Demography

The Study of Human Population

DAVID YAUKEY

DEMOGRAPHY

The Study of Human Population

DAVID YAUKEY
University of Massachusetts, Amherst

St. Martin's Press New York

Library of Congress Catalog Number: 84-51841

Manufactured in the United States of America.
98765
fedcba

For information, write St. Martin's Press, Inc.,
175 Fifth Avenue, New York, NY 10010

cover design: Darby Downey
text design: Emily Berleth
index: Linda Berman

ISBN: 0-312-19386-6

Acknowledgments

Fig. 1.1, reprinted with permission of Peter Steiner and *Science '83*.

Figs. 1.2, 1.3, 2.2, 2.4, 3.1, 3.5, 5.1, 5.2, 5.8, 7.1, 7.2, 8.3, 8.4, 10.2, 11.4, Tables 2.1, 3.2, 6.2, 7.1, 8.2, 8.3, 11.5, and the parish register in Box 7.1 reprinted with permission of the Population Reference Bureau, Inc., Washington, D.C.

Fig. 3.2 from Ansley J. Coale, "The History of Human Population." Copyright © 1974 by Scientific American, Inc., and fig. 9.2 from Charles B. Keeley, "Illegal Migration." Copyright © 1982 by Scientific American, Inc. All rights reserved.

Fig. 4.8 from Ansley J. Coale, "Population Trends, Population Policy, and Population Studies in China," *Population and Development Review* 7, no. 1 (March 1981); figs. 6.4, 6.5, and table E6.2 from Christopher Tietze, *Induced Abortion: A World Review, 1981*; table 2.1 adapted from John D. Durand, "Historical Estimates of World Population: An Evaluation," *Population and Development Review 3*, no. 3 (September 1977). Reprinted with permission of the Population Council.

Fig. 8.2 from Ansley J. Coale, "Age Patterns at Marriage," *Population Studies*, 20 (1971), reprinted with permission of Population Studies and the author.

Tables 8.5 and 8.6 from Peter Uhlenberg in Tamara K. Hareven, ed., *Transitions: The Family and the Life Course in Historical Perspective*, New York: Academic Press, 1978, reprinted by permission of Academic Press and the author. Table E8.1 from Henry S. Shryock, Jacob S. Siegel, and Associates, *The Methods and Materials of Demography*. Cond. ed. by Edward Stockwell. New York: Academic Press, 1976, reprinted by permission of Academic Press and the authors.

Figs. 8.6 and 8.7 reprinted from Andrew J. Cherlin, *Marriage, Divorce, Remarriage*. Cambridge, Mass.: Harvard University Press, 1981. Reprinted by permission.

Fig. 8.8 from Paul Glick, "Updating the Life Cycle of the Family," *Journal of Marriage and the Family* (Feb. 1977). Copyright 1977 by the National Council on Family Relations and reprinted by permission of the author and the National Council on Family Relations, Fairview Community School Center, 1910 West County Road B, Suite 146, St. Paul, Minn. 55113.

Fig. 9.3 from Woytinsky and Woytinsky, *World Population and Production*. Copyright 1953 by McGraw-Hill Book Company and reprinted by permission.

Fig. 9.7 from Everett Lee, in *Demography*, 3 (1966). Reprinted by permission of the Population Association of America.

Fig. 10.3 © 1981 by John Trever, *Albuquerque Journal*, and reprinted by permission.

Fig. 11.1 from Hilda Golden, *Urbanization and Cities*. Copyright © 1981 by D. C. Heath and Company. Reprinted by permission of the publisher.

Box. 11.1, exerpts from "People, People, People, A Proud Capital's Distress." Copyright 1984 Time Inc. All rights reserved. Reprinted by permission from TIME.

Preface

Demography is changing. It has been transformed in my professional lifetime, and perhaps in yours as well. But not all of its levels have changed at the same speed. While population facts and population issues have shifted rapidly, demographic theoretical frameworks and methods have stayed in place.

