clear. Serious problems of validity and fidelity have not been solved. Whether the enquiry was carried out among wives or husbands is obviously not a matter of indifference and the validity of the replies is affected thereby.¹⁶ Also, what precise meaning is to be attributed to a declared intention to use contraception when the declaration is made by somebody who does not know what it is all about? All this is obviously far from simple.

Nevertheless, no matter what methodological questions still remain to be answered, these surveys provide valuable information. They make it possible to see, in the first place,

¹¹ Christopher Tietze, "Effectiveness, acceptability, and safety of modern contraceptive methods", *Proceedings*, vol. II.

¹² L. P. Chow, "Evaluation of a family planning programme in China (Taiwan)", *Proceedings*, vol. II.

¹³ J. Yerushalmy, "Religious, educational and socio-economic factors associated with different methods of fertility control", *Proceedings*, vol. II.

¹⁴ John Marshall, "A statistical analysis of the time of conception in relation to the rise of temperature in 5,013 cycles", *Proceedings*, vol. II.

¹⁵ R. Freedman, P. K. Whelpton and A. Campbell, *Family planning, sterility and population growth* (New York, 1959).

¹⁶ S. J. Poti, B. Chakraborti and C. R. Malaker, "Reliability of data relating to contraceptive practices" in *Research in Family Planning*, C. V. Kiser, ed. (Princeton, Princeton University Press, 1962), pp. 51-66. W. P. Mauldin, "Fertility studies: knowledge, attitude and practice", *Studies in Family Planning*, No. 7 (June 1965).

whether a certain differentiation of fertility has begun to take place, and what factors are responsible for it—or whether, on the other hand, effective contraceptive practices are adopted by only very small westernized groups with a high standard of living and a high level of education. A considerable number of countries fall into the first category. Others, however, such as India, Tunisia and Morocco, appear to belong to the second. When we add to this the fact that the population of India is to a very large extent rural, it is easy to see that the Indian programmes must expect to meet, initially, with special difficulties.

In any case, effective contraceptive practices are not widespread. Berelson gives the following general table:¹⁷

Practising family planning now (average)	say,	10%
Have sufficient information about reproduction and contraception	say,	±20%
Those with three or more children and do not want more	say,	50%
Interested in learning more about family planning	say,	60%
Approve of birth control	say,	75%

In view of the fact that a considerable number of married couples still want to have children, that a substantial proportion of women are pregnant or have recently had a child, and that some women have already adopted contraceptive practices, it is clear that a family planning programme is aimed, in the short run, at only a fraction (about one third) of the married women of reproductive age. It may be noted, however, that as a general rule the women questioned would like to have had fewer children than they had in fact.

When differentiation does appear (except in the case of the privileged groups already referred to), the most favourable attitudes are found in towns, among middle-aged women (e.g., 30 and over), educated women, women who have already had a number of children (usually four), and women with sons. The most general desire is not to space out births, but to have no more children. The main reasons given for adopting birth control are economic. These very general characteristics are obviously a reflection of sociological and economic conditions in the country concerned, and particularly of its family institutions. This fact is illustrated by the desire of families to have a certain number of sons.

Similarly, religion appears to be an important factor. Though some religions have no

strict bar against contraception (Mohammedanism and Hinduism, for example), they are, nonetheless, in general, powerful traditionalist forces. (See, in this connexion, documents presented at other meetings, for example those by Kirk and Raman).¹⁸

Be that as it may, in one way or another it is for the women with the characteristics mentioned above that the existing programmes cater. Frequently, the programmes that are described in the papers presented have their institutional base in public health centres, and more particularly in clinic services for expectant mothers and children at the breast.

Certain particular features are noteworthy, as regards their organization.

In Ceylon, for example, in the study being made with the help of the Swedish Government,¹⁹ the aim is to employ exclusively staff already working in health services. These cater for a population of from 8,000 to 10,000 people. No attempt is made to cover the whole population. The programme is only designed to reach the couples whom it can help. Advantage is taken, therefore, of the visits made by pregnant women to health centres. When they visit the centres, the women are told what can be done for them. They are given a letter, addressed to the husband, and shortly after the birth an inspector calls upon him. Endeavours are also made to avoid requiring the women to leave their homes. Since post-natal check-ups are carried out in the women's homes at regular intervals, the visiting midwives bring the articles asked for with them and deliver them then. Thus, no family planning clinic has been opened, and wives can have their supply problems settled for them anonymously. The programme is now being extended to larger administrative areas.

Clearly, this is an ingenious way of employing existing personnel, making wide use of personal contacts and avoiding dispersion of effort, while at the same time going beyond the stage of "family-planning clinics" and respecting, in accordance with their wishes, the privacy of the women.

At Dacca in East Pakistan research is being carried out in order to ascertain what condi-

¹⁸ Dudley Kirk, "Factors affecting Moslem natality", *Proceedings*, vol. II; M. V. Raman, "Attitudes towards family size and fertility control in India—An assessment", *Proceedings*, vol. II, for meeting B.1, "Factors and patterns of fertility in areas where fertility is relatively high".

¹⁹ Arne Kinch, M.D., "Family planning in the context of community health services in rural Ceylon", *Proceedings*, vol. II.

¹⁷ Bernard Berelson, "A review of major governmental programmes", *Proceedings*, vol. II.

tions put adults in the best position to learn.²⁰ This involves studying methods of education, motivations and channels of communication.

It is believed that changes in behaviour depend both on the person concerned and on reference individuals and groups. Accordingly, an attempt has been made to measure the respective influence of the husband, the wife, the members of the family, and civil and religious organizations.

The main project consists of an examination of the effects of educational activities involving men only, or women only, or both men and women. It appears that the last-mentioned procedure is the most promising one, and that communication between the married pair plays a not inconsiderable part in the adoption of contraception.²¹

The work undertaken at Dacca has been extended to rural areas. Volunteers, chiefly women who rarely leave their homes, are recruited for distribution purposes, and the possibility is being studied of including certain shops in the distribution circuit.

Another Pakistani plan, the Comilla projects, is highly original.²² In this case, the family-planning programme is part of a general rural development plan. The plan as a whole is largely empirical, based on existing customs and institutions. The villages covered by the plan, however, are in a state of transition, and advantage has been taken of the fact to launch from within a system of co-operatives and to introduce a new kind of intensive agriculture. What is particularly noteworthy is the place given, in the plan as a whole, to measures for changing the status of women.

A limited family planning programme is incorporated in the general plan, based on the same principles. These principles are described by Khan and Choldin as follows. The teaching and demonstration centre must operate outside the village. There, the leaders chosen by the villagers can receive the necessary information. It is believed that their removal from the group in which they normally live in itself helps to wean them away from the old ways of thinking. They are relied upon to disseminate what they

have learned, with the help of experts from the departments whose function it is to promote change and development. It is also believed that the teaching centre should be permanent: the fact of its continuing existence demonstrates to the villagers that the aims announced are still being pursued. Rigorous co-ordination and supervision are required. However, the paper adds that all aspects of development must be tackled simultaneously, and success can only be achieved if the education received is regular and continuous.

Participation in the family-planning programme is, of course, voluntary. If a village decides to participate, the person appointed by it (usually a woman) goes to the centre once a week, organizes the work and distributes the contraceptives. Here, too, an endeavour is being made to organize commercial distribution. Publicity has been resorted to, based again on methods appropriate to the milieu: for example, the services of local singers have been enlisted. This plan has shown that rural populations with a low level of education are interested in family planning and can use the traditional techniques.

Korea has gone still further in this direction: press, radio and television have all been set to work.²³ Various mass activities have been organized for the month of May, which has been officially dedicated to family planning. The Korean experiment, which seems likely to be a success, appears to show that in certain circumstances mass communications can play a substantial part in the development of a family planning project. Very properly, the emphasis of the public information programme is informative rather than persuasive.

In Taiwan, since an experimental study was carried out at Taichung,²⁴ which aroused considerable interest, the programme has been extended to the whole island. Its success is to a large extent due to spontaneous dissemination of information by word of mouth.

In Taiwan, as in Korea, intra-uterine contraceptives are the ones most widely used. Perhaps their use represents a continuation of earlier practices (the Japanese Ota ring).

In Tunisia also the programme is linked with the maternal and child health services.²⁵

²⁰ William Griffiths, Beryl J. Roberts and Raisunnessa Huq, "Application of learning theory to a family planning programme in Dacca, East Pakistan", *Proceedings*, vol. II.

²¹ See the work in Puerto Rico of R. Hill, M. J. Stycos and K. W. Back, *Family and Population Control: A Puerto Rican experiment in social change* (University of North Carolina Press, 1959).

²² Akhter Hameed Khan and Harvey M. Choldin, "Application of a theory of rural development to family planning in East Pakistan", *Proceedings*, vol. II.

²³ Taek Il Kim, "Review of the family planning action programme in the Republic of Korea", *Proceedings*, vol. II.

²⁴ See B. Berelson and R. Freedman, "A study in fertility control", *Scientific American*, Vol. CCX, No. 5 (May 1964).

²⁵ George Brown and Amor Daly, "Evaluation of Tunisia's family-planning programme", *Proceedings*, vol. II.

Its initial experimental phase has shown that the urban population is more anxious to practise birth control than the rural population. Intra-uterine contraceptives are greatly favoured. No doubt this will be taken into account when the programme is extended to the whole country. It is an interesting fact that, whereas the countries of the Far East practise male sterilization, Tunisia practises female sterilization.

Lastly, a word must be said about the programmes being carried out in certain developed countries. These programmes are not to be considered in the same light as the others. It is not always easy to distinguish demographic policy from family policy, because there are aspects of each which ought to be harmonized with one another. We may say, however, that in the developing countries the demographic attitude prevails, though the other is not of course neglected. In countries such as the United States, conditions are clearly very different. Though uneasiness has been expressed, and some people consider that the population of the United States is increasing too rapidly,²⁶ family-planning programmes nevertheless have mainly family objectives: the aim is to enable each family to have the exact number of children it wants. Contraception is, of course, widely practised. Nevertheless, the family, or individual, aspect appears to take precedence over the demographic aspect.

In Chicago, the family-planning programme serves families selected from among the poorest class of the population. These families were sent letters, pamphlets and cards to give to their friends.²⁷ A subsequent survey showed that certain hypotheses advanced in the case of developing countries do not quite apply here (which is hardly surprising). On the other hand, communications, discussions between friends, etc., seem to be so important as to warrant further efforts in that direction.²⁸

All these programmes raise difficult problems of evaluation. Similar problems are met with in other connexions, and every sociologist knows that, as soon as it is a question of mea-

suring the effectiveness of a set of different decisions, the necessary operations rapidly assume a high degree of complexity. In family planning, it is relatively plain sailing if one particular element only is studied, as for example the acceptability of a contraceptive practice. However, what is known as "action research" is being increasingly employed. Here the objective is the actual preparation of a programme, the aims of which are graded and its various parts considered as forming a co-ordinated system. The flexibility, the ability needed to deal with unexpected situations means that this is far from lending itself to an experimental design, in the statistical sense of the term, or to a factorial design. The similarities between such designs and action research are more apparent than real. Moreover, the fact that, frequently, a control group has to be dispensed with and the experiment cannot be replicated does not simplify matters.²⁹

What was said earlier about the difficulties of measurement and about the validity and reliability of replies obtained should therefore be repeated. In any case, it is necessary to have a large number of indices, to compare them and try to check them against external data. Chandrasekaran also believes that useful indications of the effects of a programme can be obtained from retrospective surveys.

The whole body of indications obtainable ought, nevertheless, to reduce the degree of uncertainty. Use may be made, in particular, of the data obtained in clinics from the people visiting them or of those obtained by field workers during home visits. The participants must, of course, be followed up, and sampling surveys made for that purpose are essential, both for evaluating the intensiveness and continuity of practices and any drawbacks that they may have, and also for measuring the relative amount of "failures". These surveys should be more ambitious and provide information about what prevents certain couples who have expressed their interest from adopting practices which they believe to be useful. There are special difficulties inherent in the measurement of changes in knowledge, attitudes and practices. In order to deal with them, it is necessary to repeat the surveys, using fairly large samples. Nevertheless, the share of non-sampling errors must vary in size and nature.³⁰

²⁶ See, for example, W. Petersen, *The Politics of Population* (New York, Doubleday, 1964), especially pp. 3-25; *The Population Problem*, ed. P. Hauser (New York, Prentice Hall, 1963), especially chapter 5.

²⁷ James A. Palmore, Jr., "Hypotheses for family planning among the urban disadvantaged: United States", *Proceedings*, vol. II.

²⁸ In New York an experimental study is to be undertaken to measure the incidence of the appearance of oral and intra-uterine contraceptives. See Alan F. Guttmacher and Steven Polgar, "An action-research project on family planning in 'poverty' neighbourhoods of New York City", *Proceedings*, vol. II.

²⁹ See C. Chandrasekaran, "Problems of research design and methods in studies of effectiveness of policy measures aimed at influencing fertility", *Proceedings*, vol. II.

³⁰ John F. Kantner and Frederick F. Stephan, "Evaluation of programme objectives in family planning", *Proceedings*, vol. II.

Endeavours are also being made to measure short-term changes in fertility and here studies of birth intervals have given encouraging results.

Measurement of the effectiveness of contraception remains a difficult matter. The Pearl coefficient, which is very widely used, is perhaps less exact than it was once thought to be. It can vary either with the length of the period of observation, or with the relative number of people who leave the original group. Potter accordingly proposes the application of the technique employed in survival and mortality tables.³¹ Each interval between births is taken separately, and for each month of exposure to the risk of conception a conception rate is calculated. The difference of that rate from unity defines the proportion of couples who have "survived" without conception occurring. These proportions can be mathematically treated to give, for the whole group, the proportion of couples who have avoided conception at the end of x months. The method appears to be highly flexible and has been used successfully by Tietze.

Lastly, mention must be made of the question of the cost of a family-planning programme. It is clear that the limited resources available to the developing countries must be used primarily for economic development. Those countries can only allocate a part of their resources to family planning if the family-planning programme proposed is not very expensive and if, from the point of view of the general level of living, it gives particularly high returns. Where this is not the case, it is to their interest to devote all their resources to economic development.

Judging from the indications we are given in many of the papers, the cost does not appear to be very high.

In the years ahead fertility will, in various regions of the world, be decreasing. The dimensions and the rate of the decline will differ from country to country, but, whether the process is well under way, whether it has just begun or whether it is only on the point of starting, we are being given an opportunity of

³¹ Robert G. Potter, Jr., "Application of life table techniques to measurement of contraceptive effectiveness", *Proceedings*, vol. II.

seeing how a fundamental social transformation works. We have an opportunity to see how birth control is spreading and what channels it is using, what groups are most receptive to it and what groups are being converted to it. Moreover, the work being done covers all kinds of societies. Never, probably, in the history of the social sciences has there been an opportunity to amass so many data and to try out so many theories at the same time, and to do so in so large a number of different societies. When the work that has been undertaken is completed, sociology and demography should have reached decisive points in their development and our knowledge should be appreciably increased. Similarly, the diversity of the experimental situations should make it possible to test a large number of important hypotheses. We have seen some examples of this diversity already. In the programmes we have been told about, very different methods are used. In some, economy of means and even anonymity are aimed at, while in others the main stress is laid on mass communications. In certain of them endeavours are being made to ascertain what situations are most liable to promote the acquisition of new knowledge. In others, spontaneous diffusion plays an important part. Lastly, in certain cases, endeavours are being made to tackle economic and social development right from the bottom, the family-planning programme being included in the process.

Comparison of such widely differing experiments should yield valuable results. For example, it would seem to be essential to know what changes in economic and social structures are associated with the diffusion of contraceptive practices. All social structures do not change at the same speed: some display greater inertia than others. What structures, then, must change and to what extent, and what combination of change and relative inertia can stimulate the diffusion of contraceptive practices?

Let me close with a strong plea for more research. Such a plea is actually in the interests of action. For, unless action is based on research, it is greatly to be feared that it will soon come up against an impassable "ceiling": the barrier inevitably encountered by empiricism when faced with situations which are too complex for it.

Statement by the Rapporteur: Mr. YOU POH SENG

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The following views were expressed on the general subject of family planning and population policy.

It is the basic right of families to have access to information for responsible parenthood involving such socio-economic factors as the

functions of the family, the position of women in the society, the attitudes of parents regarding the future of their children, as well as such decisions as are needed to regulate the size and spacing of their family as a consequence of the interplay of the factors affecting them. Accordingly, couples should have access to information for attaining their desired family size, and at the same time studies should be carried out in terms of the sociological analysis of the family as a social institution.

Countries should have the right to determine their own national population policy, but they are urged not to detach this policy from the need for economic and social development. In this connexion, the rapporteur was requested to refer to the experience of the Soviet Union, where the Government does not intervene in family planning because it considers it a matter for voluntary action on the part of the citizens, but where a broad complex of social and economic measures has led to the establishment of reproduction ratios which do not give cause for anxiety.

Once a national policy has been so self-determined, and if they require it, countries should have access to assistance, especially in the form of advice and research, such as may be needed for an understanding of the population dynamics of the country concerned in relation to its economic and social development requirements, and of specific actions such as health actions involving the medical aspects of family planning, the relationship of these methods to the availability of medical manpower, the medico-social problem of abortion, etc.

There is also a need for disciplinary studies, involving demographers, economists, sociologists, ethnographers, psychologists, physicians and others, on the problem of population and the interrelationships of the many aspects of this problem with social and economic development in general.

A. EVALUATION OF GOVERNMENT-SUPPORTED PROGRAMMES

In connexion with the evaluation of government-supported programmes, stress was laid on the fact that because the financial and manpower resources involved in family-planning programmes in some countries are so large, there is an urgent need for constant evaluation to detect strengths and weaknesses. Such evaluation must be simple and practicable, bearing in mind the fact that the results must be useful. It is important to avoid burdening the national family-planning programme and diverting much-needed resources. Field reporting in one

form or another or sample survey enquiry may not be feasible; instead, some indirect indicators may have to be adopted which demographers and statisticians can help to develop. It was suggested that use may be made of desired and realized ranges of family size of women, especially those aged 35-44, and the medians of these ranges prevalent before the programme, aimed at and achieved; such measures may be more effective for the purpose than the usual vital and demographic rates, and they can be studied for different population groups. Realized family sizes are usually available in recent censuses, while some studies have shown that desired sizes differ from realized sizes only at the extremes and not at the median or the mode. Another study points up the following stages in the working of a family-planning programme—from disinterest and hostility, through realization of possibility of control but no knowledge or facilities, through provision of knowledge and facilities but only half-hearted use resulting in frequent failures, to proper use based on sound knowledge and regularity. An evaluation programme should be designed to test the various stages of this development.

Another view was put forward that the family planning programme and therefore the evaluation programme should be regarded as part of the over-all national development programme. In view of the scarcity of technical resources, this implies that it is necessary to consider balanced allocation most carefully.

B. DEMONSTRATION PROGRAMMES

In connexion with the meeting's second topic, the view was expressed that the problem is one of administration and organization rather than of knowledge and research. If the necessary government services are available and suitable, it may be desirable to place the programme, for example, within the integrated programme of the public health administration, particularly in the maternity and child health services.

Some opinions were advanced that the cost of a national family planning programme need not be high (for example, the total cost of an effective programme to cut birth rate by one-third is something like 1 per cent of the total cost of economic development of the country), and on certain assumptions it is claimed that money spent on slowing down population growth is many times more effective in raising per capita income than if it were used to accelerate production. The point is, however, that in many cases it is not a matter of clearcut

alternatives, but of choice of priorities within the over-all development programme, and with the above cost estimates and cost-benefit proportions some firmer basis for setting priorities may now be available.

The rest of the discussion was concerned with experience gained in setting up and operating demonstration programmes. It may be summarized as follows. There is, in general, a significant minority interest, and there are a large number of couples who are ambivalent or whose interest is ambiguous. In such cases, there may be need for outside stimuli and large-scale efforts in selected areas. In some other areas it would be useful to study the economic and social situations in which fertility decline is possible, as well as the effectiveness of the means used.

It has been found quite generally that diffusion by word of mouth is effective, so that efforts may be spaced at intervals for effective spread. Family planning tends to be predominantly female-oriented; more use should be made of male workers concentrating on male methods.

There may be need in some cases and in some areas to consider the legalization of induced abortion. It has been found that, where fertility declines, illegal abortion tends to increase. Also, women who practise birth control regularly are likely to be critically affected by failures resulting in unwanted pregnancies, and, since no method is foolproof, some form of curative service such as induced abortion may be required. It would be useful to have some objective account of the use of the "suction" method of induced abortion.

The methods themselves should, in general, be simple to apply and easily available, and should be unrelated to the sex union. In the case of intra-uterine devices, it is important that doctors should be trained in the techniques involved. There was no clear-cut opinion on whether the choice of method should be up to the woman.

A demonstration programme should give sufficient attention to effects on fertility and population growth, setting fairly realistic targets for expected accomplishments. It should also concern itself with the diagnosis and treatment of sterility. Indeed, the view was expressed that parents should be given more freedom within programmes with regard to preferred family size, where this might involve having more children in individual cases. This is particularly necessary in situations where families have been practically compelled to

limit their family size excessively by economic and social circumstances following upon an all-out governmental drive for family limitation.

C. METHODOLOGY AND TECHNOLOGY

The discussion on the third topic of the meeting was concerned mainly with suggestions regarding needed research. It was noted that the use of oral contraceptives has to a large extent reduced the problem of induced, often illegal, abortion. It will be desirable to determine in due course whether the intra-uterine device, which is relatively less effective than oral contraceptives, will have the same effect.

Some medical tests have been carried out on the intra-uterine device, and, although these have failed to confirm any adverse physiological effects or any cancer-inducing tendencies, more tests are necessary to keep the situation under constant review. Studies are also needed of social, cultural and psychological attitudes regarding its use. In the meantime, a warning seems to be in order to beware of putting too much reliance on the device, especially on its indiscriminate and inexpert use. Between 10 and 20 per cent of women generally cannot use the device, and, if this and other possible limitations are ignored, there is a risk of loss of interest or confidence in the over-all programme. While too pessimistic a view should not be taken, it seems to be agreed that alternatives must be available.

Again in connexion with the newer methods, mention was made of the need to study the long-term psychological implications. These new methods tend to avert the necessity of repeated decisions, and so far there has been no study into the attitudes of users toward their personal responsibility for their fertility control and related factors. This is a serious omission.

In respect of specific studies which are in progress or so far completed, the application of the life-table technique for the evaluation of effectiveness of contraception roused a fair amount of interest, and hope was expressed that more progress will be made in this direction. In reference to the application that has been carried out so far, it was suggested that, in so far as age affects fecundity and degree of risk, it may be useful to calculate the cumulative failure rate on an age-specific basis or to standardize the rate by age. Also, it is considered desirable to beware of a process of auto-selection among the subjects, for example of one out of two methods, a process which,

though apparent in the retrospective study, is not known before the study.

Finally, two suggestions were made. One related to the measurement of the effectiveness of the rhythm method and stressed that it is necessary to state whether the calendar method or the temperature method was used, and, if the latter, whether coitus occurred at the post-ovulatory phase only or at the preovulatory phase as well. Failing this, the data can be of little use for the purpose of comparison and evaluation. The second suggestion was that there should be more rigour in measurement techniques. For example, rigid criteria should be established for determining whether a failure rate is high or low, and failure rate, and there-

fore effectiveness of method, should be strictly related to age-groups.

On a quite general level it was pointed out that it would be desirable to standardize the methodology for detecting changes (however small) in fertility and to carry out systematic comparative studies for the purpose of developing sensitive indices to gauge progress from time to time.

The following speakers took part in the discussion: Adil, Agarwala, Álvarez-Lajonchere, Barnett, Carleton, Colombo, Das Gupta, Delgado, Enke, Gille, Kaprio, Kinch, Kim, Marshall, Mathen, Murumatsu, Raina, Slesarev, Tietze, Valentei, Venning, Vincent, Zimmerman.

MEETING B.12

Population genetics

Statement by the Moderator: Mr. C. STERN

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The organizers of meeting B.12 invited the submission of twelve papers. One of these, "Use of hospital data for population genetic studies", has not found an author. One other, "Perspectives in genetic demography", by Bodmer and Cavalli-Sforza,¹ was not available before the opening of the Conference. Since this thoughtful paper cannot be discussed in the Moderator's statement, a study of it is particularly recommended.

Two further papers were contributed to this meeting, both concerned with demographic studies of small populations. V. V. Bunak of Moscow deals with the use of family-genealogical investigations in small populations.² He emphasizes that demographic factors exert influences on genetic aspects, a corollary to the inverse relation according to which genetic factors have an influence on demographic aspects. L. Gedda and his associates in Rome present demographic data for a small area in the Latium region of Italy and promise future analyses.³

By definition, human population genetics is concerned with the genetic variability of man. The very existence of such variability poses important problems. Why are populations not uniform but consist of individuals all of which differ among themselves? Why is the human species divisible into a number of large so-called racial groups independently of the individual variability within these groups? Why, to use the terminology of the systematist, is *Homo sapiens* both a polymorphic and a polytypic species? How did this twofold diversity

originate? Does it represent a stable situation or will it change?

Each one of these questions covers a host of more specific ones. The genetic polymorphism of a single population is manifold, involving morphological features, physiological aspects, sensory functions, blood groups, enzymes, other proteins and, ultimately, we believe, DNA codes. The mechanisms maintaining these polymorphisms may vary in different instances so that each case requires separate study. If population genetics *per se* searches for general principles, human population genetics consists of inquiries after general principles as well as detailed studies of their workings in innumerable specific situations. It is a sign of the great limitations of our knowledge that the invited papers of this meeting deal only with a very few polymorphisms and hardly at all with polytypy.

The first of the papers to be reviewed, that by M. Kimura, is a summary of selected topics relevant to human populations.⁴ It deals with four main areas. The first of these concerns the "Maintenance of genetic variability". In addition to the two much-discussed, not mutually exclusive, mechanisms, recurrent mutation counterbalanced by selection and heterozygote superiority in fitness, a number of further situations are known which tend to maintain a genetic polymorphism. Among these are variations of selection coefficients, fluctuating either at random or correlated with different external circumstances such as ecological niches, seasonal and temporal changes in the environment, with male-female differences, or varying with allele frequencies. Still another possibility consists of a counterbalance between selection against and over-reproduction of specific genes by a variety of processes during the

¹ Walter Bodmer and L. L. Cavalli-Sforza, "Perspectives in genetic demography", *Proceedings*, vol. II.

² V. V. Bunak, "Demographic studies of small populations on the basis of family-genealogical investigations", *Proceedings*, vol. II.

³ L. Gedda, P. Parisi and D. P. Pace, "Intensive study on the population of an isolated country in the Latium region (Fumone) — Progress report", *Proceedings*, vol. II.

⁴ Motoo Kimura, "Recent advances in the theory of population genetics", *Proceedings*, vol. II.

formation and functioning of the gametes, processes which have been subsumed under the term "meiotic drive". Some of these processes for maintenance of genetic variability are known to exist in plant or animal populations; fewer examples can be specified in man; and some of them are embodied in statistical models rather than established in actual populations.

Kimura's new model concerning quantitative traits, which introduces the existence of infinite sequences of alleles instead of the customary pairs, is undoubtedly more realistic than the former, simpler models. It fits present concepts of mutations in terms of DNA changes. Mutations which consist in the substitution of one nucleotide by another may have very different selective attributes. Thus, replacement of a single nucleotide in a certain triplet leads to sickle cell haemoglobin S with its nearly lethal effect in homozygotes, in contrast to another substitution of a nucleotide in the same triplet which results in the much less harmful haemoglobin C. The replacement of nucleotides at other positions in the linear sequence may have still more minor effects, due perhaps to the fact that certain parts of the folded polypeptide chains are less involved in metabolic events than others. Mutations of a different type, those based on loss of nucleotide pairs or insertion of additional ones in the molecule should also lead to an array of phenotypes with from low to neutral selective properties. If the DNA is transcribed into RNA in a fixed sequence (e.g. from left to right), then deficiencies or insertions, unless they occurred in multiples of 3 nucleotide pairs, would have very different effects depending on their position in the cistron. Since a shift in the reading frame at the level of the change will result in "false" transcription for all succeeding codons, mutants near the left end of the gene will code for more fundamentally abnormal kinds of proteins than mutants near the right end. On the whole one may surmise that the number of mutants with slight effect at any one genic locus should be considerable, but to gather information on the mutability of one normal allele to other normal "iso-alleles" and on their maintenance is difficult. Notwithstanding their individually slight effects, their participation in the genetics of quantitative characters makes them of great importance in population genetics.

"Measurement of selection intensity" is the second topic of Kimura's paper. It deals with the concepts of the genetic load which have been proposed, attacked and defended by many leading geneticists—among them our chairman and the writers of several of the invited papers.

Kimura stresses the difference between intra-population and intergroup fitness. The former, implying an internal load, refers to the decrease of fitness relative to the optimum genotype and relates to intragroup selection, while the latter relates to intergroup selection.

One of the simplest models for Kimura's third topic, "Breeding structure of populations", assumes random mating. Actually, there are natural and cultural limits to panmixis. Distance alone is a limiting factor in one's choice of mate. It will result in random local differentiation of allele frequencies either in continuously spread or in discontinuously distributed colonies. In such populations the inbreeding coefficients will be significantly larger than zero. Migration between the sub-populations will counteract the processes leading to diversity. Insights into the breeding structure of populations promise considerable progress in the understanding of the facts of random and non-random diversity of closely related groups. The need of both theoretical model considerations and of empirical demographic studies is obvious. One of the latter will be discussed later.

The last of Kimura's topics concerns "Stochastic processes in the change of gene frequencies". Such changes may under certain conditions be primarily deterministic, but it has long been realized that decisive fluctuations in gene frequency may be based on chance events which proceed in time, such as random sampling of gametes and random fluctuations in selection intensities. A recent finding by Alan Robertson has revealed an unexpected result of such random processes. In a deterministic model a large population which contains two alleles with heterozygote advantage leads to a stable equilibrium of the allele frequencies. In a small population fixation and loss of alleles was, of course, known to be possible even in the presence of heterozygote advantage, but it had not been realized that under certain conditions heterozygote advantage not only fails to retard but may accelerate the rate of fixation and loss. This may occur with allele frequencies outside the range of 0.2 to 0.8. It follows that alleles with heterozygote advantages if retained in small populations are likely to have frequencies relatively close to 0.5.

Another aspect of stochastic processes in small populations concerns the mutational load. Kimura, Maruyama and Crow (1963) have shown that this load is considerably larger in small than in large populations; and that for a wide range in population sizes a mutant that is slightly harmful is more damaging to the

fitness of the population than a mutant with much greater harmful effect. This result is understood if we note that the smaller the effect of a gene, the more its frequency is determined by random drift. The milder gene may be carried to a high frequency by random drift and thereby cause a larger effect than a more deleterious gene whose frequency is kept very low by selection. It may be desirable to have the discussion expand on this topic and to apply these theoretical deductions to human populations.

Some of the fundamental aspects which are treated theoretically in general population genetics are given specific substance in many of the papers now to be reviewed. It should be noted that the length devoted to each such review is not a measure of the merit of the paper nor of the effort expended in its production. Rather it is an indication of the compactness of the results and conclusions which often depend on the subject than on the investigator.

Before entering upon the discussion of papers devoted to empirical data and their interpretation it is appropriate to review the report of Bernice Cohen⁵ on genetic field studies. Cohen stresses the need in genetic field studies for the same critical, epidemiological standards of design and conduct as in all other field studies. Particular attention is given to sample selection, to avoid the problems arising from the collection of data on highly selected, stratified and unrepresentative segments of the population. Unrestricted random sampling is usually the first choice, but cluster or area sampling may approach the statistical advantage of random sampling.

In some studies, the nature of the phenotypes is such that variation between cases and controls may yield large case-control differences that are a function of important factors other than those under investigation. Thus, if a population sample of total mothers were used as a control group for the mothers of children with Down's syndrome, the latter would have a different age distribution from the former and all age-correlated traits would give further differences between the two groups. The common practice in such cases has been to construct a control sample that is closely matched in pairs with regard to a series of traits such as age, sex, race, education, etc. Interestingly enough, this plausible procedure has been subject to serious questioning. The expenditure in time, energy and funds necessitated for matching may at times yield less than expected. As an

example, Cohen refers to a study by Diamond in which it was shown that for a 50 per cent probability of obtaining an age, sex and race match for an 80-year-old white male in Baltimore one would need to screen ninety households.

The second main part of the paper is a review of a whole series of problems of data collection and analysis with specific references to errors committed in disregarding necessary procedures. The essence of these critical considerations is summarized in a table designated "Preliminary considerations for genetic inferences". In the form of questions, it lists eight items which need to be ascertained: (1) Questionable assumptions? (2) Heterogeneity of data? (3) Sampling method and controls satisfactory? (4) Are additional criteria necessary? (5) What is the power of the test being used? (6) Have the various applicable genetic hypotheses been considered exhaustively? (7) Have environmental factors and artifacts been excluded? (8) Has knowledge of non-human material led to wrong conclusions in regard to human data? This is a formidable but helpful series of questions. It may be wise to check each point whenever one is engaged in a specific study. Fortunate is he who can answer confidently every doubt raised by these considerations!

We turn now to papers on specific genetic situations and begin with chromosome studies. At the genic level, mutation from normal to clearly abnormal is a rare process. This might have been predicted from general considerations on stability of populations and evolutionary controls of mutational loads. It is most unexpected, therefore, that the frequency of chromosomal aberrations in man is very high indeed. W. M. Court-Brown's compilation of his own, his colleagues and various other students' data on the frequency of subjects with chromosome abnormalities comprises information on the number of Barr bodies in the nuclei of phenotypic males and females.⁶ Beyond this it contains detailed analyses of the sex chromosomal constitutions of males with the abnormal presence of sex chromatin bodies and of females with the abnormal condition of either less or more than one such body. In addition, he furnishes data on autosomal abnormalities. A survey of the sex chromatin of over 20,000 consecutive live born babies in the Edinburgh area yielded frequencies of 2 per 1,000 doubly-chromatin positive males, 0.4 per

⁵ Bernice H. Cohen, "Some notes on the design and conduct of genetic field studies", *Proceedings*, vol. II.

⁶ W. M. Court-Brown, "The frequency of subjects with chromosome abnormalities and some implications in relation to disease", *Proceedings*, vol. II.

1,000 chromatin negative females and 1.2 per 1,000 chromatin positive females. Chromosome studies on exceptional individuals showed them to be XXY, XXYY, XO, XXX plus a considerable number of mosaics of normal and abnormal constitution, and an additional mosaic which was composed of two different kinds of abnormal nuclei. Very similar frequencies on the whole have been found in Winnipeg, Canada; Berne, Switzerland; Madison, Wisconsin; and Denver, Colorado, but a survey of numbers of Barr bodies in nearly 4,000 newborn in Bombay has failed to find a single instance of discrepancy between phenotypic sex and normality of sex chromatin constitution. It remains for future studies to decide whether this indicates an intrinsic difference between Indian and non-Indian populations and to provide comparative data for the large areas of the world for which no information is available at all. The only sample reported from Eastern Asia concerns Japanese schoolgirls of more than two and more than three standard deviations below average height. Of these 1.5 per cent and 7.3 per cent, respectively, were sex chromatin negative. The data on unselected live born babies have been supplemented by studies of adults, either from general populations or from special groups such as mental defectives and subfertile persons.

Autosomal abnormalities, primarily trisomies, add greatly to the total frequency of chromosomal disturbances. Most numerous are individuals with three chromosomes 21 leading to Down's syndrome. In Caucasian populations approximately 1.5 per 1,000 newborn exhibit this condition, but the dependence of its occurrence on the age of the mother must lead to great variations in the over-all frequency in different populations with varying age distributions of reproductive women. Trisomy for one of the chromosomes in each of the groups 13/15 and 17/18, together, adds another 0.7 abnormality per 1,000 births. Court-Brown reports also on samples of the adult population of Edinburgh describing a variety of autosomal or very rarely sex chromosomal structural rearrangements and variations as well as "noteworthy" size variations of the Y chromosome. The structural rearrangements amount to 0.5 per cent of the population; the autosomal variations to 3 per cent of the males. Given the fact that many mosaics may show a non-mosaic cell lineage of the cultured lymphocytes, the actual frequencies of many aberrations are probably higher than those observed. Even more meaningful is the fact that many if not most chromosomal abnormalities are probably incompatible with foetal survival. This is

strikingly shown by Carr's data on 200 spontaneous abortions occurring before the 154th day since the last menstrual period. No less than 22 per cent of these abortuses were chromosomally abnormal.

In a general sense, the causes of chromosomal "mutations" are twofold. Some of them may be due to non-genetic chance deviations from the regular course of mitosis or meiosis. Others may be dependent on the preexistence of features such as inversions, translocations and genic alleles disturbing normal chromosome behaviour. In either case the derived newly produced chromosome abnormality constitutes a heavy genetic load expressed in abortions, infant deaths and, in nearly all surviving types, complete sterility. In other words, most chromosome abnormalities act as dominant lethals or dominant sterility factors, with a reproductive fitness of zero. Court-Brown ends his paper with a reference to external agents which can produce chromosomal abnormalities in germ cells and somatic cells. Radiation is such an agent and chemicals and viruses are likely to be also effective. Furthermore, adverse environmental conditions associated with premature aging may perhaps have a similar effect. Studies of populations living under conditions in which some of these environmental agents are absent, or different agents are present, may greatly add to our knowledge, basic and applied.

Chromosomal polymorphism has to be recreated in each generation. Blood group polymorphisms, on the contrary, are usually regarded as stable in the sense that they are maintained at equilibrium frequencies by selective processes which are not balanced by essential mutational contributions. T. E. Reed presents a critical survey of the evidence for natural selection due to blood groups.⁷ He treats his topic under such headings as viability effects on gametes, *in utero* selection, post-natal selection, sterility, and number of pregnancies and he analyses data on the ABO, Rh, MN, P, Kell, Duffy and the secretor systems. Evidence for selective forces is regarded as definite for only the ABO and Rh groups, as probable for MN and Kell, as possible for P, and as negative for Duffy and secretor (where the terms definite, probable, etc. are not expressed in quantitative terms). In detail, each blood group is selectively affected in its own way. Thus, there is strong evidence for foetal death in ABO incompatibility as well as post-natal selection, while strong evidence for viability selection in Rh is restricted to foetal incom-

⁷ T. Edward Reed, "The evidence for natural selection due to blood groups", *Proceedings*, vol. II.

patibility, and the probable evidence for Kell selection concerns fertility as expressed in numbers of pregnancies. In the MN system the evaluation of the evidence for selective forces is also judged as probable but it remains uncertain whether meiotic drive, viability differentials *in utero* or perinatally, fertility selection, or combinations of these forces are involved.

In none of the bloodgroups is the evidence sufficient to account for the existing polymorphism. The Rh polymorphism, in as far as it involves the D antigen, is, of course, often regarded as a transient one in any given population. The selection against heterozygotes which leads to erythroblastosis of the newborn should lead to elimination of the rarer allele and it seems that many non-Caucasian populations have indeed reached fixation of the more frequent D-producing alleles. This poses the problem of the origin of the still existing D vs. non-D producing polymorphism in such populations as those of Caucasians, a problem which Haldane first explained in terms of pre-historical interbreeding of two populations with fixed opposite alleles. In detail, the Rh bloodgroups consist of many alleles. Even if Haldane's interpretation should be valid for selection against the *r* allele it does not directly account for the quantity and quality of other Rh alleles between populations. Reed cites some studies concerned with post-natal selection for the Rh groups but admits only one claim of genetical effectiveness.

In contrast to the Rh groups the ABO groups are usually regarded as in equilibrium. No balancing sheet has been drawn up for such a situation. The well-known associations of A and O groups with specific diseases would selectively interact in complex ways, but Reed points out the diverse diseases involved have a late onset and are therefore relatively ineffective on genetic fitness. For a Caucasoid population he has calculated that only 2×10^{-5} of the reproductively important population dies each year from the five most important blood-group associated diseases.

Perhaps the most striking item in this area is the contradictory results from Japan about the outcome of pregnancies in women of group O mated to A men. Studies based on data for the period before 1945 have yielded a deficiency of A children which in Matsunaga's material amounted to 23 per cent. Newer studies, however, based on data for the period after 1949 have yielded no deficiency at all. Hiraizumi interprets these findings in terms of recently improved environmental conditions permitting

a successful outcome of pregnancies which earlier often led to abortions. This is a reasonable hypothesis but one wonders whether these studies have been able to obey all the critical demands which Bernice Cohen's paper listed for epidemiological approaches. Be this as it may, one must agree with Reed that the improving living standards in the developing countries are bound to change the selective values of the phenotypes of each blood group system.

One more aspect should be singled out. "We cannot," writes Reed, "show a definite example of heterozygote advantage maintaining a blood group polymorphism... (It) may very well be present but still undetected." This situation should be kept in mind if one wants to generalize too easily the dramatic evidence for heterozygote advantage when malaria is the selecting agent. In this connexion, a very interesting possibility is suggested by W. Bodmer in a letter to the Moderator. It may well be true that those selective forces which may have been needed for initial establishment of certain polymorphisms may no longer exist. Once established, in the large human populations the polymorphisms can be maintained by very much smaller, perhaps nearly undetectable selective differences than those which may have been needed for their original establishment.

The role of malaria in the population genetics of haemoglobin variants, thalassaemia and G6PD-deficiency has been treated by M. Siniscalco in a paper which reports on fifty-two villages on the Italian island of Sardinia with over 6,000 individuals tested.⁸ Sardinia is an unusually suitable area for such studies since it is ethnically highly homogeneous, yet its population is subdivided into rather isolated villages. Its history over more than 2,000 years is well known, testifying to very limited immigration of outside genes. Most important, excellent records of the malarial morbidity of all Sardinian villages are available for the period preceding the last war (malaria in Sardinia has been eradicated since that time). The data of Siniscalco and his collaborators show frequencies of the gene for B-thalassaemia (Th) that vary from about 1 to 20 per cent in different villages. Similarly, the gene for glucose-6-phosphate dehydrogenase deficiency (G6PDD) varies greatly, from about 2 to 35 per cent. The frequencies of the two are highly

⁸ M. Siniscalco, L. Bernini, G. Filippi, B. Latte, P. Meera Khan, S. Piomelli and M. Rattazzi, "Population genetics of haemoglobin variants, thalassaemia and G6PD-deficiency, with particular reference to the malaria hypothesis", *Proceedings*, vol. II.

correlated yielding a straight regression line up to approximately 24 per cent for G6PDD but levelling off below 15 per cent for Th. Thalassaemia is due to an autosomal gene expressed as the thalassaemia trait in heterozygotes, and lethal before the reproductive age in homozygotes. G6PDD is X-linked and usually involves no serious handicap for its hemizygous or homozygous carriers except if exposed to fava beans (*Vicia faba*).

The incidences of the two conditions are negatively correlated with altitude. Values for either of them average around 20 to 24 per cent below 300 metres above sea level while above 400 metres averages of from 3 to 12 per cent are found. On the whole, altitude is negatively correlated with former malarial morbidity so that the correlation between frequencies of the two abnormal genes and presence of malaria is positive. It is Siniscalco's thesis that this positive correlation is causal in nature: malaria is the agent which selected for the abnormal genes. Differently expressed, presence of either the gene for thalassaemia or G6PDD served to protect the individual against the ravages of the *Plasmodium falciparum* parasite. The strength of this selective agent is indicated by the fact that in former times malaria in Sardinia was killing about one half of the population before the age of reproduction.

There are a few exceptional villages in which high malarial morbidity is not accompanied by high allele frequencies for Th and G6PDD or in which high allele frequencies occur in high altitudes. A closer analysis shows that the exceptions prove the rule. The low frequencies for Th and G6PDD in malarial areas find their explanation in the historical facts of rather recent settlement from immigrants who were free from these alleles; and the high frequencies in isolated villages in spite of high altitudes are understandable when one learns that these villages used to be characterized by a very intense malarial morbidity.

Given the frequencies of the two independent genes under discussion, it is natural that individuals occur which are carriers for both thalassaemia and G6PDD. Such persons seem to enjoy a higher fitness than persons with G6PDD alone. Strangely enough, the number of carriers of both genes seems to exceed that expected by chance. The reason for this excess is not obvious. Was there sufficient selective mortality, directed against carriers of a single one of the genes, thus favoring double carriers? Or were the villagers sufficiently stratified in consequence of relatively recent origins so that a non-random distribution of kindreds is

present in which relatively high frequencies of both genes coincide in contrast to other kindreds without the abnormal alleles or with low frequencies of one or the other?

The positive correlation between malarial morbidity and incidence of thalassaemia and G6PDD fits very well the theory that malaria has been the selective agent which led to the polymorphism in Sardinia at the two loci. In detail the mode of selection remains a matter of fitting models. Livingstone, who regarded both polymorphisms as of the balanced, heterozygote advantage type had earlier derived estimates for the various selection coefficients on the basis of this assumption. Siniscalco agrees with the view that the thalassaemia polymorphism is one of the balanced type but believes that any genotype containing the G6PDD allele—not only the heterozygous type—is selectively favored in a malarial situation. According to this hypothesis the polymorphism for G6PDD was a transient one which, had malaria persisted, would ultimately have led to fixation for the enzyme deficiency. In a malaria-free environment, both authors agree, thalassaemia and G6PDD lose their selective advantages and selection should favor the normal alleles.

It is a striking fact that the strongest evidence for a selective agent involved in several polymorphisms is one and the same: malaria. Search for other agents, active in other polymorphisms, is an urgent requirement for the future. Are yellow fever, hookworm, encephalitis, plague and cholera indiscriminate enemies of any genotype or are they selective? Did periodic famines and droughts select for specific metabolic properties and morphological specificities? Did common foods, spices, drugs and intoxicating beverages act selectively on different genotypes? There must have been numerous selectors for numerous alleles and combinations of them. We do not know them and even more important, we do not know how the changed environments of contemporary and future human populations will change their polymorphisms.

In his paper on thalassaemia and G6PDD in Sardinia, Siniscalco touches briefly upon the consequences of consanguinity in regard to these two conditions. It "must have been an important . . . selective agent since the increased homozygosity which follows . . . inbreeding would . . . help natural selection in getting rid of the lethal genes. Its effects on G6PD-deficiency must instead have been . . . opposite, in the presence of malaria, if the fitness estimates reported are correct." These are interesting

comments on the effects which social and cultural circumstances affecting the frequency of marriages between close relatives may have on genetic properties of populations. The importance of this inter-relation in some measure accounts for the fact that three of the invited papers deal in detail with consanguinity, in India, Japan and Brazil.

Each of the three papers stresses specific facets of the general problem. L. D. Sanghvi's report "Inbreeding in India" emphasizes the cultural determination of consanguinity in India and furnishes data on the inbreeding coefficients of various subpopulations.⁹

The data from rural areas in Andhra Pradesh are striking indeed. No less than 40 per cent of all marriages are between first matrilineal cross-cousins (the wife is the daughter of a maternal uncle) or maternal uncle and niece. Two more per cent are between patrilineal cross-cousins. The inbreeding coefficients corresponding to these frequencies are $F = 0.032$ for autosomal genes and $F = 0.051$ for X-linked ones. The magnitude of these values may be appreciated if it is recalled that a population in which all marriages are between first cousins has an autosomal $F = 0.0625$ and a population in which all marriages are between first cousins once removed has an autosomal $F = 0.0313$. The highest area F values actually encountered were 0.048 (autosomal) and 0.045 (X-linked). There were striking differences between castes, lowest values in Brahmins (autosomal $F = 0.019$) and highest among shepherds (0.038) and fishermen (0.047).

No Indian data are available on the genetic effects of cousin marriages on the offspring as compared to unrelated marriages. Such comparisons are very much to be desired. There is historical evidence that close inbreeding in South India was already prevalent 2,000 years ago and perhaps still earlier. This should have resulted in a considerable decline in the frequency of unfavorable recessive genes, and a relaxation in the practice of consanguineous marriages should result in an appreciable reduction of the incidence of corresponding hereditary diseases and defects.

Much of the effects of inbreeding on the population at large depends on the nature of the opposing forces which keep genes with deleterious homozygous effects in a population. Sanghvi presents the results of some preliminary calculations on the effects of inbreeding with $F = 0.05$ in a formerly pan-mictic population, based on an initial frequency

of homozygotes of 1 in 40,000 such as in phenylketonuria. If the gene was maintained by mutation alone the frequency of homozygotes will rise in one generation to 11 in 40,000 and then over 100 generations decline to 1 in 37,000. It would take another 100 generations to return to its stable equilibrium of 1 in 40,000. If, on the contrary, the gene was maintained by heterozygous advantage without any mutation, the frequency of homozygotes will decline more rapidly. After 100 generations of $F = 0.05$ there will be 1 case in 500,000 and in 150 generations only 1 case in 4 million. A third model combining mutational and segregational features in various proportions has not yet been worked out. Here is another task for a computer. One hundred generations is a long sequence in human populations, but it is not too long in terms of Indian marriage practices so that effects of the type calculated should be suitable for empirical investigations.

Sanghvi's discussion has stimulated W. Bodmer to work out the consequences of relaxed selection for a deleterious recessive which is maintained by either mutation or heterozygous advantage. He concludes for a specific example that the rise of homozygotes will be at a very slow rate and ultimately reach ten-fold if mutation alone is responsible for maintenance of the recessive, but that it will occur at a much higher rate and ultimately be 34.4 fold if heterozygous advantage is the essential agent.

Reports on empirical investigations in Japan form the major parts of the paper by J. V. Neel, T. Yanase and W. J. Schull.¹⁰ These authors summarize their and others' findings pertaining to the biological consequences of consanguineous marriages in that country, but they do not provide or discuss the possible interpretations. "While interpretations come and go there remains an intrinsic value in knowledge of consanguinity effects in different human populations..." Japan is an unusually suitable country for consanguinity studies, because until very recently the rate of consanguineous marriages has been very high, ranging from about 4-7 per cent in the cities to 20-25 per cent or even more in some rural areas, and because a number of cultural factors are very favorable for obtaining accurate information.

The Japanese data on consanguineous marriages have been organized under the following headings: (1) mortality of the offspring; (2) physical and intellectual development and

⁹ L. D. Sanghvi, "Inbreeding in India", *Proceedings*, vol. II.

¹⁰ James V. Neel, Toshiyuki Yanase and William J. Schull, "Consanguinity studies in Japan", *Proceedings*, vol. II.

morbidity of the offspring; (3) fertility of the marriages; (4) mortality among the offspring of an inbred individual married to an unrelated spouse; (5) physical and intellectual development among the offspring of marriages as in (4); (6) fertility of the offspring from inbred marriages. The main results, which are based on varying sizes of samples, are as follows:

1. Mortality occurring during the pre-reproductive years among the offspring of consanguineous marriages is increased over that of controls. The difference is not great and corresponds to a number of approximately one lethal equivalent carried by the average parent. The data do not yet permit a decision on the question whether there is local variation in the mortality effect of inbreeding. The B/A ratio is about five. No interpretation of this ratio is offered but two of the authors of this report have elsewhere given it a very critical appraisal. It should be noted that only the more recent data in Japan have been subjected to regression analysis in relation to the coefficients of inbreeding in various types of consanguineous marriages.

2. There appeared no or only slight but often significant differences in favor of the controls between inbred and control children in regard to differential death of male vs. female infants *in utero*, for a number of anthropometric measurements, physical and school performance and intelligence and temperament tests. An important statement made is that some 10-20 per cent of the apparent inbreeding depression is actually assignable to socio-economic variation.

3. There is no lessened fertility of consanguineous marriages; on the contrary, there is possibly increased fertility. Theoretically, the load due to antigenic incompatibility of mother and foetus should be decreased in consanguineous unions, but Neel, Yanase and Schull warn us not to use human fertility at present as an indicator of biological capacity. It may be added that the theoretical value of the incompatibility load depends on the frequencies of the alleles involved and should vary greatly between different populations. Attention should also be called to the differences discussed earlier in the outcome of incompatible pregnancies from O mothers and A fathers: presumably heavy losses of A conceptuses before 1945, no losses after 1949.

4. Early mortality shows a small increase with increasing maternal inbreeding, but not with paternal inbreeding.

5. As far as the data go, anthropometric

measurements on children of inbred parents give larger dimensions than the controls.

6. There is a significant decrease in fertility with maternal inbreeding, but further observations are needed.

It is idle to raise many questions concerning the newer data from Japan. The three authors are aware of them, and determined to extend their already unique collection of facts. The studies in Japan are important in themselves. Even more, they form guide lines for similar, much needed large-scale studies in other populations.

The last of the three reports on consanguinity is N. Freire-Maia's "Practice of consanguineous marriages and its genetic effects".¹¹ It offers a sweeping review of various facets of human inbreeding with special attention to problems connected with the genetic load. It is pointed out that the rate of inbreeding is influenced by a variety of factors. In each population special configurations of these factors exist, so that some of them may vary from insignificance to great importance. In Brazil, the most effective factors responsible for the differential distribution of inbreeding levels are cultural pattern, economic level, migration and degree of ruralization. Less important, if playing any role at all, are population density, religious structure and degree of literacy.

Freire-Maia points out that the genetic load which emerges in the offspring of consanguineous marriages must not necessarily be either mutational *sensu strictu* or segregational. The dispute of the two schools of thought may, however, be put in terms of mutational *sensu latu* and segregational. The latter load is maintained by positive selection, the former is defined in a negative way as the load which is not maintained by positive selection. Among the mutational load *sensu latu* the author thinks that even a migrational load may be included. This is defined as a load that is created by migration into an adverse environment in which some genes which were harmless in the original environment become subject to negative selection. It is the impression of Freire-Maia that the load which is revealed in the offspring of consanguineous marriages is mostly mutational *sensu latu*. Following W. L. Russell's (1952) procedure for estimating the mutational load from the results of cousin marriages, six methods are now available, of unlike merit. The estimates vary considerably for different populations in different parts of the world. The range for the mean number of

¹¹ Newton Freire-Maia, "Practice of consanguineous marriages and its genetic effects", *Proceedings*, vol. II.

lethal equivalents per person seems to extend from less than one to up to ten.

Field data on Brazilian populations often show genetic loads which are similar to those found in populations of the same ethnic background living in other countries. However, very remarkable findings have been made concerning whites and Negroes of the southern part of the state of Minas Gerais and belonging to similar low socio-economic levels. For whites the lethal equivalent load is less than one, for Negroes approximately nine. In contrast to these values, studies on other whites have yielded higher loads than one, and studies on other Negroes lower loads than nine. In former publications Freire-Maia has suggested some interesting hypotheses to explain the facts from Minas Gerais. In the present paper he refrains from speculation and rather stresses the need for more investigations among Negroes from additional regions in Brazil. Perhaps the author and others will expand on this problem during discussion.

We now turn away from topics defined by their genetic aspect to the methodological paper by H. B. Newcombe on the use of vital statistics as a source of information for population genetic studies.¹² Routine-collected data on a great variety of items are not only useful for the biostatistical purposes for which the data were recorded primarily, but also constitute in the aggregate a family tree of the populations, complete for all recent events. Routine vital statistics include, of course, births, marriages and deaths. Often they also record stillbirths, presumptions of death, annulment, divorce, legitimation, adoption and even foetal death. In some instances data are available on birth order, parental ages, birth weight, gestation, legitimacy, twinning, residence, father's occupation at time of each birth, as well as religion, occupations and residences of brides and grooms at marriage. Less often information is registered on congenital malformations, induced vs. spontaneous labor, operative procedures, anaesthetic or sedative used, complications of pregnancy or labour, birth injury, and ABO and Rh constitution of mother and, rarely, of father.

"The conventional . . . tabulations relating to a year's crop of events, are of exceedingly limited use for population genetics studies." On the other hand, the design of methods to correlate the abundant information which does not appear in the routine tabulations can provide large-scale information for use in human

genetics. Often, the accuracy of vital statistical data is far superior to that which is obtained by interview or questionnaire—not to stress the prohibitive costs of these latter methods if used wholesale. Moreover, much information can be extracted without coming in conflict with observance of secrecy respecting the non-statistical information contained in the records.

The uses of vital statistics if suitably coordinated are potentially most manifold. Newcombe mentions such areas as assortative mating, migration, race crossing, twin concordance, selection in relation to birth weight, blood groups and other single gene polymorphisms, and consanguinity. Specific studies already completed or under way are outlined in some detail. A first group of examples deals with a variety of correlations between parental age and birth order effects. In 1912 Weinberg suggested that the higher incidence of a genetic trait in children of older parents may be due to accumulation of mutations in a parent's germ line. This method of detecting possible effects of increases in mutation rate in aging parents has been applied repeatedly. Newcombe and his colleagues have used for this purpose vital statistics in Canada. Among their results we may cite that the correlation between maternal age and cerebral palsy and certain malformations of the central nervous system in the infant held up independent of birth order, in contrast to the correlation between maternal age and strabismus and certain other malformations of the nervous system which turned out to be independent of maternal age but dependent on birth order. The existence of a positive correlation between parental age and occurrence of certain traits in the child is, of course, not evidence for mutational origin. Evidence against mutational origin is sometimes derivable when the data are broken down by some other characteristic as, for instance, birth order. Thus the elevated risk of asphyxia among the newborn of older mothers is much greater for first and second than for births of higher order, a fact which does not favor a mutational interpretation. An interesting facet of critical treatment of data is reported for a positive correlation between paternal age and infant and child death from pneumonia. This significant correlation was due to heterogeneity of the population sampled which consisted of a mixture of North-American Indians with higher mean paternal age and higher mortality and non-Indians with lower age and lower mortality. When the two groups were treated separately the correlation disappeared. It would be interesting to obtain new evidence for the paternal age-dependent incidence of still births and neonatal death,

¹² Howard B. Newcombe, "Use of vital statistics", *Proceedings*, vol. II.

which has been reported earlier by Yerushalmy for the State of New York.

In the area of selection the vital statistics and records linked to them have yielded information on the problem of compensatory reproduction after the loss of a conceptus. It was found that mothers of stillborn children did indeed compensate for this event by an increased rate of reproduction in the next year, "but such compensatory overfertility was short lived, and over a four-year period they proved to be less fertile than average." Absence of compensation specifically was found for erythroblastosis in contrast to earlier studies which postulated such a process.

As a final example of the use of vital statistics in population genetics, a recent study by Milham relating to empiric risks in relatives is cited. He determined the birth rank of affected children in anencephalic and spina bifida sibships with two affected cases and found a random distribution. In other words, there is no tendency for adjacent births to be involved more frequently than by chance which minimizes the role of certain non-genetic causative factors and thus hints toward a genetic interpretation.

Newcombe points out future possibilities for record linking and ends with what seems to be a plea for wider participation. "The degree to which the files become organized for convenient use will depend upon the amount of interest there is in carrying out such studies." The discussions in our meeting will surely show such interest but the full measure of the use of vital statistics may not be realized for some time. In the meantime a plea should be entered for increasing rather than decreasing the information entered on routinely collected data. There is a tendency, for instance, to omit questions concerning the racial background of individuals in countries with several more or less distinct populations. Reluctance to inquire about this aspect is based on the desire to eliminate sources of racial prejudice. However, legitimate use of data such as that cited earlier concerning North American Indians vs. non-Indians should be carefully weighed against possible misuse. It may be an important function of our meeting on Population Genetics to discuss anew the needs of human geneticists and health-oriented investigators for biologically meaningful data from routinely collected sources.

The final paper to be reviewed is Ei Matsunaga's "Measures affecting population

trends and possible genetic consequences".¹³ The conclusions, while primarily based on facts from Japan, are applicable in their scope to every country in the world at large. Matsunaga cites a number of statistics which show how strikingly population trends can be changed within relatively few years. Thus, the number of live births of rank 4 or higher decreased from 36 per cent in 1947 to only 10 per cent in 1960. During the same period mothers aged 35 or above decreased from 20 per cent to 6 per cent, while their mean age at marriage increased from 22.9 to 24.2 years. These well-known trends, which have made Japan a model for the control of population growth, must have resulted in important changes in the frequency of those congenital defects which are correlated with maternal age. The lowering of the frequency of mothers over 35 years of age may have reduced the incidence of Down's syndrome to about 60 per cent of its former value and that of Rh-erythroblastosis to less than 50 per cent. The variety of congenital malformations recognized as maternal age dependent in Newcombe's studies must also have been reduced due to the lower frequencies of both older and very young mothers. The specific reduction values will vary in different populations since they depend on variable gene frequencies. Rh-erythroblastosis, which is very rare in Japan, might in other countries show a decrease which is relatively smaller than in Japan but absolutely much larger.

The post-war period has also produced a reduction in the frequency of consanguineous marriages in Japan. Matsunaga cites data from Ohdate City where marriages between consanguineous couples occurred in 9 per cent of all marriages before 1945 but in only 1 per cent during 1958-1961. This trend is bound to reduce at least for a long time the genetic burden caused by homozygosity of recessive genes.

The decrease in consanguinity is due to a variety of factors, of which one of the most important is the decrease in mean size of sibship in a population. If the number of children per family in two successive generations is a constant b , then the number of first cousins of opposite sex is equal to $b(b-1)$. For four children sibships this expression yields twelve potentially marriageable first cousins for each individual, but for a stationary population for which $b=2$, only two such first cousins are available. It may be surmised that the hoped-

¹³ Ei Matsunaga, "Measures affecting population trends and possible genetic consequences", *Proceedings*, vol. II.

for approach to a stabilization of population size in other countries will be a more powerful factor in the reduction of inbreeding than purely cultural changes.

The formula $b(b-1)$ takes no account of secular changes in frequency of consanguinity nor of the variance of sibship size. A number of formulae for these more general conditions have been worked out by Nei (personal communication). Given different sibship sizes the frequencies of consanguineous marriages and their genetic consequences should be highest in kindreds which limit their reproduction least.

Matsunaga regards the fact that birth control measures could be used for eugenic purposes as perhaps the most important aspect concerning their genetic effect. If the birth of a child with some disorder would induce the parents to refrain from further reproduction, a significant decrease in the frequency of affected children would result. If, for instance, every parental couple had exactly three children

unless an affected one is born, then the reduction of the frequency of the condition would be about 23 per cent as compared with the case without selective limitation.

A different question is raised in connexion with biased distribution of family planning practices in different socio-economic groups. Whether there are possibly dysgenic effects is difficult to evaluate. Moreover, non-random distribution of practices may fast change toward equalization. In this connexion, Matsunaga provides data which show that the variance in number of children per sibship in Japan has decreased relatively faster than the mean family size during the past thirty years. We do not know enough to make deliberate plans by which to influence the pattern of fertility in different subgroups of populations. Nevertheless, lack of planning may not be without far-reaching consequences. The topics of future World Population Conferences will have to include rational considerations of this and other emotionally loaded topics.

Statement by the Rapporteur: Mr. William J. SCHULL

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Why are human populations not uniform but consist of individuals all of whom differ among themselves in form? Why is the human species divisible into a number of large so-called racial groups or types independently of the individual variability within these groups? How did this twofold diversity of form and type originate? Does it represent a stable situation or will it change? If the former, how is the equilibrium maintained? What has been the effect upon man's genetic diversity of such events of the past as the influenza pandemic of the second decade of this century, or the epidemics of plague which swept Europe some centuries ago? Will such changes as may ensue from the medical, social and economic upheaval now embracing so many areas of the world alter the quality of the genetic material or merely its quantity? What effect will population planning, as presently envisaged, have upon human variability both in form and type? It was to these broad and important questions that the discussion in meeting B.12, on population genetics, was directed. More specifically, the discussion centred on ways and means for broadening our understanding of and knowledge with respect to the myriads of specific questions subsumed in the more general ones

stated above. Of particular interest were those opportunities which might lead to a more effective dialogue between the demographer, on the one hand, and the population geneticist, on the other.

One seemingly straightforward opportunity for greater collaboration involves the use of vital records for problems of genetic interest. The discussion of this topic opened with the provocative assertion that those who advocated the large scale linking of vital records with medical and sociological material did not sufficiently appreciate the very poor quality of data recorded on a routine basis by people with no given interest in the scheme. There seemed to be good reason to develop vital statistic systems in the coming years so that they could be analysed on a family basis as well as for individuals, but the amount of detailed information that could be profitably demanded would need serious study. This forthright statement of the issues precipitated further remarks on the merits of prospective versus retrospective studies, the average quality of the information at present collected, and a striving for a consensus on the steps necessary to enhance the value of vital statistical record systems. It was

generally agreed that the present quality of many records leaves much to be desired. The opinion was ventured, however, that this quality would improve if a greater conviction existed on the part of those individuals who collected the data that the data were of some utility, and if these individuals were made more intimately a part of whatever research might proceed from such data as they collected. Be this as it may, it was agreed that the most urgent steps involve changes in the vital records which will permit more rapid linking of observations on a given individual from a variety of sources, and will simultaneously permit linking records on members of the same sibship. While the latter can be and has been done with existing records in several countries, for example, Canada, the task is Herculean save in those few countries which maintain some form of household census, for example, Japan. Even in these latter countries, much information currently collected on individuals, notably with regard to changes in status of health, is never incorporated into the household record.

It was suggested that wherever possible one effective step would be the routine recording on all records of an individual of an identifying number, for example, the social security number in the United States or the National Health Service number in the United Kingdom. This would make record linking with the aid of an electronic computer a far simpler task. If, in addition, the parental identification numbers occurred on the birth record, the linking of records on members of a given family would be greatly facilitated. The many problems involved in such changes, including those of the confidential nature of many records, and the impingement on civil liberties which some individuals might construe such steps to be, were acknowledged. Some solution to these various problems was mandatory, however, if full profit was to be drawn from the extensive records maintained by society at considerable expense.

Another possible resource mentioned was the extensive genealogies which exist with regard to certain special classes of individuals in many countries. The records of the English nobility were cited as an illustration. The effective use of such records, however, had its problems; even the simplest of demographic information was frequently missing. This limitation could be partially overcome, however, through the use of codes which attempted to assign values to the missing observations and to indicate the probable reliability of the values so assigned. The task was admittedly laborious, but the

labour would seem justified in view of the further insight such data could afford into those parameters which shape and have shaped human populations.

Discussion then turned to areas of the world where specific genetic studies seem particularly profitable *a priori*. Attention was drawn to the value of Greece for observations on thalassaemia, and further data were offered on some of the problems discussed in that connexion in one of the invited presentations. Specifically, the speaker called attention to the fact that Greece, together with Italy (including Sardinia), had before the last war one of the highest prevalences of malaria in Europe, a considerable part of which was caused by *plasmodium falciparum*. Malaria has now been virtually eradicated in both countries, but a high prevalence of thalassaemia remains, presumably ascribable to the once-prevalent malaria. An extensive study made by Professor Fessas of the University of Athens among army conscripts revealed some 5 to 12 per cent (with a modal value of 7 per cent) to be heterozygous for the gene which in double dose leads to thalassaemia. Soldiers coming from the lowlands of the Peloponnesus and Crete had substantially higher frequencies of the gene than those soldiers who came from semi-mountainous areas. The speaker also called attention to the observation that infant and childhood mortality is appreciably higher in certain areas of Greece, formerly exposed to malaria, than in neighbouring areas. This difference cannot be readily explained by differences in nutrition or socio-economic variation, and it may be presumed that the mortality differences reflect some deeper difference, possibly genetic. Studies aimed at disclosing the basis for this observation are to be initiated in the near future.

At present, one of the few types of investigations which appears capable of revealing some of the mechanisms which maintain genetic variability in human populations involves the study of the fertility of consanguineous marriages and the morbidity, mortality, and growth and development, both physical and mental, of the children conceived by such marriages. However, these studies are fraught with many pitfalls. Two speakers called attention to the disturbing influence which socio-economic variation may have upon the estimation of the effects of inbreeding upon all the biological parameters of interest. They cited work in Brazil and Japan. In the former instance, Freire-Maia and his colleagues had been able to show that among white Brazilians living in the state of Minas Gerais the consanguineously

married were drawn from higher socio-economic levels, on the average, than were the non-consanguineously married. The situation in Japan was somewhat different. There, in urban areas, specifically the cities of Hiroshima and Nagasaki, the consanguineously married were at a lower economic level than the non-consanguineously married. This difference was reflected in education, occupation, income as judged by food expenditures, and household density. Interestingly, in the rural areas of Japan, it appears that consanguineous marriages more frequently involve the "well-off" than the "poorly-off". The explanations for this seeming contradiction have their roots in the culture of the country, and particularly in the inheritance of the household headship with all that this implies with regard to inheritance of property, educational attainment etc. A warning was issued about the complex interplay between biological and sociological forces which may underlie any given effect of inbreeding. In support of this assertion, the speaker again cited recent work in Japan where it had been possible to show that socio-economic level was linearly related to inbreeding, that intellectual performance was related to socio-economic level, and, finally, that intellectual performance, whether measured by school performance or by some more rigorous test such as the Wechsler Intelligence Scale, diminished with inbreeding even after the removal of effects ostensibly ascribable to socio-economic variation. Under these circumstances it was clearly difficult as well as hazardous to attempt to assign cause and effect relationships.

Another speaker agreed with this statement and further interposed the notion that in the measurement of mortality a routine attempt should be made to separate endogenous from exogenous causes. He believed that most perinatal deaths could be viewed as instances of death ascribable to endogenous factors. He further emphasized the necessity of having information on the frequency of consanguineous marriages not only in breadth but also in depth. In this regard, he alluded to observations in France which suggested that the frequency of consanguineous marriages in the late nineteenth and early twentieth centuries was actually higher than in the late eighteenth and early nineteenth centuries, for example. This would argue against the often held belief that consanguineous marriages have been slowly becoming less frequent for some time. This

observation might also account for the effects of inbreeding appearing so different in France from, say, in Japan. He urged that greater efforts should be made to incorporate stochastic elements into population genetic models and greater attention paid to perturbations of the kind just described.

Finally, with respect to this same general topic, another speaker observed that there were numerous opportunities for consanguinity studies in Africa. He stated that it was relatively easy to obtain quantitative information on consanguineous marriages either through questionnaires, interviews, or both. Moreover, local customs frequently encouraged certain types of marriages while prohibiting others, and, in general, the ancestry of a given couple was well known in the family. Speaking quite generally, social factors, he asserted, determined the frequency of consanguineous marriage in a given population, and consequently the genetic structure of that population. He stated that in Africa there was great variability in this respect, and cited observations from Upper Volta where the frequency of consanguineous marriages ranged from 0.003 among the lower socio-economic classes (servants, for example) to 0.014 among artisans.

A strong plea was made by a further speaker for population geneticists and demographers to centre more of their attention on the extent to which demographic variables may influence the hybridity, that is, the heterozygosity of a population, and the influence which the latter may, in turn, have upon the demographic variables. He urged, in short, a more dynamic view of the interplay of demographic and genetic variables, particularly as they concerned small human populations. He regretted that because of the extensive displacement of persons during the last war, there were now few opportunities for such research in the Soviet Union.

The two last speakers described some current efforts to assay the forces which presumably maintain the ABO blood group polymorphism. They were in accord in the suggestion that the role of socio-economic variation has not been adequately explored in the studies which have been published thus far.

The following speakers took part in the discussion: Bunak, Cantrelle, Cohen, Hollingsworth, Matsunaga, Reed, Spicer, Sutter, Valaoras.

MEETING A.2

Mortality

Statement by the Moderator: Mr. B. PIRC

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The student of world mortality is hampered by the fact that he has available to him fairly reliable data, so-called complete mortality statistics, for less than 40 per cent of the world's population. As far as the analysis of trends is concerned, he is limited by the fact that only a few countries in Europe and one State in the United States possess reasonably accurate data on mortality permitting existing trends to be followed for more than a century.

It is, of course, not surprising that mortality statistics should be most lacking in the developing countries. The proportion of population for whom complete death registration data are available is about 4 per cent in Africa and 7 per cent in Asia (excluding the Soviet Union). Various methods of studying conditions of mortality have been tried in these countries where vital statistics are incomplete or lacking altogether. Estimates based on population censuses and sample surveys of households are the most common means applied, and their use will have to be continued despite their deficiencies.

Among the indices most generally used in studying mortality are crude death rates, age-sex specific death rates and infant mortality. Life expectancy is a refined index which is extremely valuable and reliable, but it is often difficult to obtain the data necessary for its calculation. Proportionate mortality over 50 years of life can sometimes be used as a substitute for it, though only of course to a certain degree.

For the purposes of this meeting, the subject will be divided into three topics: levels and trends of mortality and their relations with patterns of age-sex specific mortality rates; effects of public health activities and of economic and social factors upon mortality, with special reference to effects of economic and social development of developing countries; and economic and social effects of declining mortality and improving conditions of health.

I. LEVELS AND TRENDS OF MORTALITY AND THEIR RELATIONS WITH PATTERNS OF AGE-SEX SPECIFIC MORTALITY RATES

The general conditions prevailing in the period 1955-1958 may be summarized as follows:

In Europe, statistics are well established and the picture of mortality therefore quite precise. The death rates per 1,000 population range from about 8 (Netherlands) to 12 (Austria). The expectation of life at birth ranges from 65 to 69 years in the largest group of countries (eleven); in seven countries this value is between 60 and 64 and also in seven countries it ranges between 70 and 74.

In North America and Oceania, countries accounting for about 98 per cent of the population show very similar mortality conditions. Crude death rates fluctuate between 8 and 9 and life expectancy at birth is 70 years. For the remaining 2 per cent of the population, conditions are worse, similar to those in the less developed countries.

In Latin America, about half the countries possess what are believed to be complete death registration data (United Nations Statistical Office Code C). Crude death rates range from near 8 (Argentina, Uruguay) to about 20. Expectation of life at birth shows wide variations, from 45 to over 65 years. It is estimated to be between 55 and 64 years for many Latin American countries.

In Asia, reliable or fairly reliable data are available for only a few countries. In these countries, the level of mortality is relatively low, from 6 to 10 deaths per 1,000 population. For other parts of the continent mortality conditions are not well known. In some special surveys (e.g., Cambodia 1958-1959) death rates of over 20 were found. The death rate of 11 per 1,000 in China in 1957 (estimated by Chandrasekhar) is believed to be an under-

estimate. Five countries (China, India, Indonesia, Japan and Pakistan) account for about 85 per cent of the population of this vast continent (excluding Soviet Asia), but of these only Japan possesses reliable mortality data and this country is far from representative of mortality conditions in Asia. Only a vague picture of the mortality conditions actually prevailing in this continent can therefore be obtained. Expectation of life at birth is low. In India it is estimated to be a little over 40 years. Those countries with the highest value, 65 years or more, are not typical of conditions in Asia (Cyprus, Israel, Japan).

In Africa, our knowledge of mortality is still more defective. For some African countries, reliable information is limited to the non-African minorities. In most countries, vital registration data are non-existent. Wide variations in cultural, social, economic, climatic and health conditions make it very risky to form any estimate of mortality in this continent on the basis of what is known for a few areas or population groups. In addition to what is known from registration data, so deficient in so many aspects, some insight into prevailing conditions has been provided by sample surveys. Taking all available sources of information into account, it can be said that there is a wide range in the death rate. Values vary from 10 per 1,000 for certain populations to more than 40 for others. Similarly, values for expectation of life at birth vary from 20 to near 50.

In the Soviet Union, the death rate has been under 8 per 1,000 since 1956, being at its lowest (7.2) in 1958. Life expectancy is 71 years. There are probably some variations between various parts of the country.

As far as trends are concerned, mortality conditions have been improving, at least since the last war, all over the world. For the few countries mentioned earlier with long-established death rate series, it can be seen that decisive improvement started about the middle of the nineteenth century. Since that time, life expectancy has risen generally from about 40 to 70 years. A most important and striking fact emerges from study of recent declines; the period needed for a decline of similar extent has become much shorter. In some of the countries mentioned, more than 100 years were needed to extend life expectancy by another thirty years. In countries where improvement began early in this century, the same extension has been achieved in a few decades. For example, it has taken Puerto Rico thirty-five years to achieve a life-span exten-

sion which it took Sweden 125 years to accomplish. The most recent declines in the developing countries have been at an even faster rate; in many of them, death rates have been halved in two decades (e.g., Chile, Japan and Mauritius show a decline of 40 per cent or more between 1950 and 1965).

From a review of mortality by sex, it can be stated that the female death rate is lower in the first years of life. Where mortality conditions are generally favourable, this picture remains true at all ages. In countries with high mortality, however, female death rates are sometimes higher in later childhood and adolescence, and in many instances they continue to be so throughout the reproductive age span. Within the general decline of mortality there has been a more extensive improvement in female mortality. Speaking broadly, female expectation of life at birth tends to exceed that of males by increasing amounts.

The pattern of decline in mortality varies widely among particular age groups. In some countries, the greatest gain has been in the first year, and in others the relative gain has been large also at ages 15 to 24 or even later. An exception has been observed in some countries, where an increase was noted between 1947 and 1957 or thereabouts in the mortality of males aged 45 to 64 years and also, more frequently, in the age group over 65 years.

The infant death rate is one of the most important measures of health. Recently, emphasis has been laid on the need for the rate for the first four weeks of life (neo-natal death rate) and the rate for the remainder of the first year (post-neo-natal death rate) to be studied separately. The causes of death which play a part in the mortality of these two groups are different, and the possibility of influencing them is consequently not the same.

In some developing countries, infant death rates are still at a level of well over 200 per 1,000 live births. This value was common in most now-developed countries at the beginning of the century, and in many others after the First World War. In advanced countries, those rates are now often between 20 and 30. The last few decades have seen a remarkable reduction; in some countries the rate has been halved in less than ten years. The decline has been greatest where initially infant mortality rates were highest. In countries with very low infant mortality rates, a slowing-down has been observed in the decline.¹

¹ See Iwao M. Moriyama, "Infant mortality in certain countries of low mortality", *Proceedings*, vol. II.

The decline has been largest in post-neo-natal death rates. In conditions of high infant mortality, post-neo-natal mortality is much higher than neo-natal. In countries with low infant mortality, the position is reversed.

Of the papers submitted for this meeting, ten are devoted to situations and problems falling within the first topic.

Trends of mortality in Asia and the Far East are discussed in the paper by T. Soda.² Stress is laid on the retardation of the decrease in death rates during the years around 1952-1958, following a rapid decline after the Second World War. Before that, no clear-cut decrease was observed in the countries of the region. The author calls for a careful exploration of this problem.

There is proportionally higher mortality at younger than at older ages in Asian countries when compared with similar age groups in advanced countries. However, the declining trend of the mortality rate is more marked among the younger age groups. In some Asian countries, female death rates are higher, and where male death rates are higher the difference is rather small. The trend has been to a more rapid improvement of female mortality. Expectation of life is longer for the female than for the male in most countries of the world, but in Asia the difference is not as large as in the advanced countries, and in some countries, such as Cambodia, Ceylon and India, the females have an even shorter expectation of life than the males.

There is a large discrepancy in the distribution of causes of death as between the Asian countries and the more advanced countries. Deaths from infectious diseases are more prevalent and maternal and infant mortality are higher in Asia; deaths from malignant neoplasms, hypertensive disorders and heart diseases, and from accident are more rare. Unlike the more advanced countries, the Asian countries show pneumonia and gastro-intestinal disease as the commonest causes of death. In some exceptional countries these two causes have decreased and there is an upward tendency in the diseases typical of the developed countries in Europe and America. In conclusion, Dr. Soda stresses that effective medico-social services are urgently needed to improve mortality trends in Asia.

Levels and trends of mortality in Latin America over the period 1950-1960 are ana-

lysed in the paper by J. L. Somoza.³ A set of life tables for nine Latin American countries is considered, certain others having been eliminated because of deficiencies in the basic data used in their construction. Among the conclusions drawn by J. L. Somoza from his study is the observation, mentioned also by T. Soda, that at present the decline of the mortality rate has slowed down.

The paper by M. Spiegelman⁴ discusses recent mortality in countries of traditionally low mortality. The study covers twelve European countries, England and Wales, Scotland separately, Australia (excluding full-blooded aborigines), New Zealand (excluding Maoris), Europeans in the Republic of South Africa, Canada, and the white population of the United States. The author surveys the patterns of mortality in 1960 and compares them with the conditions ten years earlier. The situation in 1960 is shown by age-adjusted death rates by sex in four broad age groups: under 25 years, 25-44, 45-64, and 65 and over. In 1960 these rates averaged 10.3 per 1,000 for males and 7.09 per 1,000 females. The lowest male death rates (under 9 per 1,000) were found in Norway (8.0), the Netherlands (8.1), Sweden (8.3), and Denmark (8.6). The countries with the lowest female mortality were Norway (5.8), the Netherlands (6.0), Sweden and New Zealand (6.3). The highest age-adjusted death rates shown are more than 50 per cent greater than these.

When these rates are compared with those for 1930 and 1950, a reduction is shown for each age-sex category, with the exception of males aged 65 and over. The author notes that the general reduction of mortality from 1950 to 1960 was accompanied by a lessening in the extent of variation in death rates. Standard deviations are smaller for 1960 than for 1950 in each sex-age category except males aged 65 and over. There has been relatively little change in the ranking of the countries under review.

The over-all reduction of death rates in 1960 over those in 1950 stands at 23 per cent for males and 31 per cent for females. However, when the average reductions are shown for sex-age groups the percentage results are: under 25, females 35 per cent, males 31 per cent; 25-44, females 35 per cent, males 19 per cent; 45-64, females 18 per cent, males 4 per

³ Jorge L. Somoza, "Levels and trends of mortality in Latin America in terms of age", *Proceedings*, vol. II.

⁴ Mortimer Spiegelman, "Recent mortality in countries of traditionally low mortality", *Proceedings*, vol. II.

² Takemune Soda, M.D., "Trends of mortality in Asia and the Far East", *Proceedings*, vol. II.

cent; 65 and over, females 8 per cent, males 0 per cent. The differences are remarkable. For females there are reductions in all age groups in all the countries under review, save one at age 65 and over. For males in the age group 45-64, four countries show an increase for 1960 over 1950. For the age group 65 and over, seven countries show increases ranging from 3 per cent to 11 per cent.

The author also stresses the differences in causes of death in the countries under review and those prevailing in the developing countries. In the former, the chronic diseases have emerged as the major health problem. In the developing countries, infectious diseases are endemic on a large scale.

Certain of the observations in another paper by E. F. Krohn and A. Weber, emphasize that within Europe there are fairly large differences in patterns of mortality.⁵ These differences exist not only in the values of crude death rates, but also in the proportions of deaths in the various age groups. In Sweden, for example, the proportion of deaths under 5 years is only 2.7 per cent, while in Portugal it is 23.3 per cent. In 1962, infant mortality varied from 15.3 to 92 per 1,000 live births. In the Northern European countries, neo-natal mortality accounts for up to 80 per cent of all infant deaths—thus the problem of infant mortality is narrowed down, more or less, to the neo-natal period, while in Southern Europe, post-neo-natal mortality still plays a considerable role.

Mean annual death rates for 1951-1952 are compared with those for 1961-1962 for four countries selected as representative of health conditions in various parts of Europe. The reduction is largest for the age group 1 to 14 years, and in all age groups it is more marked for the female population. Tables attached to the paper show the main causes of death and changes that have occurred in them in the same countries. Further insight can be obtained from these regarding trends in causes of deaths in these countries during the decade under review.

The paper by G. J. Stolnitz⁶ reviews recent mortality declines in Latin America, Asia and Africa and offers some perspectives for the future. The author studies recent trends in expectation of life at birth in these areas, by sex, and trends in crude death rates for 1935-1939, 1955-1959 and 1960-1963. These compilations suggest an enormous sweep of change.

⁵ E. F. Krohn and A. Weber, "Some characteristics of mortality in the European region", *Proceedings*, vol. II.

⁶ George J. Stolnitz, "Recent mortality declines in Latin America, Asia and Africa: Review and some perspectives", *Proceedings*, vol. II.

Even with due allowance for possible distortions, it is clear that recent trends in death rates in much of Latin America and parts of Asia involve an entirely different order of magnitude than the rapid declines in western mortality levels in the nineteenth century. The indications suggest that a life span of at least 50 to 55 years should soon be attainable in all low-income parts of the world where governments are willing to seek such targets.

The paper by I. M. Moriyama⁷ brings to light facts regarding infant mortality in certain countries of low mortality. He has selected eleven countries for analysis, taking the situation prevailing some twenty-five years ago and that of the last ten years.

In most of these countries there was a very rapid decline in the early part of the period, some infant mortality rates being halved in ten years or less. In the early 1950s the rate of decline began to slow down. The leveling-off of the trend of the death rate from infectious diseases and relatively flat mortality trends for diseases of early infancy and congenital malformations may account for this deceleration. In the early part of the period, the annual percentage rate of decline ranged from 3.2 to 6.1, while since the early 1950s it has ranged from .0 to 2.6.

There have been reductions in mortality in both the neo-natal and post-neo-natal periods of life, but experience has not been the same in all the countries considered. Mortality among neo-nates now ranges between 70 and 80 per cent of total infant deaths. Improved sanitation and, more particularly, anti-microbial theory have contributed significantly to the decline in mortality from infectious diseases and hence the total infant mortality rate.

The author explores the possible causes of this retardation in the decline. A possible explanation could be that because of obstetrical progress, more pregnancies that would have terminated in foetal death are now resulting in live births that fail to survive early infancy. Examination of peri-natal mortality trends for the various countries, however, gives no indication that such a shift in survivorship accounts for the leveling-off of the infant mortality rate.

Although further reductions in infant mortality in countries of low mortality appear possible, no marked downward change in the rate can be expected until a break-through is made in dealing with congenital malformations and the diseases of early infancy such as birth

⁷ Iwao M. Moriyama, "Infant mortality in certain countries of low mortality", *Proceedings*, vol. II.

injuries, post-natal asphyxia and premature delivery of infants.

The experience of these countries of low mortality is significant for the developing countries, which are now at the stage where many of the developed countries were some decades ago. The availability of knowledge and of the technical means for preventing infant deaths from diseases of infectious origin makes it possible to reduce the infant mortality rate substantially in a relatively short period of time.

The paper by H. Wiesler⁸ on mortality in South-East Asia refers to a sample survey conducted by the author in South Viet-Nam. The data from the survey were used to prepare a mortality table by his own simplified method. In addition, he calculated a life expectancy table for the Federation of Malaya, whose vital statistics he regards as more reliable than those of other countries in South-East Asia. The period covered by these calculations is 1957-1959. The values found for Saigon-Cholon and its suburbs are, in the author's opinion, a good indication of the mortality in other large cities of South-East Asia. Mortality in rural areas, on the other hand, is estimated to be considerably higher.

The paper by M. N. Maraviglia discusses infant mortality trends in Latin America.⁹ The author notes that while no measure of the incompleteness of infant death registration in this area is available, data by age reveal that omissions are frequent, especially in deaths occurring in the first day of life. Evidence of this fact is presented by comparing the mortality risks of children under one day of age and the average risk per day of life in the following six days. The ratio of these two risks is much smaller in the Latin American countries than in North America, which indicates under-registration.

Mortality trends in the United Arab Republic are discussed in the paper by A. E. Sarhan,¹⁰ on the basis of data from the *Statistical Yearbooks* of the United Arab Republic from 1917-1960. Up to 1946, crude death rates ranged from 25 to 30 per 1,000 population; in 1950 they fell below 20 and in 1960 they declined to about 17. Female death rates have been lower than those for males. This difference has been growing smaller in recent years, in contrast to the experience of

many other countries. In 1917, the infant mortality rate was over 250 although it declined rapidly after the war, remaining fairly stationary at over 150 until 1946. Since that year a steeper decline has been observed, to 109 for the last two years of the period under review.

Conditions in Venezuela are discussed in the paper by E. Michalup.¹¹ The author compares the results of three life tables constructed by him for three periods: 1941-1942, 1950-1951, 1960-1961. The reduction in mortality rates is remarkable, amounting to nearly 80 per cent in twenty years at the younger ages. Life expectancy at birth has risen nearly eighteen years for males and nearly twenty for females. Special tables for children under 5 years of age, for 1953-1954 and 1962-1963, show a very marked reduction. The rates for ages 1 to 4 have been halved, and those for under 1 year reduced by about 25 per cent.

Infant mortality in Poland is dealt with in the paper by J. Holzer.¹² In general, the situation there is similar to that in many of the European countries discussed earlier. At the beginning of the twentieth century, infant mortality rates were over 200, declining slowly to about 140 per 1,000 in the 1930's. By the early 1950's they were about 100, and by 1960-1961 they were about 60. It is of interest that the proportion of deaths occurring during the first ten days of life to all deaths occurring in the first month increased between 1950 and 1960 (from 61 to 73 per cent); this proportion is higher in towns than in the country.

II. EFFECTS OF PUBLIC HEALTH ACTIVITIES AND OF ECONOMIC AND SOCIAL FACTORS UPON MORTALITY, WITH SPECIAL REFERENCE TO EFFECTS OF ECONOMIC AND SOCIAL DEVELOPMENT OF DEVELOPING COUNTRIES

The effects of public health activities on mortality and the influence of economic and social factors in improving mortality conditions are questions that have long been discussed and studied. An answer in quantitative terms or one, at least, that objectively measured orders of importance would be highly desirable. It would be of assistance in directing the distribution of a country's available financial resources in accordance with the effect to be expected on conditions of mortality. Needless

⁸ H. Wiesler, "Mortality in South-East Asia", *Proceedings*, vol. II.

⁹ Maria N. Maraviglia, "Infant mortality trends in Latin America", *Proceedings*, vol. II.

¹⁰ A. E. Sarhan, "Mortality trends in the United Arab Republic", *Proceedings*, vol. II.

¹¹ Erich Michalup, "The mortality trend in Venezuela during the last twenty years", *Proceedings*, vol. II.

¹² Jerzy Holzer, "The evolution of infant mortality in Poland", *Proceedings*, vol. II.

to say, this would be especially valuable to the developing countries.

Mortality is influenced by many interrelated factors and single factors should not be studied in isolation. The results obtained from studies of factors believed to be causal have often been misleading. We know that some diseases are highly susceptible to public health measures or the achievements of medicine, some less so, and some not at all. Public health activities themselves depend on the economic, social and cultural conditions of the population, both in regard to their shape and extent and the quality and effectiveness of their work. Mortality conditions expressed by various indices can also indicate the efficiency of health activities. Studies are needed to show what kinds of mortality indices can measure or prove the influence of these activities and how to distinguish this influence from the effects of social and economic factors. Crude death rates are certainly not a measure of this influence. Other indices of mortality with specific refinements or used under special conditions must be studied and their value for this purpose assessed. For example, studies might be made of individual diseases or disease groups in which changes are expected under such an influence, or of the efficiency of public health activities in a very specific population group among which there has been extensive and definite public health work.

Eight papers are devoted to this important topic, one of them exploring a new methodology for dealing with this general problem.¹³

The paper by G. Z. Johnson¹⁴ approaches the topic along the lines described above. The author states that the decreases noted in infant and child mortality have been achieved in some countries by the implementation of certain public health measures. In Latin America, for example, there have been increases in the proportion of expectant mothers receiving prenatal care and infants receiving medical care, as well as steady progress in regard to water supply and campaigns against specific diseases.

Gains in expectation of life at birth have been to a great extent the result of a decline of infant mortality. In Ceylon, for example, 26.5 per cent of the total increase is due to infant mortality reduction.

The author also stresses the favourable results that have been achieved through im-

provements in environmental factors. After installation of safe water supplies in thirty rural areas of Japan, cases of communicable intestinal diseases dropped by 72 per cent; the prevalence of trachoma by 64 per cent, and the death rate of infants and young children by 52 per cent. Similar results were observed in Uttar Pradesh, India, after improvements of this kind.

