The twentieth century was, above all else, a century of population growth; the twenty-first century will be a century of aging. Between 1900 and 2000 the world’s population quadrupled, from around 1.5 billion to over 6 billion. Most of this increase occurred after World War II. At present, it seems unlikely that the population will grow by more than about a further 50 percent. The most plausible forecasts see a population numbering between 9 and 10 billion by about 2050, with stability or decline in total population thereafter.

However, the population at older ages will increase far more quickly in the coming century than in the last. Indeed, the end of population growth and its replacement by aging are logically related. All rapidly growing populations are young. If each birth cohort is larger than the one before, there will always be plenty of young people.

Population growth was so characteristic of the recent past that we tend to regard it as the norm. However, for most of human history the long-run rate of population growth has been very close to zero. From the biblical Adam and Eve, it would have taken only thirty-two doublings of the population to reach over 8 billion. At the rate of population growth seen in the 1960s and early 1970s – over 2 percent a year, implying a doubling time of around thirty years – and given that the gap between generations is also usually about thirty years, such an increase could have taken place inside a millennium. Even James Ussher’s 1650 estimate of October 23, 4004 B.C. as the date of creation implies we have been around much longer than that. And since Homo sapiens actually emerged one hundred and fifty thousand or so years ago, the rate of growth has obviously been close to zero.

Similarly, extrapolating the growth rates of the recent past into the future soon yields logically impossible figures. Ansley Coale once calculated that a growth rate of 2 percent a year sustained for five thousand years would lead to the sheer volume of human beings exceeding that of the solar system.

The absence of growth is a necessary but not sufficient condition for aging;
we also need long life expectancy. In populations before the modern medical era, relatively few people survived to reach three score years and ten. Thus, population aging is a novelty requiring both long lives and a low growth rate (i.e., low fertility). Though rare in the past, these conditions are now becoming the norm around the world.

When demographers try to understand the determinants of aging, they use one of social science’s great generalizing models: the demographic transition. When a population modernizes, it undergoes, along with many other aspects of development, a set of interconnected changes called the demographic transition. According to this model, every population at some point has high fertility (mostly between four and six children per woman) and low life expectancy (mostly between twenty-five and forty years). With the spread of modern medicine and public health, mortality improves; as family planning and contraceptive use become the norm, fertility falls. Usually life expectancy rises first, with a delay before fertility declines. This difference in timing leads to substantial population growth before the two processes come back into balance.

This process of transition began in the late eighteenth and nineteenth centuries in Europe, the United States, and the other neo-Europees; it became a global phenomenon after World War II. Today, more than half of the world’s people live in places where fertility is at or below the level needed for long-run intergenerational replacement (about 2.1 children per woman), and global life expectancy is approaching seventy years.

Trends in mortality can be followed in considerable detail for many European countries from the mid-nineteenth century, and for a few especially well-documented cases, as far back as the late 1700s. For Japan and the United States detailed information dates back to the early twentieth century. What these statistics reveal is both simple and striking. There has been an enormous reduction in mortality, with life expectancy for the two sexes combined now approaching, or even exceeding, eighty in most developed countries. Even more remarkably, this progress has been very regular for many decades. Jim Oeppen and James Vaupel have shown, for example, that the trend in “best-practice” life expectancy (i.e., the country with the longest life expectancy in each year) has been linear for more than 150 years.1

In each decade the “state of the art” has increased about 2.5 years. Moreover, although there has been some variation at the national level, most developed countries have demonstrated strongly linear trends in life expectancy for the whole of the twentieth century.

Paradoxically, although this trend has been evident in mortality statistics for many decades, it is only in the last few years that it has been recognized. Demographers, actuaries, and others concerned with forecasting mortality had always hitherto assumed that life expectancy was approaching some asymptotic limit and would thus level off in the near future. But if there is some biological limit to extending longevity, there is no sign of it yet. As Oeppen and Vaupel point out, estimates of the maximum possible life expectancy made throughout the twentieth century were, on average, surpassed within five years of being made. This consistent error is of more than purely academic interest – pension-

and health-care systems have been funded on the basis of large underestimates of the number of elderly people in the future.

The linearity of the upward climb in life expectancy has occurred in spite of the fact that very different age groups and causes of death have been involved in different eras. Before World War II, almost all progress took place in reducing infectious diseases, with the biggest impact for infants and children. In contrast, today much of the improvement is concentrated at old ages. Perhaps the best analogy for these remarkable changes is to be found in models of economic growth. Just as modern theory hypothesizes the existence of an endogenous rate of growth that is in some sense built into our economic system, so too there may be an endogenous rate of improvement in health, as measured by life expectancy. In any event, we have every reason to expect that continued increases in the average length of life will augment population aging.