This text is written for a changing time. It aspires to create demographic literacy, an ability to deal with new demographic realities and issues that will arise in students' lifetimes. This means an unusual emphasis on fundamentals and what may seem, *a priori*, a daring inclusion of basic demographic technology.

The book has eleven chapters. The first two define the field and its data base. Chapter three, the first substantive chapter, gives an overview of population growth. Most of the remaining chapters are devoted to the population processes that are the components of growth: mortality, fertility, then migration.

There are some departures from normal sequence in these chapters. The chapter on age and sex structure has been placed *before* those on the components of growth because I believe an early introduction to age and sex differentials and age and sex-specific rates is essential to understanding mortality and fertility as we now measure them. I include an unusual chapter on marriage and marital dissolution, a topic on which I claim some expertise and one that college-age students seem to find pertinent to their life planning. The chapter on urbanization ends the book. I urge instructors to try out my sequence rather than taking the chapters in some other order they have habitually used; the chapters are written to build on each other.

Some instructors may be surprised by the lack of separate chapters on population theories, population problems, and population policies. My reason for not following that tradition is a belief that these topics are better treated integrally in the various substantive chapters. I find it difficult to define a population "problem" without stating the theoretical consequences supposed to follow from the problematic population trends. Nor can I make sense of population policy formation without seeing how it relates to some faction's definition of the problem. These connections are made more easily just after the presentation of relevant concepts and trends on each major topic. So, for instance, relevant parts of Malthusian theory appear late in the chapter on population growth (chapter three); Easterlin's theory is stated in chapter

six, on fertility analysis. Most chapters end with five or six propositions for debate, developed to demonstrate the potential for controversy in all definitions of population problems.

This is a core text. My goal is to provide a solid trunk from which instructors can easily branch, guided by their own priorities and expertise, whether they be sociologists (like myself), economists, geographers, or formal demographers. Ample supplementary materials now are available, and they are updated more frequently than any textbook can hope to be.

A unique feature of this text is the provision of student exercises at the end of almost all chapters. If these err, it is in the direction of simplicity. Their purpose is not to impress but to demystify. All of them have been tried by my own classes over the years, without evidence of student terror.

There are several ways instructors can use these exercises. For myself, I have evolved a system in which I ask the students to try the exercises on their own as they read the relevant chapter material. I then have a review period in which we as a class go over students' attempts, correct them, and explain errors. Finally (with forewarning) I include questions on exams similar to the exercises the students have covered. Other instructors may prefer to have students hand in their attempts as homework for immediate grading.

During the five years it has taken to draft and revise this text I have accumulated many debts. The anonymous reviewers for St. Martin's Press were trenchant in their early criticisms but encouraging of the evolving product. My colleagues in the Sociology Department of the University of Massachusetts have been personally solicitous and supportive throughout. Several cohorts of students in my population studies courses have given me feedback on materials I tried on them. The departmental staff, and especially Mary Louise Creekmore, patiently typed and retyped chapters for years before my word processor came.

But the most heartfelt thanks I save for my family. My two (then) college-aged sons, Tim and Peter, had the ill fortune to represent a fair sample of my intended readership and were pressed into service early as guinea pigs. And my wonderful wife, Barbara, has been my counselor and companion throughout the prolonged labor pains of birthing this book. She deserves to have a richer husband.

Contents

1 Introduction

Most of you will be reading this book as a text for a course, rather than on your own. You may already have met your introductory class. If so, what were the first things you noticed about that class? Probably you looked around to see how large the class was and whether the room was crowded. Perhaps you noted what proportion of the students were men and women, or whether the other students seemed to be older or younger than yourself. You may even have chatted with neighbors to find out what their intended majors were.

If so, what you did was demography. You described the size and composition of a specific population, your class.

Most of us seem to sketch a quick demographic description as a first step in coping with a new social situation. We know intuitively that the size and composition of groups with which we are dealing are important. The same applies on the scale of communities, regions, nations, even planets.

