CHAPTER ONE

OVERVIEW

The quest for a longer life is as old as humankind. It has fired the imagination of dreamers throughout history—dreamers such as Juan Ponce de Leon, the Spanish conqueror and explorer who discovered Florida in the sixteenth century in a quixotic quest to find the "fountain of youth" in the New World on behalf of King Ferdinand. Juan Ponce de Leon was 53 years old when he began his quest. He died eight years later at age 61 from the wounds of a poison arrow in his stomach, shot by hostile natives he encountered during his attempt to colonize the territory.

Today medical scientists are the adventurers who are seeking longer, healthier lives for all people. Dreamers and conquerors of a different sort, they wage a battle against the diseases and debilitating ailments of old age in laboratories and clinical trials. Some pursue advances in molecular biology and genetic therapy that they hope will lead to breakthroughs that will push life spans dramatically beyond 100 years.

The future offers a broad promise of startling advances in medical science. These advances include the potential for genetically engineered organ replacements derived from one's own DNA; gene therapy against intractable ills such as Alzheimer's disease and cancer; cures for inherited genetic defects; and incorporation of new inanimate material into the biological world, where it can create more durable organs, bones, and other body parts for people.

How long will people live? Already we have the late Jeanne Calment of Arles, France, who lived the longest of any human we

know of with records to back up the claim. She knew Vincent Van Gogh and rode a bicycle until she was 100. She died at the age of 122 in 1997—blind, deaf, and confined to a wheelchair, but lucid and cheerful to the end.

Several gerontologists now theorize that 120 years is the high-water mark for life expectancy—far above the previous assumed maximum of 85 years. More and more people are expected to come closer to that level in the next half-century. Today there are 65,000 centenarians in the United States; by 2050, there will be 1.1 million centenarians, according to the U.S. Bureau of the Census.[1] Fifty years hence, the dwindling remnant of the post–World War II baby boomers will still be around, recalling the Beatles, flower power, the assassinations of President John F. Kennedy and Martin Luther King, and the first lunar landing. These events will then be as far away in time as World War I is today.

With the potential for new medical breakthroughs and the emergence of anti-aging therapies, some scientists who are on the forefront of medical research are growing more confident that humans can live even longer than gerontologists assume. "There is general optimism in the medical research community that we can extend life beyond 120 years," says William A. Haseltine, chairman and chief executive officer of Human Genome Sciences, a biopharmaceutical genomics company based in Rockville, Maryland.

Haseltine sees benefits arriving from medical research sooner than most. "I think we'll see some of the new breakthrough technology, such as the ability to regenerate an entire organ, sooner than people think. Some of it will be publicly available in 15 years and widely available in 30 years. This will push life spans beyond 120 years and closer to 150 years. Then, over the next 100 years, further breakthroughs will give people the equivalent of perpetual life," he adds. (The promise of medical technology is discussed in more detail in chapter 7.)

There is considerable cause for joy in past and future gains in longevity. In the past century, humans made enormous gains in longevity. In the United States, for example, life spans rose from 47 years in 1900 to 77 years in 2000, propelled by improvements in sanitation

early in the century, then by the arrival of antibiotics, and finally by breakthroughs in the prevention and treatment of heart disease.[2]

Elsewhere in the industrial world, life spans have risen even higher. Japan takes the prize for longevity, with average life spans for infants born in 2000 estimated to be 80.7 years.[3] Europe generally has higher longevity rates than the United States, although not as high as in Japan. Average life expectancy at birth in Sweden is 79.58 years; in Italy, it is 79.03 years; in France, it is 78.76 years; and in Germany, it is 77.44 years.[4]

Decreases in the mortality rate in the future will lead to greater numbers of old people, unlike in the past, because most of the gains are not being made against childhood diseases and infant mortality, nor against diseases that prematurely sideline working-age people. Instead, the extra years are being added onto the end of life for people who already are living well past the age of retirement.