National and international campaigns against specific diseases, such as malaria and yaws, have also produced remarkable results. The anti-malaria campaign in Ceylon reduced the number of cases from 2,750,000 in 1946 to 422 in 1960. India reduced malaria cases by 78 per cent between 1953-1954 and 1959-1960. Campaigns in developing regions reduced the incidence of active yaws from 25 to 30 per cent of the population in 1955 to about 2 per cent in 1960. All these measures have played a part in the rapid reduction of mortality in the developing countries.

The paper by R. V. Medyanik¹⁵ describes infant health care in the Ukrainian Soviet Socialist Republic, where in twenty years infant mortality has been reduced to one seventh of the rate in 1940. The author analyses the reductions in deaths from various disease groups between 1956 and 1963 and concludes that improved ante-natal protection and better medical care of infants have been the chief factors in reduced infant mortality. The decline in infant mortality has been accompanied by an improvement in children's health as seen from the rising children's health index (percentage of children in their first year of life who have never been ill).

S. Y. Freidlin, in his paper on public health measures and their influence on mortality,¹⁶ concludes that the favourable economic and social conditions created in the course of the successful building of socialism and communism are the chief factors that have determined the considerable decline in mortality among the population of the Soviet Union. Among these factors he mentions the growth of national income and real wages, subsidies from public funds (social insurance, family allowances, paid holidays, etc.), reduction of working hours and the construction of improved housing.

Large-scale public health measures also play an important part in improving health and lowering mortality. The most important of

¹³ Akira Kusakawa, "Social and economic factors in mortality in developing countries", *Proceedings*, vol. II.

¹⁴ Gwendolyn Z. Johnson, "Public health activities as factors in levels and trends of mortality and morbidity in developing countries", *Proceedings*, vol. II.

¹⁵ R. V. Medyanik, "Measures to reduce infant mortality in the Ukrainian Soviet Socialist Republic", *Proceedings*, vol. II.

¹⁶ S. Y. Freidlin, "State measures in the field of public health and their influence on mortality among the population", *Proceedings*, vol. II.

these are free medical service, increase in the proportion of doctors to population (twelve times higher in 1964 than in 1913), stress on prevention of disease, extensive introduction of the dispensary method of examination and treatment, development of all types of emergency and first aid service, increase in the number of hospital beds (90 beds per 10,000 population in 1964 as against 13 in 1913), and special care for mothers and infants (maternal mortality reduced to one fifteenth and infant mortality to one ninth of the 1913 figures).

The paper by A. M. Merkov¹⁷ compares population reproduction in the Soviet Union with that in the United States, the United Kingdom, the Federal Republic of Germany and France. The author describes conditions before the First World War and after, with special reference to recent years. He notes that the decline of crude mortality rates has been much more marked in the Soviet Union and that the rate of natural increase there has fallen much less. The Soviet Union has a more favourable population structure (a higher proportion of population in the 15-49 age group). He compares life expectancy and states that, although expectation of life at birth is not quite as high as in some countries, it is about the same in the period from 5 to 20 years and higher for ages 30 years and over. He also explores fertility indices and finds them favourable to the Soviet Union. In conclusion, he expresses the opinion that the Soviet Union's extensive public health services have played a large part in improving the health of the population, as well as the general rise in the economic and cultural level.

The study by E. Peritz¹⁸ is based on matched birth and infant death records in Israel for the years 1960-1961. The matching provides the necessary data for studying infant mortality from standpoints where more light is shed on the problem. The author studies infant mortality according to the birth region of the mother, period of immigration (i.e., length of time spent in new, unfamiliar conditions), birth rank and father's occupation. These attributes define the economic, educational and social condition of the infants. It is, of course, difficult to distinguish their specific influences.

Infant mortality rates, standardized according to the age of the mother and birth rank, show large differences in post-neo-natal mortality among children of mothers born in Europe and America (5.9), those born in Israel (6.1) and those born in Asia or Africa (10.1).

As regards father's occupation, neo-natal mortality shows very much the same differences as for birth region of the mother. It is interesting to note that in the group which may be regarded as higher on the social scale the neo-natal mortality rates are closer together than in the unskilled workers' group, when considered by birth region of the mother. Post-neo-natal mortality is on the average twice as high in the unskilled workers' group.

The study by O. Schmelz¹⁹ notes a rapid and consistent decline in child mortality among the Jews of Israel between 1918 and 1948, owing to the general improvement in living conditions and more particularly the great progress in health services among the Jewish population. The large influx of immigrants between 1948 and 1951 disturbed the decline, but the previous low value was soon achieved again.

Of special interest to our topic are data showing the mortality of children during ages 0-4 years per 1,000 live births, by period of immigration, age at immigration and years of school attendance of mothers. In the group of mothers immigrating between 1948 and 1954, the favourable influence of longer school attendance is demonstrated by the strikingly lower death rates among children born to such mothers.

The paper by F. Liberati²⁰ approaches the problem by analysing infant mortality in Italy according to the profession of the father. Infant mortality among legitimate live births is shown by age and according to the profession of the father, for six professional and two non-professional groups (using the classification of the Istituto Centrale di Statistica). Average infant mortality in the years 1955-1960 was 47 per 1,000 live births and varies from 24 to 57 per 1,000 according to the profession of the father. In post-neo-natal ages, exogenous factors play an important role, and these factors depend on economic and social conditions as reflected in the professional group of the father. Post-neo-natal mortality ranges from .7 in the most favoured group to a high point of 27 in the group "Rural and animal husbandry, farming".

¹⁹ O. Schmelz, "Reduction in child mortality of new immigrants in Israel", *Proceedings*, vol. II.

²⁰ Fabrizio Liberati, "Infant mortality in Italy according to the profession of the father", *Proceedings*, vol. II.

¹⁷ A. M. Merkov, "Evaluation of the health aspects of population replacement in the Soviet Union and in several economically developed capitalist countries", *Proceedings*, vol. II.

¹⁸ E. Peritz, "Infant mortality in Israel, 1960-1961: A study based on matched birth and death records", *Proceedings*, vol. II.

The paper by A. Kusakawa²¹ comes closest to the main problem as outlined in these remarks. The author points out that while, on the one hand, the early reduction of mortality from tuberculosis in the economically developed countries is an instance of the salutary effect of improved living conditions despite the absence of chemotherapy, on the other hand, the recent steep decline in mortality in developing countries can be attributed to the introduction of specific medical and public health measures. In most of these countries the level of living was either not rising or doing so very slowly.

He examines the hypothesis that there are two groups of conditions contributing to the mortality decline in the developing countries: one relating to health services, the other socio-economic. In his study, which covers sixty-three countries, he uses a single health service indicator (the number of hospital beds per 1,000 population), three social indicators and three economic indicators. To show the influence of these factors he analyses variances in expectation of life at birth in the developing countries. In making his analysis he encountered a number of methodological obstacles and was consequently limited in making his conclusions and evaluating all the combined effects of the factors in question. The author notes that "at this stage, any conclusion as to the extent to which social and economic factors contribute to the variation of mortality in comparison with a health service indicator, could be only of a highly tentative nature".²² The paper's value lies in the methodology for approaching the problem, while the question of appropriate indicators and reliable data for their computation remains open.

III. ECONOMIC AND SOCIAL EFFECTS OF DECLINING MORTALITY AND IMPROVING CONDITIONS OF HEALTH

As already seen, various indices of mortality can illustrate the health status of a population. There are, however, diseases important from the point of view of leading an active life which do not terminate in death and which thus escape measurement by mortality indices. We are concerned here only with health conditions as they can be expressed by mortality indices, and our question may therefore be formulated as follows: How do improving

health conditions, elucidated by mortality indices, showing a decline in mortality, affect economic and social conditions?

The economic and social consequences of declining mortality must be considered in conjunction with conditions of fertility. If fertility remains high, or decreases only slightly, the immediate effect of declining mortality is a higher rate of natural increase. Age composition changes relatively little, as has been shown by some authors. However, a decline of mortality with low or rapidly declining fertility changes the age structure of a population very quickly. There is a marked decrease in the proportion of younger and an increase in the proportion of older age groups. There are, of course, exceptions from this general pattern, depending on the rate of mortality decline in the various age groups. These two demographic changes have very different economic and social consequences.

Lower mortality among infants and the younger age groups preserves a greater number for active economic life. The most important consequence is perhaps an increased labour force. If such a force is needed, this may be regarded as favourable; otherwise, such an increase in the potential labour force may raise problems of employment for the national economy.

The preservation of infants, children and young adults for productive life through lower mortality brings a greater return on the expenditure and efforts made by individuals and by society in connexion with childbirth and delivery, child-rearing and education. The money value of this might be calculated in order to demonstrate the economic effects.

Extended expectation of life, increasing the proportion of aged population, opens up another set of social and economic problems. Gerontology is seeking to assist in solving some of these problems by studying possibilities of improving the fitness and health of old people. An active life, not merely an extension of the number of years lived, is the goal towards which medicine and public health are seeking new ways.

Only two papers dealt with the problems involved in this topic. R. J. Myers considers, on the basis of conditions in the United States, the effect which declining mortality has had and may have in the future on old-age pension systems.²³ He calculates the financial effect, expressed as the ratio of pension disbursement

²¹ Akira Kusakawa, "Social and economic factors in mortality in developing countries", *Proceedings*, vol. II.

²² Akira Kusakawa, "Social and economic factors in mortality in developing countries", *Proceedings*, vol. II.

²³ Robert J. Myers, "The effect of declining mortality on old-age pension systems", *Proceedings*, vol. II.

per year to the total payroll of the working population. He does this for mortality conditions as shown in the life tables for 1900-1902 and for 1959-1961, and a hypothetical life table constructed on the assumption of age-specific mortality rates equal to 50 per cent of those of the 1959-1961 life table. The ratios so found are as follows: 8.1 per cent for 1900-1902, 10.6 per cent for 1959-1961 and 18.0 per cent for the assumed theoretical conditions of mortality. If all the factors remained unchanged, and age-specific rates were to drop as much as 50 per cent, the ratio would be about 75 per cent higher than in 1959-1961. Raising the minimum retirement age from 65 to 72 years would keep the ratio at about the same level. Myers describes the action that has been taken in a number of countries in regard to pensionable age.

In discussing the social effect of declining mortality, the author stresses the importance of solving social problems so that retired persons can live useful and worthwhile lives during their longer retirement period. He lays special emphasis on the role of the pensioners' health conditions.

The paper by T. K. Burch²⁴ reviews and discusses three specific research results which show that the level of mortality may be a major source of variation and change in social structure.

Orphanhood, with all its implications, is a social problem in societies with high mortality. The author shows, using Lotka's methodology and United Nations model life tables, that in a society where expectation of life is, for

²⁴ Thomas K. Burch, "Some social implications of varying mortality", *Proceedings*, vol. II.

example, 20 years, 50 per cent of all persons have lost their mothers by age 20, while in societies with the lowest mortality ($e_0 = 73.9$), this proportion is only 3.4 per cent. His table of percentages of persons who are maternal orphans at various ages for differing levels of mortality is extremely instructive as showing the quantitative extent of the problem of orphanhood in societies at different mortality levels. For example, at age 10, where the expectation of life is 40 years, more than every tenth child has lost its mother, while where the expectation of life is 73.9 only one in 100 has done so. The gradual disappearance of orphanhood implies an increasing need for adults to maintain suitable relationships with elderly parents, which involves a different set of social problems.

With reference to mortality and the burden of family dependency, the author shows that, other things being equal, parents in low-mortality areas have to spend more to raise their children than do those in high-mortality areas. For example, this burden increases by 54 per cent as life expectancy increases from 30 to 70 years. A decline in mortality is sufficient by itself to introduce substantial changes in the parental role. In this connexion, he expresses the view that fertility declines may be causally and not merely temporally associated with prior mortality declines.

Studying family life cycles, the author expresses the view that the prevailing mortality level can set direct limits to the type of family-kinship organization that is feasible or likely. Concluding his paper, the author notes that greater systematic research is needed into the general area and suggests some directions for such future research.

Statement by the Rapporteur: Mr. J. SOMOZA

Demographer, United Nations, Economic Commission for Latin America, Santiago, Chile

The meeting on mortality had three topics for its consideration:

(a) Mortality levels and trends and their relations with patterns of age-sex specific mortality rates;

(b) Effects of public health activities and of economic and social factors upon mortality, with special reference to the effects of economic and social development in developing countries;

(c) Economic and social effects of declining mortality and improving conditions of health.

The majority of the documents dealt with the first topic. In the Moderator's opinion,

these documents illustrated the theme in a satisfactory way, despite the limited statistical data available in some cases. Few speakers dealt with this first item, perhaps for the very reason that the documents and the Moderator's report summarizing them gave a satisfactory over-all view of the recent mortality levels and trends in different regions and countries.

In one of the statements relating to this item, it was pointed out that the mortality differential according to sex in the various countries of Asia (India, Pakistan and Ceylon) did not have the same trend as is normally the case:

female mortality in these cases was higher than male mortality. It was maintained that this characteristic could be explained by social and economic factors.

The second topic received greater attention from the participants, and the debate concentrated on it almost exclusively.

It was clearly shown that the mortality decline had lessened, and in certain cases even stopped, in those developing countries where a spectacular mortality decline had occurred during the years following the end of the Second World War (due in particular to public health measures) and where, on the other hand, economic and social development had not progressed at a satisfactory rate or there had simply been no social advance.

In view of this, it was recommended that caution should be exercised in preparing projections dealing with future mortality trends, and that particular account should be taken in such projections of the relationship between economic and social factors and mortality rates.

There was general agreement among the participants that social and economic conditions in the developing countries must improve considerably in order to bring about a further appreciable decline in the level of mortality in these countries.

Examples were mentioned of recent favourable experience in the reduction of mortality in Romania and the Soviet Union, owing, in the opinion of the speakers, to economic, social, cultural and health improvements.

As against these cases, others were mentioned, specifically Chile and India, where recent mortality trends show that the decline has ceased or is too slow, in spite of public health measures. Economic development in these countries is slow. The example of Chile is particularly interesting for there are statistical data that clearly show that medical measures by themselves are not sufficient to influence the mortality level beyond a certain degree. If there is to be a resumption of the sharp decline in mortality rates in cases such as this, the level of living of large sectors of the population will have to be raised. Economic and social development is therefore a necessary condition for this purpose and in the opinion of some participants it can be achieved only if the existing social structures in the developing countries are changed.

Other participants, while not necessarily disagreeing with the above view, felt that specific measures might be taken which could have an effect on mortality. It was proposed, with

reference to infant mortality, that a special effort should be made to combat nutritional deficiencies in mothers and children.

Action in the home was also suggested as an effective means of influencing infant mortality. This would take the form of periodical visits to mothers by nurses specializing in child welfare. However, these measures were suggested in the light of the experience gained by socially and economically developed countries, in particular France, and they might not perhaps be as effective if applied under the conditions existing in developing countries.

It was stated that the mortality level of a population, leaving aside its age composition, depended on economic and cultural factors and on its medico-social structure. In economically and socially advanced countries today, the economic factor no longer has the importance it had in the past. Surveys carried out in France point to the preponderance of the cultural factor over the economic factor, when it is possible to make a distinction between the effects of each. It was recommended that a survey of the available antecedents of this subject should be carried out and that an attempt should be made to establish clearly the role played by each of these main factors (economic, cultural and medico-social) in the mortality level of a population.

An initial step in carrying out a survey such as that proposed, with a view to increasing the scanty information available on the subject, is to study mortality differentials in relation to the economic and social characteristics of the population, and for this reason it is of great importance to take into consideration what was said at the meeting concerning the methods used for analysing mortality differentials.

The procedures used in France and in the United States for the study of this topic were commented upon briefly. The studies carried out in France showed that mortality differences were very great between the various socio-economic categories. Such differences, it was pointed out, gave some idea of the direction which future mortality trends in that country might take as a result of the reduction of the differences between the various socio-economic categories.

The statistical information and financial resources at the disposal of these countries mean that the survey procedures presented, although of indisputable usefulness in those cases, are not appropriate for the developing countries where an adequate statistical basis is lacking and financial resources are very limited. Hence the value of a procedure such as that

used in India and Thailand, along the lines of the studies carried out on the Chicago population. It was proposed to investigate mortality differences in areas defined with due regard to socio-economic characteristics. With this in view, it will be important for the population censuses to be carried out around 1970 to facilitate the definition of areas with different socio-economic characteristics.

The topic of infant mortality, and its relationship with economic and social conditions, was considered by various speakers. Some referred to the need to be cautious in interpreting the variations observed at the local level in connexion with the infant mortality rate and the birth rate, both being closely connected with birth statistics. Should the accuracy of birth registrations improve, there might be changes in the rates which would lack demographic significance.

Summary results were also submitted of surveys carried out on infant and pre-school mortality in India and the Ukrainian Soviet Socialist Republic. In the former, an analysis was made of the different mortality rates at different ages during the first year of life and the mortality differences according to sex. With regard to the experiment in the Ukraine, it was pointed out that effective measures had been taken to bring about a reduction in infant mortality in particular, and that in 1964 an annual level of the order of 20 per 1,000 had been reached. This success was attributed to the social and economic changes that had taken place in the country.

The third topic received the least attention, which can be explained by the fact that it is

on this item that the lack of information and proper study is the greatest. Only two participants referred to it.

It was pointed out that the decline in mortality had the effect not only of increasing the number of persons of active age but also of increasing the number of persons in other age groups. Consequently, the indices of dependency (quotients between the number of persons of inactive ages—the very young and the aged—and the number of persons of active age) have remained fairly stable in the developing countries where fertility has undergone practically no change.

To sum up very briefly the salient points of the debate and the opinions expressed, which were largely unanimous, it can be said that there was agreement that in the developing countries, which include the greater part of the world's population, social and economic factors, as opposed to purely public health measures, will have the greatest influence in reducing future mortality rates. This admission and the fact, pointed out by the Moderator, that little is known of the effects of these economic and social factors upon mortality, would appear to indicate that studies should preferably be directed to this topic, and to the economic and social effects of a reduction of mortality, about which it was evident that the Conference could say very little.

The following speakers took part in the discussions: Ahmed, Behm, Calot, Croze, S. Chandrasekhar, de Haas, Hauser, G. Johnson, Madigan, Medyanik, Muresan, Myers, Panse, Sauvy, Saxena, Slesarev, Stolnitz, Visaria, Winter.

MEETING B.9

International migration as related to economic and demographic problems of developing countries

Statement by the Moderator: Mr. W. D. BORRIE

Professor of Demography, Australian National University, Canberra, Australia

This paper is concerned essentially with an evaluation of demographic, social and economic factors associated with international migrations. It supplements the background paper prepared for this session, which provided an analysis of the trends and patterns of international migrations with particular reference to the period since 1945.¹ Thirteen papers were contributed for the session, each relevant to one of the major sub-topics of the meeting as listed below:

(a) Possible effects of immigration and emigration on the growth and structure of population;

(b) Immigration as a means of obtaining needed skills and stimulating economic and social advancement;

(c) The economics of international migration.

In considering these matters, considerable emphasis will be given to the past experience of countries which are today classed as "developed" in terms of such measures as the proportions of their populations engaged in secondary and tertiary occupations, or the proportions in urban areas. This approach could be justified by the propositions that any country augmenting its population through immigration is "developing" and that any country losing emigrants is "underdeveloped"; but another substantial reason for this approach is that theory in this area of study is based mainly upon the experience of today's "developed" countries. In addition, because of the lack of adequate data still in many "developing" countries, positive conclusions regarding their migrations cannot easily be reached. Finally, as will be shown, current policies and patterns of movement in "developed" countries are

having considerable repercussions upon some "developing" areas.

A. THE EFFECT OF EMIGRATION AND IMMIGRATION ON THE GROWTH AND STRUCTURE OF POPULATIONS

Quite obviously, the effect of migration will be determined basically by the relative sizes of the migrant and non-migrant populations. Until the middle of the nineteenth century net immigration was the major factor of growth in some countries simply because immigrants were settling in lands which were virtually unpopulated. But quite quickly, after a reasonable balance had been established between the sexes, natural increase became the major factor of growth. This was the case in New Zealand and Australia before their populations had grown to one million, but immigration remained an important supplement to growth rates. An estimate for Argentina presented in one of the conference papers suggests that if there had been no immigration since 1870 the population in 1960 would have been only one half its actual figure.²

Concerning major countries of inter-continental immigration since 1945, details of which are given in the background paper, those in which immigration has been a fifth or more of the rates of natural increase are Israel, Australia, New Zealand, Canada, Argentina and Uruguay, with Venezuela only a little less. Substantial as these gains are, they have been matched by the experience of some of the major immigrant countries of continental Europe. Between 1951 and 1961 net immigration was more than 90 per cent of natural increase in Switzerland and the Federal Republic of Germany and over 40 per cent in France. These

¹W. D. Borrie, "Trends and patterns in international migration since 1945", 1965 *World Population Conference*, background paper B.9/14/E/474.

²Zulma L. Recchini de Lattes, "Demographic consequences of international migratory movements in the Argentine Republic, 1870-1960", *Proceedings*, vol. IV.

European countries thus appear as more successful immigrant areas than most of the overseas immigrant countries, but the higher levels of natural increase in the overseas countries, compared with Europe, need to be kept in mind.

Of the major European areas of emigration, net emigration between 1951 and 1961 had a major effect on the growth rates of Ireland (where it exceeded the gain through natural increase), and in Portugal, Italy, Spain and Greece. In the case of Greece, one of the Conference papers shows that the emigration loss amounted to one-third of natural increase in the late 1950's, more than half in 1960 and 1961, matched natural increase in 1962 and exceeded it in 1963.³

Although statistical data are generally inadequate to permit precise measurement in Asian and African countries, migration has probably had less effect on growth rates than amongst areas of European migrations, first because these movements have been small in relation to the total populations of the sending and receiving areas, and secondly because they have been to and from areas with extremely high growth rates. However, as some of the papers prepared for this session show, important exceptions do clearly exist, for example, in Southern Rhodesia and Ghana, and in Manchuria which has been the chief outlet of emigrants from north China, and also in Hong Kong as an outlet from southern China. The latter movements have had a considerable effect on the receiving areas, though only minor effects on the population of origin.

In terms of age and sex composition, the precise effects of recent migrations are again difficult to gauge because of the lack of statistical data; but the main differential appears to have been a more balanced sex ratio, with a high proportion of family units and with a high degree of permanent settlement in intercontinental emigrations of Europeans; and frequently a low proportion of family units and a high degree of temporary movements in intra-continental movements within Europe, Africa and in Asian migrations. High masculinity rates in movements into Ghana and in East Africa are cited in the papers by Messrs. Gil⁴ and Southall⁵ and in the Far East in the paper

by Mrs. Taeuber.⁶ Not all of the intracontinental movements in Europe were characterized by high masculinity ratios, however. Between 1946 and 1957 only 46 per cent of adult immigrants into Sweden and 49 per cent of adult emigrants out of Ireland were males.

While all voluntary migratory movements tend to be concentrated heavily within the age groups between about 20 and 40 years, they have to be on a quite massive scale to bring about major changes in the age structure of the population. This is because most modern migrations, particularly intercontinental movements, are based upon family units, so that the immigrants bring with them or rear children in about the same proportions to their numbers as in the non-immigrant population. Nevertheless, immigration, because of its age selectivities, can help to rectify deficits that have occurred from past changes in the internal population structure. For example, immigrant workers in the 1950's have helped to offset the situation created by the low birth rates of the 1930's in many of the countries of overseas European settlement. At the same time, however, they have boosted the growth rates of other sectors, so that the ratio of work force to total population was not always substantially changed.

The demographic effects of predominantly male emigration depend largely on spatial factors. These migrations often tend to be over relatively short distances with high return rates. From his examination of these movements in East Africa, Southall observes that areas with the sexes evenly balanced and little migration tend to have higher growth rates than those with imbalance as a result of migration, but he adds that African male emigrants "make very deliberate efforts not to let their wives 'lie fallow' when left at home".⁷ The impact of predominantly male migration also depends upon such sociological factors as the degree of intermarriage. Mrs. Taeuber's paper indicates that early Chinese immigrants in Hawaii frequently married non-Chinese women, but as the sex structure became balanced, marriage statistics showed Chinese marrying Chinese in high proportion.⁸ Whatever their nationality, male immigrants tend to marry within their own ethnic group, and statistics of birthplace or nationality used to measure marriage patterns generally conceal the fact that many "intermarriages" are in fact

³ S. G. Triantis, "Population, emigration and economic development", *Proceedings*, vol. IV.

⁴ B. Gil, "Immigration into Ghana and its contribution in skill", *Proceedings*, vol. IV.

⁵ Aidan Southall, "The demographic and social effects of migration on the populations of East Africa", *Proceedings*, vol. IV.

⁶ Irene B. Taeuber, "International migration and population dynamics in the Far East", *Proceedings*, vol. IV.

⁷ Aidan Southall, *op. cit.*

⁸ Irene B. Taeuber, *op. cit.*

with women born in the immigrant country but wholly or partly of the same ethnic stock as the male immigrant.

Studies carried out in the United States and elsewhere have tended to disprove Walker's substitution theory, which considered that the addition to numbers through immigration is offset by the depressing effect on the fertility of the native born. Because of its age and sex selectivities, however, emigration tends to lower the birth rate of the sending country, and this has been put forward as one of the factors in the declining birth rates in recent years in some southern European countries.

In the movements between "developing countries", as in Africa, where economic growth may be lagging behind population growth, emigration could lead to an acceleration of growth by increasing per capita food resources, and could lower the rate of growth in the receiving area by reducing per capita resources, thereby raising mortality, but, assuming voluntary migrations occur because their skills are required, such movements should increase productivity and thereby encourage population growth.

B. IMMIGRATION AS A MEANS OF OBTAINING NEEDED SKILLS AND STIMULATING ECONOMIC AND SOCIAL DEVELOPMENT

It is known that migrations of Europeans have increasingly been movements of people into non-rural occupations, that increasingly in the twentieth century the demands of the receiving areas have been for skilled rather than unskilled non-rural workers, and that in this regard both the sending and receiving areas are competitors for a scarce resource. This scarcity is a reflection of two factors: the very slow increase in the age cohorts available for training in the necessary skills as a result of the low fertility of the 'thirties and of war casualties, which affected many of the receiving as well as the sending countries; and revolutionary changes in technology. Observing that in the United States between 1940 and 1960 the input of the factors of production increased by only 1.7 per cent per decade whereas output grew by 29 per cent, Besterman concludes "that this increase in output was due primarily to the improvement of the human factor: to the increased skill of labour force, to the advances in technology and to improvements in organization and management".⁹

Assuming with Besterman that consistent economic growth and rising per capita incomes require that the middle and upper classes of manpower must grow at a faster rate than the labour force as a whole, the non-immigrant population will tend to be in the most advantageous position to equip themselves with the required skills through education in the immigrant country and therefore to be upwardly mobile, leaving the immigrants to fill initially the lower skilled levels. This substitution effect appears to have been particularly in evidence since the war, when relatively stability in the non-immigrant work force, increasing real incomes, technological developments, and greatly increased expenditure in education have all tended to accelerate the opportunities for upward mobility of the non-immigrant work force, and at the same time to open up avenues of employment for immigrants without their having to compete, and therefore to be "visible", in the sense that Robert E. Park used the term,¹⁰ to the non-immigrants.

This process would explain the tendency observed in the background paper for this session for the emigrants from Europe overseas (which contain a high proportion of skilled persons because of the highly organized recruitment processes of many of the immigrant countries) to be replaced by immigrants into Europe, either intracontinental (from southern Europe) or intercontinental (from West Indies into United Kingdom) who are relatively unskilled but fill the employments being vacated by the upwardly mobile non-immigrant populations. This whole capillary process will be stimulated so long as emigrants keep moving overseas from the skilled ranks. It is significant that the majority of workers now being drawn in such large numbers from southern Europe into the Common Market area are from rural areas but are finding employment in non-rural occupations. Mr. Mayer's paper shows that Italian workers in Switzerland have been increasingly recruited from the more rural, southern part of Italy in recent years, though only a small percentage of them were employed in Swiss agriculture.¹¹

In Africa there is still a considerable amount of migration between rural areas, and with the development of African entrepreneurial farming and available cultivable land, this process is likely to continue for some time. Mr. Southall notes that such rural-rural migration has been

⁹ W. M. Besterman, "Immigration as a means of obtaining needed skills and stimulating economic and social advancement", *Proceedings*, vol. IV.

¹⁰ "Assimilation, social", in *Encyclopaedia of the Social Sciences*, II, pp. 281-2.

¹¹ Kurt B. Mayer, "Post-war migration from Italy to Switzerland", *Proceedings*, vol. IV.

much more important than the rural-urban movement in south-central Uganda.¹²

In Ghana also rural employment has remained an important aspect of immigration, for in the census of 1960 45 per cent of the foreign born who had come from other parts of Africa were enumerated as "farmers, fishermen, etc.". However, the very large import of immigrant labour into Ghana (522,000 African foreign born were enumerated in the 1960 census) did not prove, in Gil's opinion, that this labour was either "economically sound or indispensable", for it came in when much local labour was unemployed or underemployed but was not prepared to work for the extremely low wages being offered. He adds that plans for economic development, by effectively using native population, will decrease the demand for this unskilled immigrant labour and will tend to require in turn increased mechanization and specialization, and the acquisition of higher levels of skills by increasing numbers of the non-immigrant population through high investments in education.¹³

This statement epitomises the problems of the developing countries, in which the need is increasingly the efficient use of existing and likely future manpower through the processes of economic development and education. These processes can be assisted by the temporary emigration of elites for advanced training; by technical assistance from developed countries; or by small-scale selective immigration of small groups, as in the case of the special agricultural settlements in Latin America described in Besterman's paper.¹⁴ But essentially the developing countries are not dependent upon immigration in the sense that this was the *sine qua non* of the growth of the New World in the nineteenth century. The problem of the developing countries remains the fact that in a situation of apparent world-wide shortage of technical and specialized workers, the pull of the industrially advanced countries remains strong, and seems to be getting stronger, and is tending to attract these types of workers from even the developing countries. This is seen in the very considerable numbers of industrialists, teachers, doctors and academic persons who go abroad for training but then take employment in an advanced country. That the "brain drain" of professional and highly skilled manpower to the affluent societies remains a potent force is suggested by the fact that during the period 1956-61 some 14,000 physi-

cians, 5,000 chemists, and 1,000 physicists immigrated to the United States, or again the fact that the last ten years have seen a doubling of the number of immigrants with professional skills who have entered Australia.

Mr. Pletnev's paper calls attention to the adverse effects on developing countries of a large-scale export of manpower and emphasizes the need for more assistance to the developing countries through further training opportunities abroad, expanded interchange of skilled manpower, and greatly increased investment in education to give basic training to the indigenous populations.¹⁵

Immigration cannot be regarded in the long term as the fundamental instrument of change in a society. In developing countries, for example, the skilled manpower, whether trained at home or abroad, can only be effectively used within a suitable economic and social framework. Generally, when immigration flows have been felt to introduce too much ethnic or cultural diversity, restrictive immigration policies have been adopted. In his examination of the social consequences of immigration in Canada, Mr. Jones, after emphasizing that during the past 100 to 150 years immigration has not been an important factor in Canada's population growth, concludes that technological change rather than immigration has been the major influence on social change in Canada. Immigrants have contributed to Canada's rate of industrialization by filling important jobs in the labour force, but "immigrants have had to alter their behaviour, as have native-born Canadians, in response to social changes resulting from industrialization". The paper further states that immigrants have not influenced the structure of Canadian politics, have tended to conform with Canadian family types (particularly urban families) and have been spread widely throughout all sectors of the economy, with recent immigrants strongly represented not only in low-prestige service and unskilled labouring occupations, but in such categories as craftsmen, scientific and engineering positions, the professions and the creative arts.¹⁶

Other scholars, after examining the situations of other countries, while perhaps not disagreeing with Mr. Jones concerning the major influence of economic factors in determining the social structure of industrial urbanized society, tend to give more emphasis to the

¹² Aidan Southall, op. cit.

¹³ B. Gil, op. cit.

¹⁴ W. M. Besterman, op. cit.

¹⁵ E. P. Pletnev, "Economic development and international migration of labour", *Proceedings*, vol. IV.

¹⁶ Frank E. Jones, "Some social consequences of immigration for Canada", *Proceedings*, vol. IV.

long-term effects of cultural and ethnic diversity.

C. THE ECONOMICS OF IMMIGRATION AND EMIGRATION

The economic impact of immigration depends upon such considerations as the extent to which labour units or family units predominate, how much of the immigrants' income is spent in the country or remitted to the place of origin, and the new capital demands created by the families of migrants balanced against the costs of the migrant workers' education and training in the country of origin. Some of these questions have been examined in relation to Israel in Mr. Sicron's paper.¹⁷ Here the initial mass immigration was accompanied by heavy unemployment. With the cost of absorbing an immigrant family estimated at 10-12,000 dollars, their absorption required heavy outlays by the Government and massive assistance from abroad. By 1963 only 3 per cent of the civilian labour force remained unemployed; but, as the later immigrants have had relatively low levels of skills and therefore of productive efficiency and as their family size has been greater than that of the veteran population, they have continued to exert strong inflationary pressures. An estimate in 1954 indicated that the public and private consumption of the new immigrants exceeded the National Income accruing to them by a quarter. The Consumer's Price Index rose more than 4 times during 1948-63, but it is also estimated that gross national product also increased four times in real terms over approximately the same period. As Sicron states, absorption of immigrants was only possible because the whole national economy was organized towards this end, with the population accepting severe rationing, price control, successive devaluations, high taxation and a highly inflationary situation. But crucial to the whole process was the very large transfer of capital from abroad.

In no other country were the pressures from immigration so severe, or the assistance from abroad so large; but, in a lesser degree, some of the same features have appeared elsewhere. In Australia, there were strong inflationary trends in the economy in 1948 arising from the release of demands for goods and services which had been pent up by restrictions during the war. The arrival of refugee immigrants might have greatly intensified this inflationary trend had it not been for their employment in basic industries and the postponement of invest-

ment in housing and related areas brought about by their accommodation in old army camps and other wartime buildings.¹⁸ Since 1950 the Australian Government has calculated that the population growth rate required to match planned rates of economic growth is around two per cent, with approximately one per cent derived from immigration. While this immigration target has not quite been reached since 1950, "Indigenous capital formation, together with investment from overseas and favourable balance of payments, have been adequate for the sustained growth in population without eroding per capita real income."¹⁹ The high demand for non-productive investment arising from the emphasis upon family immigration (for example in housing, schools, public works) has raised difficult problems, but these appear to have been contained perhaps partly because of investment lags, but partly by careful attention to the recruitment of immigrant workers of high productive efficiency.

While advantages of economy of scale resulting from larger populations have also been important to countries like New Zealand, Canada, and Australia, this has not been a significant factor in intracontinental European immigration. However, the demographic factors discussed above (section A) have been important here in drawing immigrants into the receiving countries of Europe and, conversely, in "pushing" emigrants from the sending countries. As already emphasized, emigration has held down the labour supplies in southern European countries which might otherwise have exceeded the absorptive capacities of their economies. But the exodus from some of these countries may now have reached proportions where it is draining them of manpower essential to their development. For example, Mr. Triantis shows that about half the Greek emigrants in 1962-63 appear to have been crafts-men and industrial workers.²⁰

In the Latin American situation, where natural population growth rates tend to be relatively high and the level of investment relatively low, and the statistics of migratory movements very inadequate, assessment of the impact of immigration is difficult. Heavy inflows have tended to suffer from lack of sustained and expanding investment to absorb the immigrants, who have tended to seek employment in the secondary and service sectors of the economies rather than in rural areas. The heavy backflows since 1958 from many of these coun-

¹⁸ R. T. Appleyard, "The economics of immigration into Australia", *Proceedings*, vol. IV.

¹⁹ R. T. Appleyard, *ibid.*

²⁰ S. G. Triantis, *op. cit.*

¹⁷ M. Sicron, "The economics of immigration to Israel, 1948-1963", *Proceedings*, vol. IV.

tries, which were examined in the background paper (section B (g)), may be a reflection of the lack of immigrant absorptive capacity generated by these factors.

In Africa, again no precise conclusions can be drawn, partly because of lack of data and partly because the patterns of migratory flows appear to have differed from region to region. In some cases immigration appears to have been due, not to rising investment levels, but to the fact that wages in the receiving area were so low that they could not attract the local population. Gil considers that this was the case in Ghana until 1960, when minimum wage levels were fixed.²¹ Since then the emphasis in Ghana has been the import of high-level technical skills, frequently from Europe and America, to assist economic expansion particularly through industrialization, thereby increasing the employment opportunities for the indigenous workforce, particularly that sector which is redundant to rural employment.

The problem of Ghana is the problem of much of Africa. Improvements in agricultural productivity and the extension of areas under cultivation to ensure an increase in agricultural output at least commensurate with the high rates of population growth must remain one basic element of development; but the employment of expanding labour forces will require continued and heavy investments in the non-rural sectors. The immigrant streams in Africa outlined in the background paper (section D) have tended to be drawn to areas which have experienced heavy inflows of foreign capital, although high levels of domestic capital formation now exists in the Republic of South Africa and in Rhodesia. The attractive power of these foreign investments, particularly in mineral resources, is apparent in the cases of Rhodesia and Zambia.²² Rhodesia, with the rapid development of a wide range of basic mineral resources, has steadily drawn labour from surrounding areas. These have gone mostly into unskilled employment, although about 35 per cent of skilled wage earners in Rhodesia are now African. Zambia, dependent essentially upon copper and therefore more sensitive to fluctuations in world prices, has not had the same attractive power as Rhodesia, but has nevertheless been an important magnet for immigrants. Both areas have drawn heavily from Malawi.

The economic consequences of migration are also closely related to the question of income

remittances. In shorter intracontinental movements in particular, a considerable proportion of the migrant's income is returned to the place of origin in the form of remittances. Exact measurement of the extent of these remittances is difficult, but they have clearly been substantial, particularly in the emigration from southern Europe. Parenti gives the following estimates of the value of remittances to four of the major countries of emigration:²³

	<i>In millions of U.S. dollars</i>
Italy, 1953-62	3,303.1
Greece, 1953-62	848.8
Portugal, 1953-62	401.6
Spain, 1959-62	387.9
TOTAL	4,941.4

In the early 1960's these remittances have been about 8 to 10 per cent of the value of imports in Italy, Portugal and Spain, and 14-15 per cent (in 1962, 22 per cent) in Greece. As proportions of national incomes, they have been between 1 and 2 per cent in Italy and Spain, between 2 and 3 per cent in Portugal, and 3 to 5 per cent in Greece. These remittances were also undoubtedly of considerable significance in prewar migrations. Parenti's analysis of Italy for the period 1861-1940 indicates that remittances were as high as 20 per cent and 27 per cent of imports, and 12 and 17 per cent of national income in the decades 1891-1900 and 1901-10, respectively, that is coinciding with the first great trans-Atlantic Italian emigration.

Parenti, taking 1901-10 as a possible model of an under-developed country in the initial period of modernization, points out that during this period the added value of industry averaged more than 5 per cent a year, and that the output in agriculture, despite high losses of manpower through emigration, increased at an average of 3 per cent. Gross investments doubled 1901-10, compared with the previous decade. Parenti emphasizes that many factors were involved in this sudden economic leap forward, but concludes that remittances were one important, and perhaps the decisive factor,

²³ Giuseppe Parenti, "The role of emigrants' remittances in the economic development of European countries", *Proceedings*, vol. IV. The figures for Greece, Spain and Portugal are the balances of the item "private donations", as they appear in the publications of the International Monetary Fund. The Italian figures represent transfers through official channels. In ILO, *International Migration*, p. 368, it is estimated that these transfers through official channels for the period 1946-57 represent only about half of all remittances. Parenti indicates that in 1962-63 the corresponding figure may have been around 70 per cent.

²¹ B. Gil, op. cit.

²² C. A. L. Myburgh, "Migration in relationship to the economic development of Rhodesia, Zambia and Malawi", *Proceedings*, vol. IV.

in beginning and giving continuity to the transformation of the Italian economy. The increase in imports 1901-10, equal to 75 per cent of the total imports in the previous decade, was compensated for by more than a third by the increase of remittances, which assured the cover of 27 per cent of the total imports.

If Parenti's conclusions are right, this Italian study may have important applications for Spain, Portugal and Greece, from which emigrants have been flowing in increasing numbers since 1958 (see background paper, section B (f)), provided these remittances are used to supplement national savings in productive investments.

While remittances may have had distinct advantages for the countries of emigration, this does not appear to have always been the case for countries of immigration. In some African areas it is considered that remittances have had deleterious consequences. In Ghana, the remittances by temporary immigrants, mainly to French-speaking African countries, created few problems, because Ghana held substantial foreign exchange reserves; but, with the depletion of these reserves by 1963, remittances of foreign nationals working in Ghana were limited to 50 per cent of their gross monetary incomes.²⁴ Remittances in Africa are, however, likely to play a much smaller role than in European migrations because of the small margin of income which remains after meeting basic subsistence. Where wages are high, however, remittances can be at least of short-run advantage to the immigrant country. This appears to have been the case in Switzerland, for example, where the tendency for the economy to "overheat" in recent years would probably have been accentuated through Italian immigration but for two factors—the temporary nature of much of the immigration—and as a result of this the small proportion of family units introduced—and the heavy remittances to Italy, estimated to have reached almost 400 million U.S. dollars in 1963. As a result of these factors Switzerland secured labour skills, particularly required in building and construction industries, with the minimum demand from the immigrants for non-productive investment and consumer goods.

D. CONCLUSION

This review has concentrated on only three aspects of international migration: it has not attempted to cover the whole field of sociological analysis relating to assimilation and absorption in their social and cultural aspects.

²⁴ B. Gil, *op. cit.*

Nor will these concluding comments consider the research potentials in these fields.

The following are suggested as broad zones in which much further research is required before there can be a reasonably comprehensive understanding of the motivations and consequences of international migratory movements, both in relation to "developed" and "developing" countries:

(a) Comparative analysis of the demographic and economic factors associated with the high rate of immigration since 1945 in "high income" immigrant areas (e.g., Canada, Australia and New Zealand);

(b) Demographic trends in Europe and their implications for intra- and inter-continental movements;

(c) Population growth in Latin America and its implications for international immigration;

(d) Potential workforce increases in high growth areas, with particular reference to Africa, and their implications, particularly for intracontinental movements;

(e) The requirements, training and allocation, through international migration, of technical experts and highly skilled manpower, with special reference to the "developing" countries;

(f) Comparative studies of immigration policies.

It is of course recognized that the satisfactory pursuit of research within almost all these fields requires a vast improvement in basic data, particularly in most "developing countries", and reasonable freedom of migration for the research workers in search of comparative materials.

Finally, if the major objective of population policies in the future should be, as suggested in the opening ceremony of the Conference, the exploration of ways and means of stabilizing the world's population, such policies will tend to reduce the flows of international migration. It should, however, be noted that virtually all "developed" countries are pursuing economic policies which imply that the goal of higher per capita incomes will be achieved by annual increments to the workforce as well as by higher productivity. The pursuit of such policies is likely to continue to sustain the present patterns of migration flows, including the drain of skills from "developing" countries, unless such flows are prevented by legislation. On balance, the trend appears to be toward facilitating the entry of such skills to "developed" countries (e.g., the virtual removal of na-

tionality quotas in the USA and Canada), although there have recently been cases of greater control over entry (notably in the United Kingdom). This pull to "developed" countries will have a negligible effect upon population distribution, but will tend to increase the pressure of numbers against resources in the high growth conditions of many "developing" countries, for it will deprive these latter of the skills required to give effect to plans of economic and social improvement.

Consequently international cooperation, accompanied by adequate economic incentives at national levels to the quantity of skilled and professional manpower is probably the most urgent problem affecting developing countries, and the pursuit of such an objective could require a radical change in the present policies of many affluent societies, including acceptance of the principle of population stabilization, or at least of a growth rate that can be served by their own natural increase.

Statement by the Rapporteur: Mr. Attilio OBLATH

International Labour Organisation, Geneva, Switzerland

[Translated from French]

INTRODUCTION

Meeting B.9 of the Conference, which was presided over by Mr. N. Ahmed, was devoted to discussion of the impact of emigration and immigration on the demographic situation and social progress in the developing countries.

The following topics were discussed:

- (a) The possible effects of immigration and emigration on population structure and growth;
- (b) Immigration as a means of recruiting necessary skilled manpower and promoting economic and social progress;
- (c) The economics of emigration and immigration.

The Moderator presented the conference paper and summarized the papers submitted by Mr. R. T. Appleyard, Mr. W. M. Besterman, Mr. B. Gil, Mr. F. E. Jones, Mr. K. B. Mayer, Mr. C. A. L. Myburgh, Mr. G. Parenti, Mr. E. P. Pletnev, Mr. Z. L. Recchini de Lattes, Mr. M. Sicron, Mr. A. Southall, Mrs. I. B. Taeuber and Mr. S. G. Triantis.

These papers and the ensuing discussion dealt for the most part with voluntary migration; thus, there was no discussion of movements of refugees.

I. THE POSSIBLE EFFECTS OF IMMIGRATION AND EMIGRATION ON POPULATION STRUCTURE AND GROWTH

The demographic effects of migration are largely dependent on the volume of immigration in relation to the population of the host countries; since the population of these countries has been increasing, the impact of immigration has tended to diminish, with natural growth making a larger contribution to the over-all increase. This has been the case with

the overseas countries which have received immigrants from Europe. In western Europe, the high birth rate among immigrants is partly responsible for the fact that immigration has, in proportion to natural growth, accounted for a very large part of the over-all increase in population. In the Far East and Africa, the demographic effects of migration are said to have been less far-reaching, on the whole, than in Europe; exceptions are Manchuria and Hong Kong, which have been the main outlets for emigration from southern China, and certain African countries such as Southern Rhodesia and Ghana.

The effects of emigration on the population of the European countries from which this movement has taken place (with the exception of Ireland and, more recently, Greece, where emigration has more than offset natural growth) have also been appreciable but relatively not as great as the population gains made by the countries receiving immigrants. In Asia and Africa, because of the continuing high birth rate, the impact of emigration has also been less far-reaching than that of immigration.

Although exact figures are not available, there is said to be a general imbalance in the sex and age distribution of migrants which varies in extent from one country or area to another. In European intercontinental migration, this imbalance is relatively slight because of the larger number of family units involved; with some exceptions, intracontinental migration in Europe, Africa and Asia involves a smaller number of family groups. Although the migrants are mainly between the ages of twenty and forty, they will not substantially affect the age structure of the population of the host countries unless there is a great increase in the

volume of migration. Nevertheless, this selective migration has filled certain gaps which had existed primarily in the population structure of the countries of immigration, while the departure of large numbers of persons born at a time when the birth rate was still relatively high has helped the European countries of emigration to deal with their employment problems. The relatively large number of young people among the migrants, including women of child-bearing age, has also tended to raise the birth rate and lower the death rate in the host countries, while in the countries of emigration the birth rate has tended to decline. It is sometimes the case, however, that migrants who have settled in a country with a high birth rate retain, at least in the first generation, the rate characteristics of their country of origin. When permanent emigration is mostly male, the proportion of married women tends to decline in the countries of origin and increase in the host countries. It is said that, in some parts of Africa where there is an imbalance between the sexes and little emigration, the birth rate tends to increase more than in areas where the imbalance has been caused by emigration.

The effects of predominantly male immigration also depend on social and cultural factors and are sometimes reflected in the rate of intermarriage between different ethnic groups, which rises in some cases and declines in others. In the case of overseas Chinese migration, social and family stability is also a factor in reducing the rate of intermarriage.

Intra-African emigration sometimes serves to accelerate population growth, since the resulting decline in the birth rate is offset by the availability of more food per person and by improved productivity.

Discussion of this subject dealt primarily with the effects of immigration in New Zealand. In that country, the influx of immigrants between the ages of twenty and thirty-four has increased the size of the labour force in proportion to the total population. However, a population consisting entirely of the survivors of a steady stream of immigration would ultimately show an increase in the 30-64 age group, for the birth rate is said to have a greater impact than immigration on the age structure of the population. On the basis of past experience, it has been estimated that if there was no immigration, but a constant annual birth rate and a normal death rate, persons under thirty years of age would comprise 42 per cent of the population; with an annual increase of 2 per cent in the birth rate, this age group would rise to 60 per cent. Immigration

has tended to reduce the percentage of persons under the age of thirty; however, despite the high level of immigration, its effect is said to have been less than that of the changes in the birth rate. If immigration halted, the labour force would decline by a third in proportion to the total population even if the annual birth rate was constant. In Australia, on the other hand, it is reported that immigration has not increased the proportional size of the labour force, its effects having been offset by an increase in the birth rate and by the high proportion of children among the migrants.

The imbalance between the sexes and other characteristics of migrants are also said to affect their attitude towards marriage. Some surveys made in areas of emigration and immigration show a marriage rate which is much lower than the rate of migration.

Population structure and growth can also be affected by the poor sanitary conditions of migrants; this has happened in certain parts of Africa, particularly in the case of movements of nomads and refugees. Action can be taken to deal with this problem and control infectious diseases if accurate information is kept regarding such movements, the times at which they occur and the frontiers crossed by the migrants.

II. IMMIGRATION AS A MEANS OF RECRUITING NECESSARY SKILLED MANPOWER AND PROMOTING ECONOMIC AND SOCIAL PROGRESS

The migration situation in Europe is characterized by a general and rising demand for skilled manpower, the supply of which is very inadequate because of the decline in the birth rate during the 1930's and the wartime losses as well as the increasingly rapid development of technology. This imbalance is all the more significant because it is felt that economic growth and a steady rise in personal income call for a greater increase in the number of skilled and semi-skilled workers than in the labour force as a whole. The lag in the growth of the labour force, the rise in income, technological progress and the substantial expenditure made for training have provided greater opportunities for people to find skilled employment in their own countries or overseas and to improve their social status. A great many openings have thus become available for unskilled workers, resulting in heavy immigration from rural areas of Europe and other continents; so long as European workers continue to emigrate overseas, this process of replacement will continue.

In East Africa, the development of agricultural enterprises and the abundance of natural resources will ensure a continued high level of employment in rural areas. Ghana, on the other hand, has had heavy immigration of skilled labour, although it has not always been put to effective use. However, economic development programmes will cause a decline in the demand for unskilled workers, while mechanization and industrialization will call for skilled national personnel, which is to be trained on a large scale. This problem is apparent in all the developing countries, which are finding it essential to make efficient use of available and anticipated manpower. That end can be furthered either by the temporary emigration of small numbers of personnel to the most highly industrialized countries for the purpose of acquiring advanced or specialized skills or, alternatively, by the immigration of small numbers of carefully selected skilled workers. However, the developing countries are not necessarily dependent on immigration. Because of the general shortage of technical and specialized personnel, the more highly industrialized countries will exert a continuing and still greater attraction.

However, immigration to the newer countries cannot be regarded, from a long-range perspective, as the means of changing those countries' social structure, since skilled workers can be utilized only to the extent that their skills meet the requirements of the countries concerned and not for the purpose of promoting social progress. Their settlement in a new environment also creates complex social and cultural problems. In some countries, such as Canada, it is felt that social and cultural diversity should not go beyond certain limits lest it should ultimately lead to restrictions on immigration; migrants should be prepared to modify their patterns of behaviour and adapt to the modes of the host country. In industrial, urbanized societies, on the other hand, different experience has led to the conclusion that marked social and cultural diversity is preferable and more beneficial.

It was emphasized in the discussion of this subject that vocational instruction and training in the developing countries, in attempting to deal with those countries' needs, could not provide highly skilled workers but only workers with medium and less advanced skills. Emigration to the more highly industrialized countries for the purpose of acquiring higher skills will continue but on a limited scale. The same applies to emigration for the purpose of gaining less advanced skills, which should in any case be undertaken only where it is possible

to take vocational training courses at the very outset. However, immigrants from the developing countries are given low-paying jobs entailing rough work when they arrive in the industrialized countries; they do not obtain vocational skills or steady employment. Hence, instead of channelling labour to the recruiting centres through emigration, the recruiting centres should be brought closer to the sources of labour; this calls for the existence of an economic base capable of ensuring a greater demand for labour.

As for the skilled workers who emigrate to the developing countries, they absorb part of those countries' investment and consume their goods but the capital represented by their instruction and training is greater than that represented by the training of the average industrial worker. Hence, such immigration is of great importance to the country's economic development and social progress. However, since it represents a reversal of the normal flow, it cannot assume large proportions and the immigrants must be offered sufficiently attractive living and working conditions. Such immigrants would be lent additional impetus if it took place in conjunction with the transfer of whole industrial units from the countries of origin. Improved living and working conditions are also essential as a means of encouraging the repatriation to the developing countries of workers employed in industrialized countries who are needed at home. One example of such personnel is the nurses and doctors from India and Pakistan whose services are needed in rural communities and for the family planning programmes.

III. THE ECONOMICS OF EMIGRATION AND IMMIGRATION

Since the last war, international migration has encountered fewer legal barriers than during the preceding period. Indeed, some groups of European countries have liberalized migration to the point of creating what amount almost to free-market conditions.

In the absence of a satisfactory theory dealing with the correlation between demographic and economic factors in a situation in which personal income is steadily rising and the population is increasing at a slow pace, economic theory tends to support the view that the initial effect of immigration is inflationary. If the structure of the immigrant population was similar to that of the host population, the economic effects of immigration would be limited, since the newcomers' requirements in terms of capital investment and consumption would be

the same as those of the population as a whole. In fact, however, most immigrants are workers; the initial immigration does not necessarily lead to an increased demand for consumer goods, while the demand for capital investment and new plant must increase sooner or later, adding to the need for public and private investment. It would therefore seem that immigration by men who are not married or have left their families at home is most advantageous from the standpoint of the host country; that is what has taken place in intracontinental European migration and also, in many cases, in Africa. However, this advantage is partly offset by the migrants' transfer of savings to their countries of origin. In the case of immigration by families, the advantage deriving from the fact that the workers were educated at the expense of their country of origin is lessened by the need for additional capital investment as a result of such immigration.

A number of these problems were experienced by Israel, where heavy immigration during a period of unemployment resulted in inflation. However, Israel was able to absorb the large numbers of immigrants, despite the high cost of settling them, because of the organized nature of the country's economy, the rationing of consumer goods, heavy taxation and substantial financial aid from outside.

Similar but less acute situations have also been reported in other countries.

The economic advantages resulting from population growth have been substantial in Canada, New Zealand and Australia, while, in the case of intracontinental European immigration, they have been less significant despite the large number of immigrants. In the European countries of origin, emigration has reduced employment demand which otherwise could not have been absorbed; in Greece, however, the recent departure of large numbers of skilled industrial workers is said to constitute a threat to future economic growth. It is reported that in Latin America immigration has been hampered by the inadequacy of the investment made for the purpose of absorbing immigrants, as is evidenced by the large number of repatriations since 1948. In Africa, where the situation varies from one region or country to another, it is said that immigration has in some instances suffered more from inadequate wages than from inadequate investment; in Ghana, immigration has increased since the establishment of a minimum wage, creating increased employment opportunities for national workers, of whom there is a particularly great oversupply in agriculture. Generally speaking, it appears probable

that economic development in Africa will continue to rest mainly on the raising of agricultural productivity and expanding cultivation so as to increase output to meet the needs of a growing population, while at the same time the necessary investment is made in non-agricultural sectors. African immigration has often been concentrated in areas possessing both substantial national and foreign capital and natural resources, such as South Africa, Rhodesia and Zambia. These factors have attracted substantial manpower, some of which has come from neighbouring areas. Migration between neighbouring countries with high birth rates will probably continue to provide an outlet for surplus manpower where the necessary increase in investment is not possible. In many countries which have a relatively small population but substantial natural resources that are not fully exploited, international migration provides additional manpower to exploit these resources more effectively for the benefit of the population.

The migrants' transfer of part of their income to their countries of origin also has significant economic effects. The inflow of these savings is regarded as an important part of the imports and national income of the European countries of emigration. Italy has benefited from it since the beginning of the twentieth century, when the wave of overseas emigration was at its height, the country's economic structure was in process of modernization and economic development was proceeding at a rapid pace. In Africa, these effects appear to have been less significant, since personal income leaves less margin for saving. The transfer of savings sometimes has important consequences of the opposite kind in the countries of immigration. In Switzerland, the export of capital by immigrants in 1963 and 1964 virtually matched the deficit in the balance of payments, while in Ghana these transfers caused such a sharp drop in monetary reserves that restrictions had to be imposed.

It was noted during the discussion of this subject that the absorption of a heavy influx of immigrants in Israel had also been facilitated by the departure of large numbers of Arabs who had left substantial property and wealth behind. It was also pointed out, in certain sections of the paper on Rhodesia, Zambia and Malawi, that discrimination in various spheres between immigrants and the rest of the population had long since ceased to exist in Zambia and Malawi, whereas in Rhodesia laws had been enacted providing for the division of land between immigrants and the indigenous in-

habitants; Africanization measures, which tend to lower the immigrants' standard of living, are applied only when the immigrants are employed by the Government.

Although of only marginal significance, daily and weekly movements of population within frontier areas make a particularly effective economic contribution to the host countries or regions because the migrants do not suffer the psychological effects usually produced by a change of social and cultural environment. Jordan, Saudi Arabia, Qatar and Libya have benefited from heavy immigration of Arabs of working age and of both sexes who possess a wide variety of vocational skills. The effects in the countries of emigration—Lebanon, Iraq, Morocco and Israel—are said to have been minor. In Tanzania, Kenya and South West Africa, on the other hand, the substantial emigration of workers between the ages of fifteen and thirty-five has reportedly deprived those countries of human resources which they need for their own economic development.

Generally speaking, there is very often a tendency not to view the migrant from a social and human standpoint but to regard him as a production factor which is added to the labour force when it is needed and cast aside when it is no longer needed. In any case, the migrant is an economic factor, and, having made the decision to emigrate, he is eager to make the greatest possible contribution to the economic development and well-being of the country which receives him. Nevertheless, immigrants represent elements of instability in the sphere of production and investment. Studies made in a number of countries show that, under free-market conditions, the long-term fluctuations in migration and economic development span periods of fifteen to twenty years which do not coincide with economic cycles, so that the latter have only limited effects on construction activities and migration. It is held that the developing countries should formulate policies designed to curb the element of instability introduced into the economy by immigrants. At the same time, since the most unrestricted migration takes place over relatively short distances and between peoples with a similar culture, migration cannot—any more than does international trade—create an international employment market, nor can it bring about uniform standards of living, levels of food production and economic opportunities. Thus, the world does not face a single demographic problem but rather a series of problems for which trade and migration provide only partial solutions. However, migration also contributes

to social progress by fostering daily contact between people of different ethnic origins and thus putting an end to ethnic isolation and prejudice.

It was noted that in the West Indies, which had benefited from the transfer of savings by emigrants, those benefits had virtually disappeared with the imposition of restrictions on emigration from the region. Generally speaking, savings cannot contribute to the economic development of the country of emigration unless appropriate economic, financial and administrative machinery exists. That was not the case in southern Italy at the beginning of the twentieth century; employment and consumption increased in that region as a result of the inflow of savings, and inflation resulted. In northern Italy, where the economy was better organized, the effect of this inflow was very favourable.

There have been similar examples of success and failure in Africa.

Over and above remittances of savings, the country of origin benefits from the improvement in its balance-of-payments position resulting from emigrants' visits to their families back home; Ireland has found this an even more valuable asset than the inflow of savings.

Other advantages of migration include tourism and increased trade. The example of certain European countries, which have engaged in such trade with foreign communities bound to them by linguistic and cultural ties, could be followed very profitably by India and China, since there are many flourishing Indian and Chinese communities in Asia and the Far East whose members include experienced businessmen and merchants. An increase in such trade could also bring about a wider exchange of manufactured goods for agricultural products, thus increasing the supply of food.

CONCLUSIONS

The conclusions to be drawn from this meeting can be summarized as follows:

1. The effects of immigration on population growth, while they have varied from one country or region to another, have been significant in Europe, the Far East and Africa. The loss of population resulting from emigration is reported to have been less significant, in most cases, than the gains accruing to the countries of immigration; it has, however, been substantial in some European and African countries. There have generally been imbalances in the sex and age distribution of migrants, but these are less pronounced in the case of permanent migration, which involves a greater number of family units. Intra-European, African and Far

Eastern migration is very largely male. As far as the age structure is concerned, most migrants tend to be young men; however, immigration is often on too small a scale to produce serious imbalances, and, where such imbalances have resulted, they have sometimes tended to diminish or disappear in course of time. In the European countries of emigration, this selective exodus has generally had the effect of making the problem of unemployment and underemployment less acute. In most cases, the predominance of young men in migration tends to increase the birth rate of the host country and reduce that of the country of origin. Here, too, the effects of migration seem destined to diminish in course of time.

2. In view of the acute and widespread shortage of skilled workers, the emigration of such workers to the developing countries can serve to stimulate the latter's economic growth and social progress, provided that the migrants possess skills which are needed by the host countries and that sufficiently attractive living and working conditions are provided for them. In Africa, however, the problem is more one of raising agricultural productivity and expanding cultivation while at the same time increasing investment in the non-agricultural sectors. Migration to the more highly industrialized countries for the purpose of acquiring vocational and specialized skills cannot be undertaken on a large scale and should take place only where opportunities to obtain vocational and specialized training actually exist.

3. Turning finally to the economics of international migration, it can be said that immigration has been a major growth factor for both European and non-European countries, including some African and Far Eastern countries. The advantages most often gained by the countries of emigration are, at least in Europe, a greater capacity to absorb surplus manpower, an inflow of savings from emigrants and, in some cases, currency earnings resulting from emigrants' visits to their former homelands. However, this capital cannot be translated into economic gains unless efficient economic and

financial machinery exists. The countries of emigration can also derive advantages from trade with linguistically and culturally kindred communities in other countries whose production complements their own.

However, many factors in international migration and many of its effects are still obscure, particularly from the standpoint of the developing countries. It has therefore been suggested that the following studies and research should be undertaken: comparative analyses of the demographic and economic factors in immigration in high-income countries; a study of trends in intercontinental European migration and its effects; a study of the effects of immigration on economic growth in Latin America; a study of the effects of internal migration in Africa, taking account of potential manpower growth; a study of the requirements for, training of and distribution through international migration of skilled and highly skilled workers in the developing countries; comparative studies of migration policies and of the factors which influence them; comparative studies of repatriation and of the utilization of repatriates in their countries of origin; an analysis of the record and effects of migration in East and West Africa, including movements of refugees; a study of the economic and social effects of the employment of large numbers of foreign workers in certain countries; surveys of the use made of migrants' savings in African countries.

Frequent references were also made to the need to co-ordinate and, above all, improve emigration and immigration statistics on a basis of comparability. It was proposed that a special United Nations centre should undertake that task in co-operation with the specialized agencies concerned. Another proposal called for an international survey, under the auspices of the United Nations Statistical Commission and the regional conferences of statisticians, of all types of travellers who, for any reason whatever, cross a frontier and change their residence or place of work.

MEETING B.3

Mortality, morbidity and causes of death

Statement by the Moderator: Mr. Maurice J. AUBENQUE

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[Translated from French]

I

Meeting B.3 is concerned with the causes of death and with the conditions and trends of morbidity, these topics being considered in their relation to levels and trends of mortality.

Causes of death and morbidity are, to be sure, linked, since it is diseases, their frequency, their seriousness and their repercussions at various ages which, together of course with violent and accidental deaths, determine the risk of death as the final inevitable issue of life. The risk of disease and death is, moreover, linked with factors of all kinds—circumstantial and individual, exogenous and endogenous—which determine its differential character. To gain an insight into these situations and their trends and to compare them, there must be an adequate body of data that can readily be compared. These data are based on cause-of-death and morbidity statistics, which must be fairly reliable and well developed if they are to provide some explanation of the factors being studied. These are statistics that are particularly difficult to improve, and they have inevitably failed to keep pace with the development of quantitative demographic statistics.

The various problems thus involved in the proposed subject and the relationships between them have been clearly perceived by the authors of the papers submitted for consideration at this meeting. Several of the papers are especially concerned with methodology, which is a legitimate matter of concern because, in the final analysis, no valid conclusions can be drawn from unreliable or seriously biased statistics. It therefore seems advisable to introduce first the papers which are mainly concerned with methods, although this does not imply any neglect of the results which they set

forth. Next will come the papers that deal more directly with the incidence of the causes of death and morbidity on mortality, no sharp distinction being made, however, between these two aspects of the question because of its nature. An attempt will then be made to bring out the highlights of the papers submitted so as to give direction to a necessarily limited discussion.

II

The first step therefore is the devising or improving of methods for the statistical measurement of morbidity and the causes of death.

It seems simpler and of more immediate interest to gain an insight into the causes of death. Their statistical measurement is indeed a complex matter especially in the case of infant mortality and the degenerative morbid conditions connected with old age. Methodological research has been carried out for a long time, and is now being conducted under the auspices of the World Health Organization, with the aim of improving the collection of statistical data on the causes of death and of standardizing these data for purposes of comparison at least on an approximate basis. Several of the papers submitted at this session report on some recent and interesting contributions to the improvement of these statistics.

Ruth R. Puffer and G. Wynne Griffith,¹ of the Pan American Sanitary Bureau, describe an investigation being conducted in twelve cities (ten in Latin America, with the addition of San Francisco, California, and Bristol, England), the essential purpose of which is to study the comparability of the statistics for

¹Ruth R. Puffer and G. Wynne Griffith, "The inter-American investigation of mortality", *Proceedings*, vol. II.

deaths attributable to cardiovascular diseases. The method consists in preparing code sheets containing data derived from comparative studies of death certificates and in assembling all possible additional information on deaths. It appears that wide variations are due both to the medical certification and to the coding. Additional information and review lead to a considerable decrease in certain overestimates of mortality attributable to cardiovascular diseases and a reassignment of the cause to other diseases such as cancer. Certain real differences nevertheless remain, e.g., the higher frequency of degenerative heart disease in the English-speaking cities. The causative factors of these differences would have to be sought through appropriate inquiries into living conditions and environment. The existing cause-of-death statistics continue to be the main source of information, but their medical basis must be improved. As, in addition, they are necessarily based on terse statements, they must be supplemented and substantiated by whatever useful information can be obtained from hospitals, physicians and other sources.

These differential characteristics in the levels of mortality from cardiovascular diseases, which are becoming more prevalent in the industrialized countries, are also the subject of a study in Italy. Nora Federici² reports on the results of a comparison of the causes of death of this type as recorded in regions differing in their economic and social structure. Degenerative cardiovascular mortality is manifestly more intense in the industrial region of northern Italy, the "early" manifestations (55-59 years of age) being also more marked, especially for males. Appreciable different situations are noted for other forms of vascular affections; for example, cerebrovascular lesions are more frequent in the central part of the country. The risk of death from rheumatic cardiopathies or arterial hypertension is more serious for females. At the more advanced ages, the differences by sex become less marked. The comparability of the results is discussed, but the possible causes of disagreement do not explain the regional differences in mortality according to age and sex. Other reasons for the real differential mortality therefore exist, and they are probably linked to differences in living conditions, diet, climate and so on. The possibility of compensatory factors must also be considered; for example, a decrease in the risk of death from infectious diseases could increase the probability of death from chronic

affections such as heart disease. This question of the statistical connexion between the various causes of death is certainly very pertinent and deserves further attention.

In addition to the critical statistical analysis of the causes of death, attention must also be given to the underlying facts of pathologic anatomy. In this connexion, McMahan³ describes the research carried out by the International Atherosclerosis Project on anatomic specimens of a highly selected group of persons whose deaths had been assigned to heart disease—especially degenerative heart disease—in the United States, where the mortality assigned to this cause is more than twice that for Latin America. While such research is of prime importance, its validity is inevitably affected by the bias resulting from the selection of the deceased persons submitted to anatomic investigation. The research should be more methodical and systematic, even though this would represent a considerable task. The comparison of anatomic-pathologic findings with statistics is nevertheless a line of research that should obviously be carried further than the realm of the simple autopsy reports that are usually relied upon.

The discrepancies attributable to observation, reporting and recording, as well as the other possible forms of statistical bias, are certainly not sufficient to explain the obvious differences in the various kinds of cause-specific mortality. In any event, caution should always be exercised in making comparisons, and control surveys should be carried out wherever possible. What is more, the very concept of cause of death must be made clearer and more explicit. The traditional notion of the principal or primary cause of death, which is often hard to isolate and is even debatable, can be usefully supplemented by the body of information supplied by the physician.

There thus seems to be reason to introduce the notions of complex morbid states and of implicated disease (as single, principal or associated cause) into the process leading to death. To deal with multiple causes of death in this way provides valuable information and broadens the notion of causality.

This, Lillian Guralnick,⁴ analysing multiple causes of death reported in the United States of America, notes that the proportion of two-cause deaths is 34 per cent and that of three-

² Nora Federici, "Incidence of mortality from cardiovascular diseases in the Italian regions, by sex and age", *Proceedings*, vol. II.

³ C. A. McMahan, "Some aspects of the problem of obtaining research leads on atherosclerotic heart disease from reported mortality data", *Proceedings*, vol. II.

⁴ Lillian Guralnick, "Multiple causes of death, United States, 1955", *Proceedings*, vol. II.

cause deaths 24 per cent, these proportions becoming higher as the age at death increases. Underlying morbid states such as diabetes, asthma, cerebrovascular or cardiovascular deterioration, chronic nephritis and so on are very often causative factors in the process leading to death without the death being directly assigned to them. The "responsibility" of some of these affections doubles when all the declarations in which they are involved are taken into account. It is also useful to consider fatal complications (such as the various kinds of septicemia, peritonitis, secondary pneumonia and so on) which are obviously not classified as immediate (or primary) causes of death. Where such complex morbid states exist, the decisive role of the reporting physician can be readily appreciated. A broadening of the cause-of-death statistics to take these complex states into account would accordingly provide more information on the incidence of morbid conditions on mortality.

The designation of the cause of death must nevertheless be kept simple so as to avoid confusion. The notion of primary cause of death should be retained on the understanding that the international conventions designed to achieve uniformity are respected (World Health Organization international classification of diseases and its rules for selection of cause of death for primary tabulation).

The problem is also particularly difficult as regards the causes of infant mortality. In some surveys carried out in this field in Australia, the connexion between foetal and neo-natal maternal pathology was taken into account.

The statistics of the causes of infant deaths presented by L. G. Hopkins⁵ show that the pathology of either the intra-uterine or the post-natal period can be the cause of death up to at least the twenty-eighth day of extra-uterine life. This causal relationship between maternal, foetal and neo-natal morbidity justifies the adoption of a single classification for the registration of foetal and neo-natal causes of death (in conformity with the draft eighth revision of the international classification).⁶

This concern for cause-of-death statistics that will more faithfully reflect the underlying pathology shows that there is no real distinction between the problem of measuring morbidity on the basis of diseases and the problem of measuring morbidity as a cause of death.

⁵ L. G. Hopkins, "Development of peri-natal mortality statistics in Australia", *Proceedings*, vol. II.

⁶ Draft adopted by the International Conference for the Eighth Revision of the International Classification of Diseases (Geneva, July 1965).

J. Střiteský, M. Šantrůček and M. Vacek⁷ point out in this regard that the certification of the causes of death must make clear the train of morbid events leading to death in conformity with the rules for the use of the international certificate of cause of death. The physician must, in particular, clearly indicate (in part II of the certificate) the conditions which, in his opinion, were not directly involved in the process leading to death. The confusion frequently resulting from the failure to distinguish between the direct causes and the accompanying or aggravating pathologic conditions certainly undermines the reliability of the statistics. Apart from this, however, the arbitrary element which enters into the assignment of the principal cause must be recognized. This is a further argument in favour of relying on multiple causes and of linking statistical studies on causes of death with those on morbidity in order to learn more about how and how often the various diseases lead to death.

Where, as is often the case in the developing countries, the basic statistical data are seriously deficient, the statistician must obviously use the sparse information at his disposal as judiciously as he can. This aspect of the matter is dealt with by Wallis Taylor.⁸ It may, however, be possible to make fairly reliable forecasts through the proper use of partial or biased data, such as statistics of public-health facilities, and by taking advantage of the analogies offered by public-health and demographic models established for populations of comparable level, such as the model established in 1956 for the population of the town of Nagpur, India. There will then be some basis for determining whether a reduction in mortality from infectious and parasitic diseases is likely to lead to a rapid population expansion, as occurred in Mauritius and Ceylon as the result mainly of the eradication of malaria.

The effect of the factors urbanization and industrialization is approached from a more theoretical methodological point of view by Felix Burkhardt and Lucie Osadnik.⁹ Although this paper might more logically have been included in the programme of meeting B.7, the introduction of mathematical methods

⁷ J. Střiteský, M. Šantrůček and M. Vacek, "The train of morbid events leading directly to death—A practical and methodological problem", *Proceedings*, vol. II.

⁸ Wallis Taylor, "Measurement and projection of mortality by cause of death in developing countries", *Proceedings*, vol. II.

⁹ Felix Burkhardt and Lucie Osadnik, "Trends of mortality by the aid of differential equations with parameters of urbanization and industrialization", *Proceedings*, vol. II.

in an area where they are still relatively uncommon is a welcome development. After contrasting death rates and their trends as between urban and rural areas and the death rates of the agricultural or industrial populations comprising these areas, the authors propose a mathematical formula which makes apparent the greater sensitivity of industrial urban populations to mortality trends. Thus, when the mortality trend is downward, the decline will be more rapid among the industrial urban population than among the rural population. It will accordingly be useful to give more particular attention to the rural population.

Although for the individual person death is an event that is unique and final, disease or physical or mental deterioration is a condition of varying length which is apt to recur a number of times and which has repercussions varying in duration and seriousness that may lead to death. Pathological conditions do not become known and cannot be tabulated until they come to the attention of a qualified person (most often a physician) who is in a position to record them.

A wide variety of methods can be used for gathering statistics which have a bearing on morbidity.¹⁰ Use can be made of the existing medical and health facilities and the statistical data originating with them (declarations of contagious diseases; activities of dispensaries, polyclinics and hospitals and of agencies concerned with social insurance, industrial medicine, school health services and disease detection; the practice of physicians and so on). Such information can also be sought through surveys of various kinds. Although the steps taken will vary according to the aim in view and the circumstances, the techniques must always be so designed as to avoid gaps and excessive biases. As far as possible these surveys should provide some basis for assessing the extent to which the risks are affected by geographical, economic, social and other circumstances. The measurement of morbidity according to its various characteristics represents one of the basic sectors of health statistics, for it consists in the final analysis of the mathematical and statistical observation of the diseases and disabilities that affect the population. Although this question is too vast to be dealt with in its entirety, certain aspects of it are touched upon in several of the papers.

M. A. Heasman,¹¹ in his paper, considers the contribution which statistics of hospital morbidity can make to a knowledge of morbidity in the community at large. Hospital statistics are clearly a basic source of information. This source, however, can obviously be only a partial one both as to quantity and to quality, and it can be properly utilized only if appropriate statistical techniques are employed.

If statistics of hospital morbidity are to be comparable as regards both time and place, hospital facilities must be adequate to the needs of the population. A considerable bias certainly results, for example, from regional differences in the beds to population ratio. Hospitalization patterns vary according to regions, social strata and so on. There are, however, some diseases, operations and injuries which almost always require hospital treatment, and in these instances the relevant statistics give a more reliable picture of the morbidity situation among the population in the area concerned.

These statistics could be greatly improved if the successive morbid episodes causing a person to be hospitalized were all traceable to that person (linked hospital statistics). Such an arrangement should include all the hospitals to which the patient might have been admitted. This has been done in England and Wales since 1954 for several types of disease (cancer, psychiatric illness) which can be followed up. The use of electronic computers should facilitate the compilation of such statistics. An experimental scheme set up in Oxfordshire by Acheson has given encouraging results. The same procedures would be very helpful in the case of hospital out-patient statistics.

When morbidity (including infirmities) is considered from the point of view of its effect in limiting activity or making it impossible, it is desirable to have a set of definitions which are appropriate to the various situations being considered (scholastic, occupational, sports activities and so on) and to the types and degrees of disability which are to be measured. The definitions must serve the purposes of operational research; they must be sufficiently simple and unambiguous to be widely acceptable as a standard of comparison.

The simple classifications used by the National Center for Health Statistics in the United States and described by T. D. Woolsey¹² meet these requirements. They constitute practical criteria for defining disability and

¹⁰ See "Morbidity", *Proceedings of the International Population Conference, Vienna, 1959* (Vienna, International Union for the Scientific Study of Population, 1959).

¹¹ M. A. Heasman, "Population morbidity as indicated by hospital statistics", *Proceedings*, vol. II.

¹² Theodore D. Woolsey, "Classification of population in terms of disability", *Proceedings*, vol. II.

limitation of activity. Their applicability to the various kinds of diseases and causes of disability makes them very useful. Experience shows, moreover, that the frequency and degree of the disabilities resulting from infirmities and chronic disease rapidly increase with age.

In a general way, an evaluation of the level and trend of a people's health, the effectiveness of public health measures and the extent of public health needs and also the planning of public health activities presuppose an adequately developed system of public health facilities and the availability of abundant and adequate public health statistics supplemented by appropriate surveys. Action and information supplement each other for the greater good of the health and welfare of the people.

The validity of these observations is demonstrated in the paper submitted by L. A. Brushlinskaya,¹³ who reports on the results achieved in the USSR through the establishment of a vast and dense network of facilities accessible to the entire population for the treatment and prevention of disease (twenty-two physicians per 10,000 population in 1963). A steady supply of information on the various aspects of morbidity and public health activities is thus assured. Supplemented by special surveys and cause-of-death statistics, this information makes it possible to check on and continuously improve the people's health.

III

The incidence of disease and causes of death on mortality can be measured when reliable statistical information is available.¹⁴ Some solid achievements have been made in this field of research.

As the advance of medicine has been especially effective in controlling the infectious and acute diseases which mainly affect younger persons, there has naturally been an increase in the expectation of life, further progress being hampered by the degenerative diseases (cardiovascular diseases, cancer and so on), which mainly affect older persons.

Some of the papers describe the progress

¹³ L. A. Brushlinskaya, "The importance of morbidity statistics in the evaluation of public health", *Proceedings*, vol. II.

¹⁴ See "Mortality trends, with special attention to areas of low death rates" and "Mortality trends, with special attention to areas of higher death rates", *Proceedings of the World Population Conference, 1954, Rome* (United Nations publication, Sales No.: 55.XIII.8); and "Mortality", *Proceedings of the International Population Conference, Vienna, 1959* (Vienna, International Union for the Scientific Study of Population, 1959).

that has been made in disease control over the years and the results achieved.

The paper submitted by V. K. Ovcharov¹⁵ gives an account of what has been accomplished in the USSR, where from the pre-revolutionary period to the present day the expectation of life at birth has risen from thirty-two to seventy years. The progress made in the fight against death and the direction in which efforts must be concentrated are described. Special attention must be given to the ages at the two extremes of life. With regard to infant mortality, the chief remaining obstacles are those of endogenous origin, such as neo-natal asphyxia, birth injuries and their consequences and so on. At the advanced ages of life, further progress will depend on the extent to which the knowledge and control of degenerative diseases improve.

I. Sandu and P. Mureşan¹⁶ make some very interesting observations concerning the Romanian People's Republic, where considerable advances in public health have been achieved since the pre-war period. Some examples of the progress that has been made are the eradication of certain endemic diseases such as malaria and relapsing fever and a massive reduction in the prevalence of other infectious diseases, particularly tuberculosis. The mean length of life in that country increased by twenty-six years during the period in question. A rise, at the more advanced ages, in mortality attributable to degenerative diseases must be viewed in the light of improved diagnosis. There are grounds, moreover, for hoping that further progress in the prevention and detection of disease will make possible a gradual reduction in the incidence of the degenerative diseases on mortality.

In a study on the secular trends of mortality in the United Kingdom, A. Smith¹⁷ also notes the striking reduction in mortality from infections, particularly from tuberculosis, whereas there seems to have been a relative, and possibly an absolute, increase, especially in recent times, in mortality attributed to neoplastic and degenerative diseases. This trend is quite clear for males, who are especially prone to coronary artery disease and lung cancer. The demographic, sociological and economic consequences

¹⁵ V. K. Ovcharov, "Morbidity factors and trends and their connexion with the level of mortality in the Union of Soviet Socialist Republics", *Proceedings*, vol. II.

¹⁶ I. Sandu and P. Mureşan, "Structural changes in mortality by cause, sex and age group in the Romanian People's Republic over the last three decades", *Proceedings*, vol. II.

¹⁷ Alwyn Smith, "The social implications of morbidity in the United Kingdom", *Proceedings*, vol. II.

of these changes in mortality are considerable. The elderly population is becoming more numerous, and there is an increasing predominance of females, who by the end of the century will probably outnumber males by about two to one at ages over 65 years. Because of the virtual elimination of child mortality (from 1 to 5 years) and the drastic reduction in mortality among young persons and adults, the survivors of the neo-natal period are now extremely unlikely to die before late middle age. On the other hand, at the more advanced ages it is becoming very difficult to reduce the risks of degenerative diseases. In addition to their unknown aetiological and pathogenic components, these conditions are influenced by the individual's living habits and personal hygiene (diet, use of beverages and tobacco, and so on), which are more matters of education than of environment. There is also a likelihood that genetic factors play a part. In very early life, the other major risk, viz., the peri-natal risk, should be easier to control. It is partly linked to external conditions, for important differences attributable to social environment are still observed. Preventive measures such as good obstetric care during pregnancy and delivery should result in further progress.

The decline in mortality in Belgium since the beginning of the century, apart from interruptions due to wars and to serious epidemics of influenza, is described by G. Reginster-Haneuse.¹⁸ The decline in mortality of young persons and of adults up to at least the age of 45 years is accounted for in large measure by the decrease in infectious diseases, tuberculosis, respiratory and digestive affections, and diseases connected with pregnancy and childbirth. The improvement in living and sanitary conditions and the effectiveness, at least in the modern period, of new methods of treatment are given as the reasons for this trend. The rise in mortality attributable to the degenerative diseases (especially circulatory affections and malignant tumours) is obviously linked with the lengthening of the life span. However, at least as regards cancer, and more specifically lung cancer, the increase in mortality must also in some measure be real because it has become most clearly evident only in the past ten years. Although infant mortality has already been greatly reduced, its present rate (27.5 per 1,000 population) should be brought down to an even lower level in order to correspond with economic and social conditions in Belgium.

¹⁸ G. Reginster-Haneuse, M.D., "Mortality trends and causes of death in Belgium", *Proceedings*, vol. II.

The effectiveness of present-day techniques in the fields of public health, environmental sanitation, disease prevention (vaccination) and the treatment of disease (antibiotic therapy) makes it possible to increase the expectation of life at birth within a fairly short period of time. In the developing countries, however, the improvements achieved in this regard lag behind those in the countries where the process of technical development began earlier.

In this connexion, the observations of H. Behm and H. Gutiérrez¹⁹ on the trend of mortality in Chile are very enlightening.²⁰ In the space of about twenty-five years (from 1937 to 1963), the expectation of life rose in that country from 42 to 58 years. This improvement, which mainly affects the younger ages, was brought about through a reduction in the incidence of infectious and parasitic diseases, diarrhoea and tuberculosis. Although the situation is still far from satisfactory, there are a number of obstacles to further progress. Infant mortality and child mortality at the younger ages is still too high; the predominance of infectious pathology is far too great. Communicable diseases have recently been responsible for a level of mortality comparable to that in England at the beginning of the century, although the diseases involved are not, of course, the same. These are no longer smallpox, scarlet fever and diphtheria but rather infectious diarrhoea and even more so, tuberculosis. The reasons for the slower rate of progress are not merely medical but are more general in character. Medical and sanitary techniques may be generally known, but they are of little value unless they are widely applied and can benefit the entire population.

Infant mortality is one of the most sensitive indicators of sanitary conditions and the social and economic level. S. Chandrasekhar²¹ has established the secular trend of infant mortality rates in Madras City.

In that city, the infant mortality rate declined from 280 per 1,000 in 1900 to 167 per 1,000 in 1951 and to 116 per 1,000 in 1961. This improvement, much of which has occurred fairly recently, has been due—as is also the case with the corresponding decline in maternal mortality and in general mortality—to the

¹⁹ Hugo Behm and Héctor Gutiérrez, "Structure of causes of death and level of mortality: an experience in Latin America", *Proceedings*, vol. II.

²⁰ It may prove useful to compare these observations with the results set out in a recent comprehensive study: *Health conditions in the Americas* (Pan American Sanitary Bureau, 1964).

²¹ S. Chandrasekhar, "Infant mortality in Madras City", *Proceedings*, vol. II.

sanitary measures of all kinds (including malaria-eradication campaigns) which have been carried out in the large towns and elsewhere.

Chronic maladies, infirmities of varying degree and the effects of past sicknesses bring their full weight to bear with the approach of old age.

In a 1962 survey of persons aged 60 to 64 years living in the town of Providence, Rhode Island (United States of America), R. G. Burnight²² discovered that 64 per cent reported that they were suffering from a chronic condition or infirmity of some severity or involving some degree of impairment which, moreover, had most often already been diagnosed by a physician. Rheumatic and heart diseases accounted for the highest prevalence rates and were followed by chronic sinusitis and bronchitis, high blood pressure and hearing impairments. It was further noted that the incidence of chronic illness was in inverse relationship to economic status: among those who stated that their financial position was poor, 80 per cent reported the presence of a chronic condition, whereas among those who stated that their position was comfortable, the figure was 57 per cent. The influence of cultural differences must also be considered. The economic consequences are important in view of the fact that 70 per cent of these persons said that they had stopped working for reasons of health.

Despite all the measures which can be taken to reduce the incidence of disease with advancing age, a limit to their effectiveness is eventually reached, at least at the present stage of progress. A stabilization of death rates in the upper adult ages has been observed in the countries where the highest levels of health have been attained. This observation was made by J. Légaré²³ in studying the recent trend of mortality in Norway and in other countries with low death rates. In Norway, female mortality for the 55-75 year age group seems to have levelled off since 1957 whereas male mortality at those ages has even undergone a noticeable increase. A rise, though less marked, in the male rates was also noted in the Netherlands and Denmark. In Sweden, the death rates at these ages are declining, but the pace of the decline is slowing down. This could be due to a process of selection; in any event, the result has been a substantial increase in the propor-

tion of females at the more advanced ages. A thorough study of this question, including the longitudinal observation of generations, would be of great value, since, in the final analysis, it would give some idea of the possibility of lengthening the span of human life.

Time comparison, at least always implicit, between the information that is available, respectively, on morbidity and mortality brings up the question of the extent to which the decline in morbidity is keeping pace with the decline in mortality. No simple answer can be given to this frequently asked question because the situation varies according to the disease involved. It is obvious that mortality resulting from morbidity could be reduced only by overcoming the risk of serious disease or the fatal consequences of disease. It appears, however, that for many categories of disease the reduction in morbidity has been much less significant than the corresponding reduction in mortality. Because of the shortcomings of morbidity statistics, these differences are hard to evaluate. At least a rough idea of their magnitude can, however, be gained from a comparison of current situations with past situations that offer considerable contrast.

On the basis of Czechoslovak social insurance statistics for the periods 1935-1937 and 1962 and of German data for earlier periods (sickness insurance at Leipzig from 1887 to 1907, and invalidity and death rates from the experience of the Prussian Railways from 1868 to 1884), M. Vacek²⁴ comes to the conclusion that for males aged 16 to 60 years there was a considerable decline in the average years of productive life lost as a result of death (7.5 years before 1900, 1.9 years in 1962). On the other hand, the losses as a result of permanent disablement (including losses from subsequent death before 60 years of age) remained almost stable (2.0 years before 1900, 2.3 years in 1962). There was during the same period a noticeable rise—from 0.9 to 1.7 years—in the losses due to short-term incapacity by reason of sickness. There was a slight increase in Czechoslovakia in the average length of future working life for males at the age of 16 years from 37.4 years about 1930 to 38.1 years about 1960, whereas for the same age the expectation of life for males rose from 51.9 to 67.6 years.

It is clear that in the case of many diseases the treatment, which succeeds in preventing death, is more effective than the measures for eliminating the risk of contracting the disease.

²² Robert G. Burnight, "Socio-economic characteristics related to chronic morbidity among older urban males", *Proceedings*, vol. II.

²³ Jacques Légaré, "Mortality at age 45 and over: Recent trends in Norway and other countries with low mortality levels", *Proceedings*, vol. II.

²⁴ Miloš Vacek, "The influence of changing morbidity upon the productive capacity of the labour force", *Proceedings*, vol. II.

This in turn demonstrates the importance which should be attached to disease prevention. There may, however, be good reason for believing that such observations on the frequency of incapacity or disablement should be interpreted in the light of the greater awareness today than formerly of the causes of work interruptions attributable to sickness.

There can in any event be no doubt that morbidity rates and the corresponding mortality rates are declining at a different tempo. This is obvious in the case of diseases such as diabetes and tuberculosis. The question is an important one and deserves attentive study.

It is not only physical health that is involved in population problems, but also mental health. The papers on mental disease are being dealt with last not because this topic is less important but because of its special character.

In a study of the conditions in which mental disorders make their appearance in Denmark, E. Strömberg²⁵ points out the difficulties that are encountered in evaluating the influence of external factors on the emergence of mental disease. He gives attention, however, to the very useful concept of "disease expectancy", by which is meant the preparatory phase of a disease whose appearance may be favoured by the influence of environment, at least in the case of predisposed persons. General population conditions automatically affect the frequency of certain mental diseases and the number of persons suffering from them. A decline in the mortality of such persons will, for example, lead to an increase in the number of schizophrenics; a lengthening of the life span brings about a rise in the number of persons suffering from involutional psychiatric reactions, and so on. Migration leads to urban maladjustment and to the formation of a "residual population" in the areas where the migration originates and where the persons, such as epileptics, mental defectives and the like, who are unsuited to migration tend to remain.

The effect of migration on mental disease is dealt with in greater detail by Everett Lee,²⁶ who notes a convergence of Negro and white morbidity rates in the case of mental disorder in the State of New York. Between the periods 1939-1941 and 1959-1961, the differences between rates of admission for the two population groups to psychiatric institutions in that state

have been diminishing. The rate for Negroes declined whereas the rate for whites rose, with the result that the high differential among Negroes fell considerably. Analysing the origin of the patients, the author notes that the Negro migrants, especially those from other states of the United States, are responsible for the differentials in question. The economic conditions encountered by the migrants have improved, although assimilation difficulties continue to be more marked for the females. The economic and social factors connected with migration are certainly responsible in large measure for this difference in psychiatric morbidity.

IV

To sum up, the authors of the papers had an understandable tendency to emphasize the contrasts observed between the mortality and morbidity situations in countries at different levels of economic development. Stress was laid, on the one hand, on the rapid decline—limited, to be sure, by external factors—in infectious morbidity and mortality and the consequent fall in infant and child mortality, and, on the other hand, on the resistance encountered in overcoming pathological conditions linked with advancing age. The demographic, health, and economic and social consequences of this differential reduction in mortality are considerable. Differing situations with regard to morbidity and mortality risks are also observed, especially in the countries which have not yet attained an adequate level of development. These are due to an inequitable distribution of facilities for the prevention and treatment of disease. An improvement would undoubtedly result if health protection measures were made more widely accessible, for this has been the case where such measures were broadened and made more effective.

