NPG Academia Series

Toward a Stationary U.S. Population

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July 2000

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Executive Summary

The United States, as the millennium arrives, is overcrowded. We are fast approaching 300 million inhabitants. More and more people are convinced that something must be done and this is especially evidenced by the current attention and concern given to the enormous and mostly unplanned suburban growth—or as it is generally called, "urban sprawl." Our highways are overwhelmed; our water supplies are dangerously low in many areas; our schools are packed—the problems are endless. However, it is both surprising and disappointing that overpopulation, by itself, is seldom seen as the culprit lurking behind these countless problems. This is in large part attributable to the media's repeated failures to put its fingers on the true and basic cause of this growth "malaise" facing our country.

A smaller and stationary (that is, having no further growth or decline) population is in the best interest of the United States. Not only would the total numbers be reduced, but we would no longer have to go through the agonies associated with sudden shifts in our demographic behavior (be it births, deaths, or moving) as we have with the baby boom that began in the late 1940s and with which we are still trying to cope as the "baby boomers" become "senior boomers" early in the twenty-first century.

Furthermore, with a smaller and stationary population, our fragile environment will be better protected. Our quality of life, however defined, will improve. Finally, we will bequeath to our children a much more sustainable population whose members can feel secure in knowing that there is "enough for all of us."

This book concentrates on the following questions: How do we achieve these goals? How do we reduce our population to a reasonable and sustainable level? How does that population's distribution attain relative efficiency (where there are no surging "bulges" in certain age groups)? We consider these goals to be not only ideal but necessary if the United States is to maintain anything close to our current quality of life and sustainability.

In the chapters that follow, we will illustrate several population scenarios by manipulating fertility, mortality. and migration (the demographic variables) in various ways. The bottom line is positive: if we are patient, if we have the courage to adjust these demographic variables, especially immigration, then the United States can attain a smaller total population without enormous age bulges—in other words, the United States can become a true stationary population—one that is small enough to sustain life at a high level of quality.

1 Introduction

The U.S. population is too large and is still growing. The Census Bureau estimates that at present levels of fertility, mortality, and migration, the nation's population will reach almost 400 million by 2050.[1] That is roughly 130 million more than the current 270 million (in 1999). When one considers that at the beginning of the twentieth century, the population was only 76 million, it is obvious that the United States population has undergone enormous growth over this period.

Today's population is unsustainable. Even so, by 2050 we will still be growing. By extending the Census Bureau projections (and using the same assumptions about fertility, mortality, and migration) the U.S. population would reach 531 million (that is over *half a billion)* by 2100. Even then it would still be growing. There is no end in sight. But there *is* a limit to our resources and our natural environment. Something has to give and the sooner the better. The United States cannot continue growing forever. It is critically important to understand what is needed to stop growth and move the United States toward a smaller, sustainable, and eventually optimum population.

It seems reasonable to conclude, based on the data just cited, that we have already exceeded our carrying capacity—however that vague term is interpreted—and more growth will exacerbate this already serious problem. This feeling is shared by numerous ecologists, biologists, and demographers.[2] Survey after survey tells us the American public has had enough–that *no more growth* is the answer.[3] Even more convincing is the fact that American families have chosen to limit their family size to below replacement level; they have voted with their reproductive choices. Unfortunately, these voluntary decisions have been undermined by the nation's political leaders, who have promoted unsustainably high levels of immigration. As the most rapacious nation in the world, it is critical that we not only put an end to growth but move toward a smaller population over the next century. As we near the millennium, we must evaluate our demographic situation: how it relates to the environment, how it affects the quality of life of *all* Americans—whether at home, on the highway, in schools, or at work. Thus we must examine the three demographic variables: fertility, migration, and mortality.

Variations in these three variables result in the changes in population growth mentioned above; they interact to produce growth or decline in population size. A combination of natural increase (births minus deaths) and/or positive net migration contributes to growth; natural decrease (deaths minus births) and/or negative net migration results in numerical reductions. Population growth (or decline) is exponential. A 2 percent rate of growth means the population doubles every 35 years. From that rate, one can see the potential momentum inherent in a positive rate of growth (e.g., 2–4–8–16–32, etc). This is the well-known "population momentum" concept. A lesser known but similar concept derives from population decline. A 2 percent rate of decline means a "halving" of the population in 35 years. This too results in momentum—of a negative type (e.g., 100–50–25–12.5, etc). Momentum (whether positive or negative) is an extremely important—though often misunderstood—aspect of population change and will be addressed often in subsequent chapters.

Given these potential population changes, where is all this taking the nation? Again looking at the Census Bureau projections, and assuming no change in the demographic variables, the U.S. population could easily reach 400 million by 2050. (In fact, Census Bureau's assumption of net migration of 820,000 per year is probably on the low side). The Bureau's high series (with some increases in fertility and net migration) suggests a possible population of almost 520 million within fifty years! The United States is facing a problem of unprecedented dimensions as it prepares to enter the next millennium, which is why this report argues for what is called a *stationary* population—and ideally, one that is smaller than at present, one that would be "sustainable" in every sense of that word. Unfortunately, population issues in the United States have become highly politicized because of their association with abortion and the predominantly minority composition of international migration flows. As a result, political leaders have been reluctant to say or do anything meaningful to address population growth or its causes. This is true at the local and national levels.

Most population and environmental groups have had little success at making people aware of the dangers posted by continued population growth. In the late 1960s, Paul Ehrlich helped form the now well-known group Zero Population Growth (ZPG). In recent years, ZPG has concentrated on world population issues (it now says little about U.S. population) and no longer discusses the population problems that results from high levels of immigration. Unfortunately, this is also a major weakness of most environmental groups. Negative Population Growth (NPG) has had the courage to face population problems in their entirety—including immigration. It should be added that the name of this group does not imply an unending process of falling numbers. Rather, NPG argues that the United States (as well as the world) has too many people and should aim for reductions in number until a more realistic and liveable level is attained, at which time zero population growth would be appropriate. We are hindered by a do-nothing government, an indifferent media, and very few private organizations willing to address this enormously important issue for the twenty-first century.

This book explores the various demographic paths that would make it possible for the United States to achieve a smaller and eventually stationary population. With the highest consumption levels and population growth rates in the developed world, the United States is arguably the most unsustainable country in the world. Population growth is undermining the quality of life of most Americans, rapidly depleting the resource base both in the United States and globally, and impairing the life support functions of the environment. The inescapable conclusion is that population growth cannot be endured indefinitely. The longer we delay in beginning the transition to a smaller and eventually sustainable population, the more difficult it will be to achieve. This book presents a positive vision of how a smaller and stationary population is an indispensable foundation for sustainability. Furthermore, it provides a practical guide for achieving this optimum U.S. population.

Endnotes

1. U.S. Bureau of the Census, Current Population Reports, P–25–1092, *Population Projections of the United States, by Age, Sex, Race, and Hispanic Origin to 2050* (Washington, D.C.: U.S. Government Printing Office, 1992).
2. For an interesting discussion of this issue, see L. Bouvier and L. Grant, *How Many Americans?: Population, Immigration and the Environment* (San Francisco: Sierra Club Books, 1994), esp. ch. 1.
3. See, for example, *Attitudes Toward U.S. Population Size and Growth (*New York: Roper-Starch, March 1996). "When Americans think about major problems we may face in the future, overpopulation is becoming a top concern. . . . 72 percent of Americans worry that overpopulation will be a serious problem in the next 25 to 50 years, up from 65% who worried about it in 1991 and 52% in 1980" (p. 2).

2 Why Is Population Growth a Problem?

What does all this mean for the quality of life of *all* Americans? Is this concern with rapid population growth simply a figment of the imagination of a few "do-gooders"? Isn't growth really "good" for the economy? Perhaps in the short run some growth is good. More jobs are created. More stores and restaurants are opened. More houses are built. So let's keep on growing—400 million, 500 million, 1 billion! No problem. Growth is seductive. It all looks so great. But these are simply "economies of growth." More people are available to divide up the expenses of building a larger infrastructure. But this all comes to an end as growth continues. Eventually, there are not enough schools, the roads are overburdened with more and more automobiles, the whole infrastructure needs rebuilding. The results are "diseconomies of scale" and at that point, growth becomes extremely expensive.

A recent example of this situation has been noted in Loudoun County, Virginia (the nation's third fastest growing county). In that county

> most new houses generate less in tax revenue than they require in services, particularly regarding schools. Local officials are scraping Loudoun's coffers to pay for 22 new schools over six years. County supervisors have increased residential tax rates by about 12 percent since 1996 and have expanded debt steeply to provide classrooms, police and fire protection for new residents arriving in Loudoun at the rate of 1,000 per month.[1]

This situation is repeated throughout the United States as population growth leads to nationwide "diseconomies of scale." The problems of continued population growth are well illustrated by examining the implications on indicators of quality of life, resources, and the environment in the United States.

Education

At a national summit on education in 1996, Louis Gerstner, chairman of IBM, commented: "Our educational system is broken—we all know that. I could stand here for hours reading the grim statistics. We are behind [other industrialized nations] and in an increasingly global economy, I'm not liking our chances." He added: "This is a national priority that rises above all others."[2]

In 1999, over 50 million children are enrolled in grades K-12. They are taught by about 3 million teachers who earn, on average, $36,000 per year. Current school expenditures amount to about $242 billion per year.[3] The teaching profession is attracting fewer and fewer college graduates. The job doesn't pay very well and is increasingly dangerous: teachers are threatened physically every day; the tragic shootings in Colorado and Georgia schools are recent examples. In many parts of the country, teachers are faced with increasing numbers of students who have little or no knowledge of the English language. Thus the demand for bilingual teachers is growing rapidly and will continue to do so.

Within a quarter of a century, if enrollment rates remain as they are today, there will be 57.8 million students in grades K-12, or 7 million more than in 2000. School expenditures, which are generally divided between state and local revenues, would rise to $300 billion. If a typical school (elementary or secondary) averages about 600 students, that means that 12,500 *new* schools will have to be constructed (in addition to repairs to older schools) between now and 2020. It means that 450,000 additional teachers will have to be trained, in addition to replacing the thousands who will either die, retire, or just give up on the profession.

Looking beyond 2020 to 2050, the nation can expect to have well over 70 million students enrolled in elementary and secondary schools. Further details are not necessary. It is obvious that the population growth envisioned under the Census Bureau's medium scenario will pose enormous challenges for our already deteriorating school systems.

Given these parameters, can we, as a nation, solve the educational infrastructure growth problems and, at the same time, attempt to improve the *quality* of the schools (for example, by ensuring that all classes have computers) to avoid such dire predictions at future national summits on education? Can one be optimistic as to whether such an educational system is sustainable? A decline in population and an end to age "bulges" would allow the nation to develop a higher quality of education for all students.

Transportation

Americans are in love with their automobiles. In 1996, over 206 million vehicles were registered—about 1 car for each adult. In 1986, less than 170 million were registered. The number of highway miles, however, has barely expanded over the past decade. In 1996, state and federal highway miles totaled 3.9 million. Ten years earlier, they numbered 3.86 million. We are all aware of the result: increased highway congestion.

What happens if we add 125 million people by 2050? If our ratio of vehicles to persons remains as it is today, that means almost 100 million more vehicles by 2050. Can our highways handle over 300 million vehicles? Will an entirely new twenty-first-century interstate system be needed? Will we simply add new lanes on all our roads? Already our highways are congested, as any drive on our interstate system illustrates. This will worsen, perhaps to the point where, like it or not, and despite our love affair with the automobile, we will have to turn to public transportation to get to work and to do our shopping. To a considerable extent, our quality of life is dependent on our ability to get around when and where we like. That may not be true in 2050. Is such growth sustainable? Again, fewer people would mean fewer cars on our highways—a pleasant thought upon which to reflect.

Waste Disposal

Of all the problems associated with continued rapid population growth, waste disposal is one of the most pressing. Today, our cities generate twice as much solid waste as they did in 1960.[4] The problems associated with waste disposal are critical:

> Because they were polluting, or simply full, the number of landfills declined from 20,000 in 1978 to 6,000 in 1990, and more than half will be closed by mid-decade [by 1995, the number was down to 3,581]. Cities have unsuccessfully tried to unload the waste on third world countries. . . . Major eastern cities have been negotiating with rural counties as far away as New Mexico and Texas to accept the stuff. The nation is on a treadmill.[5]

Each American generates over 13 tons of waste every year. Of that about 2 percent is considered hazardous. These wastes, mostly toxic, do their damage largely by polluting groundwater supplies, on which about half the U.S. population depends for its drinking water. In addition, there is no way of knowing exactly what toxic chemicals are already on their way into the water supply from leaking chemical drums, nearly 2 million buried gas station tanks, and other miscellaneous tanks around the nation that are not even subject to regulation. "In sum, the problem of toxic wastes presents a huge but unknown bill for cleaning up past poisoning and preventing its continuation."[6]

The news is not encouraging. What happens if we add 125 million more people? We are already hitting the limits. Urban sludge and agriculture are two major contributors to the degradation of surface waters and groundwater, and runoff will occur even if the sludge is put on agricultural land. A 50 percent intensification, through increased population, is a grim thought. From this perspective, is such growth sustainable? Obviously not—but an end to population growth (and hopefully some decline) would go a long way toward alleviating this enormous and growing problem.

Housing

In 1996, there were 101 million occupied housing units in the United States and about 2.5 persons per housing unit. This compares to 92 million just six years earlier. California had about 13 million housing units, New York 8 million; Wyoming, on the other hand, had a just over 200,000 as did Alaska.

Where will the next 125 million Americans live? Perhaps we should first ask: how many additional housing units will be needed? If the ratio of 2.5 persons per unit is maintained, as it reasonably should be, then 50 million more units will be needed in addition to all those that will be built to replace old, decaying units constructed many years ago.

At first glance, that may seem like great news for builders and contractors. That is the seductiveness of population growth. But *where* will these additional millions of people live? Our cities are packed; our close-in suburbs are densely populated in most parts of the country, as "urban sprawl" (the natural result of continued population growth) emerges almost everywhere. Urban sprawl is rapidly becoming a major concern for many Americans, as suburbs just keep growing and expanding. For example, the population of Henderson, Nevada (a suburb of Las Vegas) grew from 64,949 in 1990 to 151,717 in 1998 (an increase of 135 percent).[7] The same story is repeated all over the country. Suburban sprawl is getting bigger by the day.

Few people will move to the colder states like the Dakotas. The end result will undoubtedly be more and more housing developments, built further and further away from the urban centers in sprawling suburban communities, that will in many instances destroy our wetlands. This exurbanization will result in longer distances to travel to work, more highway congestion, more use of fuels which will in turn contribute to further contamination of the atmosphere. Remember, the automobile is our primary source of pollution.

We are fast covering much of our land surface with houses, shopping malls, industrial parks and the like. Yet, we wonder why so many localized floods occur. To put it simply, concrete doesn't soak up rainfall like ground does. If Americans desire an end to sprawl growth, total population must be limited or even reduced. Otherwise, we can only expect more and more exurbia located further and further away from the central cities.

Water Supply

Water shortages and water quality vary widely in various parts of the nation. In fact, the availability of water has become a source of contention between "have" and "have-not" states or sections of states. Simply put, Americans each year draw 25 percent more water from groundwater resources than is replaced by nature. "Falling water tables have already curtailed irrigation from some aquifers, and the competition for water between irrigated agriculture and urban population growth has already led to systematic diversion of water from agriculture to cities in Arizona and California."[8]

It can only be concluded that 125 million additional people will exacerbate what is already a very serious problem for the United States. Water shortages will directly affect agriculture and the prospects are dim for irrigation as a remedy. Urban demand and the need to protect wetlands threaten the cheap, subsidized irrigation supplies in California, the nation's largest agricultural producer. Moreover, the groundwater aquifers are subsiding in areas where agriculture has become critically dependent on them. The Ogallala aquifer (in the Plains states) is the largest and most important example. Some experts estimate that it may be entirely depleted within the next twenty-five years.[9]

We cannot take out more water than enters the system; we cannot see our aquifers dry up and disappear without dire consequences. Yet, adding more millions of people will have that effect. The water wars of the nineteenth century made famous (or infamous) by western movies may well return to haunt us in the twenty-first century if population growth continues according to Census Bureau projections. This supports the view that continued rapid population growth is simply not sustainable. Only by reducing population size can all Americans have sufficient water supplies.

Recreation

Being able to visit one of the nation's beautiful parks or to use our glorious beaches may not be as important has having pure air and water. Yet, enjoying the grandiosity of our beautiful country is certainly a part of what we loosely call "quality of life." Already, even trying to visit our national parks has become a test of endurance. Reservations must be made months ahead in many cases. When one finally arrives at a park, the traffic is often intolerable.

The National Park System comprises about 75 million acres. This size is not going to grow to accommodate 125 million more people. Neither will additional beaches suddenly appear. Indeed, they may diminish as pollution claims more and more beachfront. At best, parks and beaches will remain at their current size; there will simply be many more people wanting to get in. Again, quality of life will suffer because of rapid population growth. Are our national parks and beaches sustainable under such growth? The answer is a resounding “No.” The solution is fewer people.

In summary, population growth is not simply “more numbers,” as much of the media and the policy makers seem to suggest. Population growth, especially in a country the size of the United States, is an important problem that must be taken very seriously. That our policy makers will not even discuss it is intolerable. Such growth is definitely not sustainable if we, as a nation, are to maintain a reasonable quality of life. We must accept the fact that *continued growth is not good*.

It is crucial that we begin to consider how to at least *end population growth*, and preferably how to *reduce population* to a more sustainable size. That is the purpose of this report.

Endnotes

1. Justin Blum, “The Sway of Anti-sprawl Sentiments: Loudoun May Signal Regional Shift to Slow-growth Candidates,” *Washington Post,* 25 May 1999.
2. “U.S. Schools Lagging, Business Leaders Warn,” *Washington Post*, 27 March 1996.
3. These and many other statistics that follow are derived from the U.S. Bureau of the Census, *Statistical Abstract of the United States: 1995–96* (Washington, D.C., 1997) and from more recent information on the Census Bureau Internet web site http://www.census.gov/ .
4. Environmental Protection Agency, *National Priorities List Fact Book (*Washington, D.C.: U.S. Environmental Protection Agency, February 1991).
5. Bouvier and Grant, *How Many Americans?* 15–16.
6. Bouvier and Grant, *How Many Americans?* 17.
7. Hal Dardick, “Naperville, Aurora Make List for Growth,” *Chicago Tribune,* 30 June 1999.
8. Bouvier and Grant, *How Many Americans?* 15.
9. M. Falkenmark and Carl Widstrand, “Population and Water Resources: A Delicate Balance,” *Population Bulletin* 47, no. 3 (November 1992): 13.

3 How Do We Get There?

Fertility, Mortality, and Immigration

First, let's look at how we got "here." Throughout the nineteenth century, fertility was quite high and women averaged between 4 and 5 births. This all changed in the twentieth century and by the 1930s, fertility had reached a then all-time low. Women were averaging fewer than 2 births. This was followed by the postwar "baby boom" era: birth rates soared, with women averaging between 3 and 4 births for the period between 1947 and 1964. Since then fertility has begun a gradual decline, and the late 1970s witnessed a so-called "baby bust" period when total fertility rates dropped to under 1.8 (including a record low of 1.77 in 1975). Rates have since climbed slightly to about 2.0.

Mortality has fallen throughout this century. In 1900, Americans could expect to live about 35 to 40 years. Today, life expectancy has almost doubled to around 75 years. This is good news for all, but it is important to realize that increased life expectancy contributes to higher levels of population.

Finally, international migration must be discussed. From 1900 until about 1914, net migration[1] averaged close to 1 million per year. After World War I and through World War II, net migration fell drastically and even registered a negative number (that is, more people left than entered the country) in 1933. Beginning in 1946, the numbers began to rise again and attained record high levels in the 1980s and 1990s. Currently, net migration is around 1 million per year.

Thus all three demographic variables play an important role in determining population size and growth. Individuals can be thought of as "population actors." They are born (as a result of a population act by their parents); they have a certain number of offspring depending on a number of factors; they move or don't move once, twice, many times during their lives; they eventually die, but age at death is, in part, related to many socioeconomic influences.

Many people concur with the goals of either zero growth or negative growth, as the polls repeatedly indicate. However, the question is often asked: "I agree, but how do we get there?" Getting there involves some changes in the demographic variables from what they have been recently. For years the magic fertility number "2.1" was cited as the answer. But while it was technically correct that women averaging 2.1 births would eventually lead to a stationary population, this path did not include immigration.