Yet the industrial world is not entirely rejoicing about increased longevity. It is worrying about how it will pay for social security pensions and publicly funded old-age health care and long-term care without going broke. These nations also worry about a decline in fertility. Younger age cohorts are smaller than older ones. Because old-age benefits are financed primarily through taxes on the working population through pay-as-you-go financing, the fiscal outlook is bleak.

In industrial nations around the world, the impact of aging will be greatly accelerated with the coming retirement of the baby boom generation. The impact already is being felt in the year 2001, with early retirements at age 55 for people who were born in 1946. The first big wave will hit in 2008, when the first year of baby boomers reaches 62. It will steadily continue for the next 18 years in the United States and for shorter periods elsewhere. The coming transformation has been inelegantly dubbed the "geezer glut."[5]

Aging is proceeding at similar paces in the United States and Europe and somewhat faster in Japan. Variations in fertility rates, however, are causing even more striking differences across the industrial nations. Where gains in longevity and declines in fertility are greatest—Japan, Italy, Spain, and Germany—there is the prospect of depopulation and a declining workforce. This is true even for

Germany—which, unlike the other three nations, has a fair amount of immigration to offset population losses.

JAPAN—THE MOST RAPIDLY AGING SOCIETY

The most rapidly aging societies are those with the greatest declines in fertility. Again, Japan sets the pace. It has experienced one of the sharpest fertility decreases: from more than 4 children per woman in a brief baby boom between 1947 and 1949 to an average of 1.4 children per woman[6]—or, as demographers call it, a 1.4 total fertility rate[7]—in 1995 (the last year it was officially reported by the Japanese government). This rate falls far short of the 2.1 total fertility rate necessary to replace the country's population and prevent its decline.

Japan's low birth rate will lead to a loss of nearly one-fourth of its population between 2005 and 2050, according to the latest United Nations (UN) projections.[8] These levels of losses historically have been correlated with devastating wars, famines, or plagues. Some demographers and economists predict a population decline in Japan of as much as one-third by 2050; they claim that official population projections, reflected in numbers provided by the UN, are overly optimistic in assuming that fertility rates will recover. The UN, for example, predicts that Japan's total fertility rate will rise to 1.75 by 2050.

Three large European nations have total fertility rates that are lower than Japan's. In Spain the rate has fallen to a very low 1.15. Italy's is only slightly higher, at 1.18. Germany also has a low fertility rate—1.37. Sweden's fertility rate, which had risen to 1.8 during the mid-1990s, has fallen back to 1.5. At these rates, given expected levels of immigration, these four countries will lose population over the next 50 years.[9]

Germany will lose the most people in Europe over the next half-century: 17.5 million—an amount equivalent to all of the former East Germany, or 21 percent of Germany's current population.[10] Italy will lose almost as many—16 million people—but from a smaller base, causing a 28 percent decline in population.[11] Neither the U.S. Census Bureau nor the UN has an updated 50-year projection for Spain or Sweden that reflects their lower fertility rates since the last official projections in 1998.

Some parts of Europe are faring better. France, with a fertility rate of 1.75, and the United Kingdom (UK), with a rate of 1.73, have higher rates than the European average. Because of immigration, these two countries are expected to experience only modest population declines over the next 50 years, according to official forecasts.

The United States faces one of the least troublesome prospects as an aging industrial nation. It too, however, will experience large increases in the number of elderly people. The U.S. fertility rate is 2.06, according to the Census Bureau. That rate is relatively close to replacement levels, thanks to several favorable trends. First, the total fertility rate for white American women has remained fairly high at 1.84[12]—much higher than overall fertility rates in Europe and Japan. At the same time, the total fertility rate for African American women, although it has been declining over the years, remains above replacement level at 2.24. Most immigrants to the United States have a higher birth rate than natural-born Americans, boosting the overall fertility rate average for the United States. Hispanics, who represent the largest single group of immigrants, have a total fertility rate of 2.95; Mexicans—the largest group of Hispanic immigrants—have a total fertility rate of 3.20.