There is also discernible in the various papers submitted an underlying current of concern for improved means of measuring the general state of a people's health and for determining the effectiveness of the health conservation measures that have been instituted. In the countries which have a well-organized statistical system of long standing, reliable quantitative data are available on mortality and fairly suitable data on causes of death. In the latter case, however, the statistics are somewhat uncertain and cannot readily be compared. Morbidity statistics have not reached the same degree of refinement as have cause-of-death statistics, mainly because they are harder to define and to organize properly. This is certainly one area

²⁵ Erik Strömberg, "Relation of population problems to mental health", *Proceedings*, vol. II.

²⁶ Everett S. Lee, "Migration and the convergence of white and Negro rates of mental disease", *Proceedings*, vol. II.

of health statistics which needs to be developed, especially in the countries that do not have available any systematic sources of morbidity data.

These ideas and matters of concern which the authors of the papers have so clearly delineated can provide a valuable basis for the

discussions on the topic of meeting B.3, and although they may not be conducive to a discussion of all its aspects, for the subject is very vast, they will at least make it possible to carry a bit further the knowledge and the methods relevant to more limited sectors of action.

Statement by the Rapporteur: Mr. TYE CHO YOOK

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Discussion on the subject assigned to meeting B.3 (mortality, morbidity and causes of death) was divided under two headings: patterns of causes of death and their relation to levels and trends of mortality, and conditions and trends in morbidity and their relation to levels and trends of mortality.

A. PATTERNS OF CAUSES OF DEATH AND THEIR RELATION TO LEVELS AND TRENDS OF MORTALITY

In advanced countries of relatively low mortality, much concern is centered around mortality in older ages resulting from chronic and degenerative diseases, such as malignant neoplasms (or cancers) and diseases of the circulatory system, which form the major causes of death in these countries. In this context, emphasis was directed at two aspects of cause of death: first, in the older ages a high proportion of deaths are due to multiple causes (that is to say, the presence of, and interaction between, two or more morbid conditions or pathologies, jointly present in the individual, prior to and at the time of his death); and, second, the aetiologies of such diseases are complex and long-term, having as their roots events extending many years into the past, in the medical and personal history of each individual. These circumstances give rise to the question of whether or not a primary tabulation of cause of death is adequate or meaningful, and suggest that statistics of causes of death should be expanded to provide for analyses of multiple causes. It is also necessary, in the pursuit of more reliable and accurate certification of causes of death, to ensure that relevant and available pathological and other evidence should be taken into account, together with clinical evidence, in the determination and certification of the underlying cause of death. More linkage between records of the different branches of hospital services would be needed for this purpose. Evidence was adduced showing that mortalities attributed to certain causes could be

rather substantially altered in level, depending on whether or not autopsy records were available and used by physicians in the certification of causes of death.

In the context of mortality trends in advanced countries, the phenomenon of a reversing or rising trend in mortality after midlife (that is to say, above 45 or 50 years of age) raises questions as to its causes and implications to which no adequate answer seems to be presently available.

Great care was advocated in the interpretation of similarities or differences between mortality trends and patterns of different populations, and especially in the tendency to extend or apply the experience of one country to the projection of future trends and patterns in other countries which seem to be at an earlier stage of mortality evolution. It was suggested that similarity at some particular stages of evolution in two population mortalities might reflect similarities in the phenotypes as opposed to the genotypes of the populations; and unless the genotypes were also similar, the subsequent patterns would be likely to diverge. Therefore, apparent similarities between two mortality patterns (whether or not they refer to different years in time), is no assurance that projections for one based on the experience of the other would be valid.

A better understanding needs also to be gained regarding the interrelation between mortality levels at different ages of life, and the effect of changing patterns of selection through mortality at earlier ages on mortality patterns in the older ages. In this connexion it was noted that inadequate use was being made of generation life tables, because of the technical and practical difficulties in their computation.

Regarding mortality in the developing countries, concern was expressed over the continuing high levels of mortality due to infectious and parasitic diseases. Attention was

drawn to a peculiarity in parts of tropical Africa where, relative to the decreased mortality level among infants, mortality is unusually high among children aged 1 to 4 years in general, and among one-year-old children in particular. A peak in mortality at this age does not seem to have been noted at any time in the history of European mortality. It was also pointed out that snake bites in that population were perhaps as important a cause of death as motor-vehicle accidents in advanced countries.

A point raised by many discussants was that there was not sufficient evaluation and understanding of the relative effects on mortality of levels of living on the one hand, and medical and health services on the other. It seems clear, however, that the potential effect of improved or increasing medical and health services in developing countries is inhibited, if not limited, by low levels of living. This would suggest that mortality patterns associated with the trend of mortality decline in these countries can be, and are likely to be, rather different from those previously experienced in the history of the advanced countries, where rising levels of living preceded, or at least accompanied, improving health technology as a major factor responsible for mortality decline.

The discussion also touched on two aspects of the socio-economic implications of increased longevity resulting from mortality decline. First, a higher proportion of persons surviving through to the end of working age means a saving to the community in terms of working years of life. This represents greater returns on investments in human resources, and more effective use of the special capabilities acquired by workers through longer experience. Second, socio-economic planners, and especially administrators of pension plans, should recognize that, if retirement age remains unchanged, the pension payroll will increase, and could, in some circumstances, reach an ultimate level of as much as one-half the payroll of active workers.

B. CONDITIONS AND TRENDS OF MORBIDITY AND THEIR RELATION TO LEVELS AND TRENDS OF MORTALITY

The meeting noted the relative paucity of morbidity studies and emphasized the place of morbidity, or more broadly, the state of health, as a demographic characteristic of vital importance in any country. In the past, the health status of populations had tended to be considered indirectly, by the presentation and discussion of mortality data on diseases. In this regard, mortality indices as measurement of ill

health had been over-emphasized, if not misused, and consumers of such data might have tended to forget that this was only an expediency made necessary by the paucity of morbidity data in most parts of the world.

It is fallacious to think that mortality level is inversely proportional to the level of health, or that achievements in reduction of mortality can be directly interpreted as achievements in reduction of morbidity. This is not to say, however, that such a direction of correlation may not be present to a fairly high degree in the broadest sense and over a fairly wide spectrum of values, but mortality data and differentials, particularly for specific diseases, do not adequately reflect morbidity levels and differentials in a population. It is well to be reminded that mortality is a function both of the fatality of a disease and of its morbidity level; and while mortality of dangerous infectious diseases has been reduced by the prevention of morbidity itself, this is not true of most other diseases. It is possible that for some diseases (and evidence has emerged to suggest this, particularly in diseases of old age), morbidity may have been rising, in contrast to age-specific mortality which may be falling as a result of a fall in fatality alone. Such questions can also be raised in respect of mental diseases, and of injuries resulting from occupational accidents or road accidents, where the relation between morbidity and mortality has not been adequately studied. Morbidity of chronic diseases in the older ages cannot be effectively controlled or prevented by traditional public health measures, but only by the successful identification of those persons who are particularly vulnerable to these diseases, and to whom personal measures of preventive treatment can be given. The term "vulnerable group" or "high-risk group" has been described as a homogenous group of persons among whom the probability of falling ill is much higher than in the general population, and this is necessarily an extension of the morbidity concept. Special data, linking events and characteristics over time, are required for the type of epidemiological analyses needed for the identification of such groups with respect to specific morbidities.

Much discussion was devoted to ways and means of increasing and improving morbidity records so that more meaningful data could be obtained for morbidity studies. It was recognized that routine records of medical and health institutions constituted a major source of morbidity data. The inadequacies and limitations of hospital statistics as the basis for morbidity estimates are well known; nevertheless, con-

siderably more advantageous use could be made of hospital data for morbidity studies than is at present the case in most countries. Attention must be given to the design and organization of hospital records with greater orientation towards the objective of providing information for morbidity studies, in addition to the more immediate objective of meeting administrative requirements within the hospital.

Centralized hospital and medical care records, for example, can make better provision for linkage of information over both space and time, so that not only can re-admissions and multiple utilizations be taken into account, but past medical history as well as information from various branches or units of the service can also be assembled for each individual.

This is important, among other reasons, to facilitate the study of disease processes at all ages, and the complex etiologies of chronic and degenerative diseases that must be related to events, physiological characteristics, and other circumstances operating at different stages of a person's life. Similarly, the study of endogenous diseases of infancy, which have their roots in past events, also demands the ability, in record systems, to link events in time.

Some difficulties have been experienced with attempts to increase records linkage, which have given rise to some doubts as to its practicability; but there is broad agreement, nevertheless, that linkage applied to data relating to both morbidity and mortality is likely to become an increasingly essential part of activities in vital statistics offices as well as medical records offices.

In statistically sophisticated countries, especially in those where comprehensive national medical and health care programmes have been in operation for some time, much progress has already been made in the collection of integrated health data along a number of lines. In one country, for example, computer centres are used to process hospital data on a regional basis. This appears to have a twofold advantage, first, that of integrating hospital records for the regional populations, and, second, of permitting rapid feedback of statistical information to the hospital units or departments. This has also resulted, according to one speaker, in physicians taking a greater interest in the proper collection of information as they find themselves part of a self-improving system and are able to use the computer as an extension of their own thinking. Such regional integration can clearly be extended to other health institutions and personnel outside the hospital.

Some countries, though to date very few, are attempting to obtain morbidity data for the entire population by a system of reporting and centralized registration of all new cases of morbidity found by any doctor or health institution in the country.

Some countries also have morbidity data from records of periodic medical examinations of various sectors of the population.

Morbidity sample surveys constitute another major direction of development and, if integrated with social or family living surveys, enable studies to be made not only of morbidity patterns but also of their interrelation with levels of living.

In developing countries, particularly in areas lacking in routine sources of morbidity data, the survey approach is especially important as a means of obtaining much needed morbidity assessment. Surveys have been carried out, for example, to study the levels of specific conditions such as helminthic infections and diarrhoea; to study changes over time, in response to improvements in environmental sanitation and water supply; to study the amount of gross illness generally, and to study the needs for medical and health services and the extent of utilization of existing services. These experiences have shown that, provided that adequate attention is given to the formulation of specific, clear and objective criteria of each illness or characteristic appropriate to the particular objective of the survey in question, data of very great value can be obtained through relatively simple morbidity surveys. The cost of such surveys can be minimized by using lay interviewers or para-medical personnel such as medical students, nurses and health inspectors.

The sources, quantity and quality of morbidity data available depend, of course, on the stage of development of health services and record systems in the different countries. But the study of morbidity and its relationship to mortality is no less important in developing countries where data are scarce than in the more advanced countries. It is important, especially in the developing countries, to have adequate data for the scientific planning of health services as well as for their evaluation at the various stages of their implementation. This would help to ensure that limited resources will be utilized to the best advantage to meet the changing health needs of the peoples in these countries.

The following speakers took part in the discussion: Cantrelle, Cerkovny, Mureşan, Ovcharov, Somogyi, Vostrikova.

Internal migration, with special reference to rural-urban movement

Statement by the Moderator: Mr. D. J. BOGUE

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The thirty or so papers submitted for discussion at this meeting paint a picture of a very dramatic redistribution and concentration of the world's population. The proportion of the total population living in cities has increased remarkably, while the rural areas are growing only slowly or actually declining. No immediate end to this process seems to be in sight. One implication of this is that all over the world the frontier phase of population distribution has already ended or is drawing to a close. Settlement has been pushed into the arctic regions, into jungle rain forest and into desert and mountainous territory, almost to the limit that is practicable under present technology. Only a very few papers, such as that by M. Diégues Jr. of Brazil,¹ mention the settlement of new areas and net migration towards rural areas. The data presented suggest that, even in these regions, the additional population to be settled on new land will be a small fraction of additional population growth. T. L. Smith finds direct evidence that in Brazil the building of new cities in frontier areas is a major factor in rural-urban migration and that many migrants are flowing from old to new cities as a result.² Thus urbanization is the order of the day, even in newly developed territories.

An impressive characteristic of the papers submitted is the similarity of the picture they present. Thus, the paper by S. Agapitidis describing urban growth in Greece and Turkey³, that by K. Horstmann concentrating on western Europe⁴ and that by M. V. Daragan

on the Soviet Union⁵ appear to be describing identical processes. The rural-urban movement is one that transcends political boundaries, stages of economic development and political ideology. A unique paper in this regard is that of S. Vamathevan, who finds comparatively little urbanward migration in Ceylon for the period 1947-1953.⁶ However, it is quite possible that within the past decade the tide has turned there also.

So extensive are these movements that they have a tremendous demographic, economic and social impact—both upon the sending and the receiving areas. K. Tekse of Hungary uses the term "socio-occupational restructuration" to describe it.⁷ Agricultural workers are entering the non-agricultural labour force by the millions, and in the process a significant proportion are achieving higher economic status. Thus, urbanward migration appears to be a great demographic movement towards modernization and improvement of the world's level of living through industrialization.

Nevertheless, worldwide migration to the cities is also creating social problems. The cities are often unable to absorb all the migrants who come, and they are forced to settle on the outskirts in flimsily built shantytowns. These settlements are often illegal, and as a result municipal administration and public services, such as streets, water, sewerage, police, fire protection and schools, are completely lacking. Conditions in such "mushroom settlements" are sometimes worse than in the village from which the migrants departed. Such encampments, which are now a conspicuous part of developing cities everywhere, are tangible

¹ Manuel Diégues, Jr., "Internal migration in Brazil", *Proceedings*, vol. IV.

² T. Lynn Smith, "The role of internal migration in population redistribution in Brazil", *Proceedings*, vol. IV.

³ Sortiris Agapitidis, "Internal migration in Greece and Turkey", *Proceedings*, vol. IV.

⁴ Kurt Horstmann, "Rural-urban migration in the European Economic Community", *Proceedings*, vol. IV.

⁵ M. V. Daragan, "Economic development and internal migration", *Proceedings*, vol. IV.

⁶ S. Vamathevan, "Some aspects of internal migration in Ceylon", *Proceedings*, vol. IV.

⁷ Kálmán Tekse, "On some interrelationships between occupational mobility and migration to Budapest", *Proceedings*, vol. IV.

evidence of over-rapid population growth. J. A. Ponsioen of the Netherlands uses the very informative term "pre-industrial proletariat" to refer to these stranded populations.⁸ The paper by C. Senior describes the problems of adjustment which rural migrants experience when they settle in the vicinity of large metropolises.⁹ The paper by A. Bose of India presents data revealing very large sex imbalances among the migrant population, with the excess of one sex over the other occasionally reaching the ratio of 2:1.¹⁰ The animal-like existence led by many of the migrants rejected both by the city and by the village brings with it social disorganization, crime, disease and political instability. Like the migration from which it results, this problem is blind to differences of political ideology.

There is a danger that the problems of urban concentration may lead to disregard of the very far-reaching consequences which this population drain has upon rural areas. The papers by G. Beijer of the Netherlands,¹¹ K. Horstmann of the Federal Republic of Germany,¹² M. V. Daragan of the Ukrainian Soviet Socialist Republic¹³ and M. Ueda of Japan¹⁴ discuss the very strong effects which may result upon age structure, sex ratios, fertility levels, vital rates and socio-economic characteristics of the rural population. Since the migrants are heavily concentrated in the younger ages (roughly two thirds being between the ages of 15 and 29), the effect is to depress rural birth rates and urban death rates. In some European countries rural areas now have lower birth rates than the cities, because of their unusual age structure.

Another outstanding trait of the papers submitted is that they do not stop with a description of the phenomena of migration and its effects, but go on to analyse and explain it.

⁸ J. A. Ponsioen, "An analysis of—and a policy regarding—rural migration in developing countries", *Proceedings*, vol. IV.

⁹ Clarence Senior, "Integration problems of recent rural migrants to United States cities", *Proceedings*, vol. IV.

¹⁰ Ashish Bose, "Internal migration in India, Pakistan and Ceylon", *Proceedings*, vol. IV.

¹¹ G. Beijer, "Demographic, social and economic aspects of internal migration in some European countries", *Proceedings*, vol. IV.

¹² Kurt Horstmann, "Rural-urban migration in the European Economic Community", *Proceedings*, vol. IV.

¹³ M. V. Daragan, "Economic development and internal migration", *Proceedings*, vol. IV.

¹⁴ Masao Ueda, "Internal migration affecting age composition and fertility, with reference to Japan", *Proceedings*, vol. IV.

There seems to be general agreement that three key variables are involved in migration flows: employment, income and rapid population growth. Migrants flee from areas where employment opportunities are stagnant, where income is low and where the rate of population growth is high. (Often these three conditions are found together.) Conversely, they are attracted to areas of new industrial development, regions of higher per capita income and areas where the disparity between birth and death rates is less. This is emphasized in the papers by T. Kuroda of Japan¹⁵ and by G. C. Myers of the United States.¹⁶ When the disparity between areas is great, these flows are large; when the disparity is small, the flow is only a trickle. The effect of the general level of economic prosperity upon migration has been explored by D. S. Thomas.¹⁷ She finds an accelerated flow of migration in the United States during periods of greater prosperity and a slackening during periods of lower economic activity.

The hypothesis that non-economic factors also influence urbanward migration is widely accepted. The attraction of the city's amenities and the opportunities which it affords to break away from tradition and escape from the low social status ascribed by traditional rural society are mentioned in several papers. As yet, there has been little success in measuring these variables directly. R. M. Prothero's paper in particular emphasizes the presence of these factors.¹⁸

An important deficiency in the documentation on this topic is the shortage of analyses of differentials in migration, or the tendency for some parts of the population to be more mobile than others. Of the papers concerned with this aspect, that by A. R. Miller of the United States reports that, with the exception of professional workers, inter-occupational differences tend to be smaller than has perhaps been generally believed, when the factor of age is controlled.¹⁹ Dr. Everett Lee, reporting upon the incidence of mental disease

¹⁵ Toshio Kuroda, "Internal migration: an overview of problems and studies", *Proceedings*, vol. IV.

¹⁶ George C. Myers, "Migration and modernization: The case of Puerto Rico, 1950-1960", *Proceedings*, vol. IV.

¹⁷ Dorothy Swaine Thomas, "Internal migration in the United States: 1870-1960", *Proceedings*, vol. IV.

¹⁸ R. Mansell Prothero, "Characteristics of rural-urban migration and the effects of their movements upon the composition of population in rural and urban areas in sub-Saharan Africa", *Proceedings*, vol. IV.

¹⁹ Ann R. Miller, "Migration differentials among occupation groups: United States, 1960", *Proceedings*, vol. IV.

among migrants and non-migrants in New York State, finds that the incidence of mental illness is higher among migrants than among non-migrants, although there is a tendency towards equalization of this differential. Whether the mental illness is a cause or an effect of migration is a topic for further research.

A group of excellent technical papers is concerned primarily with methodology. Among these is the paper by H. T. Eldridge studying patterns of dominance in internal migration.²⁰ The author divides internal migration in the United States, 1955-1960, into primary, secondary and return migration. Given two communities, migrants will be found flowing in both directions between them. The larger flow is classified as the dominant stream of the two and the smaller as the reverse stream. Return migration is "failure migration", or the return of the migrant to his place of origin. The author makes her measurement and classification in two ways: once in terms of absolute size of the streams, and once by comparing respective out-migration rates. Quite different results are produced by the two procedures. This important insight deserves further study, especially in terms of differential characteristics.

Several measures and mapping techniques for studying internal migration are presented by R. Bachi of Israel.²¹ He proposes a concept, "preferred directions in net migration", which is similar to H. T. Eldridge's concept of "dominant" migration. He also reviews a number of techniques for mapping migration events and summarizing voluminous statistics. The continuous effort to construct mathematical models of migration is represented by the paper of A. Ghosh,²² based upon data for the Calcutta metropolitan region.

A most welcome set of papers for this meeting are those from the Soviet Union,²³

Romania²⁴ and Hungary.²⁵ Demographers have long been hungry for an exchange of migration information with fellow-scientists in the Soviet Union and eastern Europe. The paper by M. V. Daragan, reporting on the systematic collection of migration data in the Soviet Union and summarizing recent migration trends there, is an important contribution, as is the paper by L. L. Thirring describing recent migration trends in Hungary, Bulgaria, Czechoslovakia and East Germany.

Several papers mention the need for, or desirability of, a national migration policy. There is rather general acknowledgement that such a policy cannot be easily accomplished by legal enactments, but must consist rather of guiding migration through influencing the locations at which new economic enterprises are constructed. There seems to be general approval of the idea that backward regions should be industrialized rather than that more advantageous regions should be permitted to depopulate the depressed regions, to the extent that this is economically practicable. In particular, there is endorsement for the idea that great metropolises should be deconcentrated. That such deconcentration is actually taking place spontaneously is demonstrated in the papers by K. Schwarz²⁶ and K. Horstmann²⁷ of the Federal Republic of Germany which report net migration losses for several major European cities, accompanied by large migration gains in the suburban areas immediately surrounding these cities.

Much valuable statistical documentation has unfortunately had to be omitted in the reproduction of some of these papers. It is hoped that some means may be found whereby interested international readers may have access to it. The study of internal migration as a whole labours under the major handicap of insufficient data. The census plans recommended by the United Nations do not lay sufficient emphasis on the desirability of a study of internal migration as an essential part of each decennial census. It is hoped that a

²⁰ Hope T. Eldridge, "Patterns of dominance in internal migration: United States, 1955-1960", *Proceedings*, vol. IV.

²¹ Roberto Bachi, "Analysis of geographical data of internal migration", *Proceedings*, vol. IV.

²² A. Ghosh, "Immigration from rural areas into Calcutta metropolitan region: Analysis and projection", *Proceedings*, vol. IV.

²³ M. V. Daragan, "Economic development and internal migration", *Proceedings*, vol. IV; O. A. Konstantinov, "Rural-urban migration as a factor of economic development and adjustment of the ratio of urban/rural population to the general level of productive forces", *Proceedings*, vol. IV; V. I. Perevedentsev, "Relationship between population migration and ethnic convergence in the Soviet Union of today", *Proceedings*, vol. IV.

²⁴ I. Ravar, "Investments and the internal migration trends of manpower in the Romanian People's Republic", *Proceedings*, vol. IV.

²⁵ Kálmán Tekse, "On some interrelationships between occupational mobility and migration to Budapest", *Proceedings*, vol. IV. Louis Lajos Thirring, "Internal migration in Hungary and some central and east European countries", *Proceedings*, vol. IV.

²⁶ Karl Schwarz, "The influence of internal migration in the Federal Republic of Germany on the population trend in urban agglomerations", *Proceedings*, vol. IV.

²⁷ Kurt Horstmann, "Rural-urban migration in the European Economic Community", *Proceedings*, vol. IV.

much more active interest can be generated around the world, so that data which are internationally comparable as well as internally useful can be obtained at the time of the 1970-1971 census cycle.

In developing explanations of migration, it should always be borne in mind that this is a demographic process the function of which is adjustment or readjustment. Migration is a population's way of attempting to re-establish equilibrium, or to effect a major economic or social change. Therefore, its directions, its

modes of operation and the factors to which it is responsive may differ from one decade to the next. For this reason, much of what is "known" about the causes and consequences of migration today may turn out to be only partially true when predicting what will happen tomorrow. Nations which are now in the grip of devastating rural-urban migration would do well to study their own current situation carefully, rather than seek for explanations in the current or past history of the United States, the Soviet Union or western Europe.

Statement by the Rapporteur: Mr. K. C. ZACHARIAH

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The meeting on internal migration began with a brief statement by the Chairman on the importance of the study of population movements in the context of the social and economic changes in a country. She stressed the need to limit the discussion to scientific analyses of facts and to avoid speculations based on insufficient and defective data.

The Organizer explained that the meeting would be devoted especially to rural-urban migration, with particular emphasis on volume and trends, factors affecting rural-urban migration, and characteristics of migrants. He said that he had invited papers on the pattern of internal migration in countries of South-East Asia, the Arab world, the Scandinavian countries and some of the Commonwealth nations, but the response had been poor. He stressed the growing importance of the study of internal migration in all parts of the world and the need to pay more attention to conceptual problems of the classification and analysis of internal migration.

Altogether thirty papers, eleven invited and nineteen volunteered, were discussed at the meeting. The Moderator, in summarizing the papers, added many cogent remarks of his own which enriched the presentation.

The papers indicate that a very drastic redistribution and concentration of the world's population is under way. All over the world the frontier phase of population distribution has already ended or is drawing to a close. The proportion of the total population living in urban areas in general and in large cities in particular has increased remarkably in recent years, and this increasing trend is continuing at an accelerated pace in most parts of the world. There are, however, areas in the world where the trend has slowed down. Among

developing countries Ceylon is one example, and India is perhaps another where such a trend is noted. A deeper examination of the deceleration in the trend of urban-rural migration in these areas might give important clues to the factors affecting migration.

The Moderator emphasized the similarities of the pattern of internal migration in the various countries of the world. The fact of rural-urban migration is one that transcends political boundaries, stage of economic development and political ideology.

Rural-urban migration is one of the chief means of population redistribution, from the poor and the least desirable parts of a nation into richer and more industrialized parts where the migrants can improve their lot in life. Urbanward migration thus appears to be a great demographic movement towards modernization and improvement in the people's level of living. At the same time, in many developing nations, the cities to which migrants flock in large numbers are finding it more and more difficult to absorb them fully at the rate at which they arrive. As a result, many of the migrants remain unemployed or underemployed for long periods of time, and are forced to live in slums and shanty towns, multiplying the problems of municipal administration. Their living conditions in the city are often worse than in the village from which they departed.

Three variables were emphasized by the Moderator as the key factors involved in migration flows. They were expanding employment opportunities, higher income levels and differential fertility. Migrants leave areas of stagnant employment opportunities, areas of low income, and areas where the rate of population growth is high. They are attracted to areas of new industrial development, regions

of higher per capita income and areas where the growth rate is low.

Reference was also made to some methodological points. The need to control the factor of age in all studies of migration differentials is one of these. Another concerns the need for a typology of migrations: primary, secondary, and return migration, dominant and reverse streams, and the concept of preferred direction in net migration. A third relates to the construction of migration models.

In conclusion, the Moderator emphasized that migration was a demographic process whose function was one of adjustment, or re-adjustment. It is a population's way of attempting to re-establish equilibrium or to effect major economic or social changes. Much of what is known about the causes and consequences of migration today may turn out to be only partial truths in predicting what will happen in the future. There is, therefore, need for continued research on factors affecting rural-urban migration.

Such research is now being carried out in demographic centres all over the world, particularly at the two United Nations Demographic Centres, at Chembur and Santiago. The representatives of these Centres made brief statements on the research projects on migration in progress at their Centres.

It was noted that the Chembur Centre has developed an integrated programme of research using census and survey data on the volume, direction and characteristics of migration to Greater Bombay. The project includes: (i) analysis in collaboration with the census Commissioner of India of the special tabulations of the 1961 census for Greater Bombay; (ii) a sample survey of the rural areas in which migrants to the city originate; (iii) a sample survey of in-migrants in Bombay City. The census data are used to estimate volume, intensity and direction of migration and certain aspects of migration differentials, selectivity and assimilation. A provisional report on this project has been published. The survey data give information on migration history, motivations and the process of assimilation. These data supplement the census data and together they provide an integrated picture of the process by which agricultural workers around the city enter non-agricultural pursuits in the city.

The Centre at Santiago has a project quite similar to that in Bombay. CELADE has accumulated in Santiago census data from ten countries in the region. Data from six more countries will be added soon. These data include information on duration of residence, area

of origin, etc. With these data, a programme of the analysis of the volume, direction and characteristics of migration has been initiated. The census analysis is being supplemented by sample surveys in cities and villages. A migration survey at Greater Santiago has already been completed and the report published. A similar survey, but with greater details on the characteristics of migrants, will be initiated in Lima in the near future. A number of other localities, both urban and rural, are included in the programme of research at the Centre.

About twenty-five persons participated in the discussion which followed the statements by the Moderator and the representatives of the Centres at Chembur and Santiago. The discussion covered a variety of topics including points related to the methodology of migration analysis, factors affecting rural-urban migration, effects of population shifts from rural to urban areas, and policies related to internal migration.

Discussion on methodological questions were related to: (i) the place of sample surveys in collecting migration data; (ii) the place of longitudinal surveys in migration studies; (iii) the type of population to be investigated in studies of factors affecting rural-urban migration; (iv) the relative advantages of the micro- and macro-type of analysis; and (v) the question of international comparability of migration statistics.

Population registers are by far the best source of migration data, but such data are available for only a few countries. It was pointed out that a few simple questions such as place of birth, place of residence x years ago, duration of residence in the place of enumeration, etc., in censuses, can with proper tabulation and careful analysis provide a good deal of information on internal migrations, particularly that related to volume, intensity and direction of migration, and on the characteristics of migrants. In this connexion, the study of migrants in Greater Bombay undertaken by the Chembur Centre, using the data from the 1961 census of India, was mentioned as an example. Sample survey data on migration histories, motives for migration and the assimilation of migrants at their destination will provide supplementary information. One of the discussants emphasized the need to give greater emphasis to sample surveys and to link migration surveys with labour force surveys. Since migration analyses are of limited value without cross-classification by a number of factors, the sample size required for migration surveys will usually be very large. As migration

is an areal phenomenon, information has to be provided not only for the universe as a whole but also for smaller areal units.

Cross-sectional studies have many limitations in the measurements of return migration, the extent of migration by stages, and the propensity to geographic mobility of persons having various social and economic characteristics, etc. Population registers are ideal for longitudinal studies, but during the discussion several alternative sources such as the use of actual age cohorts, matching studies and retrospective data on mobility history were suggested and their applications illustrated. As an example of matching studies, the use of the list of households obtained in sample surveys such as the Moroccan Multi-Purpose Sample Survey, or the Indian National Sample Survey in which the investigations are done in more than one round, was mentioned. By matching data collected in different rounds, it is possible to make estimates of propensities to migration for the whole population as well as for various sub-groups. The possibilities of using other indirect sources for longitudinal studies need further exploration. Similarly, there is scope for methodological innovations in using cross-sectional data to get information which is ordinarily obtained from longitudinal studies. The possibility of estimating the rate of return migration from duration of residence data is one such instance.

The appropriate population to be investigated in studying the factors affecting rural-urban migration also came up for discussion. One of the participants mentioned that the village and household structure of rural Africa allowed one to build up a complete picture of persons who stay as well as those who leave the village, and that this was the only really satisfactory way of studying the motives for rural-urban migration. While it may be agreed that it is essential to study rural population and to obtain information about out-migrants from people who stay behind, such studies will have to be supplemented with information from the city to which the migrants move. Migration involves not only a decision by the migrant to leave his place of residence, but also a decision to accept a new place of residence. The factors associated with both these decisions are part of the process involved in rural-urban migration.

Reference was also made to the emphasis given to studies of differentials and selectivity in present-day migration research and the lack of emphasis given to factors such as location of industries and structure of industries. It is perhaps not quite correct to think that due

importance is not given to economic factors where such data are available. The University of Pennsylvania study is a case in point. Lack of usable data and not the failure to recognize the importance of these factors is perhaps the major reason for the shortage of studies in this direction.

The relative advantages of micro-types and macro-types of analysis for studying factors affecting migration were also raised in the discussion. It was mentioned that sample surveys were particularly adapted for the micro-type of analysis; that is, analysis based on the cross-classification of migrants' personal characteristics. The scope of such analysis was illustrated by the example of the migration survey in Greater Santiago.

One last point of a methodological nature related to the international comparability of migration statistics. It was suggested that countries should publish statistics using the definition of agglomeration proposed at the Prague International Conference of European Statisticians. It is, however, doubtful whether the proposals of the European statisticians can be uniformly applied to all countries, which vary considerably in population size, area, and in the stage of economic and social development.

The importance of employment opportunities, income and differential fertility as key factors in rural-urban migration was pointed out earlier by the Moderator. These factors were further emphasized during the discussion, and examples were quoted from Italy, Poland, Cameroon, Mali, etc. The role of industrialization and the consequent creation of new employment opportunities was mentioned especially by several discussants. Similarly, the importance of rural education was emphasized more than once. It appears that in most of the developing nations it is the more educated among the rural people who leave the village for the towns. This is evident from the experience of many countries, especially of Ghana, where, as pointed out by one of the discussants, a common reason for migration to towns is "because I have been to school". With the introduction of universal adult education in most of the developing nations, the importance of education as a factor stimulating rural-urban migration is bound to increase. The short-term and long-term effects of the draining of talents from the rural areas deserve deeper analysis.

The tendency for migrants to return to the place of origin was also pointed out as a major factor affecting population mobility, particularly for countries in Asia and Africa. As a result of the to-and-fro movements between the village

and the town, the population movements are disproportional to the net displacement of population between these areas. Measurements of the extent and characteristics of return migration are more difficult, but such measurements are needed to get a clear picture of the social and economic effects of return migration.

A number of other factors were also mentioned as relevant to rural-urban migration. These included development of new urban settlements, amenities in towns, desire to break away from the traditional social constraints in the villages, changes in political system, etc. In countries like Turkey, external migration is also a factor affecting rural-urban migration, in the sense that rural peasants flock to the cities awaiting their opportunity to move out of the country.

The discussion from the floor related also to the effects of rural-urban migration and the need for a migration policy in each country. Among the effects of migration, mention was made of the effect on birth rate, the practice of family planning, and natural increase in metropolitan cities, stagnation of population in small towns and villages, the reduction in income disparity between the sending and receiving areas, improvement in the skills of the migrants and the non-migrants at destination, and integration of ethnic groups within a population. The effect of migration on the spatial structure of cities was also mentioned.

It was suggested that studies on internal migration should be oriented towards the formulation of policy measures which could be integrated with the overall economic and social policy of a country. Several countries have policies of deconcentration of large metropolises and these policies are implemented generally through judicious location of new industries. Efforts are also being made in some countries to reduce rural exodus by a concerted effort to make the rural areas more attractive. During this discussion, the policies in Pakistan and Cameroon were described. The creation of new rural values compatible with development which will command the loyalty of educated villagers should be an essential part of all such policies.

In conclusion, it may be mentioned that, during the last decade, considerable progress has been made in research on internal migration in several parts of the world. The data on internal migration have become more

numerous. Several methodological innovations have been introduced during this period and it is now possible to obtain a much better understanding of the process of migration from census data. Thanks to the training programmes organized by the United Nations and some universities, the number of research workers interested in the problem has increased. At the same time, with the large-scale concentration of population in metropolitan cities that is taking place all over the world, problems associated with internal migration are also assuming greater magnitude. In order to appreciate these problems and devise means of dealing with them, much more co-ordinated research is needed. A primary prerequisite for this purpose is more data related to the various aspects of internal migration. The census data on migration have several defects, but for some time to come, these will remain the major source of migration data. Efforts should therefore be made to collect migration statistics in censuses on a uniform basis in all countries to provide information on at least the volume, the directions and some of the basic characteristics.

There are several problems in the field of internal migration, which should receive the immediate attention of research workers, but those related to factors affecting rural-urban migration in Asia, Africa and Latin America seem to be the most urgent. A very large number of people are drifting towards the towns. Our knowledge of the factors affecting this large-scale migration is still rudimentary. As noted by the Moderator, nations which are now in the grip of devastating rural-urban migration cannot afford to substitute for a study of their current urban migration situation, explanations and theory derived from past history of Europe or North America. In such studies, the immediate problems connected with the provision of municipal facilities to a fast-growing city population should not dissuade us from examining the probable long-term effects on the economic and social development of the country as a whole.

The following speakers took part in the discussion: Adil, Agblemagnon, Ahmed, Borowski, Bose, Caldwell, Cillov, Daragan, Das Gupta, Elizaga, Kamion, Kosinski, Kuroda, Mansell Prothero, Miro, Nazarevsky, Pokshishvsky, Ravar, Sabagh, Shryock, Somogyi, Spencer, Stefanoff, Tonye, Tugault, Zaremba.

MEETING A.8

Demographic aspects of urban development and housing

Statement by the Moderator: Mr. N. V. SOVANI

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The point of departure for this discussion is clearly the pattern of urbanization. Even the most casual examination of its course in the world in the last few decades reveals urbanization as a forward moving phenomenon which manifests different and varied characteristics in its different phases. The world-wide urban crisis, in developed and developing countries alike, is discussed in terms of broad economic and demographic differentials in the paper by E. Weissmann.¹ Although the phenomenon of urbanization is still evolving, as it presents itself to us today, it may be said to fall into two stages—a primary and a mature stage. The characteristics of these two stages seem to be sufficiently differentiated as well as sufficiently localized for easy identification and concretization. The primary stage displays the well documented features that have become familiar to us—the proportion of urban population to the total steadily increasing, larger towns and cities increasing at faster rates than other urban areas, urbanization itself giving rise to further urbanization, growing congestion in towns, etc. This is the phase in which most of the developing countries in the world are to be found.

Three volunteered papers deal with the process and pattern of urbanization in three European countries, Turkey, Greece and Spain, which lie on the border between developed and developing countries, but which are, so far as urbanization is concerned, all in the primary stage. In Turkey the proportion of the urban population increased from 16 to 25 per cent between 1927 and 1960. The big city group is growing the fastest. Urban population growth has been concentrated in the urban centres that existed in 1927. Growth clusters composed of regional groups of cities seem to be emerging. Urbanization is bringing a host of problems in

its wake. The housing crisis which is accompanied by the problem of squatters, is acute. Other problems lie in the area of public services and development works.²

Greece presents a slight contrast. Although from the point of view of fertility and mortality, Greece is closer to the developed countries, from the point of view of urbanization it can be classified between the developed and the less developed countries. The proportion of the urban to the total population rose from 17 per cent in 1910 to 42 per cent in 1960. The increase in the urban population is mainly due to the increase in the two agglomerations of Athens and Salonika. The sex ratio of the urban population shows a diminishing trend over time. The urban population has a higher proportion of population of working ages and a lower proportion of children than the rural population. Death rates are lower in urban areas and their infant mortality rates have also declined more rapidly than those of the rural areas. As regards migration, there are "push" factors affecting the population of rural areas, "pull" factors in the urban areas, and a stronger "pull" factor abroad.³

The paper by R. Perpiñá⁴ on urban-rural distribution of population and its development in Spain also illustrates some of the characteristics of the primary stage of urbanization.

The highly developed and industrialized countries of Europe and North America, however, have left this phase of urbanization far behind and are in the mature stage, roughly where more than 50 per cent of the total population is already living in urban areas. The

² Kemal Ozok, "Urbanization and internal migration in Turkey", *Proceedings*, vol. IV.

³ George S. Siampos, "The trend of urbanization in Greece (demographic aspect)", *Proceedings*, vol. IV.

⁴ Román Perpiñá, "Geographical distribution of population, urban-rural distribution and its development", *Proceedings*, vol. IV.

¹ Ernest Weissmann, "Population, urban growth and regional development", *Proceedings*, vol. IV.

most dominant trait of this stage is the rapid rate of suburbanization, associated with a decreasing rate of population growth both in the rural areas and in the large cities. Three volunteered papers deal with this pattern of development in Denmark,⁵ Belgium⁶ and the Netherlands⁷ respectively, and a fourth volunteered paper on urbanization in North America refers to it in the context of the United States and Canada.⁸ It is pointed out that cities gradually lose their role as residential areas and become more or less (at least the central parts) purely places of business. The population moves to the suburbs in increasing numbers, for residential purposes. Therefore, although the cities continue to attract migrants from rural and other areas, these tend to become residents in the growing surrounding suburbs. Thus, cities act as centres both of attraction and radiation of migrants.

It is interesting to note that there seem to be some signs of the development of suburbanization even in the planned economies of eastern Europe. A volunteered paper from Czechoslovakia discussing urbanization in that country hints at this.⁹ The proportion of urban population in that country was 57.5 per cent of the total in 1961. The countryside has become a population reservoir for immigration into towns of all sizes. Already during 1955-1959, smaller communes regularly contributed to a migration growth of other larger communes. Two exceptions have to be made in this period. Small (middle-sized) towns showed sufficient attraction to draw off even a part of the population of towns with 20,000 to 25,000 inhabitants and large towns of over 100,000 inhabitants. In the period 1960-1962, however, the most attractive centres of migration were the towns of 50,000 to 100,000 inhabitants which attracted people from middle-sized towns that had ceased to be seats of regional bodies. At the same time, however, the growth of excessively large towns, of more than 300,000 inhabitants, has been regulated and prevented

under the planned economy. It will be interesting to watch how the pattern evolves in the future.

The paper by V. F. Bourlin throws extremely interesting light on the development of the pattern of urbanization in the Soviet Union.¹⁰ The proportion of the urban population in the Soviet Union increased from 18 per cent in 1913 to 48 per cent in 1959 and 52 per cent in 1964. As we have tentatively defined it, the Soviet Union would be on the borderline between the primary and the mature stages of urbanization. It is doubtful, however, that it really fits neatly into either of these crude categories because of the very different way in which the country has developed. Before the 1917 revolution the process of urbanization was more or less similar to that of other countries in the primary stage of urbanization. Since 1917 the whole problem has been tackled on an altogether different plane from any other country in the world. The dispersal of industry and urban conglomerations has been brought about by a planned effort. This will continue and will also be accompanied by the process of limiting the growth of major cities by the reduction and, in some fields, termination of construction of new enterprises. The same purpose will be served by the transfer of some functioning enterprises, educational establishments, etc., from large cities to medium and small ones. By a tremendous effort of public housing construction in the urban areas, the problem of housing shortage has been largely mastered. The housing and communal projects which have accompanied industrial growth have gradually obliterated the differences in housing and health conditions between the centres and the outskirts of cities. This pattern does not seem to be tending in the direction of the pattern of suburbanization which seems to be emerging in countries in the mature stage of urbanization.

Attempts are increasingly being made at detailed statistical analysis with a view to studying the factors that govern the rate of urbanization and the rate of growth of big urban conglomerations. The paper by P. Carrère attempts to develop a model based on French statistics for forecasting purposes.¹¹ From a detailed study of statistics relating to the urban centres in France, and from the general basis of certain broad concepts from analyses developed in the past, the author con-

⁵ Sidney Goldstein, "Rural-suburban-urban population redistribution in Denmark", *Proceedings*, vol. IV (meeting A.3).

⁶ Frans van Mechelen, "Qualitative aspects associated with inward and outward migration towards and from a large urbanized area", *Proceedings*, vol. IV.

⁷ J. Meerdink, "Development of resident population and economic activities in a number of concentrically situated Amsterdam wards", *Proceedings*, vol. IV.

⁸ Guillaume Wunsch, "Some features of urbanization in North America since 1920", *Proceedings*, vol. IV.

⁹ Vladimír Srb and Milan Kučera, "Urbanization of population in Czechoslovakia", *Proceedings*, vol. IV.

¹⁰ V. F. Bourlin, "Demographic aspects of city planning and housing construction", *Proceedings*, vol. IV.

¹¹ Paul Carrère, "Induction effects in the growth of large agglomerations", *Proceedings*, vol. IV.

cludes that the active population of a city, A , can be divided into three categories: E = population working on exports, I = population working to satisfy the needs of the population in the city, and G = working population concerned with growth. French statistics yield the following values for these, where P is the total population: $A = 0.4P$, $I = 0.183P$, $G = 0.7 dP$. This yields the basic equation $A = 1.85E + 3.22 dA$ where dA is the annual variation in the working population. If E is constant, P is also constant; if E increases at a constant rate, P will also increase at a constant rate, and the relation between A , E and C will remain constant. The proportions of these categories change, however, and the change generally induces an appreciably higher rate of growth in the total population than that of the exporting population.

While this is an interesting attempt, it would have to be repeated in other countries and over a period of time before it could be determined whether analysis of this type can yield models of predictive power.

Whether the trends of urbanization can be predicted with any reasonable accuracy is also a problem that is of considerable significance for the developing countries in the primary stage of urbanization. While the rate of urbanization in many of these countries rose sharply during the 1940's, in some the rate seems to have slackened to a certain extent during the succeeding decade. Obviously, the process is not a monotonically increasing function as is sometimes assumed. The rather rapid rate of urbanization in the developing countries has sometimes been characterized as "over-urbanization", or urbanization unwarranted by the degree of industrialization. This kind of urbanization is said to result from pressure of population in rural areas which pushes migrants into towns. The migrants from rural areas who swell the urban population are "pushed" rather than "pulled" into the cities. It is in this context that K. Taeuber's paper on the urbanization of the Negro in the United States,¹² points out that the migration of Negroes in the United States cannot be compared to similar migrations associated with the phenomenon of "over-urbanization".

The conclusion regarding over-urbanization in the developing countries is rather superficial and need not be taken at its face value. The difficulty of forecasting urban trends in the primary stage, however, is very real, and pro-

jections have gone wrong in developing countries in the primary stage of urbanization as often as in the countries in the mature stage of urbanization. Some of the difficulties and imbalances encountered in the developing countries, Africa in particular, are described in the paper by U Aung Thein.¹³

The Latin American urban pattern seems to present some characteristics of its own. While the domination of the urban scene by one large city containing a very large proportion of the total urban population persists, a development that is superficially similar to countries in the stage of mature urbanization also seems to be taking place. The paper by M. Wolfe describes this pattern.¹⁴ There is a flight of the better-off groups from the central parts of big cities to the peripheries, in a fan-shaped pattern branching from a few main traffic arteries leading in one direction from the centre. This trend is similar to that in the great cities of Europe and North America. The centrifugal movement of the lower income groups, however, takes different forms. These derive partly from the poverty and low housing standards of the families concerned, partly from the geographical characteristics of the cities, and partly from the limited capacity of the city administrations to enforce regulations or provide low-cost housing. Huge settlements are now springing up in the peripheral zones not preempted by the better-off groups. Even the best of these peripheral settlements represents a drab environment segregated from the city proper and lacking most of the stimuli associated with urban life.

These peripheral settlements are not occupied mainly by uprooted peasants. The overwhelming majority of the settlers, except those going to some of the more precarious illicit shanty towns, have lived in the city for some time. Moreover, the majority of in-migrants to the great cities appear to come from the smaller urban centres, whether or not they are of ultimately rural origin. The peripheral settlements can thus be viewed as the last stage in a complicated and very imperfectly understood series of migratory pressures starting in the country-side.

The small towns, which are the traditional administrative, marketing and servicing centres for the rural neighbourhoods, have never carried out these functions effectively; in most of

¹³ U Aung Thein, "Some aspects of urban explosions in developing countries", *Proceedings*, vol. IV.

¹⁴ Marshall Wolfe, "Some implications of recent changes in urban and rural settlement patterns in Latin America", *Proceedings*, vol. IV.

¹² Karl E. Taeuber, "Perspectives on the urbanization of the Negro population in the United States", *Proceedings*, vol. IV.

the region they are now stagnating and in danger of losing the few functions they possess.

As the urban patterns differ, so do the housing problems associated with them. The problems of estimating the demand and/or need for houses are also different in the two phases. In the developed countries in the mature stage of urbanization, the problem is one of estimating the demand for housing, both quantitatively and qualitatively, for it is recognized that growing urbanization affects the demand for housing qualitatively as well as quantitatively. This is also true of the planned economies in eastern Europe, as A. Andrzejewski's paper based on the experience of Poland and other socialist countries confirms.¹⁵

In the past, quantitative estimates of housing demand have been based on headship rates calculated from census and related information, but other approaches are being explored. In one of the invited papers an attempt has been made to estimate the demand for dwellings in the Netherlands from the age structure and marriage rates, etc.¹⁶ The necessary number of dwellings is related to three groups in the population: the number of married people, the number of non-married people at the head of a household who are 25 or more years old, and a number of one-person households again restricted to those who are 25 or above. If the number of married people is taken as m , and the number of unmarried people over 25 is taken as n , the number of households can be obtained by multiplying m and n by suitable parameters. Statistics for the Netherlands show that the parameters for the first two groups have been remarkably stable since 1899 and that the parameter for single-person households has been tending upwards since 1930. In 1960 the demand for dwellings (L), was expressed by the following equation:

$$L = (m/2) (0.966) + n (0.205 + 0.211) - f$$

where f is the number of households living in boats and caravans. The desirable number of dwellings is $L1.02$, including 2 per cent vacant dwellings. The rate has been roughly calculated to be 288 dwellings for 1,000 persons.

A similar investigation is reported from the United Kingdom in the paper by D. E. C.

Eversley and V. Jackson.¹⁷ As the demand for houses varies directly with the number of households, the estimation of the rate of household formation becomes important for the purpose of estimating future demand. The authors find that, in the case of the United Kingdom, household projections based on a stationary population are not at all helpful. Those based on the assumption of declining rates of household fission are found to be seriously open to doubt because in recent years fission has proceeded at much faster rates than was predicted, despite inhibiting factors. Analysis of household sizes shows that, whilst a very high child population certainly leads to larger households and a very old population to small ones, the main determinants of household size appear to be income and status and educational attainment.

That the problem of estimating demand for housing is broadly similar in the planned economy of the Soviet Union is indicated by the paper on this subject by G. D. Platonov.¹⁸ In the Soviet Union all citizens enjoy equal rights as far as housing conditions are concerned. The size of the flat allotted to a family depends upon the family's size and composition. Demographic data are extremely important for town planning and for housing construction above all. Reporting on a sample investigation in Leningrad, the author points out that an investigation of the structure of families makes it possible to determine the types of dwellings which the different families require and their quantitative ratios. Special attention is devoted to the problem of the housing requirements of single persons, small families, and large and composite families chiefly in terms of future change in their composition. The practical use of demographic data has helped to derive the ratios between the different types of houses, and the structure of flats by rooms meeting the requirements of the above variety of families differing in size and composition. Five or six types of flats with removable partitions are enough to satisfy the various housing requirements of the population of a big city.

While the demand for housing varies with demographic changes affecting the number of households in the population, the supply appears to vary with economic and political cir-

¹⁵ Adam Andrzejewski, "Demographic development, urbanization and housing needs based on the experience of Poland and some other socialist countries", *Proceedings*, vol. IV.

¹⁶ L. H. J. Angenot, "Age structure and number of dwellings in the Netherlands", *Proceedings*, vol. IV.

¹⁷ D. E. C. Eversley and Valerie Jackson, "Problems encountered in forecasting housing demand in an area of high economic activity: Headship rates in relation to age structure fertility, education and socio-economic groups", *Proceedings*, vol. IV.

¹⁸ G. D. Platonov, "Demographic indicators helping to determine the demand for housing and their practical use", *Proceedings*, vol. IV.

cumstances. H. Wander's paper¹⁹ on demographic aspects of housing conditions in western Germany points out that the supply of housing has expanded about three times as quickly as demand since 1950, so that by now the total of dwellings available is almost equal to the number of households in need of their own dwellings. However, the demand is becoming increasingly qualitative. A rather heterogeneous housing supply is confronted by a demand which is becoming more and more quality-minded. Demand tends to concentrate especially on the small stock of houses equipped with bathrooms and central heating. The paper by K. Dux²⁰ represents an approach to objective comparative analysis of housing standards.

In response to the demand for housing in the developed countries the supply has tended to expand and has taken on some interesting new forms. The paper by Y. Lacoste discusses one of the forms taken by the expanding supply of housing in France.²¹ Many of the large new housing projects there contain more than 1,000 housing units each, and some more than 10,000. By 1963, 187 such complexes, containing 228,000 housing units, had been completed in France. By 1970, it is expected that 500 will have been completed. The author discusses a number of the objections levelled against the large housing projects and concludes that most of them apply equally to large developments of small individual houses. The real difficulties arise out of the unavoidable siting of the projects on the far outskirts of cities and the long distances that separate the inhabitants from their places of work. This subject of daily travel to work is taken up in T. Magda's paper on a statistical survey of commuting among the wage-earning population of Brasov, Romania.²²

The situation in the countries in the primary stage of urbanization is completely different. In these countries the housing situation in the urban areas is deplorable. The degree of overcrowding is incredible. Here one cannot talk meaningfully of the demand for housing, but only of the "need" for housing. The term

"need" refers to inadequacy of existing provision compared with a socially acceptable norm. Need is independent not only of price but also of income and consumer preference, that is of all three major demand variables. The general poverty of the people in these countries will not be able to support a demand for housing that will come anywhere near fulfilling minimum needs. The situation here is one of famine relief, not of helping people to obtain their free choice. The need must be estimated on the basis of a realistic minimum standard of housing. A pragmatic minimum standard might be the provision of 40 to 50 square feet per person, and latrines and bathrooms in the ratio of 1 to 5 persons. Even at this low standard, the backlog to be cleared is staggering in several developing countries. It will take great effort and a number of years. The paper by J. Páez Celis²³ on housing needs in Latin America gives some indication of the magnitude of housing needs in that area.

From urban housing it is an easy transition to the consideration of other urban equipment. In M. Rochefort's paper on the relationships between urban commercial, banking, cultural and health facilities and total population of the urban agglomeration in France,²⁴ a town is conceived as providing services for its inhabitants and for the people in the surrounding areas. An analysis of principal towns in France shows that the relationship between the population of a city and the level of facilities provided by it is not regular. A town's important industrial and port functions and other special functions may cause its total population to grow but this does not mean that it possesses a high level of facilities within the country's system of public services, the location of which is decided by more complex factors. On the other hand, there is a relationship between a high level of facilities and a fairly large population. Some kind of balance is observable in France between them. This is an interesting line of analysis which should be explored further in regard to other countries in the stage of mature urbanization. Along similar lines, the paper by J. Beér and J. Kovacsics on the consequences of changes in population upon administration and supply, with a view to the rational development of settlements emphasizes the need to study urban functions and service

¹⁹ Hilde Wander, "Demographic aspects of housing conditions in the Federal Republic of Germany", *Proceedings*, vol. IV.

²⁰ Katharine Dux, "A complex analysis of the standard of development of towns", *Proceedings*, vol. IV.

²¹ Yves Lacoste, "A new type of urban housing in France: The large housing projects", *Proceedings*, vol. IV.

²² Teodor Magda, "Statistical study of daily commuting to other localities", *Proceedings*, vol. IV.

²³ Julio Páez Celis, "Housing needs in Latin America", *Proceedings*, vol. IV.

²⁴ Michel Rochefort, "Relationship between urban commercial, banking, cultural and health services and the total population of the agglomeration", *Proceedings*, vol. IV.

areas in order to equip and locate urban centres intelligently.²⁵

In countries in the primary stage of urbanization, no such studies have been made. On the whole, deficiency bordering on total absence is characteristic of many services and facilities in urban areas in these countries. The problem of adequate urban facilities in these areas is rather remote, since the most urgent task is to meet shortages of basic equipment such as housing accommodation. Here the problem of urban equipment presents itself in quite a different form.

Lastly come demographic considerations in urban development and housing policies, and their relation to national policies of economic and social development. Unfortunately, only one invited paper dealing with this topic is available and it too deals with urban and rural settlement patterns in Latin America.²⁶ So far as the countries in the mature stage of urbanization are concerned, greater attention is being devoted by governments to urban renewal, and, since the rate of suburbanization is expected to continue for some time, the problems of catering for this development in a planned manner are also attracting attention. Problems associated with large conurbations and the accidents and hazards to which their population is exposed are also arousing concern. M. D. van Arsdol's paper²⁷ takes up the topic of metropolitan growth and environmental

hazards. This illustrative study of Los Angeles suggests that initial urban settlement intensifies certain natural hazards—brush fires, earth slides and floods—that become associated with land conversion to urban use. As settlement densities increase, changes in the biosphere lead to the intrusion of artificial hazards—such as air pollution and airplane noise—into the more urban portions of the metropolis. These hazards, along with other conditions associated with a high degree of settlement maturation, possibly represent an “over-utilization” of some urban land.

To sum up, there are a number of problems which call for further discussion and deliberation. Although for the purposes of this statement urbanization has been broadly classified as primary and mature, this is by no means comprehensive or inclusive. The pattern of urbanization as revealed by historical data needs to be further analysed and meaningfully interpreted, so as to be more helpful analytically. The demand for housing is at present a lively subject and further empirical analysis is needed to study the effect of the various factors influencing it. On the other hand, the study of the need for housing, in terms of an acceptable and feasible minimum standard, has hardly begun. Much more effort in this field is necessary. The study of other urban equipment is still in a very preliminary stage, even as regards the developed countries. In the developing countries it has not even begun. Here is a comparatively unexplored area which needs increasing attention from scholars. This whole subject raises the question of city planning and urban renewal and the way in which they fit into total national economic plans. This problem has received almost no attention in the papers contributed to this session, but it is important and any discussion of it should be welcome.

²⁵ Jean Beér and Joseph Kovacsics, “The consequences of changes in population upon administration and supply and the reasonable development of settlement”, *Proceedings*, vol. IV.

²⁶ Zulma Carmen Camisa, “Effects of migration on the growth and structure of population in the cities of Latin America”, *Proceedings*, vol. IV.

²⁷ Maurice D. van Arsdol, Jr., “Metropolitan growth and environmental hazards: an illustrative case”, *Proceedings*, vol. IV.

Statement by the Rapporteur: Mrs. Hope ELDRIDGE

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In his opening remarks the Chairman noted that the majority of the papers contributed to the session dealt with European countries. He expressed the hope that interventions from the floor would dwell more fully upon the situations of developing countries, particularly countries of Asia and the Far East, where urban natural increase is high and where problems of rural-urban migration, urban congestion and intolerable urban living conditions are so acute.

The Moderator's statement supported the sentiments of the Chairman and filled in some of the gaps by reference to the proceedings at the Asian Population Conference and to other sources.

The Chairman also called attention to the near absence, among the papers contributed, of any discussion of topic (d), concerning the effects of urban development programmes upon

urban growth, and of topic (e), concerning demographic considerations in such programmes and their relation to national policies of social and economic development. These lacunae were to a considerable degree remedied by the ensuing discussion.

(a) EFFECTS OF MOVEMENTS OF RURAL POPULATION ON THE GROWTH OF CITIES

Rapid urban growth is taking place in many of the developing countries, especially in the larger cities, and is mainly the result of migration from rural areas. Countries that were mentioned specifically as experiencing this kind of growth were Hong Kong, India, Senegal, Turkey, Venezuela and Zambia. In the view of most speakers, the prospect is for continued rapid growth for some time to come, unless conditions arise or can be created to prevent it.

(b) DEMOGRAPHIC FACTORS AFFECTING HOUSING NEEDS

The massive influx of rural migrants into urban areas places a severe strain upon housing resources in these areas. Migration is thus the major demographic factor affecting housing needs. Among other factors cited as giving rise to housing supply problems were the change in housing requirements attending secular change in the mean size of household (often a decrease), and the change in requirements associated with the increase in size of household that occurs among newly-formed families as part of the family life cycle. Thus, any programme that undertakes to provide adequate housing for urban dwellers must take account not only of the volume of migration, but also of demographic trends in general and of the demographic characteristics of both the migrant and the non-migrant population.

The relevant statistical unit for the purpose of assessing housing needs is the household rather than the individual. Since the family is the core of most households—often the family is identical with the household—the family is also a relevant statistical unit. However, it is essential to maintain a distinction between the two, for it is households rather than families that make up the demand for housing.

Considerable emphasis was laid upon the importance of developing and analyzing statistics for households and/or families. One speaker stated that the household was a statistical unit of such importance, not only for estimating housing needs but for anticipating family consumption needs in general, that the next Population Conference might well devote an entire meeting to that topic alone. Others

pointed to the growing demand for estimates and projections, and stressed the need for better concepts, improved data, new techniques and more refined methods of analysis than have hitherto been available.

Several specific lines of approach were presented. Procedures and concepts relating to "census households", as followed in the 1961 census of Czechoslovakia, were described. These data were used for estimating the degree of doubling-up of families in single households and for estimating the degree of "desired co-occupancy". Co-occupancy was identified on the basis of the family relationship of household members, and an objective determination of whether co-occupancy was desired or not was made on the basis of the adequacy of the dwelling as measured by surface area per household member and number of persons per room.

An analytical approach to the problem of measuring housing needs, analogous to the measurement of population growth, was proposed. The basic data would consist of statistics (1) of the stock of families or households, (2) of family or household formation ("births"), and (3) of family or household disappearance ("deaths"), each classified by size, composition and other characteristics. From such data "birth" rates, "death" rates and other demographic measures could be developed. The difficulties involved in obtaining proper statistics of family formation and dissolution and in developing transition probabilities regarding future changes in size and composition were recognized, but they were not regarded as insuperable.

A method suggestive of the above approach, and its translation into estimates of housing needs for the Paris region up to 1975, has been developed by the Development and Town Planning Institute for the Paris area in co-operation with the National Institute of Statistics and Economic Studies. Projections of the number of households by size and composition (sex, age and marital status of household members) were derived, account being taken of natural increase, migration and other factors. With the resulting knowledge of household structure, a dwelling with the appropriate number of rooms could be assigned to each prospective household. Thus, by substituting dwellings by number of rooms for households by number of members, a theoretical requirement of dwellings for 1975 was obtained. The difference between the number of dwellings needed in 1975 and the number enumerated in 1962, with allowance for destruction of sub-

standard dwellings and elimination of overcrowding, gave an estimate of the number to be built between 1962 and 1975. The unique feature of this method is that it estimates not only the number of dwellings that will be needed but also their distribution by number of rooms. For the Paris region the results indicate that somewhat larger dwellings should be built in the future—dwellings that average 3.8 rooms rather than the present 3.3 rooms.

The precise estimation of housing needs taking account of detailed demographic characteristics and considering matters of taste and quality is of particular value in the more developed countries. In the developing countries the deficiencies are so great that, for the time being at least, the question becomes one of how to increase the supply of dwellings that meet even the most minimum standards. Considerations of exactitude in numbers, types or quality are somewhat irrelevant. This point was made clear by the Moderator's statement, as well as by interventions from the floor. However, it should be kept in mind that, in the long run, effective programmes for providing sufficient and appropriate housing must take demographic factors into account, as well as other factors of a more social or cultural nature.

(c) DEMOGRAPHIC FACTORS AFFECTING NEEDS FOR URBAN DEVELOPMENT OTHER THAN HOUSING

Discussion was limited to only a few aspects of this topic. Two speakers pointed to the usefulness of demographic data in connexion with the planning and development of new towns and cities. The first remarked that such places were characterized by very young populations and therefore required an urban infrastructure that might not be suitable as the population structure changed in the direction of a higher average age. It was, therefore, important to remember that, unless social and demographic investments could be of a provisional or temporary type, there was danger of wasteful spending for equipment that would fall rapidly into disuse. The second drew attention to post-war experience in the Ukraine as being of potential value for dealing with problems of urban housing and other services in the developing countries. In an area where most towns had been destroyed during the Second World War, a massive programme of town planning and building was able to take account of demographic characteristics and trends (marriage, migration, age, activities of family members, etc.) and to meet desirable physical and health standards.

Another way in which the experience of the more developed countries might be of value to the developing countries was mentioned. A parallel was drawn between the situation of Western cities at the time of the industrial revolution and that of metropolises in developing countries at the present time. On the premise that the differences were essentially differences in time, it was suggested that a study of the pattern of Western cities might furnish useful guideposts for developing countries undergoing rapid urbanization.

One concomitant of urban growth that has its demographic aspects is the multiplication of daily mobility that is involved in travel to and from the place of work. A recent survey conducted in Brasov, Romania, has yielded information on the characteristics, motivations, travel time, family life, productivity and use of free time of commuters. Such information is useful for administrative purposes in planning urban development.

Although the discussion did not touch directly upon them, it is obvious that demographic information would be helpful in planning urban development related to the provision of schools, streets, sanitation and other urban facilities. Demographic data that would be useful for these purposes are less closely tied to the household frame of reference than is the case with housing.

(d) EFFECTS OF URBAN DEVELOPMENT AND HOUSING PROGRAMMES ON RURAL-URBAN AND URBAN GROWTH

Several speakers noted that development programmes run the risk of encouraging rural-urban migration and of defeating the objective of orderly urban growth. For example, it was reported that, in spite of government efforts to deal with the problem, the influx of rural migrants into Dakar, Senegal, had created a housing crisis compounded with unemployment. Although more than 40,000 dwellings had been constructed in 1964, the new quarters had quickly become overcrowded for such reasons as polygamy, large families and the arrival of relatives. Meanwhile, the fringes of the new residential areas had been invaded by uprooted country folk who, with their overcrowded shanty-towns, had been steadily pushed out by the advance of building and town planning. Similar conditions were described for other countries.

It was further noted that the provision of additional housing would be likely to encourage family groups rather than solitary individuals to move to the city. While this would tend to

redress the imbalance in urban sex ratios that exists in some countries, it might lead to a rise in observed fertility rates, at least until the migrants adopted the fertility behaviour of the urban elite. It would also be likely to remove the "disincentive" to rural-urban migration that is implicit in insufficient housing facilities.

One participant stated that migration from rural to urban areas was the most important of migratory movements, its principal cause being the search for lucrative work. Since the countryside is the milieu of agricultural production, the demand for its products has certain limits. Non-agricultural products are produced in the city, and the demand for such products has no limits. The city both produces goods and generates a demand for goods. As a result, the attraction of cities increases incessantly while that of the country decreases. One might conclude from this that the movement from country to city is irreversible. However, as was indicated in some of the papers contributed to the meeting and as is exemplified by the colonization of the Siberian steppes, migratory movement from urban to rural areas does exist in some parts of the world and on a large scale. It is therefore arguable that, although urbanization may be irreversible in the psychological sense, it may not be irreversible in the physical sense. In the opinion of the speaker, this was a matter of considerable import and deserved further study.

Indicating sympathy with this point of view, a number of participants took the position that desirable programmes of urban development would attempt to reverse the flow of migration or at least to reduce the volume of rural-urban movement. For example, the Calcutta Metropolitan Planning Organization, recognizing that housing needs cannot be met under present conditions, has recommended three steps: (1) the construction of work-cum-living centres in the city, (2) the setting-up of satellite towns to regulate haphazard growth in the periphery of the city, and (3) the development of counter-magnets in the hinterland to divert potential in-migrants. It was also suggested that regional cities might be useful for demonstrating the problems and difficulties of city living and for discouraging migration to the larger cities. It was added that, if a policy of decentralization were being followed, programmes of urban development might well concentrate upon smaller cities. Such places could perhaps be made more attractive to migrants if they were to be developed first.

In the Republic of Zambia, the Government's Transitional Development Plan has been at-

tempting to reverse population movement by a programme of rural development which involves locating industrial enterprises in the less developed parts of the country, establishing schools and hospitals in those parts, and improving means of transportation and communication. This programme has already begun to attract some urban residents back to rural areas.

(e) DEMOGRAPHIC CONSIDERATIONS IN URBAN DEVELOPMENT AND HOUSING POLICIES AND THEIR RELATION TO NATIONAL POLICIES OF ECONOMIC AND SOCIAL DEVELOPMENT

Programmes designed to facilitate urban development and provide sufficient housing should be framed in the context of over-all social and economic policy and with a view to their demographic implications. There was some discussion of urban policy as related to other aspects of public policy, but only two speakers touched directly upon the demographic considerations involved. One of these warned that, in countries where urban-rural differences in fertility were small or absent, policies designed to accelerate urbanization with the object of reducing fertility might not have the desired effect. The other expressed the view that, in a growing population, housing needs and expenditure would tend to augment because higher fertility leads to larger households and a more rapid rate of new household formation. If there is to be no deterioration of housing standards, the relative demand for housing will be a direct and positive function of the rate of population growth, and expenditure on housing will take up an increasing share of total gross capital formation. Meeting the induced demand for urban supporting facilities (waterworks, sewage disposal, roads, streets, etc.) will increase the drainage on investment funds. The total drainage will be greater, the higher the economic scale of living and the more democratic the political system. At high rates of drainage, the economy becomes a consumption economy with little left for industrial and resource development. Under modern economic conditions, the pressure on housing resources and capital funds owing to population growth may be as important as the more celebrated pressure on food, lands and natural resources.

Several interventions dealt with problems of financing urban development and housing. According to one participant, developing countries cannot afford to replace slums and shantytowns with subsidized housing. In his view, public authorities should stop fostering such

"futile delusions" and should give attention to the things they can do, such as paving streets, providing a clean water supply, and removing sewage and refuse. A second participant described experience in Turkey, where long-term loans at low interest rates are furnished by the Real Estate and Credit Bank and where the Ministry of Reconstruction and Resettlement has had to cope with problems of land speculation in connexion with the construction of housing for low-income families. A third participant noted that low-cost dwellings in developing countries invariably came to be occupied by middle-income families rather than by the very poor. To the extent that such housing is subsidized, there is a perversion of social policy and a squandering of government receipts.

Large-scale housing projects containing large numbers of apartments are one device that has been employed for housing low-income urban families at moderate cost. Such projects as have been developed in France were described in one of the papers contributed to the meeting. The projects have been widely criticized from the point of view of the allegedly undesirable psychological effects of regimentation and high population density. In a recent survey conducted by the National Institute of Population Studies at the request of the Centre of Urban Research, an attempt was made to investigate these effects. Residents were asked to indicate which was greater, the advantages or the inconveniences of living in such places. For 61 per cent the advantages outweighed the disadvantages; for 20 per cent the disadvantages were greater; 19 per cent made no judgement.

In a somewhat similar vein, a study of subjective aspects of urban infrastructure has been undertaken in Venezuela. Household heads in a new city that is developing under the auspices of the Venezuelan Corporation for the Guayana were asked to evaluate opportunities, prospects, equipment, services, etc., for the city in which they lived and for other possible places of immigration. Studies of this type should be useful not only as a guide to urban planning, but to set up preference scales in general and to determine migration prospects for the future.

Attention was drawn to the effect of migration into towns upon ethnic processes, particularly the consolidation of peoples and the formation of nations. Suburban slums such as those that have appeared in Latin America tend to follow lines of ethnic segregation, be-

coming "ethnic hinterlands", with the national majorities living in the city proper. In Africa, there is considerable ethnic diversity among the tribes. Since the role of towns can be a positive factor in the process of cultural integration, research in this area has great potential value and would benefit from the co-operation of demographers, geographers, ethnographers and town planners.

A report of recent experience in Hong Kong was illustrative of the possible effect of urban development upon cultural integration. In order to accommodate refugees from China, an intensive housing programme has been under way in that country since 1954. During the intervening period, more than a million refugees have been settled in public housing. Despite their cultural tradition of the extended family, the refugees have adjusted well to housing designed for the nuclear family. Also, despite their diverse ethnic, linguistic and social backgrounds, assimilation has not proved difficult except for a small minority that occupies a traditionally low status. Although it may be necessary to tolerate some self-segregation of the disadvantaged group in the early stages of such a programme, it appears that integration can be achieved, partly through intermarriage and partly through the organization of special social services staffed by leaders of the low-status group.

It cannot be said that a consensus was reached with regard to specific solutions to the problems of containing urbanization in the developing countries. There seemed to be some feeling that, in developing countries where problems of urban growth are acute, the prospects are poor for providing adequate housing and urban services under present circumstances. Solutions are thought to lie in the direction of creating conditions that will deter rural-urban migration. Migration to less congested areas was endorsed. Not much experience in this area has been accumulated, however, and the costs to government of decentralizing industrial development were not examined. The one point upon which there was general agreement was that these problems are difficult and many-sided.

The following speakers took part in the discussion: Barnett, M. Boserup, Bourlin, Clark, Clerc, Dia, Dousa, Gottlieb, Horstmann, Korkák, Kosinski, MacDonald, Magda, Meerdink, Mitra, Muhsam, Mukherjee, Mwale, Ozok. Perpiñá, Plantevin, Pokshishevsky, Spencer, Visaria, Yaroslav.

MEETING B.8

Promotion of demographic research and training in developing countries

PART I

A. Recruitment and training of personnel for demographic research and training

B. Organization and establishment of institutions for demographic research and training

Statement by the Moderator: Mr. A. T. BOYARSKY

Doctor of Economic Sciences, Moscow State University, Moscow, Union of Soviet Socialist Republics

Sixteen papers were contributed to the meeting on the promotion of demographic research and training. Three of these, which relate specifically to international co-operation in this field, will be reviewed in detail in part II of this statement. Not surprisingly, a number of basic population problems are raised in the contributed papers, since the authors regard them as related to the demand for demographic personnel and the requirements of demographic research. However, in view of the fact that these problems are to be the subject of broad and thorough discussion at other meetings of the Conference, let us turn directly to the subject of our special interest.

Let us first examine the problems of treating demography as an independent science. This approach is sharply emphasized in the paper by P. Paillat.¹ The author begins by recalling the statement of the problem contained in the survey made by D. V. Glass for UNESCO in 1958.²

The paper says that, depending upon whether demography is interpreted as an independent science or as a discipline associated with one or several social sciences, the syllabuses, the teaching staff, the types of educational institutions in which it is taught and the nature and level of the diplomas or degrees received by students will vary.

¹ Paul Paillat, "Demography and social sciences", *Proceedings*, vol. III.

² D. V. Glass, "Social Sciences in Higher Education", Demography (Paris, UNESCO, 1958), p. 208.

Paillat considers experience to be in favour of the broader conception. Where demography is treated as a poor relation, he believes it to be due to shortages of staff or of money, or to a failure to understand the real needs in this field. In Paillat's view, the use of sociology or sociologists by a demographer is not "intellectual imperialism" but merely evidence of an understanding of the importance of the work of sociologists. The author does not consider it important that the same problems are treated by demography and by other sciences, as they are viewed from different angles. For example, all demographers are very eager to study fertility, because the development and the structure of population depend greatly upon this factor. But fertility can also be studied by physicians and sociologists—the first from the physiological standpoint, and the second in connexion with research into social behaviour. The author considers the limitation of population studies to quantitative measurement and current statistical analysis to be wrong, and recommends that in elucidating particular situations, it should not be forgotten that each one is a link in the long chain of historical development.

V. H. Whitney's paper on recruitment of personnel for demographic training³ treats the matter from the more practical viewpoint. He emphasizes the expediency of organising the

³ Vincent H. Whitney, "The recruitment of personnel for training in demography", *Proceedings*, vol. III.

training of demographic personnel in independent faculties. In this way he hopes not only to raise the significance and improve the quality of the training, but also to change the attitude of students towards the choice of demography as a profession. The expediency of independent demographic departments in the universities is also emphasized by J. C. Caldwell.

Other authors, while not touching upon the problem as stated by Paillat, take it for granted that demography should be treated as an independent profession requiring special training. However, all the papers also note the necessity for certain specialists other than specially trained demographers to master a minimum of demographic knowledge. Among them they name first economists and sociologists, and Paillat gives a long list of specialists who should possess such knowledge: ethnologists, sociologists, psycho-sociologists, economists, geographers, economic historians and, of course, statisticians. It is impossible not to share the bewilderment expressed by Paillat at the fact that the study of statistics and some elements of demography has not been made a compulsory part of diploma courses in sociology. V. H. Whitney also complains of the fact that demography does not, as yet, occupy a proper place in the sociology syllabus. Meanwhile, if enough attention was paid to teaching demography in the training of personnel in certain related fields, it would be possible to employ such personnel on demographic research and there would be less difficulty in filling student quotas for demographic training.

As regards the connexions between demography and other fields of science, one should stress the very close relationship it bears to statistics, which is noted in one way or another in all the papers. This relationship, which has well-known historical roots, exists both in methodology and in subject matter of research, as demography invariably deals with statistical data. It is not remarkable, therefore, that in some cases demographic training is conducted among the personnel of statistical offices and is often combined with general training in statistics which includes, of course, training in population statistics. There are many sociologists among the specialists working in demography.

Some of the papers note that the levels of demographic research and of training for this research are not commensurate with the scope and urgency of population problems in the modern world.

In this light, the work carried out by the United Nations, described in the paper by

C. K. Dilwali and J. Hines,⁴ is of great importance. United Nations publications containing statistical data on the size and composition of population, fertility, mortality and migration, and its methodological text-books and analytical studies of general and particular questions are well known. In addition to its publishing activities, the United Nations also promotes the development of demographic research and training in demography in various ways. For example, it organizes conferences and seminars, such as the World Population Conference in Rome in 1954, the Conference of Asian Countries in New Delhi in 1963 and, most recently, this second World Population Conference in Belgrade. Three regional centres have been established under the auspices of the United Nations, and the establishment of other similar centres is being planned.

All this international activity helps to promote progress in the development of demographic research, and the establishment in individual countries of demographers.

The background paper on research and training in the more developed countries⁵ refers to the experience of twenty-seven countries. The authors note the great progress that has been made since the World Conference in Rome in 1954.

In 1954 demographic research was chiefly carried out by government bodies, mainly census offices and central statistical boards, and non-governmental research centres. There were few centres (either governmental or non-governmental) that were devoted wholly or primarily to demographic research. During the last ten years, the activity of these centres has been intensified. The establishment of new centres is a striking illustration of the achievements of demography in this period. A list is given of the centres that have been established (thirty in all) of which fourteen are in the United States, attached to universities, and seven in the socialist countries (Czechoslovakia, Poland, Hungary, Romania and Yugoslavia).

Nevertheless, conditions of training are deficient even in these countries. Even in the United States, as noted in V. H. Whitney's paper, extensive demographic courses are taught at only ten universities, and none of these has a special faculty of demography.

⁴ Charat Kumar Dilwali and Joyce Hines, "United Nations programmes for promotion of demographic research and training", *Proceedings*, vol. III.

⁵ Hope T. Eldridge and Vincent Whitney, "Demographic research and training in the more developed countries: a survey of trends since 1954", *1965 World Population Conference*, background paper B.8., part III/7/E/448.

The paper describes the competition with other specialties for material and funds, as well as for students and especially the difficulties of securing funds for student support.

The authors of the paper on conditions in the Netherlands⁶ note great advances in the field of demography. University chairs in demography have been created here for the first time, although it is not yet possible to receive a degree in demography.

There is much valuable information on individual countries in the background papers, which cannot be reproduced here.

All the papers give a very optimistic estimate of the demand for trained demographers, and its prospective increase. P. Paillat writes that the social bodies are resorting more and more to demography, and it may be said that the moment is not far away when the demand for demographers will exceed the supply. This suggests the necessity of organizing the training of personnel experienced in demographic techniques and able to cope with the tasks both of research and of training assistants and successors for themselves.

H. V. Whitney is still more definite regarding the steep future rise of demand for demographers. K. C. Zachariah also notes a clear growth of demand for trained demographic personnel in the countries of Asia and the Far East,⁷ while M. S. Khodary believes this growth to be related to the general rise of interest in population problems since the Second World War.⁸

In some papers, however, it is noted that the significance of demography is not yet properly realized in some countries. Research encounters a number of difficulties, the chief being the shortage of specialists and the difficulty of training them owing to the absence of teachers and training facilities. In this connexion, the sending of students abroad for training in foreign countries acquires special importance, and foreign help in the organization of teaching inside the country takes on still greater significance. Language barriers are still a major obstacle.

In C. Chandrasekaran's background paper,⁹ it is noted that, in general, there has been a

considerable growth of interest in demographic problems in the countries which are members of the Chembur Centre. Since 1950 special research centres have been established in these countries, and there has been great improvement in analytical studies. During the past five years 800 articles, booklets and papers have been published in these countries on demography and affiliated fields, though in most cases they were not written by specialists. The research centres are, as a rule, part of statistical institutions.

It is indicated in the paper that demographic training is offered at the Australian National University, in Pakistan, in India (at the University of Kerala and others) and at the University of the Philippines. In some cases, it means going through a course of training by specialists in other professions—beginning with sixteen hours or more, up to one or two years (two hours a week).

There are three papers on separate countries in this region. A. George complains in her paper on the teaching of demography in India¹⁰ of the slow development of demography as a special subject, the lack of funds and the difficulty of enlisting able students.

At present, demography is studied by those who go through training courses in statistics, medicine and public health. Completion of work in demography at the post-graduate level is required for statisticians, sociologists and economists. The University of Kerala was the first to introduce a master's degree course in demography; in 1963, a demographic unit was established in the Department of Statistics. Those with master's degrees in mathematics, statistics, etc., are eligible for admission, and those with bachelor's degrees undergo a preliminary examination in mathematics. The training course lasts for two years: the first year is an intensive theoretical training, the second is devoted to preparing a thesis and participating in field research.

The university carries out intensive research work which is closely connected with the Family Planning Research Programme.

A reading of M. K. H. Khan's paper on Pakistan,¹¹ on the whole imbued with a pessimistic spirit, reminds us that demand need not

⁶ S. Groenman and H. J. Heeren, "The development of demography and demographic research in the Netherlands", *Proceedings*, vol. III.

⁷ K. C. Zachariah, "Experience of the Chembur Demographic Training and Research Centre in international co-operation", *Proceedings*, vol. III.

⁸ M. S. Khodary, "International co-operation in the setting up of the Regional Centre for Demographic Training and Research, Cairo", *Proceedings*, vol. III.

⁹ C. Chandrasekaran, "Demographic research and

training in the ECAFE region", *1965 World Population Conference*, background paper B.8, part I/4/E/404.

¹⁰ A. George, "The teaching of demography in Indian universities", *Proceedings*, vol. III.

¹¹ Muhammad Khalid Hayat Khan, "Problems of recruitment and training of personnel for demographic training and research in Pakistan", *Proceedings*, vol. III.

necessarily be solvent. The author of the report complains that in his country the need for trained demographers has not yet received proper recognition and the number of job opportunities is not yet sufficient. Moreover, he tells us that, as a result of the failure to attach due importance to demographic training, pseudo-demographers knowing little about population thrive and "do more harm than good to the cause of demography".

A Social Sciences Research Centre for conducting research in demography, economy, sociology and methodological training in these branches of science was set up in 1959 at the University of the Punjab with financial help from the Asia Foundation. The paper shows that the centre concentrates mainly on demography. The training of specialists at the centre started in 1961. In three years, only twenty-seven (eleven, eight, eight) students were admitted, only eleven of whom received the diploma in demography. Eight of these were M.A.'s in statistics, two in sociology and one in mathematics.

The report notes that students taking up demography after studying other branches of science in which they have little to do with mathematics usually have great difficulties.

The authors of the paper on research and training in Iran¹² note that research in this country began very late. The first census was undertaken only in 1956. In 1950 research was started with foreign aid. In 1958 a demographic faculty and an Institute of Social Research were established at Teheran University. Here students do four hours of theory and two hours of practical work a week for four years. In addition to the university, demography also forms part of a course conducted by the Public Health Ministry of the State Civil Service. The work done by the university in translating the United Nations multilingual demographic dictionary is of great value, as is seen from A. Moezi's paper.¹³

The situation in the Arab countries described in A. M. N. El-Shafei's background paper¹⁴ may be briefly defined as one of growing interest in demography. As in other countries, however, the development of demographic re-

search encounters all the usual difficulties of growth, primarily because of the lack of trained personnel.

J. C. Caldwell's paper¹⁵ reviews the situation in countries in tropical Africa which employ English as the medium of instruction. It is based on information for twelve universities.

In four universities a full demography course, which formed a unit of the degree structure, was either already in existence or about to start. At the Universities of Ghana and Khartoum, the course has been in operation for some time; at Fourah Bay College, it began in the academic year 1963-64, and at Makerere University College, it commenced in the year 1964-65. In two universities, the course is being given within the Sociology Department, at one in the Department of Economics and Social Studies, and at the other in the Department of Geography.

At all the universities approached views were expressed in favour of a very considerable expansion of demographic research and training. All the universities in the region give some training in the general field of population. Apart from the specialized demography courses, most of the work is done in the Geography Departments. Five Departments of Economics undertake somewhat shorter periods of training on population problems, in particular those connected with economic development. A lesser amount of population study is carried out in five other departments of various universities, namely, Anthropology, Agriculture, Medicine, Statistics and African Studies.

There are no special national papers on this region, but in Caldwell's paper, besides a general review, there is a section devoted particularly to Ghana, where the Population Council has done much work in demographic training and research programmes.

C. Miró's report on Latin American countries describes a very similar situation.¹⁶ Lack of qualified personnel is impeding the development of research. Language barriers, inefficient methods of recruitment of candidates and deficiencies in the allocation of funds are impeding the training of specialists abroad. The author also complains of the shortage of fellowships

¹² Jean-Claude Chasteland and A. M. Djamchid Behnam, "Status and problems of demographic teaching and research in Iran", *Proceedings*, vol. III.

¹³ Asdolah Moezi, "Translation of the multilingual demographic dictionary of the United Nations into Persian", *Proceedings*, vol. III.

¹⁴ A. M. N. El-Shafei, "Promotion of demographic research and training in developing countries with respect to the Arab countries", 1965 *World Population Conference*, background paper B.8, part II/5/E/446.

¹⁵ J. C. Caldwell, "Demographic training and research in tropical African universities which employ English as the medium of instruction", *Proceedings*, vol. III.

¹⁶ Carmen A. Miró, "Experience and problems in the promotion of demographic training and research in developing countries: The case of Latin America", 1965 *World Population Conference*, background paper B.8, part IV/23/E/493.

granted through UNESCO and other international organizations.

A growing demand for demographic research on the part of governmental institutions is a favourable development. Academic circles display a very cool attitude, refusing even to regard demography as an independent discipline.

There is no paper from the Soviet Union on the subject under consideration, but the following information may be of interest. Demographic training in the Soviet Union is conducted at the Moscow Institute of Economics and Statistics in a specialized group of the Faculty of Statistics. Twenty-five students are admitted each year to study demography. The course of training comprises four years. Besides related disciplines (such as political economy, philosophy, a number of mathematical disciplines, the theory of statistics and economic statistics, the history of economics and other general and auxiliary subjects), the students study a complex of subjects closely connected with demography. The general demography course embraces all demographic problems: methods of observation and processing of results, the theory and history of population problems and mathematical demography. This course serves as a basis for training in demography in a broad sense which includes labour statistics, housing statistics and family budgets.

After the theoretical course, alternating with practice and probation, the students write a graduate thesis which they have to defend before a special commission. The students receive allowances from the State. The post-graduate course takes three years, after which students present a thesis in order to receive the degree of Master of Economic Sciences.

In addition to the Moscow Institute of Economics and Statistics, demography courses are conducted from time to time at the Faculty of Economics of the Moscow State University and have recently been started at the Faculty of Philosophy of the same university. A laboratory of demographic research has been organized at the university. A demography course is also conducted at Leningrad University and the courses in statistics at many other institutes give an important place to population statistics. There is a demographic department in the Research Institute of the Central Statistical Office of the Soviet Union.

Naturally, demographic research is also being conducted by the country's far-reaching statistical network and by a number of research institutions, whose main activities are in labour research, education, public health, housing construction, etc. Planning bodies give much attention to problems of population; this is of great importance to the development of demography in the Soviet Union.

PART II

C. International co-operation in demographic research and training

Statement by the Moderator: Mr. D. KIRK

Demographic Director, Population Council, New York, United States of America

These remarks will be devoted to the papers relating to international co-operation in demographic research, and especially to the three papers on the United Nations Demographic Training and Research Centres in Asia, Latin America and North Africa.

At the time of the first World Population Conference in 1954, the present topic was not on the agenda because such centres did not exist. The regional centres were in significant ways a sequel to that Conference. At that meeting there were few persons with professional demographic training from the developing countries and there was growing concern at the lack of qualified persons in such

countries to study their own population problems in their own terms.

This growing concern was expressed in a resolution¹⁷ adopted by the United Nations Economic and Social Council in May 1955, which requested the Secretary-General to study the possibilities of establishing in these areas regional centres for the study of their population problems and the training of persons specialized in demographic analysis. This was followed by two regional seminars, one for Asia and the Far East, in Bandung, Indonesia,

¹⁷ Economic and Social Council, resolution 571 (XIX) of 27 May 1955.

and the other for Latin America, in Rio de Janeiro, both held in 1955. Both strongly urged the establishment of demographic centres in the respective regions.

K. C. Zachariah's paper¹⁸ describes the origin and experience of the Demographic Training and Research Centre in Chembur, near Bombay. In 1956 the Government of India decided to establish such a centre and entered into an agreement with the United Nations to make it a regional institution. Under the agreement, the United Nations undertook to provide long-term advisers and short-term consultants on different aspects of demography and related fields of training, as well as equipment and technical literature and other reference materials for building up a library. The United Nations also agreed to provide fellowships for students from the countries of Asia other than India. This served as the basic pattern for the establishment of other centres.

Since its inauguration in 1957, the Chembur Demographic Centre has successfully trained more than 130 men and women from 17 countries of the region. It has an extensive research programme including studies in five major fields:

- (1) Fertility and family planning;
- (2) Internal migration and urbanization;
- (3) Assessment of the quality of census data;
- (4) Demographic problems of economic development, and
- (5) Special studies worked out in co-operation with the Government of India or of other nations in the ECAFE region, or with other organizations.

It publishes a newsletter, a directory of demographers and other information concerning demographic work in the region.

In these several ways the centre has laid a foundation of which Zachariah says: "The centre at Chembur is therefore in a position to develop itself into a seat of higher training and research in demography."

Carmen Miró, the Director of the Centro Latinoamericano de Demografía (CELADE), describes in her paper¹⁹ the comparable growth of regional demographic work in Latin America. In 1957, the United Nations entered into an agreement with the Government of

Chile by which a regional centre would be established at the University of Chile. The new centre was inaugurated in 1958. Since that time some ninety-five Latin Americans from eighteen countries have taken the basic course of one year, and thirty-three from fifteen countries have taken the advanced second-year course.

At CELADE the staff early became concerned with the conduct of field surveys, first of fertility and of internal migration in the city of Santiago; particularly important is a fertility study now being carried out on a comparable basis in seven capital cities of the region by graduates of CELADE. This is an outstanding example of international co-operation in research.

Under the sponsorship of CELADE, national demographic research units, often with the participation of centre graduates, have been established in ten countries. Technical assistance missions to advise on matters relating to population problems or to teach demography have been sent to fourteen Latin American countries. Both CELADE and the Chembur centre have sponsored seminars on the evaluation and utilization of population census results.

M. S. Khodary's paper²⁰ similarly describes the development of the North African Demographic Centre. A seminar on population problems in Africa was held in Cairo in 1962. At this seminar it was announced that negotiations had been successfully concluded between the Government of the United Arab Republic and the United Nations for the establishment of a subregional centre in Cairo. The agreement was signed in February 1963 and the first training course began in November 1963. According to the agreement the United Nations provided the services of the director and one demographer as well as fellowships for the countries of the North African region. A limited number of fellowships are also provided for trainees from other Arab and Middle Eastern countries, though the latter are not included in the formal region covered. The United Arab Republic provides the necessary facilities and the services of three full-time experts.

The original plan contemplated a short-term training programme of six months, but later the basic training programme was extended to a full year as at the other centres. In the

¹⁸ K. C. Zachariah, "Experience of the Chembur Demographic Training and Research Centre in international co-operation", *Proceedings*, vol. III.

¹⁹ Carmen A. Miró, "The Latin American Demographic Centre: An experience in international co-operation for training, research and technical assistance in demography", *Proceedings*, vol. III.

²⁰ M. S. Khodary, "International co-operation in the setting up of the Regional Centre for demographic Training and Research, Cairo", *Proceedings*, vol. III.

coming year a few fellowships will be offered for trainees from tropical Africa.

All the papers covered refer to major problems encountered in the organization and administration of the centres. Some of the major difficulties and questions encountered are as follows:

(1) Are the centres to be regarded as temporary or permanent regional institutions? Are they a way-station to facilitate the establishment of national institutions, or should they be planned as permanent regional institutions under international auspices?

(2) All the centres suffer from the absence or weakness of connexions with regular university curricula. They cannot offer academic degrees and undoubtedly suffer thereby in their recruitment of able trainees.

(3) There is a universal difficulty in recruiting appropriate foreign experts who have both the professional qualifications and the personal qualities necessary to fit into the local scene. This difficulty in recruitment reflects the shortages of demographers in the more developed countries themselves.

