Deconstructing Population Momentum

By John Knodel

Population momentum has been recognized as crucial for understanding not only the dynamics of population growth but also its consequences for population policy. Momentum is treated in almost every introductory population course, but its demographic components and their policy implications are easily misunderstood.

Population momentum refers to the fact that the future growth of any population will be influenced by its present age distribution. Momentum is the reason that replacement-level fertility does not immediately translate into zero population growth. Discussions of future global population growth invariably mention that, even if world fertility falls to the replacement level, momentum will cause population to continue to increase for some time.

A Matter of Measures

To understand population momentum, it is important to recognize how replacement fertility and population growth are measured; fertility and death rates are two important parts of the momentum equation. Technically, replacement fertility refers to a net reproduction rate (NRR) of 1. This signifies that, under the prevailing fertility and mortality conditions, women of reproductive age average one daughter each that survives to the reproductive ages. Thus, these women exactly “replace” themselves a generation later.

The NRR is calculated directly from age-specific fertility and mortality rates and thus is independent of the population’s age structure. Two populations will have identical NRRs if they share the same age-specific fertility and mortality rates, regardless of differences in their age structures.

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For easier interpretation, replacement fertility is often expressed in terms of the total fertility rate (TFR), the number of births (of either sex) a woman would bear if she experienced the prevailing age-specific fertility rates throughout her childbearing years. Under low mortality, a TFR of 2.1 corresponds to an NRR of 1.

In the absence of migration, population growth is measured by the rate of natural increase (RNI), which equals the crude birth rate (CBR) minus the crude death rate (CDR). Because the CBR and CDR express births and deaths per 1,000 population, both are sensitive to differences in population age structure; so, too, is the RNI. High proportions of a population at old ages, where mortality is typically high, inflate the CDR; high proportions of women in the reproductive ages inflate the CBR. Because the RNI in a given year is influenced by the age structure but the NRR is not, the two measures do not correspond.

The World at Replacement: Positive Momentum

Projecting the world population assuming that fertility falls to the replacement level in 2000 and remains there for 100 years illustrates the effect of population momentum. The starting population is the medium projection for 2000 from the United Nations 1996 assessment. A TFR of 2.13 and life expectancies of 73 for men and 77 for women are assumed, with only mortality eroding them as they age.

Considering how and why age structure changes is the key to understanding why a population temporarily continues to grow. Figure 3 shows the changes, under replacement fertility, in the number of people in two age groups: the prime childbearing ages (20 to 39) and older ages (60+). Note that, in 2000, when fertility first reaches replacement level, the next generation of parents (the 20-to-39-year-olds in 2020) consists of the current 0-to-19-year-olds. Because fertility has been above replacement until 2000, this generation of parents is larger than the 20-to-39 age group in 2000. Thus, the prime childbearing age group will grow as the population under age 20 in 2000 moves into the childbearing ages. Yet when these people start being succeeded by their own children, who were born under conditions of replacement fertility, the 20-to-39 age group ceases to grow and eventually stabilizes.

At the time replacement fertility is reached, not only the next generation of parents but also the next several generations of older people have been born. A prolonged period of growth characterizes the older age group as the successively larger cohorts under age 60 in 2000 age. Only after 60 years, when cohorts born under replacement fertility reach 60, does the older population stabilize in size.

These changes in age structure directly affect the number of births and deaths and the crude birth rate and crude death rate. Figure 4 shows that births increase during the first 25 years after replacement fertility is reached, paralleling increases in the size of the prime childbearing age group, and then stabilize. In contrast, deaths increase slightly in the first decade but then climb for another 60 years until births and deaths become approximately equal. Because deaths occur mainly at old ages when mortality is low, the increase in deaths is

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Supreme Court Decision on Sampling

On Jan. 25, 1999, the U.S. Supreme Court decided two important lawsuits concerning the 2000 census. Both suits were filed in U.S. District Courts in 1998. Both challenged the constitutionality of sampling, a method proposed by the Census Bureau to improve the count and to save money.

As originally proposed for the 2000 census, the bureau would complete the population count by taking a sample of households that did not respond to the mail questionnaire and attempting to interview them. In addition, the Census Bureau would conduct a separate quality-control survey to estimate the number and characteristics of those people missed by the census.

Both federal district courts in the original lawsuits ruled that the Census Act (the federal statutes for the Census Bureau) bars the use of sampling for apportionment purposes. The Justice Department appealed both federal district court decisions to the Supreme Court, seeking to overturn the rulings that prevent the Census Bureau from using sampling methods to produce the population counts used for congressional apportionment. The Supreme Court consolidated the cases and heard oral arguments on Nov. 30, 1998.