If demography is a widespread human tendency, what is demography as a discipline?

DEMOGRAPHY DEFINED

My students in the begining course tell me that an *informal* definition is a gentle way to start. Let us define demography, then, in terms of the *questions* that it tries to answer. In the vernacular, these are:

- How many people, of what kind, are where?
- How come?
- And so what?

A *formal* definition comes from the current *Multilingual Demographic Dictionary* (IUSSP, 1982, p. 101):

> Demography is the scientific study of human populations primarily with respect to their size, their structure [composition] and their development [change].

The bracketed insertions are synonyms I have added for clarity.

Both of these definitions make the same points: Demography describes population size and composition. It studies change in size and composition;

or, as demographers like to say, it studies the determinants (causes) of population trends. And it studies the consequences of these trends, including problems resulting from them.

Only two more preliminary remarks need be made. One is that demography deals with *aggregates* (or collections) of people, not individual people. The very term "population" refers to the numbers of people resident in some specified geographic area, be it a classroom or a nation. And demography describes characteristics of populations, not of individual members of those populations. Thus the cartoon shown in Figure 1–1, taken from *Science 83*, is something of a demographer's inside joke.

The second point is that demography is quantitative and statistical. Population features are measured by counting the people in the total population, or in segments of it, and comparing those counts. That means that demography can easily present its descriptions in tables and graphs. Paging ahead through this text will demonstrate that point to the reader. Because the subject is so numerical, readers will get used to following simple demographic arithmetic in the course of reading this text. Almost all chapters end with simple exercises that give guidance and practice at this.

CURRENT POPULATION SIZE AND COMPOSITION

Absolute Size, Density, and Distribution

Population size has three faces. First is *absolute size*. The absolute size of the earth's population in 1983 was estimated to be about 4.7 billion (Population

"They tell me you're a demographer. Whatever happened to Fred Biddlingmeyer?"

Figure 1–1 "THEY TELL ME YOU'RE A DEMOGRAPHER . . . ."
Source: Cartoon by Peter Steiner, *Science '83*.

