

# Population Aging: A Comparison Among Industrialized Countries

Populations around the world are growing older, but the trends are not cause for despair.

by Gerard F. Anderson and Peter Sotir Hussey

**ABSTRACT:** Increasing longevity and declining fertility rates are shifting the age distribution of populations in industrialized countries toward older age groups. Some countries will experience this demographic shift before others will. In this DataWatch we compare the effects of population aging on health spending, retirement policies, use of long-term care services, workforce composition, and income across eight countries: Australia, Canada, France, Germany, Japan, New Zealand, the United Kingdom, and the United States. International comparisons suggest that the United States is generally well positioned to cope with population aging; however, three areas should be carefully monitored: heavy reliance on private-sector funding of retirement, coverage of pharmaceuticals for the elderly, and a high proportion of private long-term care financing.

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SOME POLICYMAKERS AND RESEARCHERS have been asking the question, Is demography destiny?<sup>1</sup> Increasing longevity and declining fertility rates have been shifting the age distribution of populations in all industrialized countries toward older age groups. After 2010 this shift will accelerate in most industrialized countries as the “baby boomers” begin turning age sixty-five. In this DataWatch we present Organization for Economic Cooperation and Development (OECD) and United Nations (UN) data on population aging in Australia, Canada, France, Germany, Japan, New Zealand, the United Kingdom, and the United States, to compare the effects of population aging on health care spending, retirement policies, use of long-term care services, workforce composition, and income. The comparison suggests that population aging will occur at different times in different countries, with some countries already facing a demographic scenario in 2000 that is similar to what other countries will experience in 2020. These comparisons can be used to identify policy issues the eight industrialized countries will face as their populations grow older.

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## The Demographics

■ **Population age sixty-five and older.** Between 1980 and 2000 the proportion of the population age sixty-five and older increased only slightly in seven of the eight countries (Exhibit 1). The exception was Japan, where it nearly doubled. In the year 2000 the eight countries can be divided into two categories: Japan, Germany, France, and the United Kingdom, which have relatively high proportions of persons over age sixty-five; and the United States, Australia, New Zealand, and Canada, which have lower levels. As a result, the first group of countries will confront the issues of aging before the others will.

Between 2000 and 2020 the relative size of the population age sixty-five and older is projected to increase rapidly in all countries. The United Kingdom is projected to have the smallest rise (from 16.0 to 19.8 percent), and Japan, the largest (from 17.1 to 26.2 percent). In 2020 the percentage of the population over age sixty-five is projected to range from a high of 26.2 percent in Japan to a low of 15.6 percent in New Zealand. In 2020 more than 20 percent of the populations in France, Germany, and Japan will be age sixty-five or older, while less than 17 percent of the populations in Australia, New Zealand, and the United States will be in that age group.

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#### EXHIBIT 1

#### Percentage Of Total Population Age Sixty-Five And Older And Age Eighty And Older In Eight Countries, 1980-2020

Country	Percent age 65 and older			Percent increase	
	1980	2000	2020	1980-2000	2000-2020
Australia	9.6%	12.1%	16.8%	26%	39%
Canada	9.4	12.8	18.2	36	43
France	14.0	15.9	20.1	14	26
Germany	15.6	16.4	21.6	5	32
Japan	9.0	17.1	26.2	89	54
New Zealand	10.0	11.6	15.6	17	34
United Kingdom	15.1	16.0	19.8	6	24
United States	11.2	12.5	16.6	12	33
Percent age 80 and older					
Australia	1.7	2.8	3.7	66	30
Canada	1.8	3.1	4.4	74	42
France	3.1	3.8	5.5	23	45
Germany	2.8	3.6	6.3	30	76
Japan	1.4	3.7	7.5	170	107
New Zealand	1.7	2.8	3.5	65	24
United Kingdom	2.8	4.2	5.1	52	22
United States	2.4	3.3	3.7	39	14

**SOURCE:** United Nations Demographic Indicators, 1950-2050 (data diskette, 1998 revision), medium estimate.

Between 2000 and 2020 the levels and rates of increase of the percentage of the U.S. population age sixty-five and older are projected to be smaller than those in most of the other seven countries.<sup>2</sup> The percentage of the U.S. population over age sixty-five in 2020 will be roughly comparable to the percentage over age sixty-five in Japan, Germany, France, and the United Kingdom in 2000. As a result, the United States will be able to watch several other countries confront an aging population.

■ **Population age eighty and older.** Within the elderly population, the mix of younger and older people will change between 2000 and 2020, but not in a consistent manner across the eight countries. In Japan, Germany, and France the percentage of the population age eighty and older will grow more rapidly than the percentage of the population age sixty-five and older, causing a shift toward older ages within the elderly population (Exhibit 1). In Canada and the United Kingdom the percentage of the two population age groups will grow at approximately the same rate. In Australia, New Zealand, and the United States the percentage of the older will grow more slowly than the percentage of the younger.<sup>3</sup> In the United States 3.7 percent of the population will be age eighty or older in 2020—approximately the same level as in France, Germany, and Japan in 2000.