The total fertility rate indicates how many births are necessary to reach zero population growth (without immigration). It is not 2.0 (two births replace two parents) because (1) there are more male births than female births, and (2) not all females live to reproduce. Since the sex ratio at birth is about 105 males per 100 females, a total fertility rate of 2.05 is about as low as technically possible to achieve replacement-level fertility. With recent improvements in life expectancy, the replacement-level fertility in the United States is now about 2.08 rather than the oft-cited 2.1.

Mortality must also be considered. Often, those making population projections tend to minimize the impact of changes in mortality levels. Yet, a decline in mortality (or to be specific, an increase in life expectancy) can result in a substantial boost in population.[2] Of course, no one advocates a reduction in life expectancy; in this report some gains in life expectancy are expected.

Any gains would necessarily be accompanied by reductions in fertility and/or immigration if stationarity is the goal.

Finally, immigration is an increasingly important variable that contributes significantly to population growth in the United States. While fertility and mortality cannot be regulated arbitrarily, immigration can. The federal government can determine how many people may enter the country (legally) in any given year. It may not be possible to eliminate illegal immigration completely, but much can be done to reduce it significantly.

In sum, the interaction of the three demographic variables—fertility, immigration, and mortality—together determine population growth, decline, or stationarity. In the next section, we will specify how these three variables can lead not only to an end to population growth but to population decline.

Age and Ethnicity

The age composition (or structure) of a population is almost as important as its size. A "young" population (i.e., with a large proportion of young people) has vastly different problems than an "old" population (where there are many elderly people). Changes in the three demographic variables can contribute to variations in age composition. Abrupt shifts, especially in fertility, pose major problems for a society as the cohort resulting from that shift in births passes through the life cycle. There is no better example of this phenomenon than the United States "baby boom" cohort. As it ages, this giant generation affects school enrollments, entrances into the labor force, etc. We are concerned, now, about the impact on our Social Security and Medicare systems when that generation begins to reach retirement age (in about 20 years). The projections in this work begin with an age structure like that which exists in the United States today. Projected changes in fertility and immigration in the various scenarios will illustrate how that age structure might be affected.

The racial/ethnic composition of the nation is also an important variable to consider. With continued high levels of immigration, the composition of the United States is changing rapidly and will continue to do so. The fertility of the majority population is below replacement level and that of most immigrants is higher than replacement level. With the number of immigrants remaining large, it is likely that the nation will become a "nation of minorities" well before the twenty-first century is over. There will be no majority segment of the population. This will result in significant changes in the definition of what is an "American," and could be one of the most serious challenges of the twenty-first century. This process, therefore, must be evaluated very closely.

Toward a Stationary Population

There are two ways to reach stationarity: (1) with a fertility rate at replacement level (about 2.08 given the increase in life expectancy assumed) and zero migration, and (2) with a fertility rate *below* replacement combined with a constant level of immigration above zero. In the following projections, it is our purpose to demonstrate how to move in the direction of what demographers refer to as a "stationary population." This is a population where no further growth occurs; and, most important, where the birth and death rates are equal and the age composition is unchanging. These are, of course, only mathematical models and in 1999 only Sweden and Denmark approach stationarity. The path to stationarity varies for different countries.

We must also distinguish between stationarity and the more popular term, stability. Far too often, journalists and others confuse the two. A *stable* population is one which is eventually attained if the age-specific birth and death rates are maintained for a few generations. Stability does not mean that the population has stopped growing or decreasing. It simply means that it is changing at a stable rate and its age-sex composition is also stable. A *stationary* population is a special kind of stable population which has all the characteristics of stability, but which also ceases to grow or decline.

For years, demography texts pointed out that while stationarity may be ideal, it only applied to "closed populations"–that is, where there is no migration either in or out of the society and where the fertility rate is exactly at replacement; in an equation, $B = D$ (births equal deaths). However, in a February 1982 demographers Thomas Espenshade, Leon Bouvier, and Brian Arthur demonstrated for the first time that *if fertility is below replacement and net immigration is constant, a stationary population eventually emerges* (or $B + M = D$) (births plus migration equals deaths):

> [W]e have shown that any fixed fertility and mortality schedules with a net reproduction rate below one,[3] in combination with any constant annual number and age distribution of immigrants, will lead in the long run to a stationary population. The size and other characteristics of this eventual stationary population depend only upon our assumptions regarding fertility, mortality, and the age-sex composition of immigrants, and are not influenced in any way by the population we begin with. . . . We have shown that these results can be obtained even when some "generations" have above replacement fertility. All that is required to establish a stationary population in the long run is that at some point in the generational chain of immigrant descendants, one generation and all those that succeed it adopt fertility below replacement.[4]

That finding is the foundation of the present study. As long as fertility is below replacement and net immigration is constant, a stationary population eventually emerges.[5]

In the United States the population continues to grow for a brief period because of its relatively young age and continued immigration. This is partly due to what we have referred to as "population momentum." Even though fertility is low, the many births resulting from the baby boom have led to a large number of women in their reproductive years. Even if they limit themselves to 1.8 births, on average, the actual *number* of births will be high for the simple reason that many women (from the baby boom period) are available to have those births. To this we add immigration, in which young adults are generally overrepresented. Thus, for a few decades births still outnumber deaths. In the second stage, deaths begin to outnumber births (recall that the TFR must be below replacement). However, the population still increases as net migration remains higher than natural *decrease*—that is, deaths minus births). As the population continues to grow, solely because of immigration, the size of the natural decrease also grows. Eventually the final phase is reached when natural decrease equals immigration. At that point no further growth is possible, and eventually pure stationarity is attained. Again, we must point out that population momentum could be at work here, but in a negative sense. With fertility being very low, fewer women are available to have children some twenty to thirty years later. Negative population momentum contributes to a larger decrease in population size.

The aforementioned 1982 article has led to numerous studies and projections that follow its example. In their 1995 study on the population of Australia, Young and Day showed that if the total fertility rate remained constant at 1.865 births per woman, and mortality also remained constant, with net migration of 50,000 persons per year, this would eventually result in a stationary population of about 23 million.[6] More recently, Australian demographers Kippen and MacDonald wrote: "Achieving Population Targets for Australia: An Analysis of Options."[7] Other published articles, such as one by Australian demographers Kippen and MacDonald, "Achieving Population Targets for Australia: An Analysis of Options," have also been based on the 1982 finding which serves as the basis for this study.

The ideal of a stationary population (or more realistically, near stationarity) cannot be overemphasized. That society would not have to concern itself with sudden age shifts such as the United States has undergone as the "baby boom" and "baby bust" generations go through their various stages of life. Such a society could plan for the future, whether for school construction, highways, waste materials, etc. This is all the more relevant when compared to our present situation as illustrated earlier. Stationarity is an *ideal* demographic situation. Perhaps it cannot be thoroughly attained, however at this time, it is worth aiming for. Meanwhile, as we will see, stability is definitely attainable.

Endnotes

1. Since only the nation (and not sub-regions or states) is discussed in this report, the term "net migration" will be used to denote the net difference between immigration (people moving into the United States) and emigration (people leaving the United States). Migrants, when that term is used, refers to immigrants.
2. Samuel Preston and Kevin White have calculated what the U.S. population would have been in 1995 if the mortality rates at the turn of the twentieth century had not changed. They concluded that there would be about half as many Americans in today's population—139 million instead of 276 million. For a summary of this study, see Gina Kolata, "Model Shows How Improved Medical Care Allowed Population Surge," *New York Times,* 7 January 1997, B12.
3. A net reproduction rate (NRR) is a more sophisticated measure of fertility than a total fertility rate (TFR). Whereas the latter includes the entire population, the NRR limits itself to females. Thus a NRR of 1.0 means that one female will live to have one female—replacement fertility. Currently, a NRR of 1.0 approximates a TFR of about 2.08.
4. T.J. Espenshade, L.F. Bouvier, and W. Brian Arthur, "Immigration and the Stable Population Model," *Demography* 19, no. 1 (February 1982): 132.
5. It should be pointed out that the higher the fertility rate (but still below replacement) and the higher the level of immigration, the larger the eventual stationary population. Similarly, the longer a society waits to reach below-replacement fertility, the larger the eventual stationary population will be. Thus, time is of the essence.
6. C. Young and L. Day, "Australia's Demographic Future: Determinants of Our Population," in Australia Academy of Science, *Population 2040: Australia's Choice*, proceedings of the Symposium of the 1994 Annual General Meeting, Australian Academy of Sciences, Canberra, 1995.
7. R. Kippen and P. McDonald, "Achieving Population Targets for Australia: An Analysis of Options," *People and Place* 6, no. 2 (1998): 11–23.

4 Goals and Assumptions

Goals

This work is primarily concerned with developing population models that show the way to a stationary and eventually smaller (optimum) U.S. population.[1] Models are not exactly like the "real world." For one thing, changes are not noted as often as in the real world, nor can they be predicted with any reliability. Another consideration is time. In models, time spans of decades or even centuries can be included. The longer the time span of a model, however, the less likely it is that the inevitable constant—change—can be factored in accurately. As will be seen in the projections used herein, the ultimate stationary population is not reached. This is simply because, in trying to be somewhat realistic, all projections are limited to 150 years—from 2000 to 2150. However, based on the conclusion of the Espenshade et al, article discussed earlier (hereinafter referred to as "Espenshade's Law"), *if fertility remains below replacement level and if immigration stays at a constant level, a stationary population eventually occurs*.

Predicting demographic changes in models can be quite risky. For example, no one foresaw the sudden and remarkable drop in U.S. fertility when the TFR fell from 3.7 in the late 1950s to replacement level a decade later. Nor did anyone predict the "baby bust" that followed. The total fertility rate in the United States remained at about 1.8 for about fifteen years before climbing slightly to around 2.0 in recent years. The "baby boom" was a demographic surprise, unexpected by all the experts. Thus, while we can rely on models to demonstrate what would happen *if*, we must remember that they indicate what would occur given certain stated assumptions. Any sudden major changes in the demographic behavior of the population cannot be reliably predicted by models. These models, then, are projections and not predictions of any future demographic behavior. In the real world, fertility will change, mortality will change, and levels of immigration may rise or fall. Thus, these projections are hypothetical and serve as illustrations of the demographic dynamics that occur in sub-replacement fertility populations.

Two basic models serve as the basis for the projections used in this paper. In one model, we try to determine what combinations of the three demographic variables will yield an eventual stationary population of about 150 million Americans. Given the problems with rapid population growth discussed earlier, such a stationary population would be ideal. In the other model, we aim for a stationary population of about 300 million. While not as attractive, this is perhaps more attainable than the 150 million goal.

Assumptions

Looking at fertility first, it should be recalled that by definition, fertility has to be below replacement level if a future stationary population that includes some immigration is to be attained. Without any immigration, fertility would have to remain constant at about 2.08 to reach eventual stationarity. Anything above 2.08 would result in unending growth; anything below 2.08 would mean an eventual zero (not zero growth) population (but not for thousands of years!). For this study, three levels of fertility have been chosen: 2.0, 1.8, and 1.6. Lower rates could have been selected to reflect the current fertility rates in many European countries. Indeed both Italy and Spain have total fertility rates of 1.2 and lower. As demographer Antonio Golini has noted, however, "In the long term even a very low fertility rate (e.g., one less than 1.3) seems to be unsustainable. . . . In such a demographic situation, immigration does not seem to be a suitable means to restore population equilibrium."[2]

At the other extreme, 2.0 is as high as one can possibly go and still be "below replacement." While projection models are somewhat unreal, it would be absurd (if not plain wrong) to assume, for example, that the current U.S. fertility would fall from about 2.0 to 1.2 next year! For that reason, in our assumptions about fertility, all projections begin at 2.0, with the 1.8 assumption attained in 2010, and 1.6 reached in 2020.[3]

These fertility levels are the average for the *entire* population—native-born and foreign-born alike. Generally, foreign-born women exhibit higher fertility than their native-born counterparts. By the second, and sometimes third, generation, the fertility of the descendants of the foreign born tend to merge with those of the overall nation. Nevertheless, as a rule of thumb one should consider that if the total fertility rate for the nation is 1.8, for example, it suggests that the rate for the native born is lower—perhaps 1.7. Bear in mind that the native born comprise a large majority of the population, thus their fertility need only be slightly lower than that of the total population.

To simplify matters, only one mortality assumption has been selected. Life expectancy is assumed to increase from its present level of 75 years for males and 82 years for females to 80 for males and 87.5 for females by 2150. Admittedly this is not a very large increase. The final rate approximates the present life expectancy in Japan (which is the highest in the world). It reflects a limit to increases in life expectancy which, given the mortality differences by ethnicity and race, and the possible dangers from any increase in AIDS as well as in environmentally-related diseases, seems a reasonable—though conservative—assumption.

Three migration assumptions will be generated: net migration of 150,000 annually, 500,000 annually, and zero net migration.[4] Immigration of 500,000 is typical of the average annual U.S. immigration over the last 50 years. Immigration of 150,000 is thought to be about as low as reasonably possible given the current political atmosphere. The zero migration assumption serves to illustrate what would happen if in-migration equaled out-migration, that is no net immigration at all.

These combinations of assumptions for fertility, mortality, and migration yield a number of different projection models. By interpolation it is possible to develop even more projections. In a later chapter, projections using higher levels of immigration as well as fertility will be developed. Furthermore, these projections are not concerned solely with total numbers. As noted earlier, age composition is also extremely important, as is the proportion of migrants and their descendants in a population. These too will be analyzed.

Projections are limited to 150 years. The end result will not yield a true stationary population although in the models, stability will often be reached. By 2150 however, the results should be close enough to stationarity to suggest what the eventual statistics would be. Furthermore, going beyond 150 years strains the credibility of these models. To cite Kippen and McDonald:

> We will show that short-term paths to most stationary populations are not smooth. Indeed, most paths to a stationary population in the short term involve impossible or, at least, unsustainable assumptions about future trends of fertility and immigration. We demonstrate that population dynamics make it very hard to hit a target without greatly over-shooting the

mark. In general, a growing (or declining) population will continue to grow (or decline) for several decades after fertility rates and migration have reached replacement level.[5]

As we shall see, such generalizations are true of this analysis—and thus justify limiting the projections to 150 years and avoiding making such "unsustainable assumptions."

To simplify matters a bit, the various assumptions are labeled as follows:

Table 4.1 Assumptions of Selected Projections of U.S. Population 2000–2150

Title	Fertility	Migration
NPG 1	2.0	0
NPG 2	1.8	0
NPG 3	1.6	0
NPG 4*	1.4	0
NPG 5*	1.2	0
NPG 11	2.0	150,000
NPG 6	1.8	150,000
NPG 7	1.6	150,000
NPG 8*	1.4	150,000
NPG 9*	1.2	150,000
NPG 10	2.0	500,000
NPG 12	1.8	500,000
NPG 13	1.6	500,000
NPG 14*	1.4	500,000
NPG 15*	1.2	500,000

* These scenarios will be discussed in a later section. They are not examined here.

Endnotes

1. The words "model" and "scenario" will be used interchangeably in this report. Both refer to the same thing.
2. Antonio Golini, "How Low Can Fertility Be? An Empirical Observation," *Population and Development Review (*March 1998): 63.
3. This gradual pattern of fertility decline is also applicable to the very low fertility models described in a later section.
4. To simplify matters, the term "migration" will be used on most occasions rather than immigration or net migration. It is understood that "migration" refers to the net extent of international movements.
5. Kippen and McDonald, "Achieving Population Targets," 13.

5 The Models and Population Size

Since the level of migration can be changed by legislative fiat, while fertility and mortality cannot, the analysis focuses on fertility levels in relationship to the various levels of migration noted. Only one assumption on future life expectancy is used throughout the various models. Thus, the population dynamics of stationarity are determined by the interaction between the total fertility rate (TFR) and various levels of migration.

NPG1, NPG11, and NPG10—Total Fertility Rate 2.0

The first three models presented, all with a TFR of 2.0, are populations with fertility very similar to the United States today. Net immigration, however, is far below current levels, indicative of the difficulty of achieving a stationary U.S. population with below-replacement-level fertility and high immigration.

Assumes *Total Fertility Rate = 2.0*
Migration = Zero(NPG1), 150,000 (NPG11), 500,000 (NPG10)

As seen in the accompanying table (5.1) and graph (Figure 5.1), the U.S. population (under NPG1) is about 275 million in 2000 and peaks at 304 million in 2030 before beginning a long-term decline. By 2150 it will have fallen to 276 million (or about the same as at the starting point) and still be dropping, ever so slowly. Since the fertility rate is just barely below replacement, and there is zero migration, in theory this population would eventually disappear—in a few thousand years! Its annual growth rate (0.45% in 2000) begins to decline by 2035 (-0.01%), and then reaches a negative growth rate of -0.08% in 2090, where it remains thereafter.[1] Given that in the real world, fertility might fluctuate around 2.0 (perhaps falling to 1.9 and occasionally rising to 2.1), this might be a good model to follow, bearing in mind that it assumes zero net migration. If 300 million is the desired goal, that number would be reached between 2025 and 2050. At that time, some migration, however small, might be encouraged—to maintain that number. Should 150 million be preferable, then it might be appropriate to leave migration completely out of the picture until after 2150. We can only be certain of one thing: with fertility at this level (2.0) and no migration, population decline will eventually occur, but at a very slow rate.

Model NPG11 assumes migration of 150,000 annually. Again looking at the appropriate column, the population peaks at 310 million in 2035 before beginning a very long and slow decline to just under 300 million in 2150. Thus some slight growth occurs at first, followed by a very slow decline as the growth rate falls to -0.02% and then levels off at around -0.03% beginning in 2070. Such decline is so slow that between 2050 and 2150, population decreases a mere 9 million. Interested as we are in the next 150 years, NPG11 seems to be a perfect model to follow if a population of 300 million is the preferred goal. While it may peak at 310 million, it then falls gradually to the desired 300 million. On the other hand, if 150 million is the desired goal, this is not the model to emulate.

Table 5.1 Projected U.S. Population, 2000–2150 (in millions) with TFR 2.0*

Year	NPG1	NPG11	NPG10
2000	274.82	274.82	274.82
2010	286.88	288.50	292.28
2020	298.43	301.85	309.83
2030	304.02	309.29	321.59
2040	302.74	309.91	326.65
2050	299.39	308.41	329.47
2060	297.24	307.92	332.87
2070	294.95	307.12	335.55
2080	292.29	305.89	337.66
2090	290.03	305.04	340.13
2100	287.67	304.09	342.45
2110	285.23	303.04	344.66
2120	282.94	302.14	347.02
2130	280.58	301.16	349.26
2140	278.24	300.19	351.51
2150	275.99	299.31	353.83

*Note: Projection NPG1 TFR 2.0, net migration=0; NPG11 TFR 2.0, net migration=150,000; NPG10 TFR 2.0, net migration=500,000.

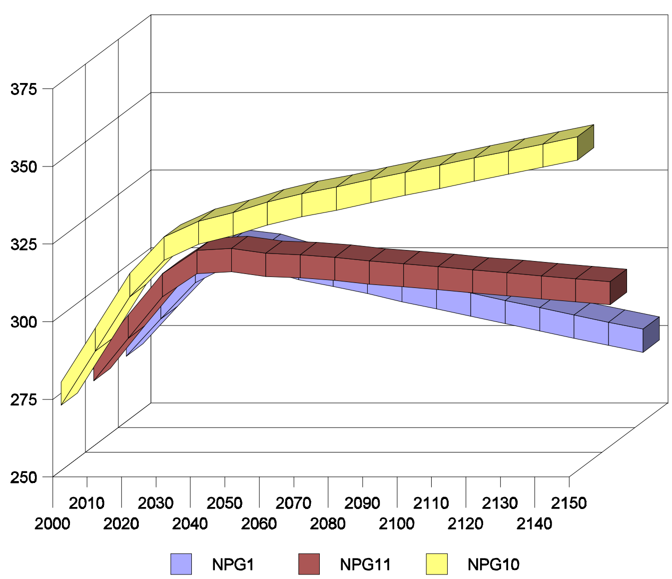

Figure 5.1 Projected U.S. Population, 2000–2150 (in millions), TFR 2.0

Model NPG10 assumes migration of 500,000 annually. This model is out of the question as a feasible path to a smaller and stationary population. The population never stops growing, reaching 354 million in 2150. Fertility may be slightly below replacement, but the level of migration is so high that true stationarity will only occur at a population substantially greater than desired. Even under these assumptions, the growth rate, which is quite high in the early years, eventually settles to 0.07% in 2070 and remains around that level to 2150 and presumably well beyond that year. Sooner or later, stationarity will be attained, but only when the population is much, much larger. Thus, this model is not a viable option for achieving stationarity. It does serve, however, as an example of what the United States may well face over the next 150 years. Currently, U.S. net migration totals approximately 1 million annually. Even if immigration were cut in half, and fertility fell slightly to 2.0, the population would reach 342 million in 2100 and 354 million fifty years later (and still be growing).