(4) The cost of training is high because of the necessity of establishing a new institution for the purpose. The cost per trainee is prob-

ably higher than the cost of sending a comparable number of persons to overseas institutions in Europe and America. This must be balanced against the advantages of providing instruction in regional languages (e.g., Spanish in Latin America) and by the greater orientation of the centres towards regional problems. Regional centres also provide other types of services in research, technical assistance, etc.

(5) Most important of all, the regional centres have suffered from inadequate financing. The United Nations has never provided sufficient funds and were it not for very substantial aid from other sources, especially private foundations, it would have been impossible to establish or continue the operations of the centres. Furthermore, the centres have been tied to annual budgets, often much delayed in approval, so that they have had to lead to a hand-to-mouth existence without the possibility of giving long-range tenure to their employees.

Despite all these difficulties, the centres have made very important contributions to the development of demographic training and research in their respective areas. The success of this and other efforts along this line is attested by the very impressive number of trained demographers from developing countries attending this Conference.

Statement by the Rapporteur: Mr. T. MONTENEGRO

Secretary-General, Inter-American Statistical Institute, Washington, D.C., United States of America

The object of meeting B.8 was to discuss the status of, and the need for, demographic research and training in various parts of the world, particularly in the developing countries.

Demographic research and training have enjoyed a decade of rapid growth in the more developed countries, as is demonstrated by the increase of established centres devoted wholly or primarily to demographic research, the number of new journals and periodicals, and the expansion of training activities through courses offered in institutions of higher learning, the establishment of chairs of demography and the creation of degrees and diplomas. Several factors, among them concern over the "population explosion", the increase in population data, the recognition of the importance of demographic knowledge for social planning, and the awareness that social and economic problems may be related to population trends, are also considered to be major factors contributing to the progress of demography.

Similar interest and growth are observed in the developing regions as a whole, as well as in many individual countries. A large part of the credit for this is due to the outstanding action and influence of the United Nations in building up technical and analytical demographic information at the international and national levels, and helping to develop the tools and materials necessary for the formulation of economic and social policy.

Particular reference was made to the work of the regional demographic centres jointly sponsored by the United Nations and the Governments of Chile (for Latin America), India (for Asia and the Far East) and the United Arab Republic (for North Africa and the Middle East), whose work is described in detail in papers submitted to the Conference.

The initiation, development and expansion of the research and training activities carried out by universities and other national institutions constitute a clear demonstration of what

can be done, even when many difficulties have to be faced daily. Examples of such accomplishments are given in the papers related specifically to the programmes conducted in tropical Africa, India, Iran, Pakistan and the Netherlands. Other programmes, such as that in Mexico, were mentioned during the meeting.

Although it was recognized that progress had been made, a number of points of a general nature which were referred to in the papers provoked discussion. Among these points were the need for a better definition of demography, the need for more research and training facilities, and the direction of the future development of international and regional training and research.

The need for a satisfactory definition of demography was recognized. The lack of such a definition creates serious areas of non-comparability in international data and between educational systems, and has meant that, even in the more developed countries, progress has been somewhat uneven. The lack of clarity regarding the relationship between demography and other branches of knowledge is not only a factor influencing the slow development of demography as a discipline, but also affects the organization of the teaching of demography, since this depends on the prevailing conception of the discipline itself, that is, whether it is considered as an autonomous science, a sort of synthesis of the social sciences, or whether it is treated as a discipline associated with one or more of these social sciences. Although the opinion was expressed that the needs of a small country for demographic research and training dictated a practical approach, as is the case in Greece, cutting through the boundaries of the various disciplines or institutions, and using special talents wherever they could be found, the need for clarifying the situation was admitted. The view was expressed that, because the territory of the social sciences was almost completely marked out when demography came on the scene, the latter was forced to establish itself within the narrow limits left. Even when it was restricted to that minimum, that is, to the biological facts—such as the number of the population, its spatial distribution, its distribution for a few characteristics such as sex, age, and family status, and the elements of its growth, such as births, deaths, marriages and migrations—it was necessary to cross those narrow bounds, and to establish a kind of condominium with the border sciences. A possible solution may be to regard all outside influences on population facts as part of demography, and all inside influences on the border

science as belonging to that science. These sharp limits, necessary theoretically for a clear classification, would not affect teaching, particularly if the teacher was competent in both matters, demography and the social sciences, and worked in collaboration with other scientists.

In connexion with the concept of demography as a science and its study as a separate specialization, another opinion was also expressed that scientific research into population problems could not be reduced to a discipline of numbers because such problems, besides their quantitative aspects, had other very intricate ones of a purely qualitative nature. Thus, demography should be considered as an inter-disciplinary science and a narrow definition would be undesirable since it cannot be claimed as a universal science. Close co-operation with other sciences may be more important than a precise definition.

The need for more research and training was reaffirmed as a consequence of the demand for improved population statistics and the growing interest in family planning. Such a need exists not only in the developing countries but also in the more advanced. Otherwise, the latter will be unable to supply the personnel who will be required more and more frequently for teaching and research at all levels.

Besides the need for more demographers, emphasis was placed on the quality of their preparation, although the number required either at the present time or in the future cannot be stated with accuracy. Increased demand is anticipated from areas in which demographic work has begun as well as those in which it has not yet started. At the same time, a rise in the number of trained persons will tend to increase the number of positions available. The knowledge of such demographers will need to be increasingly wider, in view of the responsibility they will have for conducting more complex activities at very high cost.

Mention was made of the availability of experts in the context of future needs, but opinions were divided regarding it. With reference to experts for the regional centres, it was indicated that there were sufficient qualified demographers to fill all existing positions; the apparent shortage resulted from the fact that the accent in the choice had been on "appropriate" and there would always be a dearth of "appropriate" experts.

A clear distinction was made between the needs of the regional centres and those of individual countries. The regional centres, because of the shortage of personnel, are to some

extent prevented from expanding their activities in the corresponding areas to the extent that is considered desirable and cannot give the assistance required by the individual countries; in the matter of training, since they cannot operate on a large scale, they are able to do little, for example, towards educating social scientists in aspects of population analysis. In the specific case of Africa, only the establishment of a regional centre at Dakar will make it possible to attend adequately to the needs of the French-speaking countries of the region. The Cairo Centre, established in 1963 for the six North African countries, is already serving the Arabic-speaking countries of the Middle East and will serve the English-speaking African countries of the region.

The situation of individual countries is somewhat paradoxical. Mention was made both of the lack of trained personnel and of the failure to use those already trained. The two facts seem to be closely related. It was said that in one country, for example, in which the National Planning Board had recognized the need for trained demographers, the number that could be absorbed was extremely meagre. In another country, the dearth of qualified demographers was related to the relative absence of employment opportunities. This led one speaker to insist on the advisability of giving training only to those persons who were to occupy positions in which demographic research and training would be undertaken. Otherwise, their talents would be wasted. A similar preoccupation was that training should be planned in such a way as to permit the trained person to find a job and a function in which his knowledge could be used immediately as in the health field.

The direction of the future development of research and training was discussed from various points of view. In the view of one of the participants, the direction should be from regional to sub-regional, and from the sub-region to the country and to sub-divisions within the country. Many opinions were voiced which may have an effect on future activities.

As far as the developing countries are concerned, in order to reap more benefit from the help of international agencies and other institutions, there must be a reappraisal or re-defining of policies governing the initiation and execution of research projects, to make sure that they are of use to the respective countries. The participation of local personnel is essential if the work is expected to continue after the departure of the foreign expert. New surveys should not be conducted until the analysis of

the existing data has been completed. Otherwise, the selection of the subject matter of new surveys may be influenced by the personal preferences of the adviser instead of by the requirements of the country. Co-operation between foreign and local experts in all phases of the work should become mandatory and not be left optional, if national demographers are to benefit from the surveys done in their own countries and through them acquire the experience which they lack.

More co-ordination and co-operation is also required at the national level, when several institutions are working independently on demographic research or on matters originating from it. In certain cases, the outcome of a study leads to new ones of a different nature and with different aims, involving research and training. Measures adopted to curb the effects of a series of factors may determine abrupt changes that will make new actions imperative. All this, which has already happened in Chile, makes the above-mentioned co-ordination and co-operation between governmental institutions and universities as well as among specialists vitally important. Otherwise, the waste of resources is great, particularly if interests other than strictly scientific are involved.

The application of the experience of the more developed countries is indispensable. However, it will also be important to experiment in the future in order to develop new methods and procedures better adapted to conditions in the developing countries. The constant repetition of models which originated under different conditions may also introduce distortions and bias into the conclusions.

The discussion of matters directly related to training centred on four main points: the people for whom training should be provided and the level of training to be offered; the content of the training; problems hampering the effectiveness of training; and possible complementary measures.

Training was considered to be indispensable or at least highly desirable for persons who are already working in population matters, intend to make demography their field of specialization and will work in that field as part of technical co-operation programmes. Also, for persons who have been trained in other disciplines but need to acquire knowledge on population matters, and lastly, for persons who are being trained in other disciplines but would benefit from some knowledge of population matters. The existence of a demand for all types of training was recognized, and reference was made to the efforts being developed by the

Soviet Union to satisfy the various needs simultaneously.

The inclusion of courses on population in the curriculum of the universities of the developing countries, either as an independent subject or as part of courses in the social sciences such as economics, sociology, social history, economic history and social psychology, was considered to be of the utmost importance. If this can be done, knowledge of population mechanics and population policy may become widespread and specialization will be made easier at a later stage. Also, by extending such courses to the universities, a limited self-sufficiency in demographic researchers may soon be attained.

The need to stimulate progressively the growth of demographic training and research in the developing countries was stressed. A dependence on foreign experts, who are not always fully conscious of the social and cultural background of the developing countries concerned, poses a threat to the advancement of research and the correct interpretation of the society which is being studied. This is made more important by the fact that the increase in the number of countries which require assistance may tend towards a lowering of standards in the training of experts because of their short supply. The use of pseudo-advisers can sometimes be responsible for distortions of social phenomena and social change which tend to do more harm than good.

Regarding the content of training, there was a consensus of opinion that remarkable advances have been made and that the situation is much better than it was some years ago. However, it is not yet known what the optimum content should be. Observations presented were related principally to the need to evaluate the experience gained and to fill in the gaps observed.

This kind of evaluation will be possible through inter-regional seminars on training such as the one already proposed to the United Nations. Such a seminar, if held in 1966 or 1967, will offer an opportunity for a detailed review of the accumulated experience and lay the foundations of an effective programme which should, among other aims, strike a balance between general theory and specific applications.

In regard to the contents of the training given at present, the following specific points were made:

(i) There is need to include in the curriculum essential elements of economics and economic policy-making, since only when demographers become familiar with the demands of

the economists concerned with demographic data and interpretation will they be able to contribute fully to studies and measures related to economic development. An adequate grounding in economics is necessary to improve understanding and collaboration between both types of specialists, since almost any topic of demographic analysis touches upon important economic problems. It is not enough to train demographers exclusively on the basis of sociology and mathematics; they should also speak the language of the modern economist concerned with development.

(ii) There is also need to expose trainees to live data, such as the inadequate statistics characteristic of developing countries, as well as to the newly emerging techniques for estimating vital quantities from inadequate statistics.

(iii) Instruction should be included on survey techniques, especially sample survey techniques, and data processing, since most demographers will not only have to analyse available data but also to collect and process new data.

Reference was also made to the need to diversify the training given and relate it more directly to the needs of certain regions, bearing in mind the existing openings in civil service careers or in universities, and, in the case of the university, expanding the work done in statistics, mathematics, demography and survey methods.

The difficulties and problems that hinder the effectiveness of training may be classified into three groups: those which contribute to reducing interest in the training itself, those which limit the effectiveness of the instruction given, and those which impede the application of the knowledge acquired.

The reduction of interest on the part of potential candidates as well as the limitations on the application of the training received frequently result from the conditions already mentioned: the lack of professional recognition, the lack of career prospects, the dearth of job opportunities, and inadequate salaries. It was noted, as an example of the prevailing situation, that an African demographer has a choice of working in the civil service or of taking up a teaching and research post in a university. If he chooses to go into the civil service, he will be essentially a statistician, working primarily in census, civil registration or in social surveys. Census will occupy him from two to four years in a decade; civil registration in most developing countries is not functioning, and he is unlikely to find his time fully occu-

pied; and funds for social surveys are scarce. In the universities, since demography is an ancillary subject, he will have to teach other subjects as well. Comparable situations, even though not exactly similar, exist in many countries of the other regions.

The factors which hinder the effectiveness of the training have been referred to extensively in the documents relating to the work of the regional centres and of the universities. Some of these hindrances could be eliminated or reduced without large financial assistance, such as the shortage of desk computers or of sufficient numbers of copies of standard text-books. Others, however, present more difficulty, such as the lack of bibliographies in the language of the trainees, a problem which will only be solved by means of translations such as the one being made of the *Demographic Dictionary*; the insufficient distribution of demographic publications to trained personnel; the need to ensure the advisory services for two or three years of well qualified demographers to universities which are beginning research and training programmes.

With regard to measures to complement training attention was drawn to the desirability of follow-up programmes and to the possibilities of "partnership" projects.

As indicated, the training of people from developing countries should be followed up by personal and institutional contacts over a period of years, as a way of making the training more effective and linking the work of the developing and more developed countries.

A "partnership", that is, teamwork by foreign and local personnel, would help to eliminate the situations which are sometimes observed in certain regions. As noted, there are cases in which foreign research workers come to a developing country with a theoretical background and, finding unexploited fields of social research, proceed to collect statistical raw material using local enumerators. Their collaboration with national personnel often stops here. The data processing is conducted out of the country or by the foreign expert himself, who also assumes the responsibility for the analysis and publication of the results, entirely ignoring the existing local demographers who would, at least in some instances, help to avoid surveys which are not justified or conclusions which are useless for the countries concerned. Partnership throughout the programme, that is, from the collection of the data to their analysis, would prevent intellectual isolation, avoid serious errors in the interpretation of the results, ensure understanding between

foreign and local demographers, and contribute to a better use of the knowledge and skills of each side.

The discussion of international co-operation in demographic research and training was conducted to a large extent in connexion with the points previously referred to. Nevertheless, it seems justifiable to mention, even at the risk of repeating a number of points, some of the observations made.

There is no doubt that progress has been made in the last decade in matters concerning demographic research and training. It is also undeniable that such progress has been largely due to the action of the United Nations, directly and through its regional centres, as well as to the general concern that exists regarding population problems. The work accomplished has established a solid basis that will permit more extensive and ambitious activities in the future.

It also seems clear that the training and research work of the regional centres will have to continue and be supported by international resources. The final solution, which involves the transfer of the present responsibilities of such centres to national institutions, can only be achieved gradually, as the countries are able to assume such responsibilities. One possibility, as this occurs, is that of concentrating the resources of each centre on the study of the corresponding region as a whole. Another possibility is that of expanding the use of well-known national institutions, such as the Institut national d'études démographiques of Paris, for training the personnel of other countries. The scope for development along these lines is considerable. The Institut national, for example, is already collaborating in the training of demographers from Tunisia and Mexico.

Need is felt for higher-level training, but the development of university courses on demography is not proceeding at a uniform rate in all regions. In some of them, progress in this direction has been slow. Technical and financial assistance will be needed in all regions to support initiatives of this kind. Since the national universities and research institutions will have to carry the major load of training work, it will be appropriate to extend facilities to them in order to encourage them to undertake increasing responsibilities.

The cost of regional centres, which has sometimes been considered high, needs to be re-examined not only in the light of their training activities but also taking into consideration the assistance that they are offering to the countries of the regions concerned, the support

which they are giving to national activities and, above all, the promotional work that they are doing.

At the same time, special attention should be given to the workload which has been gradually attributed to these centres, without a parallel increase in their resources. The continuation of such a trend may, in the long run, affect and hamper the effectiveness of their basic activities.

Professional recognition of trained demographic personnel needs to be considered as one of the principal aims for future years. Unless this aim is achieved, many of the

present gains will be lost, and the activities of the persons trained substantially affected and reduced. An investigation is also required of the way in which demography can be given an appropriate place in the educational system of each country, as a starting point for action in that regard.

The following speakers took part in the discussion: Adler, Adriasola, Agarwala, Ahmed, Das Gupta, Eldridge, Ghansah, Gutiérrez, Hyrenius, Iro, Kerup, Kish, Miró, Oviensky, Paillat, Schubnell, Som, Tottie, Urquidí, Valaoras, Vincent, Whitney, Winkler.

MEETING A.4

Future population trends and prospects

Statement by the Moderator: Mrs. Irene B. TAEUBER

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The organization of this second World Population Conference reflects the increasing magnitude and the widening dimensions of the world's problems of population growth. The documentation shows the altered definitions of population problems, the expanded research and the integration of population in development planning.

At the first World Population Conference more than a decade ago, the approach to world population and to population research was dual. There were separate sessions on low and high fertility and on low and high mortality. The problems of the developed countries with low birth and death rates were less sombre in 1954 than they had been in earlier periods. Since fertility fluctuated at low levels rather than continuing to decline, pro-natalist policies were no longer an over-riding concern for many countries. The problems of the less developed countries were moving into central focus, but their dynamics were viewed simply as high and unchanging birth rates existing alongside slowly declining death rates. Government policies to encourage family planning were appearing in some of the populous nations of Asia, but there was neither assistance from the United Nations system nor consensus that such assistance was desirable.

The population dynamics of the early years of rapidly declining mortality were complex. The demographic responses to needs for estimates of future populations were based on theories of natural transitions derived primarily from European experience. It was assumed that there was, or soon would be, a world-wide diffusion of industrialization, urbanization, higher status for women and secularized values. If this was so, declining fertility would lag behind declining mortality. Growth would depend on the extent and the duration of the gap between its declining components. The

theoretical formulations of inherent transitions did not solve the problems of measurement. For these, the approach involved generalization of the past experience of countries then developed. Population projections were contained within conventional demographic forms.

The demographers made projections, while the economists and the behavioural scientists used the figures as projected. There was little recognition of the circularity between the economic, social and demographic assumptions that underlay theoretical formulations and projections. Continuing population research and the evolving experience of developing countries alike confirm the hypothesis that, given industrialization, urbanization and the associated changes in social organization, roles and attitudes, fertility will decline. Continuing economic research and the experience of countries whose development is slow or delayed indicate that rapid economic development and the geographic and social mobilities of educated people are slowed if not precluded by the high rates of population growth that now exist in many countries. Given economic development, demographic transitions can be anticipated. Given demographic transitions, economic development is more probable and is likely to be speedier.

It is the dilemma of an advance that must be comprehensive rather than sectoral that is the critical problem in research, planning and programmes in population and related fields today. Asian countries were the pioneers and remain today in the forefront of action programmes. The Economic Commission for Asia and the Far East was the pioneer in including technical assistance in family planning as an aspect of its work in population fields. The United Nations system itself now recognizes population as an integral component in policies, plans and actions to speed economic development and to advance social welfare.

Development is now a total process that includes population, economy, and society in a focus of advancing science, technology and resources. Its goals include rising levels of living for present populations, educational and economic opportunities for maturing children and youth, and the strengthening and enrichment of the heritage that is transmitted to future generations.

Population growth and hence the problems involved in the projection of future growth are complex at given times and variable over time. The three billion people of the earth are diverse in locale and resources, historic development, technology, social organization and political form. Plausible interpretations of the present and the near future suggest increasing diversities within and between countries and regions, along with some convergences in knowledge, aspirations and achievements.

Levels and changes in fertility and mortality are related to each other in many and intricate ways. Both are related to the internal movements of the population, whether within the rural and urban sectors or between them, and particularly to that rural-urban movement which accompanies increasing non-agricultural employment. Vital components and migration are related to economic and social change. Forms of social organization and political administration condition economic development and demographic modernization, though demographic responses to achieved development are comparable under varying types of organization of production and distribution. Culture, history and locale are factors of major relevance.

The appropriate presentation for a session on future population trends and prospects would use most if not all the research reported to this conference, whether narrowly or broadly demographic, general or technical. This is neither appropriate nor feasible. Nevertheless, however limited the time and the presentation, two facts must be emphasized. First, population growth is a critical problem in many of the world's less developed countries. Second, the critical period is not the distant future, but the next few years or decades.

THE PERSPECTIVES OF TIME

Increasing research in historical demography in widening areas of the world indicates that sustained growth is not a modern phenomenon; that change, whether of increase or decrease, is variable among areas and over time; that neither industrialization, science, medical technology, nor other monistic factors explains the diverse regional and temporal changes; and

that fertility and mortality were and are variable in pre-modern settings. The technologies already widespread in mortality control and the newer technologies now diffusing in fertility control combine with many economic and social forces to preclude simple continuities from past to future.

While there are no uniform levels of fertility, mortality and natural increase which can be defined as pre-modern, there are broad similarities in the dynamics of growth in traditional agrarian societies. There are distinctive processes of change in the demographic transitions of industrializing societies. The basic differentiating forces involve traditional developments and the use of men and animals as motive power. On the one hand, scientific and technological developments and the use of power on the other.

A pre-modern population that was isolated in an unchanging physical milieu could achieve a continuing balance of births and deaths that yielded no growth. Except in this rare instance, no pre-modern population could achieve stability in death rates or continuity in their downward movements. Natural hazards and epidemics produced irregularity; folk medicine, ritualistic sanitation, prevalent infections and endemic disease precluded low rates. This is true whatever the relations between population and resources, and efficiency in the use of resources. Death rates that would now be defined as low could not persist apart from the science and technology that underlie the industrializing economy and the urbanizing society. Technologies, once achieved, spread beyond the countries in which they develop, sometimes in advance or apart from the economic, educational, and social complex in which they evolved. It is this fact that poses such critical and as yet unresolved questions regarding the future of the less developed populations.

The statements that can be made with reference to the levels and dynamics of fertility in pre-modern societies are less firmly based than those concerning mortality. Fertility is a demographic variable rather than a biological constant, but there are limits to the variability in pre-modern, as in modern countries. The fertility of a viable pre-modern population must have been high enough to compensate for high death rates. Given this relationship, severe imbalances would arise if fertility persisted with little change while mortality declined to low levels, yet this is the sequence of changes in the less developed countries in recent years.

Pre-modern, modernizing and modern countries differ in the range of the birth rates that

are consistent with viability, the fluctuations of death rates, and the changes of stable balances in vital rates. There were long periods of expansion among pre-modern peoples, eras of increasing production and increasing population. There is no instance in which economic, social and psychological factors initiated and sustained widespread aspirations and effective achievements as regards planned family size. Nor did those who remained dependent on human or animal power invent the major technologies of death control. The periods of growth and expansion might be long, but they terminated in restorations of mortality control.

Demographic transitions to low fertility have occurred in Europe, among European peoples overseas and in Japan. This experience is not and cannot be made a basis for prediction of the future in countries that are now less developed. The following are some of the ways in which today's less developed countries differ from countries now developed at their earlier stages of development:

(a) Population structure and dynamics, the state of the economy and society and the relations of people to production or productive potential;

(b) Science and technology subject to acquisition by borrowing rather than invention;

(c) Manifold deterrents to speedy economic growth and high rates of population increase;

(d) Availability and accessibility of resources;

(e) Dedication of governments and peoples alike to the goals of modernization;

(f) Democratization of concepts of need and welfare.

It is obvious that many of these factors were divergent among the countries that modernized earlier, that the countries now developing differ widely from each other, and that there have been pervasive changes in many of the factors over time. Nevertheless, historical replications of demographic transitions are not likely. Projection by analogy is hazardous. Today's problems of population growth are new in magnitude, in intensity and in the possibilities for swift resolution.

THE FUTURE OF MORTALITY, FERTILITY AND NATURAL INCREASE

If there were necessary relations among the components and associated factors in growth, bases for estimations of future populations could be expressed in mathematical formulation. The difficulty today is the limited association of mortality and fertility within the less de-

veloped countries, and the lack of proportionality in the relations of mortality and fertility with economic and social levels and changes in those levels.

Mortality is responsive to scientific and technical advances, while fertility continues to reflect traditional values, ancient folk practices and milieu. The relatively low levels of mortality and the persistently high levels of fertility combine to yield rates of natural increase higher than those hitherto prevalent in any areas of the world over any long periods of time. Projection of these rates into the future is patently not predictive. Numerically, the size of the populations implicit in the separately projected components would soon surpass the carrying or even the standing capacity of the earth. Logically, wide gaps between normally related components or lags in change between necessarily related variables generate unstable relations.

It is an abstraction from reality to assess the separable futures of the components of growth, for forces that influence the future of one component also influence the others. Nevertheless, there is major advantage in abstraction if time sequences are noted. Mortality has been and remains the lead variable in the less developed areas, but fertility may become the critical variable in the future. Migration and mobility may be viewed as independent variables in dynamic settings, but they are essentially dependent variables in settings where rates of population growth exceed those of economic growth.

The forces that will influence mortality in future years may differ widely among the countries. In developed countries, there are few questions as to the ability of economies to sustain populations. Continuing declines in fertility and continuing low fertility have produced aging populations; the causes of death of primary concern are those of the middle and later years. Estimates of the future of mortality may extend the curves of past mortality, or they may explore the impacts of further advances in science and technology. Without the elimination of causes of death that are now major or the extension of the life span, further reductions in mortality can have only limited effects on the population growth of countries now developed.

Given rising levels of living and improving health services, the future course of mortality in the developing countries will be downward. Rough estimation is feasible, for levels and changes in death rates by age and sex are measures of biological processes. There are age

and sex patterns of mortality at varying levels; there are patterns of age change as populations move from high to low levels of general mortality; there are close associations of death rates at the successive ages of the life span. Moreover, the programmes and achievements of national states and international organizations in the fields of public health and sanitation are objective evidence that the prolongation of life is an almost universal value among peoples and a priority goal for government action at all levels.

There is still debate regarding the responsibility to be assigned to specific and general health programmes as against or combined with general developmental activities in the declining mortality of the developing areas. However, scientific and technological advances are continuing, and public health services are being extended over wider areas. The direction of the movements of death rates should therefore be downward, with the rates of decline related, if not proportionate to present levels. If this trend, which involves a continuation of the past, is the trend of the future, the death rates of all countries will converge towards those low levels that are now technically feasible, provided economic and social developments yield permissive environments.

The estimation of the future of fertility is more complex than that of mortality, for social and psychological dynamics are involved together with social organization and economic advance. Today, fertility is generally, but not uniformly low in developed countries. The major contrasts are those between the countries of Europe west of the Soviet Union and Japan, and the Soviet Union and the English-speaking countries overseas whose populations are mainly European in origin. The fertility of the countries that were formerly transitional is now low. The fertility of the less developed countries is still high. There is a hiatus in the middle ranges between the developed and the less developed countries. There are no developed countries with gross reproduction rates above 2.0, and no less developed countries with gross reproduction rates below 2.0.

Although there have been major advances in knowledge of the reproductive processes, the biological and operational effectiveness of birth control, the associations among demographic and social or economic variables, and attitudes, motivations, plans and achievements with reference to fertility, the goal of prediction is still elusive. Some countries now developing show patterns of fertility change appropriate to the economic and social advances that are

occurring. The problems of projection are most severe for those less developed countries where declines have not yet begun, or have not yet become measurable. The methodological advances in quasi-stable population theory and field survey design contribute to measurement, but they do not provide bases in fact or in theory for evaluating the timing and the speed of declines that are not in process.

What, then, is the future of natural increase? Declining mortality is an achievement of modernization; health activities designed to attain still lower levels are continuing. Increasing numbers of countries recognize the hazards to national development and family welfare inherent in the continuation of declining death rates together with unchanging birth rates. India was the pioneer in placing family planning in the context of developmental planning. Major family planning programmes are now in operation in several countries, with technical assistance available on request from the United Nations.

Thus, a new dimension has been added to the problem of estimating future trends in fertility, and hence in population growth, in the less developed countries. Measurements of present levels of fertility and estimations of the populations that would result if fertility remained at those levels have become forces stimulating programmes to alter them. The extent and the effectiveness of these programmes and their associated educational activities cannot yet be assessed, save in the occasional instance. It is now reasonable to assume, however, that declines in fertility will be widespread, and that the speed of the decline will accelerate over time.

FUTURE POPULATIONS: CONJECTURES OR PROBABILITIES?

The field of population projections is no longer solely a concern of analysts in universities. It is, rather, a responsibility of countries that need estimates of present and future population as bases for planning and programme guidance. It is a responsibility of the United Nations to provide estimates that chart the future course implicit in present developments or in modifications of those developments.

The primary interest of this meeting is in broad generalizations of the ranges within which the future populations of the major regions of the earth, and the earth itself, are likely to fall. The evaluation of the degree of credence to be accorded to global projections requires an evaluation of the knowledge of the facts and processes that are the bases of pro-

jections for specific countries or regions. Such an evaluation also requires the assessment of the predictability of the future in widely divergent types of economic, social, and demographic situations. The documentation for this meeting is therefore particularly valuable. The essential resource is the United Nations *Provisional Report on World Population Prospects, as Assessed in 1963*.¹ The paper by J. D. Durand places estimation within the frame of world population trends from 1750 to 2000,² while that by Z. Vávra analyses the projections as of 1963 for the more and the less developed countries, with emphasis on age structures and dynamics in the middle series.³ The paper by B. Y. Smulevich presents a concise statement of the socialist population doctrine and the place of public health and family planning in development theory and programmes.⁴ The paper by A. Boyarsky contains projections for countries grouped by social system.⁵ There are two series of regional estimates for Africa, one by R. Blanc for fifteen French-speaking countries including Madagascar,⁶ the other by E. van de Walle for tropical Africa excluding Ethiopia, Somalia and French Somaliland.⁷ Projections for individual countries include those by J. V. Arévalo for Argentina,⁸ R. B. Zenteno and G. C. Acevedo for Mexico,⁹ A. Das Gupta and S. Sen Gupta for Thailand,¹⁰ and R. Pressat for mainland China.¹¹

Argentina, like Japan, is a country of advanced demographic transition in a region of

generally high fertility. Mexico is a country of rapid economic growth, but very high fertility. The papers on these countries show the hazards of regional generalization in striking form.

The analysis for Thailand is classic, not because of any unique aspects of the country, but because the assessment and adjustment of data are painstaking and incisive. The data for tropical Africa are not so amenable to adjustment. The figures on the total populations of many countries are subject to substantial error. Age structures are likely to be missing or, if available, discordant with reality. Data on fertility and mortality, where they exist, pertain to local areas or to sample populations whose representative character cannot be determined. It is not surprising, therefore, that there should be major discrepancies between various estimates for tropical Africa. There is relative concordance between the estimates of the Institut national de la statistique et des études économiques and those of the United Nations for the French-speaking areas, but the United Nations estimates rely on the French ones.

The limitations on data and hence on realistic estimates of present and future populations are serious as far as national, regional, or more broadly based planning for tropical Africa is concerned. However, the total numbers involved are relatively small, so that the course of a world population now numbering some 3,000 million is not influenced greatly by errors in estimation or projection. The situation is quite otherwise as regards mainland China.

The Chinese are the world's largest cohesive group. The area of mainland China includes one fifth to one fourth of the world's total population. In 1953 and 1954 the Government of China (mainland) conducted a census and investigation of the population. The population as of mid-1953 was reported as 583 million for the mainland. This single figure is accepted as the base for retrospective and projective estimates by all analysts. The Government also published an age pyramid for the population as of 1953, and vital rates for the years from 1952 through 1957. These data are rough approximations only. Hence the future population of 20 to 25 per cent of the world's population involves a hypothetical age structure and hypothetical vital rates, to move from 1953 to 1965 and then from 1965 to the end of the century. The range of the demographically possible is enormous. Assuming the fertility of rural Taiwan in the late 1930's along with declining mortality, the population would be 2,000 million by the end of the century. Assuming the swift realization of the Govern-

¹ United Nations, *Provisional Report on World Population Prospects, as Assessed in 1963* (ST/SOA/SER.R/7), to be published as *World Population Prospects, as Assessed in 1963* (United Nations publication, Sales No.: 66.XIII.2).

² J. D. Durand, "World population estimates, 1750-2000", *Proceedings*, vol. II.

³ Zdeněk Vávra, "Projection of world population (distinguishing more developed and less developed areas at present)", *Proceedings*, vol. II.

⁴ B. Y. Smulevich, "Present and future patterns of population replacement", *Proceedings*, vol. II.

⁵ A. Y. Boyarsky, "A contribution to the problem of world population in the year 2000", *Proceedings*, vol. II.

⁶ Robert Blanc, "Population forecasts: Practical problems of making such forecasts in the developing countries", *Proceedings*, vol. II.

⁷ E. van de Walle, "Future growth of population and changes in population composition: Tropical Africa", *Proceedings*, vol. II.

⁸ Jorge V. Arévalo, "Future population of the Argentine Republic", *Proceedings*, vol. II.

⁹ R. Benitez Zenteno and G. Cabrera Acevedo, "The future population of Mexico: total, urban and rural", *Proceedings*, vol. II.

¹⁰ Ajit Das Gupta and Suranjan Sen Gupta, "Population projections for Thailand and a study of the elements and criteria", *Proceedings*, vol. II.

¹¹ Roland Pressat, "The present and future demographic situation in China", *Proceedings*, vol. II.

ment's goals of late marriage, postponed births and a two-child family, the population would be only 1,000 million by the end of the century.

The estimates of the United Nations for mainland China show a somewhat smaller, but still large variation in future years. For 2000 the minimum is less than 900 million, on the assumption of slowly declining mortality together with substantial declines in fertility beginning in 1955. The maximum, which assumes the continuation of estimated current trends, is 1,500 million in 2000. These projections could be viewed as exercises in ingenuity, were it not for the fact that a medium projection for mainland China had to be computed for use in the world projections. For this purpose, the initial birth rate was assumed to be 38. The age-sex standardized birth rate was assumed to decline by 50 per cent in a thirty-year period after decline began. The medium projection is an average of two estimates, one assuming decline beginning in 1955, another assuming decline beginning in 1970. Thus, by assumption, the birth rate as of 1965 has already declined almost 10 per cent below the assumed level as of 1955. According to this projection, the population in the year 2000 is 1,000 million.

The deficiencies in data, and hence in estimates and projections, for mainland China introduce major uncertainties into regional and world assessments. Given the range of one billion in the population that can be computed for the end of the century on more or less plausible bases, the credence that can be given to estimates of future populations in the ECAFE region, the Asian continent and the world, is limited. And, perhaps more seriously, many of the significant country comparisons within Asia or among the less developed and the developing countries are not valid.

THE FUTURE POPULATION

The United Nations Secretariat was faced with a major dilemma, for projections had to be made for all regions and for the world's total population. The assumptions, and hence the populations projected as of 1963, differ substantially from those in earlier series. There are implicit assumptions that continuing advances in production, education and health will be accompanied by continuing declines in fertility, and that the population programmes of the countries will be factors initiating and stimulating such declines. The series as of 1963 also includes explicit recognition of the tentative nature of any projections that are used in predictive contexts. The struggle with the

dilemma of mainland China was arduous, for projections that could not be made with technical adequacy had to be made and included in the successive summations that yielded world figures. Each positive statement made in considering the results of the projections should be understood as being hedged with the limitations involved in its derivation and the cautions that surround its interpretation.

In 1920 the population of the world was less than 2,000 million. In 1960 the population was almost 3,000 million. If present trends continue, the population will increase to 7,500 million by the end of the century. (See table 1.) This is not a remote date, for it is now 1965. All people who will be age 35 and over in 2000 are already born. Their numbers can be reduced below those projected by higher mortality than that which now seems plausible. Elements of flexibility pertain primarily to those below age 35.

The question here is not whether the world could or could not support a population of 7,500 or any specified number of thousand millions of people at any specified future date. It is, rather, whether the trends of the present are likely to continue for a long period of time in the future. The answer is negative.

The contemporary associations of demographic and other variables are necessarily temporary. If mortality continues to decline and there is a transition to decelerative growth, that transition can come only through declining fertility. This in turn requires rapid economic and social development. But, if there is rapid economic and social development, there is likely to be declining fertility. Thus, the question of the future of population growth is primarily the question of the future of development. The experience of the developed countries in the last quarter-century demonstrates that declining fertility may proceed slowly or swiftly. Final declines to low levels may come swiftly after long periods of slow movement. Government action as regards permissiveness or the provision of facilities for family planning was a factor in rapid declines in some countries. However, continuing declines in fertility did not occur except as correlates of economic and social development among people whose levels of education were appreciable and increasing.

Most of the world's people live in the less developed areas, and the concentration is increasing. The analysis of the past of countries now developed cannot provide models for the future growth of countries now developing. The major determinants of the future lie in the

responses of people in situations that are new, not in the less developed countries alone, but in the world at large. Independent countries now strive for rising levels of real income, improved nutrition, positive health and vitality, educational and other opportunities for children and amenities in living. Scientific and technological advances, effective internal administration and international assistance in reducing death rates have been forces generating high rates of population increase. Long-postponed but now productive scientific and technological work in fields relevant to fertility control, effective internal administration and international assistance may now stimulate and speed declines in birth rates that will reduce rates of population increase, not only to below present high levels but eventually to low levels.

Many forces in the less developed countries are favourable to reductions in birth rates. The increasing pressures that population growth places on families, villages and the larger society are stimulants both to governmental actions and to family decisions. Knowledge of the association between population growth and developmental achievements is also conducive to the inclusion of family planning in development planning. It appears probable that increasing proportions of the people in increasing numbers of countries will decide to limit the numbers of their children and will find some of the diverse means now available, or likely to be available, to them both acceptable and effective.

If continuity in the trends of the past is not likely, what is the pattern of the future for the developing countries? The projections of the United Nations assumed declining mortality, declining fertility, and eventually declining rates of natural increase as probable futures for the populations of the less developed countries and hence for the world as a whole. Specifically, it was assumed that fertility would be reduced to half its original level within thirty years after decline began. High, medium and low projections differ more in the dates at which the declines were assumed to begin than in the speeds with which they were assumed to proceed. Summary data from the medium projections are presented in table 2, and assumed vital rates in table 3.

Even with assumptions of major and long continued declines in the fertility of the populations of the less developed areas, increase remains appreciable throughout the century. The population that was 3,000 million in 1960 approaches 6,000 million in 2000. The amount of the increase becomes larger decade by decade, but the percentage increase slows. As

this occurs, the contributions to development are major. Slowing rates of population growth are favourable to economic growth; fewer children reduce burdens on families. The needed rate of expansion in educational facilities is lessened. Eventually, less rapidly increasing cohorts of youth reach the age of entry into the labour force. Adequately trained and better utilized youth contribute more to the productivity of the economy. Age structures are more favourable to saving and to the use of savings in productive investments.

Since human populations are transformed over generations, there are no panaceas for problems that involve the birth, maturing and death of successive cohorts. Neither declining fertility nor any other demographic change offers an immediate solution for the demographic, economic and social problems of population growth. Since panaceas are not possible, the beginnings of solutions to problems of population growth through smaller entering cohorts of births are essential to priority resolutions for future generations.

PROJECTIONS, PLANNING AND FUTURE POPULATIONS

Population trends are basic to, and associated with, trends in most other aspects of economy and society. Population projections, therefore, are extended to the distribution and redistribution of the population, the economic and social functioning and the characteristics of individuals and basic institutions, and the broad economic and human development of the nation itself. Space precludes anything more than a brief note of this extension of projections to operational levels within countries.

Internal migration and urbanization are among the most distinctive aspects of the population dynamics of developed and developing areas. In Europe, mature demographic processes in countries with advanced and growing economies are associated with depleted supplies of international migrants, whether from within or outside the continent, and the introduction of temporary migrants from other continents. The demographic impacts proceed indirectly through training acquired by the migrants and developments stimulated in their countries of origin.¹² In Japan convergences in levels of fertility and mortality throughout the country have reduced the associations of internal redistribution with

¹² See Attilio Oblath, "Recent developments and prospects of migration in Europe", *Proceedings*, vol. II.

the growth of the national population.¹³ The major demographic consequence of the continuing migration projected for the remainder of the century is further concentration. The classic associations of rural to urban movement with economic and social development are major and pervasive in Yugoslavia.¹⁴ In India, as in other Asian countries now developing, rural and urban differences in marital fertility and in mortality are minimal as urbanization itself slows.¹⁵ The increasing mortality associated with unsolved problems of urban crowding and the declining fertility of planned families may lower natural increase in cities in the future.

Regional and operational planning requires assumptions as to the changing distributions of the projected population between areas of the country as well as between the urban and rural sectors on a national basis. Such projections are needed particularly for problem or developmental areas, such as Mindanao in the Philippines.¹⁶

Estimates of the characteristics of the future population are the next steps after forward projections by age and sex, whether for the national population, geographical regions, or urban and rural areas. The population projections themselves permit descriptions of estimated future changes in pre-school and school age children and youth, the male and female populations in productive and reproductive ages, the aging and the aged. Projections of marital status, families and households are relevant to many demographic, economic and social processes. Age at marriage and marital status are related to fertility; estimates of fertility may be derived from separate estimates of future trends in age at marriage, duration of marriage, and age-specific marital fertility. Families and households are units in, or related to, mobility and migration, production and consumption, and economic activity or its absence.

The most prevalent projections are those concerned with economic activity and with

education.¹⁷ Since these are topics whose relations with development are the subjects of other meetings, they are only noted here.

THE FUTURE OF POPULATIONS

When the demographic history of the twentieth century is written, that which we now call the future will be chronicled. The first of the outstanding processes of the century will be the declining death rates, particularly those that followed the application of science, technology and administrative organization to the reduction of environmental life hazards in the less developed regions. The increase of rates of natural increase to 2, 3 or even 4 per cent a year in these regions of persistently high fertility will be noted, as will the years when economic and social developments were slowed down if not deterred by the increasing rates of population growth. There will then be a survey of the forces of change and the processes of decision and action, as planned families and responsible parenthood were added to improved health and increased longevity as goals for policy, planning, and programmes.

The last chapters of this history are not yet available. Nevertheless, we know that continuities are neither probable in the short run nor feasible in the long run. We know that there are alternate paths to the future for countries, regions, and hence the world. Given stimulated declines in mortality, stimulated declines in fertility are also required if difficulties are to be avoided in transitions to decelerating growth. Thus we know that the future is not predictable.

The rapid rates of increase in school-age population, in labour force entrants and adult participants, and in marriages and families are documented in the projections and analyses before this second United Nations World Population Conference. So also are the problems of increasing food production sufficiently to provide improving nutrition for the swiftly increasing populations, when new lands are limited and people are lacking both in the education and in the capital required to achieve the increases of production that knowledge now makes possible theoretically. There is the central problem of an economic development that must surmount the multiple problems of rapidly increasing numbers, low levels of education and training, and increasing demands for rising levels of living and amenities now.

¹⁷ E.g. Jerry Miner, "Alternative population projections and first-level school enrolments", *Proceedings*, vol. II.

¹³ See Yoichi Okazaki, "Migration in relation to future growth of population and its distribution; internal migration and population distribution—Japan", *Proceedings*, vol. II.

¹⁴ See Sava Obradović, "Influence of economic development on migration in Yugoslavia", *Proceedings*, vol. II.

¹⁵ See N. V. Sovani, "Internal migration and the future trend of population in India", *Proceedings*, vol. II.

¹⁶ See Francis C. Madigan, S.J., "Estimated trends of fertility, mortality and natural increase in the north Mindanao region of the Philippine Islands, 1960-1970", *Proceedings*, vol. II.

The essential questions for research relate to the future of the factors influencing populations rather than to the methodologies of projection. These factors include basic research into human reproduction and means of contraception, administrative organization and appropriate staffing in government programmes, the receptivities of people, the channels and techniques for altering those receptivities, the natural motivations that may be present or evolving, and the extent and the efficiency of the diffusing practices as measured in reductions of family size at the personal level and birth rates at the national level.

Given education and facilities for decisions with reference to conception, what are the impact points for strategies of government action in such diverse fields as education, altered roles for women, the labour of children,

the provision of housing and amenities, land ownership and inheritance, wage policies, etc.?

Specifically, what are the interrelations between declining mortality, increasing family size, pressures of population on institutional facilities, difficulties in employment, and deterrents to economic growth? What are the intensities of associations? Does declining mortality itself generate the forces for declining fertility? If so, does it operate with sufficient speed and intensity?

Finally, what are the developmental associations between health and longevity in the countries and regions of rapid population growth? What are the trends in physiological status, nutrition, and vitality, particularly among children and youth? Are proper spacing and limitation in human reproduction aspects of medicine and public health as essential as

Table 1. Population of the world and eight major regions, 1920 to 1960, and projected, 1960 to 2000, on assumptions of continuing recent trends

Regions	Enumerated or estimated			Projected	
	1920	1940	1960	1980	2000
<i>Population (millions)</i>					
WORLD	1,862	2,295	2,990	4,487	7,410
More developed regions ..	606	730	854	1,085	1,393
Europe	327	380	425	496	571
Soviet Union	155	195	214	295	402
Northern America	116	144	199	272	388
Oceania	8.5	11.1	15.7	22.0	32.5
Less developed regions ..	1,256	1,565	2,136	3,402	6,017
East Asia ^a	553	634	793	1,139	1,803
South Asia	470	610	858	1,418	2,598
Africa ^a	143	191	273	458	860
Latin America	90	130	212	387	756
<i>Increase, 20-year periods (per cent)</i>					
WORLD	—	23.2	30.3	50.1	65.1
More developed regions ..	—	20.5	17.0	27.0	28.4
Europe	—	16.2	11.8	16.7	15.1
Soviet Union	—	25.8	9.7	37.8	36.3
Northern America	—	24.1	38.2	36.7	42.6
Oceania	—	30.6	41.4	40.1	47.7
Less developed regions ..	—	24.6	36.5	59.3	76.9
East Asia	—	14.6	25.1	43.6	58.3
South Asia	—	29.8	40.6	65.3	83.2
Africa	—	33.6	42.9	67.8	87.8
Latin America	—	44.4	63.1	82.5	95.3

SOURCE: United Nations, *Provisional Report on World Population Prospects, as Assessed in 1963* (ST/SOA/SER.R/7), to be published as *World Population Prospects, as Assessed in 1963* (United Nations publication, Sales No.: 66.XIII.2), part II, Summary of results, tables 5.1 and 5.3.

^a Estimates insecure.

obstetrics, gynaecology and pediatrics? If so, the advance of limited and responsible parenthood is a natural component in that pursuit of health which has been universally and enthusiastically undertaken by peoples and governments.

The critical question as regards the future of population is the future of fertility in the less developed areas. One critical question with reference to that fertility concerns the extent,

the receptivities to, and the effectiveness of the plans and programmes of governments in population fields. The other concerns the type and speed of economic development and social advance. Increasing rates of economic growth and slowing rates of population growth are both essential to rising levels of living and more abundant lives for all peoples in a world where internal stability and international peace prevail.

Table 2. Populations of the world and eight major regions, 1960, and projected, 1970 to 2000, on medium assumptions as to future trends^a

<i>Regions</i>	<i>1960</i>	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>2000</i>
<i>Population (millions)</i>					
WORLD	2,990	3,574	4,269	5,068	5,965
<i>More developed regions</i> ..	854	946	1,042	1,153	1,266
Europe	425	454	479	504	527
Soviet Union	214	246	278	316	353
Northern America	199	227	262	306	354
Oceania	15.7	18.7	22.6	27.0	31.9
<i>Less developed regions</i> ..	2,136	2,628	3,227	3,915	4,699
East Asia	793	910	1,038	1,163	1,284
South Asia	858	1,090	1,366	1,677	2,023
Africa	273	346	449	587	768
Latin America	212	282	374	488	624
<i>Decade increase (per cent)</i>					
WORLD	—	19.5	19.4	18.7	17.7
<i>More developed regions</i> ..	—	10.8	10.1	10.6	9.8
Europe	—	6.8	5.5	5.2	4.6
Soviet Union	—	15.0	13.0	13.7	11.7
Northern America	—	14.1	15.4	16.8	15.7
Oceania	—	19.1	20.8	19.5	18.1
<i>Less developed regions</i> ..	—	23.0	22.8	21.3	20.0
East Asia	—	14.8	14.1	12.0	10.4
South Asia	—	27.0	25.3	22.8	20.6
Africa	—	26.7	29.8	30.7	30.8
Latin America	—	33.0	32.6	30.5	27.9

SOURCE: United Nations, *Provisional Report on World Population Prospects, as Assessed in 1963* (ST/SOA/SER.R/7), to be published as *World Population Prospects, as Assessed in 1963* (United Nations publication, Sales No.: 66.XIII.2), part II, Summary of results, table 5.5.

^a See text for assumptions.

Table 3. Vital rates, world and major regions, 1960, and projected, 1970 to 2000, on medium assumptions

(Rates per 1,000 population)

Regions	1960-1965	1965-1970	1970-1975	1975-1980	1995-2000
<i>Births</i>					
WORLD ^a	33.6	32.4	31.5	30.5	25.5
East Asia ^b	32.5	30.6	29.2	27.2	19.9
South Asia ^c	42.3	40.7	38.1	35.6	26.6
Europe	17.8	16.7	16.3	16.4	15.9
Soviet Union	22.1	19.4	19.0	19.9	19.3
Africa	45.5	45.4	45.1	44.6	40.0
Northern America ^d	22.6	21.3	22.6	23.6	22.2
Latin America	39.3	38.5	37.2	36.2	30.2
Oceania	25.0	24.4	24.7	25.5	25.3
<i>Deaths</i>					
WORLD ^a	15.7	14.5	13.6	12.7	9.4
East Asia ^b	18.9	17.3	15.9	14.4	10.6
South Asia ^c	18.5	16.6	14.9	13.7	7.9
Europe	10.0	10.0	10.1	10.4	11.2
Soviet Union	7.2	7.1	7.1	7.3	8.7
Africa	22.5	20.9	19.5	18.1	13.1
Northern America ^d	9.2	9.4	9.4	9.2	7.9
Latin America	11.1	9.9	9.0	8.2	6.2
Oceania ^e	10.8	10.0	9.5	9.5	9.6
<i>Natural increase</i>					
WORLD ^a	17.9	17.9	17.9	17.8	16.1
East Asia ^b	13.6	13.3	13.3	12.8	9.3
South Asia ^c	23.8	24.1	23.2	21.9	18.7
Europe	7.8	6.7	6.2	6.0	4.7
Soviet Union	14.9	12.3	11.9	12.6	10.6
Africa	23.0	24.4	25.6	26.5	26.9
Northern America ^d	13.4	11.9	13.2	14.4	14.3
Latin America	28.2	28.6	28.2	28.0	24.0
Oceania ^e	14.2	14.4	15.2	16.0	15.7

SOURCE: United Nations, *Provisional Report on World Population Prospects, as Assessed in 1963* (ST/SOA/SER.R/7), to be published as *World Population Prospects, as Assessed in 1963* (United Nations publication, Sales No.: 66.XIII.2), appendix C, tables I, II and III.

^a Not including areas listed in ^b, ^c and ^e.

^b Not including Hong Kong, Mongolia, Macao, Northern Korea and the Ryukyu Islands.

^c Not including Israel and Cyprus.

^d Corresponding to immigration assumptions in original projections.

^e Not including Polynesia and Micronesia.

Statement by the Rapporteur: Mr. R. BACHI

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Whereas other meetings of the World Population Conference were devoted to the study of individual components of total and regional population changes, at this meeting an attempt was made to tie up all these threads and to obtain an over-all picture of future population trends.

The discussion, in which more than twenty persons took part, was largely focused on world

population prospects and future growth of population.

IMPORTANCE OF, AND DIFFICULTIES IN, ASCERTAINING WORLD POPULATION PROSPECTS

General agreement seems to have been reached on the following points. Future population trends, together with socio-economic developments with which these trends are

closely connected, will have a major impact on the foreseeable future condition of mankind. So that this future condition may be one of peace and improved well-being, timely concern for future population trends and socio-economic development is urgently indicated, both on a world-wide scale and at the national level. Study of population trends and attempts at population forecasts are therefore not only of academic interest, but must be regarded as vital instruments for the framing of national and international policies. Equal stress was given during the discussion to their basic importance and to difficulties in their preparation. In this connexion, meeting A.4 did not deal with techniques for preparing projections, but mainly with the difficulty of obtaining a view of likely future trends of mortality, fertility and migrations, on the basis of past experience. Despite broad similarities among nations in demographic transition, diversities in culture, economic development, social organization, etc., have in the past determined a wide variety in patterns and rates of population growth in the different countries of the world. They are likely to do so in future. If interrelationship of social, economic and demographic factors have been complex in the past, there is no reason to think that they will become simpler and easier to interpret in the future, particularly when it is expected that government actions may exert an increased impact, the direction and weight of which cannot be predicted, on various areas of population change and in many countries of the world.

Therefore, results in the field of population prospects and projections must be regarded as at once of basic importance for mankind and as complex and precarious, particularly if they extend beyond the immediate future. The need for caution in forecasts extending up to the end of the century, and the uselessness of making them with apparent mathematical precision, was stressed by a number of participants.

PROSPECTS FOR THE FUTURE COURSE OF MORTALITY

There was little debate in the meeting on the views expressed by the Moderator in regard to future prospects of mortality.

He felt that, for developed areas, estimates of the future of mortality might utilize projective techniques, to extend the curves of past mortality, or might involve hypotheses as to future advances in science and technology and the reduction of death rates due to specific causes. However, without unanticipated advances in the elimination of major causes of

death, further reductions in mortality can have only limited effects on future rates of population growth.

As regards less developed areas, however, the situation is different. Health programmes in practically all countries show that decrease of mortality is now universally accepted as a priority goal for government and international action. In present circumstances this action has, in a first stage, a strong impact on mortality decline as shown by data for many developing countries in recent periods. Further reductions, strongly connected with, and conditioned upon, systematic social and economic progress may however be obtainable in some areas only with reduced speed. Whilst there is little doubt of the general continuation of the downward trends, a warning was voiced in this and other meetings against the danger of too mechanistic a hypothesis of continuous rapid decrease.

PROSPECTS FOR THE FUTURE COURSE OF FERTILITY

Trends of fertility in developing areas constitute the main element as regards future world population prospects. At the same time, the estimation of fertility is a very complex procedure, since social and psychological factors, religious creeds, ethical principles and spiritual values are all involved, along with economic and social factors, and in various areas the possibility of effective government action.

Despite this, there seems to be a considerable consensus of opinion that fertility will start to decrease sooner or later in most less developed areas. However, considerable divergencies of opinion seem to exist on the ways, speed and time in which this decrease will gather momentum.

In some of the reports and many of the interventions, the view was expressed that, if national and international efforts were aimed at improving social and economic conditions in the less developed countries, at raising standards of living, increasing industrialization, improving the social status of women, etc., the tendency towards family planning would follow spontaneously. Many other reports and speakers, on the other hand, stressed the possibility, desirability, even the necessity, of systematic government action in this field, and the influence that this factor could have on reducing fertility. Whilst doubts were expressed, in this and other meetings, on the feasibility of contemplating such policies in countries at a very early stage of development, ample evidence was brought with regard to

government action actually undertaken or planned in many other developing countries.

POPULATION PROJECTIONS

Can the broad generalities indicated in regard to the future course of mortality and fertility be translated into world population projections? It would appear that the meeting generally agreed with the very cautious statement by the Moderator to the effect that, although future populations cannot be predicted over the long run nor populations projected forward with a definable margin of error, what can be done only approximately must be done.

In principle, therefore, future prospects can be expressed by reasonable projections, provided that:

(a) Dependable figures are available for size and structure of the population at the starting point;

(b) Some factual basis can be obtained from present and past records and other sources for judging current trends of fertility and mortality, and, whenever relevant, migration;

(c) Hypotheses can be based on this factual information regarding the future course or alternative courses of demographic events;

(d) Some model or mathematical framework can be built for projecting the effects of such postulated future trends.

It was fortunate, indeed, that in order to illustrate the actual limits to the value of projections the meeting had at its disposal a series of papers which gave examples of projections for major areas of the world, in regard to which the actual application of these criteria could be examined. In those examples, attention was devoted mainly to problems of factual basis and the justifiability of making assumptions on alternative future courses of events. Technical problems connected with the models to be employed were only incidentally touched upon.

From the discussion in regard to projections, it would appear that there are still large areas of the world today for which population projections are an extremely difficult undertaking, either because of lack of data or because of uncertainties in formulating hypotheses on future courses of events. Even under these adverse circumstances, however, as one speaker pointed out, projections are desirable also for national purposes. Besides, even if almost complete uncertainty is postulated in projections for a large minority of world population, there still remains a majority about which knowledge of the present situation is at least fair, and

about which hypotheses on future courses are formulated by different research workers so that final results are rather concordant. The importance of projections in these countries both for local and world-wide purposes was noted by several speakers.

Coming now to the world-wide view it should be indicated that the meeting had at its disposal the United Nations projections by countries up to 1980 and by regions up to 2000, as presented with all due explanations in the relevant papers. The meeting also received projections based on a completely different method and conducive to rather different results. However, the author of these projections stressed in the meeting that his highest estimate was close to the minimal estimate by the United Nations and that differences of opinion on future courses of world population were mainly reduced today to varying views on the speed of various phases of development.

MAIN RESULTS AND INTERPRETATION OF UNITED NATIONS POPULATION PROJECTIONS

As already indicated, it seems to be generally agreed that in the course of this century many less developed countries will start reducing fertility, and this view is fully incorporated in all the three main variants of the United Nations projections.

The medium variant indicates a population of 6,000 million, in round numbers, at the end of our century, while the low variant indicates 5,300 million, and the high variant some 6,800 million. If attention is focused on the medium variant, it is further seen that annual rates of increase per 1,000 population will diminish from 18 as at present to some 16 at the end of the century, whilst the absolute amount of annual growth will still continue to rise.

The increase will be largely concentrated in less developed countries, the population of which will pass, according to medium projections, from 2,000 million in 1960 to 4,500 million at the end of the century, whilst that of the more developed countries might increase from about 1,000 million in 1960 to 1,400 million in the year 2000.

Again, while details of the projections may be debatable, there appears to be general agreement that the expected slowing down of fertility in major world areas in the next thirty or forty years will not immediately and drastically check the over-all rate of increase of world population. A large absolute increase up to the end of the century, with only slowly diminishing world rates of growth, as obtained by the United Nations, is the result of pro-

jections which appear reasonable to many demographers.

Whilst no major divergence of opinion was recorded on this point, a variety of feelings were expressed in face of the prospect of the approximate doubling of the world population before the year 2000. Wide differences emerged also in regard to the policies to be recommended, this being a question which was not expressly included in the agenda of the meeting, but which came readily to the mind of many speakers.

While some speakers stressed the need for a change of ideology in regard to population growth and the need to aspire to an eventual stabilization of world population numbers, others stressed their optimism at the prospect that, provided there was sufficient economic and social development, population growth would inevitably slow down. Other speakers expressed distrust regarding the spontaneous response of individuals to the need for family limitation, and stressed the necessity of government action. One speaker expressed dissatisfaction at the interpretation of government action in this field, as being aimed primarily at limitation of births.

Other speakers regarded population control as a supplementary measure to foster socio-economic development and the future welfare of individual countries and mankind as a whole.

On similar lines of thought, one participant indicated that a one-sided formulation of the problem would not suffice. It would be disastrous to emphasize the need for artificial birth control while forgetting the imperative need for accelerated economic development, through more efficient use of the human and natural resources which exist in less developed areas; likewise, it would be an over-simplification to suggest that, with an acceleration of economic and social progress, birth control had little significance.

Comparatively little emphasis was put during the meeting on the possibility of alleviating the consequence of population growth by international migration. However, one paper dealt with the specific problem of international migrations in Europe and explored the possibility that European countries of emigration, having put into force specific development plans, would be able to absorb into industry a great proportion of their surplus agricultural population. The necessity of bringing more non-European workers to Europe would become greater. This might foster the skills of workers to be repatriated later and thus be of

benefit to economic and social development in their countries of origin.

Another speaker expressed the view that international migration might again become an important demographic factor. Its potential importance was shown by the maintenance of restrictive policies. While one speaker hinted at the possibility of an explosive military exodus of space-starved and hungry people, another pointed out that, although the dismal past gave ground for pessimism, the future might be different: population re-distribution, through both international and internal migration, might help to contribute to peaceful development in future.

One speaker emphasized that the main problem was that of population distribution. Vast resources were still available, and man's ability to utilize them was capable of a spectacular expansion. Another speaker agreed that there was a maldistribution of population over the earth, but indicated that, if large-scale international migration could not alleviate population pressure in certain areas, the migration of capital resources might do so.

Owing to limitation of time, the views expressed on these highly debatable subjects could not be fully discussed. No conclusive results were arrived at. This may be partly due to the inadequate time for discussion, but partly it derives from the differing standpoints from which the various participants viewed the problem. There seemed to be, however, general agreement that the formulation of policies appeared ultimately to remain the concern of individual countries and to be necessarily conditioned by differences in socio-economic circumstances and ideologies. However, considerable progress appears to have been made in meeting A.4 in two directions. On one side, the consensus on the assessment of current and future demographic trends, on which any policy should ultimately be based, seems to have broadened considerably. On the other, the reasons for caution in projections and the fields in which progress in projections is imperative were brought into sharper focus.

FUTURE CHANGES IN POPULATION COMPOSITION

Whilst world population growth is undoubtedly the most outstanding feature of today's demographic trends, many voices were heard in the meeting warning that, under the impact of this important feature, the differences between individual countries and regions, the changes in population distribution within countries and the changes in population structures

should not be forgotten. More particularly, stress was laid on the importance of changes in age distribution, which occur in different ways, at different stages of demographic development and in different areas, and may have deep and differing socio-economic consequences. An important contribution in this field charted widely different present and future age-pyramids for more developed and less developed regions of the world. Among other features, the impressive continuation of the aging of population in the more developed countries and decreases in the relative burden of dependants per person of working age, in less developed areas, were brought out. The problem of the extent of school enrolment to be expected under alternative population projections by ages was discussed in two papers.

FUTURE CHANGES IN POPULATION DISTRIBUTION WITHIN COUNTRIES

Population redistribution is now going on, on a tremendous scale, in many countries of the world, mainly under the impact of internal migration and more particularly of a massive passage from rural to urban areas. This constituted the main topic of other meetings of the Conference, but it was also discussed from various standpoints in meeting A.4.

Several papers and discussants dealt with the problem of whether a large-scale urbanization movement should *per se* constitute a factor towards rapidly decreasing fertility. In contrast to views put forward without demonstration by some discussants, a paper on Japan and a paper on India seemed to show that, at least in those countries, these factors were not to be considered as of immediate major importance.

A different problem was considered in general terms by two contributors and by the Moderator: namely, the problem of ascertaining

future trends of urban as compared with rural population, and preparing projections in regard to both factors. The Moderator stressed that such projections were essential bases for planning in such diverse fields as manpower, housing, health and education.

MISCELLANEOUS TOPICS

The use and value of net reproduction rates in the field of population projections was discussed in relation to comments made in regard to a paper on Japan. The hypothesis advanced by one contributor that expectation of life might finally differ in different countries according to their political regime was challenged. From the standpoint of the life of mankind as a biological species, another speaker asserted that the principles regulating human population growth were similar to those regulating animal population growth.

SUBJECT FOR FUTURE RESEARCH

To indicate the future subjects proposed for research in the field which were investigated by the meeting would mean giving a list of the research topics discussed at almost all the remaining meetings of the Conference. On the one hand, future population trends will be determined by the great variety of factors which affect fertility, mortality and migration, while, on the other, these trends will have massive implications as regards problems of housing, education, employment, social and economic development, and so forth. The subject of meeting A.4, in fact, stands at the centre of most demographic and related topics of research.

The following speakers took part in the discussion: Appleyard, Arévalo, Baker, Benyousef, Boyarsky, Breznik, Gottlieb, Grauman, Hashmi, Lorimer, Madigan, Mitra, Mukherjee, Muhsan, Okazaki, Olin, Pavlik, Podyachikh, Ravar, Stefanoff, Sauvy, Stewart.

MEETING A.6

Demographic aspects of educational development

Statement by the Moderator: Mr. P. J. IDENBURG

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It may be advisable, as an introduction, to clarify the terminology used in the studies presented to this meeting. In these papers, education means chiefly systematic instruction rather than development of character or mental powers. The papers are further confined to education through the educational system, in distinction to many other forms of education: religious education by churches, education by radio, television and correspondence, on-the-job training, etc. The reason for this is that, statistically, these last-mentioned activities are less easily recorded and registration of their results is a less simple matter. This restriction may be of great significance.

In order to treat the subject systematically, it should further be borne in mind that education is used in two meanings, namely as a process and as the result of that process. On the one hand, "education" denotes the receipt of education, chiefly by young people, but in some cases, particularly in developing countries, by adults as well. On the other hand, "education" may also refer to the education received. In the latter sense, it is no longer a process but an achievement, which may be measured directly by the number of years of education received or indirectly by means of the result of a literacy test or the possession of a certificate.

It is also of significance that relations between education and demographic factors are reciprocal: demographic factors act on education and the educational factor has its effects on the structure and development of the population. The difficulty in studying the two relations is that the structure and the trend of population are subject to a multiplicity of economic and social factors, the receipt of education (past or present) being only one of them. It is likewise known that education, as a process or as an achievement, is determined not only by demographic, but also by eco-

nomic, social and other circumstances. Only rarely can one isolate the importance of the often interdependent factors concerned. The educational factor is an element in the overall development of a country, a part of the modernization complex, a multidimensional phenomenon.

These distinctions are taken into account in classifying the paper represented. The first papers referred to, under the heading "General", describe educational development without directly stating the demographic factors. Papers dealing with demographic factors which influence the educational system come next, followed by the papers which discuss the influence of education on demographic development. Last come papers which deal with the planning of the educational system.

GENERAL

The paper by C. B. Nam¹ shows the development of illiteracy in the United States from 1840 to its present low level. The reduction of illiteracy attests to the efficacy of compulsory school attendance laws, the more rigid requirements concerning reading ability for jobs and the generally high value placed on literacy in modern American society. Adult education does not seem to have played an important role. Nearly all the historical reduction of illiteracy in the United States can be explained by the completion of an adequate amount of formal schooling by greater proportions of each younger age cohort.

Y. A. Bzhilyansky's paper² describes how the essence of the solution to the problem of training and distribution of qualified personnel in the Soviet Union and other socialist coun-

¹ Charles B. Nam, "Factors associated with the historical decline of illiteracy in the United States", *Proceedings*, vol. IV.

² Y. A. Bzhilyansky, "Training and distribution of qualified personnel in the Soviet Union", *Proceedings*, vol. IV.

tries lies in the improved standard of general education, and the nature of the basic specialized training. Every fourth citizen of the Soviet Union is enjoying the benefits of one or other of these two types of education. The proportion of skilled and highly skilled workers in the Soviet Union was 51.7 per cent in 1959, against 18.5 per cent in 1925. While the number of individuals with higher and specialized secondary education in Tsarist Russia in 1913 was about 290,000, in the Soviet Union in 1962 it was 15,700,000. By 1964 higher and specialized secondary education had been given to 44 per cent of the workers, 26 per cent of the peasants (collective farmers) and 50 per cent of the total active population. The school reforms carried out in the Soviet Union practically rule out the possibility of an inflow of young unskilled workers into the production sector. The number of persons studying at higher and specialized secondary educational institutions rose to over 5.6 million in the academic year 1962-1963 which is thirty-one times the number in the pre-revolutionary academic year 1914-1915. Over half of these study without discontinuing their work in the production sector.

The paper also contains information on education outside the official school system. In 1962 10.5 million persons improved their qualifications and learnt new skills directly at their place of work.

The paper by M. Ramírez Arias³ calls attention to the situation in Central America, where educational problems are tremendous because of the high and rapid rate of population growth. In addition to this, many countries are still handicapped by the existence of a native Indian culture, e.g., Guatemala, where 50 per cent of the population is Indian. The percentages of school-age population enrolled in educational institutions are very low at all levels; within the corresponding age brackets, only 50 per cent of school-age children are enrolled in elementary schools, 7 per cent in secondary schools and only 1 per cent of the population between the ages of 18 and 25 are enrolled in the universities. Of the labour force only 0.9 per cent are university graduates or have completed higher education, 2.1 per cent are secondary school graduates with one or two years of higher education, 9.4 per cent have completed elementary school but no more than one or two years of high school, and 87.6

per cent have either one or two years of elementary education or no schooling at all.

DEMOGRAPHIC FACTORS AFFECTING THE EXTENT AND DEVELOPMENT OF EDUCATION

The paper by V. Serdar⁴ is concerned with the less developed territories in Yugoslavia, which show a considerably lower educational level than the rest of the country and dampen the mean pace of raising the educational level of the country as a whole, because they play a relatively larger part in the reproduction of the Yugoslav population.

The paper by B. A. Liu⁵ studies the distribution of 116 countries, by geographical region and by level of school enrolment ratio for 1960, the latter in three categories: under 50, 50-79, 80 and over. It may be noted that nearly half of the world's larger countries have school enrolment ratios under 50; these are the educationally under-developed countries. About one third have enrolment ratios ranging between 50 and 79; these may be considered a group of countries in various stages of upward development in the quantitative aspects of school education. The remaining group of twenty countries may be characterized as having more or less fully developed their potential in school enrolment at the first and second levels of education; each of them has a school enrolment ratio of 80 or more. It appears that countries having more or less fully developed their school enrolment potential have a typically low birth rate (e.g., under 30), which has followed a generally declining trend, at least in recent periods of time. On the other hand, countries which have yet to develop their school enrolment potential have typically high birth rates (e.g., 40 or more), which have generally been tending upwards during the last ten to fifteen years. Countries in intermediate stages of educational development are likely to have intermediate characteristics as regards birth rates and fertility trends also. In the same way, the development of the school enrolment potential in a country tends to be associated with a relatively low infant mortality rate (say, under 50) in a rapidly declining trend. However, a general decline of the infant mortality rate is observed in almost all countries, including those at an early or intermediate stage of educational expansion. Other demographic aspects which are related to educational de-

³ Mariano Ramírez Arias, "Educational aspects of the labour force in relation to the economic and social development of Central America", *Proceedings*, vol. IV.

⁴ Vladimir Serdar, "Repercussions of various rates of natural population increase on educational level of the population of Yugoslavia", *Proceedings*, vol. IV.

⁵ Bangnee Alfred Liu, "Some demographic factors associated with the development of school enrolment", *Proceedings*, vol. IV.

velopment are the degree of urbanization, as measured by the percentage of population living in localities of 20,000 or more inhabitants, and the stage of industrialization as measured by the proportion of the labour force in agriculture.

Only one of the twenty countries with the highest school enrolment ratios in 1960 had an estimated proportion of less than 25 per cent of the population living in localities of 20,000 or more inhabitants, and at the same time had at least 50 per cent of its labour force in agriculture. Six countries had at least half of their population living in localities of 20,000 or more, and at the same time less than one fourth of their labour force engaged in agriculture. The remaining thirteen countries occupy intermediate positions on one or both of these rough socio-economic indices.

The other papers coming under this heading deal with specific countries.

A. Girard's paper on France⁶ states that the reasons for the rising number of secondary school and university enrolments are primarily cultural and social, but that population growth adds its own effects to those of social pressures. The case of France is indicative, because for the past twenty years that country has experienced a marked upswing in the birth-rate after a period of stagnation. The author discusses a number of problems connected with educational development such as geographic location, democratization, selection, planning, etc.

K. T. Hereford deals with Central America once more.⁷ The author summarizes the salient demographic and economic characteristics of education in Central America, assesses the capability of educational institutions there to produce an economically useful output and suggests promising avenues of public action that may enlarge the capabilities of these institutions.

J. L. Sadie describes the situation in the Transkei, a self-governing Bantu area within the boundaries of South Africa.⁸ His paper illustrates the demographic factors involved in the provision of educational facilities in a community where scarcity of national economic

resources is a much more serious obstacle than is encountered in industrialized societies.

EDUCATIONAL FACTORS AFFECTING POPULATION SIZE, COMPOSITION AND DEVELOPMENT

Most of the papers under this heading deal with the relation between education achieved and fertility.

R. M. Dinkel discusses the subject from the point of view of the United States.⁹ He notes the obvious fact that two people are involved in the interaction that leads to the birth of a child and that these two people may often differ quite widely in their backgrounds, attitudes, ideals, values and other personality traits. In view of such differences, the question arises whose interests usually predominate or are compromised in decisions regarding the number of children that couple will give birth to and rear. The author has chosen two hypotheses upon which to organize the data from a 5 per cent sample of the 1960 census of the United States: (1) the more years of school completed by the wife, the fewer the number of children ever born to the couple, and (2) the number of years of school completed by the wife is more strongly associated with the number of children ever born to the couple than is the number of years of school completed by the husband. The data found support these two hypotheses.

R. O. Carleton reviews the literature on the decline of fertility in the Latin American countries of already reduced fertility from a sociological point of view, with an eye to specifying the functional significance of the role almost universally assigned to education as a determinant in this decline. He attempts to sketch out the applicability of this relationship to future fertility trends in the social and economic context of late twentieth-century Latin America.¹⁰ He finds a surprisingly large number of different kinds of effects and relations.

However, none of the various ways in which education can affect fertility is completely independent of progress in economic development. Some of the effects he mentions act jointly with economic development, while others require economic development for the financing of any sizable programme of educational improvement. This does not necessarily mean that structural economic changes must come first. The author sees a possible alter-

⁶ Alain Girard, "Population growth and growth of education in France", *Proceedings*, vol. IV.

⁷ Karl T. Hereford, "Some demographic and economic aspects of Central American education and their implications for the public administration of education", *Proceedings*, vol. IV.

⁸ Jan L. Sadie, "The demographic factors involved in the provision of educational facilities in the Transkei", *Proceedings*, vol. IV.

⁹ Robert M. Dinkel, "Education and fertility in the United States", *Proceedings*, vol. IV.

¹⁰ Robert O. Carleton, "The effect of educational improvement on fertility trends in Latin America", *Proceedings*, vol. IV.

native in a crash programme of educational expansion (completely neglecting economic development for the moment) financed by foreign funds and sponsored, for example, by UNESCO.

In his paper on education and fertility in Puerto Rico, J. M. Stycos demonstrates that, although Puerto Rico over the past half-century has shown remarkable gains in education, the birth rate showed no signs of change until the turn of the half-century, when it began dropping from about 40 to its present rate of about 31.¹¹ Because other evidence indicates that much of this decline was due to the out-migration of Puerto Ricans in the reproductive ages, it would appear that major improvements in education did not produce automatic fertility declines within the time span discussed. This is even more remarkable since the educational development has been accompanied by marked gains in income per capita, urbanization and industrialization. Thus, educational gains have not occurred in a "socio-economic vacuum" as may occur with some Latin American countries. On the other hand, the author's analysis shows marked differential fertility by education. The fact that the differentials accelerate with education, with major declines occurring only after elementary school is achieved, accounts for the apparent discrepancy, for much of Puerto Rico's educational gains have been at the lower levels only.

As most Latin American countries are well behind Puerto Rico in education, the author's pessimistic conclusion is that Latin American countries which wait for "education" to reduce birth rates may wait for a long time.

A paper discussed in another meeting but related to those mentioned in this statement, that by C. J. Gómez, is based on a study for El Salvador.¹² The data used were collected in August 1964 as part of the "Economic and Social Survey of the Family in the Metropolitan Area of San Salvador". In this survey, a 5 per cent stratified random sample design was utilized to study labour force and fertility characteristics of the population. It was found that, as regards fertility, religion is a less important factor than education for explaining variations in fertility rates. The fertility of the more religiously devoted women proved to be greatly affected by their educational achievement: it decreased greatly among the most educated group. The fertility of the less reli-

giously devoted women was also influenced by education, the poorly educated ones showing the highest fertility rates. In general, more birth-control practice was found among the more religiously minded women with higher educational achievements than among those who were at a lower level of the social scale. The same pattern was noted in the group of women who were less religiously devout. The author suggests that education tends to give religious people the same liberal attitude as those who are less attached to the church, as far as family planning is concerned. His opinion is that the degree of religious devotion is not an obstacle to family planning. What is important is the gap between the knowledge of birth-control methods and the practice of family-planning techniques, which is much greater among the less educated social classes.

The relationship between educational achievement and migration is the subject of the paper by D. O. Price.¹³ Most studies of migration in the United States have shown that out-migrants are better educated in general than non-migrants from an area. The present rates of out-migration of Negro males from the rural South are such that, if a cohort is followed beginning at age 0-4 years, by the time the cohort is 35 years of age approximately 70 per cent of the members will no longer be residing in the rural areas of the southern United States. This heavy rate of out-migration and the previously established educational selectivity of the out-migrants lead the author to study the effects of this out-migration on the educational level of the residual population.

K. Dandekar scrutinizes data regarding educational development as shown in primary and secondary enrolment ratios and rates of change in primary enrolment ratios, on the one hand, and birth rates, on the other, for forty-nine countries.¹⁴ The correlation coefficients show a negative relationship between education and fertility. This does not mean that in all individual countries we find a regular declining trend in the crude fertility rate with a rising level of education. The explanation could be that, as suggested in J. M. Stycos's paper on Puerto Rico, the effect of education on fertility is seen only among the higher educated and is yet to spread to the lower levels of education. This may be found to be the case in India and similar countries, where the idea of fertility control has not yet started

¹¹ J. Mayone Stycos, "Education and fertility in Puerto Rico", *Proceedings*, vol. IV.

¹² Carlos J. Gómez, "Religion, education and fertility control in Latin American societies", *Proceedings*, vol. II (meeting B.1).

¹³ Daniel O. Price, "Effects of out-migration on educational level of Negro males in southern United States", *Proceedings*, vol. IV.

¹⁴ Kumudini Dandekar, "Effect of education on fertility", *Proceedings*, vol. IV.

spreading to groups with a low level of education, though it has been picked up by the more educated.

DEMOGRAPHIC AND EDUCATIONAL FACTORS IN PLANNING

In this sector, planning is in general understood as the conscious attempt by the government of a country—"usually with the participation of other collective bodies—to co-ordinate public policies more rationally in order to reach more fully and rapidly the desirable ends for future development which are determined by the political process as it evolves".¹⁵

Two papers are devoted to elements of the planning procedure.

C. F. Schmid discusses enrolment forecasts, to which the basic problems of all levels of education, including financing, staffing, physical expansion, entrance requirements, curricula and scholastic standards are inextricably related.¹⁶ Such forecasts can only be approximations. They are merely trends expressed in the form of a band or range of values, and are not precise predictions for any particular year. Random fluctuations and temporary conditions will tend to result in reported enrolments varying about the trends forecast, so that exact agreement between forecast and reported data is not to be expected. The explanation for this is that all forecasts are based on assumptions about future conditions none of which attain a state of complete stability for any length of time.

The accuracy and reliability of demographic forecasts are dependent on many different factors. The author notes as follows:

(a) Methodologically, the forecast model and subsidiary techniques must be selected, designed and implemented with great care in order to derive the best results;

(b) It would seem obvious that enrolment forecasts cannot be more reliable than the data on which they are based;

(c) An appreciable alteration of one or more of the basic assumptions from which the forecasts are derived can radically widen the discrepancy between the forecast figures and actual trends;

(d) The impossibility of deriving precise forecasts for small populations should be clearly recognized;

¹⁵ See definition of planning in Western countries given by Gunnar Myrdal, *Beyond the Welfare State* (London, 1960), p. 15.

¹⁶ Calvin F. Schmid, "Logic, techniques, interpretations, applications and limitations of enrolment forecasts", *Proceedings*, vol. IV.

(e) An enrolment forecast is not strictly speaking a single figure, but rather a range or band of values;

(f) The longer the forecast period, the greater the amount of error.

The object of the paper by E. G. Jacoby is to measure the allocation of finance to educational services as an area of human resources development.¹⁷ The index is articulated by educational levels rising from pre-school education to higher education. It provides for the distinction of the demographic component in the expansion of educational services from the development component. The author discusses the problems of choice of base year according to circumstances, of deflating changing monetary values over time, of conflicting claims for demographic expansion versus development of the educational system, particularly at different levels, and of evaluating the various strands in the development component. Projections and planning targets can be expressed by forward estimates of index numbers, based on stated assumptions about both the demographic and the development components, to fit to general patterns of planning for economic and social development. His educational growth index is illustrated by New Zealand data covering a period of twenty-five years.

J. E. Vaizey and H. M. Phillips have each presented a paper on demographic considerations in integrated planning of education. The papers give a valuable introduction to the methodology of the planning of education, particularly in developing countries.

As regards demographic factors, J. E. Vaizey states that the problems of the extension of education would be eased by the development of a positive population policy.¹⁸ The more expensive it is to rear children, the fewer children there would be per family (at a given income level), whether from postponed marriage or few children per marriage. However, this general tendency is offset by rising personal incomes and shifts in tastes towards child-centred families. Thus, in the author's opinion, what is really interesting in societies where middle-class incomes are widespread is the degree to which the family is child-centred, for this will affect not only the number of children per family but also the amount spent on children.

¹⁷ E. G. Jacoby, "An educational growth index as an instrument in measuring and planning education development", *Proceedings*, vol. IV.

¹⁸ J. E. Vaizey, "Demographic considerations in integrated planning of educational levels", *Proceedings*, vol. IV.

H. M. Phillips, summarizing evidence from different sources, demonstrates that demographic factors play a major part in educational planning.¹⁹ The load to be placed on the educational system at any given time is a function of fertility some six to sixteen years earlier, or longer in the case of higher education, less the intervening deaths and plus or minus the migration of children in the period. It is also a function of life expectancy, which in some developed countries is twice that of some developing countries. Moreover, education affects population reciprocally. As regards mortality rates, it does so both indirectly through its effect on raising levels of living and promoting economic and social development, and directly through its contribution to health campaigns and general influence on the reduction of morbidity, through the spread of knowledge. As regards birth rates, there is considerable evidence that education reduces fertility because of its influence on behavioural patterns as well as on the cost of child-raising, and the age of marriage, though its impact varies at different socio-economic levels and in different cultural situations. Further, the educational system closely affects the geographical and occupational distribution of the population. The search for better educational facilities is one of the causes of the rural exodus in many countries, while the surpluses and shortages of professional skills, whether in urban areas or in the countryside, are indicators of past successes or failures in educational planning. The educational system also affects employ-

ment by removing children from the labour market, and the flow of internal migration by increasing labour mobility. It can also be an instrument of income redistribution.

H. Yuan Tien's paper discusses some experiences with planning in China.²⁰ It is clear that "planning" in this case has a meaning different from that usually accepted in Western countries. It is based on all-embracing, centrally-directed state control with ramifications everywhere, tightly held together by the Communist Party, a programmatic and comprehensive organization of the country's social and economic activities. The author deals with the pressures or expectations which are built up in the process of educational attainment and which can have considerable impact both on individual occupational aspirations and on the internal mobility of the educated. He attempts to trace some of the consequences of educational expansion in China in relation to the geographical distribution of educated personnel and to economic development. The deployment of educated persons in relation to economic development becomes what may be called a problem of diverting them from their "traditional" occupational goals. This may entail their leaving urban areas, or returning to the countryside, or staying there, as the case may be. Many of the educated are expected to place themselves at the bottom of the vertical occupational scale and remain away from the city.

²⁰ H. Yuan Tien, "Educational expansion, deployment of educated personnel and economic development in China", *Proceedings*, vol. IV.

¹⁹ H. M. Phillips, "Demographic considerations in integrated planning of education", *Proceedings*, vol. IV.

Statement by the Rapporteur: Mr. E. SOLOMON

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The Chairman opened the meeting by commenting upon the contrast between the present Conference, with a special meeting devoted to aspects of educational development, and the World Population Conference in Rome, 1954, where a handful of contributed papers on education were discussed under the heading of "Miscellaneous new contributions to demography". For the present meeting there were eighteen contributed papers, both invited and volunteered. Twenty-seven speakers had been registered and several others had had to be turned away because of lack of time. This

attested to the growing interest in the subject, both as regards the effect of demographic changes upon educational development and educational changes upon demographic development. This interest, no doubt, had been intensified of late by the increasing importance being given to educational expansion both in the developed countries, where increasing demand for more specialized education had been observed, and in the newly-emerging nations, where education had been recognized as a basic factor in social and economic development and where planning had been undertaken

of education, among other sectors. Such planning naturally required the examination of the existing interrelationships.

The Moderator summarized the contributed papers, which were grouped according to the four sub-topics of the meeting. This report summarizes the discussions around these same sub-topics.

(a) DEMOGRAPHIC FACTORS AFFECTING PROVISION OF EDUCATIONAL FACILITIES AND SERVICES

The discussion was concerned with two major aspects of the subject: (1) the effects of demographic factors upon the provision of educational facilities and services, and (2) the methodology and data needed for analysis.

One speaker pointed out that the rapid population increase now taking place in the Asia and Far East region along with widespread illiteracy was the cause of great anxiety. Adult illiteracy in the majority of countries in this region was more than 80 per cent, which explained the paucity of medium and high-level personnel. A proper balance should be maintained between the provision of educational facilities and population growth. If the present disequilibrium prevailed, demographic and economic plans would not be successful. Proper investment and expansion of education might solve some of the prevailing problems in the region. Increasing educational facilities could maximize economic growth since many social and cultural problems that affect economic and demographic development could be influenced by increasing the literacy rate. Long-term educational planning for social and economic development should be undertaken, but it must be recognized that the cost of education compared with the available resources represented a major problem in the region. In this connexion, remarks concerning the Central African Republic, which can probably be generalized for other newly independent African countries, noted the tremendous problems involved in the provision of educational facilities for a rapidly growing school-age population in an area where existing educational facilities were meagre.

It was brought out in further discussion that the problem of providing educational facilities was not solely that of allowing for increasing numbers of school-age children. At least two reasons exist for questioning the unspoken assumption that education should remain, as in the past, an activity limited almost entirely to the young; rapid technical change calls for frequent retraining and higher productivity and

automation may reduce labour requirements. Some areas of policy-making and research, in which important results may be expected from a changing age structure of education itself, deserve note. In order to provide for new technical occupations, manpower planning could be facilitated if the lead time between recognizing the need for specialized manpower of a particular type and the availability of the required personnel could be greatly reduced. This could be effected by the re-training of adults rather than specialized programmes among youths. Some of the new leisure time that will come with the advent of higher productivity and automation could be devoted to general as well as occupational education, as has been happening increasingly in the United States. Even in countries that may experience a fertility decline, the demand of the educational sector upon public resources may continue to rise. Adolescent work-study programmes could reduce the costs in the public sector.

One discussant commented upon the papers dealing with the relation of the level of completed education to fertility. There was room for a study of the effect of adult education outside the conventional forms upon fertility. The main point made was the suggestion that the age structure of education should not always be assumed to be a constant, but should also be studied as a variable for the analysis of economic and demographic change. Another speaker pointed out that the problem of providing educational facilities was not solely the result of population pressures due to the increased school-age population but also a function of the changing social and cultural demand for education by these increasing numbers of children. In France, for example, analysis had shown that the main reasons for increases in enrolment were cultural and social, but that population growth added its own effects to those of social pressure.

In the discussion concerning the methodology and data needed for analysis, it was stated that the study of educational trends could benefit from the application of demographic techniques to educational data. Among such developments in the United States, the following were mentioned: (1) the junction of data from population censuses or surveys with data from school records to maximize information on the education of young persons; (2) collection of data about educational plans as a means of improving enrolment projections; (3) distinction between educational trends based on data for specific age groups over time in con-

trast to data for cohorts of persons born at about the same time as they age over time; (4) classification of changes in enrolment of persons attaining a particular educational level by changes due to population increase or decrease and changes due to increases or decreases in percentages of persons enrolled in school or attaining a given educational level; (5) construction of school-life tables based on the joint probabilities of surviving to particular ages and being enrolled in school at those ages, in order to derive school-life expectancies, or the average number of school years remaining to a person at a given age; and (6) retrojection, or tracing backward, of the educational attainment distribution of a population for census dates prior to the time such data were first collected, based on assumptions of fixed educational attainment after a certain age and the minimum effect of differential mortality and selective migration. These illustrations of the way in which demographic techniques can be applied to educational data may be useful to persons working with educational data in different countries.

Another speaker noted that the analysis of the relationship between demographic change and education would be facilitated by the availability of quantitative estimates of the educational attainment of the population, the educational stock. Changes in this stock would also reflect demographic changes, such as the often neglected depreciation through aging and death. The paper by Jacoby touched on this problem by measuring the expenditure associated with the annual gross addition to the stock. The speaker further noted that this technique, as well as others, could be applied to the distribution of population by levels of education received in the past, in order to yield estimates of the stock of education. The question arose of the use of weights by which different levels of education could be made comparable and aggregated. Estimates of the stock of human capital used the corresponding expenditure in monetary terms. However, income foregone while studying should also be included and the real cost of education might not correspond to its economic contribution (e.g., Klinor-Malul in Israel found the rates of return on investment to differ widely between various levels of education). The economic contribution of certain types of education were not necessarily proportionate to their cultural and social value. For certain purposes a less sophisticated measure might be found preferable, e.g., the stock of years of schooling received by the population, with equal weights given to all types of education. The effects of demographic change could

be estimated by the usual standardization procedures, and changes in the level of education expressed with the help of average numbers of school years per capita. While the shortcomings of this method were obvious, it had the advantage of using few hidden assumptions.

(b) EFFECTS OF EDUCATIONAL DEVELOPMENT
UPON TRENDS OF FERTILITY, MORTALITY
AND INTERNAL MIGRATION

It was initially brought out that educational advancement has a depressing effect on the rates and levels of reproduction and family size because, among other things, education enlarges the scope of human understanding of the basic social problems that condition a country's economic progress and a population's demographic behaviour. Therefore, as one speaker emphasized, adequate provision of education for the growing populations of developing countries is a precondition for social change. A study in East Pakistan had found that a favourable attitude towards family planning increased with educational attainment only beyond the high-school level. It was thus thought that the spread of education beyond the high-school level was a necessity if the population impediments to economic progress were to be overcome and if a lasting effect upon family limitation was to be achieved. There was a recurring theme in the discussions, namely, at what point in the educational process does a quantitative change in fertility trends take place? In some countries it was found to be merely upon the attainment of literacy, while in others, especially those where education had been more developed, a significant negative relationship with fertility was observed only at the secondary-school level or above. It appeared that the level of education that may be called "critical" in this sense is relative to the over-all educational development prevailing in a given area.

One intervention noted that the present rate of educational progress and its observed relationship with fertility as well as social and economic development, in many developing countries, is still too low to cope with population growth and to ensure the eradication of poverty in this century. The provision for educational advancement required a level of investment which many countries could not afford or were not willing to make at the expense of investment in other sectors. Education was still considered a residual sector in the development plans of some countries. Since education was considered the basis for social progress in the long run, UNESCO was called upon to intensify its campaign for the eradication of illiteracy in the developing nations and

for the rapid expansion of educational facilities at all levels.