In its ruling, the Supreme Court decided that “the Census Act prohibits the use of statistical sampling to determine the population for congressional apportionment purposes.” Although sampling could be used in the census for such purposes as collecting some demographic data from a sample of all enumerated households, the high court ruled that the population count for apportionment must be based on a direct, physical enumeration of the population.

Of the two proposed uses of sampling, the high court’s ruling unquestionably prohibits the use of sampling for nonresponse follow-up in the 2000 census. Sampling for nonresponse follow-up cannot be used because it would affect the final apportionment counts. The use of a quality control survey is still possible. The survey could be used for nonapportionment purposes, however, including for congressional redistricting within states. In past censuses, the Census Bureau has conducted a quality control survey to estimate the characteristics of the undercounted population. Such a survey deserves to be included in the 2000 census program as well.


PRB Reports on America

PRB Reports on America is a new series of reports on demographic issues. Appearing at least four times a year, this new series will bring you the latest numbers, thinking, and debate about topics such as the 2000 census, immigration, labor force participation, and the aging of America’s citizens. PRB Reports on America is part of our efforts to expand our domestic programs—in particular, to:

■ Report emerging trends;
■ Address relevant and pivotal issues in the field of demography; and
■ More easily and quickly publish the work of experts in the field.

The premiere issue, published in February, covers the 2000 census. Written by Barry Edmonston, director of Oregon’s Center for Population Research and Census, “The 2000 Census Challenge” explains the political stakes and describes some options for reforming the traditional census, especially in light of the recent Supreme Court decision that bars the use of sampling for apportionment.

As a PRB member, you will receive each issue of PRB Reports on America as part of your membership dues. Additional copies are $5 each (discounts available for bulk purchases).
Despite Strong Economy, Many Still Go Hungry

A strong economy and the lowest peacetime unemployment rate since 1957 have not remedied hunger in the United States, according to a spate of recent reports. In fact, analysis by the Food Research and Action Center (FRAC) of four multistate studies and five statewide studies indicates that food insecurity is increasing in the wake of welfare reform.

The wide range of organizations that published the studies makes their common conclusion on food insecurity—defined by the U.S. Department of Agriculture (USDA) as “limited or uncertain availability of nutritionally adequate foods”—striking. The studies FRAC analyzed were published by The Urban Institute, The United States Conference of Mayors, Second Harvest National Food Bank Network, and NETWORK—A National Catholic Social Justice Lobby (see box below, “Multistate Studies”).

Of the four multistate surveys, the two that deal explicitly with hunger—those by the Conference of Mayors and Second Harvest, an umbrella organization for food banks around the country—contain these startling findings:

- Seventy-eight percent of cities surveyed registered an increase in the number of requests for emergency food assistance during the past year. (Conference of Mayors)
- Eighty-four percent of the cities reported an increase in the number of families with children who requested emergency food assistance. (Conference of Mayors)
- Among clients, 41 percent received food stamps, but 79 percent of these recipients said the food stamps did not last the entire month. (Second Harvest)
- Among clients not receiving food stamps, 11 percent had been removed from the food stamps program during the past 12 months. (Second Harvest)
- Twenty-one percent of clients were working. (Second Harvest)
- More than 58 percent of unemployed clients had been without work for a year or more, fitting the definition of “long-term unemployed.” (Second Harvest)

Causes

City officials who participated in the Conference of Mayors survey identified low-paying jobs as the number one cause of hunger, followed by high housing costs, unemployment and employment-related problems, food-stamp cuts, poverty, low benefits in public assistance programs, and substance abuse.

Similarly, the Second Harvest survey found that 45 percent of clients came to agencies for food assistance because they had too little income from employment, 39 percent because they were recently unemployed, and 31 percent because of an emergency or crisis.

### Multistate Studies

- **Snapshots of America’s Families.** Washington, DC: The Urban Institute, January 1999. Data come from the 1997 National Survey of America’s Families, which covered 13 states and was conducted from February to November 1997. Interviewers asked adults in 44,461 randomly selected households about their food concerns during the previous 12 months and at the time of the survey. Low-income households were oversampled.


- **Phase One, NETWORK Welfare Reform Watch Project.** Washington, DC: NETWORK—A National Catholic Social Justice Lobby, April 1998. Data, for September to December 1997, come from 800 questionnaires administered by 59 agencies providing services to the poor that were owned, operated, or directed by member religious orders in 10 states. The final report for the three-phase, 16-month study will be published in April 1999.
Peter Eisinger, author of Toward an End to Hunger in America and director of the State Policy Center at Wayne State University in Detroit, noted that the purge of legal immigrants from food stamp rolls following recent welfare reform has forced hundreds of thousands of these immigrants to seek emergency food assistance.

Welfare reform also reduced the value of food stamp allotments, according to Eisinger, “from 80 cents to 66 cents per person per meal.”