Summing up the projections based on a total fertility rate of 2.0 and various levels of migration, NPG10 is out of the question. The two other models, however, suggest interesting possibilities. If 300 million is the desired goal, then NPG11 (TFR 2.0 and 150,000 migration) is a very workable model. The population never surpasses 310 million (in 2040) and, by 2150, is just below the stated goal of 300 million. At that time, there will be 24,000 more deaths than births. Some small increase in migration might be considered if it is desirable to maintain the population at that size. Under NPG11, the alternative goal (150 million) is out of the question. While stationarity is not yet reached in 2150, it will be soon after given that its growth rate in that year is -0.04%. Thus, this model is inappropriate as a means for achieving an eventual size of 150 million.

That leaves NPG1 (TFR 2.0 and zero migration) to consider. The 300 million mark is reached in 2030, after which the population begins a slow decline. To maintain a stationary population of 300 million would require a small level of migration, as natural decrease by 2050 amounts to 32,000. However, the second goal of 150 million is not realistic, as it would take many centuries to reach.

Thus, if fertility remains at about its current level, only the 300 million goal is possible under two of the alternatives: TFR of 2.0 and zero migration, and TFR of 2.0 and annual migration of 150,000. These are both relatively attainable goals if the United States were willing to substantially limit or eliminate immigration. If the lower goal of 150 million is ever to be reached, it would require some reductions in fertility.

NPG2, NPG6, and NPG12—Total Fertility Rate 1.8

Assumes *TFR=1.8*
Migration = Zero (NPG2); 150,000 (NPG6); 500,000 (NPG12)

(See Table 5.2 and Figure 5.2.) With lower fertility and without any migration, NPG2 shows the population of the United States peaking at 295 million in 2030 before beginning a long-term decline that would eventually (in thousands of years) reach zero. We are, however, only concerned with the next 150 years. By 2150, the nation's population would be down to 179 million. At that time, deaths would outnumber births by about 83,000 annually and the rate of growth would be -0.46%. Eventually, the goal of 150 million would be reached and passed. With below-replacement fertility,

Table 5.2 Projected U.S. Population, 2000–2150 (in millions) with TFR 1.8*

Year	NPG2	NPG6	NPG12
2000	274.82	274.82	274.82
2010	285.94	286.63	290.39
2020	293.69	296.14	304.01
2030	295.42	299.39	311.46
2040	288.80	294.15	310.47
2050	278.71	285.64	305.99
2060	269.28	277.45	301.33
2070	258.62	267.86	294.74
2080	246.99	257.38	287.03
2090	235.86	247.52	279.82
2100	225.35	238.20	273.02
2110	215.14	229.07	266.31
2120	205.43	220.48	260.05
2130	196.19	212.28	254.08
2140	187.32	204.39	248.34
2150	178.88	196.92	242.94

*Note: Projection NPG2 TFR 1.8, net migration=0; NPG6 TFR 1.8, net migration=150,000; NPG12 TFR 1.8, net migration=500,000.

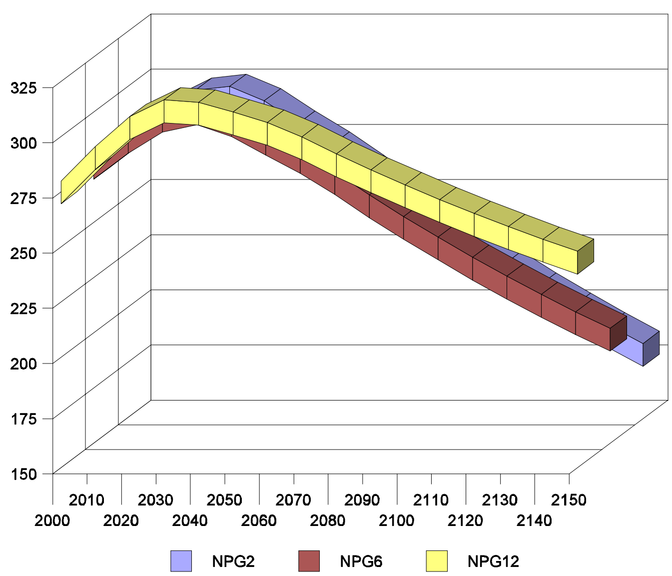

Figure 5.2 Projected U.S. Population, 2000–2150 (in millions), TFR 1.8

the momentum for population decline can be quite severe. As each low-fertility generation approaches its reproduction stage of life, fewer women are “available” to have children and thus put an end to the population decline. As noted earlier, such negative momentum can be as significant as positive momentum. By 2150, some low level of migration might be advised so that the 150 million mark can be attained but not surpassed. Whenever fertility remains below replacement and there is no migration, the conclusion is always the same: sooner or later the population disappears. This model (NPG2) is appropriate for perhaps a century after which some migration should be encouraged.

Under model NPG6 (TFR 1.8; migration 150,000), the population peaks at just under 300 million in 2030 (299.4 million). By 2150 it has fallen to 197 million. This model would appear to be about right if the goal is a stationary population of 150 million. After 2030, the level of migration could be raised slightly to compensate for the fact that by then deaths will exceed births. Indeed, by 2050, the excess deaths will amount to about 1 million. If the goal is an eventual population of 150 million, this too would occur but only well after 2150. With some tinkering with migration levels to compensate for natural decrease after 2030, a stationary population of 150 million is possible under this scenario. A population of 300 million is also possible. It would, however, require considerable manipulation of the immigration patterns.

Model NPG12 (TFR 1.8; migration 500,000) yields a somewhat larger population in future years than does NPG6. If 300 million is the desired goal, this model could be followed with certain alterations in future years. The population first reaches 300 million in about 2018. It then peaks at just under 312 million in 2035. It does not reach 300 million again until about 2060. The decline continues, reaching 243 million in 2150 at which time the growth rate is -0.42%.

Compared to model NPG 6, the goal of 300 million in NPG 12 is reached more quickly and the final population (in 2150) is considerably larger. While this model could be appropriate for the 300 million goal (with some adjustments after 2060), it is out of the question if the goal is a stationary population of 150 million.

The three models based on a TFR of 1.8 are all interesting possibilities that could be followed. The built-in momentum for decline, however, must be considered. Some migration is eventually necessary if a stationary population, whether of 150 or 300 million, is desired. Annual migration of 150,000 seems to be especially appropriate though adjustments may be necessary in the next century.

NPG3, NPG7, and NPG13—Total Fertility Rate 1.6

Assumes *TFR=1.6*
Migration = Zero (NPG3); 150,000 (NPG7); 500,000 (NPG13)

(See Table 5.3 and Figure 5.3.) While a TFR of 1.6 may appear to be quite low, recall that the U.S. rate was around 1.7–1.8 for about a decade in the late 1970s and 1980s. Without any net migration (NPG3) the population (in NPG3) rises briefly, because of the built-in momentum from a relatively young age distribution, to 293 million in 2020. Thereafter, population keeps falling steadily, reaching 200 million in about 2085 and 116 million in 2150. The annual rate of population decline reaches about -0.9% around 2070 and remains at that level until 2150. Stability has been reached and, if

Table 5.3 Projected U.S. Population, 2000–2150 (in millions) with TFR 1.6*

Year	NPG3	NPG7	NPG13
2000	274.82	274.82	274.82
2010	285.94	286.63	290.39
2020	292.75	294.22	302.04
2030	290.81	293.78	305.68
2040	280.59	284.66	300.65
2050	265.71	270.88	290.65
2060	250.51	256.72	279.69
2070	233.85	240.79	266.37
2080	215.60	223.37	251.22
2090	197.74	206.61	236.55
2100	181.00	191.07	222.90
2110	165.77	176.87	210.45
2120	151.80	163.84	199.05
2130	138.93	151.90	188.60
2140	127.22	140.99	179.09
2150	116.48	131.02	170.39

*Note: Projection NPG3 TFR 1.6, net migration=0; NPG7 TFR 1.6, net migration=150,000; NPG13 TFR 1.6, net migration=500,000.

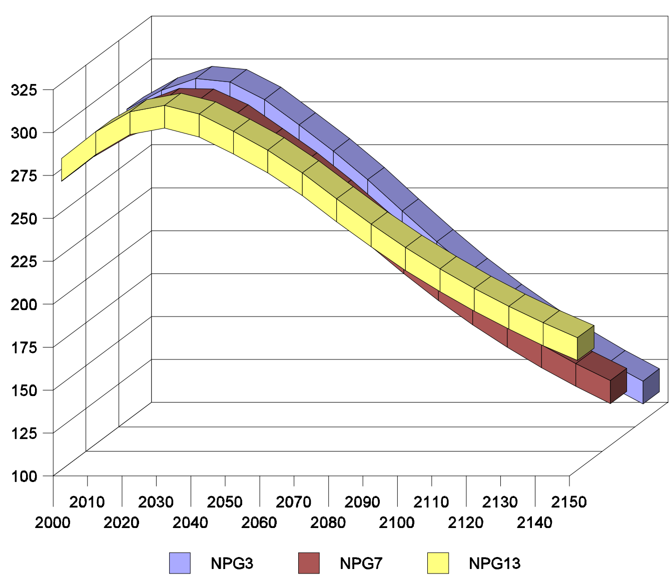

Figure 5.3 Projected U.S. Population, 2000–2150 (in millions), TFR 1.6

fertility and migration remain constant, the size of the population will be "halved" about every 75 years. At that fertility level, the population would drop to 65 million around 2225. The goal of a population of 150 million could be attained if after 2110, some migration was resumed—enough to assure that the number would remain at around 150 million. Since the 300 million mark is never reached, some migration would be required almost immediately if that goal were to be achieved.

In NPG7 (TFR 1.6) with migration constant at 150,000 annually, the population peaks in 2025 at 295 million and then begins a long-term decline to just under 200 million in 2095 and 131 million in 2150. After 2070, the annual rate of decline hovers around -0.7% or a "halving" about every 100 years. If the goal is a stationary population of 300 million, this could be realized with an increase in migration after 2025. Should the goal be 150 million, increasing migration could be postponed until around 2130, when the population would have fallen to 152 million. At that time a slight increase in migration would ensure an eventual population in the vicinity of 150 million.

NPG13, which assumes annual net migration of 500,000, makes the stated goals of this project more realistic. Under this scenario, the population would peak at 306 million in 2030 before falling to 200 million in 2120 and 170 million by 2150. In 2040, the population would approximate 300 million but would be on the verge of beginning its decline in the next five years. A slight increase in migration beginning after 2040 would ensure a stationary population around 300 million. The alternative goal of 150 million would not be reached until well after 2150. Beginning in about 2120 the annual rate of decline stays around -0.5%. The population would continue to fall after 2150 but when it did approach 150 million, migration could be increased to be certain that no further decline in numbers would take place.

To summarize, with fertility at such a low level, migration must be considered at perhaps half a million or more. Furthermore, it should be recalled that the TFR of 1.6 is for the *entire* population, including the newest immigrants. The fertility of the native-born population would have to be a little lower than 1.6 in this case.

Eventual Stationary Size

Throughout this discussion, projections deliberately have been limited to a 150-year period, realizing that even this span of time is too long for most policy makers and others. Yet, demographers are always curious as to what the eventual stationary population sizes would actually be. In a recent paper by demographer John Bermingham, a very useful equation has been prepared that allows us to determine the exact size of any population at "stationarity," providing that population meets the requirements stated in Espenshade's Law—that is, *the total fertility rate must be lower than replacement, and there must be a constant level of migration*. The equation follows:

$$Ps = (I) * (L) / (1 - TFR/TFRrl)$$

where Ps = the stationary population; I = the number of migrants per year; L = Longevity (or Life Expectancy) and $TFRrl$ is replacement level fertility.[2] The size of the starting population is irrelevant since, with fertility below replacement, that population will eventually disappear and not be a part of the eventual stationary population. The date when stationarity appears is unknown. That would require preparing actual projections for very long periods of time. Nevertheless, this information on eventual stationary population size is relevant to the present study and should guide us in the right direction. The eventual stationary populations of the various models is in Table 5.4 below. Since migration is required, the scenarios assuming zero migration are not included. Those eventual populations would, of course, be zero.

Table 5.4 Eventual Stationary Population of Scenarios (in 000s)*

	Level of Migration		
Total Fertility Rate	Zero	150,000	500,000
2.0	n/a	371,713 (299,310)	1,239,043 (353,830)
1.8	n/a	96,370 (196,920)	321,233 (242,940)
1.6	n/a	55,361 (131,020)	184,538 (170,390)

* Numbers in parenthesis are the respective projected populations for 2150.

When migration is limited to 150,000 per year, the stationary population is smaller than the projected 2150 population. (An exception is noted when the TFR is very close to the replacement level. With higher migration of 500,000, the stationary population is always larger—reflecting the significant difference in the level of such movements. With fertility at 2.0 and 500,000 migrants per year, the stationary population would surpass 1.2 *billion*—reason enough to discard this model![3]

It is important to emphasize that these stationary models assume no changes in demographic behavior after 2150, which is unlikely. Yet, such numbers serve as a "goal" to aim for—and also demonstrate that constant vigil must be placed on demographic behavior and the resulting vital rates. Only by doing so can the stated goals of this project be attained.

Conclusion

In all scenarios, fertility is assumed to be below replacement level. Eventually, the population of 2000 will disappear and be replaced by their descendants, and by post-2000 immigrants and their descendants. Again in part because of the below-replacement fertility assumptions, negative momentum was introduced as a demographic concept to be seriously considered. This possibility cannot be overemphasized. Negative growth is an interesting idea—but only temporarily. A population exhibiting a growth rate of -1.0% will be halved every 70 years (e.g., 1000–500–250–125, etc.). Just as the momentum for growth cannot be maintained indefinitely; neither can the momentum for decline.

It may be disappointing to the reader that stationarity is not reached within the 150-year limit that was set. This is not surprising. but "Espenshade's Law" should be mentioned once again. Except for those projections without any migration, stationarity will come about eventually—150 years is a long enough period to allow us to plan for the future. Should the United States eventually put a population policy in place, it is assumed that such a policy would be subject to occasional adjustments—adjustments that have not been made in this exercise. Furthermore, stability is attained in many cases and this would mean an end to age-specific upheavals.

A number of scenarios, with future adjustments in level of migration, are appropriate for the purposes of this study—for example, how to reach a stationary population of either 150 or 300 million. It is rather audacious to tell American policymakers of 2100 or 2150 how to change the nation's migration or even fertility levels. When one considers the massive alterations that have occurred in every segment of society from 1850 to 2000, it would be presumptuous to make recommendations for future long-run changes! Thus, we must settle for the next 150 years and note the direction in which these scenarios are pointing.

In the discussion of each projection, comments were made as to the usefulness of each scenario. Here we simply enumerate these and suggest that the reader turn to them to review the possibilities. All three *no migration* scenarios (NPG1,2,3) are potential approaches to follow. NPG1 is particularly appropriate for the 300 million goal, while NPG2 and NPG3 are more suitable for the 150 million goal. In all instances, migration would have to be resumed at some future point to attain these goals. Without any migration and with fertility levels all below replacement level, the population would keep falling indefinitely. In the short run, this is not a bad idea; in the long run it means societal suicide. Future policymakers might want to keep watch on natural increase. When that becomes natural *decrease*, it may be the occasion to re-examine the policies—especially as they pertains to migration and depending, of course, on the size of the population at that time.

With a total fertility rate of 1.8, migration must be considered at some point in the future. Without any migration, the population would total 170 million in 2150 and still be falling. Before then, policymakers would have to allow for some small level of migration to return to a 300 million level. The same is true, though the decision could be postponed for quite some time, if the goal is a population of 150 million. Assuming *migration of 150,000* annually, the goal of 300 million is attainable if that level of entries is increased slightly after 2030 to compensate for the natural decrease. With a goal of 150 million, this scenario is not really appropriate—at least not for the next 150 years.

If fertility falls gradually to 1.6, the eventual size of the population will be quite small. Such a rate could be sustained only if migration never ended. Depending on the preferred goal (i.e., 300 or 150 million), migration would have to be maintained or reintroduced at some point in the near future. Table 5.5 below summarizes the various population sizes in selected future years as well as the annual growth rate in those years for the scenarios under consideration.

Looking solely at the final year in these projections (2150), it becomes clear that even small shifts in fertility are more important than any changes in levels of migration. For example, NPG2 and NPG13 have similar populations in 2150. Yet the former has no migration and a TFR of 1.8, while the latter has annual migration of 500,000 and a TFR of 1.6. NPG11 has the largest population in 2150 as expected; NPG3 has the smallest. Interestingly, from 2050 onward all scenarios exhibit negative rates of growth. While these negative growth rates appear to be quite small, over time the impact of negative momentum takes hold. Any one of these suggested scenarios would be appropriate to follow, given the stated goal of a stationary population of either 150 or 300 million. In all cases, it would be necessary eventually to compensate for natural decrease by raising migration, in order to be certain that the goal is not overreached.

Table 5.5 Future Population Size and Growth Rates by Scenario

Scenario	2050	2100	2150
NPG1 (2.0; 0 mig)	299.39 (-0.11)	287.67 (-0.08)	275.99 (-0.08)
NPG11 (2.0; 150 mig)	308.41 (-0.05)	304.09 (-0.03)	299.31 (-0.03)
NPG2 (1.8; 0 mig)	278.71 (-0.36)	225.35 (-0.46)	178.88 (-0.46)
NPG6 (1.8; 150 mig)	285.64 (-0.30)	238.20 (-0.39)	196.92 (-0.37)
NPG12 (1.8; 500 mig)	305.99 (-0.15)	273.02 (-0.25)	242.94 (-0.22)
NPG3 (1.6; 0 mig)	265.71 (-0.57)	181.00 (-0.88)	116.48 (-0.88)
NPG7 (1.6; 150 mig)	270.88 (-0.52)	191.07 (-0.78)	131.02 (-0.73)
NPG13 (1.6; 500 mig)	290.65 (-0.36)	222.90 (-0.59)	170.39 (-0.49)

Endnotes

1. A growth rate of 1 percent per year results in a doubling of the population in seventy years. A rate of 2 percent results in a doubling in thirty-five years. The growth rate results from a combination of natural increase (births minus deaths) and net migration (immigration minus emigration).
2. We are indebted to Dr. John Bermingham for this remarkable, and still evolving, paper entitled, "Zero U.S. Population Growth—How Low Must Fertility Fall to Accommodate Immigration?" This is an important contribution to the field of demographic research.
3. On this point, it is worthwhile to note that Dr. Bermingham calculated the eventual stationary population of the United States based on the most recent demographic data available. The number? 1,907,266,675!

6 The Models' Future Age and Sex Composition

The basic purpose of this report is to indicate the proper combinations of fertility, mortality, and migration that are necessary to reach and not surpass stated population goals. The mortality assumption is the same for all models in this study. Actual population size may be the most significant variable. The age (as well as sex) composition, however, is also important. Shifts in migration and fertility result in some differences in future age composition. When fertility falls too far below replacement level, it eventually results in low numbers of women relative to the parental generation (which is aging and eventually dying). That is, with prolonged sub-replacement fertility, the parents are not having enough children on average to "replace" themselves. Thus, generation after generation of sub-replacement fertility leads to fewer and fewer women in each succeeding generation. This partially explains the concern with very low fertility. As noted, the momentum for continued decline is due to the very low number of reproductive age people in such populations. With so few persons able to conceive, it thus becomes difficult to increase fertility. A look at the population pyramids that accompany this section illustrate this potential problem.

In this section, those scenarios that are reasonable population-wise will be examined with respect to their age and sex composition. Then a comparison among all of them will be made. Concentration will focus on age composition in 2000, 2050, and 2150. Detailed analyses can be found in the Appendices of this report.[1]

The Census Bureau estimates that in 2000, 21.4 percent of the nation's population will be under the age of 15 while 12.7 percent will be 65 or over. The dependency ratio (number of persons 0–14 and 65 and over per 100 persons 15–64) is thus 52 (that is, there will be 52 "dependent" persons per 100 "active" persons), and the median age of the population will be about 36.[2]

In all models, the population will become "older" than it is now. One question that arises is "how does a population age?" The most common-sense answer would be that a reduction in mortality is the cause. But the mortality assumption in this case is the same for all models. Yet, all the populations "age." Demographer Ansley Coale points out that the average age of a population is the average age of living persons, not their average at death.[3] Indeed, a *decline* in fertility results in an aging of the population since fewer young people are being added, thus moving the median age higher and higher. Migration can also contribute to making the population either older or younger depending on the age distribution of the immigrant population. As the various models are discussed, this impact will be noted.

