ST/ESA/SER.A/81

Department of International Economic and Social Affairs
POPULATION STUDIES, No. 81

Manual X

INDIRECT TECHNIQUES FOR DEMOGRAPHIC ESTIMATION

A collaboration of the Population Division of the Department of International Economic and Social Affairs of the United Nations Secretariat with the Committee on Population and Demography of the National Research Council, United States National Academy of Sciences

UNITED NATIONS

New York, 1983

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The printing of this volume was made possible by a publication grant from the United Nations Fund for Population Activities

ST/ESA/SER.A/81

UNITED NATIONS PUBLICATION

Sales No. E.83.XIII.2

03200

FOREWORD

The Population Division of the Department of International Economic and Social Affairs of the United Nations has been concerned with the measurement of demographic phenomena for over 30 years. The research programme of the Division has been designed to improve the collection, analysis and understanding of demographic trends and policies; and its analytical studies on mortality, fertility, urbanization and population structure have been widely used by both Governments and scholars.

A series of technical manuals has also been published by the Population Division, describing methods of demographic analysis and demographic estimates and projections needed for the purposes of economic and social policies. These manuals deal with methods of estimating total population for current dates, appraising the quality of basic data for population estimates, projecting population by sex and age, estimating basic demographic measures from incomplete data, projecting the economically active population, measuring internal migration, and projecting households and families. The most recent manuals are *Manual VIII: Methods for Projections of Urban and Rural Population*[1] *and Manual IX: The Methodology of Measuring the Impact of Family Planning Programmes on Fertility.*[2]

In the 1960s, many Governments became increasingly aware of the implications of the unprecedented population trends for economic and social development and began to consider policies designed to moderate population growth. However, adequate demographic data, especially in developing countries, were lacking. Recognizing that there was a serious gap between the quantitative information about populations and the amount and quality of data actually available, the Population Commission, at its twelfth session in 1963, recommended that a manual be prepared on methods of estimating fundamental demographic measures from incomplete data, since it was apparent that there was a need for a manual that would make it possible for a demographer/statistician to derive the maximum of reliable information from data in a census or demographic survey. At the request of the United Nations, Ansley J. Coale and Paul Demeny, with the assistance of R. D. Esten, Erna Härm and S. B. Mukherjee, prepared *Manual IV: Methods of Estimating Basic Demographic Measures from Incomplete Data,*[3] which was published in 1967. Its importance and usefulness were quickly recognized by demographers and statisticians throughout the world. *Manual IV* was reprinted in 1969 and 1978 to accommodate the many requests.

Since the publication of *Manual IV*, a number of new techniques for estimating fertility and mortality levels and trends have been developed and many of the earlier methods have been refined. At its nineteenth session in 1977, the Population Commission recommended that *Manual IV* be revised to take into account the advances in methodology and the changes in the demographic situation in recent years.[4] Since such a revision was already under way through a project initiated by the Committee on Population and Demography of the Assembly of Behavioral and Social Sciences of the National Research Council, United States National Academy of Sciences, it was decided that the recommendations of the Population Commission would be best served by joint efforts to develop the present manual.

The Committee on Population and Demography was established in April 1977 under the Assembly of Behavioral and Social Sciences of the National Research Council. Funded by the United States Agency for International Development, the Committee has undertaken three major tasks: (*a*) to evaluate available evidence and prepare estimates of levels and trends of fertility and mortality in selected developing countries; (*b*) to improve the technologies for estimating fertility and mortality when only incomplete or inadequate data exist (including techniques of data collection); and (*c*) to evaluate the factors determining the changes in birth rates in developing countries.

The Committee approached the first task through careful assessment, by internal and external comparison; and through analysis, by application of the most reliable methods known, of all the data sources available. Each of the country studies undertaken therefore consisted of the application of a range of methods to a number of data sets. Best estimates of levels and recent trends were then developed on the grounds of their consistency and plausibility, and the robustness of the individual methods from which they were derived. Several country reports on levels and trends of fertility and mortality have been published.[5]

The Committee's second task, refinement of methodology, was seen as a by-product of achieving the first. The application of particular methods to many different data sets from different countries and referring to different time periods would inevitably provide valuable information about the practical functioning of the

[1] United Nations publication, Sales No. E.74.XIII.3.