Many speakers singled out the particular influence of the education of women upon fertility and of the comparative effect of the education of both husband and wife. One reported that in India studies had shown that total fertility declined with an increase in the level of education but that this decline was small until the wife had attained the high-school level. Of interest was the remarkable decline, of the order of 30 per cent, in total fertility of women having university education. Other studies in India had shown that fertility was associated with the educational level of both husband and wife, although the educational level of the wife was more important, especially where it was beyond the high-school level. The total fertility of couples where both husband and wife had education above high-school was found to be 40 per cent less than that of couples who were both illiterate. The significant point of these Indian studies seemed to be that high-school education of the wife is the "critical" point. Another speaker, also commenting upon India, put forward the simple universal proposition: later marriage makes for lower fertility; more education makes for later marriages. This proposition is independent of the practice of contraception since there is an abundance of evidence from areas where contraception is lacking, and from periods of history in Western countries before the use of contraceptives became widespread, to support the premise that later marriage makes for lower fertility. It was noted that Catholic girls in India married significantly later than Hindu or Moslem women because of the longer time spent in school by Catholic girls and that, as a result, they had smaller families than Hindus or Moslems. The order of magnitude of the differences in family size observed was quite significant and the investigator noted that these differences could not be attributed to occupational or income differences and certainly not to the practice of contraception. Among Catholics in India, it was stated, illiteracy was rare and the States with the highest literacy rates had the latest marriage ages and hence the lowest fertility. Another participant pointed out the possible effects of the eradication of illiteracy and the mass introduction of education and specialized training on both fertility and mortality. It was reported that in Romania, with the advent of universal literacy and mass specialized worker-training, significant decreases in mortality as well as fertility had been observed. In Czechoslovakia, another speaker noted, surveys concerning desired family size

had revealed that university-educated women desired larger families than women with only secondary education while, in fact, they had smaller families. This showed, therefore, that the impression that education may be good only as a means of fertility decline was not valid. Education might be considered as a prerequisite for deciding the optimal family size that was in equilibrium with the social and economic reality of the family concerned. It was suggested that research should be conducted on the problem of the equilibrium between economic and educational development.

It was brought out in further discussion that the relationship between education and fertility may operate through intervening variables rather than directly. The growth of education is not automatically accompanied by a reduction in fertility except where socio-economic conditions for the development of education exist. Socio-economic changes produce a growth of social mobility and a need to obtain education with a view to active participation in the economic, political and cultural life of the country. All these factors combined result in reductions in both fertility and mortality. To fulfil this, occupational and economic possibilities must be provided for those completing their education. Investigation of the relationship between social mobility and education was suggested, and it was pointed out that in the Soviet Union occupational opportunities consistent with rising educational levels were always provided. Another speaker, commenting along the same lines, suggested that, although the effect of education upon natural population movement indices was very great, education must not be seen in isolation from other conditions. It was socio-economic factors that determined demographic indices. These worked both directly and through the educational system and the public health services. The main importance of education was that it made it possible to enlist the able-bodied population and, above all, women in the active sectors of the national economy. In the Soviet Union female participation in education was still increasing but at the same time employment was also absorbing more and more female graduates and thus the relationship observed between employment and fertility was really a function of the education and specialized training of women. Another intervention stressed that the rapid increase in the education and qualifications of women in many countries resulted in changes in the male-female education ratio. This ratio was steadily changing in favour of females and some concern had been expressed over the consequences. In particular, it was

noted that more and more resources were being devoted to women's education. It was suggested that steps should be taken to ensure the adequate return of these investments to society. It was pointed out, however, that female students were not equally distributed educationally and that a concomitant unequal sexual distribution of occupations resulted.

A speaker cautioned demographers against ignoring the quality of education in favour of the quantities involved. In particular, concern was expressed that education itself as a variable should not be limited to its traditional concept, but that para-education, i.e. youth groups, cultural associations, etc., should be recognized as having a great role to play in preparing people for marriage and family life. In discussing the content of education, in this large sense, the importance of sexual education and the role of love and marriage as humanizing factors were emphasized.

(c) DEMOGRAPHIC CONSIDERATIONS IN INTEGRATED PLANNING OF EDUCATIONAL DEVELOPMENT

The interventions can be grouped around three main themes: (1) the data and methods involved in analysis, (2) the effects of demographic factors in planning and development, and (3) the effect of such development upon the educational system itself. In discussing the first theme, it was brought out that educational development plans have not been without flaws. The main cause, in the opinion of one speaker, has been the absence of adequate population data. It is incumbent upon demographers to provide educational planners with actual population size and future trends if educational facilities are to be provided with due regard to equal opportunities and equitable geographical distribution. It was noted that many developing countries had a long way to go before reaching a satisfactory educational level. It must be realized that "cheap" education of an inferior nature was not the desired goal. An increase in enrolment entailed an increase in educational allotment and the educational plan must incorporate a realistic cost basis if it was to maximize resources and maintain or improve the quality of education. The adequate financial support of educational development could be facilitated greatly by the availability of demographic data.

A participant, in commenting upon methods used in enrolment projections, emphasized that it was possible inadvertently to introduce errors in the projections due to the interdependence of the age-specific enrolment ratios. With the

objective of minimizing the investment required to enrol the back-load of young unenrolled persons of ages 6, 7, 8 and over, and all those reaching age 6 in the future, a method has been established by the UNESCO International Educational Planning Institute in Paris. The basic factors affecting enrolment, drop-outs, repeaters and graduates have also been identified and these factors should be used in all studies of the educational system, it was remarked. With these basic factors it was possible to define precisely the output of the educational system and thus permit the study of the evolution of the educational structure of the population and of the labour force.

Another speaker criticized the fact that, in many demographic tabulations and studies, the word "education" referred to the number of years of schooling completed. This measure, while practical and readily accessible, gave no indication of what was taught or how it was taught nor did it give an indication of the extent and influence of education outside the regular school system. This included not only organized adult education outside the regular system but also informal education, effects of information media, family, clubs, church groups, etc. These were the very influences which were essential to social change and to changes in attitude towards population control. The detailed information on adult education, on informal education and on the substance of regular education could be obtained by techniques available in sociology, anthropology, psychology and education. It was suggested that the relationships between education and demographic phenomena could be clarified if, in intensive studies supplementing censuses, such essential information were used in the description and measurement of "education".

One discussant criticized some of the traditional methods of forecasting demands for education in relation to social and economic development. It was noted that the methods of enterprise enquiries and analyses of job vacancies had too often been used in isolation from the production and economic objectives of the society as a whole. It was stressed that such studies must be co-ordinated with national production goals from different sectors and that the planning of education for employment was by necessity a global operation and therefore assessment of future demand must itself be in global terms to be effective for planning educational output.

Another participant commented on the educational growth index presented by Jacoby, which aims at a distinction and estimate of the

variables in the cost of education services. The data on enrolment by level serve as quantities and the costs per pupil/student by level as weights. This index attempts to separate the demographic component from the development component. The speaker noted that, in measuring expenditure on education, the loss to the labour force or the loss in income due to earnings foregone by pupils should be taken into consideration. This expenditure was invested by society in its human capital. It was made by one generation in favour of the next, being in this sense similar to the so-called "demographic investment". It was suggested that the part of human capital investment that was made in favour of the "next" generation should be considered as part of the "demographic investment". This part of the investment in human capital was relatively large because education was received by young generations which, in growing population, were relatively larger than those already in the labour force and returns on this investment were realized only after a considerable time lag. Physical investments, on the other hand, generally yielded returns in a much shorter time and were made in favour of the same generation. The proper assessment of all those investments was required for policy planning.

In commenting upon the second theme, one speaker noted that the developing countries of the world faced a grave problem in achieving literacy and educational levels favourable to social and economic progress. Most of the developing countries now had literacy rates between 10 and 30 per cent of their population 5 years of age and over. Furthermore, these small proportions of literates in developing countries consisted largely of persons who could barely read and write. These literacy and educational levels, characteristic of developing countries, constituted serious impediments to economic growth. It was well known that low levels of literacy and education were accompanied by high birth and death rates, high infant mortality, subsistence agriculture and low per capita income. Moreover, a labour force predominantly characterized by illiteracy and low educational levels could perform only inadequately the tasks involved in rationally organized and technologically advanced production systems. Planners in the developing countries were not likely to achieve desired levels of productivity if they did not provide for drastic expansion of educational activities.

Another speaker commented upon the interrelationship between the educational demand of the population and the economic demand for

educated people needed to implement national educational and economic development plans. However, there was a distinction to be made between the educational demand, which was a function of the aspirations of individuals, and the economic demand, which concerned the national need for educated people as a function of long-term development planning. Since educational plans should be incorporated in over-all economic development plans, these must be integrated at the stage of conceptualization through the co-operation of the Ministries of Education and Economic Development. Demographic implications and considerations were fundamental to both types of planning and could serve as an integrating factor.

Another intervention stressed the role of education in the evolution of a country. Using examples from France, the speaker noted that education was definitely a factor in migration and occupational redistribution from agriculture to industry. Education could therefore be used as a tool for the evolution of a population.

In commenting upon the third theme, one speaker brought out that the advent of rapid population growth affected not only the quantitative aspects of the educational system but should also affect the qualitative aspects of education. The rapid population growth witnessed in developing countries demanded enormous efforts in order to build a self-supporting economic system for an ever-increasing population. This necessitated, first of all, the inducement and the development of creative capacities and functional rationality. It was doubtful whether traditional European intellectual verbal and humanistic education as conceived during the sixteenth century was efficient for the needs of industrialization which had produced new forms of vocational and technical training but had hardly affected traditional general education. The majority of the youth in developing countries still preferred general to technical education. Moreover, a great number of technical-school graduates ended in administrative posts. Along with a scarcity of technicians and technologists one found intellectual unemployment and a great number of unemployed and unskilled labour who had received only a primary-school education. There seemed to be a great need to guide students from the primary school onwards to creative attitudes towards technical and affiliated fields. It was suggested that educationalists should pay more attention to such curriculum reforms in primary and secondary education as were required for economic growth.

which, among other reasons, was necessitated by population growth.

Another participant noted that the evolution of population increases and in particular the considerable increase in school enrolment was having the effect of shattering traditional pedagogic methods. As regards developing countries, the speaker referred to the position of a French agronomist to the effect that traditional building methods as well as formal education itself posed an insurmountable as well as unnecessary financial obstacle to these countries, when their real needs were for the improved training of young peasants and agricultural technicians in order to ameliorate existing rural conditions.

Concerning the developed regions, the increase of students due both to demographic growth and the expansion of educational opportunity imposed dramatic pressures upon secondary and higher educational methods. In passing from an education of the élite to an education of the mass the dialogue between students and teachers became increasingly difficult because of the accentuation of the psychological segregation between generations which could result in a revolt, overt or covert, of the young against the adults. Thus the young became abandoned in spite of their so-called advantages, and media of mass communication (television, radio, press and cinema), instead of facilitating a dialogue, contributed to a further depersonalization. In order to re-establish contact, courage should be found to bring up to date our humanism, our culture and scholastic programmes which were not applicable to today's needs. This posed a fundamental question. What should be transmitted from the cultural and human heritage and how should it be transmitted? Another fundamental question was how our cultural and humanistic heritage could be opened to present and future generations. The teaching of demographic problems presented an excellent means to this end. Those who had been educated at the medium and higher levels knew how much these demographic questions interested and preoccupied the young. In France, an interesting effort to introduce this field had been made through the study of human geography and this had introduced demography to students of other human sciences. It was not sufficient, however, to introduce these questions to the young. In this field, it was also the adults, family associations, organizations of parents, labour unions, etc., who waited, not without anxiety, for knowledge. Those skilled in the study of population problems had no right to leave their questions

unanswered; it was already disturbing enough that the technical future of humanity was being abandoned to a small number of engineers and scholars.

Therefore, next to the difficult and complex requirements of scientific research, there existed a lasting responsibility for the popularization, in the most noble sense of this term, of the results of such studies, if erroneous interpretations were to be avoided. The speaker stressed to the Conference the subtle and complex interdependence of demographic factors. It would be extremely serious to give the idea that the future happiness of humanity depended solely upon the number of children that women brought forth into the world. It depended first of all upon the triumph over violence and hatred. This could be a result of culture and the knowledge of the subtle and complex demographic factors which must be diffused through teaching.

(d) SUPPLY AND DISTRIBUTION OF SKILLED PERSONNEL IN RELATION TO ECONOMIC AND SOCIAL DEVELOPMENT

A speaker reported that in France a new system had been instituted that would permit a study of the relationship between university studies and professional work as well as follow up studies of school life. It was done by a system of assigning code numbers for university entry, examination, inscription, etc., which would give all the information necessary for computer analysis. The number used in this instance was the individual's Social Security number.

CONCLUSION

In the discussion concerning the relationship of demographic factors to the provision of education, the integrated planning of education and the supply and distribution of educated persons, much attention was focused upon what was needed to aid the process of educational development in such a way that such expansion was in harmony with the social and economic objectives of society. Research was called for to clarify the relationships themselves and, in particular, new tools and methods for such research were suggested. The possible utilization of demographic techniques, as well as those from other relevant disciplines, and the need to improve and enlarge sources of data which become manageable with these techniques and the use of computers were frequently suggested.

The discussion devoted to the effects of educational development upon population trends

pointed to the recognition of the relationship itself and also to its complexities. Much research was indicated in order to identify the processes involved, since the concept of education itself had not been properly defined in so far as it might operate to induce demographic change. Identification of the relevant components of "education" and investigation of how the mechanism works as it affects demographic change were the areas most often cited for future research.

That an important relationship exists was recognized without exception. That a proper understanding of this relationship is necessary, in order to develop fully the intellectual capa-

cities of society in harmony with its optimum demographic development, was also generally accepted. This appears to be one area of enlightenment where men of goodwill from all over this world, coming from different social, economic, religious and ethical systems, can agree upon the desired objectives as well as upon the means to achieve them.

The following speakers took part in the discussion: Ahmed, Benyoussef, Carrère, Conrad, Correa, De Lestapis, Febvay, Ferenbac, Frejka, Gardezi, Girard, Goyal, Hovne, Jacoby, Kleiman, Misginna, Muhsam, Nagda, Nam, Nevett, Ponsioen, Rochefort, Ryabushkin, Slesarev, Vimont, Wynnyczuk, Yesse.

MEETING A.5

Demographic aspects of labour supply and employment

Statement by the Moderator: Mr. Jan L. SADIE

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While our knowledge of the demographic aspects of labour supply and employment has been substantially advanced during the past ten years, it remains true, as pointed out by many of the authors who submitted papers for this meeting, that analysis in this field of study is still hampered by a complete absence of basic data in some cases and inadequate international and historical comparability of statistics in others. Inviting special attention as an obstacle to comparison is the variation, as between countries and in the same country from one census to the next, in the identification of unpaid family workers. No less intractable is the problem of determining the employment status of the "fringe" or "marginal" group — mostly women — who might accept employment if suitable jobs were offered to them, as is pointedly illustrated by the example of Japan, cited by K. J. Penniment, where a change in the term "seeking work", as between one survey and the next, resulted in a disparity of some 1.7 million in the number who could qualify for the status of unemployed.¹ The limitations thus imparted to the analysis of international data led J. N. Sinha to the conclusion that such analysis "can yield at best tentative hypotheses which need to be verified by intensive studies within particular regions and countries".² L. Herberger, referring to the 1960 simultaneous sample surveys in the European Economic Community, in which it proved possible to phrase questions so as to yield comparable data while corresponding to national definitions, concurs.³ This *modus operandi* has, in fact, made a significant contri-

bution to our knowledge of labour force phenomena.

In the absence of labour force statistics, or to circumvent the spurious elements present in them, recourse might advantageously be had to the "manpower" concept, and it has, on occasion, been maintained that this represents an adequate analytical framework in subsistence economies.⁴ Its drawback is the widening of the gap between "labour force" and "manpower" in the process of economic change. Moreover, if it is accepted that morbidity is the pertinent problem in developing countries, information is needed on the disabling incidence of sickness and malnutrition in order to determine the economically effective manpower.

THE PROPENSITY TO PARTICIPATE IN THE LABOUR FORCE

The two factors which determine the proportions of the economically active population are: (a) the propensity to participate in the labour force as reflected in the schedule or curve of rates-by-age, and (b) the demographic factors, with the existing age and sex structure as the proximate factor which is, in turn, determined by mortality, fertility and migration. These two variables are not completely independent since the first can be influenced by the second, while both are a function of ultimate factors in the form of social and cultural values, psychological attitudes and economic conditions. Imponderables and controversy pertain to the first variable, even more in the case of females than of males.

With regard to males, the familiar phenomenon that, while almost all men between the ages of 20 and 55 are economically active

¹ K. J. Penniment, "The influence of cultural and socio-economic factors on labour force participation rates", *Proceedings*, vol. IV.

² J. N. Sinha, "Dynamics of female participation in economic activity in a developing economy", *Proceedings*, vol. IV.

³ Lothar Herberger, "Demographic changes and manpower problems in the Common Market countries of Europe", *Proceedings*, vol. IV.

⁴ A. J. Jaffe, "Working force", *The Study of Population*, Hauser and Duncan, eds. (University of Chicago Press, 1959), chapter 25, p. 617. See also Virginia Moscoso, "Our economically active population", *The Philippine Social Security Bulletin*, No. 4 (March 1962), p. 60.

regardless of the type of economy, the lower the degree of economic development of a people the higher are the rates of participation at the extremes of the working life span, is confirmed by several of the papers. Over time, however, these rates tend to decline in agricultural and semi-industrialized economies, as they have been doing in the present-day industrialized countries, and projections are more often than not based on assumptions of a continuation of the diminishing propensity to participate. As a factor at the lower end of the age scale, the role of compulsory school attendance and a lengthening of the period of study beyond the minimum school-leaving age is stressed. By increasing the amount of education, training and skills embodied in the labour force, it may counterbalance the rise in the dependency ratio. In so far as the productivity of workers over 65 is lower than average, a decline in their relative numbers will raise the average output per person in the labour force.

While the gross years of active life, as a summary index of the propensity to participate in the labour force, are highest in the economically least-developed countries, the net years of active life of their populations, embodying the effect of mortality in addition to workers' rates, are lower on the average than those of the industrialized countries. Typical of trends and conditions in the latter is the experience of the United States described by S. Garfinkle.⁵ The improvement in the survival ratios since the beginning of the century raised the expected years of active life at birth from 32 to 41, despite a decline in workers' rates which was responsible for a curtailment, by three years, of work life expectation at age 60, and which prolonged the mean expected number of years of life remaining in retirement at age 20 from 2.8 in 1900 to 7.0 in 1960. The extension of life prior to accession to the labour force permitted more persons out of a cohort of births to receive education and training and to become workers, while the lengthening of working life has made it possible for the acquired knowledge and skills to be applied over a longer average period. Garfinkle's suggestion that more perspective could be given to international comparisons by synthesizing "these developments in a single measure of man-years of productive capacity" merits attention and some clarification. On the other hand, the relative economic burden of retirement, in terms of the output per year of active life required to provide the wherewithal for the period of life

in retirement, has doubled since 1900. Moreover, it would be interesting, and not devoid of importance, to know whether the developed societies have not reached a stage where increased longevity will not suffice any more to offset or over-compensate for a diminishing propensity to participate in the labour force.

The situation in some developing countries is depicted by the experience of Malaya as analysed and reported by S. Swee-Hock.⁶ At 36.7 the expected mean years of active life at birth are lower than in the United States, but represent a larger portion of total expected life. The portion of the latter spent in a condition of dependence is broken up into four components, namely, the pre-education, the education, the retirement and the never-entered work components. The retirement rate of Malaya's male working population is slightly more than one-third of that of Great Britain, while losses due to death are 2 per 1,000 higher, yielding a total rate of separation substantially lower than the British.

The trend towards progressively earlier retirement among men is usually ascribed to rising levels of income per capita, the extension of pensions and social security benefits, retirement schedules, urbanization and the diminishing importance of agriculture as field of employment, a decrease in self-employment, and technological progress; the association has in certain cases been substantiated by statistical analysis. However, the work done by one researcher in this field appears to have introduced some uncertainty about the significance of a number of these factors,⁷ and further rigorous statistical analysis might be undertaken with profit. It is also of interest to know to what extent the extended family system may induce earlier retirement or semi-retirement.

The absorption into employment of married women—who form the large majority of the adult female population—is either not considered a matter of course or, where it is, the dual status is retained of housewife and participant in economic activity. The propensity of married women to participate in the labour force depends on a large variety of circumstances and factors, which can be summarily stated as follows: customs and traditions; legal enactments and regulations relating to, among others, minimum school-leaving age, retirement, work shifts allowed; biological and psycho-

⁶ Saw Swee-Hock, "Uses of working life tables in Malaya", *Proceedings*, vol. IV.

⁷ Clarence D. Long, *The Labor Force under Changing Income and Employment*, Study by the National Bureau of Economic Research (Princeton, Princeton University Press, 1958), chapters 4, 5, 9.

⁵ Stuart Garfinkle, "The lengthening of working life and its implications", *Proceedings*, vol. IV.

logical factors, and individual motivations such as escaping the monotony of house-work, or the anonymity of city life, and meeting friends at work; skills and qualifications to satisfy the requirements of the employer; geographical mobility; demand for income or standard of living; demand for their services in the household, and employment opportunities. Some of these variables are interdependent or a function of still further or ultimate factors. Where all of them are in operation the outcome is uncertain, unless interdependence predominates or their effects should coincide by chance. Disentangling the explanatory variables in specific situations and over time, and identifying the incidence of each, appears to be a major field for further research, which could perhaps form the basis for the construction of a model of female labour force behaviour. It is common knowledge that in this area of study, where the most detailed and reliable statistics are required for valid conclusions, the demographer is badly served by census data.

Since homemaking, if not child-bearing and child-rearing, is a primary function in the lives of a majority of adult women, the demand for their services at home can be singled out for special consideration. The difference between married and unmarried women in this respect is obvious, and the latter have, as a rule, a higher propensity to participate in the labour force. Nevertheless, in Hungary, according to E. Szabady,⁸ and in the household enterprise sector of an economy, according to J. N. Sinha, marital status is of negligible significance. It is also possible that instability of marital unions may be responsible for higher activity rates among women. In so far as single women, at least in developed countries, tend to retire at an earlier age than men, a question which arises is whether a biological differential is involved, as has been suggested,⁹ and what part is played by the age-selectivity of jobs usually occupied by women?

The domestic demand for the services of housewives and mothers will depend on the number of children, their ages, and the availability of servants and substitutes for the mother's care and supervision, such as members of the family, *crèches*, kindergartens, and labour-saving household appliances and services. Reviewing the literature on the in-

fluence of family-building activity on women's labour force behaviour, M. Gendell¹⁰ finds that the available evidence shows an inverse correlation between the number of minor children at home and women's rate of participation, but that the age of the youngest children is of greater consequence than their number. Mothers are more likely to do paid work when their youngest child has reached school-going age than when he is in the pre-school stage and are more likely then to accept full-time employment. This is responsible for a second cycle of entry or re-entry into the labour market. On the basis of British experience among married women with no dependent children, one writer has concluded that, "but for the distorting effect of having to give up work to look after children of the marriage, for married women with the support of a husband the desire to work outside the home declines steadily with advancing age", the rates-by-age curve moving downwards in an almost straight line, from a peak at age 30 to virtually zero at age 60.¹¹ Is this conclusion more generally valid, and, if so, does it mean that the bearing and bringing up of children cause a temporary break with the labour force only, or does the secondary peak reflect a newly generated demand for additional income consequent upon the increased financial obligations occasioned by the growth in the size of the family?

In developing countries the combination of household duties and economic activity is easily accomplished in house industries, and the age pattern of activity which approaches that of males suggests that fertility does not affect women's propensity to participate in the labour force. Where the age pattern displays a slight trough around age 25, this may represent a temporary break due to marriage. In Hungary, too, female workers' rates are independent of the number of children born, a situation which, by inference, may also prevail in the Soviet Union.

It is generally agreed that participation in labour markets subject to wage contract is a selective process. But does it also have a determinative function in the level of fertility? Freedman *et al.*, quoted by M. Gendell, have found that in the United States working wives are more likely to use the most effective contraceptive methods, and consequently to have

⁸ Egon Szabady, "Demographic aspects of the changes in the structure of the population by economic activity in Hungary", *Proceedings*, vol. IV.

⁹ F. le Gros Clark, *Women, Work and Age: To Study the Employment of Working Women Throughout Their Middle Lives* (London, Nuffield Foundation, 1962), p. 88.

¹⁰ Murray Gendell, "The influence of family-building activity on women's rate of economic activity", *Proceedings*, vol. IV.

¹¹ C. M. Stewart, "Future trends in the employment of married women", *British Journal of Sociology*, No. 12 (March 1961), p. 9.

fewer children.¹² If this holds true generally, particularly in developing countries, the entry of females into the organized labour market—as distinct from household enterprises—would promise a solution to high birth rates. However, we do not know whether this causal relationship obtains in most developed communities, and, in the case of the developing countries, the meagre information available is unreliable and inconsistent, the findings ostensibly indicating that economic activity could be neutral with respect to marital fertility, or could induce an increase or a decrease in the number of children born. In a recent survey in Lima, special attention was devoted to this problem and the outcome was that “employment status was more often a consequence of marital fertility than a cause”.¹³ The controversy between the “optimists” and the “pessimists” cannot be resolved until a great deal of reliable evidence has been produced. In this connexion, as well as with regard to other aspects of female labour force behaviour, longitudinal studies, or approximations to them, will provide demographers with much needed information.

While a basic reason for women's entry into the labour force is to earn a wage or salary, or to augment the family income, there is still uncertainty about the way in which these two magnitudes are related. J. N. Sinha argues that in densely settled developing countries an increase in male earnings might reduce financial pressure and render household work a preferred alternative by raising the quality of the home to be taken care of.¹⁴ The findings of some researchers support this conclusion, while those of others apparently do not. Theoretically, the issue might be resolved by premising that additional income is demanded as long as its marginal utility exceeds the marginal disutility of effort required, and that marginal utility, because of differing values among individuals and peoples, is not uniquely related to the level of income and is not independent of time or place. Within this framework, apparently divergent static and dynamic relationships need not be inconsistent. A question which can be posed in this regard is whether the earning of a wage or salary does

not provide its own motive power to some extent, in that, having become accustomed to the benefits derived from the extra source of income, married women remain in employment longer than they originally intended.

Social customs and traditions which have been, and still are in some countries, an employment-inhibiting factor, may be another variable in respect of which participation in the labour force has a cumulative effect: the larger the number of women who accept paid work, the weaker this constraint becomes, raising still further the number of females who will seek employment. Cultural bias is still an obstacle in Latin American countries with a Spanish tradition and in Moslem countries, but not in Indonesia although it is predominantly Moslem. A. M. N. El-Shafei argues that more and better education will lower the barriers, as it will reduce the fertility of women (to judge by the experience of the United Arab Republic) and thus raise their activity rate.¹⁵ In India, however, according to J. N. Sinha, education apparently only promotes female employment when the level of education exceeds the matriculation standard. Below this, illiterates have a higher propensity to participate in the labour force than the literates.

Finally, the supply of employment opportunities, representing as it does the demand for labour, constitutes an ultimate constraint on the employment, and thus on the economic activity, of women. Citing the examples of Japan, Ceylon and the regional differences in the Common Market countries, K. J. Penniment concludes that “the lack, or apparent lack, of suitable jobs is the strongest disincentive for members of the ‘fringe group’ to acquire labour force status”.¹⁶ The supply of suitable opportunities depends on a number of factors: the degree and rate of economic development in relation to the supply of male labour; the industrial structure; the social organization of production; the economic organization of production, that is whether part-time work or convenient shifts are provided; the attitudes of employers who, more often than not, have certain reservations about the employment of married women, and the location of demand in relation to the geographical distribution of the female population, whose mobility may be

¹² R. Freedman, P. J. Whelpton and A. A. Campbell, *Family Planning, Sterility and Population Growth* (New York, McGraw-Hill, 1959), pp. 53, 197-198.

¹³ J. Mayone Stycos, “Female employment and fertility in Lima, Peru”, *The Milbank Memorial Fund Quarterly*, No. 43 (January 1965), p. 53.

¹⁴ J. N. Sinha, “Dynamics of female participation in economic activity in a developing economy”, *Proceedings*, vol. IV.

¹⁵ A. M. N. El-Shafei, “Past trends and future prospects of changes in structure of population and labour force in the Middle East”, *Proceedings*, vol. IV.

¹⁶ K. J. Penniment, “The influence of cultural and socio-economic factors on labour force participation rates”, *Proceedings*, vol. IV.

limited by traditional inertia or by social conventions.

Demographers will be in agreement with C. M. Stewart who maintains that "it would be impossible to discover a single statistical pattern to fit the past experience of all countries and have a reasonable chance of correctly forecasting the future in any".¹⁷ Nevertheless, on the basis of evidence produced for this meeting, the following four industrially induced stages in female labour force participation might be distinguished for consideration, assuming that *ad initio* there is no cultural bias against the activity of women in production carried on within the traditional framework of the family unit.

(i) In the first stage, when the economy is predominantly agrarian, female workers' rates are high, regardless of marital status. The rates-by-age describe a dome similar to that of males, or with a slight depression around age 25 representing a temporary break occasioned, perhaps, by the act of marriage.

(ii) In the second stage, secondary industry begins to develop and urbanization is taking place. While small-scale house industries may proliferate, facilitating the participation of women, there are some modern establishments whose development militates against the employment of women, because preference is given to men who may otherwise be unemployed, and because family responsibilities prevent married women from accepting regular and full-time jobs located outside the home. Economic pressure obliges some women to resort to employment in domestic service. On the whole, opportunities for gainful occupation are fewer than in the agrarian economy, and lower and diminishing average female workers' rates prevail. For growing numbers, marriage ushers in the end of association with the labour force and the age pattern of participation now reaches a peak around the early twenties and declines until age 30-35, at which stage it may level off somewhat before starting to decline once more.

(iii) Thirdly, when the rate of industrialization has attained a level sufficient to catch up with the supply of male labour, and a modern service sector auxiliary to secondary industry has attained considerable proportions, while the demands made upon the classical administrative sector have increased concomitantly, the downward movement of the

propensity to participate in economic activity is checked and reversed. In the sectors mentioned, a certain amount of flexibility in hours of work is possible, and part-time or full-time employment for part of the year can be arranged. Female workers have been moving away from domestic service into light industries and from there to the modern (and classical) service industries. A second cycle of entries or re-entries develops beyond the age interval of minimum activity determined by child-bearing and family responsibilities, and in time a second peak is described by the schedule of rates-by-age.

(iv) A fourth stage may have to be provided for, in which the second peak has risen to nearly the same level as the first, in approximately the same horizontal plane as the curve of the first stage whose depression in the middle, where it does exist, may, however, be less pronounced. It seems permissible to infer that where the State, as owner of the means of production, has actively intervened, as in the Soviet Union, to remove the obstacles to the employment of women, the fourth stage is being approached. One of its characteristics would probably be that heavy industries and certain specialized occupations would no longer be the preserve of male workers.

If this schema fits the facts, it would lend support to the scepticism expressed about the alleged large-scale increase in the participation of women in some of the developed economies over long periods, particularly when the spurious elements in census data are taken into account. Has the more striking long-term trend not rather been the shift from self-employment to salaried jobs, and from domestic service to non-domestic occupations?

The shorter-run situation is clearer. During the past decade or two the female propensity to participate in the labour force has risen in a number of countries—e.g., Austria, the Federal Republic of Germany, Switzerland, the United Kingdom, Australia, New Zealand and certain Latin American countries—and remarkably in others—Japan, Sweden, Nicaragua, United States, Canada, Puerto Rico and some Eastern European countries. This is especially true of the 20-to-64, or 30-to-54, age group, and of married women, since in most instances the workers' rates of the under-20 and over-65 group have declined. However, in half of the twenty-eight countries whose data have been examined by K. J. Penniment, the average rates around 1960 were lower than those of 1950, associated, mostly, with a diminution of employment in agriculture.

¹⁷ C. M. Stewart, "Degree of urbanization and patterns of labour force participation", *Proceedings*, vol. IV.

PROPORTIONS ECONOMICALLY ACTIVE

The influx of women into the labour market, where it has occurred, has raised the ratio of females to males in the work force, but has been either barely sufficient, or insufficient, to offset the diminution in male workers' rates which appears to have taken place almost universally during recent years. The proportions of total populations economically active in industrialized countries have been more or less maintained, while the trend in less developed economies, aggravated by unfavourable developments in their age structures, has been generally downward. Projections with respect to the European Economic Community show that population growth is exceeding the increase in the labour force, except in Italy and the Netherlands. In India, the rise in the economically active proportions between 1951 and 1961 appears to be favourable, but, in the words of B. N. Datar, "the numbers involved are really staggering".¹⁸ Among ten selected countries of Asia and the Far East, which contain one-half of the world's population and include the two most populous countries on earth, B. B. Aromin's projections show that it is only in India, Indonesia and the Republic of Korea that population is expected to grow at a slower rate during 1970-1980 than during 1960-1970.¹⁹ More striking than the expected rise in the ratio of inactives to actives are the large absolute increments in the labour force to be provided for in an already overcrowded area: 13.8 million per year in 1960-1970 and 17.4 million per year during 1970-1980, in terms of simple averages. As a result of diminishing male activity rates, not adequately counter-balanced by an increase in the economically active females, and of declining mortality coupled with approximately stable levels of fertility, which caused an expansion of the 0-to-14 age group, dependency ratios in some Latin American countries are rising, according to J. van den Boomen.²⁰ A similar situation apparently prevails in Middle Eastern countries. According to the paper of S. Saïdi, in Morocco, between 1952 and 1960, total population increased by 30 per cent, and the active population by 12 per cent.²¹ B. El-Tawil and R. Tabbarah submit that projections

of total and economically active populations in Africa should allow for not constant but rising fertility, at least in the short run, in conjunction with declining mortality, so that, even if the propensity to participate in the labour force remained constant, dependency ratios would increase. They find that the average worker in Ghana, Tanganyika and the United Arab Republic might have between 16 and 23 per cent more dependants to take care of by 1975 than in 1960.²²

Applying constant sex-age specific activity rates to the medium projections of population contained in the United Nations provisional report on world population prospects as assessed in 1963,²³ G. S. Revankar finds that, if the underlying assumptions were realized, the labour force of the more developed countries of the world would expand by 24 per cent, or 78 million, between 1960 and 1980, in comparison with just under 400 million, or almost 50 per cent, in the less developed parts of the world. He points out that these figures do not necessarily reflect the number of jobs to be created, since employees in industrialized countries tend to increase faster than the labour force, while the converse obtains in the other economies, some of the new entrants being accommodated in self-employment or as unpaid family workers.²⁴

UNEMPLOYMENT AND UNDEREMPLOYMENT

Unemployment is considered to be a phenomenon of the organized labour market subject to wage contract, while underemployment is the pertinent problem of the lesser developed economies. While by no means absent in industrialized countries, unemployment is usually of a frictional, cyclical or seasonal nature in which an inadequate demand for labour, rather than its supply, is stressed as the significant causal factor. In developing economies, the large and increasing supply of labour is emphasized, although, obviously, both supply and demand determine the level of employment. In Latin America, Asia and the Far East, rates of unemployment which range from 4 per cent of the labour force in Thailand to 9 per cent in the Philippines and 11 per cent in Puerto Rico have been reported. However, in a country

¹⁸ B. N. Datar, "Demographic aspects of unemployment and underemployment with particular reference to India", *Proceedings*, vol. IV.

¹⁹ Basilio B. Aromin, "Population and labour force growth in selected countries of Asia and the Far East", *Proceedings*, vol. IV.

²⁰ J. van den Boomen, "Population and labour force growth in selected Latin American countries", *Proceedings*, vol. IV.

²¹ Salama Saïdi, "Demographic aspects of labour and employment", *Proceedings*, vol. IV.

²² Bahgat El-Tawil and Riad Tabbarah, "Population and labour force growth in selected African countries", *Proceedings*, vol. IV.

²³ United Nations, Department of Economic and Social Affairs, *World Population Prospects, as Assessed in 1963* (United Nations publication, Sales No.: 66.XIII.2).

²⁴ G. S. Revankar, "An aspect of the global view of labour force growth", *Proceedings*, vol. IV.

such as India, a 5 per cent rate involves very large numbers, and, despite substantial increases in investment during each of its development plans, unemployment accumulated from 5.3 million in 1956 to 8 million in 1961 and will probably rise by a further 4 million by the end of the Third Plan.

According to the paper by J. C. Elizaga,²⁵ it was found in a study carried out in Puerto Rico that most of the unemployed came from families which had more than one earning member, which might reflect a greater ability to afford unemployment and seek work which suited their capacities rather than accept the first job that comes to hand. Data collected in an immigration survey in Greater Santiago, Chile, suggested that migrants might have been in a poorer position than native workers to withstand unemployment. Its incidence is invariably highest among the youngest workers who have not yet had experience of the labour market and are not protected by seniority rules; which implies that, *ceteris paribus*, demographically youthful populations with high labour-force replacement ratios may experience the greatest difficulties in this respect. That single men and women are more likely to be unemployed than married persons could be due to a selective process.

Because of an inadequate growth of the co-operant factors of production in relation to the expansion of the labour force, developing economies are rife with underemployment. Using income level as criterion, J. C. Elizaga reports that 25 per cent of male and 57 per cent of female manual workers earned less than the legal minimum wage in Santiago de Chile, and that more than half of the inhabitants of Latin America receive less than 150 dollars per annum, although the per capita average is more than twice that amount. The percentages of visibly underemployed, in terms of involuntary participation in employment of less than normal duration, range from 1 per cent in Israel to one out of eight employed persons in the Philippines, and 22 per cent in Pakistan, while even higher rates have been found in other surveys. The demographic pressure on the land and the small areas of farm land per worker are usually emphasized in this connexion. In some Latin American countries, from 20 to more than 50 per cent of farms are less than 2 hectares in size. In India, some 15 to 18 million persons are underemployed, and if the dependence of the labour force on agri-

culture is to be reduced from 70 per cent in 1961 to 60 per cent in 1976, this would still involve the addition of a further 23 million to the agricultural work force. Even this target seems well-nigh impossible of attainment in view of the fact that, according to B. N. Datar, a transfer of only 2 per cent of the male population was achieved during 1951-1961. He warns, however, that "the magnitude of underemployment (in agriculture) is not synonymous with removable surplus", the seasonal nature of agriculture making for a certain amount of unavoidable underemployment.²⁶

A. Hovne's submission that the most significant group of underemployed in Israel are those persons who are not in the labour force because of inconvenient working hours and the lack of household assistance and transportation, merits consideration, though it might be more appropriate to refer to it as unused labour potential.²⁷

J. van den Boomen's statement that "theoretically arguments may be advanced which would either support a contraction or an expansion of the labour supply" when the demand for and supply of labour are in disequilibrium, revives a classical conundrum.²⁸ Might a solution of the problem not be approached by having recourse to a dichotomy based on the level of economic development and, thus, of income per capita? Where the latter is a bare minimum, and there are no savings to fall back upon and no unemployment benefits to be had, unemployment of the chief breadwinner entails the loss of the wherewithal to acquire the necessities of life, obliging other members of the household to seek employment. Underemployment in these circumstances will induce an increase in the labour supply, or at least no diminution of it, each new pair of hands being considered an addition to the labour force of the family whose income could thus be supplemented, giving rise to the vicious circle in which the combined action of individual families is self-defeating. In industrialized countries where average income is relatively high, and the problem is usually posed in terms of conditions in the short run, recent evidence would point to the operation of two opposing forces, represented by two categories of "fringe"

²⁶ B. N. Datar, "Demographic aspects of unemployment and underemployment with particular reference to India", *Proceedings*, vol. IV.

²⁷ Avner Hovne, "Demographic aspects of employment and underemployment in Israel", *Proceedings*, vol. IV.

²⁸ J. van den Boomen, "Population and labour force growth in selected Latin American countries", *Proceedings*, vol. IV.

²⁵ Juan C. Elizaga, "The demographic aspects of unemployment and underemployment in Latin America", *Proceedings*, vol. IV.

labour supply. The first would include all persons to whom considerations of economic necessity or the maintenance of a standard of living is not of overriding importance, and who, given their marginal rate of substitution between leisure and income, will be encouraged by an ease of finding jobs and by a rise in the remuneration of labour, during periods of prosperity, to enter the labour force, and will be deterred by adverse conditions in the labour market and not seek re-employment when they are retrenched. In the second category are married women and other members of households whose propensity to participate in the labour force is a function of the employment situation of the chief or permanent breadwinners. When the latter are employed, as in prosperous times, the necessity on the part of the fringe workers to seek work is obviated. When this condition is not fulfilled, as may happen during depressions, and incomes are not completely stabilized by liberal social security benefits, compensatory action will be taken by secondary workers, resulting in an addition to the labour supply. Whether, therefore, the size of the working population is positively or negatively associated with business conditions, or appears as a stable quantity in the short run, may depend on the relative strength of the two opposing forces. The longer-run version of the relationship might be couched in terms of the analysis suggested earlier with regard to women's economic activity and the level of income. The uncertainties involved point to the usefulness of more studies on the labour force participation of the family or household as the reference unit, which should reveal the employment and job status and income of the head in relation to the size of the family and the sex, age, marital status and income of the other economically active members.

MIGRATION

A few papers discuss the repercussions, in developing countries, of the urbanization process, which is considered inevitable and has, in some cases, left behind an aged agricultural labour force with increased proportions of females, and in one instance the cessation of the cultivation of some land. These papers direct attention to a problem which has assumed alarming proportions, to wit, the convergence on cities and towns of large numbers of young people who are unable to procure employment there because of a lack of opportunities, or because they are illiterate and do not possess the skills required in modern industry. The

rapid job turnover among some of them adds to costs of production. V. Olin, pointing to the high incidence of unemployment among high school graduates 16 to 21 years old in the big cities revealed by an Indian national sample survey, declares that this situation, in a conjuncture which includes inadequate or expensive housing, the absence of friends and relatives to turn to, wives who cannot adjust, etc., contributes to a sense of frustration on the part of those arriving from the rural areas with great expectations, and could lead to social unrest.²⁹ Her statement that "population growth is superimposed on the problem of cultural change and represents an additional aspect of the complex and often painful transformation from an agricultural to an industrial economy" is applicable to many communities. C. M. Stewart emphasizes the fact that, while an awareness of this urgent problem "does not provide a solution, it is a necessary first step to the preparation of plans...".³⁰ Such awareness would be promoted by basic studies in more areas of the world. In addition, investigations in depth, on the basis of work histories of immigrants, to determine the process of integration into the economic life of urban areas would be illuminating, while, at the macro-demographic level, immigration should be related to economic and social change in the urban areas, shifts in the occupational and industrial structure of the labour force, and the costs of urbanization. To what extent internal migration of workers is a movement between communities of the same type is another field requiring further investigation.

An allied phenomenon is that of temporary migration of labour within and over national boundaries. Our knowledge of the demography, in relation to the economics, of migratory labour—which relieves demographic pressure but does not necessarily eliminate it, as G. G. dell'Angelo points out³¹—could be greatly enhanced through the co-operative efforts of demographers in the receiving areas and the countries of departure.

A. Hovne's paper demonstrates how large waves of unprepared-for foreign immigration can cause unemployment to soar, although it could, under more propitious circumstances,

²⁹ Ulla Olin, "Population growth and problems of employment in Asia and the Far East", *Proceedings*, vol. IV.

³⁰ C. M. Stewart, "Degree of urbanization and patterns of labour force participation", *Proceedings*, vol. IV.

³¹ Gian Giacomo dell'Angelo, "Regional aspects of employment and underemployment in Italian agriculture", *Proceedings*, vol. IV.

actually contribute to labour shortage.³² The relatively high incidence among new immigrants in Israel, compared to veterans, is mostly due to lower educational qualifications and their unfavourable location *vis-à-vis* the centres of intense labour demand. The need for detailed information, in all receiving countries, on the labour force and employment characteristics of immigrants as factors in their integration and assimilation and in economic change, is obvious.

While geographic mobility of workers implies job mobility, the reverse need not be true. Little is known, however, about the extent to which it may be true, and our knowledge of the demographic aspects of job mobility *per se* is limited as regards area. Applying the working life table techniques, S. Garfinkle found that, in the circumstances prevailing in the United States during 1961, the average man of 20 in the labour force could be expected to change his job six to seven times during his working life, spending five and a half years in each job, while the likelihood of a change at the higher ages is small.³³ Are there any differences in this respect between newcomers to an urban area and settled inhabitants, and between males and females? What is the incidence by age of voluntary and involuntary changes, and are they negatively associated? Does voluntary mobility effect a systematic improvement in job status and remuneration?

OCCUPATIONS AND INDUSTRIES

Applying the techniques employed in macro-demographic studies to data on occupations, strategic information can be extracted on the basic ingredients of the labour force. By projecting existing trends with regard to entries and separations, probable resources can be compared with expected needs, to reveal possible disequilibria, if any. Of late, projections of this nature, as base for the formulation of policy regarding educational, training and other requirements, have been much in evidence in a number of countries.

Taking the medical profession as an example, the paper by J. Bui-Dang-Ha Doan illustrates the type of research that is being undertaken in France.³⁴ It brings to light the period of education and training involved, the number who do not practice the profession they have been

trained for, the replacement ratio, the supply per 1,000 of the population, sex and age distribution, and the geographical distribution and mobility. In some investigations the interrelation with the standard of living, technological progress, the cultural milieu, etc., has also been studied. The results could be used for comparing the input of economic resources in the formation of a worker of a specific type and the output over that worker's working life. Studies of job status and the age and sex distribution of the labour force by occupation and industry over time might indicate in which instances aging or "feminization", as reported by J. Gravogl,³⁵ is taking place, or how the incidence of own-account workers is related to demographic factors and economic change.

K. S. Gnanasekaran, noting the diminution in the proportions or absolute numbers of the labour force in agriculture experienced by developed economies, points out that our knowledge of the implications of these man-power shifts is deficient "in terms, on the one hand, of the occupational structure and, on the other, of the educational and vocational training that must precede or follow immediately these transfers".³⁶ He distinguishes three categories of occupations: (a) high level, i.e., professional, technical, administrative, executive and managerial jobs; (b) middle level, i.e., craftsmen and production process workers, and (c) others, and emphasizes the vertical dependence of the three levels. On the basis of a cross-section analysis, he finds that, in the process of economic growth, category (a) workers increase most rapidly, industrialized countries showing proportions five times as high as those in less developed countries. The parameters of his equations would suggest that for every 10 per cent increase in employment in secondary industry, a 1.1 per cent expansion of professional and technical manpower would be required, and that an addition of one person to this category is associated with an increase of approximately seven persons in the middle-level occupations. This latter group of craftsmen and production process workers form no more than one-fifth of the total labour force in less developed economies, compared to two-fifths in industrialized countries.

This study indicates the kind of relationships to be looked for in a field of enquiry where a great deal more research is called for and in which a greater amount of disaggregation could

³² Avner Hovne, "Demographic aspects of employment and underemployment in Israel", *Proceedings*, vol. IV.

³³ Stuart Garfinkle, "The lengthening of working life and its implications", *Proceedings*, vol. IV.

³⁴ J. Bui-Dang-Ha Doan, "Demographic studies on occupation in France", *Proceedings*, vol. IV.

³⁵ Josef Gravogl, "Demographic influences on labour force in Austria", *Proceedings*, vol. IV.

³⁶ K. S. Gnanasekaran, "Manpower structure in relation to economic growth", *Proceedings*, vol. IV.

usefully be resorted to—as has been done in some studies. It might prove very rewarding if one occupation, that of the entrepreneur—which is, in fact, one of the four factors of production—could be identified and singled out, single it represents the crucial driving force behind economic development. The problem is whether the entrepreneur's role can be quantified since it is quality rather than quantity which is important, as emerges clearly when the large numbers of small "poverty-induced entrepreneurs" in some developing countries are considered.

POLICY

The relevance, to matters of policy, of the type of information to which attention has been drawn in the last few paragraphs is obvious since, in the words of P. M. Hauser, "among the developing nations there must come a time when the non-agricultural sector of the economy must provide job opportunities sufficient for the whole increase in the labour force".³⁷ V. N. Yagodkin's paper stresses the strategic importance of improving the cultural and technical level of the population, and of training skilled workers and highly qualified specialists in order to achieve rapid economic development.³⁸ A problem facing some authorities in less developed economies is whether work standards are to be reduced to provide opportunities for the many unemployed who do not possess the required skills and training. Should the educated young unemployed congregating in cities be persuaded to accept manual work, and how is this to be done? Some of the answers require a comprehensive approach involving the disciplines of the sociologist, psychologist and economist rather than that of the pure demographer. U. Olin, arguing that the essence of the problem lies in "the change of value systems rather than in population growth", maintains that rapport should be established between leaders and the youth by emphasizing the hardships involved in economic development and by appealing to young people to endure them in the interests of their community, thus offering them a challenge.³⁹ To channel the rural-urban movement, A. Zimmerman proposes the formation of national development armies, modelled on the military

draft system, into which youths of superior stock, who might be moulded into potential leaders, would be conscripted at about the age of 18.⁴⁰ While strict army-like discipline would be observed, they would be instructed in reading, writing and arithmetic, and, in specialized camps, taught to handle tools, machinery, building materials, financial accounts and monetary matters, while those returning to the land would learn about modern agricultural methods. While in the camps the youths would be able to make a useful contribution through the construction of roads, simple dwelling units, irrigation and drainage systems, the opening up of new territories for settlement, etc. Camp labour could also be leased to private companies. Similar institutions might be operated for female draftees who would be instructed in the art of homemaking. A. Zimmerman believes that in this way youths could be prepared for economic life, an open-mindedness towards new ideas engendered, the age at marriage raised, the mobility of labourers increased and the trammels of caste eliminated.

While nobody advocates a cessation of the rural-urban flow of workers, it might be desirable to discourage excessive horizontal mobility, that is, when the rural exodus does little more than transform rural underemployment into urban unemployment and underemployment. Some of the questions involved in a decision about the desirable dimensions of internal migration are the location of investment, whether labour input per unit of cultivated land can be increased by introducing labour-intensive cropping systems⁴¹ and whether the area of cultivation can be extended. Should mechanization and automation be undertaken to raise the productivity of labour amidst large-scale unemployment and underemployment? According to P. P. Litvyakov, increased productivity permitted a reduction of one hour in the work day and a concomitant absorption of an additional 500,000 workers in Soviet industry during the three years after 1928, in which the underemployment of some 8 to 9 million agricultural workers was eliminated.⁴² I. S. Paskhaver's paper details the

⁴⁰ Anthony Zimmerman, "A proposed mass technique to promote fuller utilization of human resources in developing countries", *Proceedings*, vol. IV.

⁴¹ In Pakistan, the answer is in the negative. See United Nations "Inquiry among governments on problems resulting from the interaction of economic development and population changes", Report of the Secretary-General (ECOSOC, 37th Session, annex 21), 24 November 1964, p. 49.

⁴² P. P. Litvyakov, "Economic and social factors in ensuring full employment (experience of the Soviet Union)", *Proceedings*, vol. IV.

³⁷ Philip M. Hauser, "Interrelationships of manpower policy and population policy", *Proceedings*, vol. IV.

³⁸ V. N. Yagodkin, "Technical progress and employment in the Soviet Union", *Proceedings*, vol. IV.

³⁹ Ulla Olin, "Population growth and problems of employment in Asia and the Far East", *Proceedings*, vol. IV.

measures employed in the Soviet Union to achieve rational utilization of rural manpower.⁴³ These include the redistribution of land, the collectivization of farming, the use of advanced technical methods in agricultural production and the accommodation of the resulting surplus manpower in secondary industry located, particularly in rural regions, which is promoted by planning and free education and training, a dampening of the seasonality of labour needs, intensification of production, and the resettlement of rural population whose mobility is stimulated through the provision of various incentives.

Given the vertical dependence of manpower at the various levels of skill, so that the availability of top-level workers is a prerequisite to the employment of those in the lower echelons, the marginal social net product of the former would be considerably greater than their marginal private product in developing countries where they are in short supply, in contrast with industrialized countries. Since the opportunities for the less developed economies to "export" their unemployment and underemployment are practically non-existent, would the appropriate remedy not be the importation of scientifically and technically skilled personnel and entrepreneurial initiative? The gains from such immigration would be large in comparison with the loss sustained in the process by the richer countries. Attempts to reverse the movement of trained manpower from developing to developed countries, which is occurring to some extent, seem to be indicated.

P. M. Hauser argues in favour of a policy of a more strictly demographic nature, namely, a dampening of the present rates of population increase in developing countries.⁴⁴ A reduction in fertility would lower the dependency ratio, and in time also the ratios of replacement of the labour force. *Ceteris paribus*, this will permit of an increase in the investment per worker and per capita of the population, and of larger investments in human resources by way of educational and training facilities, while labour input per capita would increase considerably. On the other hand, P. P. Litvyakov maintains that "the solution of the problem of raising the efficiency of the population structure is not to be found in the reduction of the birth rate, but in the socio-economic conditions of a coun-

try's development".⁴⁵ He describes the role of industrialization, with emphasis on heavy industries, mechanization, urbanization and the training of workers in the Soviet Union. Is the key to the Soviet Union's achievement not to be sought in the fact that a government, imbued with a spirit of economic progress, fulfilled the function of the modern entrepreneur, the scarcest and most strategic factor of production?

While the creation of employment opportunities for women in the organized labour market and the active promotion of their participation in economic activity are not considerations of primary importance where male labour is already oversupplied, they might become so if evidence of an inverse causal relationship between economic activity, as determinant, and fertility were to accumulate. The former might then become a factor which not only reduces the growth of the labour force—though female activity by itself will be partly neutralizing in its effect—but could also stimulate economic progress by way of new values transmitted to children.⁴⁶ In developed societies, the question of the use of manpower is receiving increasing attention. If the active promotion of their participation is considered desirable, it seems indicated to take measures to remove or minimize the obstacles which inhibit the combination of family obligations with paid employment, such as have been implemented, for example, by the Soviet Union. Where, however, the State is not the employer, the elimination of all obstacles may prove to be difficult.

While the zeal with which the cause of the elderly is being espoused appears to have diminished of late, it is still, as C. M. Stewart points out, "one of the unsolved problems of industrialized countries to find means whereby those of advanced years may be enabled to continue to play an active part in the affairs of the community",⁴⁷ particularly in view of the large and increasing numbers, if not proportions, of elderly persons in the manpower age group. Recommendations which have been tendered in this regard include flexible retirement schedules and benefits which might

⁴³ I. S. Paskhaver, "The rational utilization of rural manpower in the Soviet Union", *Proceedings*, vol. IV.

⁴⁴ Philip M. Hauser, "Interrelationships of manpower policy and population policy", *Proceedings*, vol. IV.

⁴⁵ P. P. Litvyakov, "Economic and social factors in ensuring full employment (experience of the Soviet Union)", *Proceedings*, vol. IV.

⁴⁶ David C. McLelland, "The achievement motive in economic growth", *Development and Society*, David E. Novack and Robert Lekachman, eds. (New York, St. Martin's Press, 1964), pp. 179-189.

⁴⁷ C. M. Stewart, "Degree of urbanization and patterns of labour force participation", *Proceedings*, vol. IV.

provide, among others, an incentive to prolong working life, the creation of opportunities for part-time work, flexible working hours or shifts and tempo of work, reorganization of jobs, retraining and adult education. It is agreed,

however, that in the last resort it is the rate of development and the level of economic activity which, as determinant of the demand for the services of elderly workers, is of decisive importance.

Statement by the Rapporteur: Mr. J. HAREWOOD

Director, Central Statistical Service, Port of Spain, Trinidad

I. PATTERNS AND TRENDS OF RATES OF PARTICIPATION IN ECONOMIC ACTIVITIES AND DEPENDENCY RATIOS, AND FACTORS AFFECTING THEM

The importance of so-called "socio-economic" factors in affecting labour-force participation and in explaining differences in participation between countries was stressed in a number of papers and was dealt with comprehensively in the Moderator's statement. Female participation in developing countries received special attention. In this regard, a participant, quoting statistics from the 1960 census of his country, Poland, indicated some of the relationships between labour-force participation of females and socio-economic factors. Statistics of economic activity by marital status, number of children and age revealed significant differences in participation between agricultural and non-agricultural areas. In the former, marriage raised labour-force participation, which remained almost constant independent of the number of children. In non-agricultural areas, however, marriage led to a lowering in the rate of economic activity, which was further reduced as births occurred.

Another point made was that young women appeared to give up their jobs more easily than older women, probably because they could depend on assistance from their mothers or mothers-in-law, and probably partly because after women had been working for some time they became more attracted to the idea of working and were therefore less likely to withdraw from economic activity than women who had joined the labour force more recently.

The majority of the factors included under the title "socio-economic", either in the papers or in the interventions, were in fact "social" factors. Where the influence of economic factors was considered, attention was generally focussed on the supply of jobs and its effect on economic activity participation. One contributor pointed out that the scarcity of labour demand affects in particular new immigrants, persons of marginal ages and the female population, thus increasing unemployment and underemployment. The improvement of employment opportunities produces the contrary

effect, but at the same time it might give rise to a new form of underemployment as regards married women with young children who work part-time. Although this part-time employment might be voluntary, it depends upon demographic conditions which might suffer a change (a rise in the marriage age and a decrease in the number of children) and consequently such demographic conditions might be considered a factor of underemployment. A speaker, however, drew attention to the importance of what he called "the socio-economic structure" of a country in explaining the level and type of manpower participation. He drew attention specifically to the terms of trade and argued that the prevailing terms of trade did, in many countries, artificially affect the pattern of manpower participation by forcing the population into certain types of activity and impeding any move towards a reallocation of the country's resources. He argued that the classical and neo-classical thinking which would hold that poor countries were in all cases better off for such international trade was not correct.

Economists in those developing countries whose principal exports had been subjected to falling prices in recent years were keenly aware of the economic problems which the worsening terms of trade were creating for them. This was well brought out at the United Nations Conference on Trade and Development in Geneva in 1964. However, when the employment problems of these countries were considered, the terms of trade were seldom included as one of the factors likely to affect the situation.

These comments encourage a widening of the approach in considering the influence of socio-economic factors on labour force participation.

One of the speakers drew attention to the high level of dependency in the ECAFE countries (Japan and Thailand excepted) and stressed the need for a reduction of dependency through reduced birth rates and higher female participation in economic activity. As one practical measure which could lead, through later marriages, to small families and a reduced birth rate, a contributor proposed a system of

compulsory quasi-military service for youths, starting at about age 18. The purpose of this draft service would not be military, however, but socio-economic, and would include the teaching of special skills for future employment. At the same time, it might provide the youths with an opportunity to gain more self-control over the sex appetite and thus greater control over their family size. The contributor believed that this method might be regarded as a mass technique of preparing youths in developing countries for life during transition to an industrialized economy.

While the call for a reduced birth rate was fairly general, the proposal that female participation rates should be raised encountered less support, perhaps because in most developing countries there is already a shortage of demand for labour and increased female participation will, in the short run at least, create further problems of unemployment and underemployment.

The idea, nevertheless, found support among some other speakers. One, for example, pointed out that a decline in fertility would in fact lead very soon to increased female participation in economic activity and thus an increase in the labour supply, while its effect in reducing the number of young persons joining the labour force would not be felt for about fifteen years or so after the decline. She urged, however, that the enlarged female labour supply should not be a cause for concern even if it posed some serious short-term problems, for in the long run it was a great asset to have within a country the opportunity of almost doubling adult manpower without its costing very much more than providing fair educational opportunities for both sexes. The economic progress of Sweden in the next ten years would depend on increasing the participation of married women in paid work, and so confident was Sweden of the benefits of increased female participation in the labour force in any circumstances, that that country had focussed part of its technical assistance programme to Africa on vocational training for women so as to facilitate the exploitation of this important resource—the large reserve of female manpower.

Another speaker joined in regretting the tendency in some quarters to view increases in manpower as a liability. While not minimizing the difficulties, he felt that ways and means must be found to use the increased supply of manpower (he did not restrict his remarks to womanpower) as the important asset and resource that it was.

Another speaker distinguished between actual labour supply—persons actually in the labour force—and the potential labour supply—persons fit for productive work. He found that the gap between potential and actual labour supply arose when cultural and economic factors discouraged participation in the labour force or caused underemployment among those who were in it. He appeared to be of the opinion that employment policy should aim at minimizing this gap, which had been widened by the following recent aggravating trends: the unfavourable age composition that follows rapid population growth; increased school enrolment which eliminated child participation in the labour force and increased the cost of child dependency; a reduction in the importance of agriculture and the consequent diminution in the early stages of female activity rates, and voluntary as well as involuntary underemployment.

He explicitly deplored the fact that there were many people in India who were voluntarily underemployed or unemployed and to whom additional wages were no incentive for additional work. He urged that to overcome this there must be mass education which would inculcate a new sense of values.

Yet another speaker stressed the importance of increasing female participation in economic activity. Unlike many of the other speakers, he referred to specific measures by which this could be achieved. He claimed that socio-economic factors were particularly important in increasing the female population's level of employment, provided they operated in harmony with demographic factors. As a result of a system of measures put into effect in the Soviet Union, the level of employment of "womanpower" now exceeded 90 per cent. He stressed that to secure the most effective combination of demographic and socio-economic factors, it was necessary to carry out comprehensive studies of the population, its age and sex composition, its geographical distribution, the migration flows within the country, and so forth.

Little attention was paid, however, to the measures that might have to be taken to meet the problems that would arise in developing countries as a result of a largely increased supply of female labour when unemployment and underemployment were already very high. These problems would seem to require serious and urgent consideration, as a trend towards increased female labour participation is already in evidence in some developing countries.

Most of the speakers on this topic appeared to assume that any worthwhile activity of females, who through a reduction in fertility were less tied down in the home, must be economic activity in the sense that this term is generally used. Only the last speaker at the meeting suggested at the end of his remarks that maximum full employment of women outside the home might not always be an ideal condition. He felt that there were certain values in the close association of parents and children in the home, especially when the children were young, which should be taken into account and prized.

Similarly, in developing countries, there may well be much scope, even outside the home, for a great deal of useful and very beneficial community service which need not fall within the sphere of paid employment or the production of economic goods and services, but which is essential for the general welfare of the community.

While one speaker based his pleas for reduced fertility and higher female participation rates on the high rates of dependency in developing countries, another felt that dependency ratios in developing countries were already as low as, or lower than, in developed countries. He felt that statistics in developing countries which appeared to show the contrary were for the most part inaccurate. He was of the opinion, however, that dependency would rise in many African countries because of rising birth rates, the introduction of universal and compulsory elementary and secondary education, and rapid urbanization with its depressing effect on activity rates of the aged and of females.

The role of rising birth rates in increasing dependency is obvious, but, while a number of speakers considered it important that efforts should therefore be made to reduce birth rates in developing countries, one speaker warned of the danger of introducing either the practice of, or the desire for, birth control in his country at a time when there was far from complete control over mortality and the danger still existed of large-scale losses of population as a result of epidemics, famines, etc.

On the same point, another speaker reminded the participants that every child that was born was not only a mouth to be fed but a pair of hands to work. This pointed to the importance, he said, of large families, and he also called for considering the economic and social importance of a large number of families. Agreeing that rapid population growth created some employment problems, he felt that on the whole this was an advantage. He stressed that,

like other population problems, this problem must be tackled by an inter-disciplinary approach, with the demographer, the economist, the sociologist, the physiologist, the physician and the official each having an important contribution to make to good government.

II. DEMOGRAPHIC CONSIDERATIONS IN MANPOWER AND EMPLOYMENT POLICY

The formulation of manpower and employment policy has been given considerable attention in recent years both in developed and developing countries. An example of the problems that need to be faced and the steps that have to be taken to study these problems was given by a speaker who pointed out that in his country there was at the same time a large number of young, unskilled people entering the labour force and looking for work each year, as a result of the rapid natural increase of the population since the war, and a shortage of skilled workers for the implementation of the country's economic development plans. In order to deal with these problems, his country like others had been striving to improve its demographic and manpower data.

Another speaker pointed out that, faced with the problem of large-scale unemployment and underemployment, many developing countries had based their employment policy on the belief that rapid and large-scale industrialization would lead to large increases in industrial employment, thus permitting the industrial sector to become the leading employment generating sector. This seemed, for example, to be the point made by one contributor who, in talking of involuntary underemployment in India which was particularly conspicuous in agriculture, had said that the obvious solution was industrialization. He would no doubt agree, however, that rapid population growth complicated the situation and that it was unlikely that the non-agricultural sector could provide employment enough to absorb the whole of the additional supply of manpower.

On this point the speaker showed that in Puerto Rico and the Philippines, for example, despite rapid increases in production, the rate of growth of the industrial labour force was much slower than that of the total labour force.

It was for these reasons that another speaker proposed massive public works programmes which could be executed with local labour and local materials as a method of utilizing the large and rapidly increasing labour supply.

Another speaker spoke of the qualitative and quantitative aspects of man-power utilization. On the qualitative aspect, he stressed the need

for technical training, and hence both current and projected estimates of manpower needs in terms of skills, and education, with higher levels of education requiring special emphasis because of development considerations.

He felt that, in countries with large populations dependent upon agriculture, the quantitative aspects of manpower utilization presented many problems. The policy-maker must decide on a number of questions, among them whether employment should be one of the main objectives of development or whether it should be merely a by-product, the prime objective being, presumably, increased output and improved standards of living. If employment was the main objective, was it practicable to plan for achieving full employment within a given period and should there be a policy of preference for labour-intensive projects? Lastly, what should be the attitude towards female participation in economic activity?

While hoping that the discussion would give some useful indicators on these problems, he felt that, on the basis of the Indian experience, there should be no rigidity about labour-intensive or capital-intensive projects, a judicious mixture of both approaches being necessary.

III. DEMOGRAPHIC ASPECTS OF UNEMPLOYMENT PROBLEMS

A speaker pointed out that, in interpreting the data for any given country, it should be borne in mind that social and cultural factors could affect the reported participation rates and labour-force status in two ways; first, by conditioning actual force behaviour (say, of women), and, second, by creating reporting bias. He urged investigators to avoid conditions which might encourage reporting bias in any entries they undertook.

He further pointed out that the attitude of the population towards economic activity participation was likely to change with employment opportunities, and he gave as an example the phenomenon of increasing unemployment with industrialization, which he felt might arise merely because more and more people declared themselves as available and looking for work as industrialization progressed.

Another speaker stated that, with the establishment of a planned system for the training, re-training and re-distribution of manpower, full employment and the rational utilization of the employable population could be achieved. This had been done in the Soviet Union where, despite the fact that technical progress resulted in a release of manpower, unemployment had

been overcome. This was because, in an economy based on social ownership, permanent factors were operating which ensured full employment. These included a rapid, steady growth of industry without depression shortening of the working day and expansion of the "non-productive" sector of the economy.

Yet another speaker confirmed that for many years unemployment had not existed in the Soviet Union, while employment, as well as the ratio of total workers to the total adult population, had been growing. She found it difficult to understand why, in some countries, there should be problems of finding suitable jobs for young people. In the Soviet Union young people had a wide range of opportunities. After their basic education, they could either continue in higher education or immediately obtain suitable employment. There was, likewise, scope for the suitable employment of older persons who had retired but were willing to continue working.

Another speaker remarked on the impressive account of specific aspects of this integrated programme for the full utilization of the potential labour supply in the Soviet Union as set out in one of the papers. He felt that scientists in the developing countries would benefit from a study of this experience. He felt, however, that some of the demographic aspects of economic development in the Soviet Union which were not mentioned in that paper should be taken into account. He referred especially to the very moderate rate of growth of the population of the Soviet Union between the wars, and to the fact that there were about 10 million fewer children in the Soviet Union in 1940 than there would have been if the birth rate had remained at the 1926 level.

A final speaker spoke of the rapid urbanization in his country, Senegal, where the urban population was already 13 per cent of the total. A major problem facing the Government of his country was urban unemployment, which was high, both among citizens and among foreign workers originating in the countries of the former French West Africa. In January 1965, in urban areas, almost one half of the paid workers were unemployed. This problem of urban unemployment following rapid urbanization is, of course, one of grave concern for most developing countries, and was dealt with at some length in some of the papers of the Conference.

The following speakers took part in the discussion: Abad, Chen, Das Gupta, Datar, Dia, Lindstrom, Litvyakov, Lorimer, Nagda, O'Heideain, Ruprecht, Sinha, Tabbarah, Venant, Vielrose, Ulyanova, Yagodkin, Zimmerman.

MEETING B.11

Definition and measurement of economically active population, employment, unemployment and underemployment

Statement by the Moderator: Mr. Ajit DAS GUPTA

Consultant, Calcutta, India

Eleven papers were contributed to this meeting, including one volunteered paper. The fact that the amount of papers was among the smallest received for any meeting is far from discouraging, because this topic (unlike those competing with it as regards the minimum number of contributed papers) had no meeting assigned to it at the 1954 World Population Conference. No papers on the measurement of employment were contributed to the 1954 World Population Conference meeting on new techniques of demographic measurement, but at least three papers on the topic were included in the meeting on concepts and definitions of demographic statistics; B. N. Davies, E. Ortiz and W. E. Moore, in their papers for meeting 9 of the 1954 Conference, already questioned the suitability of concepts growing out of the industrialized economies for measuring employment in the less developed countries.¹

While the International Population Union was not particularly active in sponsoring discussions on the demographic aspects of the measurement and analysis of employment, the International Statistical Institute devoted a meeting to the topic at its Tokyo session in 1960. The International Labour Organisation has assembled seminars and expert bodies, and has kept the current status of theory and experience on the subject under review.

It was planned to organize the discussions of this meeting under four broad headings. It was apparent, from the nature of the divisions planned, that it would be difficult to avoid some degree of overlapping between papers received under different headings. Because of the similarity between the subject matter of this meeting and that of meeting A.5 on demographic aspects of labour supply and employment, there has

been some overlapping between the papers received for the two meetings. The papers received for this meeting are arranged and described below in the order of the discussion headings originally planned and on the basis of the major emphasis of the papers.

A. RECENT EXPERIENCES CONCERNING DEFINITION AND MEASUREMENT OF ECONOMICALLY ACTIVE POPULATION

The paper by L. S. Albright outlines some of the recommendations for an improved European programme for the 1970 censuses, drawn up by a working group of the Conference of European Statisticians after review of the implementation of the 1960 programme.² Included in the tentative list of basic and additional topics proposed for the 1970 programme is current activity, that is, activity on the day of the census or during a specified week; the topic of usual activity was put on the additional list.

At the censuses centred around 1960, data on type of activity were collected by all European countries, but data on secondary occupation and time worked were collected by only nine out of twenty-eight countries reporting. The European Programme for 1960 recommended adoption of a specific time reference for definition of economically active population, suggesting that the reference period should neither exceed one year nor probably be less than one month. However, the great majority of countries asked for information on economic activities during a specific short period, in most cases the day of the census or the week preceding the census. In some countries, modifications were introduced to take account of

¹ United Nations, *Proceedings of the World Population Conference, 1954*, vol. IV (United Nations publication, Sales No.: 1955.XIII.8), meeting 9.

² Leland S. Albright, "Recent developments in statistical standards concerning the economically active population as exemplified in European censuses of population", *Proceedings*, vol. IV.

recent changes in activity, and five countries collected information on "normal" or "usual" activity without any specification of the reference period.

The paper shows how little the censuses were used in Europe for measurement of employment, in so far as only about one third of the reporting countries asked even for time worked. The limitations of the census medium and the availability of alternative sources of employment statistics might have given rise to this situation.

In view of the importance of the manpower factor, the Indian census gave special attention to labour force classification at the 1961 census. The paper by A. Mitra recounts the problems of measurement and classification that were actually faced by the census organization.³ There will be agreement with the author's observation that sample surveys occupy a much more advantageous position in the field of employment measurement; even conditions of illiteracy do not present the same handicap to a sample survey, where the trained investigator can spend ample time ascertaining facts. Of course, there will be great reluctance to give up further experimenting with the census medium in the field in order to get the best value from it.

The census is an established institution, and, since it is the only source of population statistics in many developing countries, it has a special significance of its own; moreover, only the census can provide the small area statistics required for regional planning. In spite of its limitations, therefore, the best possible use should be made of this established medium for measuring manpower and employment. Through the census, a number of developing countries collected information on days or hours worked during the preceding week; the distribution of time worked obtained in this manner provides a valid measure of employment, although it is in gross time and is pertinent only to the census season.

The author refers to the inapplicability of concepts phrased in European terminology to Asian-African situations and to the difficulties of comparing results even within the same country, because of differing social attitudes to work and seasonality. Nevertheless, the adoption of different reference periods for rural and urban sectors and for different sectors of the economy, as done in the Indian census, needs careful re-examination. Different refer-

ence periods injected an extraneous disturbance into the comparability of data, particularly as regards the freedom allowed in choice of reference period in the rural sector; such a procedure calls for a good deal of justification.

The experiences of censuses in the Soviet Union as regards grouping of active and non-active population is described in the paper by V. V. Rodzyalovskaya.⁴ Both the 1939 and the 1959 censuses grouped the population by sources of livelihood, namely, as the employed who were the recipients of earnings and as the dependants of the State or of individuals. The author explains that with the consolidation of the socialist system, there is no unemployment in the Soviet Union, but she argues that the unemployed, where found, should be classed with dependants rather than with the economically active. In the 1959 census, the employed category included members of families on collective farms, others engaged on their personal subsidiary farms (about 9.9 million, or less than 10 per cent of the total employed), individual peasants (about 0.3 million), members of the liberal arts professions and members of the armed forces, apart from the predominant group employed in social production.

The employed were defined as persons employed on the census date, but the single day of the census was not the reference day. The usual approach of classification by activity was applied instead, and persons working in seasonal jobs earlier in the year, though not during the winter at the time of the census, were counted among the employed. The system of monthly establishment reporting provided estimates of average employment throughout the year, besides helping in the computation of average wages and productivity. The average number of people employed fell short of the census count, even after adjustment for population growth. For example, the average annual number given by establishment reporting was 94 per cent for the 63 million workers and office employees counted by the census, but it was only 75 per cent of the 32.3 million collective farmers counted by the census.

From comparison of the two sources of statistics, it appears that there is scope for discussion of the fuller utilization of manpower, particularly the section engaged in seasonal work; indeed, proposals have already been made to collect information in future censuses on the nature and duration of work.

³ Asok Mitra, "Indian experience in recording economically active population: 1961 population census", *Proceedings*, vol. IV.

⁴ V. V. Rodzyalovskaya, "The range and limitations of the standard definition of active and non-active population and of partial employment in Soviet statistics", *Proceedings*, vol. IV.

V. V. Rodzyalovskaya mentions the higher proportion of economically active population reported in the 1959 census (52.2 per cent employed), as compared with the proportion reported in the 1939 census; it will be interesting to verify how much of the increase arises from change in the population age structure.

B. RECENT EXPERIENCES CONCERNING DEFINITION AND MEASUREMENT OF EMPLOYMENT AND UNEMPLOYMENT

The paper by H. P. Lacroix describes the various sources of numerical data on labour force and points out how the choice between different definitions is necessarily restricted by the nature of the source.⁵ The author outlines the basic elements of a co-ordinated system of labour force statistics and the manner in which different sources, such as censuses, sample surveys, establishment reporting, employment exchanges and unemployment registration, could be pieced together to provide a better understanding.

Lacroix makes the important point that definitions and classifications should be carefully established by statisticians in co-ordination with users of the results, taking into account the stage of economic development of the country concerned.

The paper by J. Harewood highlights the difficulties of measuring employment and unemployment in developing countries, using the traditional concepts.⁶ Since the employment problems of developing countries are fundamentally different from those of industrialized countries, the concepts and methodology of industrialized countries are inapplicable, in many respects, to developing countries; the author therefore suggests a review of the whole approach. Chronic under-utilization of manpower capacity is the problem of the less developed countries, and measurement techniques should be geared, accordingly, to the objective of better manpower utilization. In this context, the author notes that maximizing economic growth and increasing utilization of manpower will sometimes conflict.

Harewood recommends available manpower time as the basic unit of measurement and use of sample surveys as the process of measurement. He prefers a twelve-month reference

period; this may be satisfactory if a short moving reference period such as a week is used to cover the whole cycle of seasons in the year, but a single unit of a year as a reference period will be seriously disturbed by recall lapse. The author draws attention to the importance of collecting data on the social characteristics of individuals, their skill and their experience; for proper measurement, the location of skills and their utilization must be ascertained.

The paper goes a little beyond the terms of reference of the meeting when it enters the area of substantive aspects of manpower utilization, but the matter is fundamentally important to the demography of developing countries and is, therefore, not altogether out of place.

The paper by Y. Miura contains a very careful and comprehensive study of operational definitions of the economically active population, as used in about sixty censuses and sample surveys conducted in African and Asian countries during the decade.⁷ The value of the summary would be enhanced if the censuses and surveys that collected information on hours worked, days worked and hours available were also specified.

From my own experience of Thailand, I do not think the author's suspicion that most housewives were routinely reported as economically active is justified. Although what constituted "work" was not defined in the 1960 census of Thailand, an adequate definition had been given in the Socio-Economic Surveys of 1954; the participation rates of women were at the same level in both the census and the surveys. The fact is that in Thailand the level of female participation in economic activity is one of the highest in the world.

From my association with the Ceylon Employment Survey of 1959 to 1960 mentioned by the author, I can vouch for the fact that both the main and the secondary activities of respondents were recorded in the survey. A multiple approach to the measurement of activity was adopted, first, to gain deeper understanding of the employment structure, and, second, to avoid omitting the unpaid family workers and others on the borderline of the labour force. Indeed, a special category for persons "without any substantive work or duties, though able to work or take up duties wholtime" was introduced into the survey in order to identify cases on the borderline of the labour force. Apparently, complete documen-

⁵ Henri P. Lacroix, "Labour force statistics", *Proceedings*, vol. IV.

⁶ Rupert J. Harewood, "Some views on the collection, analysis and utilization of current employment statistics in an economically less developed country", *Proceedings*, vol. IV.

⁷ Yuki Miura, "A comparative analysis of operational definitions of the economically active population in African and Asian statistics", *Proceedings*, vol. IV.

tation of the survey was not available to the author.

Miura mentions that no reference period was specified for "current usual" status in the Ceylon survey. This position is not completely correct, as the reference period was actually left with an open end in the "current usual" approach; but the difficulties in having a reference period instead of a reference point of time in the usual approach should be clearly understood. The conflict between a period of reference and the "usual status" classification will be obvious if one tries to classify such people as a former student, a previously unemployed person who started a permanent job three days ago, or an aged person who retired from a permanent job three days ago, when the reference period of classification is the past week. Then a system of priorities is required regarding work and other duties, but even so, the result may not always be the one desired. Complications arise in connexion with the reference period of classification if there has been a change of status during the period; when there has been no such change, the period and the point of time should yield the same classification, provided the reporting takes into account the usual pattern (for example, the pattern that shows occasional days of no work in a series of days of work for a casual labourer). If there has been a recent break in the pattern, the natural unaided response on a question regarding "usual status" is likely to conform to the current pattern.

C. PROBLEMS OF DEFINING AND MEASURING ECONOMICALLY ACTIVE POPULATION, EMPLOYMENT AND UNEMPLOYMENT IN NON-MONETARY SECTORS OF THE ECONOMY, WITH PARTICULAR REFERENCE TO LESS DEVELOPED AREAS

The paper by A. Sauvy illustrated how finely the distinction is drawn between the economically active population and the rest of the population. The author cites the case of Hillary, whose labours in climbing Mount Everest do not count as activity in the labour-force sense.⁸ To sharpen the illustration, I may add that the similar labours of Tenzing, with whom Hillary climbed Everest, might well have counted as activity in the labour-force sense! In view of the fine dividing line between economic activities and other activities, the author suggests a more complete recording of respondents' activities throughout the day.

⁸ Alfred Sauvy, "Definition of the working population", *Proceedings*, vol. IV.

Sauvy also brings out some new sources of reporting bias, particularly in the operation of unemployment benefits and old age pension legislation. Whereas previously it was good form to declare oneself as working, those who are now retired but are doing part-time work would rather declare themselves as economically inactive than risk the loss of State benefits. This bias is becoming important in view of the increased number of aged people who are now in good health and willing to work. Since respondents are not yet able to place full reliance on secrecy clauses in the censuses and surveys, greater confidence must be fostered.

One consequence of the bias towards concealment of economic activity is inflation of the productivity index; another consequence is the loss of realism in future labour force projections, which naturally rely on recent reported experience of economic participation.

The paper by S. Stanev considers the elements in the definition of economically active population in the context of the utilization of labour resources.⁹ The main requirements put forward by the author for this purpose are systematic employment of labour in projects of social utility and receipt of fixed income. Stanev investigates the distribution of socio-economic characteristics in the economically active population and suggests a system of grouping these characteristics.

Stanev bases his groups on spheres of economic activity and also on features such as education and length of experience. These groups will not be discussed further, as they appeared to be somewhat removed from the topic of this meeting.

D. DEFINITION, MEASUREMENT TECHNIQUES AND PROCEDURES IN OBTAINING DATA ON UNDEREMPLOYMENT

Z. Pavlík brings out the historical fact that classification of population according to economic activity came last in the system of economic classifications used in censuses, and he cites as examples the Austrian, Hungarian and Czechoslovak statistical systems.¹⁰ Interest was focused first on occupations or professions, then on branches of economy. The author considers the main criterion for theoretical determination of economic activity to be the relation of population to work done for society. Economic activity should, therefore, comprise

⁹ Stéfan Stanev, "Socio-economic characteristics of the economically active population", *Proceedings*, vol. IV.

¹⁰ Zdeněk Pavlík, "Definition of, and research on, economically active population", *Proceedings*, vol. IV.

every activity which is part of the economic productive process and which is intended, in principle, for other persons.

Pavlik feels that the concept of labour based on direct monetary reward is not adequate. He appears to share Sauvy's dissatisfaction regarding classification of the housewife's activities; in the past, much unpaid work was performed within the family and a sizable part is still performed there. He suggests that a separate question on economic activity should be included in the census, but this query is already included in most censuses.

The author gives a classification plan for economic activity which comes close to the grouping used in the Soviet Union, with the major exception of his placing the unemployed within the economically active category. His classification plan may, therefore, open the way for a single, uniform internationally accepted system.

The paper by K. C. Doctor gives a comprehensive summary of recent discussions on concepts and definitions of labour force, employment and underemployment.¹¹ He refers to the current emphasis on the positive aspect of manpower, contrasting its fuller utilization with concepts of surplus labour or population which were popular for so long. The author also draws attention to the shift in the method of inquiry, with qualitative appraisal yielding to quantitative analysis and field survey techniques.

He mentions the concept of marginal productivity of labour used in economic analysis and explains how the concept lacks operational significance. Concepts and measurements must be appropriate to operational purposes and must satisfy the criteria of utility, objectivity and feasibility. The paper outlines the international recommendations of the Ninth International Conference of Labour Statisticians in Geneva in 1957, which considered the question of methods in relation to underemployment statistics at the international level. These recommendations were reviewed by the International Labour Organisation's Meeting of Experts on Measurement of Underemployment, held in Geneva in 1963.

Doctor stresses the importance of elements such as skill, income and productivity, apart from time worked. In view of the heterogeneity of manpower, however, the total available labour time has to be divided into skill or capacity segments for proper measurement of utilization. He points out that no single criterion

or approach to the measurement of employment is fully satisfactory. He mentions the objective of optimum use of existing skill, but an objective such as progressively improved utilization is equally purposeful and easier to chart.

More mention could have been made of the explorations done in developing countries. For instance, the study of labour time disposition carried out in Uttar Pradesh, India, in the early nineteen-fifties under the direction of J. K. Pande and published in the Indian Journal of Labour Economics, could have been described in some detail, along with the other contemporary works cited in the paper.

The paper by A. J. Jaffe and L. E. Quesada describes problems faced in the actual field situation of the recent Panama employment survey.¹² The authors state that the major problem of the definition is its application, but the very purpose of an operational definition is to minimize the difficulties of measurement. The authors impose a number of pre-conditions under which the measurement of employment would be successful; it may be argued, however, that effective and useful measurement could be made under much less ideal conditions. The authors refer to a stable relationship between time worked and wages; it should be realized that this is only possible with homogeneous skill or capacity strata. Estimation of income is undoubtedly very difficult outside the organised or regularly paid sector and, therefore, the expenditure approach to income was adopted in a number of surveys.

Whatever their experience might have been in the Panama survey, it is hard to believe that Jaffe and Quesada are seriously making a general suggestion that employment cannot be measured for agricultural or self-employed sectors. There have been a series of well documented studies in a number of developing countries where the measurement of employment went beyond the frontiers established in the Panama survey. The International Labour Organisation Seminar on Labour Statistics, held at Manila in 1958, discussed this question and had, even at that time, a volume of critically reviewed and well established experience which was contrary to the experience of the authors. The authors' statement that it was immaterial whether the self-employed were fully employed or underemployed is also arguable; in developing countries, where the self-employed comprise 50 per cent to 80 per cent of the economically active population, the level

¹¹ Kailas C. Doctor, "Recent progress in underemployment statistics and analysis", *Proceedings*, vol. IV.

¹² A. J. Jaffe and L. E. Quesada, "Assessment of underemployment in non-agricultural industries of the less developed countries", *Proceedings*, vol. IV.

of self-employment makes all the difference. It has already been noted that separate definitions for rural and urban sectors are inadvisable.

It will be clear from the foregoing that although the concepts and the techniques of measurement of economically active population, employment, unemployment and underemployment—or, to broaden the scope slightly, the measurement of manpower resources and their utilization—have made rapid advances during the decade, they still are not thoroughly established. In order to facilitate further discussion, I shall try to introduce a few aspects that were not brought out in the papers or in the summary so far and to draw attention to certain issues.

One of the specific needs for employment measurement may be mentioned at the outset. As Harewood stated, a number of developing countries have development plans and make investments accordingly, one of the major objectives of such plans being increased employment. Consequently, unless the level of the citizens' employment is measured periodically, the effect of these investments will not be known. The measurement of employment for this purpose cannot be limited to persons as units or even to gross person time. For example, a national plan may indicate that through the establishment of a new textile factory, 1,000 more people will be employed (including the multiplier effect), but until a measurement of employment is made, it will not be known how much the employment of traditional weavers and their distribution channels are affected by the new textile factory. In other words, the added net employment contributed by a project will only be known from employment surveys.

Another aspect of employment measurement that deserves attention is the definition of the base population, the potential manpower resources whose utilization is to be assessed. Stanev mentions the base of able-bodied population. In my 1960 paper entitled "An empirical approach to measurement of underemployment", presented at the International Statistical Institute session at Tokyo, I, too, suggested that a start should be made from a definition of "able" population. Since the measurement of employment should be related finally to the total population and its age structure, the delimitations of the able segment will not disturb basic comparisons.

While the able-bodied segment provides a ceiling indicator of manpower, the available time is what employment measurements are really concerned with. In Harewood's paper there is reference to available time as a unit of

measure. In my opinion, another important aspect of employment is viewpoint, which may be individual or national. From the individual viewpoint, employment concerns only those offering themselves as available; but from the national or social viewpoint, the criterion of availability could be stretched much further, drawing in not only the voluntarily idle, but many others on the borderline of the labour force. When Sauvy suggested in his paper that the complete activities of individuals throughout the day should be recorded, perhaps he had in mind the assessment of available time from the broad national viewpoint. In spite of much common ground, these two viewpoints have some basic differences. Apart from the question of availability, the utilization aspect assumes greater importance from the national viewpoint, as does productivity. Earnings and their distribution, on the other hand, assume greater importance from the individual viewpoint.

Another aspect that was not brought out so clearly is the heterogeneous nature of the labour force, touched upon by K. C. Doctor's paper. The co-existence of a huge surplus of unskilled labour (or, looked at differently, the serious under-utilization of unskilled manpower) with an acute shortage of skilled technicians is a common phenomenon in developing countries. Available population and available time (suitably defined) have to be divided into broad skill strata to provide the basic measure of capacity. Thus, the total population, with able and available segments defined and divided into skill strata, provides the base for measurement of employment and utilization, between countries and over time. Setting up static norms is not essential, as the level of utilization at different times could be compared directly, without the intervention of norms. Various norms may be applied, however, for analytical purposes, for examination of the probable effects of different policy measures, or even for international comparisons. As Jaffe and Quesada point out, the norms are changing and will be changing even within the traditional framework of the censuses. We should prepare ourselves for a more relative and dynamic frame of reference; the physical sciences provide an example in which measurements are made within a relative dynamic frame.

Another important aspect of the technique of measurement referred to by Doctor is a multiple approach to the measurement of activity or employment, which permits multi-dimensional classification and analysis. Apart from helping to gain an understanding of the employment structure, a multiple approach may

help to maintain desired continuity with past statistics. The Ceylon Survey, for example, asked not only for main and secondary current usual status, but also for hours worked during the preceding week and days worked during the preceding month. Even if the survey has to cover the whole cycle of seasons, from the technical standpoint the reference period in interview surveys should not exceed a week or,

at most, a month. In the Ceylon Survey, full details of activities and time spent at various activities were systematically recorded for the previous twenty-four hours, in very much the same manner as Sauvy suggests; details of output were recorded simultaneously in an attempt to produce some work measurements by which the productivity of what was called the "net" time worked could be assessed.

Statement by the Rapporteur: Mr. L. HERBERGER

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Meeting B.11 was concerned with the definition and measurement of manpower and employment. The emphasis in the discussion was on matters of definition, but methodological questions were also touched upon.

In order to provide a background for this summary of the discussion, it may be useful, as an illustration of the complexity of the topics discussed, to cite the example of a scale or, to use a more abstract term, of a continuum. This continuum ranges from full employment, looked upon from the point of view of individual working-time, or, in other words, full utilization of manpower, at one end, to no employment, at the other. In between there are transitional stages from employment through underemployment to unemployment from economic activity to exclusion from the labour force. All definitions use a more or less arbitrary cut-off point. They must, however, satisfy three pragmatic criteria: utility, objectivity in measurement and operational feasibility.

The example of the continuum shows that the definition of the economically inactive population depends upon the definition of the economically active population, for a person may be either economically active or not economically active. The point at which the continuum is divided is therefore important. This fact was brought out in the discussion on the definition of employment, underemployment and unemployment.

There are, of course, transitional stages from one group to another. The importance of these transitional stages in regard to the definition to be chosen or to be used depends on the phase of economic development and on the structure of the economy.

One of the major points made in the discussion as well as in a number of the papers contributed was that the employment problems of the developing countries are on the whole so fundamentally different from those of the

industrialized countries that the concepts and methodology derived for the industrialized countries are in many respects inapplicable to the problems of the developing countries. This point was brought out in regard to several countries, Algeria being one.

The discussion concentrated upon three main topics. The first of these was the problem of the definition of the economically active population, and its corollary, the definition of unemployment. The main point made here was that the labour force concept alone would not be a suitable approach for the measurement of employment in developing countries. The second topic was problems of defining and measuring underemployment. Attention was drawn here to the difficulty of measuring underemployment and the reasons for this. Mention was also made of the difficulty of international comparisons. Changes were suggested in terminology, as well as in the method of measurement. It was proposed that available manpower time should be used as the basic unit of measurement. If this was used as a basis, other definitions relating to underemployment could be derived. Lastly, the discussion turned to methodology. Mention was made of the need to define the objective of each survey clearly, before choosing the appropriate methods and definitions. In the analysis of labour force data, more use should be made of breakdowns with more than two variables.

As regards the classification of population by type of economic activity, two concepts are available: the "labour force" concept and the "gainfully-employed" concept. It was stressed that the choice of concept should depend on the purpose of the analysis. Two speakers noted that labour force data are generally used in connexion with the calculation of the national income, while the general balance sheet of manpower resources uses information about the utilization of labour.

The definition of family workers is of great importance in defining employment. The family workers' group is particularly important in the agricultural sector. One of the papers contributed to the meeting shows how this group influences labour force participation rates. The employment of family workers, of course, exhibits a high seasonal variation. Objections were made to the suggestion that this problem could be solved by using different reference periods for family workers and other workers in a single set of statistics. This approach would merge two different concepts: it would use the labour force concept for the majority of the population and the gainfully-employed concept for family workers.