In passing, it should be mentioned that the aging of a population is a phenomenon that is noted in many parts of the world. In a recent (March 1999) *U.S. News and World Report*, Philip Longman comments that: "The world is going gray, and one day soon, the implications of that trend could unnerve today's boom psychology."[4] Concord Coalition founder Peter Petersen has dealt in rich detail with the problems associated with high proportions of elderly—a problem that will emerge to some degree if fertility remains well below replacement level.[5] While this is not the place to discuss these somewhat "doomsdayish" views, aging of the society will present significant problems. One simply has to look at the concern currently being expressed over the funding of the nation's Social Security and Medicare programs as examples of the perceived dangers involved in an older nation.

Zero Net Migration

Let us begin by looking at the zero migration scenarios starting with NPG1 (TFR 2.0; zero migration). Stability (though not stationarity) is approximated early in the twenty-first century with the percent in each age group hardly changing thereafter. By 2050, the proportion of people ages 0–14 has fallen to 18.3% and will fall slightly more by 2150 (to 17.6%). On the other hand, the elderly share (65 and over), which was 14.6% in 2000, will rise to 19.9% in 2050 and 22.3% in 2150. The dependency ratio will rise from 52 in 2000 to 62 in 2050 and 67 in 2150. The median age will rise from 36 in 2000 to 41 in 2050 and 42 in 2150. This then will be a fairly old population when compared to today (1999). As the pyramid (Figure 6.1) indicates, it also exhibits a very smooth age composition. This is attributable to the fact that no baby boom or baby bust is assumed.

Numbers can sometimes be more enlightening than percentages. For example, while the 2150 population will be about the same as that in 2000, the number of persons 65 and over will rise dramatically. From 35 million in 2000, the elderly population will reach 62 million just forty years later (mainly because of the "last breath" of the baby boom and its echo) and then remain at about that level through 2150. Thus, in a mere forty years the elderly population will grow by 27 million—a difficult challenge for any society to face.

Now let's examine NPG2 (TFR 1.8; zero migration) where a similar, though even more drastic, age composition for the future is seen. Comparing the pyramids in 2150 for NPG1 (Figure 6.1) and NPG2 (Figure 6.2) makes the difference more vivid. By 2050, 16.2% of the population will be between 0 and 14. That share will drop slightly to 15.4% in 2150. At the other end of the age spectrum, the elderly share (21.8% in 2050) will rise to 25.3% in 2150. By the middle of the twenty-first century, approximate population stability will have been reached. By 2040, the dependency ratio will have risen to 60 and will rise gradually to 69 by 2150. The median age will be 43 in 2050 and 45 one century later. Looking at the pyramid (Figure 6.2) for this model, it is smooth though a slight growth is noted among those aged 55 to 60. Of course, compared to its counterpart for 2000, its overall size is considerably smaller.

Turning again to numbers, the difference between a constant total fertility rate of 2.0 and 1.8 (without any migration) can be quite remarkable. The elderly population will total 63 million in 2035 and then begin to fall, reaching 45 million in 2150—considerably smaller than the 62 million noted in model NPG1. And this is all due to a difference of 0.2 in the total fertility rate! Near the youngest end of the age scale, those 5–14 will number 40 million in 2000 before beginning a decline that reaches 19 million in 2150. The sex ratio remains between 96 and 97 throughout the 150-year projection period.

NPG3 (TFR 1.6; zero migration) yields even more unexpected results. Again, a comparison of the pyramids (Figures 6.1, 6.2, 6.3) for 2150 for the three scenarios where there is no net migration provides a graphic picture of the impact of extremely low fertility. Less than 15% of the population in 2050 will be between 0 and 14 (14.4%). That share will drop even more to 13% in 2150. In just fifty years, almost one in four residents of the United States will be 65 or over (22.5%). One century later that proportion will approach 29 percent. By the end of the twenty-first century, stability will have been reached and the dependency ratio will remain around 70 per 100 through 2150. The median age will reach 48 in 2080 and remain around that level through 2150.

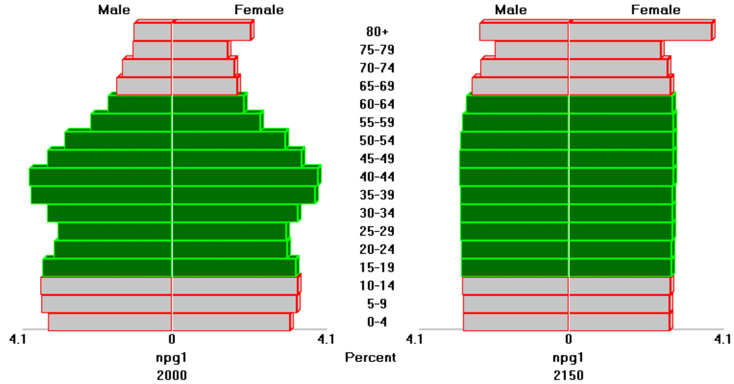

Figure 6.1 Projected U.S. Population 2000 and 2150, by age and sex (NPG1, TFR 2.0, zero migration)

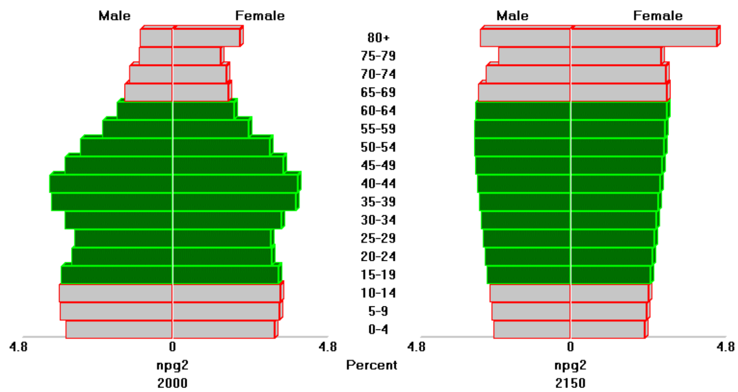

Figure 6.2 Projected U.S. Population 2000 and 2150, by age and sex (NPG2, TFR 1.8, zero migration)

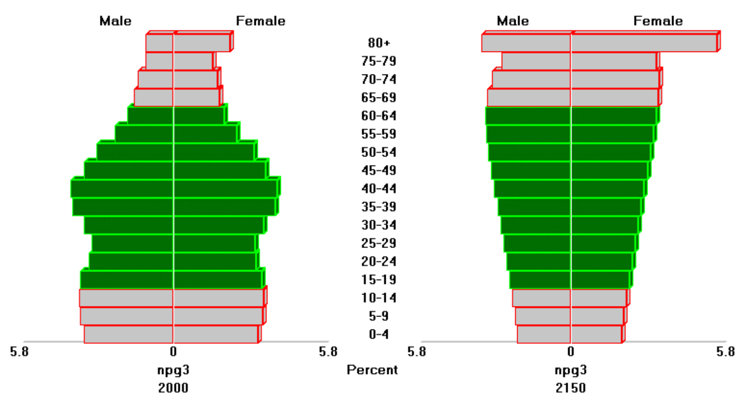

Figure 6.3 Projected U.S. Population 2000 and 2150, by age and sex (NPG3, TFR 1.6, zero migration)

The numerical variations over time are substantial. For example, the elderly will number 63 million in 2035 and then proceed to fall to 34 million by 2150. The school age population (i.e. between 5 and 14) peaks in 2000 at 40 million. It then begins to fall precipitously, reaching 10.4 million in 2150. This is a striking illustration of what happens to the age distribution of a population exhibiting such a low level of fertility. The sex ratio, over the 150-year period, remains around 96 males per 100 females.

To this point the discussion has been limited to those models where migration is not a factor. But migration level not only affects population size, in some instances it may result in differences in age and sex composition.[6]

Net Migration = 150,000

According to model NPG11 (TFR 2.0; net migration 150,000), although future population size is significantly affected by migration, age composition is not—at least not at this level of migration. The age composition of NPG11 (see Figure 6.4) is remarkably similar to that for NPG1, which has the same fertility assumptions but no migration. In 2050, in NPG11, 18.2% of the population will be between 0 and 14 and that share will fall slightly to 17.5% in 2150. At the older age (65+), the respective shares will be 19.8% in 2050 and 22.2% in 2150. In both age groups, the percent distributions are almost identical to those noted for NPG1. Thus, as would be expected, the median ages and the dependency ratios are also comparable. Even a cursory examination of the two pyramids in 2150 suggests a similar pattern. Overall, the age similarities are remarkable. Population stability is reached around 2030 and the sex ratio will gradually rise to 99—resulting from the assumption that males comprise a larger share of the immigrant population than do females.

The overall numbers will not as closely resemble those from NPG1. The elderly total will rise to 64 million in 2035 and then fall to 61 million in 2050 (the baby boom becoming the senior boom by around 2035). It will then gradually rise to 66 million in 2150. The elementary-school-age numbers (5–14) will fall gradually over the 150-year period, from 40 million in 2000 to 35 million in 2150. These totals are, of course, somewhat greater than those for NPG1. It is interesting that even with 150,000 immigrants entering the country every year, age structure and the dependency ratio are barely affected. This suggests that the arguments for continued migration to "solve" some of our Social Security problems may not be as valid as is sometimes stated.

Let us turn now to NPG6 (TFR 1.8, net migration 150,000). As with NPG1 and NPG11, this scenario closely resembles NPG2 (TFR 1.8; zero migration) in age composition (see Figure 6.5). The proportion of youth ages 0 and 14 in 2050 is quite similar (16.0%); in 2150 the difference is minuscule (15.2% as compared to 15.4% for NPG2). Among the elderly, minor differences are noted. Migration of 150,000 per year results in a very slight reduction in the proportion of ages 65 and over. In 2050, it is 21.3% (compared to 21.8% without migration). The difference then increases over time and in 2150 the proportion for NPG6 is 24.0% compared to 25.3% for NPG2. For both scenarios at both times, the dependency ratio is the same: 67. Likewise, median age barely varies whether in time (2050 or 2150) or by scenario. The sex ratio is almost an even 100 by 2150. Stability is attained late in the twenty-first century.

Because of relatively low fertility, the youth population (5–14) falls gradually from 40 million in 2000 to 31 million in 2050 and 20 million by 2150. Thus, in 150 years that age group's

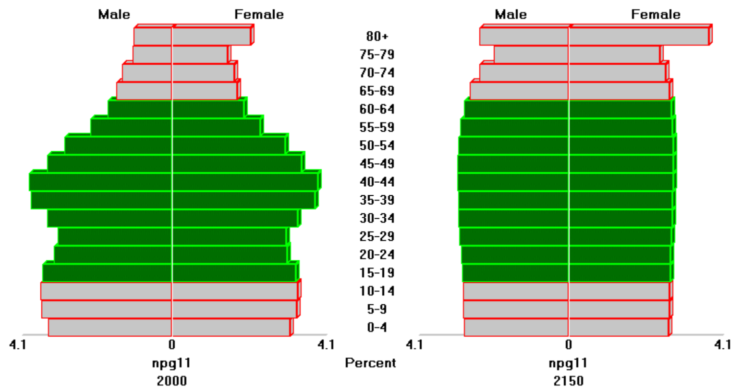

Figure 6.4 Projected U.S. Population 2000 and 2150, by age and sex (NPG11, TFR 2.0, net migration 150,000)

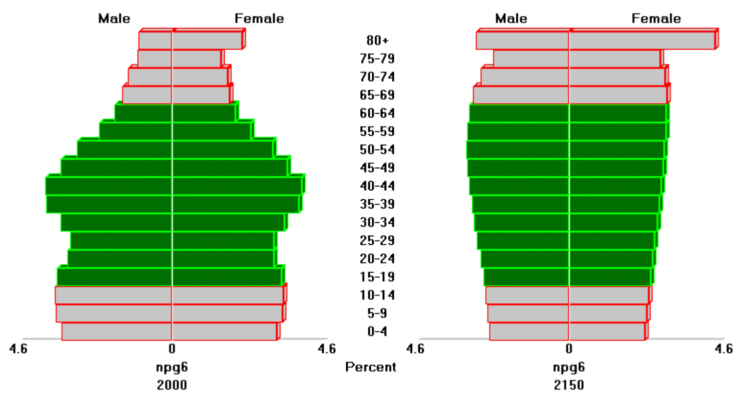

Figure 6.5 Projected U.S. Population 2000 and 2150, by age and sex (NPG6, TFR 1.8, net migration 150,000)

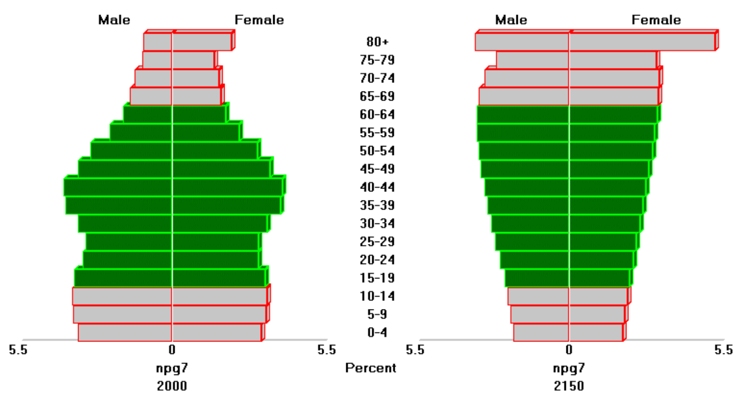

Figure 6.6 Projected U.S. Population 2000 and 2150, by age and sex (NPG7, TFR 1.6, net migration 150,000)

numbers are reduced by half. The elderly population peaks in 2035 at 64 million (senior boomers) before beginning a fairly gradual decline to 49 million in 2150.

Yet another comment is warranted regarding the argument that migration must increase to replace the very low fertility of native-born Americans. As noted in this analysis, age differences are minimal at best. A glance at the two population pyramids attests to this conclusion. Accepting 150,000 persons annually would do practically nothing to change the age distribution of the population; it would, however, result in more Americans in future years. Furthermore, it would lead to a vastly different "kind" of United States, as will be seen later.

Finally, we examine NPG7 (TFR 1.6; net migration 150,000). Even with such a low fertility rate, the age distribution pattern above is repeated here (see Figure 6.6). Comparing NPG7 with NPG3 (same fertility), the share of 0–14 in 2050 is approximately the same (NPG7 14.2% and 14.4% for NPG3). The same continues to hold in 2150 when 12.9% is the share for NPG7 while that for NPG3 is 13.0%. The proportion of elderly is barely lower with migration than without. In 2050, the respective shares are 22.5% and 24%. By 2150, they are 28.3% and 29.0%. Thus, annual migration of 150,000 does result in a slightly larger share of elderly, though the difference is hardly perceptible. The dependency ratio is almost the same for both scenarios whether it be in 2050 or 2150: 58 dependents per 100 active age individuals in 2050; 70 to 72 in 2150. Likewise, for median age, differences are again infinitesimal. Because of the very low level of fertility, stability is not yet attained in 2150 although age variations are quite minor. The sex ratio increases over time and by 2150 is almost equal.

In 2000, the 5–14 population is expected to be about 40 million. That number then begins to fall gradually to 26 million in 2050 and 11.5 million in 2150. The impact of very low fertility is quite obvious. At the other end of the age scale, the elderly population, 35 million in 2000, climbs to 64 million in 2035 (the senior boom), then falls somewhat before reaching 64 million again in 2065 (the baby boom "echo" effect). It then proceeds to decline gradually to 37 million by 2150.

The conclusion remains the same: whether there is or is not any migration (at least at no more than 150,000 per year), the age distribution of the population is barely affected, as can be seen by comparing the respective pyramids. The primary difference is that the total numbers are obviously larger with than without migration.

Net Migration = 500,000

In models NPG12 and NPG13, net migration is assumed to be 500,000 per year. We will now look at these models to determine whether differences in migration or fertility demonstrate any variations in the future age and sex composition of the nation's population.

Looking first at NPG12 (TFR 1.8; net migration 500,000), the proportion of 0- to 14-year-olds barely surpasses 15% whether it be in 2050 or 2150 (see Figure 6.7). The elderly share does increase over time—from 20.9% in 2050 to 24.6% in 2150. The dependency ratio remains between 62 and 65 for the entire period 2060–2150. The median age does climb slightly from 43 to 45. The sex ratio also rises gradually, surpassing 100 (males per 100 females) by 2040 and eventually reaching 104 in 2150. The age-sex composition of the immigrant group is assumed to remain at the level noted in recent years (i.e., 1990). At that time there were about twice as many male immigrants as there were female. In addition, the age distribution of migrants must also be considered, as was

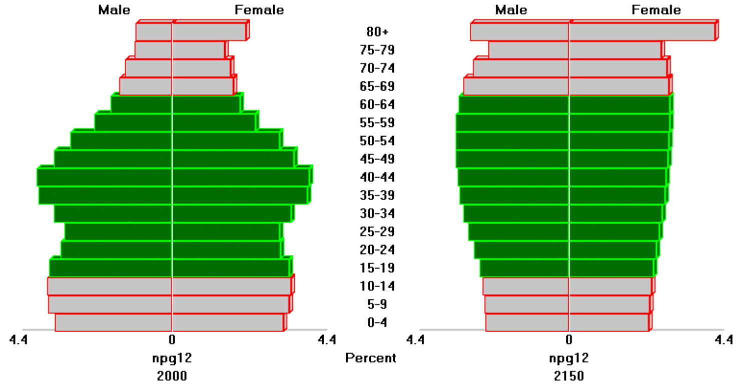

Figure 6.7 Projected U.S. Population 2000 and 2150, by age and sex (NPG12, TFR 1.8, net migration 500,000)

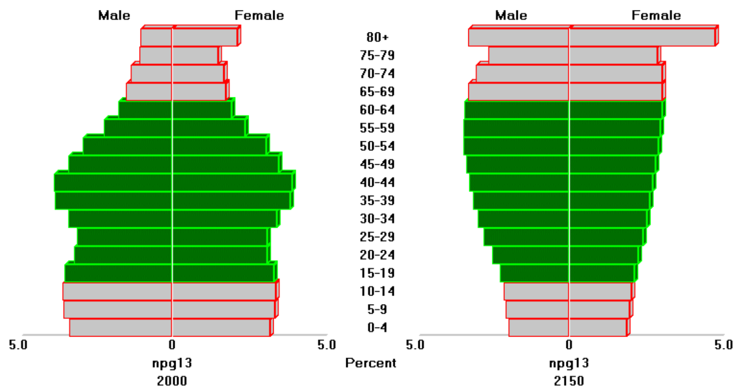

Figure 6.8 Projected U.S. Population 2000 and 2150, by age and sex (NPG13, TFR 1.6, net migration 500,000)

noted earlier. There appears to be little reason to expect any substantial alterations in these age and sex distributions. The reader, nevertheless, should be aware of these assumptions, which are reflected in the augmented sex ratio noted above. Stability approaches after about 2070.

The actual numbers better explain the changes over time in this scenario. Those school-aged people 5–14, 40 million in 2000, decline in number to 33 million in 2050, 28 million in 2100, and 25 million in 2150. The elderly, on the other hand, grow from 35 million in 2000 to 68 million in 2065 before beginning a gradual decline to 60 million in 2150. This is further evidence that the lack of change in the dependency ratio is attributable to the drop in the share of the very young, that is under age 5. Their numbers also fall—from 19 million in 2000 to 12 million in 2150. A brief look at the pyramids for NPG12 (Figure 6.7) and NPG2 (Figure 6.2) (same fertility with no migration) suggests that while the overall numbers are considerably larger for NPG12, the age-sex composition of both groups is quite similar with a slightly greater “bulge” for NPG12 in the middle ages. Thus, with migration set at 500,000, some impact is noted on age-composition but it is hardly drastic.

Now consider NPG13 (TFR 1.6; net migration 500,000). With lower fertility, the proportion of young people can be expected to be smaller and the proportion of elderly is greater (see Figure

6.8). By 2050, 14.1% of the population will be between 0 and 14; that share will drop to 12.7% by 2150. At the other end of the life cycle, the elderly share will grow from 22% to 27% over the same period. The dependency ratio will rise from 46 in 2010 to 67 in 2150. The median age will also rise from 45 to 48. These increases in the population's age reflect its very low fertility. By 2050, there will be more males than females and the sex ratio will reach 106 by 2150. By about 2080, stability will be approaching, although the elderly share will increase a bit at the expense of the young. A glance at the pyramids for 2000 and 2150 demonstrate the incredible difference in age-sex composition as well as in size for the 150-year period.