LABOR SHORTAGES WILL EMERGE WITH BABY BOOMER RETIREMENT

The pace of aging is set to accelerate when the first wave of the baby boom generation begins to retire in significant numbers in some countries in 2008. Already the issue of baby boomer retirement threatens to exacerbate labor shortages in the private and public sectors where retirement plans allow for retirement long before age 65. For example, U.S. federal employees are eligible for retirement at age 55 with 30 years of service. This arrangement will give the federal government a first taste of the coming impact of baby boom retirement. Within five years, 30 percent of the 1.6 million full-time employees in the federal government will be eligible to retire; another 20 percent will be eligible for early retirement.[13] Although it is not yet

clear whether everyone who is eligible to retire will do so, the magnitude of the potential shortfall is worrying the federal government. It soon may be hard-pressed to fill all of the vacant slots.

Baby boom retirement, combined with lower fertility rates over the past several decades and into the future, eventually will create tight labor markets even in Europe,[14] which currently has high and intractable unemployment (9 percent and higher). It also will tighten labor markets in Japan, where young people today are having increasing difficulty finding jobs in an economy that has remained sluggish for 10 years—a time known in Japan as "the lost decade."

The working-age population in Japan is expected to decline by 34 percent in 2050,[15] according to the UN's medium-variant projections (one of three projections—the others are high-variant and low-variant projections—that the UN plots on a periodic basis). In Italy, the working-age population will decline by an alarming 43 percent by 2050. Germany's working-age population will decline by 23 percent. Again, France and the UK fare better, with projected working-age population declines of 11 percent and 13 percent, respectively.[16]

The U.S. working-age population is expected to rise by 16 percent over the next 50 years[17]—a fairly sluggish pace compared to trends in the past half century. Canada tops all industrial nations with an expected gain in working-age population of 18 percent,[18] aided by net migration rates[19] that are double those of the United States and a projected rise in the total fertility rate from 1.55 to 1.9.

The portion of the population that is older than 65 in Japan will increase from 17.1 percent today to 31.8 percent in 2050. In Italy it will increase from 18.2 percent to 34.9 percent. In Germany it will rise from 16.4 percent to 28.4 percent. In the United States it will rise from 12.5 percent to 21.7 percent—giving the United States as a whole a population profile of elderly Americans similar to that now found only in Florida, although the elderly may be unevenly distributed across the country and concentrated in some areas of the West and South, according to an analysis by the Milken Institute.[20]

In spite of what appears to be a slower aging process in the United States, the potential impact on Social Security and Medicare of aging populations will be significant and will pose threats to the viability of

both programs. According to the official 2000 forecast of the U.S. Social Security Administration (SSA), in 75 years income from the payroll tax will provide only two-thirds of what will be needed to pay for benefits. The cost of the program is slated to rise to 19.5 percent of payroll while the payroll tax will be only 13.3 percent, including increases already slated under current law. Thus, the cost of Social Security will rise from 4.2 percent to 6.8 percent of the gross domestic product (GDP).[21]

MEDICARE COSTS WILL RISE SHARPLY IN UNITED STATES

Medicare in the United States faces a similar shortfall, according to official projections. The cost for Medicare Part B—which pays for physician, outpatient hospital, home health, and other services for the aged and disabled—rose 38 percent over the past five years, to $82.3 billion in 1999. The Federal Supplemental Medical Insurance Trust Fund, which administers Medicare Part B, is kept afloat mainly by infusions from general tax revenues. Premiums, which were $45.50 a month in 1999, pay for only $19 billion or 23 percent of the cost of the program. Medicare trustees have noted "with great concern" that costs continue to rise faster than GDP and are projected to grow to 2.4 percent of GDP by 2075—two and one-half times the current level.[22]