Another point raised was what was to be regarded as economic activity. For example, when a grandmother takes care of her grandchildren because her daughter or daughter-in-law goes out to work, she is in fact doing the work of a nursemaid. However, her work is not regarded as economic activity. A similar point was raised in connexion with the work of housewives. The question was asked whether the classification of occupations ought not to take into account social contributions as well as actual economic considerations in regard to the employment of women especially.

Again in connexion with the classification of the economically active and economically inactive population, it was suggested that persons not economically active should be classified according to the economic characteristics of the person on whom they were dependent.

Another important aspect of the definition of employment and unemployment was raised by the Moderator. He suggested that a distinction should be made between the individual point of view and the national or social point of view. From the individual point of view, employment concerned only those currently employed or offering themselves as available for employment; from the national or social point of view, the criterion of availability could be stretched much further, taking into account not only the voluntarily idle but many others on the borderline of the labour force. Remarks in the discussion supported this suggestion. The approach was considered to be very practical for the users of labour force statistics.

The point was stressed in several papers that underemployment must be defined and measured differently in different countries, and that meaningful international comparisons are virtually impossible. Since there is a need for international comparability, the hope was expressed that it may be possible to work out a

multifactor approach, using a statistical matrix and a number of criteria.

A speaker noted that the question "Do you want more work?", asked of people working part-time in order to obtain information on underemployment, had certain limitations. One of these limitations was that the respondent's answer related to what he might do in a hypothetical situation. Another speaker felt that the use of subjective concepts in the measurement of employment should be avoided.

An alternative concept for measuring underemployment, that of manpower-time units, was suggested by a third speaker. At present, it is chiefly visible underemployment which is measured. The labour time disposition approach has not proved altogether satisfactory. It was suggested, therefore, that income earned should be used as a basis for measurement. It was also felt that the measurement of underemployment was hardly possible without some information about the level of skill.

Another very difficult problem is the measurement of underemployment among the self-employed. In order to define underemployment in an economy which is predominantly "self-employed", it is always useful to take into account what has been termed the labour time disposition of persons in the labour force. Because of the difficulty of obtaining direct measurements of underemployment among self-employed farmers, it was suggested by one speaker that the number of days required to farm one hectare of land for a given crop should be used as a basis for measuring.

Also in this context, the suitability of the term "underemployment" itself was questioned. It was suggested that it should be replaced by two clearly distinguishable terms: under-utilization of labour and excess supply of labour. Under-utilization of labour would be determined by comparison between hours actually worked and some standard of "reasonable" input of labour, laid down on grounds that might include political and moral factors. The excess supply of labour, on the other hand, would be determined by asking people to state how many additional hours or days they would be prepared to work at a given wage if employment were available.

In connexion with the usefulness of the approaches for measuring underemployment, one speaker felt that consideration should be given to the various reasons that make the measurement of underemployment more difficult in the developing countries. First, the sense of time in developing societies is different from that in industrialized societies, which

means that their attitudes towards the way in which time should be used also differ. Moreover, there is no clear distinction between working and not working. Second, the number of persons registered as unemployed may depend on the number of jobs offered and the advantages given to the registered unemployed.

In regard to methodology, stress was laid on the necessity of clearly defining what is to be measured and framing the questionnaires accordingly. If an answer supplying complex information is required, a series of suitably designed questions should be used rather than a single comprehensive question. Measurement should always be carried out in the simplest way possible. In designing surveys to measure underemployment, over-refinement is undesirable, given the scale of the problem.

The remarks in the discussion referred mainly to definitions used in population censuses and household sample surveys. The inadequacy of unemployment registers was mentioned by one speaker. In this context, further attention should be paid to a co-ordinated system of labour force statistics, and the manner in which different sources, such as population censuses, sample surveys, establishment reporting, unemployment registration, etc., could be linked together in order to provide a better understanding of the functioning of the labour market. Such a system was

outlined in one of the papers submitted to the meeting.

Two important conclusions emerged from the discussion of the definition and measurement of manpower and employment. First, although the measurement of manpower resources and their utilization has made rapid and substantial advances during the last decade, some problems still remain to be solved and new problems are sure to arise. Second, the purpose of international standards of measurement drawn up by international organizations is to make it possible to obtain comparable figures for the same items. Generally speaking, international standards are based on the typology of the phenomenon for which internationally comparable figures are needed. Some new ideas in this field were brought out in the discussion. The knowledge of the typology of phenomena which has led to the adoption of international standards will enable statisticians to design better questionnaires, etc. In this way it will be possible to obtain comparable figures for the same items on an international basis with due regard for the different cultural and social conditions of each country.

The following speakers took part in the discussion: Barnett, M. Boserup, Cépède, Datar, Gil, Gnanasekaran, Gottlieb, Harewood, Hovne, Jaffe, Korčák, Rochefort, Sicaud, Thirring, Tilak, Ulyanova.

MEETING B.4

Projections of population size and age-sex structure

Statement by the Moderator: Mr. H. S. SHRYOCK

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I

METHODS AND PROBLEMS OF PROJECTIONS OF POPULATION SIZE AND SEX-AGE STRUCTURE

Four of the papers contributed to this meeting may be classified under this heading. The paper by B. Bendiksen¹ reports that the demand for small-area population projections, for use in public and private planning, has been increasing in Norway and that the projections completed in 1961-1962 by the Central Bureau of Statistics for the 700-odd communes have received much attention. The preparation of projections by age and sex for such a large number of areas was made possible by the use of an electronic computer. The projections were made at five-year intervals up to 1980, using the 1960 census as the benchmark. The input was in terms of single years of age through 14 for males and 44 years for females, with grouped ages thereafter.

Age-specific death rates were allowed to decrease geometrically. Since regional variations were actually small, a single set of rates was used for all communes.

National age-specific birth rates were first applied to the number of women in each commune by single years of age. Adjustment factors were then applied to allow for past local deviations from national levels. Apparently, it was assumed that there would be no changes in fertility rates during the projection period.

Communes were classified into three groups on the basis of net migration during the 1957-1959 period: net in, net out, and net balanced. The net-out category was further classified into four subgroups according to the size of the net out-migration rate. Future net out-migration was then computed using age-sex specific

¹ Bjørnulf Bendiksen, "Schematized local projections in connexion with a population census", *Proceedings*, vol. III.

rates. Allowance was also made for emigration. The net out-migrants from communes, distributed by sex and five-year age groups, were allocated to the communes having had net immigration. It should be stressed that net, rather than gross, migration statistics were used throughout, even though the former are probably more variable over a short period of time, such as three years. (Presumably these data came from the population register.)

Totals for the nation and intermediate subdivisions, including functional groupings of the communes, were obtained by adding the projections for the communes.

The paper by A. F. Pobedina² also describes the use of an electronic computer to produce projections for territorial units. Again, the age-cohort method was used. (She states that this method was used in the Soviet Union as early as the time of the first Five-Year Economic Development Plan.) Projections are needed for Union republics, economic areas and administrative regions. The input to the computer included:

(a) Population of the area in 1964 by sex and single years of age, and urban-rural residence;

(b) Corresponding one-year survival rates;

(c) Corresponding fertility rates for women 15 to 49 years old by single years of age;

(d) The sex ratio at birth.

It is not clear whether (b), (c), and (d) are national values or local values.

The separate treatment of the urban and rural populations is a fairly unusual feature. Since there is a high rate of mobility between the two residential types, the procedure took account of (i) rural-urban movement within republics, (ii) migration between republics,

² A. F. Pobedina, "The use of electronic computers for population projections", *Proceedings*, vol. III.

and (iii) reclassification of rural territory as urban. These migration rates were based not on the experience of recent years but rather on plans for the future economic development of the administrative units concerned. The rates used were also by sex and single years of age. When a community was reclassified from rural to urban, it was assigned the urban "reproduction rate".

As for natural increase, there were assumptions of annual declines in life-table mortality rates (q_x) and, in some republics, of annual increases in age-specific fertility rates. In an alternative model, there had been an assumption of no future change in the "reproduction rate". The several variants produced were studied "comprehensively from an economic angle", and the optimal one was selected.

The paper concludes with a summary of the computer programme in the form of "block diagrams", or a simplified flow chart.

The paper by H. V. Muhsam³ on the use of cost functions in making assumptions for population forecasts continues this author's earlier theoretical analysis of the general subject. It complements the papers that deal with the *ex post facto* measurement of the accuracy of forecasts, in that it touches on the problem of gauging in advance the probable accuracy of population forecasts. More directly, it examines the advantages and disadvantages of presenting alternative projections and the optimization of the choice of high and low alternatives.

The advantage to the planner in making use of alternative projections will be maximized if the demographer can supply certain information about these alternatives. Ideally, the demographer should provide the likelihood that the true future population will lie within the range of the high and low projections. Muhsam admits that such probabilities cannot be calculated by the demographer but argues that guesses will "suffice for computing the expected loss and for determining the assumed figure which minimizes this loss". (By "loss" is meant "the difference between the cost of providing immediately for the true number of persons and the sum of the cost of providing immediately for the assumed number of persons and that of providing later for any excess of the true number over the assumed number.") Some simple suggestions are given for making these guesses. He concludes by recommending that the low and high assumptions should be chosen "in

such a way that they embrace nearly all plausible outcomes" of population growth.

The paper represents an application of decision theory: the issue would appear to be whether the application can be quantified in a realistic or helpful way.

The paper contributed by N. Maroufi-Bozorgi⁴ presents population projections for Iran by the component method. Apparently, the methods suggested in United Nations manuals II and III were used to evaluate and adjust the basic census statistics and to make the projections. Fertility was assumed to remain constant from the census date (1956) to 1976, and mortality was assumed to fall rapidly.

DEGREE OF SUCCESS OF EFFORTS TO FORECAST POPULATION GROWTH DURING THE 1950'S AND SOURCES OF ERRORS

Three of the four papers which may be classified under this heading deal with a particular world region, whereas the fourth is more general in its coverage. It would seem logical, therefore, to start with the latter.

The paper by J. V. Grauman⁵ begins with a description of the situation at the time of the 1954 World Population Conference. Whether produced for economically advanced or for developing countries, population projections made during the 1940's were shown very quickly to be almost universally too low. Out of the ashes of failure, however, more penetrating research on demographic processes was stimulated to rise like a phoenix. At such places as France's Institut national d'études démographiques, the Scripps Foundation for Population Research, Princeton University and the United Nations, such "sub-components" of fertility as age at marriage, birth spacing and desired ultimate family size were investigated and incorporated into the methodology of new projections. Difficulties of measuring the age-sex structure of population and vital rates in countries with deficient statistics led to the development of population models that could be fitted to the scanty and inaccurate figures available. Stable and quasi-stable population theories were prominent in these models.

Grauman traces the evolution of the United Nations published projections from 1951 to 1963, and mentions the projections co-ordinated by regional organizations. Even in 1954 the United Nations methodology relied chiefly

⁴ Nasser Maroufi-Bozorgi, "Population projection for Iran, 1956-1976", *Proceedings*, vol. III.

⁵ John V. Grauman, "Success and failure in population forecasts of the 1950's: A general appraisal", *Proceedings*, vol. III.

³ Helmut V. Muhsam, "The use of cost functions in making assumptions for population forecasts", *Proceedings*, vol. III.

on rates of growth. The 1963 project used regional age composition, current trends of the components of growth and their future prospects, often independently of official national projections. (Grauman might have mentioned that the official projections did not affect the United Nations projections made on the assumption of "continued recent trends" but that they were used on a judgement basis in the other three series.)

National projections made by national statistical agencies have made considerable progress. Important developments include the projections of births in European countries from nuptiality and fertility rates by duration of marriage, the separate treatment of urban and rural populations in the Soviet Union, and cohort fertility methods in the United States. Opinion surveys on fertility expectations are being used in the United States, Eastern Europe and Japan. The study of trends in mortality is being refined by examining causes of death. External migration is still calculated mostly from *ad hoc* models. Many countries with poor statistics are using the methods described in the United Nations manuals, which are simple in their application. According to Grauman, it is too early to judge the success of these adaptations.

Most forecasters are more or less forced by circumstances to assume a "guarded optimism" (although it may be added that many in high fertility countries have a pessimistic view about the time of onset of fertility decline). Despite the title of his paper, Grauman presents no quantitative data on the accuracy of past forecasts.

The paper by S. Kono⁶ discusses mainly the projections made by Tun-yih Lu for Taiwan (1960), by Kim Yun and Im Tae-bin for South Korea (1960 and 1963, respectively), and by the (Japanese) Institute of Population Problems for Japan (1955, 1957, 1960, and 1964). He also treats the United Nations projections for South-east Asia made in 1959. He then computes percentage differences of the projections from a following census or registration. (No table is shown.) It should be noted that the dates given above are the publication dates. In most cases the latest statistics used relate to several years earlier. In assessing the accuracy of a forecast, of course, the relevant date is not that of publication but rather the "benchmark" date of the last preceding census or current estimate.

In the case of Taiwan, the benchmark date

was 1956 and Lu's forecasts were compared with the registration of 1961. The large underestimates for males 25 to 34 years old seems to reflect under-enumeration in 1956. Comparisons are complicated by the fact that both the census and the registration covered only the civilian population. In general, the differences were small.

For the Republic of Korea, the United Nations projection and Kim's medium projection were about 3 per cent too low, the age group under 5 years having been particularly underestimated. Here, as in a number of other Asian countries, the United Nations appreciably underestimated the rate of decline in mortality.

The 1957 Japanese projection for the total population was only about 0.5 per cent below the 1960 count, with the youngest age group again showing the largest deficit. (Kono feels that the youngest and oldest age groups are particularly difficult to forecast.) He suggests that, when future fertility decline for other Asian countries is modeled on the Japanese experience, the pre-war period 1925-1938 should be considered in order to avoid the artificial effect of the post-war baby boom. Mortality trends in the more backward Japanese prefectures could also serve as a guide to what is to be expected in some of the neighbouring countries.

Kono points out that the United Nations sex-age-adjusted birth rate uses weights that are quite different from those observed in Japan and Taiwan. Therefore, he suggests the use of weights based on experience in a region. He also shows how the use of an inappropriate model life table can produce errors not only in estimated mortality rates but also in estimated fertility rates where these are computed from a census count of children 5 to 9 years old using a reverse survival rate. In Japan, as in a number of Western countries, the use of conventional age-specific fertility rates is no longer adequate. A trend towards having fewer children but having them earlier in the child-bearing period requires the development of new materials for the cohort analysis of fertility.

The paper by P. M. Visaria⁷ analyses population projections in the 1950's for the countries of Middle South Asia. Since all but one projection for India and Pakistan have been too low, Visaria considered only the high series from given sources. Davis (1951), Gopalaswami (1953) and the Planning Commission (1956) extrapolated the past growth rate of

⁶ Shigemitsu Kono, "Forecasts in some Asian areas during recent years: Criticism and suggestions", *Proceedings*, vol. III.

⁷ Pravin M. Visaria, "Population projections for countries of Middle South Asia during the 1950's", *Proceedings*, vol. III.

India. Das Gupta and Majumdar (1952), Coale and Hoover (1956), Chellaswami (1957), Agarwala (1959) and the Expert Committee on Vital and Health Statistics (1959) used the component method. The table on the accuracy of these projections makes no explicit allowance for the interval between the time when the projection was made and the time of the census with which the comparison is made. Taking this factor into account, however, Visaria concluded that projections by the component method tended to be more accurate.

Only in Ceylon did all the projections over-estimate the population counted at the subsequent census. Here the decline of mortality was not so great as was assumed. Furthermore, failure to allow for net emigration also contributed to the over-estimation of population. Only for Pakistan, in fact, did the national projections assume net migration different from zero. The projection for Nepal was made by the United Nations on the basis of an assumed growth rate.

The paper by L. W. Törnqvist⁸ compares the post-war population development of Finland with projections made after the war. In 1947 Törnqvist directed the preparation of a series of national projections extending to the year 2000 for Finland. Age-sex specific fertility and survival rates were extrapolated graphically. International migration was assumed to be nil. There were high, medium and low assumptions for both fertility and mortality. The range was "aimed to give an 80 per cent confidence interval". (This requirement is not further explained.) The high fertility assumption called for a decrease to pre-war levels in five years. However, the decrease actually required ten years, mainly because of an increase in the proportion marrying. Actual births in the 1946-1960 period were almost 10 per cent above the number derived from the high assumption. Because of the unanticipated successes of antibiotics, the mortality levels assumed for the year 2000 were actually attained by the end of the 1950's. The 1960 census count was almost 6 per cent above the high projection.

New projections for the nation and for regions were made in 1963 under the direction of Tor Hartman. Here net emigration, inter-regional migration and urban-rural migration were assumed to continue at the levels of the recent past. Life tables for 1961 were continued in force to 1990. Birth rates were assumed to decrease, however, as were inter-area differen-

ces in birth rates. Up to 1990, the projections of 1946 and 1963 are very similar for the age groups 45 years old and over.

Projections made in 1964 by A. Strömmer yielded different national totals for 1990 (5.19 versus 5.48 million), depending on whether or not allowances are made for migration. The higher forecast was also above all of the earlier forecasts that have been mentioned.

The paper by C. A. Peláez⁹ on population forecasts for Latin America during the 1950's deals with two of the three main headings suggested for this meeting: degree of success, and types of data and studies needed to effect improvements.

As regards the degree of success, the population forecasts he appraises are those made by the United Nations in 1954 and 1955 and exclude those made in the nations themselves. Fifteen census counts were available for comparison. Like most analysts, he concerns himself with the quantitative errors and not with the social and economic costs attributable to the existence of these errors.

From the published projections, figures were interpolated for the census dates of each country. Apparently, these national figures for somewhat different dates were simply added together for purposes of obtaining a regional evaluation. The high projections aggregated 3.4 per cent below the comparable census counts, the median projections, 4.5 per cent, and the low projections, 6.8 per cent below. Another criterion is whether the high and low projections bracketed the actual count. Looked at in this manner, only four of the fifteen sets of projections were successful. Over-estimates occurred in several countries, mainly in temperate South America. There was some advance consensus that the medium projections were the most reasonable for these temperate countries.

The errors may, of course, be the result of greater compensating errors in the components. For each country, Peláez examines the contributions of the individual components to the error of the population projections, as far as the available data permit. Actual and expected fertility are compared in terms of the crude birth rate, and actual and expected mortality in terms of the expectation of life at birth. Even here, the actual figures had to be based on the current estimates of various experts rather than on official statistics from the regis-

⁸ Leo Törnqvist, "The post-war population development of Finland compared with predictions made after the war", *Proceedings*, vol. III.

⁹ César A. Peláez, "The degree of success achieved in the population projections for Latin America made since 1950. Sources of error. Data and studies needed in order to improve the basis for calculating projections", *Proceedings*, vol. III.

tration of vital events. Peláez also recognizes that the difference between the projection and the census count for the same date will reflect the under-enumeration in the earlier census, the one serving as the basis for the projection. More precisely, the relative errors of the two censuses contribute to the difference being measured.

TYPES OF DATA AND STUDIES REQUIRED TO IMPROVE THE BASIS FOR PROJECTIONS OF POPULATION SIZE AND SEX-AGE STRUCTURE

In discussing studies needed to improve projections, Peláez differentiates between the shortcomings of the assumptions regarding the future trends in the components of population growth and the errors in the benchmark measures of past and current population size and structure of past and current components of growth. He discusses only the latter. An appraisal by the United Nations found the registration of vital events to be incomplete in fourteen of the twenty Latin American republics. Moreover, it is said to be more difficult to improve registration statistics there than to improve censuses. There is a discussion of the need to educate governments and the public concerning the importance of vital statistics. Meanwhile, sample surveys have an important role to play in measuring vital rates and these surveys can be used at the same time to study social and economic differentials and attitudes and plans regarding fertility. CELADE is making contributions in this field. More attention should also be given to trends and prospects of international migration.

Two papers have been written on the bases for population projections in tropical Africa. One is more concerned with the evaluation of the available data and with the most appropriate methods of projecting to be used, while the other is more concerned with the possibilities for improving the basic data. There is a certain degree of overlapping between the two.

The paper by A. Romaniuk¹⁰ assumes that the problem is to make projections by age using the component method. There seems to be a specific pattern of age misreporting in African censuses. As compared with a stable-population distribution, there is an apparent deficit at ages 10 to 19 with an excess at ages 20 to 44, especially for females. There is a deficit of older persons, but a good fit for children under 10 years old. He prefers to use

a stable population model rather than smooth the distribution empirically.

Most information on fertility and mortality must be deduced from recent censuses. From census items on children ever born and children now living with the mother, Brass has a technique for estimating probability of death from birth to age. There are also some survey data on deaths occurring in the past year. Infant deaths are grossly under-reported in such surveys. Romaniuk prefers to use a United Nations model life table or, better, one of those developed more recently by Coale and Demeny.

The available fertility data for tropical Africa are more diverse and more reliable than the mortality data. From the census, there are useful statistics on children ever born and on childless women. Data on births in the past year have been collected in surveys. Age-specific fertility rates are biased, however, by the misreporting of women by age. Hence, he prefers to use the general fertility rate, estimating the number of women 15 to 44 years old from the appropriate stable age distribution.

As to trends in the next twenty-five years, Romaniuk thinks that the best assumption would be one of no change from the present high levels of fertility. No urban-rural differentials are observable at present. A recent rise in average age at marriage has been observed, however. The high sterility level observed in some African countries suggests that a reduction in venereal disease would lead to even higher fertility. Most previous projections imply a rise of half a year per year in expectation of life at birth for the next twenty years mainly by analogy with what has happened elsewhere. He himself is not so optimistic.

E. Adams and P. S. Menon state in their paper¹¹ that projections prepared by various experts for nineteen tropical African countries were utilized by the United Nations in its 1963 projections. The United Nations assumed uniform mortality levels for three subregions of tropical Africa, but varied fertility in accordance with the findings of sample surveys. The use of model life tables and ingenious analytical techniques devised by Brass to estimate fertility and child mortality are essentially stopgaps in the absence of comprehensive and accurate statistics.

The authors recommend first that the so-called "administrative censuses" (reports of

¹⁰ A. Romaniuk, "Projection basis for populations of tropical Africa: A general discussion", *Proceedings*, vol. III.

¹¹ Edith Adams and P. Sankar Menon, "Types of data and studies needed to improve the basis for population projections in tropical Africa", *Proceedings*, vol. III.

tribal officials, etc.) should be replaced by canvasses in which every dwelling is actually visited. Post-enumeration field checks on a sample basis should be a standard part of censuses. Special attention should be given to the groups most difficult to enumerate, such as mobile young adult males. Even when ages are not at all well-known by most members of the population, it is recommended that ages should be recorded in single years (rather than in functional groups) and combined and adjusted later. Some experimentation with translating indigenous systems of denoting age (so-called "age grades") has been encouraging.

As for vital statistics, the long-range objective must always be an adequate registration system covering the entire country. A country could start, however, with intensive efforts on a sample of registration areas and gradually extend these methods to the remaining areas. Registration data should be checked against retrospective reports in surveys. The international movements of workers should be studied; census questions on place of birth will provide data for the countries receiving such immigrants. Often these movements are not permanent changes of residence.

Other recommended studies include the evaluation of censuses to check the accuracy of implied inter-censal growth rates; the reality of the great diversity of fertility rates reported for different parts of tropical Africa — possible effects of sterility, polygamy, temporary absence of male workers, etc., the applicability of existing model life tables to tropical Africa, and more information on causes of death from surveys and registers.

The last paper considered here is that contributed by J. T. Yamaguchi,¹² who seeks to investigate the effects on population projections of errors in the initial population by age and sex and in the registration of births. He takes as his illustration the national projections to 1985 published by the United States Bureau of the Census in 1964.

The net effect on the size and structure of the native population resulting from errors of coverage and of classification was investigated by the author in an earlier paper using cohort-survival techniques, comparisons with birth, etc. The adjustment factors computed for the native population are applied to the total population, including the foreign-born. Estimates of the under-registration of births are based on tests

conducted by the National Office of Vital Statistics. Errors in survival rates were not considered explicitly. The enumeration errors result in a net understatement of about 2.5 million in 1985, for which date the four published projection series ranged from 248 to 276 million. Under-registration of births had a negligible effect.

II

A number of general conclusions emerge from the papers contributed. As regards the methods used, most of the projections presented or reviewed in this set of papers employ the component method even when necessary basic data are lacking and resort must be made to demographic models. Even for the more statistically advanced countries, the measures of fertility and mortality are usually simple age-specific rates. The use of alternative assumptions is only moderately common. These almost always take the form of high, medium and low levels. Efforts are occasionally made to choose a reasonable assumption about the future course of immigration or emigration; but all too often this component is, in effect, ignored. It should be emphasized that the twelve papers for the meeting do not give a representative indication of the range of projects carried out in recent years.

Many of the projections reviewed have employed the general method outlined in the United Nations *Manual III: Methods for population projections by sex and age*.¹³ This practice is particularly true for the countries with relatively deficient demographic statistics. One encounters frequent use of model life tables, sex-age-adjusted birth rates, and the recommended simple methods for testing and adjusting the age-sex structure. The uses of stable and quasi-stable population theory are not so well appreciated, probably because they require more mathematical and analytical facility; but a few of the present papers attest their authors' familiarity with these techniques.

Where the simple methods developed by the United Nations are used in a particular country, they often appear to have been applied rather uncritically without much of an attempt to adapt them to local conditions. A few authors do raise questions as to whether certain average relationships and trends that were observed in the statistics available around the world will apply in the future to particular countries and whether relationships and trends observed in

¹² J. Tohr Yamaguchi, "Under-enumeration of the initial population and under-registration of the births as sources of errors in population projections", *Proceedings*, vol. III.

¹³ United Nations, *Manual III: Methods for population projections by sex and age* (United Nations publication, Sales No.: 56.XIII.3).

the country's own region might not be more appropriate. The particular progression of mortality called for by the United Nations model life tables and the sex-age-adjusted birth rate are the objects of such challenges.

There is a great deal of interest in the papers in the accuracy of past forecasts. Many of the comparisons, however, are made with census conducted only a few years after the forecast was made. Hence, not much is available on the accuracy of long-range forecasting. Even in a rather short time, the forecast can turn out to be fairly wide of the mark, and the census count is often not even comprehended between the high and low projections. Under-estimates of future population seem to have been much more common than over-estimates—in developing countries mainly because the decline of mortality was under-estimated. (In the industrialized countries, a fairly universal failure was not anticipating the post-war reprise of fertility.)

Some of the authors have computed the errors attributable to the components of population change. Occasionally, the failure to allow for any external migration has contributed a fairly substantial portion of the total error. In some cases, of course, errors in the several components are partially offsetting and in others all three contribute to an over-estimate or under-estimate of the future population. Finally, some of the errors can be traced to apparently faulty enumeration in the benchmark population—whether from census or current estimate. Often this faulty enumeration was not detected until the next census was taken.

Very little is suggested in this set of papers about ways of improving the assumptions concerning the future course of fertility, mortality and migration in the preparation of national projections. Some of the newer measures (child-spacing, marriage cohorts, expectations data, causes of death, etc.) are described briefly, but there is little by way of suggestions for further methodological explorations. There is no definite consensus on the part of the authors themselves or of the many publications they have summarized that cross-sectional age-specific measures are inadequate and hence outdated as a means of projecting fertility.

Since this meeting is much concerned with better projections for countries with deficient demographic statistics, there is, not surprisingly, much discussion of the need for evaluating and improving the statistics. It would perhaps be unfair to say that this discussion amounts to saying that more complete and accurate censuses and vital statistics are impera-

tive, but no simple methods for achieving or by-passing these objectives are offered. There is obviously a long and difficult road ahead for many countries. Even when those in power are convinced of the needs and are willing to appropriate funds generously, they in turn must persuade the ordinary citizen to co-operate. With the best will in the world, the illiterate peasant will often be unable to tell the date of his or her birth or to recollect the number of children she has ever borne. In such matters the statistical benefits of education will come gradually. Nonetheless, a start must be made, and meanwhile certain ingenious stopgaps (stable population theory, interlocking sample surveys and registration projects, measures computed from the relationships between data from different sources, post-enumeration sample surveys as checks on censuses, etc.) are being developed.

We may turn now from national projections to those for geographical subdivisions of nations—provinces, states, cities, communes, economic regions and the like. Bendiksen and Pobedina both attest to the increasing demand for such projections for planning purposes. Here national and local governments are very much on their own, since projections for such areas are rarely produced by international organizations even though advice may be offered.

The projects described in these papers happen to be those in which projections were made for all the areas of a particular class and not for a particular subdivision. In fact, the set of areas comprehends the entire territory of the nation. Many projections of a more restrictive coverage are made in practice, of course, and chiefly by agencies of the given locality.

Whether to use national fertility and mortality rates for all subdivisions or whether to use individual rates has depended upon such factors as the present amount of variability and the time and resources available for making the necessary computations. Even when an electronic computer is used, there is the task of securing the necessary input both in terms of initial rates and of future trends. (Sometimes, a large number of areas have been grouped into a few relatively homogeneous types, each having its characteristic rates.)

Internal migration, including rural-urban migration, is obviously a very important, usually the most important, determinant of the future redistribution of population among geographical subdivisions. In the projections described for both Norway and the Soviet Union, this component of change was given direct attention in as realistic a manner as appeared feasible. Migration assumptions of this sort, however,

are by no means universally made in the preparation of regional projections in even the "statistically-advanced" countries. When migration is projected, the net amounts (or rates) of a recent period are usually continued or attenuated. Pobedina, on the other hand, states that future migration was assumed so as to be consistent with projections of the future economic development of the administrative units concerned.¹⁴ One wishes that she had more space to describe the method by which these phenomena were related, since this is indeed an important and complex relationship whatever the type of society. How quickly the migrants adopt the fertility patterns of their new environment and the extent to which their chances of survival are influenced by their rearing in a different area are also complex matters about which demographers know all too little. These questions have been handled at best by very simple assumptions; usually the assumptions are merely implicit in the computations for the remaining parts of the projection period.

In the various publications presenting projections for geographical subdivisions, the importance of economic and social factors is sometimes mentioned. This consideration rarely goes beyond lip service, however. Part of the difficulty lies in the absence of projections of economic development and of other economic and social phenomena. Even when there are official economic plans, they seldom extend for more than five years. Moreover, it is admittedly difficult to determine the implications of such plans for the components of population growth. On the national level, it is true, a few countries have recently set explicit goals for their population growth rates.

An era seems to be dawning when electronic computers will be frequently used in the computation of population projections. So far, the main objective seems to be to reduce the amount of labour required in making projections for a large number of areas. Less frequently computers are used to apply more complex measures. The notion that the computer is an analytical tool that greatly facilitates experimentation with assumptions and methods is not yet widespread, either among these writers or even more generally.

To sum up, those writing about the development of projections over the past decade seem to feel that some progress has been made. Certainly, population projections are in more

demand and are more frequently produced. Demographers concerned with developing countries with relatively deficient statistics can and do resort to simple standard methods. Some writers feel that the projections for the industrialized countries with relatively good statistics have been based on more realistic assumptions than were used in the 1930's and 1940's. Whether the greater accuracy of their recent short-run projections of total population reflects mainly the fact that these countries have been passing through a relatively orderly period of population growth remains to be seen.

III

What constitutes knowledge in the case of population projections? If we adopt Hajnal's pessimistic position, the forecasting of future population is not really possible and scientific methods may be no more successful than mere guesses.¹⁵ If a demographer claims that he is not really aiming at a target, how does one characterize the margin by which he misses it? Is this an "error" of his projection? What if he presents a number of projections without designating one of them as his best series? Obviously, one of them will come closer to the total count of the next census than the others, but how should we use the words "success" and "accuracy" in this situation? Is the search for methods of making more accurate population forecasts a search for a non-existent philosopher's stone? In a number of countries (for example, Sweden, France, India, Taiwan and Korea) projections made on the assumption that fertility will remain at the current level have stimulated programmes (either pro-natalist or promoting family limitation) for changing that level. On the other hand, one finds in the demographic literature a widely held belief that some methods are better than others. Can one be confident that they will also produce more accurate forecasts? The economic planner and other users of projections may have a mild interest in what would happen if present demographic tendencies continue, but essentially they would like the demographer's expert judgement. In this situation, confidence is usually more welcome than candour.

Against this uncertain background, let us discuss (a) the major gaps in knowledge, (b) different views on controversial questions, and (c) main directions of current research. Some of the points that are stated only briefly here

¹⁴ See A. F. Pobedina, "The use of electronic computers for population projections", *Proceedings*, vol. III.

¹⁵ John Hajnal, "The prospects for population forecasts", *Journal of the American Statistical Association*, 50(270) (June 1955), pp. 309-322.

are dealt with in more detail in the background paper for this meeting.¹⁶

Among the major gaps in knowledge, one might list, first of all, the present population size, age-sex structure and components of change over the majority of the world's area. Even for many countries with relatively good statistics, there are errors in age reporting that have an appreciable effect upon the projections by age. Attention to refinements of methodology and choice of assumptions are of little avail when benchmarks are very faulty.

There is considerable doubt as to how well the theory of demographic transition describes past and prospective demographic developments. A related question concerns the extent to which the demographic experience of countries that have already developed economically is applicable by analogy to the countries that are now developing. This question is discussed intensively in the background paper on future population trends by Irene B. Taeuber.¹⁷

How do cyclical fluctuations and secular trends in economic phenomena (unemployment, per capita income, levels of living, occupational structure, etc.) affect population growth? More needs to be known about the separate relationships with fertility, external migration and internal migration. This set of questions applies more to the economically advanced countries. In the case of the other parts of the world, the interactions between the components of population change (not excepting mortality) and such economic phenomena as the transition to a market economy, underemployment and the rate of capital formation challenge our attention. Moreover, social and political phenomena could be added to the list of factors whose effects are still only partially understood.

Another area of uncertainty is that of the most meaningful metrics for showing trends in mortality, fertility and migration. Are there more refined measures that would give a better indication of the underlying trends and would be less disturbed by transitory influences? If so, would the use of such measures lead to a narrower range between the high and low population projections for any given future date? Some examples of more refined metrics are: cohort fertility rates specific for marital status and parity, with account taken of the intervals between successive birth orders or between births of each order and date of mar-

riage; generation instead of cross-sectional life tables; and gross rates of out-migration with migrants distributed to their destinations on some probabilistic basis, instead of net migration rates.

There are still other gaps in our knowledge of mortality. For example, what are the reasonable upper limits on expectation of life from the application of present medical knowledge and extension of the best contemporary public health practices, but without major "break-throughs" in the prevention and treatment of the degenerative diseases? (Removing the last restriction makes the question much harder to answer.)

Again, how does reduction of mortality in the early life of a cohort affect its chances of survival in later life?

Lastly, how well do the systems of model life tables developed by the United Nations and similar mortality models worked out by Campbell and by Coale and Demeny apply to other parts of the world (beyond those countries and periods contributing to the average relationships utilized), and are they likely to describe the course of events in the next few decades?

It is relatively easy to list a number of areas of at least partial ignorance that affect the projection of fertility. For example, how are female marriage and fertility rates affected by the number of potential husbands available at various ages when the normal age-sex distribution has been seriously distorted by war losses or by extreme variations in the initial size of successive birth cohorts? How are marital fertility rates and the size of marriage cohorts affected by ruptures of unions during the child-bearing period and by remarriages? How well can and will women interviewed in "expectations" surveys state the number of babies they expect to have in the balance of their child-bearing period or in a specific future period such as the next five years? Can unmarried adolescents and young women, who will be contributing the majority of the births ten or fifteen years ahead, give realistic answers to such questions? We need to know a great deal more about the way in which age at marriage, child spacing and completed family size are affected by such factors as changing economic conditions, urbanization, social systems, the role of women in the home and in the working force, and rising expectations regarding education and the possession of various durable goods of a convenience nature. Particularly in developing countries, how rapidly can the use of various methods of family limitation promoted by gov-

¹⁶ Henry S. Shryock, "Projections of total population and of age-sex structure", 1965 *World Population Conference*, background paper B.4/9/E/454.

¹⁷ Irene B. Taeuber, "Future population trends", 1965 *World Population Conference*, background paper A.4/8/E/453.

ernment programmes of given kinds be expected to diffuse through the population? Given the cultural diversity of such countries, it is very unlikely that there is only one set of answers to these questions. In what the United Nations calls countries of "stabilizing" fertility, at what fertility levels is stabilization likely to occur, say in terms of the gross reproduction rate? What will be the distribution of births by age and duration of marriage associated with these?

Regarding migration, where this is an important component of population growth, should migrants be assumed to have the same fertility and mortality as the native population, account taken of age and sex? If not, how should the differences be determined and how long should they be assumed to persist? Also, how can population projections for geographical subdivisions be tied in with projections of employment by type of industry, national and local production, or income levels for these subdivisions?

One of the important questions on which views differ is whether all officially published projections should be realistic in that they are intended to be not far removed from the actual future population, or whether it is also useful to the public to make assumptions that simply demonstrate the consequences of specified levels or trends of the components of change. There have also been differences of opinion as to whether one or a number of projections should be made and, if the latter, whether one of these should be designated as most probable. In addition, not all demographers would agree with Muhsam and Törnqvist that standard errors can be attached to population forecasts.

Another controversial question is whether it would be reasonable to have an alternative assumption of rising mortality for countries where population pressure might greatly threaten nutritional levels, the adequacy of housing, expenditures on public health, etc. Some authorities feel that it suffices to update official projections every five or six years unless there is an abrupt change in the trend of population growth, whereas others feel that revisions should be made to bring the projections into line with current estimates as often as once a year. Demographers' views regarding the theory of demographic transition range from regarding it as describing the past or future evolution of population in most countries fairly well, as being a good description for a number of countries in the past, to its being largely a myth. As a result of experiences with projections in countries with low or moderate fertility,

some demographers have concluded that cohort fertility rates are a necessary substitute for period rates, whereas others feel that the use of conventional age-specific rates is adequate. Are period rates quite adequate except in a few unusual periods, or should cohort rates be used as a matter of course wherever the necessary statistics are available? Even between neighbours as close as Norway and Sweden, different opinions are expressed in connexion with the official projections for localities as to whether it is better for the assumptions regarding net internal migration to be made centrally or by the local planning authorities. In the past decade, the practice in England and Wales adhered to the Swedish recommendation of decentralized judgement, whereas that in the United States of America agreed with the Norwegian practice of having the national statistical agency make specific assumptions. In France, the practice changed from taking no account of migration in the official 1957 projections by departments to making an alternative assumption of the continuation of recent migration patterns in the regional projections published in 1965.

It is a source of satisfaction that much of the current research is concerned with the major gaps in knowledge listed above. For example, there is considerable theoretical research going on regarding population dynamics, the inter-relationships of the components of population change. Historical data are also being examined anew to test the theory of demographic transition and particularly to establish the factors associated with the early decline of fertility. In addition, model life tables are being constructed for particular epochs and regions. L. Henry has formulated a mathematical model for the legitimate fertility of couples not practising any form of birth control, which takes account of a number of biological factors as well as of the duration of marriage. Ryder has explored the relationship between period and cohort fertility rates, partly in an effort to extrapolate the incomplete fertility of cohorts. Increasingly fertility rates are being computed that take account of marriage, parity and child spacing. Field surveys have been used to validate previous statements on the number of children expected by women and to study the acceptability and effectiveness of various methods of family limitation. Lastly, some regional and local agencies are relating population change or net migration to independent forecasts of employment based on detailed analysis by industry or on the regression between these demographic variables and average income per capita in the area.

To sum up, leading tendencies include the building of demographic models, cohort analysis, sample surveys and the use of electronic computers. Whether or not this research has any direct effect on the accuracy of population forecasts, it is certainly resulting in considerable advances in the demographic theory that is essential to more meaningful forecasts.

IV

In listing questions that should receive special attention in the discussion to follow at this meeting, attention could well be given first to the six controversial questions listed above. In addition, we might consider the way in which more explicit use can be made of economic and social factors in the projecting of the

components of population change; whether we already know enough about variations in mortality trends to justify substituting other model life tables in certain countries for the United Nations models (the primary reference here is to countries with defective mortality statistics); one degree of promise offered by questionnaires on expected future numbers of children and the ways in which such data can be evaluated; whether it is better, in the projections of internal migration, to use amounts or rates, gross or net migration; the way in which the measurement of the errors of forecasts, particularly in the case of the comparison of methods, can be standardized. The elapsed time should obviously be controlled somehow. Or, again, is it even agreed that it is meaningful to measure such "errors"?

Statement by the Rapporteur: Mr. P. R. Cox

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The work of the Rapporteur in summarizing the discussion, and in giving a balanced account of controversial questions, could clearly be a highly responsible task with certain subjects. On the topic of how to make population projections, however, there were not many controversies and none were very sharp. Instead, there were a number of exchanges on particular situations, on specific problems and on general issues.

Although controversy was not sharp, it did not follow that all demographers would make population projections in the same way in a given set of circumstances. There were, indeed, many alternative approaches, not only of method, but also of presentation and interpretation. Many speakers emphasized the need to widen the range of choice of projections and, indeed, to canvass as wide a variety of expert opinions as possible on the future prospects before any projections were made.

The discussion brought out that the growth of public attention to population questions and the need for forward planning of all kinds have provided an increasing amount of projection work for demographers, and hardly any regarded this as a cause for regret. Indeed, many speakers welcomed this trend. They felt that the demand should be met by the best possible efforts of the most skilful demographers. The expert would be ill-advised to refuse to act, because it would only follow that the task would be allocated to other, less-skilled practitioners. Nevertheless, when asked to make a "forecast" (and this is the usual form of

request), the demographer often did, and always should, feel a sense of unworthiness because forecasting is impossible. The limitations were now realized better than before. All the same, one should not be frightened off the subject of projections because of past failures. The view was frequently expressed at the Conference that the prime needs are for better and more precise data, more careful research and more deep thinking on important issues.

The topic was divided by the Organizer into three parts, as follows:

(a) Methods and problems of projections of population size and sex-age structure;

(b) Degree of success of efforts to forecast population growth during the 1950's and sources of errors;

(c) Types of data and studies required to improve the basis for projections of population size and age-structure.

On the first topic, speakers indicated that the methods and problems of projections have increased in number with the growth in the volume of data and the rise in the demand for this type of exercise. In particular, there had been a movement away from the use of mathematical curves representing total population size, in favour of "component" methods in which census and registration statistics could be more fully and fruitfully employed. There remained, indeed, areas where models still needed to be used, but some speakers criticized the results of their use in respect both to mathematical models and to data derived from other

countries whose experience was supposed to be parallel to that of the country under consideration. Other speakers, however, felt that where basic data were largely untrustworthy, it was better to continue to use models for the time being.

In component methods, it was first necessary to decide on bases of calculation in regard to fertility, mortality and migration; thereafter the calculations were made on these foundations. The discussions recognized that the first of these two tasks was much more crucial and more difficult than the second. Moreover, although methods of projection were becoming more complex, it had not yet been established whether, or to what extent, a greater complexity of method led to better success in projection. On the whole, speakers called for a greater depth of analysis and the study of more detailed statistics, but warned against any expectation that greater complexity of method would lead to more accurate projections. Some expressed the feeling that methods, and especially modes of presentation, should remain broad and simple.

The choice of bases for projection purposes should naturally represent all that was known of fertility, mortality and migration; on the subject of the probable future changes in experience in regard to these elements, discussion centred mainly on the following topics:

1. The strong probability of future changes in general level: projections assuming a continuation of current experience were going out of favour. For instance, fertility might fall as a general movement of population took place from the countryside to the town; nevertheless, in some respects a continuation of current experience might be assumed, especially where redistribution of this kind seemed unlikely to change the national experience as a whole.

2. The possibility of changes in trends: thus the decline in mortality might slow up after the eradication of infectious diseases, and new medical discoveries might be required or public hygiene might have to improve before advance in longevity could be resumed. Many projections still assumed, however, a continuation of current trends, and this might be appropriate if no evidence were forthcoming of a likely change of direction.

3. The need for and respective merits of the analysis of experience by calendar year and by year of birth (or marriage): most demographers felt that, wherever possible, studies of cohorts should be undertaken. Even so, secular influences remained strong and also needed attention. For instance, in mortality, generation

methods of projection were little employed. As regards fertility, one speaker who had used the cohort method for projection purposes enumerated a number of practical difficulties that he had experienced. He had found it difficult to integrate all recent, relevant statistics into the method and also to make the best possible use of opinion surveys and knowledge about birth spacing. Nevertheless, he was able to suggest a number of ways in which the method might be improved on future occasions.

4. Projections of mortality rates could be made either by extrapolation from past experience or by considering what ultimate level the death rate might be expected to reach in the light of medical and social progress, and how rapidly this ultimate level might be attained. Under either approach, it might well be helpful to consider separately certain groups of causes of death such as infectious diseases, accidents, ailments of the circulatory system and cancer. One speaker thought that morbidity statistics and epidemiological studies might also be helpful. Although opinions differed as to the extent to which growing populations could be supported in the future by the resources of food and energy that might become available, in general the choice of mortality bases for projections had not been biased by fears of a worsening health situation. The discussions emphasized the need for adopting a different approach according to the type of area under study. For instance, special difficulties might be experienced in countries with limited resources where a campaign for the eradication of a particular disease had been successfully completed, but further improvements would clearly be more difficult and costly to effect. Again, the difficulty of projection varied from age to age and mention was made of the slowing down in the rate of improvement of male mortality in middle life as constituting a particular problem.

5. Some speakers emphasized the interconnections between mortality and fertility changes and argued that decisions on bases for fertility projections should be taken in the light of the mortality rates adopted. Some argued that the consequences of adopting an optimistic view of the prospects for increasing longevity should be that a considerable fall in fertility should be assumed. One speaker expressed the opinion, however, that in some areas a fall in mortality might actually lead to an increase in fertility. This question illustrated a larger problem with which all demographers are familiar, namely, the dependence of fertility on economic development, on changes in fashion and on government

intervention, both direct and indirect. A range of views was expressed on the chance of a fall in fertility as economic development proceeds. Some felt that what had happened in many countries must necessarily happen again in others as they progressed. Some demographers, however, aware of the very limited knowledge of causes and effects, expressed their doubts. Among the particular aspects of the association between fertility and economic development that were noted were a possible increase in the birth rate with the decline of polygamy and a probable fall in fertility with increasing urbanization. While it was generally agreed that the effect of increasing urbanization was likely to influence both urban and rural fertility, the possible effect on the national fertility as a whole was more problematical.

Another group of questions upon which a decision might have to be reached in connexion with the projection of fertility related to age at marriage and to birth spacing. Some speakers placed that in a period when marriage is taking place at earlier ages, and children are being born sooner within marriage than before, measures of fertility are distorted. The reverse effect was also seen when the age of marriage was rising or births were being postponed. These points needed to be carefully considered if misleading projections were to be avoided, but it was pointed out that it was particularly difficult to forecast how the timing of such events might vary in the future. A wider issue was whether marriages and fertility within marriage should be separately projected or whether the two should be combined in a set of all-women's fertility rates. The answer usually depended upon the nature of the data available. The statistical material at hand was usually less comprehensive in the developing countries than in the economically developed ones, and this meant that simpler methods must necessarily be used there. It was pointed out that a broad responsibility lay on the shoulders of demographers in economically developed countries to give a lead, by research, in discovering which method was the most appropriate. Reference was made to the construction of models for this purpose, particularly those which might show the effect of a spread in the use of family planning. One speaker pointed out that, where several projections were made, fertility rates should probably differ not only in their general level, but also in their composition by age and perhaps other factors.

6. Attention was drawn to the importance of international migration and particularly, in recent times, to the movement of foreign

workers into certain highly developed countries. The difficulty of estimating in advance the probable movements of this type was stressed, and it was pointed out that the type of data collected at censuses needed to be carefully considered in this connexion. Statistics that were ill-defined for the purpose could be quite unsuitable. Attention was also drawn to the fact that in certain respects, for instance in the degree of their dependence on economic changes, such international movements had an affinity with some types of internal migratory flows. Here the demographer was advised to consult with economists as to the range of possible prospects for the future. It was also suggested that he should take his directions from planners as to the degree of development which was likely to be encouraged in each separate area.

7. The discussion made it abundantly clear that there was a growing demand for population projections for local areas and that this trend should be encouraged. This and other related topics were discussed in further detail at meeting B.5 of the Conference. This type of projection brought additional problems, for instance:

(a) The need for consistency between the areal projections and the projections for whole countries. On the one hand, it was possible to aggregate the local figures and so arrive at the national total. On the other hand, some speakers felt that the national total should be derived first and the figures for separate areas obtained by a method of apportionment.

(b) The need in some instances to adopt assumptions as to fertility and mortality, which varied from one region to another. Some demographers allowed for such variations, while others did not appear to have done so. The suggestion was made that areas might be assembled in homogeneous groups in regard, for instance, to the nature of their agriculture or industry, and projected in these groups.

(c) The need to correct projections based on past experience in regard to internal migration, bearing in mind that the results obtained in this way might not be consistent with the economic potentialities of the areas. For example, in some countries it proved necessary to adjust the projections because they seemed to lead to a greater or smaller growth in population than it was envisaged that the area could support. In another example, it was necessary to consider the allocation of scarce resources, such as manpower, and this was taken into account in adjusting the projections. In this connexion, attention was drawn in particular to the fact that there might be under-developed

areas in developed countries, and that rectification of this position might well lead to a rapid and radical change in the internal migratory flows.

After discussing the choice of bases for projection, speakers moved on to questions of presentation, many of which were considered to be of the greatest importance. In using the word "projection" the demographer implied a hypothesis, and the Conference was reminded that the fact of the hypothesis, as well as an indication of its nature, should always be clearly set forth. While, however, some demographers seemed to quote single projections, others believed in ranges and some argued that no attempt should be made to indicate which projection among the range might be regarded as most likely. Thus, while one school of thought appeared to favour the adoption of high, medium and low projections, another preferred a system which gave no middle series that might appear to be specially favoured. Again, the question was raised whether the projections should be equally spaced over the range. In this connexion, one suggestion was that the spread of the results should be uniform, in respect rather of principal economic consequences, than in respect of numbers of people. The idea of using the degree of spread of the projections to indicate the range of possibilities was mooted, but warnings were also given that it was both impracticable and misleading to attempt to assign probabilities to the different alternatives or to attach any specific statistical meaning to their dispersion.

Another subject for discussion was the length of the period ahead for which projections should be quoted. The general view seemed to be that twenty years was the maximum for which figures of any practical value could be given. Nevertheless, it was obvious that much interest was lent to the projections of the United Nations Organization, which covered nearly forty years, and in the Conference, generally, references had even been made to times still further ahead. Probably the period of the projection should vary in length with the degree of substantiation of the projections, which depended, *inter alia*, on the nature of the demographic data available. Several speakers emphasized the need for frequent revisions of projections, some even mentioning annual or biennial reconstitution.

On the question of methods of calculation there was little argument, because it seemed to be generally realized that the method must depend essentially on the data available and the purpose of the projection. Broad interest

was expressed in the use of electronic computers. This was becoming normal practice and had opened up prospects of presenting a greater number of alternative projections with more sub-divisions. It had also enabled simulation assessments to be carried out which dealt with persons individually, instead of as a group. At the same time, there was a general realization that the use of greater elaboration did not guarantee a corresponding improvement or, indeed, any improvement at all in the degree of success of projections. The following points were made in connexion with the use of electronic computers:

1. Demographers would need to learn how to write their own programmes.

2. Programmes were laborious to prepare and it might still be preferable in certain circumstances to use less elaborate computation machinery.

3. Great advantages should follow from the exchange of programmes and of experience in the use of electronic machines for such purposes.

4. Those who had computers available would do well to lend them, or lend time on them, to those who had not the advantage of these instruments.

5. The use of computers involved a danger in that it became easier to arrive at a preconceived result. This danger should be carefully avoided.

On the second main topic of meeting B.4, namely, the degree of success attained in projections made during the 1950's, it was emphasized by the Organizer that he regarded evaluations of success or failure as being of the first importance in the study of this subject. It was first necessary to try to define what was meant by success. The following points arose from the discussion:

1. Success or failure in a single projection might be assessed by comparing the actual total population with the projected total population at corresponding points of time. In relation to a range of projections, it seemed to be felt that full success must mean that the actual population lay at the middle of the range. If the actual population proved, in the event, to lie wholly outside the range, the projection could not be accounted successful. If the actual population was found to lie near the edge of the range, the result must be accounted a partial failure.

2. It was hardly enough, however, to compare total numbers in this way. A coincidence in total between projected and actual population could not be accounted a complete success if

it were the result of compensating major errors, for instance, in mortality and fertility.

3. The degree of success must be measured in relation to the length of time elapsed since the projection was made. Thus, a discrepancy of 3 per cent after twenty-five years might be accounted a good result, but a similar error after one year would probably be regarded as bad. Some regard might also be paid to the nature of the period passed through and the type of country concerned, especially in relation to the quality of its demographic data.

4. The aim of the projections should also be borne in mind. One clearly designed as a warning, rather than a reasonable hypothesis, should probably not even be tested for its success, except perhaps in the sense that a change in experience away from the area warned against might be accounted a success.

5. A successful projection might conceivably be defined as one that, presented in balanced terms, led to suitable decision-making, even if it did not predict the actual population closely.

There was some divergence of view in the discussion as to the degree of success of the projections made in the 1950's, as far as these can be judged after an average of ten years. Some speakers appeared to feel that they did represent an improvement over those of earlier decades. Others were more doubtful. The fact that a shorter time had elapsed since the more recent projections were made tended to give a favourable impression. On the other hand, the areas for which some projections had more recently been made may well have presented greater problems than did the areas which figured in much of the earlier work. Nevertheless, many speakers expressed a lack of satisfaction with the results of the projections of the 1950's, and some rated the degree of success as being low. In addition to the areas mentioned in the papers, and in the report of the Moderator, the discussion brought out that:

1. In France and Germany, projections were consistently too low in respect to fertility. Births turned out to be more numerous than expected and consequently the population was above the projected quantity.

2. On the other hand, in the United States of America and in Russia fertility had recently fallen somewhat below expectation.

3. In respect to India, it was felt that the work done just after the close of the decade promised more success than that achieved hitherto.

4. Mis-reporting at censuses had caused difficulties in projections made for the develop-

ing areas, but the direction of mis-reporting showed no particular trend. In some places population had been over-enumerated; in others it had been under-enumerated.

The lessons to be drawn from the experience with projection work in the 1950's could perhaps be generalized as follows:

1. Projections could not have much value if they were based on inadequate or inaccurate data or inappropriate models. In this respect, the position appeared to be improving gradually.

2. Rates of decline in mortality had often been under-estimated, and as a result some projected populations had been understated. Here again the prospects for a more correct assessment seemed to be getting better.

3. Incorrect projections of fertility had been made in some instances and this had been regarded as the biggest single cause of error in numerous projections. The lesson demographers learnt from this was to consider past experience over a longer period and in more detailed respects than before, and by more sophisticated methods, as a better guide to the future.

4. As even the most refined statistical methods could not help as much as would be desired, because of social and economic changes that were hard to foresee, opinion surveys on fertility expectations were being used in some countries as a basis for projections. First indications were that these might be of much assistance, but it was rather too early to make a firm judgement.

5. It did not seem very clear to what extent the projections, although generally unsuccessful in the narrow arithmetical sense, had been valuable in the wider sense of offering a reasonable basis for decision-making. It would appear that difficulties of presentation and comprehension had been experienced and that room for improvement remained.

On the third major topic of meeting B.4, namely, the types of data and studies needed to improve the usefulness of projections, the points made were as follows:

1. Considerable emphasis was placed on the desirability of more consultation in the future than in the past. It was suggested that demographers should pool their views, that they should co-operate internationally, that government staff should discuss the question with academic staff, and that economists, planners and physicians should be called into consultation.

2. Historical research was suggested. One speaker argued that in order to decide whether population projection was a valuable procedure, it was necessary to establish whether past experience provided any valid guide to the future. In order to decide this question, he suggested that research workers should delve back into the past and make projections from different points of time, assuming no knowledge of actual subsequent events. They should then compare their projections with what was known to have occurred. He felt that in this way a more comprehensive picture of the prospects for success could be built up. Another speaker asked, however, what validity there would be in assuming that the success or failure of projections for, say, the nineteenth century, had any relevance for the success or failure of projections made in the twentieth century.

3. In connexion with the need for better statistics, attention was drawn to the value of social security records, which were sometimes overlooked. A number of references were made to the value of sample population surveys, but here, too, their validity was queried on the ground that they were also subject to errors of various kinds and provided insufficient detail in some respects. Calls were made for better data of local population movements and of birth spacing. It was also suggested that statistics should be extensively stored on tapes for reference purposes.

4. There was some discussion of the value of studying population trends separately for distinct ethnic groups, as a guide to projection. Some speakers felt that separation of ethnic groups was desirable, but others pointed out that the value of this type of subdivision must vary from one country to another, according to the degree of intermarriage which was customary or might become customary.

Many speakers at the Conference referred to "optimism" and "pessimism", and most of them declared themselves as being in one camp or the other, but this simple dichotomy hardly seemed adequate to the complexity of the situation. Thus, for instance, it was probable that the demand for population projections would continue to increase. This was not a development for unqualified good, or unqualified evil, but was probably a desirable change in some ways and an undesirable one in others. Thus good might flow from the greater education which the public and its leaders would gradually receive in the limitations of the subject, and from the interest that would be stimulated in the collection of better data. Benefit might also flow from the application of more refined

methods than before over larger areas as the developing countries became able to introduce the newer applications developed by leading demographic institutes; but there would probably also be unfavourable trends: continued failures to predict and to understand the limitations, continued reappraisals of economic plans as a consequence, and a continuation of the process already in evidence at two World Population Conferences — for the essentials of demography to be rediscovered from time to time, rather than for real advances to be made.

Numerous speakers emphasized what was called the lack of real understanding of the extrinsic factors affecting the components of population change, and it would probably be wrong to attempt to draw detailed conclusions in regard to questions of fact, policy, needs for research and methods of research.

The discussions clearly indicated that projections were usually unsuccessful in the narrow sense of achieving a coincidence between numbers forecast and numbers later enumerated. In predicting the separate components of births, deaths and migration, they were even less successful. The prospects for material improvement in the future were doubtful, although some demographers were more hopeful than others. Although there was very little detailed evidence of the success of projections in the less stringent sense of their having a beneficial effect on general policy, it was felt by some that the economic, and especially the population policies adopted by a number of countries, did reflect an approach to practical problems that had been stimulated by demographic projections independently arrived at.

The Conference did not, in general, reveal any startlingly new lines of research to help in the work of projections in addition to the essential basic studies of mortality, fertility and migration, which are reviewed by other rapporteurs. The meeting did, however, fruitfully discuss the use of electronic computers as an aid to the rapid completion of calculations in a greater degree of detail than had hitherto been possible, although the point was well taken that a greater degree of subdivision did not materially improve the chances of numerical success.

The following speakers took part in the discussion: Akers, Brackett, Cabrera, Castellano, Croze, Febvay, Henry, Hyrenius, Igund, Mackensen, Morales, Muhsam, Myers, Pobedina, Pressat, Schwarz, Siegel, Som, Spencer, Strohbach, Vacek, Visaria.

MEETING B.10

Population and natural resources

Statement by the Moderator: Mr. Edward A. ACKERMAN

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I

As long as population problems have been studied, comprehensive discussions of national or international population data usually have included reference to natural resources. The reason is obvious: if we seek knowledge of the size and condition of the future human family, we must examine the size and condition of the house it is to live in. The study of natural resources, of course, is only the beginning of the study of the economic structure through which men satisfy their material needs. But natural resources form the indispensable base from which all economic activity ultimately springs. The condition of man cannot be considered apart from the condition of the planet, and particularly that part of the planet on which man lives.

Meeting B.10 has one most important question set before it, far overshadowing all other possible questions for discussion. It needs to be placed in perspective and to be given adequate attention. The same question has been raised in other meetings of the Conference, particularly in meeting A.7, "Demographic aspects of agricultural development and food supply". The question is: what is a responsible working hypothesis for the world as regards the future relation between population and resources? Corollary questions are: what view can a world organization safely adopt? Is it safe for a nation to use the same working hypothesis?

A "responsible" working hypothesis ought, presumably, to minimize risks of social disaster, to be applicable indefinitely in time and to be viable for any nation of the present-day world.

The study of resources in a demographic context comes very quickly to the question of adequacy. It is a question to which it is easy to give a simple answer. Indeed, two simple and very comprehensive answers to this question have been given much recent attention. One or

the other is familiar to a large proportion of literate people in the world. But these answers cause difficulty because they are contradictory. One answer, which may be called the view of planned population equilibrium, is that men are headed for impending doom unless they mend their procreative ways; the other, which might be described as a point of view of technological optimism, is that man, properly organized, will not be faced with physical limitation in numbers for a long time to come, if ever. The latter point of view was very ably and succinctly stated for this meeting by N. M. Zhavoronkov when he wrote that as long as the sun shone and people were capable of creative thinking, they had no need to fear the future.¹ In its rational form, the planned population equilibrium view takes the position that the world must plan not only for the exploitation of resources, but also regulate numbers of people; that is, there must be a planned equilibrium between resources and people which takes into account both sides of the equation. Both positions are, of course, maintained with equal sincerity and conviction. They illustrate the difficulty that even specialists may have in arriving at truth in these matters.

The truth, indeed, is a very complex matter when one treats the population-natural resources adequacy question. There is an element of truth in both positions, even at their extremes. Argument on these two hypotheses has been both bitter and inconclusive in the recent past. The reason is that we are concerned here with a problem of evaluating comparative risks. As in most problems of probabilities, there is no clear black-or-white answer.

For the sake of orientation, the problem will be restated: what are the comparative risks of

¹ N. M. Zhavoronkov, "Chemistry and the vital resources of mankind (the use of substitutes and their industrial and economic significance)", *Proceedings*, vol. III.

social disaster or the probabilities of social success in the adoption of one or the other of the following two working hypotheses about the future relation of human population and the productivity of natural resources?

The technological optimism view. Although the earth is finite, the potential resources of the earth are so large when man's creativity is applied to them that it is meaningless to set arbitrary limits for future world population for an indefinite period in the future. The contemplation of such limits at this time is anti-social, or, as Zhavoronkov says, "man-hating". The world and the nations in it should concentrate on technical progress and on the economic and political organization needed to apply that technical progress universally.

The planned population equilibrium view. The world population-resources problem must be viewed as one of unstable equilibrium, with the demand of population eventually having the capacity to outrun the supply from resources. To ignore the demand side of this balance in planning and action is like running a vehicle without brakes. The risk of eventual disaster is high. While the eventual population limits of the earth cannot be specified, if the dignity of human life on earth is to be enhanced, the limits should be approached by stages in a planned equilibrium adjusting both demand from population and supply from resources. This view is summarized by M. King Hubbert in his paper: "We must look forward to the achievement of a state of non-growth, but the future welfare of mankind is highly dependent upon the manner in which this is accomplished".²

The comparative risks of the two views should be evaluated in four different situations: (a) the highest recent estimate by the United Nations for world population shortly after the turn of the next century; (b) a continuation of the recent 2 per cent growth rate of world population for about a century and a half; (c) a situation of growing world population without time limit; and (d) the situation of the individual nation states of the present day. Where appropriate, references will be made to the papers for meeting B.10 and other meetings.

II

There can be no doubt that the technological optimism position is correct if we are to consider the world as a whole for the longest period projected in the discussions at this Con-

ference, that is, about fifty years. The world has the resources to support the population which would be attained by a projection of the 2 per cent growth rate that has recently prevailed, and probably at a higher average standard of living than now. An important and perhaps unrealistic assumption for such a prognosis would be a completely co-operative set of world nations, all oblivious to obstructing differences in ideology, all dedicated and effectively working for the common good. With this assumption and for this range of time, we might adopt the technological optimism view as a working hypothesis and say, "Get on with the job". The evidence for this conclusion can be drawn from many sources. It is considered to be sufficiently a matter of public record for no restatement or documentation to be needed here.³ However, as we shall see later, the same conclusion is not necessarily applicable to all regions of the world, considered individually.

III

If we are to endorse the technological optimism view, we should examine its validity over a longer range than fifty years. What are the limits for the population of the earth, and what would some of the general conditions for their support be? For the sake of simplicity, let us assume that a 2 per cent growth rate will continue until 50,000 million people occupy the surface of the earth. This figure is suggested because limits of "upwards of fifty billions [50,000 million] of persons" provided for in "comfort and convenience" have been postulated in some past technical studies,⁴ and a 2 per cent growth rate is that which is actually occurring as a world average today. This would cover the land surface of the six non-polar continents with a density of approximately 385 persons per square kilometre, about the density of the Netherlands today. Put in these terms, the figure does not seem frightening, for the Netherlands is a well-ordered place where there seems to be some room for people to move about. It is, incidentally, about twice

³ For purposes of this discussion, the data introduced in N. M. Zhavoronkov's paper "Chemistry and the vital resources of mankind", *Proceedings*, vol. III, will be accepted as adequate within the constraints of this case, i.e., for fifty years and the world taken as a whole. A more extended analysis treating technology and resources-use patterns that can be projected from today also supports the above conclusion. See J. L. Fisher and N. Potter, *World Prospects for Natural Resources* (Washington, D.C., and Baltimore, Maryland, Resources for the Future, Inc., 1964). The Fisher and Potter projection, however, was limited to the year 2000.

⁴ For example, Richard Meier, *Science and Economic Development* (New York, 1959).

² King Hubbert, "Mineral resources and rates of consumption", *Proceedings*, vol. III

the population density of the heartland of mainland China.⁵

This analogy may be somewhat misleading, however, because the 385 persons per square kilometre is averaged out over all the land surface of the six continents, including the permafrost regions of Arctic Siberia, Canada, and Alaska, all the extensive arid lands, and the low-latitude rain forest regions. Furthermore, if the present over-all population growth rate of approximately 2 per cent per year were to continue, the present population of approximately 3,350 million would reach a figure midway to the limit, 25,000 million, within a little more than a century. The limit of 50,000 million itself could be reached within 135-140 years from now.

Let us extend the validity of the technological optimism point of view and postulate that it is valid for about 150 years. We shall assume also that the 50,000 million persons can be supported in "comfort and convenience", although we do not know the exact meaning of this phrase. What does this mean as regards the availability of natural resources and the pattern of resource use in the world at the end of another century or so?

First, it will mean a very different pattern of materials use over the world. As King Hubbert's data and arguments show, the finite limits of production for many mineral resources are such that an annual world consumption rate fifteen times larger than now is quite impossible.⁶ The prevailing methods of producing a balanced amino acid supply in nutrition also could not possibly be continued for a world population even several times larger than that of the present. Animal husbandry will have to be relatively far less important than in the present world. Metallurgy using fossil fuels will have to give way to other methods of obtaining metals. The topics discussed by Zhavoronkov are of special interest in this connexion. First, substitutions of more abundant traditional materials will have to occur, then radically new departures in the produc-

tion of important food supplies and materials. These subjects are also discussed on a more immediate time scale by L. W. Bass and S. J. Langley.⁷

Second, if a world population limit of this size is to be approached, the geographical pattern of resource exploitation will also be greatly different from that of today. The great potential resources of the low latitudes, very incompletely exploited as yet, would become employed. An entirely new agricultural technology may have to be developed to use tropical lands. As further exploration uncovered new mineral deposits, geographical foci of mineral production would certainly be changed. The productive capacity of the oceans and the ocean floors, like those of the low-latitude lands, would have to be used with an intensity not understood today.

The utilization of all resources will have to be undertaken with a high degree of efficiency, that is, with a minimum of wastage and with effective conservation. Water in particular will present a special challenge for a huge world population. We see from Y. Kahana's paper that alert and imaginative use can support amazingly varied and extensive activity on relatively small amounts of water.⁸ The fresh-water economy of the world would be managed on continental or subcontinental scales, with massive transfers over long distances and massive beneficiation of waters having uneconomic quality, such as sea-water.

Administrative organization is also highly important in conservation. This is the subject that J. L. Fisher had in mind in stressing the importance of future levels of education, science and technology, and managerial skills, as well as the search for additional scientific knowledge about land, water, and minerals.⁹ In this connexion it will be interesting to see what answers to the problems of public and family transportation may be developed. For example, how temporary a phenomenon is the American and the European automobile, and what will take its place?

A vastly increased production and consumption of energy would be required for a population of as much as 50,000 million. Nearly every step away from the use of traditional and more easily acquired natural resources

⁵ The traditional eighteen provinces and Manchuria. The low-density areas, Tibet, Sinkiang, Hsikang, Chingai, Dzungaria, and Inner Mongolia, are not included.

⁶ M. King Hubbert, *Energy Resources—a Report to the Committee on Natural Resources*, National Research Council publication 1000-D (Washington, D.C., National Academy of Sciences, 1965); also, "Earth scientists look at environmental limits in human ecology", *National Academy of Sciences—National Research Council News Report*, No. XIV (1964), pp. 58-60. See also Paul McGann, "Technologic progress and minerals", in J. J. Spengler, ed., *Natural Resources and Economic Growth* (Washington, D.C., Resources for the Future, Inc., 1961), pp. 74-97.

⁷ Lawrence W. Bass and S. J. Langley, "Utilization of renewable resources as a stimulus for socio-economic development", *Proceedings*, vol. III.

⁸ Yona Kahana, "Conservation and repeated use of water", *Proceedings*, vol. III.

⁹ Joseph L. Fisher, "The relationship of material resources and population to economic and social development", *Proceedings*, vol. III.

demands increased uses of energy; this applies also to increased "comfort and convenience", now at undesirably low levels for a large majority of the world's population. Energy production, for these and other reasons, will have to be increased much more than fifteen times in order to support a 50,000 million population. This is very strikingly illustrated in Zhavoronkov's description of possible carbohydrate synthesis. The emphasis given to energy resources at this meeting is therefore justified. It is reassuring to find that projectable energy resources, thanks in large part to nuclear processes, can be adequate for a period long enough to allow for the technological development of now more speculative processes, such as those of solar energy and nuclear fusion. Fisher notes that energy production has recently tended to increase at a more rapid rate than the increase of population. It is one of the few resources for which growth at stable or even declining prices has kept pace with population growth. J. A. Jukes notes that nuclear power shows promise of producing energy at economically acceptable costs anywhere, presumably for a greatly increased population.¹⁰

A huge population cannot be supported in comfort and convenience without further very extensive industrialization. Yet no heavily industrialized nation of today is adequately endowed with domestic sources of all the materials required in modern industrial production. The Soviet Union, with its vast territory, will probably come closer to supplying all of the wide range of materials required by future industry than any other nation. Taken together, the United States, Canada, and Mexico also approach a nearly complete coverage, but few, if any other countries can have such hopes.

It is plain that if industrialization is to spread over the world, and the levels of comfort and convenience are to rise, trade in resource products must also rise. Colin Clark has noted at meeting A.10 of this Conference, "Demographic aspects of economic growth", that the volume of trade accompanying industrial growth increases at about the seven-tenths power of the rate of growth of the real national product.¹¹ As demands for scarce materials rise from all corners of the earth, highly effective organization of trade will be needed. For

example, is the allocation of scarce materials to be left solely to the mechanism of price or the political preference of the producing country? The world commodity trade is already changing; it is a vital subject for those who would make estimates of future resource adequacy.

IV

Viewed from a world perspective and a very rough analysis, the technological optimism point of view could conceivably be supported by the potential availability of resources over a 150-year period. However, it could be supported only in the light of the extremely important qualifications set forth above. We had set a time limit of approximately a century and a half. What are the probabilities of accomplishing the production needed for "comfort and convenience" over so short a period? Is our technology and economic organization equal to the demands for resource production that a 2 per cent growth rate for a century and a half would cause?

The answer to this question cannot, of course, be given with precision. Much would depend on the imponderables of developing technology, administrative skills, and political co-operation. A world population fifteen times that of today will mean very great changes in the pattern of materials use, a greatly different pattern of resource exploitation, a high degree of conservational efficiency, a vastly increased consumption of energy, and probably near-perfect fluidity of international trade in resource products. When any one of these is viewed with a practical eye, it seems a staggering task for the world. In any direction that one turns, one can see stupendous obstacles and high levels of uncertainty.

A new pattern of materials use depends not only on the future solution of many important technological problems, but also on a whole new pattern of consumer acceptance. The full exploitation of the rainy low latitudes also depends on a technology that has many difficult problems as yet unsolved. The political obstacles to perfect fluidity in international trade continue to be formidable, in spite of some progress within this century. The conservational efficiency of many cultures in the world, including some of the technically more advanced, is very low.

Of the several general requirements that must be met if a huge population is to be supported, we may be mildly optimistic about the achievement within the space of a century and a half of only one, that is, the production of

¹⁰ J. A. Jukes, "Nuclear energy and other recent developments in the generation and distribution of energy", *Proceedings*, vol. III. See also Paul McGann, *op. cit.*, for a stimulating discussion of more speculative possibilities.

¹¹ Colin Clark, "The first stages of economic growth", *Proceedings*, vol. IV.

V

vastly increased amounts of energy the world over. The huge obstacles facing the achievement of the other requirements suggest that optimism about supplying the resources needed to provide for a 2 per cent growth rate over 150 years is not warranted. To maintain optimism about supporting a 2 per cent growth rate, one must make many assumptions about the development of practical technology from now speculative ideas, about enormous strides in education and great changes in cultural habits, and about the achievement of a political compatibility unknown in the previously recorded history of man. Such an optimism can hardly be defended as rational.¹² We must, therefore, entertain the thought that the planned equilibrium hypothesis may be more applicable than technological optimism to this situation. The probabilities are very high that the world could not sustain an unrestricted 2 per cent growth rate of population for 150 years. The applicability of technological optimism then hinges on the reliance to be placed on cultural "feedback" to population dynamics. Could the automatic reduction in rates of natural increase that has been observed for some industrializing societies be depended on to adjust numbers? The modern history of Japan casts enough doubt on this process to suggest that the risk in such reliance would be large. Japan's recent dramatic reduction in natural increase is, in large measure, traceable to national acceptance of the planned equilibrium hypothesis. In reality, there is only a choice between planned equilibrium of resources and population and what one author has called "subhuman methods".¹³

Thus our evaluation of a choice between the technological optimism view, on the one hand, or planned population equilibrium, on the other hand, becomes a matter of evaluating risk. The risk of producing world social failure by adopting a technological optimism point of view in relation to an unrestricted 2 per cent growth rate appears to be very high. The view encouraging a planned equilibrium between resources and population, on the other hand, seems the rational view for the century-and-a-half range in the light of an evaluation of these risks.

¹² Compare Lord Brain's statement: "It may well be true that, with a better organization of its resources, the world could support a much larger population than it does now. But the organization is not at present there, and even assuming the utmost co-operation among all the countries concerned, it must take a considerable time to set up", *Science*, No 148 (1965), p. 194.

¹³ E. S. Deevey, Jr., *Scientific American*, vol. CCIII (September 1960), pp. 195-204.

Even if we accept technology optimism, we are left with an inescapable question: what would lie beyond the 50,000 million persons limit (whenever it might be achieved)? We know that the planet Earth is finite. Even if one considers the vast oceans, the resources of the earth must also be finite. The human population dependent on those resources, therefore, cannot increase to an indefinite number, even if simple subsistence only is considered. There is a population limit, and the maximum is finite. But what is the limit? Could we support 100,000 million people at the end of two centuries (or some longer period), or 200,000 million people after a further time increment has elapsed? Again, the answer might be yes, assuming that most resource problems are ultimately reducible to energy production and that technology would have been able to provide for the stupendous energy production increases required. But then, what about the 1,600 billion people at the end of two more exponential increases?

We might pause here, before we arrive at the now trite "standing room only" projection.¹⁴ For every square kilometre of land surface on the non-polar continents, that is, Africa, Asia, Europe, North America, South America and Australia, 1,600,000 million people comes to 12,350. This is equivalent to the density of settlement in many western cities; indeed, it is a density that exceeds that of most cities. The central part of Washington, D.C., for example, contains only about 4,630 persons per square kilometre at this time.

These figures should illustrate vividly the final problem that the world must ultimately face about a huge population, the problem of adequate space.¹⁵ Few of us would wish to maintain that any city of the world, in its present form, was a comfortable place to live, particularly if there were no escape from it. In contemplating the possibility of a population of this size and even a much lower total number, the world must face the problem of the quality of life that it is to maintain for its people. Is twenty square metres of the land surface of the earth enough for one individual to maintain his psychological health, even with adequate nourishment? We may doubt it. We know al-

¹⁴ Clearly and entertainingly described by Paul Sears, "The inexorable problem of space", *Science*, vol. CXXVII (January 1958), pp. 9-16.

¹⁵ This problem has been outlined by a number of writers in the past. P. Sears, *op. cit.*, provides a very clear statement; P. McGann, *op. cit.*, has some imaginative insights that relate numbers, time, space and standards of living.

ready, from experiment with, and observation of other living creatures, that crowding has nervous and other physiological effects.¹⁶ In limited space, we have the final inescapable resource limitation on population. It may be the ultimate Malthusian control, beyond reach of the cleverest space-adjusting technique.

We must conclude, even without a *reductio ad absurdum*, that there is an end to population growth, probably within a few centuries, even if technology advances rapidly. The question, therefore, is not whether world resources limit world population growth; space alone decides that question. Instead, it is whether the final adjustment to limited space will be an unplanned (Malthusian) adjustment or a planned equilibrium of population in its resource environment. Important corollary questions concern the level of individual "comfort and convenience" chosen to set the equilibrium and the period of time needed to achieve it. Whatever the technology, the higher the level of living, the lower the total numbers at which the equilibrium can be set and the shorter the time period available for adjustment. If effort towards a planned equilibrium is delayed, it is also clear that the difficulties of achieving it will increase as the numbers of people in the world become larger. To seek this equilibrium too late is like trying to stop a vehicle by braking it for the first time near the bottom of the slope, as compared with stopping near the start of the descent. The planned equilibrium view thus appears to be the responsible hypothesis for the long range.

VI

We noted earlier that the technological optimism view was conceivably valid when applied to the world as a whole for the next half century. We now return to examine whether or not it could be a valid working hypothesis for all types of nations in the world over the short range, with which this Conference is most concerned. Are there special regional problems for which no solution can be expected in the context of world averages? What is the situation of the nation states of the world today?

Thus far, we have talked about the world as a more or less homogeneous set of units. Nearly every literate person knows that there

are great differences among countries. Every journalist distinguishes between developed and less developed (or developing) countries. C. Murgesco has outlined some of the characteristics of less developed areas.¹⁷ We have also spoken of resources in general as non-deteriorating through time. This, too, is not reality.

The simple division of the world into developed and less developed countries is not sufficient for analysing population-resource attributes. In a very general way, this crude classification calls attention to one important feature, that of technology. Resources become productive to men mainly through the medium of culture. The comparative state of a country's or a region's technology, therefore, tells us something about the availability of its resources. The more advanced the technology, the greater the capacity to support numbers of people the resources of the country or region will have. However, one must also take account of the existing density of population in relation to potential resources and make some evaluation of the natural environment of the country or the region.

Instead of developed and less developed areas, the world may be classified into technology-source and technology-deficient areas.¹⁸ In addition, there are areas with high population-resource ratios and areas with low population-resource ratios.¹⁹ To complete the simple criteria of classification, we should distinguish between the unproductive natural environments, such as the deserts and arctic regions, and the actually or potentially more productive environments, comprising the remainder of the earth's land area.

With these few criteria, we can produce a simple but useful classification of the countries and regions of the world that reflect their population-resource relations. There result five

¹⁷ Costin Murgesco, "Can natural resources and manpower be used more efficiently? The outline of an answer based on Romania's experience", *Proceedings*, vol. III.

¹⁸ One measure of technological state is the number of patents granted for inventions. All but a very small percentage are granted to persons or organizations in the technology-source areas.

¹⁹ One available indicator of the population-resource ratio is the ratio of people to agricultural land. A rough dividing line between the low population-resource and high population-resource countries is about 0.6 person per acre of agricultural land in use. Most East Asian countries have 1.0 persons or more per acre. See data in United States Department of Agriculture, *World Food Budget, 1970*, Foreign Agricultural Economic Report No. 19 (Washington, D.C.), table 6; also, V. M. Dandekar, "Role of food aid under conditions of rapid population growth", *Proceedings*, vol. III, table 1.

¹⁶ E. S. Deevey, Jr., op. cit.; P. Sears, op. cit.; J. Christian, "Endocrine adaptive mechanisms and the physiological regulation of population growth", *Physiological Mammology* (New York, Academic Press, 1963); V. C. Wynne-Edwards, "Self-regulating systems in populations of animals", *Science*, vol. CXLVII (1965), pp. 1543-1548.

types of regions: (a) technology-source areas of high population-resource ratios (European type); (b) technology-source areas of low population-potential resource ratios (United States type); (c) technology-deficient areas of low population-resource ratios (Brazilian type); (d) technology-deficient areas of high population-resource ratios (Indian-Chinese type); and (e) technology-deficient arctic or desert areas, with few potential food-producing resources (see map, p. 651).

On the basis of these rather simple distinctions, some very interesting observations can be made about the regional attributes of the world's population-resource relations. The most striking single observation is that more than one half of the world's people lives in technology-deficient areas with a high ratio of population to potential resources. China, India, Java and other islands of Indonesia, Korea, Egypt, Pakistan, Iran, and some other countries are in this classification. Although data are incomplete, the best available observations leave no doubt that many millions of people in these regions are poorly nourished, particularly because of protein shortages, and even because of insufficient caloric intake. The probable daily average for most people throughout this area is 2,100 calories or less, compared with the estimated minimum of 2,400 calories needed for health. Many of the 300 to 500 million people considered to be seriously undernourished by the Food and Agriculture Organization (FAO) Third World Food Survey live in the regions mentioned above.²⁰ It is reasonable to assume that Malthusian "controls" are operative, even today, in all of these areas. For all, there is a problem of adequacy of resources, and the equilibrium that is kept between population and resources would appear to have a strong Malthusian element. The high death rates of most of these countries give a strong hint of a partially Malthusian condition.

At least two thirds of the total population of this group of countries live under natural conditions where vagaries of weather, particularly drought, cause notable fluctuations in resource productivity. At these times, the Malthusian controls become even more operative. These lands have very few "cushions" to protect them against the inevitable fluctuations in natural productivity found in varying degrees throughout the world. These cushions can be provided either by excess resource base or by technology. The great future problem for these

areas relates to the speed with which cushions can be provided, or indeed, whether they can be provided at all.

The remaining half of the world's population is divided almost evenly among three of the other population-resource types. About one sixth lives in the technology-deficient countries of low population-potential resource ratios. They are exemplified by much of Africa and Latin America. The principal problem of this group is one of the immediate adequacy of employed resources, a condition from which they generally suffer because of technical deficiencies. Large numbers of people in these countries live adjacent to potentially productive resources, but they still exist close to the subsistence-leveling level of the technology-deficient densely settled lands.

Another sixth of the world's population lives in countries or regions where industrial organization and technology permit them to extend their resource base through world trade, thus effectively meeting the deficiency of their low domestic per capita resource productivity. These are the technology-source areas with a high population-resource ratio. The Western European countries and Japan are illustrative of this group. Although their present supply of available resources is relatively secure, these countries are vulnerable, over the long run, to competing demands from other lands for resources that they now draw upon outside their own territory.

A final sixth of the world's population lives in countries that are technically advanced and have territory that permits relatively low ratios of population to potential resources. The United States, important sections of the Soviet Union, Canada, Australia and others come within this group.

If all the world's nations fell within the last three groups, we might say that the technological optimism hypothesis would be temporarily tenable. Even though formidable obstacles will have to be surmounted in providing for the population projected for these countries, the cushion provided either by technology or by presently employed resources is large enough for the risk of using technological optimism as a hypothesis to seem acceptable. But these countries contain less than half of the world's people.

VII

It is at least conceivable that the technology-deficient high-density countries offer great enough opportunities for improved productivity for the technological optimism hypothesis to apply also to them. We are speaking now of

²⁰ P. V. Sukhatme, W. Schulte and Z. M. Ahmad, "Demographic factors affecting food supplies and agricultural development", *World Population Conference 1965*, background paper A.7/10/E/455, p. 13.

the short-range future, the period of the next four to five decades.

By definition, the technology-deficient countries certainly should be able to expect substantial advances in their productivity through the application of technology known elsewhere in the world. Allowance can be made also for the development of indigenous innovations. In addition, there are unused resources, even agricultural resources, in these countries. In all of them, there are cultivable but uncultivated lands, although these are only a fraction of the land now under cultivation. Even greater opportunities are available for the expansion of non-agricultural resource use and productivity. Can half the world's population take the industrial route that has been followed by Japan since 1875?

A detailed examination of these questions would require more space than is allotted to this paper. However, we can examine briefly one case that covers several hundred million people and one that we may extrapolate safely to the situation of another 800 or 900 million people in the technology-deficient high-population regions. Food producing resources form the key for all these people.

The Indian food production outlook has been examined in papers for meeting A.7 of this Conference and elsewhere. Panse and Amble report that in fifty years the Indian population will have increased 2.9 times, while the available food supply will be capable of increasing only 2.74 times, even assuming the realization of the "full potential of increased agricultural production", making the best possible use of known technology and allowing for little administrative or cultural waste.²¹ These large production increases would fail to meet the minimum standard of 2,435 calories per day by approximately 20 per cent and would provide sustenance of a quality inferior to the low standard of today's diet, which already has shortages of proteins and protective foods. In a background paper for meeting A.7 Sukhatme estimated that the Far East, as a whole, would require an increase of 3.43 times in food supplies for the year 2000, in comparison to supplies available in the early nineteen-sixties. This was for what he called a "medium target" diet, which included a very modest improvement in diet quality.²²

²¹ V. G. Panse and V. N. Amble, "The future of India's population and food supply", *Proceedings*, vol. III.

²² P. V. Sukhatme, *et al.*, "Demographic factors affecting food supplies and agricultural development", *World Population Conference 1965*, background paper, A.7/10/E/455.

In view of the evidence from India concerning food resources and a variety of other reasons, the achievement of production increases that will keep pace with unrestricted population growth must be regarded as highly speculative and, therefore, as a high-risk projection. The probabilities seem very high that the diet of technology-deficient high-density countries will deteriorate by the year 2000 if these countries have to depend on their own food supplies.

There remains a brief examination of developing industrialization and its capacity to attain a level high enough during this period to permit exchange of industrial products in sufficient volume to cover the importation by Far Eastern countries of food for 700 million people. By the year 2000, 700 million people would be 20 per cent of the projected population of the technology-deficient high-density countries. We must add to food imports the importation of many materials for the required industry.

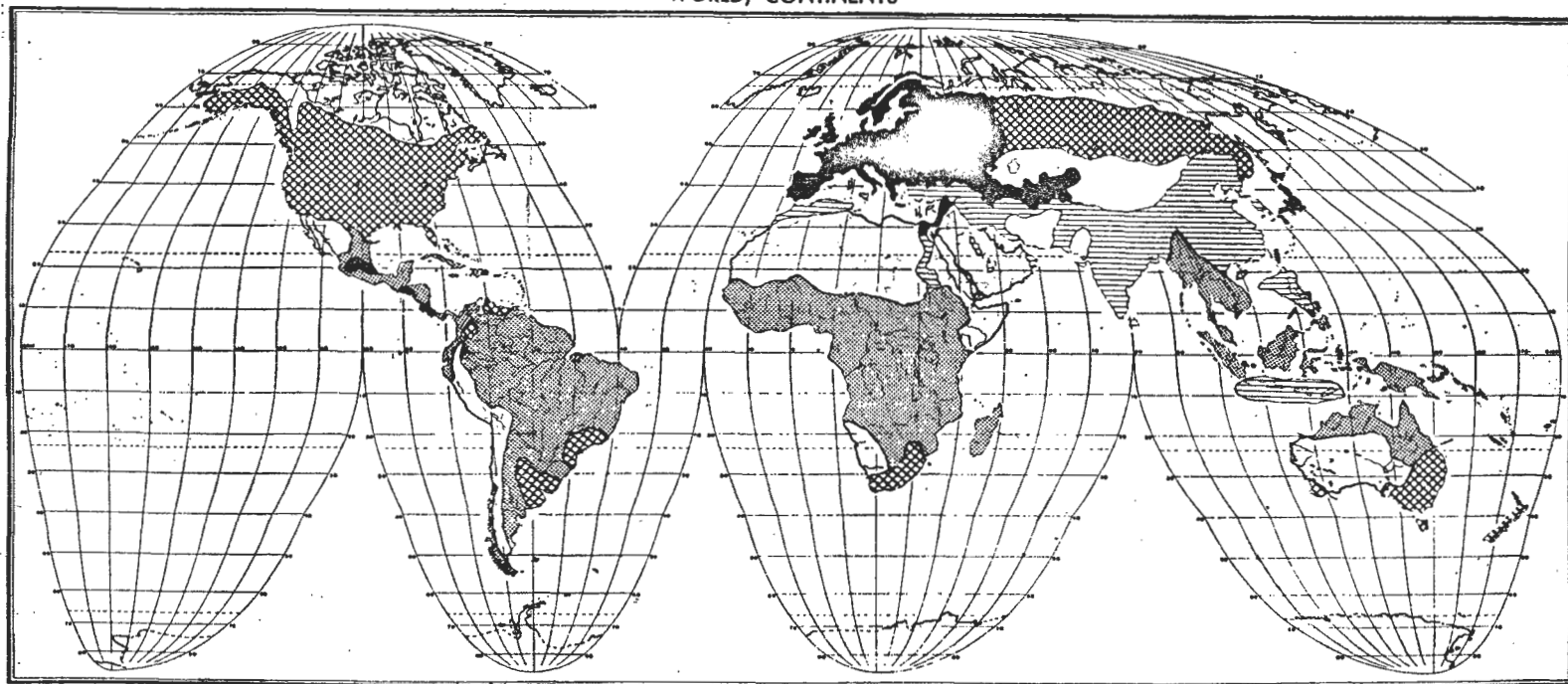
We should consider these countries' import needs in the light of the rising aspirations towards higher living standards that characterize their societies. We must also consider them in the light of heavily increased competition for resource products throughout the world. In recent years, the dynamic technical centres, the technology-source areas, have exhibited a rapidly increasing capacity to absorb materials and capital not only from within their own boundaries, but from abroad, as well. The appetite of the technically advanced countries for materials from the world at large shows little sign of abating. It may be expected to continue as the technology-deficient countries develop needs for foreign materials to support industrial economies, thus offering serious competition for many materials.²³

For the sake of completeness, we shall mention two other possibilities for meeting the prospective resource deficits of these regions. One is emigration beyond the high-density areas, and the other is simply an outright gift of surplus production from technology-source areas in sufficient volume to cover the deficits of high-density technology-deficient countries.

Emigration in the numbers needed to make any appreciable inroad on the problems of re-

²³ Joseph J. Spengler, "Population and natural resources", *World Population Conference 1965*, background paper B.10/16/E/447. Spengler notes that dearth of natural resources is more of a deterrent to economic growth in less developed countries than in developed countries. Effects of competition for resources can thus be felt acutely in the developing countries.

WORLD, CONTINENTS



European type
(Technology-source;
high population-resource ratio.)



United States type
(Technology-source;
low population-resource ratio.)



India-China type
(Technology-deficient;
high population-resource ratio.)



Brazil type
(Technology-deficient;
low population-resource ratio.)



Arctic and desert type
(Technology-deficient;
few food producing resources.)