The shifts in numbers are quite startling. The 5–14 population will increase to 28 million in 2050; then a drop will begin and by 2100, that group will number 20 million. It will reach 15 million in 2150. The elderly too will go through some fairly rapid age upheavals. First, that group will grow to 64 million in 2050 and peak at 68 million in 2065 before beginning a long-term fall to 47 million in 2150. Such changes in age composition illustrate the need for policymakers to be constantly on guard so as to be better able to react to shifts in demographic behavior, whether those shifts are in fertility, mortality, or migration.

Summary and Conclusion

Going through each of these scenarios can become quite confusing. To summarize them, four tables have been prepared that identify each of the basic age-related statistics discussed above: population 0–14 (Table 6.1), population 65 and over (Table 6.2), dependency ratio (Table 6.3), and median age (Table 6.4). As a reminder, in 2000 the respective numbers or percents are population 0–14, 21.4%; population 65 and over, 12.7%; dependency ratio 52; median age 36.

Table 6.1 Percent of Persons 0–14 by Scenario, 2050 and 2150

	Zero Migration		150,000 Per Year		500,000 Per Year	
Fertility Rate	2050	2150	2050	2150	2050	2150
2.0	NPG1		NPG11		N/A	
	18.3	17.6	18.2	17.5		
1.8	NPG2		NPG6		NPG12	
	16.2	15.4	16.0	15.2	15.8	15.1
1.6	NPG3		NPG7		NPG13	
	14.4	13.0	14.2	12.9	14.1	12.7

Table 6.2 Percent of Persons 65 and Over by Scenario, 2050 and 2150

	Zero Migration		150,000 Per Year		500,000 Per Year	
Fertility Rate	2050	2150	2050	2150	2050	2150
2.0	NPG1		NPG11		N/A	
	19.9	22.3	19.8	22.2		
1.8	NPG2		NPG6		NPG12	
	21.4	25.3	21.3	25.0	20.9	24.6
1.6	NPG3		NPG7		NPG13	
	22.5	28.9	22.5	28.3	22.0	27.3

Table 6.3 Dependency Ratio* by Scenario, 2050 and 2150

	Zero Migration		150,000 Per Year		500,000 Per Year	
Fertility Rate	2050	2150	2050	2150	2050	2150
2.0	NPG1		NPG11		N/A	
	62	67	61	66		
1.8	NPG2		NPG6		NPG12	
	60	69	60	67	58	65
1.6	NPG3		NPG7		NPG13	
	58	72	58	70	56	67

* To remind the reader, the dependency ratio is the number of “dependent” persons (0–14) + (65 and over) per 100 “active” persons. In other words, it is the total number of young and old expressed as a percentage of the number of those of working age.

Table 6.4 Median Age by Scenario, 2050 and 2150

	Zero Migration		150,000 Per Year		500,000 Per Year	
Fertility Rate	2050	2150	2050	2150	2050	2150
2.0	NPG1		NPG11		N/A	
	41	42	41	42		
1.8	NPG2		NPG6		NPG12	
	43	45	43	45	43	45
1.6	NPG3		NPG7		NPG13	
	45	49	45	49	45	48

Irrespective of the measure used, changes in fertility have a much stronger effect on age composition than does migration. For example, look at the proportion ages 5–14. Note how that share falls, whether in 2050 or 2150, with declining fertility—irrespective of the size of migration. On the other hand, note how the proportion in this age group is barely affected by differences in migration, irrespective of the fertility level. This generalization largely holds true for all four measures of age distribution. Migration has a definite influence on eventual population size; it has little influence on future age composition.

Regardless of what scenario is followed, the population will age by any of these four measures. However, while the elderly group may increase substantially in a number of scenarios, the very young population will fall. To repeat what was stated earlier, this negates the argument that increased migration will alleviate the dependency problems in the United States. That simply is not the case if both dependent age groups (young and old) are considered together. Thus, future policy makers must be as aware of changes in age composition as they must be of population size per se.

Endnotes

1. The summary demographic indicators in Appendix B show most of the data necessary to understand each of the projection models. Nevertheless, some explanations may be appropriate. Under "Fertility," the fertility table used is called "UN Asia." The timing of childbearing can lead to substantial differences in the eventual size of a nation's population. This timing varies with the number of children a woman has. The UN Asia model peaks in the 25–29 age group—and this most closely resembles the situation in the United States. Other UN fertility models are: Sub-Saharan, Arab, and Average. Likewise for mortality, the Life Table model labeled "Coale-Demeny West" was chosen. This reflects the age-specific pattern of deaths typically seen in "Western" countries. It was developed by demographers Ansley Coale and Paul Demeny. The other measures in this table are self-explanatory.
2. The dependency ratio is calculated as follows: in 2000, 21.4 percent of the nation's population will be between ages 0–14, while 65.9 percent will be in the working-age group 15–64, and 12.7 percent will be 65 and over. The young and the old together, therefore, will represent 34.1 percent of the population. Dividing 34.1 by 65.9 gives the dependency ratio of 51.8 percent.
3. Ansley J. Coale, "How a Population Ages or Grows Younger," in *Population: The Vital Revolution,* ed. Ronald Freedman (New York: Doubleday-Anchor, 1964), 37–47.
4. Phillip J. Longman, "The World Turns Gray: How Global Aging Will Challenge the World's Economic Well-being," *U.S. News and World Report,* 1 March 1999.
5. Peter G. Petersen, *Gray Dawn: How the Coming Age Wave Will Transform America—and the World* (New York: Times Books, 1999).
6. The age-sex composition of the migrant population is assumed to be the same as recently produced by the Immigration and Naturalization Service (INS). This assumption is also used in all Census Bureau projections. Unless there is strong evidence of a dramatic shift in the age and sex composition of this group, there is no reason to assume any changes.

7 Continued Migration and Racial Composition

Yet another variable must be considered—the proportion of immigrants (and their descendants) in the future population of the United States. This is a controversial topic referring, as it does, to immigration and the ethnic composition of the population. In this report no attempt is made to determine the actual racial or ethnic proportions in future years. Rather, we are simply determining, for each relevant scenario, the proportion of post-2000 immigrants and their descendants in future years.

Another matter to consider is the makeup of the immigrant population. Beginning in the 1970s, the proportion of Asian or Latin American origin increased year after year. Today, some 80 percent of migrants come from these new areas. Given the expected continued population growth in both Asia and Latin America, it seems reasonable to assume that a large majority of future migrants will continue to come from these areas. Thus the identity of the nation will change dramatically during the twenty-first century. Non-Hispanic Whites (the present majority population) will comprise about half the total by mid-century, and will become a minority by the advent of the twenty-second century especially if immigration remains high. Table 7.1 below looks at the scenarios that are applicable. Those scenarios that assume zero migration are not considered.

Table 7.1 Future U.S. Population by Percent of Post-2000 Foreign-Born and Descendants, Selected Scenarios

Scenario	2050	2100	2150
NPG6 (1.8-150)	2.4	5.9	9.2
NPG7 (1.6-150)	1.9	5.3	11.1
NPG11 (2.0-150)	2.9	5.4	7.8
NPG12 (1.8-500)	8.9	17.5	26.4
NPG13 (1.6-500)	8.5	18.8	31.6

What do these percents tell us? The higher the fertility and the lower the level of migration, the smaller the proportion of post-2000 immigrants and their descendants. Conversely, the higher the level of migration and the lower the fertility, the greater the share of post-2000 immigrants and their offspring. This is highlighted by comparing NPG11 with other scenarios. Even in 2150, less than 8% of that year's population will be post-2000 immigrants and their descendants. The remaining 92 percent will be the descendants of present-day residents of the United States (i.e., in the year 2000). However, looking at NPG13, almost 32% of the population will consist of post-2000 immigrants and their descendants. This is another issue, in addition to size and age-sex composition, for the policy makers of tomorrow to consider.

The consequences of continued high levels of immigration should not be underestimated. Not only is the future size of the population affected, its racial and ethnic composition may change quite drastically. In California, soon there will be no majority population. Census Bureau projections indicate that by 2050, non-Hispanic whites will barely comprise a majority (51%)—according to current demographic behavior. Perhaps the most vivid picture of what happens when immigration as well as fertility changes is the present picture in Kosovo. In 1950, Serbs made up about half the population, Albanians the other half. Now, nine out of ten Kosovars are Albanians.[1] How did this come about? Changing demographic behavior. Albanians have long had the highest fertility rate of any European nation. Albanians in Kosovo followed the same pattern. With Albania's population increasing rapidly, many moved across the border to Kosovo. In addition, and ironically, many Serbs left Kosovo for Serbia with the encouragement of President Milosevic! As a result of these demographic shifts, the ethnic makeup of the Kosovo population changed in a relatively short time. To make matters even worse, Serbs are generally Orthodox Christians while Albanians are predominantly Muslim. A similar, though far less tragic, situation is happening in Belize (formerly British Honduras). Once inhabited by predominantly black English-speaking colonists, today Belize has an Hispanic majority which has taken over the government.

Thus, the repercussions of shifts in demographic behavior, mainly migration, can prove to be extremely unsettling for the nation involved. It is not unrealistic to visualize an entirely different United States—a nation composed solely of numerous minorities— in 2100 or 2150. This will be most likely if immigration remains at high levels.

Endnote

1. "Why Are U.S., Allies Launching Strikes Now?" *Orlando Sentinel*, 25 March 1999, 1.

8 Unrealistic Projections

Throughout this study we have attempted to develop sensible projection models. While many did not come even close to the stated goals of this project, they were nevertheless possible. But, as is the case with many controversial matters, individuals on the two sides of the issue sometimes get carried away and develop what are eventually seen as absurd models. This is true in making population projections as it is with making economic projections. In this section, two extremes—one arguing for incredibly low fertility and migration and the other arguing for no limitations on either demographic variable—are discussed, and projections are developed illustrating the impact of such "far out" assumptions.

The Low-Level Assumptions

In Table 4.1, it was pointed out that models NPG4 and NPG5, NPG8 and NPG9, and NPG14 and NPG15 would be discussed later, since they were not appropriate for the stated goals of this project. For models NPG4, NPG8, and NPG14, the total fertility rate is 1.4. To many readers, such a low fertility assumption may seem totally unsuitable. Yet, fertility levels are now *lower* than that in a few European countries. According to the latest UN estimates, no fewer than nineteen countries have total fertility rates of 1.4 or lower. The rate in Spain is 1.15, in Romania 1.17.[1] These incredibly low rates may be temporary, but they are real. Though hardly likely, it is not inconceivable that the U.S. rate could fall to 1.4 at some time in the future. Even if this does not occur, such projections illustrate what the impact of a really low total fertility rate would be. The population pyramids in Figures 8.2, 8.3, and 8.4 offer a graphical comparison of the three projections. Note that for these projections, numbers rather than percentages are used in the pyramids.

Looking first at NPG4 (1.4 and no migration), from 275 million in 2000, the population would fall to 258 million in 2050, 150 million in 2100, and 76 million in 2150 (see Table 8.1 and Figure 8.1). At that time it would be still falling at an annual rate of -1.34% or a "halving" about every fifty years. While there is concern about our present rate of growth and some of us would like to see a decline in numbers, it is doubtful that anyone would advocate a total fertility rate of 1.4 and no migration! Yet, that is what is happening in most of those nineteen countries with fertility rates even lower than 1.4—and most of those countries have little or no migration.

Accepting 150,000 immigrants annually (NPG8) would not solve the problem of depopulation. By 2100, numbers would total 158 million; fifty years later, the U.S. population would fall to less than 89 million. While the 150 million mark would not be reached until after 2100, by that time the age composition of the nation would make it very difficult to recoup population losses through the introduction of increased migration. The momentum for decline would be almost impossible to stop. By 2150, the annual rate of decline would be -1.1%.

NPG14 (migration of 500,000 per year) appears to be somewhat more feasible—though barely so. By 2020 the population would actually surpass 300 million and remain at that plateau for another 15 years. Thereafter the population would drop quite rapidly—reaching 188 million in 2100 and 123 million in 2150. At that time the rate of decline would be -0.74% annually. If around 2025

Table 8.1 Projected U.S. Population, 2000–2150 (in millions) with TFR 1.4*

Year	NPG4	NPG8	NPG14
2000	274.82	274.82	274.82
2010	285.94	286.63	290.39
2020	292.75	294.22	302.04
2030	289.92	291.97	303.81
2040	276.27	279.44	295.20
2050	258.16	262.19	281.54
2060	238.92	243.61	265.89
2070	217.55	222.83	247.37
2080	194.63	200.50	226.90
2090	171.90	178.65	206.66
2100	150.45	158.32	187.69
2110	131.25	140.24	170.81
2120	114.72	124.69	156.35
2130	100.16	110.98	143.58
2140	87.40	98.99	132.44
2150	76.36	88.62	122.83

*Note: Projection NPG4 TFR 1.4, net migration=0; NPG8 TFR 1.4, net migration=150,000; NPG14 TFR 1.4, net migration=500,000.

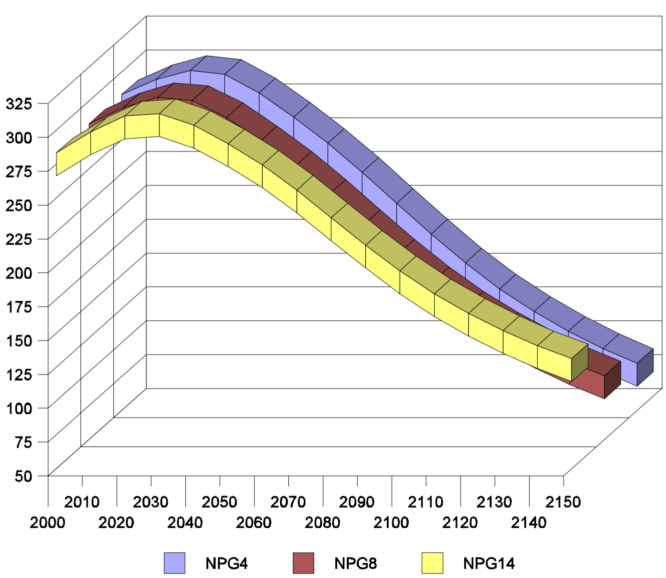

Figure 8.1 Projected U.S. Population, 2000–2150 (in millions), TFR 1.4

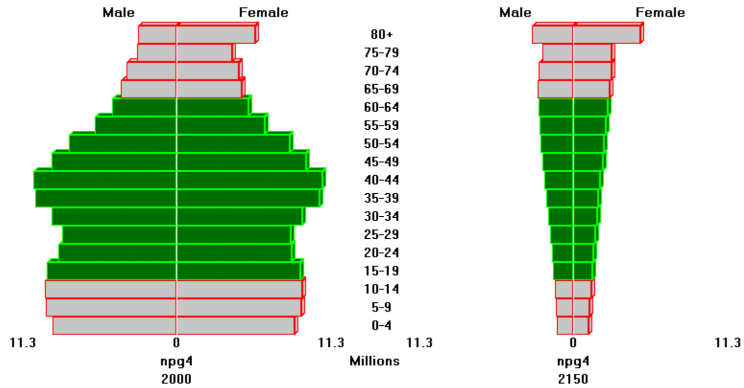

Figure 8.2 Projected U.S. Population 2000 and 2150, by age and sex (NPG4, TFR 1.4, zero net migration)

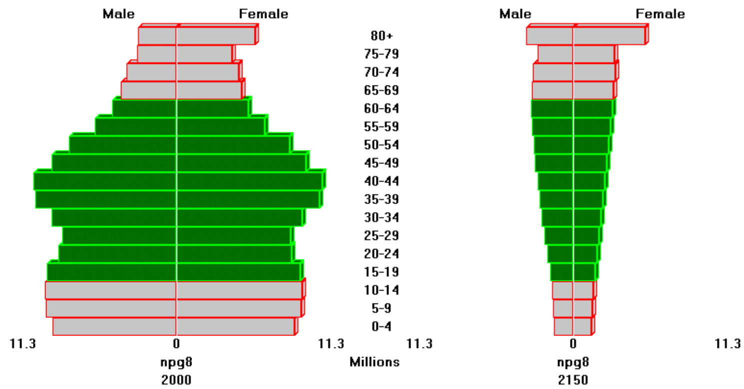

Figure 8.3 Projected U.S. Population 2000 and 2150, by age and sex (NPG8, TFR 1.4, net migration 150,000)

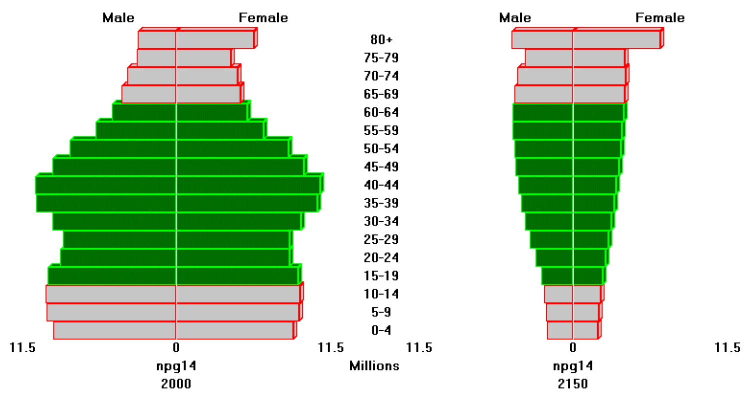

Figure 8.4 Projected U.S. Population 2000 and 2150, by age and sex (NPG14, TFR 1.4, net migration 500,000)

Table 8.2 Projected U.S. Population, 2000–2150 (in millions) with TFR 1.2*

Year	NPG5	NPG9	NPG15
2000	274.82	274.82	274.82
2010	285.94	286.63	290.39
2020	292.75	294.22	302.04
2030	289.92	291.97	303.81
2040	275.45	277.77	293.45
2050	254.24	257.44	276.52
2060	232.27	235.95	257.74
2070	207.65	211.64	235.39
2080	181.11	185.58	210.85
2090	155.00	160.19	186.68
2100	130.21	136.38	163.79
2110	108.00	115.25	143.40
2120	89.27	97.65	126.42
2130	73.90	83.20	112.52
2140	61.11	71.14	100.92
2150	50.51	61.20	91.38

*Note: Projection NPG5 TFR 1.2, net migration=0; NPG9 TFR 1.2, net migration=150,000; NPG15 TFR 1.2, net migration=500,000.