Spending for Medicare Part A—which helps pay for hospital, home health, skilled nursing facility and hospice care for the aged and disabled—also is expected to "grow rapidly as a fraction of workers' earnings, from 2.8 percent in 1999 to 6.7 percent in 2075," according to official projections.[23]

If future U.S. Congresses are unable to raise payroll and income taxes to cover the projected shortfalls in Social Security and Medicare, as some observers now predict, the result could be benefit cuts. Many alternatives have been suggested to avoid benefit cuts. There is some support in Washington for delaying the age of retirement for all workers, as well as for some type of prefunding in return for benefit cuts. Other options include increasing immigration and expanding workforce participation by the elderly and by members of the working-age population who are not now working. Increased fertility

levels also could help, although the initial impact would begin only after about 20 years even if a new baby boom were to occur in the coming year.

The other nations of the industrial world face similar dilemmas, with other twists and complications that differentiate the scope of the problem. The exception is the UK, where much of the old-age pension program has been privatized. There is considerable possibility for increasing workforce participation in Europe, where unemployment is high and early retirement is pervasive. Increasing the workforce participation of women also is a way to address the problem in countries where female participation rates are low, such as Italy and Spain. Immigration is regarded as a more difficult option in Europe than in the United States because of a growing political backlash against immigrants in many countries, as a result of huge influxes (since the fall of the Berlin Wall in 1989 followed by the wars in the Balkans throughout the 1990s) as well as continuing heavy immigration from North Africa. There have been several programs to raise fertility levels in Europe, with only modest and temporary success (e.g., in Sweden) or an even more modest but sustained result (in France).

Japan faces all of the problems that Europe faces, with a further complication that it will continue to outpace the rest of the world in longevity gains. Japan's policy options are hampered by a sluggish economy that is still undergoing restructuring after a decade of stagnation following the bursting of the bubble economy of the 1980s. The outlook is for continued sluggish growth: 1 percent per year or less. Indeed, the failure of the Japanese government to address a host of economic and fiscal problems, including taking steps to bring Social Security into balance, has led to even higher savings rates in a country with already high savings rates, thereby depressing the consumer demand that is needed to strengthen the economy.

Japan's Department of Health and Welfare has calculated the levels of taxation necessary to sustain current benefits. The current Social Security burden represents about 18.5 percent of GDP. That burden is projected to rise to 33.5 percent by 2025. Meanwhile, the overall tax

burden on the Japanese people, including national and local taxes, will rise from 36.9 percent today to between 50 percent and 56 percent during the same period, according to official projections.

JUMP IN OLD-AGE DEPENDENCY RATIO THREATENS FISCAL CRISIS

The growing imbalance between the population of working people and those who are retired threatens to cause a future fiscal crisis in virtually every nation in the industrial world. This crisis will occur because virtually all social security systems, including elderly health and nursing care, operate on a pay-as-you-go basis. That is, they are not prefunded by contributions that are invested in liquid assets that earn a return on those investments. Current workers support current retirees through the payroll tax (sometimes called a "contribution" in some countries), income tax, and other taxes.

The old-age dependency ratio, then, is the key economic indicator that economists and demographers watch in their forecasts. This ratio is the number of people over age 65 for each person in the working-age population. Sometimes this figure is expressed as the support ratio, or the number of people of working-age population per person age 65 or older.

In Japan today there are 86.3 million working-age people and 21.7 million people age 65 and over, according to the UN. Those figures translate roughly into four working people for each retiree, or an old-age dependency ratio of 0.25.[24] That old-age dependency ratio is projected to jump to 0.46 in 2025 and then to 0.58 in 2050, when Japan will have 57.1 million working people and a very large cohort of people age 65 or over (33.3 million). At that point, there will be only 1.7 workers for each retiree.

Italy faces an even more daunting increase in its old-age dependency ratio, which is expected to rise from 0.27 in 2000 to 0.42 in 2025 and to 0.66 in 2050. Germany's old-age dependency ratio will rise from 0.24 in 2000 to 0.37 in 2026 and to 0.49 in 2050. France's ratio is projected to rise to 0.44 in 2050, and the United Kingdom's ratio will rise to 0.42 by that year.