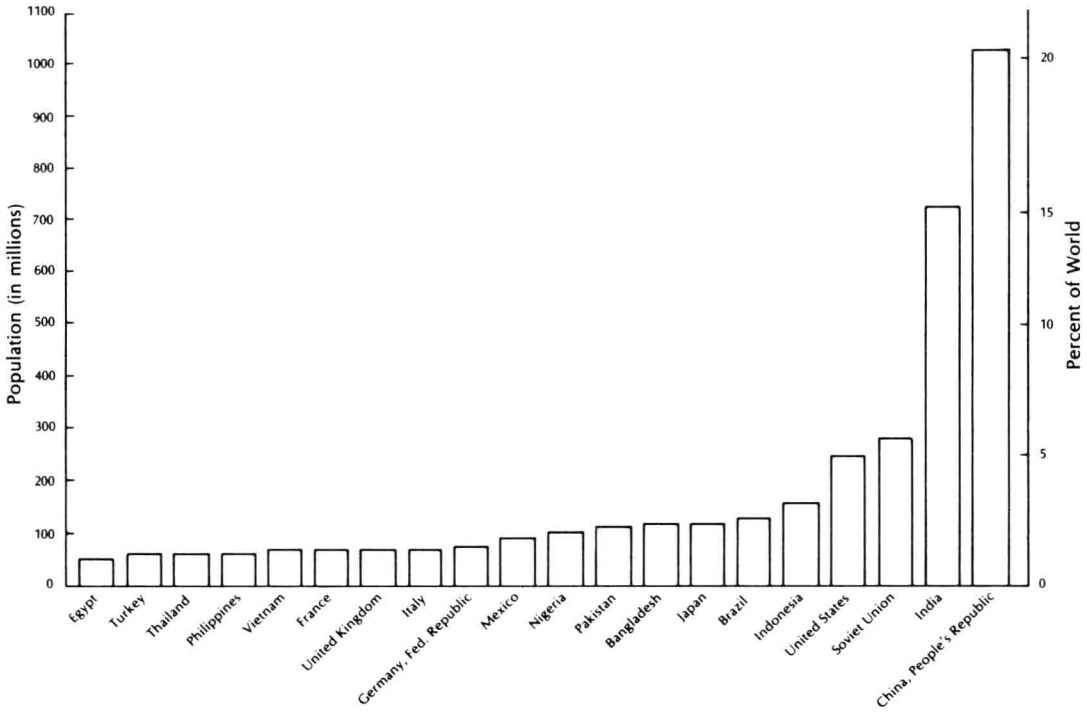

Figure 1–2 THE WORLD'S TWENTY MOST POPULOUS NATIONS, 1983
Source: 1983 World Population Data Sheet of the Population Reference Bureau.

Reference Bureau, 1983). The absolute sizes of the populations of the earth's twenty most populous countries are graphed in Figure 1–2.

Absolute size has its own consequences. To use our classroom illustration, large classes have to be taught differently than small classes, more by lecture than by discussion. The immense cities of today have different problems than did the villages and towns of yesterday, and they have developed different kinds of governments to handle them. But one of the main consequences of large size is that it implies density of settlement.

That is the second face of population size: *density*. In our classroom illustration, if you noticed how crowded the room was, you were noticing density. It refers, in its most restricted use, to the relationship between population size and the space in which the population is located. For large geographic units, one might measure density in persons per square mile.

Density, too, has its own consequences. The very concept of "overpopulation" (see chapter three) implies a concern over too dense a population.

The third face of population size is *distribution*, or relative size. If we

compare the lengths of the bars in Figure 1–2, we observe international distribution of the world's population. China has the longest bar, by far. The United States is fourth, behind India and the Soviet Union.

Distribution, as well, has its own consequences. For instance, citizens of western countries tend to be alarmed that the people of nonwestern countries outnumber them now and will outnumber them by even more (see chapter three). Distribution of population within nations also is a subject of concern. For example, many less-developed countries are worried about premature and extreme urbanization (see chapter eleven).

Composition

The topic of composition recalls our first demographic question, with added emphasis: How many people, *of what kind*, are where? In our classroom illustration, you were observing composition when you counted the males and females, those younger and older than yourself, and the numbers from various majors. Demographers go the next step beyond simply counting the absolute numbers in categories and compare the numbers, using, for instance, percentage distributions or ratios. Composition, then, focuses on the *relative* size of categories.

Which traits do demographers use to classify? The list is potentially limitless; however, some kinds of characteristics turn out to be more useful than others. First, characteristics that either do not change easily or change in predictable fashion tend to be more useful. Therefore, sex, age, and racial or ethnic identity are more useful than body weight, satisfaction with the president, or number of cars owned.

Second, demographers focus on traits that are used as a basis for ascribing societal roles. Role ascription, to sociologists, means assigning people to roles on the basis of traits over which the individual has no control. All societies use sex and age to some degree in ascribing roles, and thus sex and age are basic in population composition. Indeed, we devote chapter four to age and sex composition (or structure).

Third, governments seem especially concerned with the economic welfare of their populations and with their populations as workforces for their economies. Thus modern censuses usually include questions on literacy and education, occupation, and income.

Finally, the public is concerned with the size and distribution of identifiable subsocieties within the nation. Thus most national censuses deal in some way with the subject of ethnic identity, be it by race, religious affiliation, or native language.

The study of population composition is not a closed book. Priorities can change, as they have. But some international consensus about these priorities is evolving. Figure 2–1 in the next chapter gives a list of topics recommended by the United Nations for the 1980 round of national censuses. The census is the main source of information on population composition for any nation.

POPULATION CHANGE

So far, we have been dealing with population description as of a given moment. Clearly, that can be only the beginning of a public-supported demographic enterprise. The future population is the one we plan for, not the present one. Describing a present population helps mainly to the degree that it tells us something about that population in the future. The public wants to know the trends in population change, for these trends have their own consequences. Demography, therefore, includes the study of population change, especially change in size.