**Demographics**

As its name suggests, the Second Harvest study profiles the clients who receive emergency food assistance. Doug O’Brien, director of policy and research at Second Harvest, described an earlier time when the people who came to emergency feeding centers were “the chronically unemployed, homeless adults, and the chemically dependent.” Now, he said, one in five people in these centers is a child because the working poor and their families face limits on their wages, and have had their benefits cut.

His own assessment of the bigger picture is that many people are falling through the cracks because “they lack a skill set and education level that would allow them to benefit from the good economy.”

**Turning People Away**

The Conference of Mayors study reports that, although food assistance increased in 48 percent of cities surveyed, 47 percent of the cities had to turn people away from food pantries because of a lack of resources.

The Second Harvest report estimates that programs served by the network’s food banks were forced to turn away 70,067 clients because of a lack of food.

On the path toward poverty, O’Brien said, people turn first to family and friends for help, then to the government, then to charities. If charities have to turn people away, he explained, “that is a terrible position to be in.” Because many charities have a strong “moral sense of mission,” he noted, “they go to extraordinary efforts to get aid for people.” If charities must turn away large numbers of people, he concluded, “this is a more serious problem than most Americans are aware.”

**What These Studies Don’t Tell Us**

In his book, Eisinger offers caveats to the statistics on food insecurity. Very often, he wrote, “studies of demand for food assistance from street-level providers offer no basis for estimating the prevalence of hunger, either nationally or within any subnational jurisdiction.” Furthermore, some unknown number of hungry people never use emergency food services, and some may not even live in places served by such providers.

With these caveats in mind, he concluded that the study by the Conference of Mayors and the Second Harvest study “are important to note, for they represent the broadest perspective on the growth of the emergency food assistance sector and its expanding client base.”

But, Eisinger said, the study by the Conference of Mayors, which has been done annually since 1984, does not provide “good longitudinal data for a panel of cities.” Comparing data for one year against another is inaccurate, he explained, because the cities surveyed were not the same set of cities from year to year.

Eisinger commended both the accuracy and the range of data on food insecurity obtained from a USDA-sponsored special supplement to the 1995 Current Population Survey (CPS). Those data show the number of people living in food-insecure households with either moderate or severe hunger is 11.2 million.

Data from supplements to the 1996 and 1997 CPS will be released this summer. Another USDA-sponsored survey, on the emergency food assistance system, is underway.

**For more information:**


Food Research and Action Center: http://www.frac.org.


The Urban Institute: http://www.urban.org.

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### Who's Hungry

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<td>Adults 18-64</td>
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<tr>
<td>Female</td>
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Source: Second Harvest.
Estimated United States Population:


Estimated World Population:

As of February 1999 5,975,000,000
Annual growth 84,000,000

Extrapolated from the mid-1998 population on PRB’s 1998 World Population Data Sheet.

Latest Provisional Statistics for the U.S.: September 1998

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Note: Fertility rate is given per 1,000 women ages 15-44; infant deaths per 1,000 live births; other rates per 1,000 population.


SPEAKING GRAPHICALLY

Homicide Rate, United States, 1950 to 1997

Source: Bureau of Justice Statistics.

In 1997, the U.S. homicide rate fell to its lowest level in three decades after nearly doubling between the mid-1960s and late 1970s, peaking in 1980, and then rising again in the late 1980s and early 1990s. Much of the decline occurred in cities with populations of 1 million or more, where the homicide rate fell from 35.5 per 100,000 population in 1991 to 20.3 per 100,000 population in 1997. The rise and fall of gun violence among teens and young adults may have been responsible: The number of homicide offenders ages 18 to 24 rose sharply in the 1980s and early 1990s, peaking at 41.3 per 100,000 population in 1993. By 1997, this rate had dropped to 33.2 per 100,000 population.
Deconstructing Momentum

The CBR and CDR, which directly determine the RNI, relate the number of births and deaths to total population size. Because the total population is increasing during the first 60 years following the start of replacement fertility, changes in the CBR and CDR differ somewhat from changes in the number of births and deaths. As Figure 5 shows, the CBR remains steady for the first two decades as births and total population size increase by similar proportions. Then the CBR falls because births cease to increase while population continues to grow. Only when population size remains relatively constant does the CBR stabilize. In contrast, after the first decade, deaths increase proportionately more rapidly than the population and thus the CDR increases for another 60 years.

Because the current age structure of the world’s population is much younger than the one that would emerge if replacement fertility were achieved and maintained, positive momentum exists. The initial young age structure severely depresses the crude death rate to a level well below the crude birth rate. The CDR takes more than 50 years to rise to its eventual level. Also the proportion of the present world population in prime reproductive ages is higher than it would be under replacement fertility, thereby inflating the CBR above its eventual level. However, the decline in the CBR following the onset of replacement fertility is less pronounced than the rise in the CDR. When the two eventually meet, the momentum is spent and growth becomes zero.