In the United States—which starts out much better than Europe or Japan, with an old-age dependency ratio of 0.19 in 2000—the ratio is expected to climb to 0.36 in 2050. Canada starts at the same ratio as the United States (0.19), but its ratio is expected to deteriorate a little more, coming closer to the levels in the UK.

The prospect of these rising dependency ratios got the attention of the World Bank, which, after two years of research, declared in 1994 that pay-as-you-go systems around the globe clearly were unsustainable. "The world is approaching an old age crisis…[and] existing systems of financial security for old people are headed toward collapse,"[25] it warned ominously at a time when public awareness of the extent of demographic transformation and the potential fiscal fallout were just emerging.

The World Bank also urged careful consideration of how to reform old-age pension systems. Inappropriate reform policies to deal with aging societies could harm the world economy, whereas appropriate policies would promote economic growth. This theme is behind nearly all of the major reforms that have emerged in nations around the world since then to deal with the fiscal challenge of aging.

The future imbalance between workers and retirees in industrial nations could lead governments to make sharp cuts in old-age benefits. Alternatively, it could lead to large run-ups in debt that could destabilize some currencies and financial markets. It also could lead to large tax increases that would dampen economic growth or cause what some economists call "aging recessions." All three outcomes—benefit cuts, higher debt, and higher taxes—could occur simultaneously or in succession in any given country over the next three decades, as the aging crunch begins to hit.

The World Bank report followed on the heels of currency crises in Europe in the early 1990s. These crises resulted partly from the perception by currency traders and speculators that old-age welfare programs in Europe were unsustainable and were most worrisome in countries with high debt levels and sluggish growth. Such crises have the potential to wreak havoc in financial markets around the world—as they did during the Asian crisis that began in 1997 and led to a meltdown in August 1998 after Russia defaulted on its bonds.

The World Bank criticized pay-as-you-go systems for their generational inequity. It warned that when such systems mature, taxes are so burdensome on workers that some workers resort to "strategic manipulation" of the system to evade payroll and other taxes that support the system for part of their working lives, while still qualifying for a generous benefit because the benefit is not tied explicitly to contributions.[26] Instead, it is tied to the salary earned nearest retirement.

The World Bank report urged more prefunding of benefits and a more diversified retirement system with more "pillars," or sources of retirement income. Some European countries, such as Italy and France, have virtually no employer-sponsored pension systems. Although Japan and Germany have such systems, they are greatly underfunded. Only in the United States are the great majority of private pension plans—which cover only half of the workforce—fully funded.

The World Bank recommended that pay-as-you-go systems be curtailed to offer a minimum benefit as a way of preventing poverty in old age. Then, countries should establish a second pillar: a mandatory retirement savings plan funded from workers' incomes—an approach that has been adopted by Australia. These plans would be portable between employers and managed by the private sector, the World Bank suggested. Finally, it recommended that governments develop policies to encourage a more personal, voluntary savings as a third pillar of retirement income. This pillar would include savings vehicles such as 401(k) plans and Individual Retirement Account (IRA) plans in the United States.

If governments fail to take sufficient actions in coming years, there could be more financial crises and economic fallout in the future. At the moment, financial markets appear to be betting that, in the long run, governments will avoid potential major crises by cutting benefits or raising taxes, or both, instead of running up debt. Government bond ratings remain high, on the basis of these assumptions, according to Vincent Truglia, head of Sovereign Risk at Moody's Investor's Service in New York. "We expect almost every industrial nation to 'default' on its pension promises," Truglia has stated.[27]

SHRINKING, AGING POPULATIONS MAY BRING ECONOMIC DECLINE

Japan is one nation where some minor downgrades of government bonds have occurred. Its bonds still have very high ratings, but the outlook appears to be more troubling for Japan than for any other country. As the world's most rapidly aging country, Japan could demonstrate the dangers that lie ahead for other nations that are facing depopulation and aging.