■ **Factors affecting population aging.** One reason for an aging population is increasing life expectancy. At age sixty-five, mean life expectancy for men in 1996 ranged from 14.8 years in the United Kingdom to 16.9 years in Japan.<sup>4</sup> For women, it ranged from 18.3 years in the United Kingdom to 21.5 years in Japan. At age eighty, life expectancy for men and women ranged from seven to ten years.

Between 1960 and 1996 all eight countries experienced increases in life expectancy at ages sixty-five and eighty. In all countries the increases were larger for women than for men. Japan had the greatest increases in life expectancy at age sixty-five for both women and men. The United States had the smallest increases for women, and Canada and New Zealand had the smallest for men. Life expectancy at age eighty increased between one and four years from 1960 to 1996 in the eight countries. The largest increases for both women and men were in Japan; the smallest were in the United States.

The UN demographic projections assume slower rates of increase in life expectancy from 2000 to 2020 than occurred from 1960 to 1996. However, these projections have created considerable debate among demographers; they assume that current trends cannot be sustained because the biological limit to human life span is being approached. However, the mere existence of a biological limit has been questioned by demographers and biologists.<sup>5</sup> Also, some em-

pirical data cast doubt on the UN projections. For example, there is no evidence of attenuation in the extension of longevity in Japan. If life expectancy were to increase at the same rate from 2000 to 2020 as it did from 1960 to 1996, the magnitude of population aging would be much greater than projected. The policy significance of this debate became apparent in the United States as the Social Security and Medicare trustees debated the effect of life-span projections on the Medicare and Social Security trust funds.<sup>6</sup>

A second factor is declining fertility rates. Fertility rates declined in all eight countries between 1950 and 1995.<sup>7</sup> In 1950 fertility rates were between 2.0 and 3.0 in France, Germany, Japan, and the United Kingdom and between 3.0 and 4.0 in Australia, Canada, New Zealand, and the United States. By 1995 they had fallen below the replacement rate of 2.1 in all eight countries. Fertility rates were highest in New Zealand and the United States in 1995 (2.0) and lowest in Germany (1.3) and Japan (1.4). The UN medium-scenario projections are that fertility rates will remain below the replacement rate through 2020 in all eight countries. The UN publishes a range of demographic projections based on different fertility rates. The high-fertility projections are that total fertility rates will be between 1.9 and 2.3 children per woman by 2020, while the low-fertility scenario is between 1.2 and 1.5. Although fertility rates are a result of societal values and behaviors, they can be influenced by public health interventions, policies affecting families, and labor practices.

A third factor affecting the age of populations is immigration. Canada and Australia have the highest immigration rates; Japan, the United Kingdom, and France, the lowest rates; and the United States, New Zealand, and Germany, in the middle.<sup>8</sup> Immigration rates are not high enough now to greatly affect the age composition of the eight countries, but changes in immigration policies have been cited as one way countries could counter the effects of population aging.<sup>9</sup>

■ **Gender balance in aging populations.** At advanced ages, women outnumber men.<sup>10</sup> Slightly more male than female babies are born; by age sixty-five the ratio is approximately nine men for every ten women. By age seventy-five, the ratio declines to approximately 7.5 men for every 10 women; after age eighty, approximately five men for every ten women. For this reason, women are more likely than men are to be the beneficiaries of retirement programs, health care, long-term care, and other support programs for the elderly.

## Health Expenditures For The Elderly

Between one-third and one-half of total health care spending goes for the elderly in each country (Exhibit 2).<sup>11</sup> Japan spends the largest proportion on the elderly, while Germany spends the least. Another

## EXHIBIT 2

### Health Spending For The Elderly In Eight Countries, 1993–1995

Country	Percent of total health spending on the elderly	Ratio of health spending for persons age 65 and older to persons under age 65	Estimated percent of GDP spent on health for the elderly	Percent of GDP spent on health	Health spending per capita, 1997 <sup>a</sup>
Australia (1994)	35%	4.0	3.0%	8.3%	\$ 5,348
Canada (1994)	40	4.7	3.6	9.3	6,764
France (1993)	35	3.0	3.4	9.6	4,717
Germany (1994)	34	2.7	3.5	10.4	4,993
Japan (1995)	47	4.8	3.4	7.3	5,258
New Zealand (1994)	34	3.9	2.5	7.6	3,870
United Kingdom (1993)	43	3.9	2.8	6.7	3,612
United States (1995)	38	3.8	5.0	13.6	12,090

**SOURCES:** *OECD Health Data 1999* (Paris: Organization for Economic Cooperation and Development, 1999); and authors' calculations.