Note: The classifications shown on this map are intended to be generally illustrative only.

source adequacy (say, on the order of 20 million persons per year) is confronted with formidable cultural obstacles in both the donor countries and in the receiving areas. The problems of capital formation to permit resettlement, cultural readjustments, technical problems of handling new environments where there are open lands and effects on the birth rate of the exodus country should dampen quickly any enthusiastic thoughts about emigration. Even where emigration opportunities have existed within a national state, such as Japan's Hokkaido, and Sumatra and other islands of Indonesia, movement has been very slow.

The case for gift surpluses is undoubtedly a more practical one. However, it can hardly be considered an acceptable solution for a long period of time because its stability could never be assured, because it might injure the national pride of deficit countries and because it would do little to meet the long-range problem of improvements in standards of living. The wise use of surpluses to meet temporary regional crises is essential, but we can hardly envision it as a web of permanent obligations from one part of the world to the other.

All this evidence, of course, contains imponderables. Little evidence can be found, however, to support the technological optimism view as a responsible short-range working hypothesis for the technology-deficient high-density half of our present world. Even optimistic views of the application of technology over the next forty years show high risks of social deterioration and social disaster, if action on the population side of the balance is not sought at the same time as increased productivity.

One is forced to the conclusion that the planned population equilibrium view is the responsible working hypothesis for the technology-deficient high-density nations. To adopt the technological optimism view for these countries would be to court disaster. It is a luxury which one half of the world can, perhaps, afford, but one which the technology-deficient high-density half cannot afford. It should not be forgotten that an important part of Japan's progress in the last twenty years has been due

to adoption of a planned equilibrium view as a working hypothesis for the nation. Japan's example appears to be receiving careful consideration from policy leaders in some of the larger technology-deficient high-density countries.

In the circumstances of the technology-deficient high-density areas, the planned equilibrium view is not a "man-hating" hypothesis, but one that attests to man's dignity as an individual and to his right to minimize, as much as possible, the risks of malnutrition, disease and discontent. It would appear to be merely an extension or a part of the larger concept of social security, now almost universally accepted throughout the world.

VIII

This paper began with the question as to what a responsible working hypothesis would be for the future relation of population and resources. The criteria for evaluation between two opposing hypotheses, technological optimism and planned population equilibrium, were cast in terms of the risk of social deterioration and disaster for the world or for a given nation. Which view gambles less with the future of man?

On first sight, technological optimism seems valid for the world, as a whole, for the next fifty years. Looked at more closely, however, its application to the world today may be questioned because this view is not a responsible working hypothesis for members of the technology-deficient high-density group of nations. Finally, technological optimism does not seem valid as a hypothesis on which the world can operate for a much longer period of time.

On the basis of analysis, the planned population equilibrium view best meets the criteria for a responsible working hypothesis. This view is applicable to all nations of the earth today and indefinitely over time. It takes into account the mounting world-wide desire for a better life. The technological optimism view, on the other hand, cannot be extended indefinitely in time and it is applicable, without high risk, to countries representing less than half the population of the world today.

Statement by the Rapporteur: M. Stjepan HAN

Professor, University of Belgrade, Belgrade, Yugoslavia

During this well prepared and wisely guided session almost each of the speakers added something to the steadily strengthening im-

pression that we were somehow celebrating the centenary of an almost forgotten, but still extremely valuable, classical book, concerned

with the important question of how size of population is related to the volume of available natural resources. It was indeed in 1865 that W. Stanley Jevons wrote *The Coal Question: An Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of our Coal-mines*. I shall take the liberty to come back to this book in a few minutes. Let me mention only that Harald Wright, in judging the merits and demerits of Jevons' challenging inquiry, said that at the time two parliamentary commissions have been set up to study the implications. A few pages later, Wright stated that the final reports of the parliamentary commissions agreed with some of the assumptions of Jevons, and that they presented their views in 1905. I must say that I am invariably under the obsession that it was *the same commission* which came into being forty years earlier. If I am not mistaken in that respect, I cannot help feeling that something which the distinguished members of parliament could study and analyse during forty long years at their ease, your rapporteur had to accomplish in two days. And that is not all. Jevons was presumably most of the time in agreement with himself, but the participants in this Conference between themselves were not.

Each rapporteur is supposed to summarize the salient points brought out at his meeting; to give a balanced presentation of views on controversial questions; and finally to try to formulate general conclusions to which the discussion has pointed.

THE DILEMMA

The thought-provoking statement of our Moderator, Mr. Edward A. Ackerman, started with the following assertion:

"Meeting B.10 has one most important question set before it, far overshadowing all other possible discussion questions... The question is: what is a responsible working hypothesis for the world on the future relation between population and resources?"

He then offered two answers. One, which he called the neo-Malthusian approach and the other, which he described as the technocratic view. After having made an honest declaration of faith in favour of the neo-Malthusian point of view, he very ably analysed the two contradictory hypotheses, weighing what he considered to be the pros and cons of the two opposing approaches. He finally came to the conclusion that the neo-Malthusian point of view best answers the criteria for a responsible working hypothesis, because it takes into account the ever stronger desire for a better life

and is applicable to all nations of the earth, today and indefinitely over time. The technocratic approach, on the other hand, is in Mr. Ackerman's mind applicable only to the richer half of the world's population and cannot be extended indefinitely in time.

The seventeen discussants who successively got the floor accepted with but a few exceptions the high priority accorded by the Moderator to this fundamental question, but there seemed to be not very many who thought they could agree with the conclusions. One of them expressed the opinion that rapid rates of growth of both the population and industrialization are of recent origin and that most such growth has in fact occurred during the twentieth century. Though undeniable, as a result of *post hoc* confrontations of figures and indices, this view does not seem to be valid as a proof of the novelty of our main problem as such. It was, indeed, at the threshold of the first industrial revolution, 167 years ago to be exact, that our illustrious forerunner Robert Thomas Malthus wrote:

"... the great question is now at issue, whether man shall henceforth start forwards with accelerated velocity towards illimitable, and hitherto unconceived improvement, or be condemned to a perpetual oscillation between happiness and misery, and after every effort remain still at an immeasurable distance from the wished for goal".

Continuing after a few lines with almost prophetic foresight and giving an astonishingly exact description of what our meeting in that respect became, Malthus said:

"... it is much to be lamented, that the writers on each side of this momentous question still keep far aloof from each other. Their mutual arguments do not meet with a candid examination. The question is not brought to rest on fewer points, and even in theory scarcely seems to be approaching a decision".

I am sorry for the length of these quotations and would be even more so if you would now label me as an old- or neo-Malthusian. But thanks to them it seems to be clear that the main question around which most of our discussion centres is by no means new.

It is true, though: voices have been heard that seemed to deny the high importance of this basic problem. Disbelief in the absolute essentiality of any single resource, expressed by the statement that we could do without copper and even grain, on the one hand (G. T. Jones); or doubts concerning the validity of the thesis that coincidence of the rapid growth of population, of industrialization and of the

desire to improve living standards must inevitably lead to disaster, on the other. This second remark was based on the view that in spite of the tremendous increase of population during the last decades mankind is not worse off than two or three centuries ago. To the contrary, living standards are considerably higher (I. Stefanoff).

THE NEO-MALTHUSIANS

They believe that overpopulation will have to be stopped by birth control, at a density of population where equilibrium will be reached under conditions more worthy of the dignity of man, than at Malthusian levels of poverty and starvation. While one speaker asked for stabilization of the world population in say 100-150 years (W. Brand), others were more pessimistic, and believed that the finite limits of production for some mineral resources are set in such a way that the non-food resources of the earth could never support, say, 50,000 million people (K. Hubbert); at least not at levels of consumption comparable to those of today.

THE NON-MALTHUSIANS

They usually depart from the conviction that labour is the ultimate source of all value, and the most important asset of society, so that in a well-organised community population can never become excessive. They criticized substance and terminology of the Moderator's statement. One of the opposing speakers said that the classical theory of optimum population knows of two different consequences of population increase: less natural resources per capita, but greater division of labour (A. Spencer).

As population increases, natural resources per capita fall, and the marginal productivity of labour falls—under the assumption that patterns of production are not changed considerably. At the same time, however, the increased population allows an increased division of labour, i.e., higher productivity through specialization, what may balance and even over-compensate the losses of productivity, due to the decrease of per capita natural resources (A. Spencer).

Besides such and some similar remarks to the substance of the neo-Malthusian thesis, views have been expressed concerning the proposed terminology. Instead of "technocratic" the term "optimistic" has been proposed (Ja. G. Mashbitz) and supported (V. V. Pokshishovski). One speaker refuted the term "neo-Malthusian" (M. Gottlieb) and it should be said that the need has been felt throughout our

session for terminological simplification and innovation.

FORECASTS

The discussion concentrated on forecasts of available quantities of non-renewable natural resources, because the forecasting of population increase was the topic of another session. It has been said that resources are improved by research and technology, and augmented by discoveries (M. Gottlieb). It was understood that all estimates of available natural resources must be handled with a certain reserve.

In the lifetime of your rapporteur much more minerals have been mined than in all the millennia before, yet the estimated reserves grew even faster from year to year. In connexion with that, it should have been taken into consideration that estimates of quantities of various resources are subject to considerable understatement, particularly in respect to the less thoroughly explored parts of the globe.

Some attention has been given to the economic aspects of the relative finiteness of resources. Although the reserves do not seem likely to be exhausted physically in a not too distant future, rapid growth of population may actually shorten their foreseeable lifetime and thus accelerate the increase of costs in the long run—what was by the way the main argument of Jevons' "inquiry" concerning the coal question. It is just this approach which is one of the great merits of Jevons' masterpiece, and certainly more useful than the diligent figuring out of years how long the various kinds of scarce minerals may last.

Another qualification of average and over-all population-resources ratios came from those who analysed the quite considerable territorial differences, as well as the variety of natural resources, needed to keep the wheels of national economies turning. Our colleague from Kuwait (A. R. Al Awadhi) pointed to the fact that a nation can live on one and only one resource, using of course the channels of foreign trade, while Prof. W. Winkler from Austria described the difficulties of the Central Powers during the First World War when the channels of foreign trade had been cut and the free flow of vitally-important resources hampered.

Not too much attention has been paid to the role of technology. Mentioning, though, the importance of technological factors in connexion with new discoveries of natural resources, we did not have time to consider the complex action of scientific and technological progress upon a whole range of questions constituting the core of our problem. High-techno-

logy industry is a voracious consumer of ever larger quantities of power and raw materials. Industrialization of hitherto underdeveloped countries, in combination with rapid increases of population, puts additional strains on national economies. But science and technology act in the opposite direction, not only by enabling humanity to discover untapped reserves but by finding substitutes at the same time to an ever increasing number of vitally important raw materials and fuels.

So it might be said that prime importance should be given not to the simple confrontation of population growth on the one side, and availability of natural resources on the other, but rather to the dynamism of human societies, acting within and upon their environment. Incomparably more difficult than the traditional approach—asking for interdisciplinary research carried out and co-ordinated on higher levels than now—this way of looking at the man-resources problem seems to be promising to an extent that may justify new efforts.

Symptoms of a new synthesis of opposing views had been felt throughout our discussion.

One of our colleagues spoke about a false dilemma between neo-Malthusianism and the technocratic view (F. Lorimer), while another declared that the so-called “technocrats” are not at all against birth control if, when and where it is really inevitable, but that they fought in the past, and will continue to do so in the future, against an approach which departs from the scientifically-proved danger of immediate exhaustion of resources, and expects most or everything from birth control (J. P. Guzevaty).

May I add that this approach, which surpasses the “either-or” controversy, is probably full of new potentialities, but that these promises have to be activated by thoroughly interdisciplinary research (V. G. Panse), international collaboration and farsighted goodwill.

May I be allowed to finish this report with what seems to be the conclusion of our discussions in B.10 and what, in a quite different context, had been felt decades ago by Bergson when he said that the future of mankind remained uncertain, because it was in our own hands.

MEETING B.5

Projections of urban and rural population, economically active population, households and families

Statement by the Moderator: Mr. H. V. MUHSAM

Associate Professor of Statistics, Hebrew University, Jerusalem, Israel

This meeting is concerned with projections of school enrolment, labour force, urban and rural population, families and households, i.e., with certain parts or sections of the total population of a country, which are not solely determined by sex and age or geographical criteria. In the following, projections of such parts of a population will be referred to as "sectional projections".

Papers presented to this meeting deal with two basically independent aspects of sectional projections:

(a) The purpose of preparing such projections, and the practical uses to which they are put in social and economic planning;

(b) The methods of preparing sectional projections.

The discussion of the purposes and uses of sectional projections may be considered to be at the margin of the objects of this meeting and, in any event, most contributors touch this subject only incidentally, most of them in the introduction or the conclusion of their paper. No detailed exposition will be given, therefore, of these aims and purposes.

It should, however, be mentioned that among the practical purposes served by sectional projections, two types can be discerned.¹ Such projections provide a quantitative basis for (a) the logistics of planning; and (b) the establishment of goals.

This differentiation is of importance for the discussion of feedback effects of forecasts upon themselves. It is indeed significant from that point of view whether the forecast is used in establishing ultimate goals of social and economic policy, or whether it is used only in preparing action plans with a view to reaching

goals which are established independently of the forecast in question.

I. METHODS

As regards methods of preparing sectional projections, two different approaches should be mentioned, generally referred to as the cohort method, and the ratio method.

(a) *The cohort method* of projecting sectional populations consists of applying to a section of a population essentially the same methods as are generally used in component projections of total population. Obviously, in the projection of a section of the population, additions to, and withdrawals from, the section are often of a different character from births and deaths in total projections: with respect to school enrolment, we have new enrolments, drop-outs and graduations; in labour force we have entrants and retirements in addition to deaths; in urban and rural population we have internal migrants, and in households and families we have foundations of new units and dissolutions of existing ones.

(b) *The ratio method* of projecting sectional population relies completely on a projection of the total population. The size of the section in question is then obtained by applying suitable ratios (enrolment ratios, labour force participation rates, the percentage urban or rural, and "headship" rates) to the total population, or to groups conveniently defined by sex and age as well as, wherever applicable, marital status.

However, the main discussion of the methods of preparing sectional projections will be based on the differentiation between sectional projections and total projections. This approach offers the opportunity of describing most of the contributions made to the theory and practice of sectional projections in the papers presented to this meeting and will, at

¹ United Nations, *Draft standards for national programmes of population projections as aids to development planning* (E/CN.9/170).

the same time, bring some kind of systematics into various problems of sectional projections. This approach will also co-ordinate the various fields of sectional projections (school enrolment, labour force, urban-rural distribution, families and households) and bring out similarities between the problems encountered in these fields. It seems likely that, through our subsequent discussion, we may arrive at the conclusion that there exists a well defined and uniform field of study concerned with the projection of sectional populations.

II. CONCEPTUAL SYNOPSIS

Sectional projections as opposed to projections of the total population are characterized by at least six properties.

(a) Sectional projections are performed within the frame of a projection of the total population;

(b) Sectional projections do not relate to a closed population, where closed is understood to mean affected only by birth and death processes in the physiological sense of these terms;

(c) Various sectional projections are inter-related. For instance, in the projection of labour force it is necessary to take the projection of school enrolments into consideration;

(d) The growth, or decrease, of sectional populations is primarily affected by social and economic development;

(e) Action programmes in social and economic development are often immediately geared to projections of sectional populations, and as these projections are primarily affected by social and economic developments, we are faced with feedback effects, which may complicate the preparation of projections or their interpretation;

(f) The section of the population which should be projected is not easily defined, and changes in the limits and definitions used for its boundaries are often among the subjects of a projection.

It is obvious that not all sectional projections are necessarily affected by all — or even only one — of these characteristics, and that a projection of the total population may well take one or another of these aspects into consideration. But, on the one hand, these aspects were barely mentioned at the meeting devoted to projections of population size and age structure (B.4), and on the other, almost all of the papers presented to this meeting centre around one or other of these considerations.

In the following, therefore, each of these conceptual differences between total and sectional projections will be described in view of the light thrown on it by the papers presented to this meeting; some further relevant considerations, even though not explicitly mentioned by any of the contributors, will also be submitted.

A. *The use of a total projection as a frame for sectional projections*

Normally, the forecaster of sectional population has available to him a forecast of the total population.

It is, however, true that, in certain circumstances, a better projection of the total population can be obtained by recomposing the total from the projections of certain sections. This is a logical extension of the approach followed in component projections, and is discussed in detail in a paper presented by R. Mackensen to meeting B.7.² Similar procedures were proposed by several contributors to meeting B.4. They seem to be particularly useful, if a distinction is made between the urban and the rural population. As fertility and mortality may have different levels and trends in urban and rural areas, and internal migrations entail continuous changes in the proportions of rural and urban population, it is more difficult to forecast the trends of fertility and mortality for the total population than to forecast the two trends — for the urban and rural components — and obtain the total population as the sum of its urban and rural components.

Otherwise, all but one of the proffered methods of projection rely in some fashion on a projected total, either for the actual projecting or at least for certain final checks on the projections.

It should, however, be stressed that the recommendation of such checking procedures does not imply that in the case of a discrepancy, higher confidence should necessarily be placed in the total projection. But in view of the difficulty of appreciating the reliability of all projections, no opportunity should be missed of comparing a forecast with any available datum, even if it is not strictly independent of those which were used in preparing the forecast.

Projections of school enrolment³ by the ratio method are obtained by applying suitable enrol-

² Rainer Mackensen, "Regional computer projection by demographic types of partial populations with incomplete data", *Proceedings*, vol. III.

³ Surinder K. Mehta, "Some views on the needs and problems of school-age population projections in the developing countries", *Proceedings*, vol. III; also Meyer Zitter, "Forecasting school enrolment", *Proceedings*, vol. III.

ment ratios to projected population figures, classified by sex and age, as obtained from a component projection, but broken up, if possible, into single years of age.

The projection of school enrolment by the cohort method is also linked to the projected totals by the estimate of new enrolments; this is obtained by the application of a suitable percentage to the projected population of the age of entrance into school.

The supply of labour force⁴ is projected by the ratio method, exactly like school enrolment, by applying suitable labour force participation rates to the projected total population, broken down by sex and age, and with respect to women, if possible, by marital status.

Much sophistication can here be put into the estimation of future participation rates, but their discussion seems to us to lie outside the field of this meeting, particularly in view of the fact that meetings A.5 and B.11 are devoted to this and closely related subjects.

In projections of the demand of labour force, the element of projected population totals is often intentionally disregarded, as far as possible, in order to obtain an estimate of demand which is substantially independent of the estimate of supply. But it is obvious that information on future population cannot be completely ignored because it must be used in estimating the volume of consumption and, if labour force presents the scarcest factor of production, as it sometimes does, the forecasted total population figures must be used also in estimating future production within the frame of forecasting the demand of labour.

A number of variants of the ratio method of projecting urban and rural population have been proposed by J. Siegel.⁵ The method is most useful wherever only estimates of the urban and rural totals are required and a projection of the total population is readily avail-

able. Here, the forecasted ratio is simply applied to the projected total. But the ratio approach is also applicable to data classified by sex and age, either as the basic method of projecting or as a subsidiary method to the simple over-all ratio, in order to obtain the projected sex-age structure of the urban and rural segments.

Projections of families and households⁶ are also very conveniently prepared by the ratio method. Here, projected headship rates, i.e., the percentage of heads of families or households out of the total number of persons of given sex, age and often marital status, are applied to projected numbers of persons of the same age, sex and marital status, to estimate the future number of heads of families or households, i.e., that of families or households. Forecasts of headship rates may be prepared so as to reflect expected changes in age at marriage, in the frequency of "doubling up", in the tendency of elderly persons to form independent households, and similar factors.

The use of specific headship rates by size of family (or household) has been proposed for projecting the distribution of families (or households) by size; but the cohort method is generally recommended for this purpose. Whichever method is used, the total population, as computed from the distribution of families (or households) by size, should always be checked against the forecast of the total population as resulting from conventional component projections.

B. Sectional populations are open populations

Any section of a population may obviously gain or lose members through the passage of individuals across the boundaries of the section; this circumstance may even be considered as a criterion for defining sectional populations as against total population, at least from the point of view of forecasting. It is true that the total population, e.g., of a country, often gains or loses population also through international migrations. But whereas such migrations are, in general, considered by forecasters of total population as some kind of secondary disturbing factor, the forecaster of sectional populations is primarily concerned with this type of gains and losses.

⁶ Hildebrando Araica A., "Some factors limiting the study and calculation of households in Latin America", *Proceedings*, vol. III; Robert Parke, Jr., "The choice of assumptions in household and family projections", *Proceedings*, vol. III; József Tamásy, "Projections of families in Hungary: method and some preliminary results", *Proceedings*, vol. III.

⁴ P. de Wolff, "Employment forecasting by professions", *Proceedings*, vol. III; Harald Hanslwwka, "A projection of the Austrian labour force until 1980", *Proceedings*, vol. III; Adam Józefowicz, "Notes on the methods of the manpower projections", *Proceedings*, vol. III; V. R. K. Tilak, "Some problems in projecting the economically active population", *Proceedings*, vol. III; Erland von Hofsten, "Projections of the economically active population", *Proceedings*, vol. III; and A. F. Ulyanova, "The methods of drawing up the current and planned balances of labour resources in the Union of Soviet Socialist Republics", *Proceedings*, vol. III.

⁵ Jacob S. Siegel, "Some principles and methods of projections of urban-rural population by age and sex", *Proceedings*, vol. III.

In the projection of urban and rural population,⁷ gains and losses, other than births and deaths, are accounted for by projection of internal migration. Special attention must however be given to the event of the transfer of whole communities from the rural to the urban stratum, as a consequence of their crossing the size limit between rural and urban communities (e.g. 20,000 inhabitants), of a change in character of the community concerned, or of its incorporation into a larger unit belonging to the other category (the rural community being "eaten" by a growing city).

It would seem that projections of school enrolment are rarely performed by accounting explicitly for new enrolments and separations from the school population, i.e., by cohort methods, although M. Zitter exposes this approach in detail.⁸ All that is needed, in fact, to prepare such a projection, is a census of school enrolment including, if possible, information on the age of the pupils, school survival ratios, preferably also by age, and estimates of the number of new enrolments which may be obtained by applying a suitable ratio (say, 100 per cent) to the appropriate age class (say, six years) of a population forecast. Obviously, the element which is most difficult to obtain is the set of school survival ratios. This difficulty becomes even more acute if projections are desired by grade; here grade progression rates and rates of repeating grades, as well as dropping out at various grades, are needed; but methods are available for estimating such rates even if only partial information is available.⁹

Such an approach was not proposed by any of the contributors for projections of labour force as a whole, although working life tables supplying information on probabilities of entrance into, and of retirement from the labour force are more commonly available than the corresponding probabilities relating to school enrolment.¹⁰ In the case of projections of sup-

ply in distinct professions only, the existing population of the profession is "aged" and separations from it, through death and retirement, as well as recruitment of new members, through graduation from the suitable school or other source of supply, are explicitly estimated.

The projection of families and households by cohort method presents some very peculiar difficulties, which stem probably from the fact that in demographic theory and practice the concept of a family or a household exists almost solely in the description of a population, i.e., in stock data, but is never an item of current "vital" statistics, or flow data. Neither the foundation of new families or households, nor the dissolution of families or households, seems ever to have been the subject of direct investigation, not to speak of registration; nor does the concept of the age of a family or a household exist in common demographic analysis, and even the duration of marriage cannot be taken as a substitute for the age of a family because a new marriage does not necessarily constitute a new family or household: the husband (or the wife) may have been the head of a household before he (or she) was married, or the newly wed couple may "double up" with their in-laws, i.e., not constitute a new household immediately after marriage.

For analytical purposes including forecasting, families and households are apparently always identified with their head, and his age is used as the criterion of establishing specific rates of formation and dissolution of families and households. But it must always be remembered that the fact of a person becoming head of a family or a household cannot be identified with the formation of a new unit, nor can the death of the head be identified with the end of the existence of the unit. It is true that in the case of either of these events, the family or household affected changes its composition, but families and households do this very often without changing their head, namely whenever a child is born, a grown up son or daughter leaves his parents, the wife of the head of a household dies, or a widowed head of a household remarries, etc. In spite of these complications, the use of the cohort method of projecting households is discussed in detail and recommended by Parke¹¹ and mentioned incidentally by Tamásy.¹²

⁷ P. G. Podyachikh, "Population projections in which allowance is made for migration", *Proceedings*, vol. III; John Stuart Macdonald, "Anticipating city growth and population projections for urban development planning", *Proceedings*, vol. III; Jacob S. Siegel, "Some principles and methods of projections of urban-rural population by age and sex", *Proceedings*, vol. III; Kingsley Davis, "Conceptual aspects of urban projections in developing countries", *Proceedings*, vol. III.

⁸ Meyer Zitter, "Forecasting school enrolment", *Proceedings*, vol. III.

⁹ H. V. Muhsam, "Educational statistics—a branch of demography", *Bulletin of the Institute of Internal Statistics*, No. 53 (1957), pp. 253-262.

¹⁰ S. L. Wolfbein, "The length of working life", *Population Studies*, No. 3 (1949), pp. 286-294.

¹¹ Robert Parke, Jr., "The choice of assumptions in household and family projections", *Proceedings*, vol. III.

¹² József Tamásy, "Projections of families in Hungary: method and some preliminary results", *Proceedings*, vol. III.

C. *Relations between projections of different segments*

It has already been mentioned that most of the contributors have discussed, in greater or lesser detail, the relationship between the projection of a section of a population and that of the corresponding total. Some of them have also mentioned certain relations between sectional populations of various types, such as school enrolment and labour force, school age population (and enrolment) and rural-urban distribution, and families (and households) and urban-rural distribution. But none of them has presented details of the methods by which such interrelationships would be accounted for in actual projecting.

In the case of the interrelation between school enrolment and labour force, this matter is relatively simple; at the ages of overlap, the rate of enrolment and that of labour force participation, should add up to practically 100, at least for males. For females, in many developing countries, the matter may be much more complicated, because at the outset of a projection, both rates may be low, and both are expected to rise gradually. However, none of our contributors discusses this problem.

Most of the other interrelations mentioned in the papers presented to this meeting concern the effect of projected changes in the urban-rural distribution of the population on the behaviour in other aspects: school enrolment, labour force participation and structure of the family and the household. One of the contributors, J. Siegel, discusses the question of whether birth rates prevailing in the receiving, e.g., urban, population should be applied, at once, and without modification, to the immigrants (in this case from the rural areas).¹³ But the same problem arises with all the different rates used in sectional projections. It is well known that in many developing countries, rural-urban migrants maintain for some time their traditional ways of life, not only in matters of natality but also with respect to school enrolment, labour force participation and family structure. It was stressed by the Moderator, H. S. Shryock, at meeting B.4 that a discussion of this aspect, namely how and to what extent such forces of inertia can be taken into consideration, is most desirable.¹⁴

¹³ Jacob S. Siegel, "Some principles and methods of projections of urban-rural population by age and sex", *Proceedings*, vol. III.

¹⁴ World Population Conference, 1965, meeting B.4, statement of the Moderator, Henry S. Shryock, "Projections of population size and age-sex structure", *Proceedings*, vol. I.

Effects in the opposite direction, i.e., of labour force characteristics on urban and rural growth, have also been discussed by some contributors. In these studies, the demand for labour is first projected; then the labour force is "blown up", in the reverse of the dependency ratio, to the size of the corresponding population. In the case of non-agricultural labour, and of the forecast of the future population of a specified, urban area, this supplies an immediate estimate of the future urban population. In the case of the agricultural labour force, and the rural population, the situation is slightly more complicated, because the rural population contains in general a sometimes considerable non-agricultural element. This must be taken into consideration in forecasting urban and rural population by following this approach.

The last type of relationships mentioned by contributors is perhaps easy to conceive, but definitely difficult to measure: this is the delayed effect of school enrolment, i.e., that of educational achievements on labour force, both from the aspects of participation and of quality and specific skills.

D. *The effect of social and economic development on sectional projections*

The need for estimating future trends in fertility and mortality, with a view to projecting the population of a country is so evident to forecasters that it is not surprising that they also endeavour to prepare conjectures regarding future trends in the various rates and ratios needed for projecting sectional populations. The discussion of theories and working hypotheses regarding the effect of socio-economic developments on the ratios needed for sectional projections, seems, however, to be outside the scope of the present meeting.

Indeed, other meetings of this Conference are devoted to the discussion of the effect of social and economic development on the behaviour of the population in matters of school enrolment (A.6), of labour force participation (A.5), and of urban-rural migration (A.3). Only the economic and social determinants of the foundation of biological families and socio-economically defined households do not form the subject of any of the other meetings of this Conference. This deficiency has already been noted by R. Pressat and other participants at meeting A.8, on urban development and housing, and does not require further discussion here. Furthermore, none of the contributors to this meeting thought it worthwhile to present more than incidental remarks on this subject.

E. *The effect of forecasts on subsequent developments*

Forecasters in the field of sectional population are well aware of the effect of social and economic development on the events which they wish to forecast, and they often try to take these effects into consideration. They are no less aware of the fact that their forecasts are often used as elements in formulating policy aims of social and economic development, as well as strategies to reach these aims. At least one of the contributors, E. von Hofsten, noticed also the circle which is thus formed:¹⁵ forecasts of sectional populations are used in social and economic planning; these plans, or actions taken with a view to implementing the plans, affect the assumed behaviour of the population and other assumptions made for the purpose of forecasting, and may thus cause the course of events to deviate from its forecasted pattern. Forecasts thus exert a feedback effect upon themselves.

Let us assume, for example, that within the frame of goals of social and economic development, a projected labour force of magnitude X appears insufficient because a labour force of magnitude Y is needed. Accordingly, measures will probably be taken to induce the population to increase its inclination towards economic activity (e.g., by establishing day nurseries for working mothers). If such measures are actually taken, the labour force may attain Z , which is more than X and may still differ from Y . This deviation from X to Z can be considered as perhaps an indirect effect of the primary forecast; in the absence of the forecast, the above-mentioned actions would not have been taken, and the forecast of X would have become true — whereas in the presence of the forecast, they were taken and the labour force reached Z . This is what von Hofsten refers to, when he claims that a forecast often “kills itself”, and what we prefer to call feedback effects. In view of the theoretical interest of this feedback effect, as well as its practical implications (including the danger of the forecast “killing itself”), it seems worthwhile to discuss the logics of the situation, as well as the conditions under which a forecast is liable to kill itself. We recognize that there are also other conditions where a forecast can become a “self-fulfilling prophecy”.

A forecast, as distinct from an intuitive hunch, is an attempt to predict events which assumedly come about as a consequence of the

action either of laws of nature or society, where the outcome depends on given circumstances, or of rational action of men, i.e., action taken in view of relevant information. But the forecast itself represents one such circumstance (or a piece of information), and thus the future events may differ, in the presence of this element, from what they would have been in its absence.

A common type of this effect has just been indicated by the example of labour force participation. In this case, all that is needed to solve the contradiction is an “adjusted forecast”, which is prepared by duly taking into account the actions which are planned, and assumedly carried out, in view of the primary forecast. One reason why the situation of this example is relatively simple is the circumstance that the policy goal is set independently of the forecast, and planning has the sole purpose of bringing a revised forecast, i.e., the expected real course of events, in line with the goal.

But we can imagine a more complex situation. Thus, let there be future urban growth, as expected in the absence of changes in the behaviour of the population and in its trends. The very fact that somebody seemed concerned enough to take the trouble to prepare the forecast may encourage some otherwise purely potential migrants to actually migrate; there may be hope that those who cared enough to make the forecast will also care for the migrants. A similar effect — and perhaps an even stronger one — may be produced by the publication of the forecast figures: no matter what they are, their very publication is liable to encourage more persons to migrate than the forecasted figures of urban growth would imply. In both cases, the forecaster might be advised to keep his forecast secret (or better still, refrain from forecasting) if he wishes to make sure that his forecast will prove correct. We are thus led into situations where the effects of the forecast itself, and of its degree of publicity or secrecy, would have to become part of the forecast. It can even be claimed that in these circumstances, it may become not only desirable not to publish the forecast, but even necessary to publish a “false” forecast; theoretically, an intentionally false published forecast may be so calculated as to facilitate the attainment of desirable goals. The problem of ethics involved in such a procedure is obviously a serious one, and eventually, once the trick became public knowledge, even such a procedure would be self-defeating. It is evident, therefore, that forecasting must always be carried out with flexible procedures, permitting fre-

¹⁵ Erland von Hofsten, “Projections of the economically active population”, *Proceedings*, vol. III.

quent adjustment and revisions as trends change and the future gradually unfolds.

F. *Changes in concepts and definitions*

It is true that in enumerating, estimating and projecting total populations, questions of definition, such as those concerned with *de jure* or *de facto* population, cause serious difficulties to the demographer. These problems persist obviously in sectional projection, but in that case new complications are added. One of the papers presented to this meeting, that by K. Davis, deals with these matters in connexion with urban-rural projections.¹⁶ But, in fact, the situation is very similar in other fields: the terms "school" and "enrolment", needed for the definition and projection of school enrolment, the concept of labour force, as well as those of family and household — all of these are not easily defined and applied, and, indeed, a whole meeting of this Conference (B.11) is devoted to the clarification of one of these concepts.

It would obviously be beyond the scope of this meeting to engage in a discussion of definitions of many terms and concepts. On the other hand, the implications of such difficulties with respect to sectional projections deserve our attention here because, as one of our contributors frankly points out, "projections have little value, if the person making them does not understand what he is [projecting]...".¹⁷

The core of the problem may be described as follows: in the course of social and economic development, some of the concepts affecting the definition of the projected section of a population may undergo changes; if this is so, should the projection supply numbers of the sectional population as delimited by a rigid application of the original definition, which, in the course of time, loses its meaning? Or should the information relate to a changing aggregate always defined in a way which is meaningful in the social setting of the time to which the forecast relates? If this is done, however, the comparability of estimates relating to different dates becomes doubtful, at least.

Let us illustrate the problem by a very simple example. In projecting the population of one city, the boundaries may be kept constant, so that all future estimates relate to exactly the same territory. In the alternative procedure, the territorial expansion of the city would be taken into account, so that all future esti-

mates would relate to a real socio-economic unit, sometimes called "metropolitan area" or "greater London, Bombay, Moscow...".

A similar situation is encountered in projecting the urban population of a country, if "urban" communities are defined by their size. If the population of the country increases and no new towns are established, some communities will pass the size limit between the rural and the urban sector, and even in the absence of rural-urban migration, industrialization, or any other change in the character of a single community, the urban percentage necessarily increases. The same applies to the number of cities, or that of their inhabitants belonging to the class of the largest size, be it 100,000 and over, or 1 million and over, or anything else; the weight of such an open class can only increase, as long as the total population increases. The alternative here would consist of studying the population of a fixed list of communities. The former procedure is liable to exaggerate urbanization, while the latter disregards the possibility of a change in character of a community as a direct consequence of its growth.

None of our contributors in the other fields (outside urban-rural projections) discusses this problem. This may be due partly to the widely accepted opinion that in projections of school enrolment, of labour force and of families and households, the projection should always reflect changes due both to demographic factors (i.e., the growth of the population, changes in its age structure, etc.) and to social and economic development, with all its consequences and implications. Thus, if the educational system is expected to change from traditional, informal education, where classes close at any hour of the day or season of the year when the working hands of youngsters are needed for urgent agricultural work, to the formal school, it seems desirable that projections of school enrolment should measure the whole effect of this change. Or, similarly, where families or households are likely to change from traditional large families and households to biological families, the projection is again expected to reflect this development, together with the effects of population growth, of changes in age structure, of marriage habits, etc.

In view of the discussion of urban-rural projection, however, this attitude does not appear so very self-evident. And, on the other hand, it looks as if the forecaster in the field of urban-rural distribution could use the consent and practice of forecasters in other fields

¹⁶ Kingsley Davis, "Conceptual aspects of urban projections in developing countries", *Proceedings*, vol. III.

¹⁷ *Ibid.*

as some kind of guiding principle in selecting his own procedures.

The last remarks, together with a large number of parallels which could be drawn between the different types of sectional projections, may serve as evidence in favour of the claim that the field of sectional projections is one single, self-contained subject of demographic theory and practice, with many problems and some solutions which are common to all the types of sectional projections with which we are concerned.

III. TOPICS SUGGESTED FOR FURTHER DISCUSSION AND RESEARCH

The following few points, which seem to represent new contributions to the methodology or to be otherwise important aspects of forecasting sectional population, are suggested as subjects for the discussion at the meeting, as well as for future research.

(a) Is it desirable and possible to collect "flow" data, resembling those contained in "working-life tables" or "school-survival rates", with respect to families and households, for the purposes of projection, as well as general demographic analysis?

(b) What is the relative reliability of sectional and total projections and how can comparisons be used most efficiently for improving one by means of the other?

(c) If future internal migration is taken into account in sectional projections, is it permissible to subject new migrants immediately to relevant ratios (school enrolment, labour force participation, headship, etc., not to men-

tion birth and death rates) prevailing in the receiving population, or is it necessary to carry out research into the length of time for which such migrants should be assumed to maintain the pattern of behaviour of their area of origin?

(d) How can projections of certain characteristics of a population, e.g., urban-rural residence, be taken into consideration in projecting sections otherwise defined, e.g., labour force? Is it desirable to take all the various important characteristics into account simultaneously, and can the electronic computer help in preparing such "cross-classified" projections?

(e) What should be done in case of changes in the meaning of concepts and definitions: should a projection relate to a segment which is rigidly defined in terms of concepts which are relevant to the base period, or should it also reflect changes in essence of the segment which come about as a consequence of social and economic development?

(f) What are the theoretical bases and the practical implications of feedback effects of forecasts upon themselves?

It might be emphasized again that perhaps all, but undoubtedly the last five, problems are common to all types of sectional projections. It is suggested, therefore, that these problems, or any other subject brought up for further consideration, should be discussed as far as possible in such a way that forecasters of all types of sectional populations will benefit from the deliberations, or at least so that those interested in one particular field can profit from the experience and the theoretical knowledge accumulated in the other fields.

Statement by the Rapporteur: Mr. P. C. GLICK

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Problems of method and procedure. There has been much methodological development in population projections for entire countries, by groups of sex and age, account being taken of anticipated trends in fertility, mortality and migration, and this has been discussed at other meetings of this Conference. Even in that context it was noted that compositional changes in the population, such as progressive urbanization or rises in educational levels, may have at least some incidental effects on the over-all course of trends in a country's total population.

The problems of producing serviceable "sectional" population projections, discussed at meeting B.5, are often more subtle and more complex. Whereas, quite naturally, the development of adequate techniques has been concerned mainly with the refinement of appropriate methods, the discussion revealed that problems of procedure are of no less importance. The experience brought together in the discussions has been gathered in countries of varied political and economic machineries for the channelling of initiatives in central or decentralized organs of government. Under such

varied conditions, the role of population projections in relation to the arrival at decisions concerning economic and social policy can be of various kinds. On the one hand, "autonomous" population projections, such as correspond to an extrapolation of recorded past demographic trends, may be presented as a stimulus for economic and social administrators to shape their decisions accordingly. On the other hand, an economic and social plan may already have been constructed, and foreseeable changes in the distribution of pertinent population characteristics would then have to be incorporated in the corresponding demographic projection.

The degrees of autonomy among various trends, demographic, economic and social, themselves vary, however, and these several phenomena are usually more or less interdependent. Ideally, therefore, projection and corresponding policy should become one continuous process of mutual approximations and reconciliations. This can never be completely achieved because the interrelations are many and complex while policy decisions must not be unduly delayed. It is possible, however, that with further exchange of comparative experience, and with the possibilities of complex data processing now offered by new electronic machinery, the needed approximations for supple decisions of policy may eventually be worked out within briefer intervals of time.

Contrasts with projections of total population. Projections of population characteristics are sometimes called "sectional projections" and differ in several respects from projections of the total population. Sectional projections are developed within the framework of those for total population by groups of sex and age; they relate to open populations (thus, persons may enter or leave school, the labour force, the headship of a family, or an urban or rural area); they tend to be interrelated (for instance, most young people tend to go to school or to work for pay but not both); their growth or decline is a function of social and economic planning and hence are subject to "feedback" effects which need to be taken into account; and they involve complications because of changes over time in the concepts (for example, changes in the boundaries between urban and rural territory, changes in legislation concerning school-leaving age, etc.).

Ratio and cohort methods. One early use of projections of total population for the derivation of projected population characteristics has been cited. In 1938, the United States National Resources Committee published alternative

projections of the number of households up to 1980 using the "ratio method". In that instance, it was assumed that the percentage of persons (of each sex-age group) who were heads of households as of the 1930 census would remain constant. From the cumulated experience of results of successive censuses, however, this simple methodology was modified, and now the trend over a period of years in the sex-age specific rates of household headship is being extrapolated into the future, and these variable rates are then applied to projected sex-age groups of the total population. This principle, namely the use of extrapolated age-specific ratios, has been applied in many countries, and in respect of numerous other population characteristics, such as school enrolment, educational attainment, economic activity, and residence in urban rather than rural areas. Such projections are also being taken increasingly into account in the decisions of governments and other enterprises pertaining to the rational allocation of investments and other resources.

The "cohort method" has recently found much use in the projection of the fertility component of future population trends, and the same type of approach has likewise found effective applications in the projection of various population characteristics. In this type of method, persons born in a particular period of years are traced through life with respect to the proportion who have the relevant characteristic; the characteristic may be the number of children born, economic activity, residence in an urban area, the marital condition, and so forth. Elaborations of this method include work done in recent years in input-outflow diagrammes wherein increments to and decrements from each "cohort" (i.e., group of individuals traced through life) are approximated, and the component parts are traced through the recorded past and extrapolated into the future under varying assumptions about probable continuity and change of the observed processes. Though not always so convenient as the "ratio method", the "cohort method" has the advantage that, if properly employed, inconsistencies in the behaviour of particular age groups, passing through life, can be effectively avoided. Thus, certain types of economic activity may depend on prior educational experience, and methods of this type permit the making of projections of economically active population and of school attendance which are mutually consistent.

Projections of urban and rural population. Because of differences in the levels of the com-

ponent trends (fertility, mortality, migration) between urban and rural areas some countries have now introduced the practice of projecting separately the urban and rural populations, and then deriving the country's total population as the sum of the two. Where distinctions in urban and rural population trends appear less important, as in Sweden, attention has been turned to the elaboration of regional population projections. In countries with more numerous large cities, such as India or the United States, there has been an increasing demand for population projections of individual cities, metropolitan areas, or other regions specially defined for purposes of planning the provision of needed facilities, for example, water supply, public roads, etc.

Apart from differences of scope of needed urban or regional projections, there are also variations in other circumstances which suggest that the same methods may not be used with equal advantage in diverse parts of the world.

Urban population generally grows more from internal migration than from natural increase. The migration to cities varies with rates of economic development and social change, and with disparities in income levels. Nor can urbanization proceed indefinitely at any one tempo observed currently or in the past. Cities in India, for instance, have been attracting more rural migrants than they could adequately accommodate, and future conditions in that respect may differ, in one way or another, from those observed so far. Furthermore, deliberate policy governing local investment priorities may affect the rates, or turnover, of migration, and cause them to differ from those which prevailed before such policy measures were taken.

Often there is a wide difference between fertility levels in urban and rural areas, and it is not well known whether the fertility of migrants, settling in urban places, is likely to resemble more that of the urban or of the rural population. In separate projections of urban and rural population, such as those calculated in the Soviet Union, the tendency is to assume that having moved, migrants adopt urban fertility patterns, and this assumption may be appropriate in some countries, but not necessarily everywhere. Unfortunately, the subject has been insufficiently studied to offer any clear guide-lines. Since in Latin America a majority of the migrants from rural to urban areas are female, while in Asia and Africa a majority are male, it is to be assumed that

there is much regional diversity in the social selection and accommodation of migrants. Consequently, there may be similar diversity in the duration of urban residence required before such migrants conform more closely in their behaviour with that of long-established urban residents. It is at least doubtful that the same procedures for the projection of urban population can be equally recommended where many other conditions vary.

Projections of the economically active population. The traditional procedure for making projections of the economically active population is to extrapolate past trends in specific labour force participation rates and to apply these rates to the sex-age groups of the projected total population. This procedure provides only one type of model, and it may yield results that are either too high or too low. The experience has been made repeatedly that changes in public policy affect the level of business activity and, hence, the number of people who make themselves available for employment. The probable effects of such changes on the future level of the economically active population under differing conditions need much further study. Caution is urged in making labour force projections in direct relation to planned changes, because actual change often lags behind schedule. Furthermore, some crucial requirement, such as an adequate supply of acceptable housing, may fall short. Consequently, the labour supply may not be forthcoming in those numbers which would at first seem more directly indicated in the plan, or it may present itself under conditions insufficiently foreseen, such as the influx of migrants from a large distance, or the growth of peri-urban settlements, near the towns, with sub-standard housing conditions.

The study of trends of change ordinarily depends on statistical time series reaching into the past. But in many countries having great need of projections of detailed population characteristics, the pertinent statistics have been secured only recently. Serious errors can result in projections where constant levels of employment are assumed, hence the projections may have to be made in terms of comparative observations derived from the data of other countries. While comparative international experience can provide rough guide-lines in that respect, it is evident that these are no substitute for the study of time trends within each given country. The comparative employment patterns among sub-areas of the same country at a given moment of time may offer an alternative approach, and such a procedure has

been used advantageously in certain Latin American countries. Ecological correlations were calculated between the labour force participation rates and the proportions of the labour force in non-agricultural occupations, and from the resulting regression equations the economically active populations of those countries were projected into the future.

Labour force projections based on trends observed over a short period of significant change may yield results that are reasonable in the short run, but misleading in the longer run. Improvements in income, for instance, may for a time call forth an increased participation in economic activities but eventually, through changes in taste and leisure habits, bring about a different accommodation to the consequently changed social circumstances. Workers may migrate to other places where their acquired new tastes are better satisfied but employment levels are lower. Wage standards may also be raised so that many marginal workers are once more excluded from regular employment.

Labour force projections can be refined if made separately for population groups distinguished by level of education and, hence, responding variously to varied employment conditions. In the complex input-output models, furthermore, changes in both the working and consuming population can be anticipated, and workers may be substituted by numbers in common units of measurement, through a mathematical weighting process, to represent equivalents in "full labour units".

Projections of school enrolment. In making realistic projections of future numbers of school students at different grade levels, account must obviously be taken of the future capacity of schools and teachers to accommodate the students. On the other hand, desirable future school enrolments, as quantified in an appropriate projection, can serve to determine the allocation of resources for building materials, books, and especially teacher training, which may often have to be planned long in advance.

Enrolment projections based on the cohort approach start with the number of children entering first grade and proceed by determining the probable number of "surviving" (i.e., graduating) students passing into successive grades until the entire school cycle has been completed. If the ratio method is used, the enrolment projections are made by applying extrapolated enrolment rates to projected age groups of the population. Here considerable inaccuracy may be expected because of the fact

that within only a few years after the time when the projections are made, all of the children freshly entering school have not yet been born, in addition to the fact that improvements in educational achievements may cause varying proportions of particular age groups of children to attend at the corresponding grade levels. Since there is uncertainty regarding future birth rates, reliable school enrolment projections cannot be made over an extended future period. In view of the interrelation between withdrawal from the educational system and entry into the labour market, it is advisable to make projections of school enrolment and employment simultaneously.

Household and family projections. Because of methodological difficulties, refined projections of numbers of households have not often been made, although there is much need for them. Household projections are especially useful in forecasting housing needs and the demand for other market goods which are generally consumed by households as single units. Theoretically, projections in the gross change of the number of households might be made by component methods, but the component factors causing the formation of new households and dissolution of old ones are several and not readily available in convenient statistical form, hence demographers generally content themselves with preparing projections of net changes in the numbers of households. To be most useful, the results should be presented by type of household (e.g., those headed by a married couple, a widowed person, etc.) and by changes in household composition occurring in the course of the life cycle of the household.

Projections of households by size (whether of one member, two members, etc.) is a very complex demographic problem, but such detailed projections are needed in providing for future housing needs of varied types. Experimental projections have nevertheless been made in a few European countries by making use, for instance, of average household size and a theoretical distribution of households by size. Checked with results obtained by alternative methods, these projections appeared relatively successful. Similar methods have also been employed in historical studies of households of varied size.

Among the hazards in projecting future numbers of households for specific localities are the fact that housing preferences can change as economic circumstances vary, with consequent overcrowding of housing facilities of one type, or the relative redundancy of other types

of housing. In industrialized countries, retired aged persons often form their own separate households. In research on housing demand in local areas in the United Kingdom, it was found that education was an important factor conditioning the likelihood of household headship for persons of varied sex and age.

CONCLUSIONS

Several conclusions from actual work done on the projection of population characteristics emerged in the discussion and deserve mention.

1. The demographers who make the projections and the administrative and industrial planners should exchange progress reports on their respective areas of work. By doing so, they would reduce the laborious work of making revisions of projections in response to policy changes. The demographer can then best anticipate the dates when trend changes may occur in employment rates, college enrolment rates, housing construction rates, and so forth, and can fashion his projections accordingly.

2. If the basic projection for the total population is grossly defective, the demographer engaged in projecting population characteristics would be ill-advised to employ elaborate methods, as these entail the risk that unwarranted conclusions might be drawn. It often proves that projections of population characteristics by simple methods are the most valuable. The range of alternative trends allowed for in the projections should probably be made to depend on the amount of deficiency in the knowledge of basic data and their provable interrelations.

3. Where the use of refined projections is indicated, the knowledge regarding trends in various population characteristics should be used, in so far as it is relevant, in the projection of each of these characteristics. Such pro-

cedure is recommended at least in so far as it ensures that the several projections will be mutually consistent. Where the work is done with electronic computers, results on all the inter-related subjects (e.g., school enrolment, employment, household formation, the growth of urban and rural population) can be obtained simultaneously, offering the added opportunity of interpreting them in their conjunction.

4. Short-range projections of population characteristics concerning persons already born can be used with greater confidence than longer-range projections. Because of variability in the fertility factor, over the same range of time the population yet to be born cannot be projected with similar assurance. Whereas school enrolment projections for the next six years, labour force projections for the next fifteen years, and household projections for the next twenty years, will still be affected by errors from other sources, namely assumed mortality and migration, they are at least more reliable than those for longer periods. For the shorter periods, in fact, the demographic factor in forecasting future production and distribution requirements tends to be one of the most dependable variables at the disposal of social and economic planners.

5. Demographers who undertake the preparation of projections should be well aware of their responsibility. They must be able to distinguish between reasonable and unreasonable results, and between reliable and unreliable results, and they would be well advised to inform the users of their findings about the strengths and weaknesses of their projections.

The following speakers took part in the discussion: Araica, Benitez, Calot, Carrère, Colombo, Ducoff, Eversley, Febvay, Kleiman, Litvyakov, MacDonald, Mackensen, Mukherjee, Perpiña, Podyachikh, Subramanian, Siegel, Tamásy, Tilak, Volkov, von Hofsten.

MEETING A.7

Demographic aspects of agricultural development and food supply

Statement by the Moderator: Mr. Conrad TAEUBER

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In his address to the United Nations Population Commission in March 1965, the Director-General of the Food and Agriculture Organization (FAO) summarized the position of food and population in terms which are widely accepted. Looking ahead to the year 2000, and stressing the critical importance of developments during the next fifteen or twenty years, he said:

"If a solid foundation can be laid for increasing food supplies to the tune of about double the actual rate of annual increment and this enhanced rate can be sustained over a long period; if family planning is accepted and practised on a wide scale in the rural communities of the developing countries; if the food-producing capacity of the developed nations can be fully utilized and surpluses distributed to the advantage of all and detriment of none; and if international co-operation is further strengthened to this end—the general picture of hunger and malnutrition in the world should show a distinct improvement... Whether all these 'ifs' will be answered in the positive is another matter. But the alternative is clear."¹

A close relationship between changes in the numbers of people and food supply has often been observed. Historically, population growth and increasing density of settlement accompanied the shift from hunting and food-gathering to the crude agriculture of the digging stick and later to continually improving techniques of cultivation. Population growth has led to intensification of cultivation, and the improvement of cultivation has, in turn, made possible a population increase. For example, irrigation has led to enlarged and more stable crop production, and drainage of swamps to gain agricultural lands has, in turn, led to a reduction of diseases such as malaria. Population in-

crease in some situations need not lead to under-employment in agriculture, for with smaller holdings there is a need for more intensive cultivation of the land and, hence, for greater labour inputs.² Some students of history see weak population pressure or a decline in population as more dangerous to the customs protecting fertility of the soil than a high rate of population growth.³ The patterns of land use are not solely a result of population pressure, but are to a large extent based on cultural factors which include the patterns of population growth.

However, the experience of many countries has been that rapid population growth, coupled with a division of the land, leads to fragmentation of holdings and to under-employment of the people on the land. Migration to industrial and urban centres has long been one of the means of alleviating this situation. Part-time farming, the combination of work in agriculture and in industry, can be viewed as a transitional stage which permits the use of rural labour in industry without immediately incurring the expenditures for housing and social services required as a result of migration from rural to urban areas.⁴ Rural-urban migration and the consequent increase in the urban population leads to an increase in the demand for food which, in turn, leads to increased pressure to produce agricultural commodities for the market. The search for new lands may be the result of the need to secure new products for domestic consumption or for export.

² Ester Boserup, "The interrelation between population trends and agricultural methods", *Proceedings*, vol. III.

³ Michel Cépède, "Relationship between population pressure (or growth) and systems of land tenure, the fragmentation of holdings, and customs affecting fertility in rural areas", *Proceedings*, vol. III.

⁴ Stane I. Krasovec, "Role of peasant-workers in economic development under conditions of population pressure", *Proceedings*, vol. III.

¹ Statement by Dr. B. R. Sen, Director-General of FAO, to the United Nations Population Commission, New York, 24 March 1965.

The relationship between population and food supplies is not a simple relation between limited physical resources and population with an irresistible tendency to expand. Important institutional and cultural factors are involved. Many of the industrially developed countries have had rapid expansions in agricultural production, along with a slowing down of rates of population growth. Traditional agriculture, and the small farms that prevail in many countries, are often the home of cultural values that favour large families. In many areas, peasant culture has emphasized the conservation of resources and has tended towards an intensification of cultivation that included measures to protect—not deplete—the fertility of the soil. Government policies favouring small farms, especially those favouring the ownership of small farms, have often led to increasing production per unit of land.

Increased yields per unit of land or labour create conditions which favour population growth. Dramatic changes have resulted from the introduction of new crops, especially when they have been linked with increasing inter-continental trade. The potato is given credit for a major role in the early sustained population growth in Europe. Similar observations have been made in connexion with maize and sweet potatoes in China, cassava in Africa, and maize in the Danube Basin.⁵

In the modern period, population growth led to the search for new products and for new agricultural techniques. Change in demand for food affects agricultural practices primarily through price levels. A growing non-agricultural sector of the economy creates a demand for agricultural products and this often has been the most effective stimulus to technical and economic improvement. Population pressure exerted through a growing urban and industrial population often leads to an improvement in agricultural techniques, whereas increasing population on the land might lead chiefly to an increase in the production for subsistence of the people on the land. An increase in agricultural production generally requires capital, especially in the form of industrial products, but in some instances much of the early investment needed to increase agricultural production may be in the form of the farmer's labour and thus may not be reflected immediately in a demand for industrial products. There is also a problem in creating effective increases in demand for food which leads to increased production over and above

the propensity of peasants to hoard and to speculate.⁶ The differing relations between population growth and food supplies reflect in large part the different conditions in the developed and the less developed countries. It is clear that there is no one pattern of development of these relationships which is applicable to all countries.

The statistical evidence on population growth and trends in the volume of food production amply bear out the recent statement of the Director-General of the FAO:

"... it would appear that the gap in available food supplies per capita between the rich and poor nations is widening rather than narrowing, this in spite of all the efforts that have been made by national governments and international agencies, both bilateral and multilateral in promoting economic development in the developing countries".⁷

Food output per person in the less developed regions of the world increased during the nineteen-fifties, following declines during the war years. In the nineteen-sixties, however, food production has increased less rapidly than population. The increase in food supplies has not kept up with the growth in numbers. Before the war, the less developed regions were exporting 11 million tons of grain per year to the developed countries. After the war, these regions became importers of food. During the early post-war years, 4 million tons of grain per year moved from the more developed to the less developed countries. During the 1950's, the volume of these shipments increased and by 1961 it reached 21 million tons. Preliminary estimates for 1964 put the figure at 25 million tons. A growing share of the increase of population in the less developed countries is being sustained by food shipments from the developed regions, especially North America.⁸

The recent imbalance in the rates of growth of population and food production, especially in the less developed regions of the world, coupled with an awareness of the prospective rates of growth of the population in the future, have again raised the question whether the earth can provide food for its increasing numbers. It is often asked whether this imbalance foreshadows a situation in which hunger will

⁵ N. K. Sarkar, "The influence of population trend in the plans of developing countries", *Proceedings*, vol. III.

⁷ Statement by Dr. B. R. Sen, Director-General of the FAO, to the United Nations Population Commission, New York, 24 March 1965.

⁸ Lester R. Brown, "Increasing world food output, problems and prospects", *Foreign Agricultural Economic Reports*, No. 25 (United States Department of Agriculture, April 1965).

⁶ E. de Vries, "Historical evidence concerning the effect of population pressure and growth on technical progress in agriculture", *Proceedings*, vol. III.

offset the gains that have been made in the control of infectious diseases, and the long and rapid declines in death rates will give way to an increase in death rates because of irregular and insufficient nutrition. Reductions in high birth rates, it is argued, are necessary if rates of population growth are to be reduced to a level at which growth in food production can again keep pace with them.

It is recognized that for the world as a whole, the growth in population may be expected to be concentrated in the areas which now have a relatively low level of nutrition and also a somewhat lower level of calorie requirements on account of higher temperatures and a lower body weight (even among well nourished adults). This will have a slightly depressing effect on the future calorie requirements per person. The simple numerical consequence of the changed distribution of population on effective demand may result in a reduction in the world average level of food consumption.

The FAO has pointed out, however, that any realistic assessment of food requirements must take into account not only the increased number of mouths, but also the improvement of existing diets, for in large areas of the world these fall far below the minimum standards of nutritional adequacy.

For the less developed countries as a whole, the elimination of hunger and modest but progressive improvements in the quality of diets to meet the needs of vulnerable groups would require an increase in total food supplies of 45 per cent by 1970, 103 per cent by 1980, and 261 per cent by 2000. The increases in food supplies from animal sources would be considerably larger. These are minimum increases, and they assume some special distribution measures such as school feeding programmes. If the usual economic factors continue to determine the distribution of food, the required increases would be larger.⁹

While the expected increase in the urban population of the world would not increase the need for food, it would lead to substantial increases in the quantity of food marketed. These would have to increase more rapidly than the total amount of food. This, in turn, leads to need for improved marketing, transportation and food processing if the needs are to be met. Urbanization is also likely to affect relative food prices, as the prices in urban areas rise because of increased marketing costs. At

the same time there would be a change in the consumption pattern away from staple foods, and consumption other than food might become relatively more important. This might well exert a dampening effect on food demand in the less developed countries. Such an effect would not apply uniformly to all food groups.

The question whether the earth can feed its present population, or the population that is in prospect in the foreseeable future, can be answered in the affirmative in so far as the answer rests on the existence of the necessary resources. This does not necessarily mean that these resources can or will be utilized to increase food production rapidly or extensively enough to forestall the critical situation visualized by many analysts.

The world's supply of the basic chemical requirements, carbonic acid, nitrogen, phosphates, potassium and water are considered to be more than adequate for the needs of a population that is many times the present world population.¹⁰ Many estimates of availability are quite optimistic. For example, it is asserted that the present planted acreage can be increased at least seven times. According to one study, it should be possible to increase agricultural output twenty times.¹¹

Increases in output of agricultural crops can be achieved by two principal means: by increasing the area under cultivation, and by increasing the yields of the crops which are grown. Throughout much of man's history as a cultivator, increases in food production have come principally from increasing the tilled area. Large portions of the world's surface have been brought under cultivation in the past century. It will be increasingly costly to clear much of what remains. In less densely populated countries, there remain substantial areas which are potentially arable. Just how much could be brought under cultivation economically is not known; the amount would, in fact, change with changing circumstances.¹²

However, nearly half the world's people live in developing countries that to a large extent have fixed land economies; that is, almost all the land that can readily be cultivated is already in use. Regardless of efforts to bring new land under cultivation, the continuing growth of population is such that land available

¹⁰ K. M. Malin, "Food resources of the earth", *Proceedings*, vol. III.

¹¹ M. M. Sokolov, "Prospects of agricultural development in connexion with population growth", *Proceedings*, vol. III.

¹² E. N. Omaboe, "The population pressure and the development of new areas", *Proceedings*, vol. III.

⁹ P. V. Sukhatme and W. Schulte, "Forecasts of nutritional requirements and the expected levels of demand for food", *Proceedings*, vol. III.

per person for food production is expected to shrink substantially below present levels.

Increases in food production in the future must come mainly from increases in the yield of crops and livestock. It has been suggested that more can be done to improve the productivity of labour in agriculture than the productivity of the land, though the degree to which this is true varies with the quality of the soil and the amount of rainfall. Capital must be substituted for land, and new techniques must be applied. This is the course which the developed countries, especially those with surplus agricultural production, have followed. It is a course which is difficult to follow in the developing countries.

The problem of increasing production is not a lack of basic materials or knowledge, though much fundamental research remains to be done, especially in tropical and subtropical areas. The problem is rather to develop and apply the necessary technology where the components essential to production can be combined effectively. Capital, education, social and economic organization, personal motivation, and governmental policies all need to be taken into account along with the basic science and technologies of food production. If land must provide the nutrients, as well as the standing room for the plants, the situation is less favourable than it is where increasing amounts of the nutrients are introduced as fertilizer. The failure of the developing countries to use science and technology effectively in increasing production is a major factor in their lagging production. Under these varied circumstances, widely disparate rates of growth in agricultural production are to be expected. There are, for example, wide variations among the states of India in the rate of return per hectare and in the rate of increase in food production.¹³

One computation concludes that if the world's population were to be 8,000 to 10,000 million, the Japanese level of efficiency would have to spread all over Asia, and an agriculture equivalent in efficiency to that of present-day Western Europe would have to be spread over the rest of the world's agricultural lands, which, in the meantime, would have been expanded by 50 per cent.¹⁴

During the past quarter century, all the increase in food output in both North America and Western Europe came from rising yields

¹³ S. R. Sen, "Population, land resources and agricultural growth", *Proceedings*, vol. III.

¹⁴ Ralph W. Phillips, "Interrelationships among population trends, land availabilities, and food supplies", *Proceedings*, vol. III.

per unit of area. Yield per acre increased by 109 per cent in North America. In contrast, yield per acre increased only 7 per cent in Asia and in all of the developing world, only 8 per cent.

Increased yields can be achieved through the use of more productive varieties of plants, adequate supplies of water and plant food, improved cultural practices and a greater capacity to carry these out at the right time, protecting the growing crop from pests and diseases and by the control of pests where grain is stored. Improved tools and mechanization can add materially through better cultural practices. Although there is a growing body of evidence that the application of fertilizers makes for significant increases in yields, during the past two years only one tenth of the 39 million tons of plant nutrients which were applied as fertilizers were applied in the developing countries. Much of the fertilizer was used on non-food crops.

The possibilities of increasing livestock production are fully as great as those of increasing crop production. Yields in the countries with an advanced livestock industry are six to 100 times as great as those in the less developed countries. Most developing countries are still applying traditional methods of livestock production and utilization which do not make efficient use of existing resources.

It is generally assumed that there is a large potential for increasing the supply of protein in the diet through development of the world's fisheries.

A major element in increasing food supplies from all sources lies in those improvements in preservation, conservation and marketing that reduce the spoilage and waste which now occur.

Atomic energy is playing an increasingly important part in scientific research leading to improved yields and to the effective control of fungal and bacterial infection and insect pests. When it is possible to supply inexpensive power through nuclear reactors, agricultural production will undoubtedly be a major beneficiary.

Research on non-conventional sources of food promises major developments. For instance, protein concentrates can be produced from resources hitherto largely unused. However, there is usually a considerable amount of time between the discovery of a new source or process and its application in large-scale production. The carbohydrate-rich byproducts of certain industries, such as the sugar and the wood pulp and paper industries, could be used

to produce sizable quantities of edible yeast. In a recent development, proteins are produced by yeasts growing on certain hydrocarbons obtained in the refining of crude petroleum. Pilot mass cultures of algae have been very encouraging in relation to quantity and acceptability of the products. Extracting protein directly from green leaves is a promising possibility. The most critical and difficult aspect in introducing products such as these for large-scale use in the human diet is acceptability and marketing.¹⁵

A successful breakthrough in the desalination of sea water would revolutionize current food production forecasts.

There is little doubt that there is a potential for large increases in food output. It is necessary, however, to look beyond the physical potential to the economic, technological and institutional requirements for the realization of the potentials. The increases needed in the less developed countries are very large. Success in meeting these needs will require drastic changes in techniques, major capital investments, and a far-reaching intensification and reorganization of agriculture.

Current research is demonstrating that increasing literacy among the cultivators could make a significant contribution to increasing yields. Agricultural experiment stations and experimental plots on cultivators' fields in all parts of the world have clearly shown that large increases are possible. But the new ideas and techniques must move from demonstration plots into common practice. Breaking through long established customs and traditions in regard to agricultural practices is often difficult even in a largely literate population. It is far more difficult in a population that is largely illiterate and essentially cut off from the continuing flow of modern ideas and practices. Raising the general level of education would contribute directly to increasing agricultural production.

Governmental policies towards agriculture often need to be changed in order to stimulate increased production. The importance of cash crops for export to provide foreign exchange is generally recognized. But in some of the less developed countries there appears to be little or no awareness of the extent to which a progressive agricultural industry can contribute to the national economy.

There is a close relationship between the average level of income per person in a coun-

try and the country's ability to raise agricultural outputs. But as emphasis is put on increasing yields, the capital requirements of agriculture are increased and agriculture becomes dependent on other sectors of the economy for a wide variety of goods and services. These include capital inputs such as fertilizers and pesticides, and services such as research, agricultural extension, credit, transportation, food processing, storage, and marketing. In many instances, institutional arrangements such as land tenure will need to be altered, for it is essential that the cultivator should be assured of those incentives which will motivate him to increase his productivity.

The internal capital requirements of the agricultural sector will also clearly expand with the increase in population, probably faster than agricultural production itself. W. Herer calculates that to attain a 3.5 per cent increase in agricultural production, agricultural investment would have to equal 22 per cent of the net agricultural product.¹⁶

Some students hold the view that population growth tends to restrict the availability of capital in the developing countries, particularly in the agricultural sector, for it tends to reduce incomes. Within the agricultural sector the presence of diminishing returns to labour strengthens this assumption, unless population growth provokes a faster rate of development in the other sectors or an increase in food prices. In that event there may be increasing incomes, especially in that part of the agricultural sector in which commercial sales are possible.

The prerequisites for increasing agricultural yields are such that the advantage lies with the countries which have already moved forward in the process of economic and social development. The trend observed in recent years may be a forerunner of the course of future developments unless major changes can be effected. In some of the developing countries there has already been a trend towards declining agricultural output per person, especially in the 1960's.¹⁷

Conditions vary widely from country to country, and no one set of procedures would fit all situations. Taking into account a variety of the relevant factors, the FAO has estimated that it may be feasible to secure an annual rate of

¹⁶ Victor Herer, "The relationship between the volume of agricultural investment and the rate of population increase", *Proceedings*, vol. III.

¹⁷ Carlos Alberto de Medina, "Urbanization, industrialization and food production in Brazil", *Proceedings*, vol. III.

¹⁵ O. E. Fischnich, "The possibilities of expanding food production by 1980", *Proceedings*, vol. III.

increase in production of 1.75 per cent in the densely populated areas of the Far East by the application of improved techniques on the existing agricultural land. Relatively smaller increases may be expected in the less densely populated areas, perhaps 1.25 per cent in the Near East, 1 per cent in Latin America and 0.75 per cent in Africa. Rates of population growth are higher than these estimated rates of food increase in all of these regions. It is obvious that there will be declines in indigenous food supplies per person if increases in food production do not exceed increases in population.

It is difficult to assess the likely effect of increasing population on food production in areas where a large proportion of the population is entirely dependent on agriculture. With growing populations, even with no increase in cultivated areas and no technical progress, production may tend to increase as a result of the more intensive use of available agricultural resources. The increase in production resulting from an increase in labor input varies widely. The increase in production in response to a 1 per cent rise in labor input, according to one study, was, on the average, 0.21, which was below the increase from additional land or capital and other services. However, the coefficients were 0.3 for India, Japan, and Taiwan. One report shows a range of 0.3 to 0.7 for the population effect in dense and less dense regions.¹⁸ There is clearly more room for intensification without technical progress in the less densely settled areas of Latin America and Africa than in the Far East, where land resources are already being used intensively, or in the Near East, where lack of water is a severely limiting factor. However, such increases are likely to be quite inadequate.

Though the movement of foodstuffs, especially grain, from the surplus producing countries to the deficit countries is important, it deals only marginally with the problem of the future. The conclusion appears inescapable that the effective long term solution of the world's need for increased food must be sought within the countries where the deficits are greatest. Increased agricultural production is an essential part of economic development and, in turn, depends in large part on the entire process of development. The ability to raise yields is closely related to the level of development of the non-agricultural sector.

Thus, there is need for a continuing rise in the level of productivity per worker, both in agriculture and in the non-agricultural sector. But to a large extent the workers that move from the rural to the urban areas in developing countries are without training or experience in the non-agricultural tasks in which they need to be engaged. This situation again points to the importance of general educational programmes which would lead to better qualified manpower for the non-agricultural and the agricultural sector and to greater receptivity for the new technology that is essential to a developing agriculture.

Increasing attention needs to be given to the reduction or elimination of institutional factors which retard the application of available technology for the increase of agricultural yields. Institutional developments are also needed to facilitate the application of capital inputs, including arrangements for credit and for appropriate producer prices. There can be no single formula; the desirable institutional arrangements will vary from country to country in conformity with the prevailing social systems.

In many rapidly growing rural populations there is large-scale under-employment and a large amount of seasonal unemployment. More effective utilization of the labour force that is available is a major element in an agricultural reorganization which would also lead to increased total production. The fertility of the soil and the capacity of the labour input, as well as the gross labour return, are often determining factors in developing a cropping system. In Taiwan, some cropping patterns were developed that involved a labour input per hectare of cultivated land of 305 days in the years 1955-1960, as compared with 220 days in the years 1931-1935, and 195 days in the years 1911-1915. The seasonal distribution of the labour requirements under the new system, which results in four crops per year, is more even than it was formerly. One objective of the system was to reduce the waste of labour and instead increase the productivity of both land and labour.¹⁹

The development of the programme in Taiwan was based on modern methods of analysis of the favourable combinations of factors, including linear programming. Similar analyses in Japan have sought to find combinations that would improve the utilization of the labour that is available on the farms, increase produc-

¹⁸ P. V. Sukhatme and W. Schulte, "Forecasts of nutritional requirements and the expected levels of demand for food", *Proceedings*, vol. III.

¹⁹ S. C. Hsieh and T. H. Lee, "The effect of population pressure and seasonal labour surplus on the pattern and intensity of agriculture in Taiwan", *Proceedings*, vol. III.

tion and farmers' incomes and lead to an increased supply of dairy products.

Studies in Hokkaido have shown significant possibilities of increasing production and net income, while at the same time reducing the seasonal labour surplus that is characteristic of many small farms in that area.²⁰

The effect of alternative rates of population growth on technical progress in agriculture depends to a large extent on local conditions. A number of related questions stand out: the effect of the number and age of the people on the number of innovators in agriculture, the effect of industrial development and commercialization on agricultural progress, the incentive effects of land scarcity on some forms of innovation, the depressing effects of a labour surplus and capital shortage on others.

Population pressure may lead to excessive subdivision of agricultural holdings with the consequence that it might be difficult to secure the necessary working capital or to apply the more effective technology to the new holdings. Density of settlement, on the other hand, may make it easier to transport agricultural requisites, such as fertilizers. It is pointed out that under a planned economy system an underdeveloped country with a large reserve of agricultural manpower can, under certain circumstances, attain a much higher rate of growth of agricultural production than an industrialized country which has no such reserves. This is particularly true where irrigation projects, with wide possibilities of "do-it-yourself investments", play an important role.²¹

Substantial shifts of manpower from agriculture to the non-agricultural sectors of the economy are essential aspects of economic and social development. Such a shift of manpower resources has already occurred in the industrially developed countries and it is continuing there.²² It is of even greater importance to the countries that are embarking on a programme of development. Transfer of human resources from agricultural to non-agricultural employment is an essential part of economic diversification. Agricultural advance must precede, or at least occur simultaneously with, the

growth of the industrial and other non-agricultural sectors of the economy if development is to continue.

The paper by V. G. Panse and V. N. Amble²³ points out that although the bulk of additional production in India in the future will have to come from increased productivity of land, there is some scope for expanding the area under cultivation, partly by clearing and breaking waste land and partly by an expansion of double cropping.

The capital investments and improvements in methods that are needed for the proposed increases are large. They include increasing the area under irrigation from 32 to 81 million hectares. The potential for contour bunding and terracing is estimated at 49 million hectares out of which only about 1 million were covered at the end of the second Five-year Plan. Changes in farming practices are assumed to be associated with this increase. The widest possible use of fertilizer is considered to be the most important single factor for raising agricultural production, though water supply and the use of fertilizers are treated as complementary measures.

The development of new crop varieties would lead to increased response to fertilizers, but for the near future this improvement is assumed only for maize. The chemical control of pests and diseases is expected also to make a contribution of 10 to 15 per cent to increased production.

Assuming that these requisites become available to the Indian farmer, there remain the substantial tasks of altering practices to ensure the proper use of the new materials and facilities. There would need to be a reduction in the number of work animals, rationalization of their use, and a spread of mechanization. If the work animals could be reduced to about one fourth their present number and if the feed that is now consumed could be diverted for the increased production of milk, the supply of milk per person could be doubled, thus bringing it somewhat above the modest levels assumed to be needed in India.

V. G. Panse and V. N. Amble conclude that India's population faces the grim possibility of being condemned to a permanent state of under-nutrition and malnutrition, with the attendant deterioration in labour productivity and the national economy. If this is to be avoided there must be vigorous action to in-

²⁰ T. Yajima, "The effect of population pressure and seasonal labour surplus on the pattern and intensity of agriculture", *Proceedings*, vol. III.

²¹ Victor Herer, "The relationship between the volume of agricultural investment and the rate of population increase", *Proceedings*, vol. III.

²² Louis J. Ducoff, "Population growth in relation to the agricultural labour force in developed and some developing American countries", *Proceedings*, vol. III.

²³ V. G. Panse and V. N. Amble, "The future of the population and the food supply of India", *Proceedings*, vol. III.

crease agricultural production, to mechanize agricultural processes and to reduce the rate of population growth.

Numbers applied to India are necessarily large because of the large population. In terms of technically trained manpower, a governmental organization dedicated to increased food production and an industrial economy that can expand to provide the necessary supplies, India is better equipped to carry through the needed improvements than most of the other developing countries. To achieve the increases projected there will require major efforts. In most

other countries of the developing world, the task will require even greater efforts, and large amounts of technical assistance, agricultural requisites and food will be required if agricultural production is to be increased to meet the needs of the increasing population.

It is clear that reduction of rates of population growth would make this task more manageable. Both increasing agricultural production and decreasing rates of population growth are essential to economic and social development. Neither is to be viewed as an isolated goal, nor is either sufficient alone.

Statement by the Rapporteur: Mr. Bernardino G. BANTEGUI

Director, Office of Statistical Co-ordination and Standards, National Economic Council, Manila, Philippines

In introducing the subject of the meeting, the Organizer referred to two ways in which the effect of population growth on the envisaged food supply could be considered. First, the active way, in which emphasis was placed on the steps by which food needs can be met; second, the passive way, in which an estimate was made of the rates at which food production was likely to grow at different rates of population growth. Both these approaches had been kept in mind in preparing the background paper and in organizing the meeting. The Organizer pointed out that the answer to the challenge of population growth could be considered at various levels: the family, the village, the market, the country and the world. The meeting had been organized with all these levels in mind, population growth being thought of chiefly as the beginning and agricultural development as the end. At the same time, the Organizer invited consideration at all these levels, starting from the balance of needs and requirement and working back to the level of population growth. Both lines of investigation might give reasons for hope as well as concern at some if not at all levels.

The Moderator then summarized the main aspects of existing knowledge on the subject, and the salient points set out in the papers received for the meeting were presented and discussed.

It was pointed out that historical evidence showed a close relationship between population growth (or pressure) and technical progress in agriculture. Population growth has led to intensification of cultivation, and the improvement of cultivation has, in turn, made possible an increase of population. For example, irrigation

has led to expanded and more stable crop production, and drainage of swamps to gain agricultural land has in turn led to a reduction of diseases such as malaria. In some situations, population increase need not lead to underemployment in agriculture, since with smaller holdings a need for more intensive cultivation of land arises and, hence, greater labour input is required. In fact, some students have suggested that low and/or falling population pressure is a greater threat to the conservation of soil fertility than a high rate of population increase.

In many instances where rapid population growth has led to fragmentation of holdings and underemployment, migration to industrial and urban areas has served as a means of alleviating the situation. Part-time farming, which combines work in agriculture and industry and therefore permits the use of labour in industry without immediately incurring expenditures for housing and social services required as a result of rural-urban migration, can be viewed as a transitional stage.

Rural-urban migration and the consequent increase in urban population provides increased stimulus to produce agricultural commodities for the market.

It has been observed that the relationship between population and food supplies is not simple. Different conditions (including important institutional and cultural factors) to a great extent account for the differing relationships between population growth and food supplies in the developed and less developed countries. Among the important examples cited were: (1) cultural values that favour large families in

countries where traditional agriculture and small farms prevail; (2) the achievement of rapid expansion in agricultural production, along with declining rates of population growth, in many of the industrially developed countries; (3) the emphasis on the conservation of resources in peasant culture in many areas, and the tendency to apply intensive cultivation including measures to protect, that is, not to deplete, the fertility of the soil in such areas; and (4) government policies favouring small farms, especially those favouring the ownership of small farms, which often lead to increasing production per unit of land.

The following important observations on the relationship between population growth and food supplies were also considered: (1) population growth has led to the search for higher production and for new agricultural techniques; (2) population pressure exerted through a growing urban and industrial population often leads to an improvement in agricultural techniques, whereas increasing population on the land may lead chiefly to an increase in production for the subsistence of the people on the land; (3) an increase in agricultural production generally requires capital, especially in the form of industrial products, but in some instances much of the early investment needed to increase agricultural production may be in the form of the farmer's labour and thus may not be reflected immediately in a demand for industrial products; (4) it is not easy to create effective increases in demand for food such as may lead to increased production over and above the propensity of peasants to hoard and to speculate; and (5) increased yields per unit of land or labour create conditions which favour population growth (cited as examples in this connexion were the dramatic changes that have resulted from the introduction of new crops, especially from other continents, such as the potato, which is given credit for a major role in the early sustained population growth in Europe, maize and sweet potatoes in China, cassava in Africa, and maize in the Danube Basin).

Recent figures indicating the widening gap in available food supplies per capita between the developed and less developed countries were cited. Less developed countries, which exported grain to developed countries to the tune of 11 million tons per year before the last war, have started importing grains in steadily increasing amounts, from 4 million tons during the early post-war years to 21 million tons in 1961 and, according to preliminary estimates, about 25 million tons in 1964. The recent

imbalance in the rates of growth of population and of food production, particularly in the less developed regions of the world, coupled with an awareness of the expected rates of growth of population in the future, have again raised the question whether the earth can provide for its increasing numbers.

According to the Food and Agriculture Organization, in order to eliminate hunger and bring about modest but progressive improvements in the quality of diets to meet the needs of vulnerable groups, an increase in total food supplies of 45 per cent by 1970, 103 per cent by 1980 and 261 per cent by 2000 would be required. The required increases in food supplies from animal sources would be considerably larger. It was also indicated that these were minimum increases and that some special distribution measures such as school-feeding programmes had been assumed in making such estimates.

It was noted that urbanization would not increase over-all food needs but might bring about, apart from substantial increases in the quantity of food marketed, a change in the consumption pattern away from staple foods as well as a rise in importance of consumption other than food. This might well exert a dampening effect on food demand. It was also observed that the growth of the world's population might be expected to be concentrated in areas with a relatively low level of consumption and a somewhat lower level of calorie requirements on account of higher temperatures and lower body weight. This would have a slightly depressing effect on future calorie requirements per person and might eventually result in a reduction in the world average level of food consumption.

It was felt that the existing resources were more than adequate to meet the needs of a population that was many times the present world population, provided these resources were effectively utilized. Many estimates of availability are quite optimistic. The present planted acreage, according to one study, can be increased at least seven times, while another study concludes that it should be possible so to increase agricultural output as to feed twenty times the present population at good nutritional levels, using conventional agricultural methods but with very substantial investment in land.

The possibilities for increasing agricultural output and productivity were assessed. It was noted that increases in output of agricultural crops could be achieved by two principal means: by increasing the area under cultivation, and by increasing yields of crop and livestock. Until

recently, increases in food production have come principally from increasing the tilled area. Almost all the land that can readily be cultivated is already in use. Regardless of efforts to bring new land under cultivation, the continuing growth of population is such that the land available per person for food production is expected to shrink substantially below present levels.

Increases in food production in the future will come mainly from increases in the yields of crops and livestock. The problem is not a lack of basic knowledge (though much fundamental research remains to be done, especially in tropical and subtropical areas), but rather to develop and apply the necessary technology by which the components essential to production can be effectively combined. Capital, education, social and economic organization, personal motivation, and governmental policies all need to be taken into account along with the basic science and technologies of food production. It was observed that the failure of the less developed countries to use science and technology effectively in increasing production was a major factor in their lagging production.

It is generally recognized that increased yields can be achieved through the use of more productive varieties of plants, adequate supplies of water and plant food, improved cultural practices and a greater capacity to carry these out at the right time, the protection of the growing crop from pests and diseases, and the control of pests where grain is stored. Improved tools and mechanization can assist materially through better cultural practices.

Various possibilities for increasing the world's food supplies were considered. Among these were: the modernization of the livestock industry in less developed countries, the development of the world's fishery resources, improvement of the preservation, conservation and marketing of food from all sources to reduce the spoilage and waste which now occur, and the use of atomic energy in scientific research for the improvement of yields and the control of fungal and bacterial infection and insect pests. Likewise mentioned were major developments expected from research on non-conventional sources of food such as the production of protein concentrates from sources hitherto largely unused (for example, the production of yeast from carbohydrate-rich by-products of certain industries, such as the sugar and wood pulp and paper industries), mass cultures of algae, and the extraction of protein directly from green leaves, as well as the revolutionary effect on current food production

that may be expected to be exerted by a successful break-through in desalination of seawater.

It was felt that the realization of the large potentials for increasing food output (particularly in the less developed countries where the need for food increases is greatest) would require drastic changes in techniques, major capital investments and a far-reaching intensification and reorganization of agriculture.

Internal capital requirements of the agricultural sector will also clearly expand with the increase in population, probably faster than agricultural production itself. One contributor calculated that to attain a 3.5 per cent increase in agricultural production (of which 2.5 per cent covers the increase in population), agricultural investment would have to equal 22 per cent of the net agricultural product. Hence, an increase of 3.5 per cent (or more) places a heavy burden upon the agricultural income of a developing country. The capital/output ratio is generally higher in agriculture than in manufacturing or mining. A country that is predominantly agricultural thus faces an especially difficult task, since agriculture is expected to bear the cost of financing increases in both agricultural and non-agricultural production. Rapid population growth makes the problem of providing the needed capital even more difficult.

The need for raising the general level of education, for active government policies to stimulate increased production, for the modification in many instances of institutional arrangements such as land tenure to motivate cultivators to increase their productivity, the need for greater capital inputs such as fertilizers and pesticides and services such as research, agricultural extension, credit, transportation, food processing, storage and marketing, were also stressed.

In so far as the above prerequisites for increasing agricultural yields are concerned, it was noted that countries which were already ahead in the process of economic and social development had enjoyed an advantageous position.

The varying prospects for increasing agricultural production in different regions were assessed. According to FAO estimates, it may be feasible to secure an annual rate of increase in production of 1.75 per cent in the Far East by the application of improved techniques to existing agricultural land; 1.25 per cent in the Near East; 1 per cent in Latin America and 0.75 per cent in Africa.

Estimates were also made by the FAO of the positive effect of population growth itself

on production through increases in the agricultural labour force and other indirect consequences. These were put at 0.3 per cent for each 1 per cent rise in population growth in the Far East and Near East, and 0.7 per cent in Africa and Latin America. Clearly, these effects of technical progress and population growth are inadequate individually to offset increased needs; acting jointly with each other and making certain allowances for extra land brought into cultivation, food supply per capita should tend to rise, although too slowly.

The magnitude of the problem of population and food supplies was illustrated using India as an example. It was pointed out that although the bulk of additional production in the future would have to come from increased productivity of land, there was some scope for expanding the area under cultivation, partly by clearing and breaking waste land and partly by an expansion of double-cropping. The capital investments and improvements in methods are large. They include increasing the area under cultivation from 32 to 81 million hectares. The potential for contour bunding and terracing is estimated at 49 million hectares, of which only 1 million had been covered at the end of the second Five-year Plan. The widest possible use of fertilizer is considered to be the most important single factor for raising agricultural production, though water supply and the use of fertilizer are treated as complementary measures. The chemical control of pests and diseases is expected also to make a contribution of 10 to 15 per cent to increased production. It was therefore concluded that India's population faced the grim possibility of being condemned to a permanent state of under-nutrition and malnutrition, with attendant deterioration in labour productivity and the national economy. If this is to be avoided there must be vigorous action to increase agricultural production, to mechanize agricultural processes and to reduce the rate of population growth.

The different aspects of the problem of imbalances in the rates of growth of population and food production provoked varied reactions.

For example, one speaker expressed the view that population growth rates ought to correspond with the rates of growth of production of food-stuffs, implying a need to decrease the birth rate in order to slow down population increase. Other speakers, however, emphasized the necessity of developing agriculture and bringing food production into line with population growth.

It was observed that the problem of matching food production with the present rate of popu-

lation increase was a crucial one, and that many factors of a political and social character conspired to create an atmosphere inimical to economic development. Radical institutional changes, it was suggested, were required to eliminate the tenacious social and political obstacles to rural development. Against this background, what may be called involution rather than evolution tends to arise, and where such involutionary trends prevail, nothing less than revolutionary means can reverse the process. Another speaker pointed out that in dealing with issues such as the interrelationship of population and resources—involving human beings—simplistic solutions were almost invariably wrong. For example, remarks heard at an earlier meeting, which seemed to imply that the promotion of family planning was a kind of cheap alternative to economic and social development, neglected, to say the least, the key fact that development helped to provide the motivation for responsible family limitation. On the other hand, the idea that efforts to extend family planning have no utility until a high level of development is reached, neglects the other side of the interrelationship and the needs and rights of families in less developed countries. It was therefore emphasized that no analysis of the population-resources problem was adequate if it concentrated merely on the question of quantity and neglected the more basic issue of the quality of personal, family and social life. It was likewise averred that the problem of population growth was primarily a problem of organizing a life worthy of human beings and their dignity.

Some speakers focused attention on the grim consequences which mankind faces if present low levels of consumption and income and the deterioration of living standards should prevail, and made a plea for massive action on a broad front to bring into balance the world's resources and the world's population, including the breakdown of conventional attitudes towards certain foods. Citing the fall in the birth rate along with the acceleration of economic growth in his country, one participant suggested that economic development could be the most effective instrument for dealing with population growth.

The effects of simultaneous increases in rural and urban population in countries where food is produced partly for farm consumption and partly for sale to the urban sector by means of hired labour and other purchased imports were discussed. It was observed that massive gifts of food to countries of this type might prevent the population pressure from causing

any change in the sectoral terms of trade and thus prevent the intensification of agriculture. It was also stressed that the movement of food-stuffs, especially grains, whether through food aid or regular imports, from surplus-producing to deficit countries, dealt only marginally with the population problem. The solution to the problem of the world's need for increased food, it was suggested, lay within the countries where the deficits were greatest.

One speaker said that to regard food supply and population as competitors in a race was a fundamental error. In reality there was no single producer whose conscious motive was to win such a race. When food production got too far ahead, surpluses mounted, prices and incentives dropped. When population advanced it dragged food production along. In the United States, farmers invested resources in agriculture in response to price, against a background in which the Government was retiring 50 million acres of land from production. Incentives in developing countries may need to be interpreted in a wider sense than prices alone. The farmer's liability to share money with relatives, and the less ambitious horizons for the use of profit for purchase of goods and services must be taken into account. Attempts can be made to foster intensive methods by example, but they may go unheeded; debt repayment may act as a spur to production, but the effect may evaporate when the debt is repaid. Other incentives such as rewards in the form of prizes at fairs, or opportunities for higher education could be considered.

Another speaker considered that price incentives did substantially affect producers in developing countries in two ways: by affecting their capacity to purchase necessary inputs, and by giving them an incentive to use these inputs more intensely. Efforts must be made to ensure that the incentive reached the farm level even if demand on resources for other sectors did not permit all the income to reach the farmer. He stressed that optimism concerning the use of the price mechanism for adjusting food production and consumption in the context of population growth depended on the assumption that price elasticities for supply of food were large in relation to price elasticities of demand. He presented some casual and generally optimistic estimates of regional supply and demand elasticities, but stressed the almost complete lack of information on the supply elasticities for food as a whole and the need for further research.

The view was expressed by one speaker that

the calorie standards set by the FAO were too high. In support it was stated that if FAO standards were applied to calorie intake data from the National Nutrition Survey of Japan, one fourth of the Japanese population would be shown as hungry, which does not tally with the actual situation.

In reply, it was pointed out that the data excluded consumption outside the home. For instance, consumption of sugar fell far short of supply. Nearly all this supply was imported and accurate statistics were available. The evidence was therefore insufficient to establish any upward bias in the FAO calorie requirements. It was pointed out that the scale related to individuals leading a healthy and active life and did not define a subsistence level. The shortfall in calorie supply in India and China must be interpreted in this light.

Another speaker assessed the future of highly populated countries at various stages of development in the context of the benefits offered by technical progress and cited the great disadvantages faced by countries in the process of development. Those countries were cautioned against the temptation of abandoning their agriculture in favour of activities which gave a higher return—in so doing they would run the risk of giving up their independence while making the solution to the over-all problem of feeding the population more difficult. Another speaker stressed the fact that in some countries, particularly in Africa, under-population was as serious a problem as over-population, and insisted that still greater emphasis should be placed on the application of improved techniques in agriculture. Yet another speaker explained the apparent inconsistency of having to face under-production of food at high levels (and as a consequence, under-nutrition of humanity) in terms of the diverse states of equilibrium of the world agricultural economy, which all corresponded to low wages. He stressed therefore that the social and economic structure was the basic cause of under-nutrition and the slow pace of agricultural development.

Another speaker illustrated this point with reference to Latin America, where, he claimed, 1.5 per cent of the farms comprised 65 per cent of the agricultural area, and 16 per cent of the population consumed 50 per cent of the food produced. Another speaker illustrated the response of agricultural production to population growth in a socialist framework in the Ukraine. Scientific anticipation of requirements was possible once a high level of economic and cultural development had been achieved.