There are, of course, exceptions to this optimistic picture. In the Soviet Union and its client states in Eastern and Central Europe, life expectancy stagnated from the 1960s until the end of Communism. It then worsened still further in many cases, in the immediate aftermath of revolution. In Russia and many of the post-Soviet states it remains low, especially for men. Male life expectancy in Russia today is roughly the same as it was in 1950: about sixty years. To put this stagnation into perspective, the equivalent figure for the United States has increased since 1950 by almost ten years from sixty-six to seventy-six.

In the post-Communist countries further west, however, the last decade has seen rapid improvements; life expectancy there will likely converge to levels seen in Western Europe within a few decades. The origins of the health crisis under Communism and its persistence in Russia, Ukraine, and the other post-Soviet states is a matter of heated debate in both the scientific and general literature. Whatever the cause, the crisis serves as a warning against unqualified Panglossian optimism. Likewise, the emergence of HIV/AIDS and the associated reemergence of tuberculosis make clear that all future estimates of improvement in public health must take into account the potential for severe reversals.

Overall, however, the last half-century has seen unprecedented convergence in mortality patterns around the world. While rich countries still lead in life expectancy, the gap between these leaders and most developing countries has shrunk substantially. In fact, there has been more convergence in demography than in any other aspect of modernization. For example, consider Latin America as a whole, where the United Nations estimates current life expectancy is seventy-two years, and GDP per head (adjusted for inflation and other factors) is below $4,000, according to the Organization for Economic Cooperation and Development. Now consider the United States. Life expectancy in the United States was seventy-two years as recently as the early 1970s. In contrast, the U.S. GDP per head exceeded $4,000 by 1900. Latin America is a century behind the United States in income growth, but only thirty to thirty-five years behind in life expectancy. We can make similar comparisons for most developing countries. And though the gaps in educational attainment or urbanization are somewhat smaller than in GDP per head, none of the other conventional quantitative indices of development has converged as rapidly as demography.
In recent decades there has also been a striking convergence in fertility, which has declined rapidly in most countries. More than half of the world’s population now lives in countries or regions in which fertility is below the level needed for intergenerational replacement. In most of Southern Europe (including Italy and Spain) and in most of Central and Eastern Europe, the total fertility rate (the number of children born per woman) is below 1.3. Similar values are now seen in Japan, South Korea, and many of the more developed parts of China. Even some countries that might seem unlikely candidates have experienced rapid fertility decline. In Iran, for example, fertility fell from over six children per woman to just over two between the mid-1980s and mid-1990s. In contrast, fertility in the United States has seemed to defy gravity, staying close to or even above the replacement level for the last two decades. Among the developing countries in which fertility is now lower than in the United States are China, Brazil, Thailand, and Tunisia. If the trends of the last twenty-five years continue for another decade or so, the U.S. fertility level will be well above the median for the human population as a whole.

The very speed of fertility decline in many countries will produce an exaggerated form of aging. While aging is an inevitable and global phenomenon, countries in which fertility has fallen rapidly will experience a form of ‘super aging’ in the middle decades of this century. The baby boom cohorts of Southern Europe or the pretransition cohorts in China are very large compared to those that followed, and their getting old will greatly exacerbate any problems that aging generates.

There is also a sense in which aging can be ‘locked in’ as part of a country’s demographic regime through a form of negative momentum. For example, in Southern Europe, the large number of baby boomers moving through the childbearing ages has disguised the very low fertility rate of recent decades. The largest age groups at present are those ages 25 to 39. In the coming decades, however, the much smaller cohorts born since the mid-1980s will be in the reproductive ages. Unless these cohorts (currently ages 0 to 19) have much higher fertility than their parents, the number of births in countries such as Italy and Spain will shrink even more rapidly in the future than it has so far. In contrast, the United States and other countries in which fertility has stabilized at close to the replacement level (in Europe, they include France and the Nordic countries) will face much less severe challenges from demographic disruption.

The future is always uncertain to some degree, but when trends have been so clear and so consistent for decades, they form a solid basis for prediction. It is very close to certain that aging will be one of the defining global phenomena in the twenty-first century. The ways in which societies choose to adapt to this new reality will test the old adage that “demography is destiny.” Fatalism, however, is uncalled for – to a substantial degree we can still choose our future. However, demography does impose strong constraints on the range of feasible options. Taking these constraints into account is the basis for informed reactions to the challenges posed by aging.