Population Growth and Its Components

To demographers, "growth" means change in population size (IUSSP, 1982, p. 701). It is called growth even if it is negative. The amount of growth is obtained by subtracting some earlier population count (P_1) from some later count (P_2). Clearly, the difference can be either positive or negative, although in these days of population explosion we are more used to finding positive growth (see chapter three).

What are the immediate causes of population growth? That is, what could happen to alter a population from P_1 to P_2? Common sense furnishes the answer. There are four—and only four—ways that a geographic area can add or subtract from its population: people can be born into it; people can die out of it; people can cross the border into it; or people can cross the border out of it. That is, we are dealing with a closed system. That system is described by equation (1−1):

$$P_2 - P_1 = B - D + M \qquad (1-1)$$

In words, this says that the growth of the population of a specified area during a specified time interval equals the number of births (B), minus the number of deaths (D), plus the net migration (M). *Net migration* is the balance between the movers in the the movers out and can, of course, be either positive or negative. Demographers also have a special term for the balance between births and deaths ($B - D$): ***natural increase***. An exercise at the end of the chapter offers practice in using this equation.

Growth Components as Population Processes

So far we have been talking about the causes of population growth as *events*. Each birth, each death, each move across a boundary is a population event. However, demographers—and indeed the general public—are used to thinking of these individual events as expressions of underlying collective processes. That is, we think of the number of births that occur in a population as an expression of the *fertility* of that population. The number of deaths is the manifestation of its *mortality*, and the number of moves across the border (in and out) is the population process of ***migration***.

The simplest measure of a population growth process is the *crude rate*. Before we discuss it, we should ask, why construct rates at all? Why not simply count the number of events and let that total be the measure of the process? Perhaps the best answer to this question may be obtained by asking the readers how they feel about the following reasoning: Suppose that exactly the same number of deaths occurred in the United States during 1900 as occurred during 1980. Can one conclude that the mortality of the United States was the same in 1980 as in 1900? Most readers will feel that such a statement is misleading. There probably were more than twice as many people available to die in 1980 than there were in 1900. Demographers would express that same thought by saying that the population *at risk* of dying was greater in 1980, and that should be taken into account.

The basic demographic strategy for doing this is to divide the number of events by the population at risk. This step produces *rates*. The numerator is the number of events; the denominator is the population at risk. Generally speaking, rates tell us the probability that a member of the population at risk participated in one of the events. A *crude* approximation of the population at risk for demographic processes is the size of the total population during the specified year. Dividing by the estimated total population produces *crude rates*.

The general formula for crude rates is as follows:

$$\frac{E}{P_m}(1{,}000) \qquad (1-2)$$

"E" is the number of the specified events (births, deaths, whatever) occurring in the specified place and year. "P_m" refers to the estimated midyear total population; since the size varies throughout the year, this is taken as a representative figure for the total population at risk during the year. The convention of multiplying by 1,000 has the function of minimizing the decimal places in crude rates. Thus a crude death rate tells us the number of deaths in a year per thousand inhabitants. (An exercise at the end of this chapter offers practice in constructing crude rates.)

The equation stating the components of population growth can be expressed either in terms of absolute numbers (equation 1−1, above) or in terms of crude rates (equations 1−3a and b, below). All three are expressions of the growth equation, sometimes called, redundantly enough, the "balancing equation." Conversion from absolute numbers to crude rates is achieved by dividing both sides of the equation by P_m (and multiplying by 1,000).

$$\begin{aligned}\text{crude growth rate} = {} & \text{crude birth rate} - \text{crude death rate} \\ & + \text{crude rate of net migration}\end{aligned} \qquad (1-3a)$$

or

$$\begin{aligned}\text{crude growth rate} = {} & \text{crude rate of natural increase} \\ & + \text{crude rate of net migration}\end{aligned} \qquad (1-3b)$$