[2] United Nations publication, Sales No. E.78.XIII.8.

[3] United Nations publication, Sales No. E.67.XIII.2.

[4] *Official Records of the Economic and Social Council, Sixty-second Session, Supplement No. 4*, para. 186.

[5] Available from the National Academy Press, 2101 Constitution Avenue, N.W., Washington, D.C. 20418, United States of America.

methods themselves. Particular data sets might also require the development of new methodology or the refinement of existing techniques.

Manual X has its origins in the first task of the Committee on Population and Demography, but it has grown to include the presentation of the methodological developments resulting from the Committee's work on its second task. When the Committee was first considering the establishment of panels to prepare country studies, it recognized that much of the valuable methodological work carried out in the preceding decade was widely scattered through technical publications which were difficult to obtain. To facilitate the panel's estimation work, the Committee decided that it would be useful to have a manual of the most up-to-date analytical methods. As the work of the Committee progressed, several new methods were developed and a number of existing methods were refined. In view of the United Nations work in this area, it was decided that the manual, rather than being a mere tool in the preparation of country studies, should become an up-to-date comprehensive demographic estimation manual to be developed with the collaboration of the Population Division of the Department of International Economic and Social Affairs of the United Nations Secretariat.

The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering and the Institute of Medicine. The members of the Committee responsible for the report were chosen for their special competences and with regard for appropriate balance. The report has been reviewed by a group other than the authors, according to procedures approved by a committee consisting of members of the Academies and the Institute.

The United Nations wishes to thank Kenneth Hill and Hania Zlotnik of the Committee staff and James Trussell of the Office of Population Research, Princeton University, who wrote *Manual X*. Hania Zlotnik has also prepared computer programs to apply some of the techniques described in this work. These are published in a separate volume entitled *Computer Programs for Demographic Estimation: A User's Guide*.[6]

The United Nations also wishes to thank the members of the Committee on Population and Demography for their contribution to this important study: Ansley J. Coale (Chairman), Office of Population Research, Princeton University; William Brass, Centre for Population Studies, London School of Hygiene and Tropical Medicine; Lee-Jay Cho, East-West Population Institute, East-West Center, Honolulu; Ronald Freedman, Population Studies Center, University of Michigan; Nathan Keyfitz, Department of Sociology, Harvard University; Leslie Kish, Institute for Social Research, University of Michigan; W. Parker Mauldin, Population Division, The Rockefeller Foundation; Jane Menken, Office of Population Research, Princeton University; Samuel Preston, Population Studies Center, University of Pennsylvania; William Seltzer, Statistical Office, United Nations; Conrad Taeuber, Kennedy Institute, Center for Population Research, Georgetown University; Etienne van de Walle, Population Studies Center, University of Pennsylvania; Robert J. Lapham, Study Director.

Acknowledgement is also due to the United Nations Fund for Population Activities, whose financial grant made possible the printing of this *Manual*.

6 Report No. 11 of the Committee on Population and Demography; available from the National Academy Press.

CONTENTS

ANNEXES

LIST OF TABLES

LIST OF FIGURES

Explanatory notes

The following symbols have been used in the tables throughout the report:

Three dots (. . .) indicate that data are not available or are not separately reported.

A hyphen (-) indicates that the item is not applicable.

A dash (–) indicates that the amount is nil or negligible.

A minus sign (–) indicates a deficit or decrease, except as indicated.

A full stop (.) is used to indicate decimals.

A slash (/) indicates a crop year or financial year, e.g., 1970/71.

Use of a hyphen (-) between dates representing years, e.g., 1971-1973, signifies the full period involved, including the beginning and end years.

Details and percentages in tables do not necessarily add to totals, because of rounding.

Reference to "dollars" ($) indicates United States dollars, unless otherwise stated.

Reference to "billion" indicates a thousand million.