Finally, a speaker issued a word of caution concerning the comparison of rates of growth among demographic and agricultural data, on account of errors of observation, and pointed out possible pitfalls in the analysis of demographic and agricultural and related data.

The following speakers took part in the discussions: Barnett, Boserup, Bourlin, Cépède, Clark, Denis, Fagley, Das Gupta, Jones, Mashbits, Nagda, O'Heideain, Panse, Phillips, Schubnell, Sukhatme, Théodore, Valentei, Vincent, Wertheim, Zimmerman.

MEETING A.9

Demographic aspects of savings, investments, technological development and industrialization

Statement by the Moderator: Mr. J. FAALAND

Director of Research and Fellow of the Christian Michelsen Institute, Bergen, Norway

In discussing demographic aspects of savings, investments, technological development and industrialization, we are clearly interested in the relationships between demographic factors and economic growth and change. Our analysis at this meeting, however, is in a sense one step removed from economic growth; the demographic aspects of growth itself will be discussed at another meeting for which our discussion of demographic aspects of the strategic determinants and characteristic constituents of economic growth should provide a basis.

SAVINGS

There are considerable problems involved in choosing an appropriate method of analysis of the nature and extent of effects of demographic factors on savings. Realized (*ex post*) savings, their sources, volume and distribution, depend on a whole range of economic factors, including in particular the ways in which savings are in fact incorporated in investments. Investments, however, will be discussed at a later stage. Here we shall concentrate our attention on the forces that go to determine the capacity to save, the forces that affect the preference functions of individuals and families between consumption and savings, etc.

Since we are mainly concerned with the direct or immediate effects of demographic factors on savings, ours is, in a real sense, a partial and limited analysis. Clearly, changes in savings induced by demographic factors will in turn have effects on over-all product: its volume, composition and distribution, which again will influence savings. Such indirect effects — which clearly may be very important — are essentially outside our analytical framework. To take account of them would require a comprehensive, fully integrated model for the whole economy, reflecting the structure of the economy not only as it appears at a given point

of time, but as it would evolve in a setting of dynamic change. The fact that we shall not discuss these indirect relationships between demographic change and savings, precludes a meaningful analysis of long run effects. We must concentrate on the immediate and direct relationships.

The most important and interesting of these relationships, as they are brought out in the contributed papers, are as follows: the first proposition is that a larger population, in terms of sheer numbers, has a lower capacity to save than a smaller population, provided we compare economies for which a wide *ceteris paribus* assumption applies; in particular, that aggregate income levels are the same. Taking savings capacity more or less as a residual above basic consumption requirements, the larger population will then have proportionately lower per capita income, leaving capacity to generate savings correspondingly smaller. Given the static framework of analysis which we have adopted, this is a trivial finding on which no disagreement is reasonably possible.

It is argued in the literature, however, that savings cannot always be properly regarded only a residual — as the difference between income and consumption. Savings have functions of its own: to provide a cushion for fluctuating fortunes, to provide for retirement, to provide for expected heavy expenditures in the future, of both consumption and investment character. While this point should be granted, it is not altogether relevant for our concentration on what is conceived as the capacity to save.

Differences in age distribution and in dependency rates give rise to more interesting analysis. High dependency rates (reflecting in part the age distribution), it is argued, make for high consumption and thus for low savings. C. J. Martin of the International Bank for

Reconstruction and Development, in his paper discussing the situation in Africa, states that "Changes in the age composition of the population and its social structure can have as serious consequences for economic development as changes in absolute numbers or rates of growth.... The recent increase in the rate of population growth in Africa has not caused a population pressure problem as much as enlarging the proportion of children in the total population."¹

While there is no disagreement, it seems, on the importance of such factors as age distribution and dependency rates to the capacity of a community to save, there are a number of off-setting and complicating factors.

Consumption requirements are typically found to be smaller for children and retired people than for the population active in the production process. This is discussed in P. Demeny's background paper.² Qualitatively there is no disagreement on this point, but the actual quantification of the conservation ratio to adult consumption equivalents represents a difficult statistical problem.

It is argued in the literature that for important areas of consumption, it is the number of households rather than total population that counts. In any event, it is by now clearly established that consumption levels depend both on total numbers and on the size of family and household units in which the population lives. The picture derived from per capita consumption averages, therefore, is incomplete.

While this approach presents mainly statistical problems of measurement, some writers raise problems of a more conceptual nature. Basic consumption standards, it is argued, cannot be rigidly determined, either in terms of levels or of patterns of consumption. Both of these are changing over time: a meaningful minimum standard of consumption—defined in relation to savings capacity—tends to increase in its level and widen in its coverage, as the society's general level of income increases.

The suggestion is made in the literature that high rates of fertility, and thus a young population (which would mean a high dependency rate), reflect preferences for one type of consumption, namely enjoyment of the blessings of

many children, over other types of consumption, such as more spacious housing, better clothing, etc. This argument suggests, of course, that capacity to save need not be low even though per capita incomes are low. Per capita incomes may be low simply because the dependency rate is high as a result of high fertility rates, which again may be a reflection of a conscious preference in favour of large families as against improved material standards.

In this connexion, an interesting point is made in the paper by N. K. Choudhry and Y. Kotowitz.³ Discussing Canadian experience and prospects, they suggest that the type of savings is different in populations where dependency rates are high from that in populations where the children and the above sixty-five age group are smaller proportions of the total. On the basis of some material analysed by W. R. Waters, the authors point out that the savings pattern of large families reflects a (relative) preference for consumer durables, housing etc., relative to financial savings that can be channelled into risk-bearing entrepreneurial investments. They predict that the development of the population pyramid, as they see it for Canada, will lead to changes of this nature in savings patterns with concomitant detrimental results for the volume of savings available for productive investments. This savings pattern effect, if it operates at all, could clearly be even more pronounced in the economies of developing countries, where today the most marked demographic changes are taking place. Further research into the qualitative nature and quantitative impact of the age—distribution—induced savings pattern effect might yield important returns.

Demeny's background paper contains a most interesting account of how divergencies in income distribution are in some respects more important for savings in a community than per capita income levels. A distinction is made—and this is related to the point made in the preceding paragraph—between income accruing to the entrepreneurial groups, who save for expansion of business, and income to individuals and families, who save for retirement, for durable consumption purposes, for specific future needs of dependants, etc. Demeny discusses how demographic factors influence the distribution between these groups, as well as between high and low income groups, between traditional and modern sectors of the economy, etc., and how the resulting income distribution

¹ Cyril J. Martin, "Demographic aspects of capital formation in economies with large subsistence sectors (Africa)", *Proceedings*, vol. IV.

² Paul Demeny, "Demographic aspects of saving, investment, employment and productivity", *World Population Conference 1965*, background paper A.9/11/E/460.

³ N. K. Choudhry and Y. Kotowitz, "Some simple economic-demographic relationships—the Canadian experience", *Proceedings*, vol. IV.

again affects profits *versus* wages, and thereby savings.

He also refers to the demonstration effect which operates where incomes are unevenly distributed, and describes how the savings of the lower income groups may thereby be adversely affected. On the other hand, he also makes the point that the savings of the richer group may be stimulated by the existence of a large group of low income families, through what may be called a reverse demonstration effect, i.e., the reduction of consumption standards of the richer groups which may result from the existence of large groups whose incomes do not in any event allow them to keep up with the rich.

A. Mitra's paper emphasizes the need to take into account the rural-urban differentials in demographic trends.⁴ The author postulates that the rate of population growth (gross of migration) is higher in rural than in urban communities. Although this may be a generalization which is of doubtful accuracy in all circumstances, Mitra advances two main reasons in support of his contention. First, he makes the observation that in most countries per capita incomes are in fact lower in rural than in urban sectors. This fact, coupled with the generally observed inverse correlation between natural population growth and per capita income, suggests higher population growth rates in rural areas. Second, he draws attention to the longer time-lag for effective introduction of population control policies in rural than in urban communities. Although, of course, there are some offsetting factors, Mitra's conclusion that rural-urban differentials in demographic factors tend to make the savings rate in the rural economy considerably lower than in the urban sector can be accepted. Mr. Mitra adds to this the purported fact that the distribution of rural income tends to be more even than that of urban incomes, a fact which further mitigates against rural savings.

On the basis of his analysis and his reading of the factual situation—mainly as he finds it in India—Mitra concludes that rural, autonomous savings are so low, that in fact rural capital formation takes place largely by transfers (through government intervention) from other sectors of the economy. This conclusion may be questioned as a general proposition. In several developing countries today, the rural economy is not in fact consuming its own

product to the extent that he suggests. A good part of value added in agriculture is either saved autonomously in the rural economy or transferred to the modern sector through government policies of procurement of agricultural products at low prices, through protection of industries, through over-valued exchange rates, etc. However, it is only through such and other policies for more or less forcible creation and mobilization of rural savings that the agricultural sector can be made to contribute to the supply of investment resources to an appropriate extent.

Nevertheless, over-population may be conducive to accumulation in several ways. Over-population in the subsistence sector means low consumption standards and therefore tends to provide a source of labour at low wages for the growing modern sector. Demy's paper includes an interesting discussion of the conditions under which this holds, in particular the very limiting condition that expansion of the modern sector does not depend on the low income traditional sector as a market for its products. If the over-populated subsistence sector constitutes the major market outlet for the modern sector, however, the wage level may well be low in relation to the cost of other inputs, but not necessarily in relation to the price at which the product can be sold to the poor population constituting its market. In conditions where an expanding modern sector can sell its products mainly in foreign markets, however, rapid population growth with over-population in the subsistence sector may be conducive to rapid industrialization, to high levels of profit relative to wages, etc., and thus to high savings relative to average per capita income levels.

The assumptions underlying this thesis have, of course, been questioned. Governments do, in fact, intervene in the setting of returns to labour, less perhaps by fixing wage rates than by laws and regulations concerning housing and other conditions under which industrial enterprises are permitted to establish and operate; enterprises—and typically foreign investors—do not necessarily exploit fully the low opportunity costs of the labour they employ; for institutional, as well as personal and psychological reasons, the low marginal labour productivity in the over-populated subsistence economy is not fully reflected in the rates of wages at which labour is supplied to the modern sector. And, finally, if the rate of growth is or becomes high enough to approach the complete absorption of the increase in population in the subsistence sector, that sector can

⁴ Ashok Mitra, "The demographic aspects of capital formation. Differences between urban and rural populations", *Proceedings*, vol. IV.

only be further tapped for labour by means of higher inducements in terms of increasing wage rates, reflecting the rising marginal labour productivity in agriculture.

Among the multitude of other relationships between demographic factors and savings analysed or suggested in the contributed papers, reference may be made to a quantitative judgment expressed in the paper by Y. A. Sayigh on the situation in the Middle East.⁵ While recognizing the importance of rapid population growth as a check on the domestic savings potential of developing countries, Mr. Sayigh emphasizes that capital assistance from abroad is a more powerful instrument for augmenting the supplies of investable resources, than are population controls as an instrument for augmenting domestic savings capacity. On the basis of hypothetical, but not altogether improbable, volumes of capital assistance flows to the Middle East, and on an assumed capital-output ratio as high as 4 to 1, Sayigh concludes that: "Alone, this factor (of capital assistance) could almost entirely compensate for population growth." In any event, capital assistance "would contribute more (to capital formation) than an unlikely drop in population growth rate". Although no one could reasonably argue that population control and capital assistance should be viewed as alternative and not complementary policies to effect adequate supplies of investable resources, it is perhaps useful to have a sense of proportion as to the relative contribution that may be expected from measures of capital assistance and measures of population control.

INVESTMENTS

Investment is the embodiment of savings. Since the demographic aspects of the accumulation problem from the point of view of supplies of savings or of investable resources has already been discussed, this leaves the pattern of investments as influenced by demographic factors. The paper by P. M. Rabinovitz,⁶ however, is concerned neither with the level, nor the pattern of investment or income, but with the impact on population growth of the cyclical components of economic growth in market economies. This adds a needed dynamic element to the demographic analysis, which is potentially useful, although the author may perhaps have over-emphasized

this particular relationship in order to make his point.

The significance for economic growth of the pattern of investment, not only of the volume of investment, is evident. V. L. Urquidi, discussing the Latin American situation in his contributed paper, finds that the population problem requires — *inter alia* — changes in the pattern of investment providing for "increased resource allocation to non-active population, greater concern with structural maladjustments, chiefly rural over-population coupled with excessive urbanization, and with fuller industrialization".⁷ He draws the conclusion that "Population growth has a direct bearing on land and educational reforms, industrial development, housing programmes and methods, etc., and forcefully justifies development planning."

M. Macura in his contributed paper surveys the several ways in which the pattern of an effective development programme must be conditioned by the demographic situation and trends.⁸ Although in his paper the author casts his net much wider, his remarks are particularly relevant for the discussion of demographic determinants of the pattern of investments within a comprehensive development programme.

K. Bjerke makes the point that the needs for investments in the agricultural sector are not necessarily correspondingly reduced by out-migration of labour to other sectors.⁹ He describes in quantitative terms for the case of Denmark how, on the contrary, such migration has concided with and probably stimulated large-scale investments in agriculture. However, Bjerke's findings for Denmark may have little applicability to the situation in developing countries.

Two categories of effects of high population growth on patterns of investments are worthy of attention. In the first place, a more rapid population growth requires larger investments in social and economic overheads simply to maintain the same basic services and standards for the increased numbers. Such overhead investments, it is argued, have high capital-output ratios and, therefore, are relatively costly in terms of investment resources. Many of the social overhead investments thought of

⁷ Victor L. Urquidi, "Population growth and economic development in Latin America", *Proceedings*, vol. IV.

⁸ Miloš Macura, "Relation between demographic projections and formulation of a development programme", *Proceedings*, vol. IV.

⁹ Kjeld Bjerke, "The decrease in the Danish agricultural labour force, the increase in real capital and the effects on productivity", *Proceedings*, vol. IV.

⁵ Yusif A. Sayigh, "Population growth, capital formation and economic growth in the Middle East", *Proceedings*, vol. IV.

⁶ P. M. Rabinovitz, "Influence of economic cycles on the movement of population", *Proceedings*, vol. IV.

in this connexion have to do with size of population as such, not specifically with the age distribution of the population.

In the second place, however, the fact that a more rapidly growing population tends to have a different age distribution from that of a stationary or more slowly growing population, has distinct consequences for the pattern of investments. A series of expenditure items for the care and maintenance of children, retired people and other dependants are classified as investments. Depending on the extent to which the difference in the growth rate of populations reflects differences in mortality or in fertility, the patterns of investments in social overheads will also differ. It seems to be a fairly typical characteristic of most such overhead investments, however, that they exhibit high capital-output ratios. Hence, a demographic development towards higher dependency rates requires investment patterns relatively less efficient in terms of economic growth.

It should be added, however, that the characteristic of high capital-output ratios for overhead investments does not necessarily apply in all cases, at least not if a longer time horizon is considered. It may well be, for instance, that, in the long run, education—which would need to be expanded more rapidly in a rapidly growing and therefore young population than in a slower growing population—may in fact yield some of the highest returns on investments. Even granting this, however, the conclusion would seem warranted that in faster growing populations, relatively more investment resources must be devoted to investment purposes which yield small and slow returns in economic growth.

TECHNOLOGY

The contribution which most nearly presents a discussion of demographic aspects of technological development is the paper by H. Leibenstein.¹⁰ Technological development in an economy is expressed partly by changes in the structure of investments and production, and partly by changes in the methods of production which are applied within each line of production. As for the former, some of the important effects of demographic developments on the pattern and structure of capital formation and production have already been referred to. This leaves the effects of demographic developments on the growth of the modern sector as against the subsistence sector.

¹⁰ Harvey Leibenstein, "The impact of population growth on 'non-economic' determinants of economic growth", *Proceedings*, vol. IV.

Demographic developments may hinder or hasten the growth of the modern sector of a developing country: rapid population growth tends, for instance, to reduce the scope for capital accumulation generally, and also—as suggested by Choudhry and Kotowitz—tends to favour capital investments of a traditional character rather than more advanced and risky entrepreneurship; the traditional sector tends to remain a poor outlet for products of the modern sector, etc. Technological development, in other words, tends to be slow when population growth in developing countries is high, because a poor economy with stagnant or slowly rising per capita income is also a poor environment for the growth of those sectors of the economy which require modern techniques. This statement is nothing more than another formulation of the vicious circle of poverty: low productivity reflects backward technology and means low incomes; this, in turn, means that there is little scope for modern technology, which, in turn, means low productivity, and so on.

There are, of course, also some positive aspects of rapid population growth in relation to technological development and modernization of the economy. Increased population growth, when it reflects increased fertility, implies a younger population and therefore less weight for those groups that represent tradition and conservative attitudes to social and economic organization. The younger the population, the larger (relatively) is the group with education of some sort which may make them efficient operators in a modern production process.

As for the effects of demographic developments on methods of production within a given pattern of outputs, the general proposition runs as follows: rapid population growth keeps labour-to-land and labour-to-capital ratios relatively high throughout the economy, and also means that the modern sector has elastic supplies of cheap labour from the over-crowded urban populations and from the relatively overpopulated subsistence sector. This mitigates against advanced production methods, in particular those in which modern technology is embodied in the capital equipment itself.

The question of the effects of growth of population and of labour supply on methods of production and on technology must be treated with circumspection. As a general proposition, it is true, of course, that with a given stock of capital, higher rates of growth of population and of labour force in developing countries will—for the economy as a whole—tend to give lower capital-output ratios, since more labour will be associated with given increases in

capital stock. It is equally true that in these circumstances more labour intensive processes will be employed, where alternatives are, in fact, open to the *entrepreneurs*. But the scope for substitution of labour for capital in the production process seems to be relatively modest for most modern products. For given industries, *entrepreneurs* in the modern sector in developing countries, on the whole, seem to find that the technology developed in industrial countries is, in fact, the most suitable also in their own countries, in spite of the difference in relative scarcities of labour and capital. For example, the brewing of beer and ale is a capital intensive process in developed economies, and there seems to be no efficient labour intensive substitute process available for adoption in developing countries. Either one establishes a brewery along lines very similar to those developed in industrial countries, or one does not enter that industry at all. While activities associated with the brewing process, such as the cleaning of bottles, various transport services, etc., may, of course, be done by very different technologies in rich and poor countries, the central process itself runs along nearly identical technological lines, regardless of the relative scarcities of labour and capital. Modernization and industrialization in developing countries involves adoption rather than adaption of technology from industrialized countries. The differences in relative scarcities of labour and capital is reflected more in the pattern of development than in the technology actually applied in the modern sector.

While rapid population growth in developing countries on balance probably tends to weaken the scope and incentive for general introduction of modern technology, it does not make technological advance impossible. While the task of fostering technological development may be made more difficult by the rapid population growth, it is all the more important to strengthen and supplement the forces that nevertheless make advance possible.

INDUSTRIALIZATION

The emphasis to be given to industrialization in developing countries is subject to considerable controversy. This meeting is concerned only with the demographic aspects of that question, but even this is a large subject.

Going back one or two hundred years, the demographic argument for industrialization in Western Europe could be paraphrased in terms such as these: the scope for continuous and cumulative growth of output in the agricultural sector was limited in relation to the accelerating growth in populations. The then developing

countries of Western Europe could escape the bottleneck represented by relatively sluggish expansion in their own agriculture by exports of industrial products to other parts of the world in exchange for raw materials and foods. In other words, they could meet the structural imbalance in growth potentials in their economies by extensive foreign trade. It was feared, however, that this would only provide a temporary alleviation and a postponement of the day when the assumed intrinsic imbalance in agricultural versus industrial expansion would so seriously worsen the terms of trade of industry as to bring its expansion—and that of the economy as a whole—to a halt. As far as terms of trade goes, the boot was—apparently—on the other foot when compared to the disadvantage at which today's developing countries find themselves. The pessimists of yester-year used to argue further that the supplies of agricultural materials and products from distant lands would in fact vanish, as their populations expanded and—for one thing—gradually over-populated the arable land, leaving less and less of exportable surpluses, and—for another—they, in their turn, developed industrial production that would substitute for imports from Western Europe, and even tried to escape the agricultural bottleneck themselves by trading with other countries in competition with Western Europe.

These fears have so far been proved unwarranted and the projections have not been borne out by actual developments. In the countries of early industrialization, population growth has decelerated, agricultural output and productivity have increased spectacularly, technological advance in industry has drastically reduced the dependence on raw materials from agricultural and mineral sources, trade in industrial products and among industrial countries has proved to be increasingly advantageous, and even the market for industrial exports to developing countries has expanded tremendously.

For the late-comers in the development process, this experience has strongly suggested industrialization as the main strategy for meeting the challenge of providing a rising standard of living for a rapidly growing population. While this inference for development policy may be unjustified for a few developing countries, which still have (relatively) very high land-to-labour ratios, the conclusion seems plausible for a great many of today's developing countries. The market for primary products in developed countries expands, but only slowly, as a consequence of the low rate of growth of population, coupled with the advance of tech-

nology which is biased against such products. At the same time, exportable surpluses in developing countries may dwindle as a consequence of their own very rapid growth of population. So, while the terms of trade effect of these forces may or may not turn out to be unfavourable to agricultural products, the potential expansion of trade in primary products does not appear commensurate with the needs for imports of developing countries to support the rapid development of their economies, which they now seek to attain.

Looking into the future, existing population trends and present land-to-labour ratios strongly suggest that more, rather than fewer, de-

veloping countries will become net importers of food and other primary products, and exporters of manufactures. This does not mean, of course, that the demographic reasons for industrialization should be considered conclusive in all developing countries, or, indeed, that agricultural advance is not essential also in those countries which must depend on imports for some of their needs. But current demographic trends in developed and in developing countries certainly seem to suggest that rapid development of the industrial sector is a necessary, though not sufficient, condition of sustained economic growth in most developing countries today.

Statement by the Rapporteur: Mr. H. CORREA

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The interest in this topic arose not from the effects of demographic change on saving and investment as such, but from the fact that savings and investment were causal factors in the development process. Although there is no agreement among students of development about the exact role of saving and investment in the development process, it has become almost a professional convention to consider them of major importance. The absence of facts for testing the various theses of the relation of demographic factors to saving and investment was emphasized at the meeting, as was the point that even if these facts were available for certain conditions, they might not be transferable and applicable to others.

Attention was drawn to the greater pessimism of demographers and sociologists as compared with economists, and the importance of maintaining a scientific attitude in the study of demographic change in saving and investment. It was felt that the pessimistic view might not have a factual basis and experience was quoted as showing that such an attitude might bring about errors. The data available did not permit definitive conclusions. Reference was made to models showing the advantage of low population growth or lower birth rates. These models were considered by some to be unrealistic since they did not take into account, among other things, the investment required to achieve such a reduced birth rate or other demographic changes.

There was a wide consensus of agreement that high rates of population growth had detrimental effects on rates of saving and investment. Some of the papers presented and also

much of the discussion demonstrated the variety of interrelationships involved and the need to modify the conclusion of the background paper and of the Moderator's statement. This conclusion, in an extremely simplified form, can be stated as follows: rapid population growth and the dependency characteristics that go with it tend to reduce the rate of saving and investment and to create employment problems.

The experiences of Greece, Tunisia, Libya, Morocco, Algeria and countries in the ECAFE region were mentioned in support of this conclusion.

It was noted that rapid population growth would not increase the numbers of skilled persons entering the labour market and if the same fixed amount of resources was made available at different times, only the same absolute numbers could be trained. Since high population rates of growth could result in allocations to individual sectors being cut, the position could deteriorate even in absolute terms, while in relative terms it would become much worse.

It was observed that the relationship between savings and demographic trends was very complex. Only a small part of the population, it was stated in one submission, saved and a high rate of growth of total population had only a minor influence on this savers' group. This characteristic was especially valid in developing countries because savings came mainly from the capitalist sector of the economy and in this sector only from the small group which received profits. From this analysis it was deduced that the influence of demographic factors on savings could be exaggerated and a

statistical investigation was quoted in support of this point.

Reference was made to the fact that population is the least dynamic of the components of development and it was stated that it was important to invest in people, through education and improved qualifications, so as to obtain the highest efficiency. Reference was made to the action taken in the Soviet Union to achieve such results.

Some dissenting views were expressed. Examples were cited wherein estimates of capital/output ratios had been too high. Note was also made of the fact that marginal ratios were usually lower than average ratios. The point was made that reduction in population growth did not automatically bring better standards of living; such standards had to be obtained through radical change in the socio-economic structure. The value of making external resources available to the developing countries in the beginning of the development process was also stressed. It was stated that rapid population growth might bring about reduction of the capital/output ratio through economies of scale and by separating the cost of "invisibles". Rapid population growth could also be a great stimulus to enterprise in developing countries where enterprise was scarcer than capital. A recently completed analysis showed that population growth had in the past stimulated the rate of savings. It was observed that the bad effects of rapid population growth could be avoided by means of a wise investment policy. At the beginning of the development process, investment should go to industry and only later to social projects such as housing. However, education should be considered as a vital investment.

It was mentioned that the bad effects of rapid population growth on employment could

be avoided by increasing the number of jobs in the services sector and in industries which were capital-extensive. Errors were often made in the calculation of investment requirements through using too high capital/output ratios on the assumption that all employment increases were in capital-intensive industries. Such calculations could be misleading and estimates of total required investment were often too high.

An intervention on the subject of health services stated that economists often blamed the medical profession for having created the population explosion, which nullified the efforts to improve per capita income. It was postulated that this view was wrong and that the right kind of health services—those of a comprehensive type—were an asset to the orderly growth of the population and of the economy, and that studies in many developing countries showed that where medical assistance could be given on personal problems of family size, the other demographic and economic problems were alleviated.

In conclusion, a feeling emerged from the meeting that the decline in the rate of population growth, although of importance, was not the sole, or most important, variable in determining economic growth. The demographic phenomenon was one of many interrelated variables and at a Conference focusing attention on population problems, sight must not be lost of those other variables which under certain conditions were more critical than that of population change.

The following speakers took part in the discussion: Abad, Agapitidis, Benyoussef, M. Boserup, Choudhry, Clark, Daragan, Das Gupta, Gottlieb, Jones, Litvyakov, Mertens de Wilmars, Muhsam, Nagda, Pokshishevsky, Sinha, Wright, Yagodkin.

MEETING A.10

Demographic aspects of economic growth

Statement by the Moderator: Mr. Simon S. KUZNETS

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I

The effects of population growth and structure on the rate and structure of economic growth, and the reverse effects of economic growth on demographic processes, constitute a wide topic. The thirty-two papers contributed to this meeting represent a rich store of empirical findings, interpretative hypotheses and policy suggestions. However, this wealth of papers, ranging over a wide field, makes the moderator's task a difficult one. Within the time and space limits set, it is impossible to summarize these papers and do them justice. The only practical possibility is to seek to classify them in some meaningful way, and, in so doing, to try to convey their flavour, if not their content.

The classification may follow several criteria of distinction. First, there is the difference in the direction of effects considered—whether of population growth and structure on economic growth, or of economic growth and structure on population trends, as well as the more complex model of sequential interrelation of the two sets of effects. Next, there is the difference between general and often hypothetical formulations of the effects and empirical studies employing statistical data and tools. Within both the abstract formulations and the empirical studies, but especially in the latter, there may be significant differences in the time and space co-ordinates, so that the emphasis in some cases may be on earlier periods, whereas in others it is on recent years or decades; in some, the empirical data cover a variety of countries or regions, while in others they relate to a single country. There may be, of course, additional distinctions with respect to particular components of population or of economic growth whose effects are emphasized, or with respect to policy problems that originate in some specific effects that are emphasized.

Without elaborating further the complex matrix of cells that would result from cross-classification by combining the various criteria of distinction just suggested, I shall try to distribute the papers among the following wide groups.

The first group of papers deals with the broad formulation of effects of population on economic growth, or, conversely, of economic growth on population. The most general treatment is given in J. J. Spengler's paper, "Points of contact between the growth of population and the growth of national product".¹ This is followed by V. E. Ovsienko's paper, "Influence of social and economic factors on demographic characteristics",² and two volunteered papers, one by W. Brand, "Some observations on the relationship between population increase and economic growth",³ and the other by E. Garzouzi, "The effect of industrialization on population growth".⁴ Another volunteered paper, dealing with a specific but widely prevalent aspect of the general interrelation of population and economic growth, is that by R. A. Easterlin, "On swings in demographic and economic growth".⁵ Lastly, in view of the broad analytical bearing of the discussion, we may include here the paper by C. Clark, "The first stages of economic growth",⁶ a paper that ranges over the millennia of humanity's adjustments

¹ Joseph J. Spengler, "Points of contact between the growth of population and the growth of national product", *Proceedings*, vol. IV.

² V. E. Ovsienko, "Influence of social and economic factors on demographic characteristics", *Proceedings*, vol. IV.

³ Willem Brand, "Some observations on the relationship between population increase and economic growth", *Proceedings*, vol. IV.

⁴ Eva Garzouzi, "The effect of industrialization on population growth", *Proceedings*, vol. IV.

⁵ Richard A. Easterlin, "On swings in demographic and economic growth", *Proceedings*, vol. IV.

⁶ Colin Clark, "The first stages of economic growth", *Proceedings*, vol. IV.

to the slow shifts in food technology, reaching back to the hunting economy.

The second group comprises papers that deal, in a general way, with the problems of developing countries. This group includes the paper by F. Benko on "Economic progress, investment and population growth in developing countries";⁷ by L. Tabah on "Comparison of evaluations of capital requirements of developing countries";⁸ and by V. K. R. V. Rao on "Manpower planning and economic growth, with special reference to less developed countries".⁹ To these may be added the volunteered paper by M. Boserup, "The economic problem of the demographic explosion",¹⁰ that by Y. N. Guzevaty, "Modern Malthusianism and problems of social development of liberated countries",¹¹ and possibly also that of B. I. Braginsky, "Demographic factors in connexion with planning economic development",¹² although this last paper could, perhaps, be placed in the first, more general group.

Nineteen of the twenty remaining papers, excluding R. Horvath's bibliographical note on Kossuth's views,¹³ may be grouped by the type of economy emphasized. They deal either with market economies, mostly developed, or with countries designated as socialist, or with developing countries.

The group dealing with market economies comprises papers by J. Berent, "The impact of changes in the employment structure on the rate of economic growth, illustrated by post-war trends in Europe";¹⁴ by J. Fourastié on "Economic growth and the working population

in France since 1950";¹⁵ by W. Bickel on "Foreign workers and economic growth in Switzerland";¹⁶ and by G. Tagliacarne on "Repercussions of the economic situation on demographic movements in Italy",¹⁷ although this last paper deals only with short-term changes in both population and economy, rather than with growth aspects. Lastly, we should add the paper by J. Ros-Jimeno on "Population and economic development in Spain".¹⁸

The fourth group comprises papers dealing with socialist countries. Here the papers of wider scope are those volunteered by T. V. Ryabushkin, "Social and economic development and demographic processes in European socialist countries",¹⁹ and by W. Billig, "Population trends in the socialist countries".²⁰ The group also includes K. Romaniuk's paper, "The demographic aspects of economic growth in Poland",²¹ and that by G. A. Slesarev on demographic changes in a selected industrial area in the Soviet Union (the Gorky oblast).²² The remaining three papers are closely related to the next group, those on developing countries: T. A. Zhdanko and G. P. Vasilyeva on Central Asia and Kazakhstan,²³ O. R. Nazarevsky and D. A. Tchumichev on the Soviet Central Asian Republics,²⁴ and W. F. Wertheim on recent trends in mainland China's population policy.²⁵

The fifth and last group consists of seven papers dealing with the developing countries;

¹⁵ Jean Fourastié, "Economic growth and the working population in France since 1950", *Proceedings*, vol. IV.

¹⁶ Wilhelm Bickel, "Foreign workers and economic growth in Switzerland", *Proceedings*, vol. IV.

¹⁷ G. Tagliacarne, "Repercussions of the economic situation on demographic movements in Italy", *Proceedings*, vol. IV.

¹⁸ José Ros-Jimeno, "Population and economic development in Spain", *Proceedings*, vol. IV.

¹⁹ Timon V. Ryabushkin, "Social and economic development and demographic processes in European socialist countries", *Proceedings*, vol. IV.

²⁰ Wilhelm Billig, "Population trends in the socialist countries", *Proceedings*, vol. IV.

²¹ Kazimierz Romaniuk, "The demographic aspects of economic growth in Poland", *Proceedings*, vol. IV.

²² Gennadij A. Slesarev, "Demographic changes in an industrial area and their social significance", *Proceedings*, vol. IV.

²³ T. A. Zhdanko and G. P. Vasilyeva, "The influence of industrialization and urbanization on the way of living of the peoples of Central Asia and Kazakhstan", *Proceedings*, vol. IV.

²⁴ Oleg R. Nazarevsky and D. A. Tchumichev, "Demographic processes and their relationship with the processes of social and economic progress in the Soviet Republics of Central Asia", *Proceedings*, vol. IV.

²⁵ Willem F. Wertheim, "Recent trends in China's population policy", *Proceedings*, vol. IV.

⁷ François Benko, "Economic progress, investment and population growth in the developing countries", *Proceedings*, vol. IV.

⁸ Léon Tabah, "Capital requirements of the developing countries: a comparison of evaluations", *Proceedings*, vol. IV.

⁹ V. K. R. V. Rao, "Manpower planning and economic growth with special reference to less developed countries", *Proceedings*, vol. IV.

¹⁰ Mogens Boserup, "The economic problem of the demographic explosion. Some general reflections", *Proceedings*, vol. IV.

¹¹ Y. N. Guzevaty, "Modern Malthusianism and problems of social development of liberated countries", *Proceedings*, vol. IV.

¹² B. I. Braginsky, "Demographic factors in connexion with planning economic development", *Proceedings*, vol. IV.

¹³ Robert Horváth, "Kossuth's views on the interrelation of economic growth and demographic factors in his lectures at London University", *Proceedings*, vol. IV.

¹⁴ Jerzy Berent, "The impact of changes in the employment structure on the rate of economic growth, illustrated by post-war trends in Europe", *Proceedings*, vol. IV.

in a sense, this group is a supplement to the second, in which discussion is more general. There are three major regional surveys: J. A. Mayobre on Latin America,²⁶ A. A. Igun on Africa,²⁷ and S. Nagda on the ECAFE region.²⁸ There are also four papers on individual countries, all former French colonies or protectorates: by A. Assouline on Morocco,²⁹ by F. N. Agblemagnon on Togo,³⁰ by A. L. N'Diaye on Senegal,³¹ and by M. Seklani on Tunisia.³²

While the above classification accounts for all papers but one (at the cost of possible error in judgement), it tells only what the papers are about, not what they say. As already noted, a full summary is out of the question here; more important, it probably would not provide a proper basis for effective discussion of the major problems in the field. Numerous and valuable as the papers are, their coverage of the wide field is necessarily uneven. Even the most general papers, those in the first group, cannot come fully to grips with the variety of effects suggested by the complicated matrix of cells mentioned above, for which the required empirical basis is lacking. The more empirically oriented papers in the second and fifth groups, dealing with developing countries, stress the effects (most often inhibitive) of population growth on economic growth, whereas papers in the third group, dealing largely with developed market economies, and some of those in the fourth group, dealing with socialist countries, stress the effects of economic growth on population. This is only natural, since developing countries have not yet experienced modern economic growth; economically developed countries are less concerned with population pressure than with undesirable impacts of economic growth on demographic growth and differentials. An adequate basis still is lacking

for general consideration of major problems in the field in the light of past experience.

In view of the diverse scope and the uneven coverage of the papers presented, it seems advisable to narrow the focus of our attention, limiting it to demographic aspects of modern economic growth, largely since the early or middle nineteenth century; concentrating on long-term relations, thus disregarding the otherwise important ties that exist between short-term economic conjuncture and demographic processes; and, in general, emphasizing aspects of discussion in the papers that have a clear bearing upon problems for the proximate future. In thus narrowing the focus, we may regrettably lose the interesting content of some papers; but on the other hand, we may hopefully establish a basis for systematic discussion.

The comments that follow deal, first, with some general conclusions that may be derived from past experience with relations between population and economic growth; second, with the major problems that have emerged currently in the interrelations between population trends and economic growth; and, finally, with some general notions for consideration of policy alternatives that may be derived from the juxtaposition of past experience and current problems.

II

Our first task is to seek to indicate points of agreement concerning some general aspects of the relation between population growth and economic growth, bearing in mind that we deal with long-term relations—trends and not cycles—even if we allow for long swings in empirical implementation.

There was, and is, no invariant and significant direct effect of population increase on the rate of rise of per capita product, if the latter is the accepted measure of economic growth. At least this is the conclusion for the range of rates of population increase observed in the modern past. In some countries, high rates of population increase were accompanied by high rates of growth in per capita product; in others, low rates of population growth were associated with low rates of growth of per capita product; and in still others, low rates of population increase were combined with high rates of growth of per capita product. This diversity of relations is found in countries within both the developed and the less developed groups, although the developed group, as a whole, showed a higher rate of population increase than the rest of the world in the nineteenth and early twentieth centuries.

²⁶ José Antonio Mayobre, "Economic development and population growth in Latin America", *Proceedings*, vol. IV.

²⁷ Adenola A. Igun, "Demographic approach to the problems of social and economic development in Africa", *Proceedings*, vol. IV.

²⁸ Sohanlal Nagda, "Population growth and economic development in the ECAFE region", *Proceedings*, vol. IV.

²⁹ Albert Assouline, "Natural increase in population and economic development in Morocco", *Proceedings*, vol. IV.

³⁰ F. N'Sougan Agblemagnon, "Demographic aspects of economic growth: the case of Togo", *Proceedings*, vol. IV.

³¹ Amadou Lamine N'Diaye, "The difficulties of rapid population growth in an under-populated country. An example: Senegal", *Proceedings*, vol. IV.

³² Maimoud Seklani, "The cost of population growth under the Tunisian Development Plan (1962-1971)", *Proceedings*, vol. IV.

It follows from the above that the key implications of the rigid Malthusian theory (that a rise in population numbers would reduce per capita supply of means of subsistence and thus bring into operation the "positive" checks) has not been sustained by the long-term experience of societies since the late eighteenth century; nor is this surprising, considering the potential of technological change that became available and considering the variety of social institutions by which that potential could be exploited. Clearly, the variety of social and economic institutions and the changing stock of useful knowledge barred any invariant and significant direct effects of population increase on the rate of economic growth.

The absence of direct effects means only that both the mechanism by which population increase was attained and the economic and social conditions under which that increase occurred differed widely in time and space, so that the rise in numbers affected the growth of product per capita in various ways; it does not mean that population increases have no effect on per capita product. Under certain conditions, population increases have an expansive effect on per capita product; under other conditions, such increases have a depressive effect; much depends also on the magnitudes of the increases. In the general interdependence between population and economic parameters, changes in population numbers must have some effect; marked changes in the rate of population increase may constitute a problem, in the sense of requiring equally marked changes in the adjustment responses of economic and social institutions.

Current concern with the population "explosion", like concern with population "stagnation" some thirty-five years ago, stems from the problem raised by a marked shift in the rate of population increase; in this case, the shift was upward, and in many parts of the world it has reached high levels for which there is no parallel in the past and for which the existing patterns of social and individual behaviour may not provide an adequate response. Whether the problem lies in the possible adverse aggregative effects on per capita product (which is likely to be the case in less developed countries) or whether it lies in the differential impact on various components in the population (which is likely to be the case in more developed countries), a marked increase in the rate of population growth naturally leads one to ask whether resources of knowledge and patterns of usual behaviour are adequate. A similar question would arise if the rate of population growth declined sharply, particu-

larly if it meant sharp absolute declines in numbers. In both cases, adequate response means not merely the imaginative capacity to supply sustenance for a large population or to maintain productivity with much smaller numbers; it also means the perception of feasible alternatives whose costs can be weighed properly and whose attainment is within reasonable grasp of the populations involved, rather than the feats of derring-do performed by benevolent despots shaping docile populations at will.

The reverse effects of growth in per capita product and of associated shifts in economic structure on the rate and structure of population growth are also variable. Although some economically affected differentials (for example, rural-urban ones) are fairly general and persistent, a rise in per capita income does not lead directly and invariably to a reduction in death rates or to invariable effects on birth rates. Death rates can decline sharply, as they have done in many less developed countries in recent decades, despite persisting fairly low per capita incomes; they can also remain constant, as they did in many developed countries during much of the nineteenth century, despite rapidly rising per capita incomes. In recent years, birth rates in many developed countries rose while per capita income was rising sharply, whereas the opposite relation prevailed in these countries between the late eighteenthies and the late nineteenth-thirties.

Yet, like the effects of population growth on per capita product, the effects of economic growth on demographic processes must be wide and extensive. Broadly speaking, an advanced economy with high per capita product requires and imposes a demographic pattern in which the birth rate cannot be as high as those in many less developed countries today (or as high as those that were prevalent in the pre-industrial centuries) and in which the death rate must be at a low level commensurate with the required high standard of health. Variability in the effects is limited; it reflects the consequence of changes in health technology and conditions of life (independent of economic growth) on mortality and the influence of social and economic factors (still imperfectly understood) on fertility, over and beyond the direct effects of increasing per capita product and the associated changes in economic structure.

Two general observations concerning the relations between population and economic growth seem to be justified in the light of the summary above. First, these relations are clear and important when we deal with wide con-

trasts. Thus, unusual rates of population growth — high or low — must exercise various effects on the growth of per capita product, particularly on the structural mechanisms involved (internal migration, mobility, etc.); large upward or downward shifts in the rate of population growth pose serious problems for the proper adjustment of economic and social institutions. Likewise, the broad contrast between a country in the upper range of economically developed nations and one in the lower range of less developed nations must be accompanied by marked differences in demographic patterns. Variability in the relations thus falls within the limits of population growth rates that are not "unusual" and economic growth levels that are between the extremes of highly developed and quite under-developed countries. Yet for purposes of analysis relevant to policy, it is these limits and the variations within them that are important; it would be well to have some acceptable notions of the quantitative parameters and of their reliability for prediction and planning.

The other observation is that the looseness in the relations under discussion, although partly a reflection of our ignorance, may be a true indication of alternatives in adjustment and hence of a variety in the policy approaches that should be considered. If, in some circumstances, a high rate of population growth is compatible with a high rate of growth in per capita product and if, in other circumstances, the latter requires a low rate of population growth, the difference between the two sets of conditions may be subject to policy manipulation; policy choices may exist, therefore, between those bearing directly on population growth and those bearing directly on sources of growth of product. The implication can be seen clearly if we assume the opposite: if a rate of population growth over 2 per cent per year or under 0.2 per cent per year invariably is accompanied by low rates of growth in per capita product, the presumption is that in order to raise the latter, we must consider policies that would bring population increase within the range of 0.2 to 2 per cent per year; similarly, if a rate of growth of per capita income over 3 per cent per year invariably brings population increase to a standstill, the presumption is that if we wish population to grow, we must consider policies bearing directly on sources of growth. A genuine variability in relations means a greater variety of foci of policy impact.

III

Discussion of the relations between popula-

tion and economic growth, focusing on major questions or problems that loom in the immediate future, should be useful. In attempting to specify these, let us begin with the contrast between current and prospective rates of population growth in economically less developed countries compared with more developed regions of the world (see table 1).

Table 1, based on the United Nations *Provisional Report on World Population Prospects, as Assessed in 1963*,³³ extends the comparison only to 1980 and carries it back only to 1950. We know, however, that the projections beyond 1980 are likely to accentuate differences and that the greater rate of population growth in less developed countries in 1950 to 1960 is a new trend that began in the nineteen-thirties. The distinction between developed and less developed countries is fairly crude; some small, less developed areas (for instance, Albania) are included with developed countries and vice versa (for instance, Argentina is included among less developed areas). Of course, the range in per capita income within both the more and the less developed categories is wide. But these are minor qualifications of a broad theme.

Three findings suggested by table 1 deserve explicit emphasis. First, the rate of population increase was already much higher in less developed areas than in more developed areas during the decade of the nineteen-fifties (see column (2)), despite unusually high rates of increase, associated with recovery from the Second World War, in many developed countries. Since this excess of rates of population increase in less developed areas goes back to the late nineteen-thirties and extends into the nineteen-sixties, the rates of growth of population of working age and thus, presumably, of labour force seeking employment, are also much higher in less developed countries.

Second, if the birth and death rates prevalent during 1960 were to continue to 1980, the rate of population increase in developed areas would be somewhat lower than it was in the nineteen-fifties (compare columns (2) and (3), lines 1 to 4), whereas the rate of population growth in less developed countries, as well as in mainland China, would be distinctly higher than it was in the nineteen-fifties (see columns (2) and (3), lines 5 to 9). In other words, the population expansion of the nineteen-fifties was slowing down by 1960 in more developed coun-

³³ United Nations, *Provisional Report on World Population Prospects, as Assessed in 1963*, to be published as *World Population Prospects, as Assessed in 1963* (United Nations publication, Sales No.: 66.XIII.2).

tries, but it was showing signs of accelerating in less developed countries. Thus, any attempt to reduce the rate of population growth below that in the 1950 to 1960 decade would require a substantial reversal of ongoing trends in less developed countries, but only a continuation of the current trends in more developed countries.

Third, even if the low projection were to be realized in less developed countries and the high projection were to be realized in more developed countries, the rate of population increase for the former group (excluding mainland China) from 1960 to 1980 would be 25 per cent per decade (column (6), line 9) and for the latter group it would be only 12.6 per cent per decade (column (4), line 4); even under this unrealistic, extreme assumption, the excess of population growth would be greater in 1960 to 1980 than it was in 1950 to 1960. If we use the more realistic medium assumption for both groups, the excess of the projected rate for less developed countries over that for more developed countries, 27.7 per cent over 10.3 per cent, would be absolutely and relatively far greater than it was in the nineteen-fifties.

It follows that any attempt to narrow the per capita product disparities between more and less developed countries in the proximate future will face the additional handicap of the much higher rates of population growth in less developed areas and, in general, the problem of the absolutely high rate of population increase that will be accentuated in less developed areas. One should note that even the developed areas with the most rapidly growing populations (North America, Australia and New Zealand in line 3) show rates well below those of any large less developed area (lines 5 to 8).

M. Boserup's interesting paper recommends emphasis on the effects of population "explosion" on savings and capital formation, rather than on agricultural food supplies or on adequate employment opportunities for the growing population.³⁴ But one may suggest that since the share of the agricultural sector is large in most less developed countries, greater productivity in agriculture is a prerequisite for generating an adequate flow of savings and capital formation; while the food supply is not specifically at issue, the productivity of agriculture (the usual food source) is. One may also argue that unless the role of employment as a source of income and as a basis of acceptable position in society changes

somehow, adequate employment opportunities are indispensable for the population, even disregarding the obvious fact that labour is a resource whose utilization must be explicitly considered and whose training must be evaluated as both complement and alternative to material capital formation. On the other hand, the impact of a higher rate of population growth on savings may not be too important in view of the rather small savings fractions required to finance capital formation. It would seem to be safer to consider the varied effects of population explosion in the less developed countries. These effects include the need to increase agricultural productivity and food supply, to provide adequate employment opportunities for the growing labour force, to supply savings for capital formation and, perhaps even more important, to instill in the population the confidence that, under existing social institutions, having fewer children would assure better training and a richer future for these offspring than continuing the traditionally high birth rate.

The structural aspects of these problems, particularly as stated in J. A. Mayobre's paper,³⁵ should be noted explicitly. A high rate of total population increase usually means a high rate of natural increase of the agricultural population which is perhaps higher than that of the non-agricultural population. Given the usual status of agriculture in less developed countries, this means increasing pressure of population on land and under certain conditions, it means a movement toward the cities created by a "push" off the land, rather than by a "pull" of clearly available adequate employment opportunities in the cities. Although the resulting urban slums may provide a better level of living and more hope than the stagnant country-side provides, the social and political problems thus created cannot be gainsaid.

In the case of more developed countries, two aspects of current and prospective demographic trends deserve mention because of their bearing upon economic growth and their implications. The first aspect relates to differential fertility and is illustrated with data for the United States in table 2. In general, family income and number of children ever born are inversely correlated for every significant age group of wives within the child-bearing cycle. The median income of families with more children under eighteen years old than model values of three for urban areas and four for rural areas is far below the peak; in general, per capita income is lower for families with more children.

³⁴ Mogens Boserup, "The economic problem of the demographic explosion. Some general reflections", *Proceedings*, vol. IV.

³⁵ José Antonio Mayobre, "Economic development and population growth in Latin America", *Proceedings*, vol. IV.

This association with family income differentials reflects partly the rural-urban and the occupational differentials in fertility, but this fact does not make these differentials less real. V. E. Ovsienko, in his paper on the Soviet Union,³⁶ suggests the same results in a table giving the distribution of families with differing numbers of children by industry and occupational status of family head (in so far as per capita income in the *kolkhoz* is likely to be lower than in urban pursuits, where per capita income is likely to be lower among manual workers than among white collar workers).

The indicated greater fertility of the lower income groups and the large proportion of the younger generation originating within lower-income families suggest the problem of assuring a large proportion of the future adult population and labour force of living and educational opportunities which will be adequate to the projected demands of economic growth. This problem is difficult because the educational and mental requirements associated with new growth industries are constantly rising and because the formal educational, social and training institutions face a particularly heavy task when family conditions of the younger generation do not provide the interest and motivation or the supplementary training that are so much a part of life for higher-income parents with more education. In view of the increasing emphasis on greater investment in human capital as a prerequisite for modern economic growth, it is sobering to realize that even the more developed countries face a serious problem in overcoming the effects of greater concentration of the next generation in the lower income groups. Efforts that have been made in some developed countries to improve the distribution of educational facilities, to reduce the number of school drop-outs and to establish training and re-training programmes are clear evidence of concern regarding the possible impact of this demographic pattern on the acceptable level and structure of economic growth.

The second aspect of demographic patterns of developed countries is the increased proportions of groups above working age. Z. Vávra's paper for Meeting A.4,³⁷ "Future population trends and prospects", indicates that in developed areas the proportion of persons sixty-five years and older to total population (which was eighty-three per 1,000 in 1960) will rise

to 109 per 1,000 in 1980, whereas the proportions in less developed areas are thirty-three per thousand and will be forty per thousand, respectively.³⁸ The proportions of the groups aged fifteen to sixty-four (referred to as the "working") will remain approximately the same (650 per thousand in 1960 and 637 per thousand in 1980) and the ratios of aged to people in working ages will rise from 13 per cent to 17 per cent. Since working life starts several years after age fifteen in more developed countries, it is likely that the aged will be 20 per cent or more of the total working age population by 1980.

The need for adequate provisions for this increasing proportion of the population (of which a large fraction is economically dependent) has been a matter of increasing concern in many developed countries. Even more important, from the standpoint of economic growth, is the effective utilization of this large experienced population group in activities satisfactory both to the persons concerned and to the societies in which they live. While the age of entry into the labour force was raised in the course of modern economic growth by the requirements of longer education and training, the concomitant lowering of retirement age and the improvement in health standards which extended the life span brought about a form of disguised unemployment (in addition, of course, to genuine "unemployability") that represents a waste of valuable resources.

IV

The comments above suggest the current and prospective demographic trends that seem most likely to present economic growth problems in both developing and developed countries. Before considering the bearing on policy, we should note that the "problems" exist because substantial rises in per capita product in developing countries and equality of economic and social opportunities in developed countries are viewed as desirable goals. If, for some reason, population growth in developing countries were considered desirable (even at the expense of rises in per capita product) or if equality of opportunity within developed countries were not a major aim, these problems would disappear, in the sense that the demographic trends noted would not constitute obstacles to desirable goals. This obvious comment must be made explicitly in order to stress

³⁶ V. E. Ovsienko, "Influence of social and economic factors on demographic characteristics", *Proceedings*, vol. IV.

³⁷ Zdeněk Vávra, "Projection of world population (distinguishing more developed and less developed areas at present)", *Proceedings*, vol. II.

³⁸ *Ibid*, table 2. The developed areas are defined in Mr. Vávra's paper as they are in table 1 of this paper, except that temperate South America (largely Argentina) has been added. The 1980 figures are, presumably, for the "medium" projection, although no explicit indication is given.

the importance of specifying desirable goals, which implies consideration and possible choice of alternative goals; the latter, while disposing of one set of problems, would probably give rise to another, with its own bearing on policies.

Even if we accept the goals and recognize the problems as stated, consideration of policies must begin by our asking whether the demographic trends are serious obstacles to desirable goals in economic growth. Is the acceleration of population increase in developing countries the major obstacle to an adequate rate of increase in per capita product in the proximate future, as distinct from the much longer run that would permit a postponement of active policy consideration? Or are other, perhaps weightier, impediments, such as social and political structure or the system of beliefs, more dominant in this proximate future, so that (all other conditions being equal) policy consideration ought to emphasize these other obstacles which are assumed to be policy-susceptible, rather than the population trends? Clearly, this question involves an attempt to gauge the relative impact of various immediate, policy-susceptible obstacles to a sustained rise in per capita product; and obviously, the answer would not only be difficult, but it would differ from one developing country to another. Likewise, one may ask whether differential rates of natural increase, favouring the lower income groups, are the major source of inequality of economic opportunities within developed countries or whether other, more important, policy-susceptible factors make such inequality. This question, too, might be answered differently for different developed countries. The important point here is to recognize that population trends are only one of numerous sources of "problems", that is, of possible obstacles to economic growth; policy considerations of problems presumably originating in population trends must begin with an attempt to gauge the relative importance of these and other obstacles to economic growth. This obvious comment also must be stated explicitly because reserves for policy changes are always limited, both in the supply of people who can carry out such policies and in the tolerance of the population for policy effects and changes; concentration on one set of problems, in this case demographic, should not limit our attention and vision to these problems alone.

Next, if we conclude that demographic trends constitute a serious problem which creates major obstacles to economic growth in the proximate future, consideration of policies directed at these trends must weigh the costs of policy alternatives, including the alternative

of not trying to change these trends directly. Cost considerations are clearly crucial; obviously, these costs would differ for various types of population policy, for various countries, for various estimates of the magnitude of the growth obstacle that the policies are intended to remove or to reduce.

The cost-return argument prevents simple and dogmatic answers to policy questions raised by what seem to be major problems involved in current and prospective demographic trends. Will the higher rate of population growth for 1960 to 1980 in less developed countries cause a lower per capita income or a lower rate of growth either to 1980 or beyond, lower than those that might be realized with a lower rate of population increase? The answer would be clear if the lower rate of population increase could be attained at no cost, that is, with no effort and no adverse effect on productivity. But this assumption prejudices the answer and cannot be accepted. We must specify how the lower rate of population increase is to be attained, so that we can evaluate the costs and implications. If this result is to be achieved by policies aimed at lowering the birth rate while keeping the death rate low, the question could be re-phrased: will the resources devoted to lowering the birth rate produce a higher rate of growth of per capita product than their use elsewhere in the economy? The answer involves evaluating comparative returns on similar costs; for many less developed countries with plentiful natural resources or with populations resistant to modifying their birth patterns, it may be more expeditious to devote the inputs to uses other than reducing the birth rate. Even in the densely populated less developed countries, where retardation of population growth clearly is desirable to permit a higher per capita product, consideration may have to be given to returns relative to costs, a point that is involved in the very consideration of comparative effects of higher versus lower rates of population increase: the argument still may favour inputs into material capital formation and education, rather than into measures to control the birth rate directly, because the effects of the former are more far-reaching and their impact on changes in values would make the population receptive to the modern view of family planning. Yet in many developing countries, family planning may prove to be, within limited range, a high return-low cost policy.

Similar questions concerning specific ways in which demographic trends affect growth of per capita product and other aspects of economic growth apply to developed countries.

Differential fertility, which results in a high proportion of the new generation originating in low income families, may pose special problems if wide-spread economic progress is to be

attained. Even so, it is not clear that the advantages of greater economic and social mobility will not outweigh the presumptive disadvantages, as they apparently have done

Table 1. Projections of population to 1980, major world areas

	1960 population (millions) (1)	1950 to 1960 (2)	Decennial rate of growth (per cent)			
			Projections from 1960 to 1980			
			Current trends continued (3)	High (4)	Medium (5)	Low (6)

<i>More developed countries</i>						
1. Northern, Western, and Southern Europe	327.8	8.1	7.7	7.0	5.6	4.3
2. Soviet Union and Eastern Europe	311.3	16.0	14.9	15.1	12.1	10.4
3. North America, Australia, and New Zealand	211.4	20.0	17.0	17.8	15.0	12.1
4. All developed countries (lines 1 to 3 and Japan)....	943.7	13.6	12.5	12.6	10.3	8.4
<i>Less developed countries</i>						
5. Asia (excluding Japan, mainland China, South-west Asia; including other Oceania)	852.1	22.6	28.6	27.7	26.0	23.6
6. Middle East (South-west Asia and Northern Africa)	125.0	27.8	32.5	32.5	32.1	29.6
7. Sub-Saharan Africa	206.9	22.5	28.3	29.2	27.0	24.8
8. Latin America	212.4	30.8	35.0	34.3	32.6	28.7
9. All less developed countries, excluding mainland China (lines 5 to 8)	1,396.4	24.3	29.9	29.4	27.7	25.1
10. Mainland China	650 (686)	16.1 (22.5)	19.9	22.5	13.9	9.2
11. World (lines 4, 9 and 10 combined)	2,990 (3036)	18.9	22.5	23.6	19.5	16.7

SOURCES: all calculations are from United Nations, *Provisional Report on World Population Prospects, as Assessed in 1963* (ST/SOA/SER.R/7), to be published as *World Population Prospects, as Assessed in 1963* (United Nations publication, Sales No.: 66.XIII.2).

Notes: column 3 is based on a projection of the growth of population if fertility were to continue at the levels observed in 1960 (or according to the latest available data) and if mortality were to go on decreasing at the average rates that prevailed in the nineteen-fifties in different parts of the world (see *Provisional Report on World Population Prospects, as Assessed in 1963*, p. 40).

High, medium and low assumptions (column 4 to 6) differ largely in the assumed initiation of decline in fertility (most prompt in "low", most delayed in "high").

Entries in parentheses in lines 10 to 11, column 1, reflect the higher estimate of population of mainland China in 1960 implied in the high projection in column 4, line 10.

in the past, once proper education and training are provided. In other words, policies aimed directly at reducing differential fertility may be far more costly in the long run than those aimed at overcoming an undesirable effect such as restricted opportunities for too large a proportion of the younger generation.

If our discussion is to serve as a guide to policy consideration, it must examine critically the impacts on economic growth of the demographic trends noted above relative to other possible obstacles to economic growth, scrutinize the costs of various policies compared with their returns in reducing inhibitive effects on economic growth and consider the likely

differences among countries in the relative weight of demographic trends as growth obstacles and the no less likely differences in relative costs of alternative policy lines of action. So long as attention to these important aspects of policy choice does not serve as an excuse for inaction, in itself a policy commitment, there is much to be gained from an attempt to consider them specifically for given countries at given times, rather than resorting to a general dogma that either views population growth as the overwhelming threat or takes for granted man's capacity to provide for growing population at satisfactorily increasing levels of per capita product.

Table 2. Number of children ever born, per one thousand married women, grouped by age and family income, and median family income, groups of families by number of children under eighteen

Age in 1960; family income (money only) for 1959; totals							
A. Family money income							
Age of wife	Less than \$2,000 (1)	\$2,000 to \$3,999 (2)	\$4,000 to \$6,999 (3)	\$7,000 to \$9,999 (4)	\$10,000 and over (5)	All (6)	
20 to 24							
1. Number of wives	281	812	1,553	532	144	3,321	
2. Children per 1,000 wives ..	1,785	1,622	1,486	1,055	1,017	1,455	
25 to 29							
3. Number of wives	250	720	2,031	991	389	4,381	
4. Children per 1,000 wives ...	2,931	2,614	2,323	1,934	1,743	2,266	
30 to 34							
5. Number of wives	272	660	2,091	1,298	723	5,044	
6. Children per 1,000 wives ...	3,568	3,088	2,713	2,412	2,296	2,671	
35 to 39							
7. Number of wives	291	621	1,970	1,430	1,019	5,331	
8. Children per 1,000 wives ...	3,620	3,149	2,765	2,515	2,438	2,727	
40 to 44							
9. Number of wives	292	560	1,557	1,253	1,109	4,771	
10. Children per 1,000 wives ...	3,392	2,978	2,601	2,442	2,411	2,608	
B. Families with number of children under eighteen							
Median income (in dollars)	None (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)	6 and over (7)
11. All families	5,023	5,534	5,832	5,793	5,365	5,048	4,141
12. Urban	5,547	5,862	6,046	5,958	5,575	5,542	4,805
13. Rural non-farm ...	4,558	5,372	5,848	5,936	5,571	5,081	4,265
14. Rural farm	2,466	2,840	3,328	3,346	3,096	(2,600)	2,109

SOURCES: lines 1 to 10: United States Government, *Census of Population, 1960*, Report PC (2)-3A (Washington, 1964), table 38, pp. 187-198; lines 11 to 14: United States Bureau of the Census, *Technical Paper*, No. 8 (Washington, 1963), table 5, pp. 114 ff. In line 14, the entry for families with five children was interpolated by the movement in 1958.

Statement by the Rapporteur: Mr. A. M. Djamchid BEHNAM

Professor of Demography, University of Teheran, Teheran

[Translated from French]

The purpose of this meeting was to study the demographic aspects of economic development and the interrelationships between economic and demographic factors.

The problem of the interaction between these two sets of factors is of special interest to the entire world and particularly to the developing countries at a time when the population is increasing at an alarming rate in many countries and there is a widespread desire for improved standards of living.

Now that the once inflexible "cycle of life and death" has been brought under a measure of control, will the increase in the number of human beings impede the rapid economic growth of the developing countries? Must demographic factors be regarded as paramount or do these factors rarely have a significant effect on economic well-being and progress?

Since the subject is a very broad one, the debate at this meeting focused on general ideas regarding these interactions and, as the Chairman pointed out, the discussions were closely linked to those held during the Conference on other questions, such as capital formation, investment, manpower and agricultural development.

The meeting began with the report of the moderator, who, after classifying in five groups the thirty-two documents before the meeting, suggested that the discussion should be limited to the demographic aspects of economic growth in modern times and their long-term effects.

The moderator observed that the experience of the recent past does not show a clear parallelism between population growth and the growth of per capita national product; indeed, the relationship is sometimes an inverse one, just the opposite. While the growth of national product depends in part on population growth, it is influenced by a number of other factors as well. Moreover, although the growth of national product may affect certain demographic characteristics, the important part played by other elements cannot be denied. Everything depends on the level of development and the social and economic conditions characteristic of the country in question.

The second part of the Moderator's report dealt with the various aspects of the interaction of economic and demographic factors in the developing and the advanced countries. It analysed recent data on population growth rates,

projections and the relationship between family income and number of children.

The Moderator then discussed non-economic problems and the cost of dealing with them. Finally, he stressed that if a realistic and relevant policy was to be formulated it was essential to define its goals.

The Moderator's report served as a basis for discussion of the following two topics:

(a) The effects of the rate of population growth and of population structure on individual production and economic development prospects under the economic and demographic conditions prevailing in certain countries;

(b) The problems created by efforts to overcome demographic obstacles to the achievement of the goals of economic development; factors relating to institutions and to organization; the prospects for the success of these efforts under the conditions prevailing in certain countries.

In discussing the first topic, a number of speakers drew attention to the way in which demographic factors can influence economic factors and per capita product. They noted that population growth is a major obstacle to economic development in several parts of the world. In the developing countries, the high rate of population growth is depriving the development effort of the benefit of a considerable part of national savings and capital goods, since these must be used to maintain per capita product at a constant level.

A serious failure of production growth to keep pace with population growth is already apparent in several parts of the world, and if there is to be genuine economic development, population growth cannot be treated as a phenomenon over which human beings have no control.

In the view of other experts, population growth is not an obstacle to economic development and the problem of achieving a balance between the population and the economy should be approached from an economic standpoint.

Some speakers, rejecting the Malthusian theory, sought to demonstrate that history has failed to justify its pessimistic predictions. They noted that the increase in the world's population in the past few centuries has been accompanied by rising levels of culture and material well-being.

Economic and social progress, they held, is by no means incompatible with population growth. This is confirmed by the experience of the industrialized countries in particular, which have attained a high level of development even as their populations have increased.

In the developing countries, where in most cases the level of technological development is low at present and the available capital is clearly insufficient, the problem lies in the fact that the rate of population growth greatly exceeds that of production growth. That situation is the result of a general economic backwardness attributable to certain specific social conditions which can be corrected only through drastic agrarian reform and the establishment of national industry.

Thus, according to these speakers, a solution should not be sought in an artificial reduction in the birth rate. Economic development is always determined by economic and social conditions, and rapid economic expansion can go hand in hand with population growth.

They noted that statistics show a general rise in per capita national income during the period 1950-1959, even though it was a period of population growth. Other data show that the rate of growth of total national income has exceeded that of population growth.

Another group of speakers stressed the importance of social, cultural and institutional variables and the need to find means of measuring them.

A number of speakers discussed possible policy approaches, emphasizing the conditions necessary for the implementation of a population policy and laying particular stress on psychological factors.

Finally, several speakers described the application of certain policies designed to deal with the demographic aspects of economic growth; the examples of China, India, Romania and Czechoslovakia were cited.

Some speakers took a theoretical approach, without considering specific local conditions, while others were influenced by the requirements of their own national problems. Thus, the need to differentiate among geographical, social and cultural environments and levels of development in formulating solutions to these problems was once again brought out. The United Nations Secretariat's inquiry among Governments concerning the reciprocal action of economic development and population changes, to which speakers frequently re-

ferred in the course of the debate, also emphasizes this difference in approach.

The replies of a number of Governments of developing countries reflect considerable uneasiness over the accelerating rate of increase of their populations, which they regard as a serious obstacle to economic and social development. Some Governments even doubt that it will be possible to achieve satisfactory progress in the near future if population growth continues at the present high rate. Others observe that although income has increased substantially in recent years, there has been little increase in average per capita income because of the rapid growth of the population. The replies of Governments of advanced countries show less concern over the economic problems resulting from the growth of their populations than do those of a number of the developing countries.

Because of the broad scope of the subject, it was not possible to arrive at specific conclusions, but the main points made in the course of the debate can be summarized as follows:

(a) Much remains to be learned about the relationship between demographic and economic trends, and specialists in this problem continue to differ widely on the subject.

(b) More work must be done in the field of statistics if we are to improve our knowledge of the relationship between demographic and economic changes, particularly in the developing countries.

(c) In studying the interaction of economic and demographic factors, it is essential to take psychological, social and cultural factors into consideration. Work must be done along these lines.

(d) Present population policies differ both in terms of the relative importance attached to demographic and economic solutions and in the light of the particular problems raised by each of these approaches.

The Chairman referred, in a concluding statement to the respective views of the pessimists and the optimists with regard to the relationship between economic and demographic factors. It has been said, he noted, that the difference between a pessimist and an optimist is that one feels that night follows day and the other feels that day follows night, whereas in fact night and day succeed each other.

Let us hope, he said, that the future will enable us to be among the optimists and to achieve the balance between economic and demographic factors which is so earnestly desired and sought.

CLOSING SESSION

Friday, 10 September 1965

The final meeting of the Conference was held immediately after meeting A-12. Mr. Ante Novak, Chairman of the Yugoslav Arrangements Committee, was the first speaker and made the following statement.

Mr. Chairman, ladies and gentlemen, comrades—allow me to address you at the end of the second World Population Conference in the name of the Yugoslav Local Arrangements Committee and to congratulate you on the remarkable success of the Conference.

This success must undoubtedly be attributed to the careful preparation and work of the various bodies of the United Nations, the International Union for the Scientific Study of Population and above all the Preparatory Committee which, under the chairmanship of Mr. Benjamin, accomplished its task in such an excellent manner.

As you know, it was with great pleasure that Yugoslavia accepted the resolution of the United Nations concurring with the proposal of the Yugoslav Government to hold the Conference in Belgrade. I trust that the participants in this Conference are persuaded that the idea which led us to organize the Conference in Belgrade was justified.

Our means are modest but we have done all in our power to facilitate the work of the Conference and to make the stay of our many guests in Yugoslavia as agreeable as possible. As occurs with every organization, and with us also, certain minor misunderstandings and difficulties cropped up. I must apologize to you all, while hoping that they are already forgotten, for you have given evidence of your complete understanding of our many difficulties.

Above all, I wish to express my deepest gratitude to our colleagues of the United Nations and above all to Mr. Durand and Mr. Dilwali, and to Miss Constance Rhodes, who helped us with the greatest tact to overcome certain difficulties in connexion with the organization and work of the Conference by means of certain improvised solutions which perhaps did not in every case create the best working conditions. I thank them all and, at the same time, all those who gave us much useful advice and assistance which greatly helped our Committee in the performance of

its duties and also other Yugoslav bodies which had to carry out many complicated tasks in connexion with the work of the Conference and the arrangements connected therewith.

While conveying to you the best wishes for your future work in the demographic sciences and their application from the Yugoslav authorities and public who desire wholeheartedly that the United Nations will in future give its full attention to population questions, I am glad to be in a position to inform you that the work of the Conference has aroused the greatest interest in my country, and was followed by the most careful attention. The television, radio and press gave much time and space to the work of the Conference. The arguments and opinions expressed during the Conference have been the subject of lively discussion throughout Yugoslavia.

Such a wide diffusion of the subject is of the highest value and will doubtless have a great influence on the positive development of theoretical research and the practical application of the demographic sciences in my country.

Many relationships, that already existed, have become strengthened and new ones have been formed. All this will certainly contribute to fruitful discussion in the future, the exchange of opinions, and co-operation in seeking solutions for the problems that have been discussed here.

This leads me to express my great pleasure that the Conference should have fulfilled its task with such great success and I sincerely trust that all participants will long cherish a pleasant memory of their sojourn in Yugoslavia, and of the success of this Conference.

My deepest thanks to all for their kind understanding and cordial co-operation. In wishing you once again much success in your future work, allow me to conclude with those Serbo-Croat words already known to nearly all of you: Sretan put i dovidjenja! God speed to you all and may we meet again.

The Chairman then called upon Mr. John D. Durand, Representative of the Secretary-General, who spoke as follows.

Mr. President, ladies and gentlemen, I should like first to give you some information which I think will be of interest, about the registration returns.

As expected, the number of registrations has increased considerably since the opening day of the Conference, when Miss Henderson gave you preliminary figures. Although the final total may still be subject to some slight adjustment in the course of checking of the records, we can now see that the number of participants having attended the Conference is approximately 815 (not including twenty observers). This is nearly twice as many as attended the first World Population Conference in Rome in 1954. Since the increase of the world population in the meantime has probably not exceeded 25 per cent, the difference can be read as one of the signs of increased interest and concern with population problems and increased activity in demography and related fields of study.

The number of countries represented is eighty-eight and this, too, is somewhat more than the number represented at the Rome Conference; seventy-four countries, including non-self-governing territories, were identified in the list of participants who attended the Conference in Rome.

A comparison between the classifications of participants by major regions of the world for the 1954 conference and the present one shows a large increase in participation from every region. The increase in the number from Asian countries is most impressive; 148 participants in the present conference as against fifty-seven in 1954. For Africa, fifty-six were registered at the present conference, and this is approximately twice the number who came from Africa to the Rome Conference. The ratio of increase is similar for Latin America: thirty-seven participants in 1954, sixty-seven at present. The total for Northern America (USA and Canada) is 166 at the present Conference, again approximately double the number in 1954. For Europe together with the USSR, we have about 300 participants in this conference as against about 200 in 1954.

Of course, the success of the Conference cannot be measured merely by the number of participants. In fact, from one point of view, the large number of persons in attendance may have been a handicap to the present Conference, in so far as it has inhibited free exchange of views in the course of the discussions. Perhaps we have been getting some experience here

with the problems of over-population. But in spite of this, we trust that each of you has gained something of positive value for your work from the papers and discussions and from your association during the last two weeks with colleagues from different parts of the world. The full measure of the success of the Conference will be what it adds over a period of years in the future, to the strength and impetus of efforts devoted to the collection of basic demographic data, the extension of research frontiers, and the development of action programmes to cope with population problems. In these terms, it is our hope that the returns will well repay the investments of your time and efforts, and of the resources contributed by the collaborating organizations to this great project.

The scientific and technical documentation contributed for the Conference is undoubtedly a major part of its achievement, and in this connexion I should like to tell you briefly what are our plans for publications. A brief, non-technical summary of highlights of the Conference is planned to be published within a few months in several languages, for broad international distribution. The proceedings are to be issued in three volumes which we hope to make available about one year hence. The first of the three volumes, to be published in four languages, will contain the statements of the moderators and rapporteurs, the list of participants, conference programme, and other information about the Conference in general. The other two volumes, to be published in three languages, will contain the invited papers and possibly also, if the limitation of funds permits it, a few of the volunteered papers for some of the meetings. The format of the publication will be more compact than that of the 1954 conference proceedings, and we hope that the delay of publication will be considerably shorter.

Mr. President, since Mr. de Seynes and Miss Henderson have been called away by other duties, the honour and pleasure now devolve on me to say a few words of appreciation on behalf of the Secretary-General of the United Nations and the executive heads of the five specialized agencies which have co-operated in this Conference. In their names, I thank all of you who have come to Belgrade to attend these meetings as well as those who could not attend but who contributed papers or took part in the planning of the meetings. We are especially indebted to the organizers for the major work which they have done in

the course of the last three years, making plans for the meetings and obtaining the co-operation of contributors of invited papers; to the moderators, whose performance of their difficult and delicate tasks has been an outstanding feature of the meetings; and to the rapporteurs, thanks to whose Trojan efforts we have been provided a resumé of the main points in the discussions at all the meetings, before the end of the Conference.

I also wish to express our gratitude to our colleagues of the International Union for the Scientific Study of Population, who have given us their generous assistance and support in many aspects of the Conference work since the preparation began three years ago. It was our good fortune that Professor Glass was serving as President of the Union during the period of the preparatory work, and I wish to thank him warmly for the generous way in which he has given us the benefit of his knowledge and wisdom as an adviser and collaborator. Our special thanks are due also to Mr. Benjamin, whose sure hand guided the Preparatory Committee through its last three sessions, and who never stinted his attention to our requests for advice and assistance during the intervals between the sessions; to Mr. Stassart, the weight of whose duties as Administrative Director of the Union was doubled, I am sure, by our continual demands; and to Mr. Notestein, whose work as Chairman of the Union's Finance Committee for the Conference was a key factor in the breadth of participation, particularly of experts from the developing countries.

We offer our thanks to you, Mr. President, and to the vice-presidents and the other members of the Steering Committee, especially for the trouble you have taken to evaluate the plans and arrangements for this Conference in the light of the experience of the last two weeks.

A brief statement was also made on behalf of the International Union for the Scientific Study of Population by Mr. Frank Lorimer (United Kingdom).

Mr. President—it would be a little complicated for you to report on the International Union in your capacity as its President to yourself in your capacity as President of the Conference. Therefore, I am honoured to speak in your place.

The International Union for the Scientific Study of Population is not an honorary society. It is the working association of demographers throughout the world. Its membership involves a certain ritual, but is open to all who are seriously concerned with population studies. There are now 740 members from sixty-eight

The Steering Committee's advice on these matters will be highly valuable for the planning of other conferences of this kind in the future.

Above all, we wish to express our heartfelt gratitude to our Yugoslavian hosts, in particular to Mr. Novak, Mr. Sercic, and their staff of the Local Arrangements Committee, who have made prodigious efforts to provide for our needs and to make our stay in Belgrade an enjoyable experience (including on the whole admirable arrangements for the weather) and to Mr. Macura and his staff of the Federal Institute of Statistics, who have given us solid and steadfast material and technical support in this project since its inception.

At this point, if I may insert a word on behalf of my colleagues in the United Nations Secretariat who have taken part in the preparatory works during the last three years, and in the provision of services during the Conference, I wish to record our deep appreciation of the devoted and tireless work of our Conference Secretary, Mr. Dilwali. It is on his capable shoulders that the major work of this vast project has been carried, and he deserves our heartfelt thanks and congratulations for a job so well done.

Mr. President, it has been mentioned that the long-range programme of work of the United Nations in the population field includes a provision for World Population Conferences to be held in the future at ten-year intervals. Those of us in the Secretariat who can count on a ten-year expectation of continuing service to the United Nations will look forward hopefully to seeing many of the present participants and offering them services again at the third World Population Conference, about the year 1975. On their behalf and my own, I thank you all and bid you farewell and *bon voyage* on your homeward journeys.

countries in all regions: North and South America, Eastern and Western Europe, Asia and Africa. It keeps demographers informed through four periodicals about progress in this field. It has five commissions on different technical problems.

The Union has always been happy to co-operate with the United Nations. The first World Population Conference was organized by the United Nations in response to a request by the Union. In arrangements for this conference, it has offered its services in nominating individual scientists from many countries, in-

cluding China, Outer Mongolia, and various regions in Africa. It obtained special financial contributions from foundations, governments and individuals, so that it could extend needed assistance to 240 participants, mostly from the less developed countries.

There is a general consensus that Belgrade has offered a most felicitous *milieu* for our meeting. There is also a general consensus that the Conference has been a memorable and valuable experience. It registers a notable advance during the past decade in mutual

understanding in this field among persons of different political and religious orientations, both with respect to the urgency of the problems with which we are concerned and with respect to their complexity.

During our sessions we have received a shocking reminder that mankind has not yet achieved the wisdom required for the rational solution of conflicting interests. But the Conference has proceeded in the spirit of peace. It has, I believe, made a positive contribution, within one special field, toward the establishment of a rational world order.

Mr. W. D. Borrie (Australia) made a statement on behalf of the participants and proposed the following vote of thanks, which was adopted by the Conference.

The participants in the second World Population Conference held under the auspices of the United Nations in Belgrade, Yugoslavia, from 30 August to 10 September 1965 wish to express their deep appreciation and gratitude to the United Nations and the specialized agencies which have collaborated in the Conference, to the International Union for the Scientific Study of Population, and to the Governments, Organizations and individuals

who have assisted in the preparation, conduct and financing of the Conference. They wish to thank particularly the Government of Yugoslavia for inviting the United Nations to hold the Conference in Belgrade and for providing such generous facilities. The participants also wish to express their gratitude to chairmen, moderators, rapporteurs, organizers, and the interpreters who contributed so much to the success of each working session.

Finally, the President of the Conference, Mr. Dolfe Vogelnik, addressed the Conference, and closed the Conference with the following statement.

Our conference is going to its end.

To the many thanks that have been given and exchanged between the organizers and participants of this big gathering I have to add my personal thanks to all who have helped me in performing my duties of the President of the Conference. I owe my special gratitude to Mr. Durand and the Secretariat and to Mr. Novak and his staff. In fact I did not have very much to do. I had to watch the general course of the conference and try to remain in touch with it. I have been glad from each day to the next one of stating that there was nothing or almost nothing that would necessitate my intervention. So smoothly the whole mechanism was previewed and organized. And this is the special merit of both: the organizers of the Conference and the high spirit of all the participants, inspired only by their aims of exchanging their scientific views and through this exchange and discussions coming a little nearer to what we call—perhaps in somewhat ambitious way and by big words—the truth.

Now—besides and in addition to joining his personal thanks to the over-all ones, what is expected to be the duty of the President in his concluding statement?

Should he try to give a summary of the excellent summaries that we could hear yesterday and this morning from the rapporteurs of all the meetings? To give a kind of a general evaluation of the results of the Conference?

I may perhaps disappoint you in not trying to do this, and by two special reasons. First of all, I think it would be too much asking one person—and too ambitious of the person in accepting such a demand to give an over-all scientific appreciation of the results of a Conference that covered such a wide field of problems and displayed such a richness of facts, thoughts and opinions as did this World Population Conference.

And secondly, in my thinking, the full appreciation of the fruits of a conference of this kind, of a world scientific conference, could be possibly given only at a far more remote distance when the new ideas that the Conference has stimulated, will have their time to penetrate into what we could perhaps call universal scientific treasury of our knowledge on population and settle there as a permanent contribution to it.

Such a consideration does not mean that I should not try to express some general

thoughts connected with the issues of the Conference. I am giving them exclusively as my personal feelings—some of them may find a more or less general consensus of the participants of the Conference.

My first thought—that most probably will meet general acceptance—is that the Conference showed very clearly that during the last eleven years since the first World Population Conference in Rome in 1954 has taken place—a significant progress in our knowledge of demographic phenomena has been accomplished.

This Conference, through its results and their final scientific appreciation, will represent a vigorous stimulus to the expansion of demographic knowledge over many areas of the world and stimulate the further development not only of the science of demography, but of related economic and social sciences as well.

The advancements of our knowledge of population phenomena and the stress that was given through this conference to the importance of such a knowledge for a better understanding of the economic and social development, will be—I am convinced—of real help to the Governments of the countries throughout the world in shaping their development programmes and in implementing them.

Secondly, I would share the feeling of many participants that the views on some important demographic problems are getting closer and the differences smaller. I think that this statement, if it holds, is a consequence of the development of demography as a science and can be regarded even as a test, that our science has reached a level where certain facts, tendencies, trends and relationships have been firmly established and cannot be doubted upon.

Thirdly, there are differences that in fact are not really existing differences. They are the expression of misunderstandings in terminology, definitions, techniques of measuring that are not yet standardized and specified in the degree as to exclude misinterpretations. I think that a great deal of our common efforts in the future should be used in this direction.

Close in connexion with this category of differences I would put the differences that are, I would say, a necessary consequence of the existing gaps in our knowledge of facts. We simply do not know enough of many pheno-

mena that we are speaking about. We are often inclined to generalizations to conceal by them our ignorance, and to generalizations that are not allowed since they are concealing the real differences in institutional background, in social, economic and cultural characteristics of demographic phenomena we are observing. Our world we are living in is far too complex that we could bring everything to a common denominator. Only impartial and objective examination of the facts based on sound theory or working hypothesis will help lessening the danger of too hasty generalizations.

There are of course differences—and this is my last remark—differences in theoretical interpretation of population phenomena that result from quite different methodological approaches and from different working hypotheses of the very nature of the facts and trends we are investigating.

I do not think that we should be very unhappy of differences of this kind. They are the very motor that pushes the never resting and always wrestling human mind forwards. The road towards the truth is not broad and even and pleasant to walk on; it is stony, steep and winding. It is only through clashes of different and even contradictory thoughts and ideas and their verifications and condemnations by the facts that we can hope to move forward, step by step.

Now, the differences which necessarily appear between the men of science and their ideas in their common search for truth, are not differences—as I believe—that are dividing them. The search for truth corresponds to what is the most precious and human in the mens nature, and all what is human, never divides the humanity; it always binds it closer together.

And the feeling that the common search for truth that for ten days governed the spirits, the talks and discussions in these rooms, has brought us closer together and learned us to respect and appreciate each others view, I think, is not one of the least important results of our World Population Conference.

May I be permitted to conclude with this idea in mind the final statement of the President of the World Population Conference in Belgrade. I wish to all of you many success in your further scientific work.

ANNEXES

A. Officers of the Conference and members of committees

PRESIDENT OF THE CONFERENCE

Professor Dolfe Vogelnik (Yugoslavia).

VICE PRESIDENTS

Dr. M. Tachi (Japan);
Mr. Thomas Curtis (Guinea);
Prof. Victor Urquidi (Mexico);
Mrs. Irene Taeuber (United States of America);
Dr. V. E. Ovsienko (Union of Soviet Socialist Republics);
Prof. S. Somogyi (Italy).

PREPARATORY COMMITTEE

International Labour Organisation:

Mr. K. Penniment;
Mr. James N. Ypsilantis.

Food and Agriculture Organization of the United Nations:

Mr. P. V. Sukhatme;
Mr. Joseph L. Orr.

International Bank for Reconstruction and Development and International Development Association:

Mr. E. López-Herrarte;
Mr. C. J. Martin;
Mr. John Adler.

United Nations Educational, Scientific and Cultural Organization:

Mr. B. A. Liu;
Mr. J. Vershys;
Mr. J. W. Kappel;
Mr. N. G. Varkados.

World Health Organization:

Dr. W. P. D. Logan;
Dr. M. Grais.

International Union for the Scientific Study of Population:

Mr. Bernard Benjamin;
Mr. D. V. Glass;
Mr. E. Grebenik;
Mr. Dudley Kirk;
Mr. Alfred Sauvy;
Mr. Joseph Stassart;
Mr. Jean Bourgeois-Pichat;
Mr. M. Croze.

Regional Experts invited by the Secretary-General:

Mr. Ajit Das Gupta;
Mr. Milos Macura;
Miss Carmen Miró;
Mr. Peter G. Podyachikh;
Mr. Hanna Rizk.

The Secretary General was represented by Mr. John D. Durand, Assistant Director, Bureau of Social Affairs, in charge of the Population Branch. Mr. C. K. Dilwali acted as Secretary of the Committee.

YUGOSLAV LOCAL ARRANGEMENTS COMMITTEE

Mr. Ante Novak;
Mr. Milos Sercic;
Mr. Dusan Breznik.

SPECIAL FINANCE COMMITTEE OF THE INTERNATIONAL UNION FOR SCIENTIFIC STUDY OF POPULATION

Chairman:

Mr. Frank Notistein (USA).

Members:

Mr. Fredrick H. Osborn (USA);
Mr. Yuzo Morita (Japan);
Mr. Hans Harmsen (Federal Republic of Germany);
Mr. Fernand Randhuin (Belgium);
Mr. Pierre Depoid (France);
Mr. Marcello Boldrini (Italy);
Mr. A. Arca Parro (Perú);
Dr. Aly el Gritly (UAR).

STEERING COMMITTEE

President of the Conference:

Mr. Dolfe Vogelnik (Yugoslavia).

Vice-Presidents of the Conference:

Mr. Minoru Tachi (Japan);
Mr. Thomas Curtis (Guinea);
Mr. Victor Urquidi (Mexico);
Mrs. Irene Taeuber (USA);
Mr. V. E. Ovsienko (USSR);
Mr. S. Somogyi (Italy).

Government of Yugoslavia:

Mr. Ante Novak;
Mr. Milos Sercic;
Mr. Dusan Breznik.

International Union for the Scientific Study of Population:

Mr. Bernard Benjamin (UK);
Mr. David V. Glass (UK);
Mr. E. Grebenik (UK);
Mr. Dudley Kirk (USA);
Mr. Alfred Sauvy (France);
Mr. Joseph Stassart (Belgium).

International Labour Organisation:

Mr. James N. Ypsilantis.

Food and Agricultural Organization:

Mr. P. V. Sukhatme.

United Nations Educational, Scientific and Cultural Organization:

Mr. N. G. Varkados.

World Health Organization:

Dr. W. P. D. Logan.

International Bank for Reconstruction and Development:

Mr. John H. Adler.

Regional Experts:

Mr. Ajit Das Gupta (India);

Mr. Miloš Macura (Yugoslavia);

Miss Carmen Miró (Panama);

Mr. P. G. Podyachikh (USSR);

Mr. Hanna Rizk (UAR).

United Nations: Representatives of the Secretary-General:

Mr. Philippe de Seynes;

Miss Julia Henderson;

Mr. John D. Durand.

Secretary of the Conference:

Mr. C. K. Dilwali.

CONFERENCE OFFICERS

<i>Meeting</i>	<i>Organizer</i>	<i>Moderator</i>	<i>Rapporteur</i>	<i>Chairman</i>
A.1. Fertility	V. G. Valaoras (Greece)	R. Freedman (USA)	M. El-Badry (UN)	D. V. Glass (UK)
A.2. Mortality	B. Benjamin (UK)	B. Pirc (Yugoslavia)	J. Somoza (UN)	D. Breznik (Yugoslavia)
A.3. Internal migration	A. Neiva (Brazil)	D. J. Bogue (USA)	K. C. Zachariah (India)	Dorothy S. Thomas (USA)
A.4. Future population	M. Tachi (Japan)	Irene B. Taeuber (USA)	R. Bachi (Israel)	R. Pressat (France)
A.5. Manpower	F. Blanchard (ILO)	J. Sadie (South Africa)	J. Harewood (Trinidad)	P. F. Myers (USA)
A.6. Education	J. Arias (Guatemala)	J. Idenburg (Netherlands)	E. Solomon (UNESCO)	B. A. Liu (USA)
A.7. Agriculture	P. V. Sukhatme (FAO)	C. Taeuber (USA)	B. Bantegui (Philippines)	V. E. Ovsienko (USSR)
A.8. Urban development	P. George (France)	N. V. Sovani (India)	Hope Eldridge (USA)	A. Mitra (India)
A.9. Savings, investments, etc. ..	J. H. Adler (IBRD)	J. Faaland (Norway)	H. Correa (UNESCO)	H. Leibenstein (USA)
A.10. Economic growth	A. Sauvy (France)	S. Kuznets (USA)	A. M. D. Behnam (Iran)	T. V. Ryabushkin (USSR)

	<i>Organizing Chairmen</i>	<i>Rapporteurs</i>
A.11. Plenary summary ...	J. Mertens de Wilmars (Belgium)	UN staff
A.12. Plenary summary ...	P. G. Podyachikh (USSR)	UN staff

<i>Meeting</i>	<i>Organizer</i>	<i>Moderator</i>	<i>Rapporteur</i>	<i>Chairman</i>
B.1. Fertility-high fertility areas	H. Rizk (UAR)	G. W. Roberts (Jamaica)	K. Dandekar (India)	Carmen Miró (Panama)

CONFERENCE OFFICERS (*continued*)

<i>Meeting</i>	<i>Organizer</i>	<i>Moderator</i>	<i>Rapporteur</i>	<i>Chairman</i>
B.2. Fertility-low fertility areas	F. W. Notestein (USA)	B. Colombo (Italy)	M. Muramatsu (Japan)	A. Klinger (Hungary)
B.3. Mortality, morbidity	W. P. D. Logan (WHO)	M. Aubenque (France)	Tye Cho Yook (Malaysia)	H. Behm Rosas (Chile)
B.4. Projections, size, age, etc	H. Hyrenius (Sweden)	H. S. Shryock (USA)	P. R. Cox (UK)	V. Urquidi (Mexico)
B.5. Projections, urban, rural, etc. . .	B. Bendiksen (Norway)	H. V. Muhsam (Israel)	P. C. Glick (USA)	V. Bourlin (USSR)
B.6. New methods of data collection	F. E. Linder (USA)	W. Brass (UK)	C. A. L. Myburgh (Rhodesia)	E. Omaboe (Ghana)
B.7. New developments of method, etc.	J. Bourgeois-Pichat (France)	N. Keyfitz (Canada)	S. Kono (Japan)	A. J. Coale (USA)
B.8. Promotion of research and training	C. Chandrasekaran (India)	D. Kirk (USA) A. Y. Boyarsky (USSR)	T. Montenegro (Brazil)	A. M. N. El-Shafei (UAR)
B.9. International migration	K. T. de Graft-Johnson (Ghana)	W. D. Borrie (Australia)	A. Oblath (ILO)	N. Ahmed (Pakistan)
B.10. Resources	H. L. Keenleyside (Canada)	E. Ackerman (USA)	S. Han (Yugoslavia)	D. Valentei (USSR)
B.11. Definition and measurement of active population . .	M. Macura (Yugoslavia)	A. Das Gupta (India)	L. Herberger (F. R. Germany)	H. E. Riley (ILO)
B.12. Genetics	R. L. Kirk (WHO)	C. Stern (USA)	W. J. Schull (USA)	L. D. Sanghvi (India)
B.13. Family planning . .	W. P. Mauldin (USA)	J. Morsa (Belgium)	You Poh Seng (Malaysia)	H. M. Husein (UAR)

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