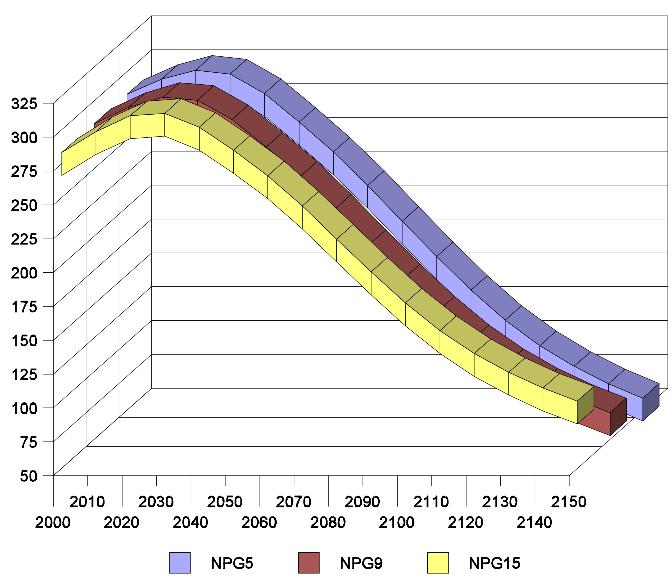

Figure 8.5 Projected U.S. Population, 2000–2150 (in millions), TFR 1.2

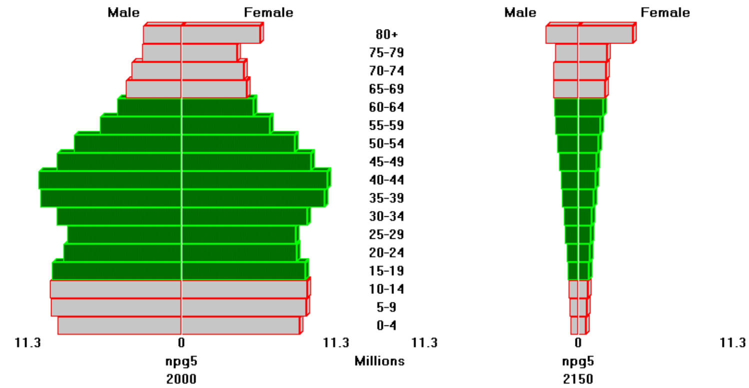

Figure 8.6 Projected U.S. Population 2000 and 2150, by age and sex (NPG5, TFR 1.2, zero net migration)

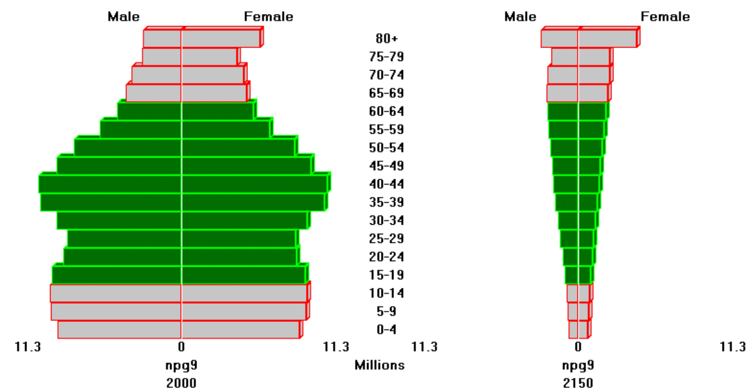

Figure 8.7 Projected U.S. Population 2000 and 2150, by age and sex (NPG9, TFR 1.2, net migration 150,000)

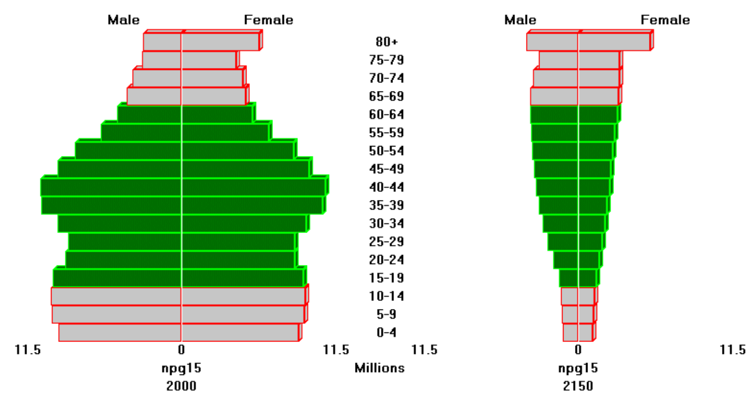

Figure 8.8 Projected U.S. Population 2000 and 2150, by age and sex (NPG15, TFR 1.2, net migration 500,000)

or 2030, however, it was decided to *increase* migration, then the 300 million level might be maintained indefinitely by observing the extent of natural decrease and compensating for it through additional migration. That could also be done around 2120 if 150 million were the preferred goal. Such proposals are not recommended; they are merely indications of the tremendous impact of very low fertility and the enormous demand for migration that such fertility would necessitate if the stated goals of either 150 or 300 million Americans were to be met.

Summing up, with fertility at 1.4, even accepting half a million immigrants annually realistically would not allow the nation to reach these goals. They could be reached only by vastly increasing immigration. The end result would be an entirely different nation, racially as well as in age composition, as Table 8.1 above shows.

It has just been demonstrated how a fertility rate of 1.4 would be far too low for the maintenance of the American society. Turning to models NPG5, NPG9, and NPG15 (where the TFR is 1.2), even with considerable migration, it follows that the result would be even more dramatic. See Table 8.2 and Figure 8.5 for projected population figures. Within 100 years, NPG5 projects that the U.S. population would fall to 130 million (from 275 million in 2000); by 2150, it would total only 51 million if migration ended in 2000. Adding 150,000 immigrants annually would only lead to a population of 61 million in 2150; adding 500,000 would result in a population of 91 million in 2150. Furthermore, such a hypothetical society would be unrecognizable both racially and ethnically. It would also be a very old society. Figures 8.6, 8.7, and 8.8 are population pyramids comparing these projections.

The words of demographer Antonio Golini cited in an earlier chapter warrant repeating: “In the long-term even a very low fertility rate (e.g., one less than 1.3) seems to be unsustainable. . . . In such a demographic situation, immigration does not seem to be a suitable means to restore population equilibrium.” In our analysis, a fertility rate of 1.4 is definitely too low, especially if the age and racial composition of the eventual population is considered.

The High-Level Assumptions

“Cornucopians” like the late business economist Julian Simon, have long urged that the United States should take in many more immigrants, and that this would be good for the economy. According to Simon, “each year about 1 million immigrants [should] be admitted legally for the next three years. This quota could be reviewed every three years and boosted—say by another million per year—if no major problems arise.”[2] Another cornucopian, journalist Ben Wattenberg, is convinced that adding more immigrants could save the nation’s Social Security system. In addition, he has argued forcefully for American women to “have one more child.”[3] In other words, the three-child family would supersede the two-child family. Even if they were correct, which they are not, such analysts never mention what the size of the population would be if their recommendations were followed.

In this section, we develop two projections: the first (see Figure 8.9) will follow the present demographic pattern in the United States to see where it would lead us, population-wise. We rely on our fertility rate of 2.0 and maintain the same life expectancy used in all the previous projections. However, in this model (NPG16) annual net migration is assumed to be constant at 1 million. In actuality, this is about where it stands today. Thus, this projection pretty much typifies what would

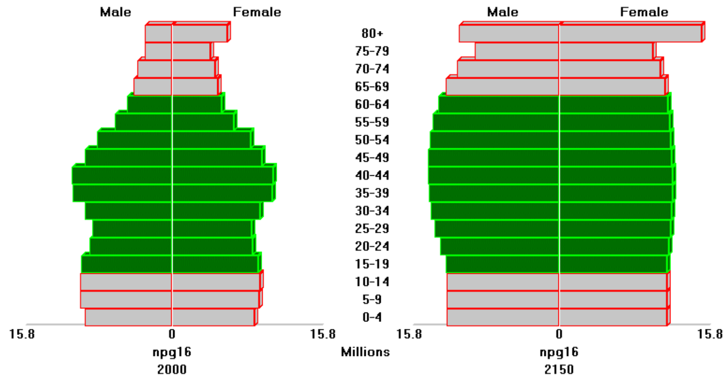

Figure 8.9 Projected U.S. Population 2000 and 2150, by age and sex (NPG16, TFR 2.0, net migration 1 million)

happen by 2150 if current demographic patterns remained constant (falling mortality being a minor exception).

Should current demographic patterns remain unchanged over the next 150 years, the U.S. population will reach the higher goal of this study (300 million) in about 2015. Just after the beginning of the following century (2100), the 400 million mark will be surpassed and, by 2150, the nation's population will have surpassed 431 million—or 156 million more than expected in 2000! The "good news" is that, by 2150, the growth rate will be a mere 0.16% and stationarity will be fast approaching, perhaps at about half a billion! Bear in mind that should current demographic patterns be maintained (including some minor increases in life expectancy), this is the population size that can be expected in future years.

The second (see Figure 8.10) calculates what would happen demographically if cornucopians were taken seriously. In this final projection of the study, we turn to the ridiculous—assuming that immigration increases to two million as recommended by Julian Simon and that fertility rises to 3.0 as advocated by Wattenberg. These two champions of increased population growth (and others) have never, to our knowledge, published the projected populations that would evolve from their demographic suggestions. The following numbers and graphs may boggle the imagination but they are correct! (Note that the numbers are in *billions* and not millions.)

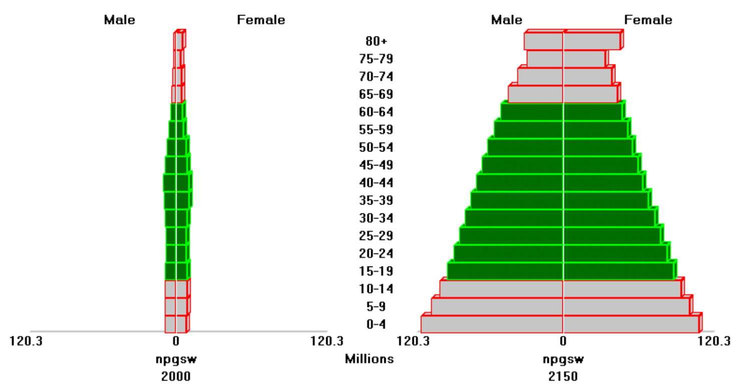

Figure 8.10 Projected U.S. Population 2000 and 2150, by age and sex (NPGSW, TFR 3.0, net migration 2 million)

By 2050, the U.S. population will approximate 600 million. In 2100, numbers will have reached 1.2 *billion*. In 2150, the U.S. population will be approaching *2½ billion*! That is more than the combined population of today's two "demographic billionaires"—China and India. Furthermore, at that time, the growth rate will have pretty much stabilized at about 1.4%—a doubling every fifty years! The accompanying age pyramid (which itself is patently ridiculous) graphically illustrates the enormous growth that will occur in the United States should such demographic behavior actually take place.

But can it ever happen? While we seriously doubt it, recall that at the peak of the baby boom, the total fertility rate was 3.7 births per woman. Immigration of 2 million per year seems almost impossible to fathom. Today, it may already well be above one million and with the enormous growth anticipated in the young adult populations of the typical sending countries (like Mexico, the Philippines, India, etc.), additional increases, legal as well as illegal, could occur if we do not remain forever vigilant about such possibilities.

Summary

In this section, we have tried to illustrate the dangers involved in either too low fertility and immigration or too high fertility and immigration. (In all projections mortality remained at the levels used in all previous projections.) If the dictums of extremists on either side were to be followed, the nation would end up in serious trouble. At one extreme, we could be running out of people; at the other, we could be swamped with too many people. It is our opinion that demographic behavior must be monitored at all times by an agency of the federal government, and that any major shifts in behavior should be made known to the legislative and administrative branches. It is vital to the future of the United States that a demographic balance be preserved. This is true even if the recommendations of this study are not followed.

Endnotes

1. United Nations Population Division, *World Population Prospects: The 1998 Revision (*New York: United Nations, 1998).
2. Julian Simon, "Getting the Immigrants We Need," *Washington Post,* 3 August 1988.
3. Ben J. Wattenberg, *The Birth Dearth*, 2d ed. (New York: Pharos Books, 1989).

9 Recommendations

This report began by projecting a variety of different demographic models and then selecting nine of them for closer examination. But which ones are actually attainable given the political, social, and economic situation in the United States today? First, some caveats about selecting which model(s) to follow. Using any of these models as a guide for achieving a desired demographic future requires that the U.S. government actively implement a clearly defined population policy. The policy should be specific, goal-oriented, and include the practical measures necessary to achieve those goals. Apart from the Rockefeller Commission in the early 1970s, the U.S. government has never examined seriously the consequences of continued population growth, let alone tried to implement an explicit policy.[1] Implicitly however, Congress, with the support of all administrations in the last twenty-five years, has promoted a policy of rapid and continued population growth—by fostering the highest sustained immigration in U.S. history.

Immigration aside, the majority of U.S. families have chosen to limit their average family size to below replacement level. The most important component for achieving a stationary U.S. population has been in place for more than two decades, that is, sub-replacement fertility of the majority non-Hispanic white population. In 1970 it comprised almost three-quarters (74%) of the total U.S. population. Had Congress limited immigration to replacement level in 1970 the U.S. population would already be well on the way to stabilization and eventual stationarity. Instead, politicians in Washington have undermined the choice of most Americans for a smaller U.S. population by allowing historically high levels of immigration and a population that is growing with no end in sight. Although it is certainly not too late to implement the demographic course outlined in this report, a stationary U.S. population realistically cannot be achieved without a concerted effort and specific population policy. Such a policy would have one indispensable component: substantially reducing immigration—both legal and illegal—into the United States.

A second caveat involves dealing with the real world. It is one thing for demographers to develop alternative projections of the U.S. population, but we must deal with reality. Changes in fertility or mortality cannot be made arbitrarily. Life expectancy is assumed to rise in the next century. Our health habits can be improved. For example, less smoking undoubtedly contributes to improvements in life expectancy. Should life expectancy rise more than projected in this study, then adjustments in fertility and/or migration should be made to compensate for this improvement. No government, however, can "legislate" gains in life expectancy!

A somewhat similar argument can be made considering efforts to lower fertility; however, there is a difference. Incentives can be offered if it is felt that the fertility rate should be lowered. For example, the newly passed child allowance on income taxes could be eliminated. So could the deductions for more than two children. Family planning programs could be broadened and made available to more people. But the bottom line is the same: the government cannot legislate family size. It can only encourage lower fertility.

International migration is an entirely different matter. Since 1820, the U.S. Congress has passed laws determining and changing acceptable size and type of immigration. The Federal government can set the annual level of legal immigration at whatever number it deems proper.

What, then, are the most reasonable, as well as realistic, models to follow? As noted above, any increases in life expectancy above what is assumed in these projections would require some adjustments in fertility and/or migration. Since it is not possible directly to manipulate fertility, this strongly suggests that any increase in life expectancy would mean that immigration levels would have to be lowered somewhat. Such a possibility is not addressed in this report since only one mortality assumption in used.

Realistically, how low can fertility fall? A total fertility rate of 1.8 is certainly within our limits, but is a TFR of 1.6 possible? Perhaps not, bearing in mind that it would require that the fertility of the native-born be no higher than 1.5 and perhaps even lower. Furthermore, the age composition of the population would be incredibly old and the foreign-born (and descendants) portion would be quite large. With all these problems and difficulties, it seems more appropriate to proceed under the prospect that the U.S. fertility will remain between 2.0 and 1.8 in future years.

This leaves the most manageable variable: immigration. Is it reasonable to assume zero migration? Would Congress ever pass legislation eliminating immigration, or even pass a moratorium on such movements, as has been suggested occasionally? Even if such laws were approved, and signed by a future president, how would that end illegal movements across the border (or visa abusers)? Much more could be done to reduce illegal entries if the government so desired. Ending it completely, as well as policing visa abusers, seems out of the question. The assumption of net migration of 150,000 per year is perhaps as low as can be realistically expected. Recall that this is a net number, which includes illegal entries and takes emigration into consideration. In practice, if 150,000 were the approved number of entries annually, it would be reasonable to assume that a certain number beyond 150,000 would enter illegally (despite increased efforts to curtail such movements), and that a similar number would perhaps emigrate. The 150,000 number would not be cast in stone. Should a baby boom occur, for example, immigration might well be halted temporarily; this would also be the case if life expectancy rose beyond expectations. On the other hand, if fertility did fall to 1.6, for example, then some minor increases in migration might be advisable, albeit temporary ones.

Given all these caveats and reasonable expectations, our scenario options are drastically reduced. Recall that the goal is a population of 300 million or 150 million Americans within the next 150 years—or at least, to be headed in that direction by 2150. In actuality, however, any of the selected models are possible given that all have a negative rate of growth well before 2150. In many cases, though, age composition makes them undesirable. Furthermore, a great deal of government manipulation of fertility and immigration would be required should some of these models be adopted. Let us now turn to a discussion of the two most sensible scenarios.

NPG6 and NPG11 appear to be the most reasonable scenarios for implementation within a limited time frame. NPG6 assumes a total fertility rate of 1.8 and annual net migration of 150,000. NPG11 has fertility of 2.0 with net migration at the same level (150,000) per year. The former is applicable to the goal of a population of 150 as well as 300 million; the latter fits the goal of 300 million. Eventual size, however, is not the only reason for selecting these two models. By not using lower fertility assumptions, the eventual stable age composition is quite reasonable. Also, while the percent of post-2000 descendants rises in both scenarios, using lower fertility would also have an impact on that demographic aspect of the transition to stationarity. Thus, NPG6 and NPG11 are compromise selections. They also rely less on future "adjustments" than do most of the other scenarios.

Reviewing NPG6, the population peaks at just under 300 million in 2030 and then begins a steady decline to 238 million in 2100 and 197 million in 2150. This is considerably less than the year 2000 population of 275 million. By 2150 the growth rate will be -0.37%. If the demographic rates remained constant after 2150, the eventual stationary population (in hundreds of additional years) would be 96 million. If, by the middle of the twenty-first century, the American people still desire to reach a population of 150 million, it might be appropriate to increase immigration slightly to ensure that the population does not fall below 150 million. Equally important is the future age composition of the nation. Care must be taken to ensure that the age distribution doesn't become so top heavy that the momentum for population decline will be almost impossible to overcome. The pyramid for 2150 indicates that this is not likely to be an impossible challenge. By about 2070, stability is reached and from then on about 15 percent of the population are under 15; 60 percent are between 15 and 65; 25 percent are 65 or over. Thus, this is a somewhat older population than today. Finally, even in 2150, the proportion of the population in that year who are post-2000 immigrants and their descendants will be about 9 percent.

Advocates of an eventual population of 150 million may be somewhat disappointed by the length of time it will take to reach that goal. We have tried to be as realistic as possible. Adjusting fertility and migration rates decade by decade could produce a 150 million population sooner, but would be far less realistic, if not impossible.

The beauty of this scenario is that it is entirely achievable. A total fertility rate of 1.8 is just a little lower than the 2.0 presently observed. In the United States, a TFR of 1.8 (and even 1.7) has been recorded as recently as the late 1970s. With a slight decrease in adolescent pregnancies and a nationwide movement to have "only wanted and desired" children through the increased use of better contraceptives; together these would make the goal of a TFR of 1.8 a definite possibility. In fact, for 1997 the majority non-Hispanic white population had a TFR of 1.8 (a rate typical for this population over the last two decades). Merely reducing immigration to 150,000 a year would go a long way toward reducing the fertility rate of the overall population. Actually reducing immigration to 150,000 a year would take some courage on the part of legislators. Yet, that is close to the historical average for the period immediately prior to the passage of more liberal laws in the 1960s.

Let us now turn to NPG11, the other most sensible scenario. While fertility is set at 2.0 (or about the same as today), migration remains at 150,000 per year. The population peaks at 310 million in 2040 before beginning an extremely slow decline to just under 300 million in 2150. At that time the rate of decline would be -0.08%. Then, and only then, might some small increase in migration be considered. Recall, however, that the eventual stationary population under this scenario would actually be *larger* than the 2150 population, thus any migration should be discussed only after serious consideration of the alternatives. The age-sex composition in 2150 is particularly smooth, more so than for NPG6. By then the population would have been stabilized for some 60 years. Youth under 15 would total about 17.5 percent of the population, the "productive" group (15–64) 60.3 percent, and the elderly 22.2 percent. The dependency ratio would be 66—again, higher than at present. With higher overall fertility than in NPG6, the proportion of post-2000 immigrants and their descendants would be smaller—7.8 percent in 2150.

These two scenarios appear to be both achievable and attractive. Certainly, a small decline in fertility to 1.8 (or 2.0) is highly possible and perhaps even probable. Lowering migration to 150,000 would require action by the U.S. Congress and executive branch. Nevertheless, it remains a definite possibility. The bottom line remains the same: whatever “policy” option is chosen (whether to limit population size at 150 or 300 million), some tinkering with the demographic variables, especially migration, will be necessary. Equally important, complete and accurate demographic data must available so that the policy makers can make intelligent decisions.

Beyond 2150?

For the two recommended scenarios, longer-term projections to 2300 have been prepared. Under no conditions should these be viewed as predictions of anything! It would be sheer folly to assume constant levels of the three demographic variables for such a long term! These projections have been prepared simply to illustrate how long it would actually take to reach stationarity. (In fact, as we will see, it takes even longer than 300 years.) Looking first at NPG6, its population would have reached 197 million in 2150. By 2300, it would total 113 million and still be falling—at a rate of -0.34% per year. As indicated in Table 9.1 below, that negative growth rate is slowly but surely declining and *eventually* would reach zero. Recall that the stationary population will be about 96 million, thus by 2300, there would be light at the end of the tunnel! A stationary population would be in sight.

Table 9.1 Projected Population and Growth Rates, 2150–2300 (in millions)

	Population		Growth Rate	
	NPG6	NPG11	NPG6	NPG11
2150	197.0	299.3	-0.38	-0.04
2170	182.3	296.5	-0.39	-0.05
2200	162.2	291.4	-0.39	-0.06
2220	150.3	288.1	-0.38	-0.06
2240	139.6	284.8	-0.37	-0.06
2260	129.8	281.6	-0.36	-0.06
2280	121.0	278.5	-0.35	-0.06
2300	113.0	275.5	-0.34	-0.05

NPG11’s projected population for 2150 is just under 300 million. A century and a half later (by 2300) it would have decreased further, to 275 million. At that time, its annual growth rate would be -0.05%. A few decades later, that population would begin increasing again ever so slowly. When stationarity was achieved, the population would be about 372 million. This suggests that in the long run, NPG6 is a more suitable scenario to follow than NPG11.

These two long-range projections illustrate the length of time needed to attain a near stationary level of population. They also reinforce arguments that 150 years into the future is sufficiently long enough to produce scenarios that can be followed if governments see fit to do so.