The economic fallout of aging in Japan promises to be worrisome. One possible downside of an expected decline of 25 percent or more in the population of Japan by 2050 is "a long-term decline in the future of the Japanese economy," according to Noriyuki Takayama, professor of economics at Hitotsubashi University's Institute of Economic Research.[28]

"Some Japanese say that we can get much better and happier with a smaller population in Japan," Takayama said in a speech at the Japanese Embassy in the United States in 1997, "and that since the population density would be much less, land prices would tend to be less expensive, and we could have higher salaries. Yes, I know that in the world there are some rich countries with a smaller population, such as Switzerland, Denmark, and Sweden. But the country we will be faced with in the future is rather different than these countries. We might have an upside-down population pyramid. A sharp decrease in the young labor force will take place.… A larger and larger proportion of the labor force will be middle-aged and elderly workers."

What does it mean to have an older workforce and fewer young people? "Generally speaking, young countries are more lively, energetic, and dynamic than others," Takayama said. "As Japan gets older, less new investment will follow. A decline in the number of young people will decrease the savings rate. In summary, a probable consequence is a sharp decline in young labor, a decrease in the savings rate, and a decrease in capital formation. All these factors will contribute to the shrinking of the Japanese economy," he concluded.

Takayama also predicts very paltry gains in real per capita income. Per capita income gains can come from a decline in the old-age dependency ratio or an increase in productivity. Although continued

investments will raise worker productivity, Takayama argues, the rise in dependency could drag down productivity, canceling out the overall effect of higher worker productivity on the economy.

In time, predicted Takayama, "The Japanese keen appetite for longevity will be much abated.… This is what Jonathan Swift described in his famous novel, *Gulliver's Travels.* Gulliver found a horrible world of old age after he had seen some immortals.… In the end, things might change little between Luggnagg in the early eighteenth century and Japan in the middle of [the twenty-first] century." The fictitious land of Luggnagg had among its population men and women known as *struldburgs* who had not eternal youth but eternal old age, with all of its worst infirmities—always growing older, sicker, more deformed, and more infirm—but unable to die.

The prospect of longer lives, then, is a doubled-edged sword, not only because old age benefits are provided by the government and supported through taxation of workers but also because it could have a dampening effect on the economy and global financial markets.

Notes

[1] The Census Bureau's January 2000 report projects 1,095,000 centenarians in 2050—777,000 women and 318,000 men.

[2] U.S. Bureau of the Census, May 2000. The average life span for males and females born in 2000 is 77.12 years—79.90 years for females and 74.24 years for males.

[3] In Japan the average life expectancy for females at birth in 2000 is 84.05 years; for males it is 77.51 years.

[4] In Sweden the average life expectancy for females at birth in 2000 is 82.37 years; for males it is 76.95 years. In Italy the average life expectancy for females born in 2000 is 82.4 years; for males it is 75.9 years. In France the average life expectancy for females born in 2000 is 82.89 years; for males it is 74.85 years. In Germany the average life expectancy for females born in 2000 is 80.75 years; for males it is 74.3 years.

[5] J. R. Brandstrader, "From Baby Boom to Geezer Glut," *Scientific American Presents* 11, no. 2 (summer 2000): 22.

[6] Japan's total fertility rate in 2000 is reported as 1.4075 by the U.S. Census Bureau, International Data Base, May 10, 2000, update, www.census.gov/ipc/www/idbprint.html accessed July 2000).

[7] *Total fertility rate* is defined as the average number of births a woman would have if she were to live through her reproductive years (ages 15–49) and bear children at each age at the rates observed in a particular year or period.

[8] The population of Japan is expected to rise from 125.5 million in 1995 to reach its peak at 127.5 million in 2005, thereafter falling continuously to 104.9 million in 2050. See *Replacement Migration: Is It a Solution to Declining and Ageing Populations?* (New York: United Nations Secretariat, 2000), p. 116.