Negative Momentum

Most discussions of population growth focus on positive momentum, but population momentum also can be negative. This occurs when a population has a sufficiently long history of below-replacement fertility and therefore an older age structure than would be consistent with constant replacement fertility. Several European populations are in such a situation today. Even if fertility were to rise to replacement level and remain there, in the absence of migration, these populations would decline before stabilizing.

Germany’s population provides an example. German fertility has been below the replacement level for the last half century. If fertility in Germany rose to the replacement level in 2000 and remained there for 100 years, the population would decline for 70 years and eventually stabilize at a level 16 percent below its current size. The reason for this is the shape of the German age structure in 2000. Because the recent parental generation bore fewer children than needed to replace itself, the next generation of parents will be smaller and thus decrease the crude birth rate. At the same time, large numbers of currently middle-aged people will move into the old age groups and inflate the crude death rate. Eventually, as the new age structure emerges under replacement fertility, the CBR and CDR become equal, and zero population growth is attained.

The Winds of Change

With this issue, “Spotlight,” a regular feature of this newsletter since 1984 and a presence on page 7 since 1994, has been discontinued. We have eliminated this feature in response to your feedback on the members’ survey conducted last year. We are in the midst of planning a new look and editorial focus for Population Today, so there will be more changes in the coming months.

As the new editor, I want to make sure that the newsletter continues to meet your needs for information and a “good read.” If you have suggestions or comments about the format of Population Today or would like to contribute an article, please contact me, Allison Tarmann, at PRB, 202/939-5475; e-mail: atarmann@prb.org.
NEWS AND RESOURCES

Straight talk on contraceptives

PRB’s Contraceptive Safety: Rumors and Realities, second edition, is now available in English, French, and Spanish. This 40-page booklet contains up-to-date information on the safety of contraceptive methods and includes new information about contraceptive implants, emergency contraceptive pills, and female condoms.

Contraceptive Safety answers questions such as: “What are the advantages, disadvantages, risks, and benefits of each method?” and “How do the potential risks compare with those associated with pregnancy and childbirth?”

To order, contact PRB’s circulation department at 1875 Connecticut Ave., NW, Suite 520, Washington, DC 20009-5728; phone: 800/877-9881; fax: 202/328-3937; Web site: http://www.prb.org. Copies are $5 each; discounts are available for bulk orders. (This publication will also be on PRB’s Web site in the near future.)

Research on ICPD progress

PRB and the Population Council have just published A Guide to Research Findings on the Cairo Consensus. It summarizes 180 studies, reports, and fact sheets prepared by 50 nongovernmental organizations (NGOs) on issues outlined in the 1994 Cairo International Conference on Population and Development (ICPD) Programme of Action. The guide also gives ordering information and lists participating organizations. PRB and the Population Council produced the guide for the Task Force on Communicating Research Findings, as part of the U.S. NGOs in Support of the Cairo Consensus.

To order, contact the Population Council Office of Publications, phone: 212/339-0514; fax: 212/755-6052; e-mail: pubinfo@popcouncil.org. One copy is available free to each requesting organization. This publication is also available on PRB’s Web site: http://www.prb.org.

Diabetes rate double for Hispanics

Six percent of Hispanic adults in the United States and Puerto Rico have been diagnosed with diabetes—twice as many as non-Hispanic white adults—according to a new report by the Centers for Disease Control and Prevention (CDC).

The study, which includes data from 1994 and 1997, is the first to show diabetes prevalence among Hispanics in the United States and Puerto Rico.

Diabetes prevalence varied according to geographic location. Hispanics in Puerto Rico and in the U.S. West and Southwest were more likely to have diabetes than were Hispanics in other areas of the United States.

The report also finds that diabetes prevalence among Hispanics increased with age and was more prevalent among Hispanics without a high school education than among those with at least a high school education.

For more information, contact Lisa Swenarski de Herrera, CDC, phone: 770/422-5328; or visit the CDC Web site: http://www.cdc.gov.

Upcoming PRB Policy Seminar

PRB hosts monthly noontime seminars on demographic trends and policy issues at our Washington, D.C., office.

On Wednesday, March 17, Mark Rosegrant of the International Food Policy Research Institute will discuss the links between water and land resources and future prospects for global food supply.

PRB policy seminars are free and open to the public. To receive regular notices of upcoming seminars, contact PRB at 202/483-1100; fax: 202/328-3937; e-mail: popref@prb.org. Or visit PRB’s Web site at http://www.prb.org.

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