Conclusion

First, almost any of the selected scenarios (not just our two choices) could be followed, providing the government was willing to make adjustments in migration on a regular basis to allow for any unexpected shifts in demographic behavior. However, NPG6 and NPG11 appear to be the most sensible and realistic models to follow. Both assume that migration will be limited to 150,000 annually. Fertility would range between 1.8 and 2.0. These two models can serve as guidelines for policy making. For example, migration could be reduced even more—perhaps to 100,000. That would mean the population would fall more rapidly; it also would mean a somewhat older age composition. In summary, some reduction in fertility—though not to the level exhibited in many European countries today—is appropriate, as is a reduction in migration. The level of migration depends on the goal—it could be as low as 100,000, it could be as high as 500,000—but 150,000 is not only ideal but doable. Furthermore, given that fertility is almost within the parameters of these two scenarios, policy could be put into place almost immediately—policy makers willing. We conclude that there is hope that the United States can eventually reach near stationarity at a lower size than today with some manipulation of the basic demographic variables, especially immigration. Failure to do so, however, would see unending growth in the nation's population—something that could destroy it economically, as well as socially.

Endnote

1. An exception should be mentioned. In 1978, the U.S. House of Representatives Select Committee on Population, chaired by Rep. James Scheuer (D–NY) produced excellent reports dealing with the nation's population problems. Unfortunately, no significant legislation followed its recommendations.

Appendix A
A "How to Do It" Recipe

Some of this report's readers may wish to duplicate its projections for their own states or countries. If projections are planned for a smaller geographic area, you should bear in mind that the smaller the political division, the less reliable the projections will be. For example, while the immigration data for the United States may not be as accurate as it could be, developing migration data for a specific state is even less reliable. This should not deter anyone from making population projections. As long as the demographic parameters are stated clearly, any projection is appropriate. Be sure to make certain that your reader knows exactly what the demographic assumptions are.

What Data Are Needed?

Before preparing a population projection, certain basic data are required. First, the population base must be determined. It is important that the most recent and accurate information serve as the base population for the projections. Generally, the total population by age (in five-year intervals) and sex from a recent census or government estimate is sufficient. Second, one must obtain the most up-to-date data on fertility, mortality, and net migration. Getting this information can sometimes be more difficult than simply getting the age-sex composition of the region. What is needed are: the most recent total fertility rate (age-specific rates are even better, but as we will see, these are not necessary); the most recent life expectancies at birth for males and females; and last but most difficult to locate, the age-sex specific level of net migration. If you are preparing this for a state, you must include *both* internal migration (state-to-state) and international migration (from outside the country to the specific region). Except for the ten or so states which are the destinations of a large majority of immigrants, international migration generally has not been a big factor for many states and local communities. You may have to rely on the most recent data from the Census Bureau to get an idea of the age-sex composition of interstate movements. If you have an idea of what the total net migration is in a recent year, then it is permissible to use an earlier age-sex distribution, unless you feel that major shifts have recently taken place in the migration.

Where Do I Find These Data?

The U.S. Census Bureau (or for other countries, the Dept. of Statistics may be a good place to start) is the obvious place to get the best data for any state. Their web site (http://www.census.gov/) is an excellent starting point. Most states also have state demographers, and they can be very useful. To get vital statistics, you might turn to the National Center of Health Statistics web site: (http://www.cdc.gov/nchswww). Again, the state demographic office can usually provide the most useful information. Finally, any library that has government publications is an excellent source for data. Often, a librarian is assigned to that particular department and is well-versed in demographic questions

How Do I Develop Projections?

This is the easy part! There are no limits to what can be done with projections. Simply ask yourself: "What if . . .?" and go with it. Seriously, it is always prudent to begin with an extension of present demographic behavior. The question becomes: "What if current demographic patterns continue unchanged?" For the most part, in this report we have used fairly reasonable assumptions—exceptions are the very low fertility models and the Simon-Wattenberg projection. After that first projection is completed, there is no limit as to the number of scenarios that can be imagined. Examples might include the following: "What if the TFR fell to 1.0; how long before the population is zero?" "What if net migration doubles?" "What if life expectancy falls?" You must also determine the length of the project. In this report we have limited the length of time to 150 years. However, if desired, that period could be extended indefinitely. But, as mentioned in this report, long-term projections tend to lose their credibility and many readers will simply ridicule them.

Now, the Big Question: How Do I Do the Actual Projections?

Years ago, graduate students in demography had to go through this ordeal using a calculator. It was an arduous assignment! Today numerous computer programs are available that do the hard work for you. An excellent program is available from the World Bank. Prepared by demographer Kenneth Hill, it is called: "Proj3S—A Computer Program for Population Projections." It is available from the World Bank, 1818 H Street, NW, Washington, D.C. 20433. The program used in this report was developed by John Stover and Sharon Kirmeyer of The Futures Group, a Washington, D.C. "think tank." Called "DemProj" it can be downloaded from the Internet at http://www.tfgi.com/software/software.htm. It operates on any IBM-compatible computer running Windows 3.1 or Windows 95, and requires about 3MB of hard disk space. The instruction manual is also available through the Internet at http://www.tfgi.com/. Click on *Software*; click on *Spectrum* (in the top left column); go to the end of the Spectrum screen that appears; click on *Download Manuals*. You can also request a hard copy from The Futures Group International, 1050 17th Street NW, Suite 1000, Washington, D.C. 20036.

One advantage of this program (Spectrum) is that it compensates for missing data. For example, if you don't have the age-specific birth rates but have the total fertility rate, the program will provide you with an option of different fertility patterns. This is also true of mortality rates. There are other computerized projection programs but these two rank among the best.

How Do I Arrive at a Stationary Population?

First, bear in mind the two rules mentioned in this report: (1) Either the TFR is at replacement and there is zero net migration, or (2) the TFR is below replacement and net migration is constant but positive. Then turn to the equation discussed earlier in this report and apply it to your data. This will give you the size of the population when it reaches stationarity. Unfortunately, it doesn’t indicate how long it will take to reach that point.

Ok: Now What Do I Do?

Download the program and the manual and enjoy!

Appendix B
Summary Demographic Indicators
Results of Selected Projections, 2000–2150

NPG1 TFR 2.0; 0 Mig	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Fertility																
Input TFR	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
GRR	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
NRR	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Mean Age of Childbearing	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4
Child-woman ratio	0.27	0.27	0.29	0.28	0.28	0.29	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Fertility table: UN Asia																
Mortality																
Male LE	75.0	75.3	75.7	76.0	76.3	76.7	77.0	77.3	77.7	78.0	78.3	78.7	79.0	79.3	79.7	80.0
Female LE	82.0	82.4	82.7	83.1	83.5	83.8	84.2	84.6	84.9	85.3	85.7	86.0	86.4	86.8	87.1	87.5
Total LE	78.6	78.9	79.3	79.6	80.0	80.3	80.6	81.0	81.3	81.7	82.0	82.4	82.7	83.1	83.4	83.8
IMR	8.0	7.5	7.1	6.6	6.1	5.7	5.6	5.5	5.5	5.4	5.3	5.2	5.2	5.1	5.0	4.9
U5MR	8.9	8.4	7.8	7.2	6.7	6.2	6.1	6.0	5.9	5.8	5.8	5.7	5.6	5.5	5.4	5.3
Life table: Coale-Demeny West																
Immigration																
Male immigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Female immigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total immigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vital Rates																
CBR per 1000	13.5	13.2	13.0	12.1	12.1	12.2	12.0	12.0	12.0	11.9	11.9	11.9	11.8	11.8	11.8	11.7
CDR per 1000	9.0	8.9	9.3	11.0	12.9	13.3	12.6	12.9	12.9	12.7	12.8	12.7	12.6	12.7	12.6	12.6
RNI percent	0.45	0.43	0.37	0.12	-0.08	-0.11	-0.06	-0.09	-0.09	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08
GR percent	0.45	0.43	0.37	0.12	-0.08	-0.11	-0.06	-0.09	-0.09	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08
Doubling time	154.3	162.7	188.8	598.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual births and deaths (in millions)																
Births	3.72	3.75	3.83	3.68	3.67	3.66	3.57	3.56	3.52	3.46	3.44	3.40	3.36	3.32	3.28	3.25
Deaths	2.48	2.54	2.75	3.33	3.91	3.98	3.76	3.81	3.78	3.68	3.68	3.64	3.58	3.56	3.51	3.47

NPG1 TFR 2.0; 0 Mig	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Population (in millions)																
Total population	274.82	286.88	298.43	304.02	302.74	299.39	297.24	294.95	292.29	290.03	287.67	285.23	282.94	280.58	278.24	275.99
Male population	134.34	140.83	146.56	149.05	148.52	147.44	146.70	145.63	144.41	143.33	142.20	141.06	139.96	138.82	137.69	136.59
Female population	140.48	146.05	151.88	154.97	154.21	151.95	150.54	149.32	147.88	146.69	145.47	144.17	142.99	141.77	140.55	139.39
Percent 0-4	6.88	6.48	6.38	6.01	6.02	6.08	5.97	6.00	5.99	5.94	5.95	5.92	5.90	5.89	5.87	5.85
Percent 5-14	14.55	12.99	12.58	12.39	12.01	12.20	12.15	12.01	12.08	12.00	11.95	11.95	11.89	11.86	11.84	11.79
Percent 15-49	50.88	47.71	44.29	43.94	43.43	43.13	43.32	43.03	42.93	42.91	42.69	42.61	42.51	42.35	42.26	42.14
Percent 15-64	65.88	67.73	64.76	61.29	61.62	61.79	61.19	61.31	61.18	60.89	60.88	60.67	60.49	60.39	60.20	60.05
Percent 65 and over	12.69	12.81	16.28	20.32	20.35	19.93	20.69	20.68	20.76	21.16	21.23	21.45	21.72	21.86	22.09	22.30
Percent females 15-49	49.77	46.43	42.81	42.27	41.83	41.72	41.95	41.66	41.56	41.54	41.33	41.26	41.17	41.02	40.94	40.82
Sex ratio	95.63	96.42	96.50	96.18	96.31	97.03	97.45	97.53	97.66	97.71	97.76	97.84	97.88	97.92	97.96	97.99
Dependency ratio	0.52	0.48	0.54	0.63	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.65	0.65	0.66	0.66	0.67
Median age	36	38	39	40	41	41	41	41	41	41	41	41	42	42	42	42

NPG2 TFR 1.8; 0 Mig	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Fertility																
Input TFR	2.00	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
GRR	0.98	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
NRR	0.97	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Mean Age of Childbearing	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4
Child-woman ratio	0.27	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fertility table: UN Asia																
Mortality																
Male LE	75.0	75.3	75.7	76.0	76.3	76.7	77.0	77.3	77.7	78.0	78.3	78.7	79.0	79.3	79.7	80.0
Female LE	82.0	82.4	82.7	83.1	83.5	83.8	84.2	84.6	84.9	85.3	85.7	86.0	86.4	86.8	87.1	87.5
Total LE	78.6	78.9	79.3	79.6	80.0	80.3	80.7	81.0	81.4	81.7	82.1	82.4	82.8	83.1	83.5	83.8
IMR	8.0	7.5	7.1	6.6	6.1	5.7	5.6	5.5	5.5	5.4	5.3	5.2	5.2	5.1	5.0	4.9
U5MR	8.9	8.4	7.8	7.2	6.7	6.2	6.1	6.0	5.9	5.8	5.8	5.7	5.6	5.5	5.4	5.3
Life table: Coale-Demeny West																
Immigration																
Male immigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Female immigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total immigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vital Rates																
CBR per 1000	13.5	12.6	11.8	11.1	10.6	10.5	10.3	10.2	10.2	10.1	10.1	10.1	10.0	10.0	10.0	9.9
CDR per 1000	9.0	8.9	9.4	11.2	13.4	14.1	13.8	14.5	14.9	14.7	14.7	14.7	14.6	14.6	14.6	14.5
RNI percent	0.45	0.36	0.24	-0.02	-0.28	-0.36	-0.35	-0.43	-0.47	-0.46	-0.46	-0.46	-0.46	-0.46	-0.46	-0.46
GR percent	0.45	0.36	0.24	-0.02	-0.28	-0.36	-0.35	-0.43	-0.47	-0.46	-0.46	-0.46	-0.46	-0.46	-0.46	-0.46
Doubling time	154.3	192.3	286.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual births and deaths (in millions)																
Births	3.72	3.56	3.45	3.28	3.08	2.96	2.81	2.67	2.55	2.42	2.30	2.19	2.09	1.99	1.89	1.80
Deaths	2.48	2.53	2.74	3.32	3.91	3.98	3.75	3.78	3.71	3.52	3.34	3.21	3.04	2.90	2.77	2.63

NPG2 TFR 1.8; 0 Mig	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Population (in millions)																
Total population	274.82	285.94	293.69	295.42	288.80	278.71	269.28	258.62	246.99	235.86	225.35	215.14	205.43	196.19	187.32	178.88
Male population	134.34	140.34	144.14	144.67	141.41	136.89	132.44	127.11	121.40	115.98	110.84	105.85	101.11	96.58	92.23	88.09
Female population	140.48	145.59	149.56	150.76	147.39	141.82	136.85	131.50	125.58	119.87	114.51	109.29	104.32	99.61	95.09	90.79
Percent 0-4	6.88	6.17	5.83	5.51	5.29	5.29	5.19	5.12	5.13	5.10	5.08	5.07	5.05	5.03	5.02	5.00
Percent 5-14	14.55	13.03	11.82	11.47	11.07	10.86	10.80	10.65	10.61	10.61	10.53	10.51	10.48	10.44	10.41	10.38
Percent 15-49	50.88	47.86	45.00	44.26	43.24	42.40	41.78	41.56	41.31	41.24	41.10	40.93	40.83	40.69	40.55	40.43
Percent 15-64	65.88	57.95	65.81	62.11	62.31	62.45	61.17	60.65	60.67	60.37	60.18	60.07	59.84	59.67	59.51	59.31
Percent 65 and over	12.69	12.85	16.54	20.91	21.33	21.41	22.84	23.58	23.59	23.92	24.21	24.34	24.63	24.86	25.06	25.31
Percent females 15-49	49.77	46.58	43.48	42.52	41.57	40.90	40.32	40.05	39.80	39.73	39.60	39.44	39.35	39.21	39.08	38.97
Sex ratio	95.63	96.40	96.38	95.96	95.94	96.52	96.78	96.66	96.67	96.76	96.80	96.86	96.92	96.95	96.99	97.02
Dependency ratio	0.52	0.47	0.52	0.61	0.60	0.60	0.63	0.65	0.65	0.66	0.66	0.66	0.67	0.68	0.68	0.69
Median age	36	38	40	42	43	43	44	44	44	44	45	45	45	45	45	45

NPG3 TFR 1.6; 0 Mig	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Fertility																
Input TFR	2.00	1.80	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
GRR	0.98	0.88	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
NRR	0.97	0.87	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Mean Age of Childbearing	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4
Child-woman ratio	0.27	0.26	0.25	0.23	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Fertility table: UN Asia																
Mortality																
Male LE	75.0	75.3	75.7	76.0	76.3	76.7	77.0	77.3	77.7	78.0	78.3	78.7	79.0	79.3	79.7	80.0
Female LE	82.0	82.4	82.7	83.1	83.5	83.8	84.2	84.6	84.9	85.3	85.7	86.0	86.4	86.8	87.1	87.5
Total LE	78.6	78.9	79.3	79.6	80.0	80.3	80.7	81.0	81.4	81.7	82.1	82.4	82.8	83.1	83.5	83.8
IMR	8.0	7.5	7.1	6.6	6.1	5.7	5.6	5.5	5.5	5.4	5.3	5.2	5.2	5.1	5.0	4.9
U5MR	8.9	8.4	7.8	7.2	6.7	6.2	6.1	6.0	5.9	5.8	5.8	5.7	5.6	5.5	5.4	5.3
Life table: Coale-Demeny West																
Immigration																
Male immigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Female immigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total immigration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vital Rates																
CBR per 1000	13.5	12.6	11.2	10.0	9.5	9.0	8.7	8.6	8.4	8.4	8.3	8.3	8.3	8.2	8.2	8.2
CDR per 1000	9.0	8.9	9.4	11.4	13.8	14.7	14.7	15.8	16.7	17.1	17.2	17.0	17.1	17.1	17.0	17.0
RNI percent	0.45	0.36	0.18	-0.14	-0.42	-0.57	-0.60	-0.73	-0.83	-0.87	-0.89	-0.87	-0.88	-0.89	-0.88	-0.88
GR percent	0.45	0.36	0.18	-0.14	-0.42	-0.57	-0.60	-0.73	-0.83	-0.87	-0.89	-0.87	-0.88	-0.89	-0.88	-0.88
Doubling time	154.3	192.3	390.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual births and deaths (in millions)																
Births	3.72	3.56	3.26	2.91	2.71	2.44	2.22	2.04	1.85	1.69	1.54	1.40	1.28	1.17	1.07	0.97
Deaths	2.48	2.53	2.74	3.32	3.90	3.97	3.74	3.77	3.69	3.45	3.19	2.89	2.65	2.43	2.21	2.02

NPG3 TFR 1.6; 0 Mig	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Population (in millions)																
Total population	274.82	285.94	292.75	290.81	280.59	265.71	250.51	233.85	215.60	197.74	181.00	165.77	151.80	138.93	127.22	116.48
Male population	134.34	140.34	143.65	142.31	137.22	130.25	122.85	114.47	105.41	96.63	88.49	81.07	74.25	67.97	62.25	57.01
Female population	140.48	145.59	149.09	148.50	143.37	135.46	127.66	119.38	110.19	101.10	92.51	84.70	77.55	70.96	64.96	59.47
Percent 0-4	6.88	6.17	5.53	4.97	4.79	4.56	4.41	4.34	4.26	4.25	4.24	4.21	4.20	4.19	4.17	4.15
Percent 5-14	14.55	13.03	11.85	10.68	10.13	9.87	9.43	9.25	9.18	9.08	9.08	9.04	8.99	8.97	8.93	8.89
Percent 15-49	50.88	47.86	45.15	44.97	43.50	42.08	40.78	39.61	39.40	39.15	38.95	38.87	38.67	38.53	38.41	38.24
Percent 15-64	65.88	67.95	66.02	63.10	63.13	63.11	61.61	60.32	59.53	59.35	59.19	58.86	58.72	58.52	58.27	58.10
Percent 65 and over	12.69	12.85	16.60	21.24	21.95	22.46	24.55	26.08	27.02	27.32	27.49	27.89	28.10	28.32	28.63	28.85
Percent females 15-49	49.77	46.58	43.61	43.17	41.78	40.53	39.25	38.03	37.76	37.49	37.31	37.24	37.05	36.92	36.81	36.64
Sex ratio	95.63	96.40	96.35	95.83	95.71	96.15	96.23	95.89	95.65	95.58	95.65	95.71	95.74	95.80	95.83	95.85
Dependency ratio	0.52	0.47	0.51	0.58	0.58	0.58	0.62	0.66	0.68	0.68	0.69	0.70	0.70	0.71	0.72	0.72
Median age	36	38	40	42	44	45	47	47	48	48	48	48	49	49	49	49

NPG6 TFR 1.8; Mig 150	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Fertility																
Input TFR	2.00	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
GRR	0.98	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
NRR	0.97	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Mean Age of Childbearing	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4
Child-woman ratio	0.27	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fertility table: UN Asia																
Mortality																
Male LE	75.0	75.3	75.7	76.0	76.3	76.7	77.0	77.3	77.7	78.0	78.3	78.7	79.0	79.3	79.7	80.0
Female LE	82.0	82.4	82.7	83.1	83.5	83.8	84.2	84.6	84.9	85.3	85.7	86.0	86.4	86.8	87.1	87.5
Total LE	78.6	78.9	79.3	79.6	80.0	80.3	80.7	81.0	81.4	81.7	82.1	82.4	82.8	83.1	83.5	83.8
IMR	8.0	7.5	7.1	6.6	6.1	5.7	5.6	5.5	5.5	5.4	5.3	5.2	5.2	5.1	5.0	4.9
U5MR	8.9	8.4	7.8	7.2	6.7	6.2	6.1	6.0	5.9	5.8	5.8	5.7	5.6	5.5	5.4	5.3
Life table: Coale-Demeny West																
Immigration (in thousands)																
Male immigration	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Female immigration	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Total immigration	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Vital Rates																
CBR per 1000	13.5	12.3	11.9	11.0	10.5	10.5	10.3	10.2	10.2	10.1	10.1	10.0	10.0	10.0	9.9	9.9
CDR per 1000	9.0	8.9	9.4	11.2	13.3	14.0	13.7	14.4	14.8	14.5	14.5	14..6	14.5	14.5	14.4	14.3
RNI percent	0.45	0.33	0.25	-0.02	-0.28	-0.35	-0.35	-0.43	-0.46	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45
GR percent	0.45	0.39	0.30	0.03	-0.23	-0.30	-0.29	-0.37	-0.40	-0.39	-0.39	-0.39	-0.38	-0.38	-0.38	-0.37
Doubling time	137.6	179.5	230.7	2205.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual births and deaths (in millions)																
Births	3.72	3.49	3.49	3.28	3.11	3.03	2.87	2.74	2.64	2.52	2.42	2.23	2.22	2.13	2.05	1.96
Deaths	2.48	2.54	2.75	3.34	39.4	4.03	3.84	3.90	3.84	3.64	3.50	3.37	3.22	3.10	2.98	2.85