[9] U.S. Census Bureau, International Data Base, May 10, 2000, update.

[10] Germany's population will fall from 82.1 million in 2000 to 64.6 million in 2050, according to UN's 2000 projections.

[11] Italy's population will fall from 57.3 million in 2000 to 41.2 million in 2050, according to the UN's 2000 projections.

[12] Center for Disease Control and Prevention, National Center for Health Statistics, *National Vital Statistics Reports* 48, no. 3 (March 28, 2000), pp. 35–36.

[13] Stephen Barr, "Retirement Wave Creates Vacuum," *Washington Post*, May 7, 2000, pp. 1, 14.

[14] Unemployment will fall to virtually zero by 2016, according to projections published in *The European Labour Market in Light of Demographic Change* (Brussels: European Commission, 1999), p. 4.

[15] Japan's working-age population is projected to fall from 86.3 million in 2000 to 72.4 million in 2025 and then to 57.1 million in 2050; *World Population Prospects, 1998 Revision*, Volume 1, Comprehensive Tables (New York: UN Secretariat, Population Division, 1999).

[16] Italy's working-age population is projected to fall from 38.7 million in 2000 to 32 million in 2025 and then to 21.9 million in 2050. Germany's working-age population is projected to fall from 55.4 million in 2000 to 50.7 million in 2025 then to 42.6 million in 2050. France's working-age population is projected to fall from 38.6 million in 2000 to 37.7 million in 2025, then to 34.5 million in 2050. The UK's working-age population is projected to fall from 38.3 million in 2000 to 37.1 million in 2025, then to 33.4 million in 2050. *World Population Prospects, 1998 Revision*, Volume 1, Comprehensive Tables.

[17] The working-age population of the United States is projected to rise from 183.7 million in 2000, to 205.1 million in 2025, and to 213.1 million in 2050. *World Population Prospects, 1998 Revision*, Volume 1, Comprehensive Tables.

[18] Canada's working-age population is projected to rise from 21.2 million in 2000 to 23.7 million in 2025 and to 25 million in 2050. *World Population Prospects, 1998 Revision*, Volume 1, Comprehensive Tables.

[19] Net migration rate is the net number of immigrants (total number entering the country less those leaving) per 1,000 people. The average rate in Canada between 1995 and 2000 was 5.6; it was 2.8 in the United States. *World Population Prospects, 1998 Revision*, Volume 1, Comprehensive Tables.

[20] William H. Frey and Ross, C. DeVol, *America's Demography in the New Century: Aging Baby Boomers and New Immigrants as Major Players* (Santa Monica, Calif.: Milken Institute, 2000), pp. 9–12.

[21] Board of Trustees of the Federal Old Age and Survivors Insurance and Disability Insurance Trust Funds, *2000 Annual Report,* p. 3.

[22] Board of Trustees, Federal Supplementary Medical Insurance Trust Fund, *2000 Annual Report,* p. 2.

[23] Board of Trustees, Federal Hospital Insurance Trust Fund, *2000 Annual Report,* p. 2.

[24] United Nations, *World Population Prospects, 1998* (New York: United Nations, 1999).

[25] World Bank, *Averting the Old Age Crisis: Policies to Project the Old and Promote Growth* (New York: Oxford University Press, 1994), inside front cover.

[26] Ibid., p. 12.

[27] Vincent J. Truglia, "Public Sector Pensions in Industrialized Countries: A Rating Agency Perspective" (paper presented at "The Graying of the Industrial World," conference sponsored by Center for Strategic and International Studies as part of its Global Aging Initiative, January 2000).

[28] Noriyuki Takayama, "Japanese and American Social Security Systems: Grappling with the Future" (lecture at Japan Information and Culture Center, Embassy of Japan, Washington, D.C., March 27, 1997).