NPG6 TFR 1.8; Mig 150	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Population (in millions)																
Total population	274.82	286.63	296.14	299.39	294.15	285.64	277.45	267.86	257.38	247.52	238.20	229.07	220.48	212.28	204.39	196.92
Male population	134.34	140.93	145.84	147.36	145.00	141.41	137.66	132.91	127.80	123.01	118.45	114.01	109.82	105.81	101.95	98.30
Female population	140.48	145.70	150.30	152.03	149.16	144.23	139.80	134.95	129.58	124.50	119.75	115.06	110.66	106.47	102.44	98.63
Percent 0-4	6.88	6.04	5.84	5.45	5.25	5.27	5.14	5.10	5.11	5.07	5.05	5.04	5.01	5.00	4.99	4.96
Percent 5-14	14.55	12.88	11.67	11.45	10.92	10.77	10.73	10.54	10.54	10.52	10.44	10.43	10.39	10.34	10.31	10.27
Percent 15-49	50.88	48.18	45.27	44.45	43.40	42.38	42.02	41.75	41.51	41.51	41.33	41.18	41.11	40.96	40.85	40.74
Percent 15-64	65.88	68.25	66.03	62.38	62.68	62.62	61.29	60.93	61.00	60.64	60.54	60.43	60.18	60.07	59.91	59.72
Percent 65 and over	12.69	12.83	16.45	20.73	21.15	21.34	22.83	23.43	23.34	23.77	23.98	24.10	24.41	24.59	24.79	25.04
Percent females 15-49	49.77	46.81	43.61	42.58	41.65	40.84	40.53	40.23	39.98	39.99	39.81	39.68	39.62	39.48	39.37	39.27
Sex ratio	95.63	96.73	97.04	96.93	97.21	98.04	98.47	98.48	98.63	98.81	98.92	99.09	99.25	99.37	99.53	99.67
Dependency ratio	0.52	0.47	0.51	0.60	0.60	0.60	0.63	0.64	0.64	0.65	0.65	0.65	0.66	0.66	0.67	0.67
Median age	36	38	40	42	43	43	44	44	44	44	45	45	45	45	45	45

NPG7 TFR 1.6; Mig 150	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Fertility																
Input TFR	2.00	1.80	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
GRR	0.98	0.88	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
NRR	0.97	0.87	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Mean Age of Childbearing	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4
Child-woman ratio	0.27	0.25	0.24	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Fertility table: UN Asia																
Mortality																
Male LE	75.0	75.3	75.7	76.0	76.3	76.7	77.0	77.3	77.7	78.0	78.3	78.7	79.0	79.3	79.7	80.0
Female LE	82.0	82.4	82.7	83.1	83.5	83.8	84.2	84.6	84.9	85.3	85.7	86.0	86.4	86.8	87.1	87.5
Total LE	78.6	78.9	79.3	79.6	80.0	80.3	80.7	81.0	81.4	81.7	82.1	82.4	82.8	83.1	83.5	83.8
IMR	8.0	7.5	7.1	6.6	6.1	5.7	5.6	5.5	5.5	5.4	5.3	5.2	5.2	5.1	5.0	4.9
U5MR	8.9	8.4	7.8	7.2	6.7	6.2	6.1	6.0	5.9	5.8	5.8	5.7	5.6	5.5	5.4	5.3
Life table: Coale-Demeny West																
Immigration (in thousands)																
Male immigration	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Female immigration	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Total immigration	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Vital Rates																
CBR per 1000	13.5	12.3	10.9	9.9	9.4	9.0	8.7	8.5	8.4	8.3	8.3	8.3	8.2	8.2	8.2	8.1
CDR per 1000	9.0	8.9	9.4	11.3	13.7	14.7	14.7	15.9	16.7	16.9	16.9	16.8	16.8	16.7	16.6	16.6
RNI percent	0.45	0.33	0.15	-0.14	-0.43	-0.57	-0.61	-0.74	-0.83	-0.85	-0.86	-0.85	-0.85	-0.85	-0.85	-0.84
GR percent	0.50	0.39	0.20	-0.09	-0.38	-0.52	-0.55	-0.68	-0.77	-0.78	-0.78	-0.77	-0.76	-0.75	-0.74	-0.73
Doubling time	137.6	179.5	340.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual births and deaths (in millions)																
Births	3.72	3.49	3.20	2.92	2.69	2.46	2.26	2.08	1.91	1.76	1.62	1.49	1.37	1.27	1.17	1.08
Deaths	2.48	2.54	2.75	3.34	3.94	4.03	3.83	3.89	3.81	3.55	3.29	3.03	2.80	2.59	2.39	2.21

NPG7 TFR 1.6; Mig 150	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Population (in millions)																
Total population	274.82	286.63	294.22	293.78	284.66	270.88	256.72	240.79	223.37	206.61	191.07	176.87	163.84	151.90	140.99	131.02
Male population	134.34	140.93	144.86	144.49	140.15	133.87	127.07	119.10	110.48	102.29	94.73	87.82	81.47	75.65	70.33	65.47
Female population	140.48	145.70	149.36	149.28	144.51	137.01	129.65	121.70	112.89	104.32	96.34	89.05	82.37	76.25	70.66	65.55
Percent 0-4	6.88	6.04	5.39	4.93	4.70	4.52	4.38	4.30	4.25	4.23	4.22	4.19	4.18	4.16	4.14	4.12
Percent 5-14	14.55	12.88	11.59	10.54	10.00	9.69	9.34	9.17	9.10	9.03	9.00	8.95	8.91	8.87	8.83	8.79
Percent 15-49	50.88	48.18	45.57	45.14	43.51	41.95	40.78	39.90	39.68	39.51	39.37	39.28	39.15	39.05	38.95	38.85
Percent 15-64	65.88	68.25	66.46	63.41	63.44	63.29	61.60	60.46	59.95	59.79	59.63	59.42	59.29	59.14	58.97	58.84
Percent 65 and over	12.69	12.83	16.56	21.21	21.86	22.50	24.68	26.07	26.71	26.95	27.15	27.43	27.63	27.83	28.06	28.25
Percent females 15-49	49.77	46.81	43.88	43.20	41.70	40.34	39.20	38.27	38.00	37.82	37.69	37.60	37.49	37.39	37.30	37.20
Sex ratio	95.63	96.73	96.99	96.79	96.98	97.71	98.02	97.86	97.87	98.05	98.33	98.62	98.90	99.22	99.54	99.87
Dependency ratio	0.52	0.47	0.50	0.58	0.58	0.58	0.62	0.65	0.67	0.67	0.68	0.68	0.69	0.69	0.70	0.70
Median age	36	38	40	42	44	45	47	47	48	48	48	48	48	48	48	49

NPG11 TFR 2.0; Mig 150	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Fertility																
Input TFR	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
GRR	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
NRR	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Mean Age of Childbearing	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4
Child-woman ratio	0.27	0.27	0.29	0.28	0.28	0.29	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Fertility table: UN Asia																
Mortality																
Male LE	75.0	75.3	75.7	76.0	76.3	76.7	77.0	77.3	77.7	78.0	78.3	78.7	79.0	79.3	79.7	80.0
Female LE	82.0	82.4	82.7	83.1	83.5	83.8	84.2	84.6	84.9	85.3	85.7	86.0	86.4	86.8	87.1	87.5
Total LE	78.6	78.9	79.3	79.6	80.0	80.3	80.7	81.0	81.4	81.7	82.1	82.4	82.8	83.1	83.5	83.8
IMR	8.0	7.5	7.1	6.6	6.1	5.7	5.6	5.5	5.5	5.4	5.3	5.2	5.2	5.1	5.0	4.9
U5MR	8.9	8.4	7.8	7.2	6.7	6.2	6.1	6.0	5.9	5.8	5.8	5.7	5.6	5.5	5.4	5.3
Life table: Coale-Demeny West																
Immigration (in thousands)																
Male immigration	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Female immigration	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Total immigration	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Vital Rates																
CBR per 1000	13.5	13.2	13.0	12.1	12.1	12.1	11.9	12.0	12.0	11.9	11.9	11.8	11.8	11.8	11.7	11.7
CDR per 1000	9.0	8.9	9.2	10.9	12.7	13.1	12.5	12.8	12.8	12.6	12.7	12.7	12.6	12.6	12.5	12.5
RNI percent	0.45	0.43	0.37	0.13	-0.06	-0.09	-0.06	-0.08	-0.09	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08
GR percent	0.51	0.48	0.43	0.17	-0.02	-0.05	-0.01	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Doubling time	137.5	143.5	163.4	397.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual births and deaths (in millions)																
Births	3.72	3.77	3.87	3.73	3.75	3.75	3.68	3.68	3.66	3.62	3.61	3.59	3.56	3.55	3.52	3.50
Deaths	2.48	2.54	2.76	3.34	3.95	4.04	3.86	3.94	3.93	3.85	3.87	3.84	3.80	3.80	3.76	3.74

NPG11 TFR 2.0; Mig 150	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Population (in millions)																
Total population	274.82	288.50	301.85	309.29	309.91	308.41	307.92	307.12	305.89	305.04	304.09	303.04	302.14	301.16	300.19	299.31
Male population	134.34	141.88	148.76	152.41	153.03	153.03	153.20	152.90	152.40	152.03	151.60	151.15	150.74	150.29	149.85	149.44
Female population	140.48	146.61	153.09	156.88	156.87	155.38	154.72	154.22	153.49	153.01	152.49	151.89	151.40	150.87	150.34	149.87
Percent 0-4	6.88	6.48	6.37	5.99	6.01	6.05	5.94	5.97	5.95	5.91	5.91	5.89	5.87	5.86	5.84	5.82
Percent 5-14	14.55	12.95	12.55	12.34	11.95	12.12	12.06	11.92	11.99	11.91	11.86	11.86	11.80	11.77	11.75	11.70
Percent 15-49	50.88	47.86	44.57	44.25	43.66	43.32	43.47	43.18	43.08	43.06	42.84	42.76	42.66	42.51	42.42	42.30
Percent 15-64	65.88	67.81	64.94	61.60	61.97	62.06	61.42	61.54	61.40	61.12	61.10	60.90	60.72	60.62	60.44	60.29
Percent 65 and over	12.69	12.75	16.14	20.06	20.08	19.76	20.58	20.57	20.66	21.06	21.12	21.35	21.61	21.75	21.97	22.19
Percent females 15-49	49.77	46.51	42.96	42.44	41.99	41.87	42.09	41.80	41.71	41.69	41.48	41.42	41.32	41.18	41.09	40.98
Sex ratio	95.63	96.77	97.17	97.15	97.55	98.48	99.02	99.14	99.29	99.36	99.42	99.51	99.56	99.61	99.67	99.71
Dependency ratio	0.52	0.47	0.54	0.62	0.61	0.61	0.63	0.62	0.63	0.64	0.64	0.64	0.65	0.65	0.65	0.66
Median age	36	38	39	40	41	41	41	41	41	41	41	41	42	42	42	42

NPG12 TFR 1.8; Mig 500	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Fertility																
Input TFR	2.00	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
GRR	0.98	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
NRR	0.97	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Mean Age of Childbearing	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4
Child-woman ratio	0.27	0.25	0.26	0.25	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fertility table: UN Asia																
Mortality																
Male LE	75.0	75.3	75.7	76.0	76.3	76.7	77.0	77.3	77.7	78.0	78.3	78.7	79.0	79.3	79.7	80.0
Female LE	82.0	82.4	82.7	83.1	83.5	83.8	84.2	84.6	84.9	85.3	85.7	86.0	86.4	86.8	87.1	87.5
Total LE	78.6	78.9	79.3	79.6	80.0	80.3	80.7	81.0	81.4	81.7	82.1	82.4	82.8	83.1	83.5	83.8
IMR	8.0	7.5	7.1	6.6	6.1	5.7	5.6	5.5	5.5	5.4	5.3	5.2	5.2	5.1	5.0	4.9
U5MR	8.9	8.4	7.8	7.2	6.7	6.2	6.1	6.0	5.9	5.8	5.8	5.7	5.6	5.5	5.4	5.3
Life table: Coale-Demeny West																
Immigration (in thousands)																
Male immigration	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00
Female immigration	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00
Total immigration	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00
Vital Rates																
CBR per 1000	13.5	12.3	11.9	11.0	10.5	10.5	10.2	10.1	10.1	10.0	10.0	9.9	9.9	9.9	9.8	9.8
CDR per 1000	9.0	8.9	9.2	10.9	12.9	13.6	13.4	14.2	14.5	14.3	14.3	14.3	14.2	14.1	14.1	14.0
RNI percent	0.45	0.34	0.27	0.01	-0.24	-0.31	-0.33	-0.41	-0.44	-0.43	-0.43	-0.43	-0.43	-0.43	-0.43	-0.42
GR percent	0.63	0.52	0.43	0.17	-0.08	-0.15	-0.16	-0.24	-0.27	-0.25	-0.25	-0.25	-0.24	-0.23	-0.23	-0.22
Doubling time	109.8	133.9	160.8	417.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual births and deaths (in millions)																
Births	3.72	3.53	3.57	3.40	3.26	3.21	3.08	2.99	2.91	2.81	2.74	2.67	2.59	2.52	2.46	2.39
Deaths	2.48	2.55	2.76	3.38	4.02	4.17	4.07	4.21	4.19	4.02	3.92	3.83	3.70	3.62	3.52	3.42

NPG12 TFR 1.8; Mig 500	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Population (in millions)																
Total population	274.82	290.39	304.01	311.46	310.47	305.99	301.33	294.74	287.03	279.82	273.02	266.31	260.05	254.08	248.34	242.94
Male population	134.34	143.39	150.92	155.07	155.29	154.07	152.27	149.08	145.36	141.90	138.59	135.36	132.33	129.43	126.65	124.03
Female population	140.48	147.00	153.09	156.39	155.17	151.92	149.06	145.66	141.66	137.92	134.43	130.95	127.72	124.65	121.69	118.91
Percent 0-4	6.88	6.04	5.84	5.42	5.22	5.22	5.09	5.05	5.06	5.01	5.00	4.99	4.96	4.95	4.93	4.91
Percent 5-14	14.55	12.80	11.63	11.35	10.80	10.64	10.57	10.38	10.38	10.36	10.27	10.26	10.22	10.17	10.14	10.10
Percent 15-49	50.88	48.54	45.91	45.16	43.96	42.87	42.47	42.19	41.97	41.97	41.80	41.67	41.61	41.47	41.37	41.27
Percent 15-64	65.88	68.46	66.42	63.09	63.47	63.24	61.88	61.55	61.59	61.26	61.18	61.07	60.86	60.75	60.61	60.44
Percent 65 and over	12.69	12.70	16.12	20.14	20.51	20.90	22.46	23.02	22.97	23.37	23.55	23.68	23.97	24.14	24.32	24.56
Percent females 15-49	49.77	46.99	43.95	43.00	42.04	41.24	40.94	40.65	40.43	40.44	40.28	40.17	40.11	39.98	39.89	39.80
Sex ratio	95.63	97.54	98.58	99.16	100.08	101.41	102.15	102.35	102.61	102.89	103.10	103.37	103.61	103.83	104.07	104.30
Dependency ratio	0.52	0.46	0.51	0.59	0.58	0.58	0.62	0.62	0.62	0.63	0.63	0.64	0.64	0.65	0.65	0.65
Median age	36	38	39	41	43	43	44	44	44	44	45	45	45	45	45	45

NPG13 TFR 1.6; Mig 500	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Fertility																
Input TFR	2.00	1.80	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
GRR	0.98	0.88	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
NRR	0.97	0.87	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Mean Age of Childbearing	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4	27.4
Child-woman ratio	0.27	0.25	0.24	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Fertility table: UN Asia																
Mortality																
Male LE	75.0	75.3	75.7	76.0	76.3	76.7	77.0	77.3	77.7	78.0	78.3	78.7	79.0	79.3	79.7	80.0
Female LE	82.0	82.4	82.7	83.1	83.5	83.8	84.2	84.6	84.9	85.3	85.7	86.0	86.4	86.8	87.1	87.5
Total LE	78.6	78.9	79.3	79.6	80.0	80.3	80.7	81.0	81.4	81.7	82.1	82.4	82.8	83.1	83.5	83.8
IMR	8.0	7.5	7.1	6.6	6.1	5.7	5.6	5.5	5.5	5.4	5.3	5.2	5.2	5.1	5.0	4.9
U5MR	8.9	8.4	7.8	7.2	6.7	6.2	6.1	6.0	5.9	5.8	5.8	5.7	5.6	5.5	5.4	5.3
Life table: Coale-Demeny West																
Immigration (in thousands)																
Male immigration	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00	333.00
Female immigration	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00	167.00
Total immigration	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00
Vital Rates																
CBR per 1000	13.5	12.3	10.9	9.9	9.4	8.9	8.6	8.4	8.3	8.3	8.3	8.2	8.2	8.1	8.1	8.1
CDR per 1000	9.0	8.9	9.2	11.1	13.3	14.2	14.4	15.5	16.3	16.4	16.4	16.2	16.2	16.1	16.0	15.9
RNI percent	0.45	0.34	0.17	-0.12	-0.39	-0.53	-0.57	-0.71	-0.79	-0.81	-0.81	-0.80	-0.80	-0.80	-0.79	-0.78
GR percent	0.63	0.52	0.34	0.05	-0.23	-0.36	-0.40	-0.52	-0.60	-0.60	-0.59	-0.57	-0.55	-0.53	-0.51	-0.49
Doubling time	109.8	133.9	207.0	1506.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual births and deaths (in millions)																
Births	3.72	3.53	3.27	3.02	2.83	2.62	2.44	2.28	2.12	1.99	1.87	1.75	1.65	1.56	1.47	1.39
Deaths	2.48	2.55	2.77	3.38	4.01	4.17	4.06	4.19	4.15	3.93	3.71	3.47	3.27	3.08	2.90	2.74

NPG13 TFR 1.6; Mig 500	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
Population (in millions)																
Total population	274.82	290.39	302.04	305.68	300.65	290.65	279.69	266.37	251.22	236.55	222.90	210.45	199.05	188.60	179.09	170.39
Male population	134.34	143.39	149.91	152.12	150.28	146.24	141.22	134.60	127.13	119.97	113.35	107.31	101.78	96.70	92.08	87.86
Female population	140.48	147.00	152.13	153.56	150.37	144.41	138.47	131.76	124.09	116.58	109.55	103.14	97.28	91.90	87.00	82.54
Percent 0-4	6.88	6.04	5.39	4.91	4.68	4.48	4.34	4.26	4.21	4.19	4.18	4.15	4.14	4.12	4.10	4.08
Percent 5-14	14.55	12.80	11.54	10.45	9.89	9.58	9.21	9.04	8.97	8.89	8.86	8.81	8.76	8.72	8.67	8.63
Percent 15-49	50.88	48.54	46.20	45.85	44.10	42.50	41.34	40.51	40.34	40.21	40.11	40.06	39.97	39.91	39.86	39.79
Percent 15-64	65.88	68.46	66.85	64.12	64.25	63.94	62.25	61.22	60.75	60.64	60.54	60.38	60.29	60.20	60.08	59.99
Percent 65 and over	12.69	12.70	16.22	20.52	21.18	22.00	24.19	25.48	26.07	26.28	26.42	26.66	26.81	26.96	27.15	27.30
Percent females 15-49	49.77	46.99	44.23	43.63	42.12	40.78	39.70	38.82	38.61	38.47	38.38	38.34	38.26	38.21	38.16	38.10
Sex ratio	95.63	97.54	98.55	99.06	99.94	101.26	101.99	102.15	102.45	102.91	103.47	104.05	104.63	105.23	105.84	106.45
Dependency ratio	0.52	0.46	0.50	0.56	0.56	0.56	0.61	0.63	0.65	0.65	0.65	0.66	0.66	0.66	0.66	0.67
Median age	36	38	40	42	44	45	46	47	47	47	48	48	48	48	48	48