**NOTE:** GDP is gross domestic product.

<sup>a</sup> U.S. dollars, in purchasing power parities (PPPs). See Note 13 in text.

way of looking at the same data is the ratio of per capita spending for persons age sixty-five and older compared with spending for those under age sixty-five.<sup>12</sup> Japan spends proportionally the most on the elderly (4.8 times the amount spent on younger persons), while Germany spends the least (2.7 times).

It is well known that the United States spends more on health care than other industrialized countries do. This is also true for the elderly population. Average health spending for the elderly ranged from \$3,612 per person in the United Kingdom to \$12,090 in the United States in 1997 (Exhibit 2).<sup>13</sup> The percentage of gross domestic product (GDP) spent on health care for the elderly ranged from 2.5 percent in New Zealand to 5.0 percent in the United States. However, there is very little correlation between the percentage of GDP spent on health care for persons age sixty-five and older and the percentage of the population in this age group (correlation coefficient = -0.07). This suggests that an aging population does not necessarily mean higher health spending; other factors are much more important predictors.<sup>14</sup>

## Long-Term Care

■ **Institutionalization.** Although the organization, financing, and delivery of long-term care differ greatly among the eight countries, one common theme has been explicit or implicit: policies promoting deinstitutionalization.<sup>15</sup> Despite different approaches, the institutionalization rate of the elderly is remarkably similar in all eight countries, ranging from one in fifteen elderly persons in Australia and Germany to one in twenty elderly persons in the United Kingdom (Exhibit 3). The rate of institutionalization for the elderly is not

## EXHIBIT 3

## Long-Term Care Provision And Spending In Eight Countries, Various Years

Country	Projected institutionalization rate, age 65 and older, 2000	Formal home-care rate, age 65 and older, 1995	Percent of elderly population living alone, 1990	Total long-term care expenditures <sup>a</sup>	Public long-term care expenditures <sup>a</sup>
Australia	6.8%	11.7%	26.0	0.9%	0.8%
Canada	6.2	17.0	27.0	1.1	0.7
France	6.5	6.1	28.0	– <sup>b</sup>	0.6
Germany	6.8	9.6	41.0	– <sup>b</sup>	0.7
Japan	6.0	5.0	14.0	– <sup>b</sup>	0.8
New Zealand	5.5	– <sup>b</sup>	33.0	0.9	0.4
United Kingdom	5.1	5.5	38.0	1.6	1.0
United States	5.7	16.0	30.2	1.3	0.7

**SOURCES:** S. Jacobzone, “Ageing and Care for Frail Elderly Persons: An Overview of International Perspectives” (Paris, Organization for Economic Cooperation and Development, 1999). Formal home-care data for the United Kingdom are from personal communication with Clive Smee, U.K. Department of Health. For New Zealand, percentage of elderly population living alone, circa 1990, Prime Ministerial Task Force on Positive Aging, “Facing the Future: A Strategic Plan” (Wellington), 18.

<sup>a</sup> As percent of gross domestic product (GDP). Figures are for latest available year: France and the United States, 1994; Canada and Germany, 1995; Australia and Japan, 1996; New Zealand and the United Kingdom, 1998.

<sup>b</sup> Not available.

expected to change substantially between 2000 and 2020, assuming that there are no changes in age-specific disability rates, and could actually fall slightly if current trends toward deinstitutionalization continue.<sup>16</sup>

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■ **Formal home care.** The proportion of elderly persons receiving formal home health care varies widely among the eight countries (Exhibit 3). Formal home health care is the provision of nursing care and assistance with activities of daily living (ADLs) in the patient’s home. Canada and the United States provide formal home health care to the greatest percentage of the elderly population—one in six elderly persons in 1995. Japan provided such care to the smallest share of the elderly—only one in twenty.

■ **Informal care.** Informal care, or unpaid long-term care usually provided by a relative or family member, is an important part of long-term care in every country. Japan has the largest percentage of the elderly population living with their adult children—50 percent in 1997 (Exhibit 3). In the other seven countries 10–20 percent of the elderly live with their adult children. At the same time, Japan has the smallest proportion of the elderly living alone—14 percent in 1990. In the other seven countries the percentage of the population age sixty-five and older living alone in 1990 ranged from 26 percent in Australia to 41 percent in Germany.

Informal care support appears to have weakened over time. In all eight countries the proportion of elderly persons living alone rose from 1970 to 1990, although the limited available data from the 1990s indicate that the level has stabilized.<sup>17</sup> The percentage of elderly persons living with their grown children declined from 1970 to 1990

in all eight countries, as well.

■ **Long-term care financing.** Public long-term care expenditures account for 1 percent or less of GDP in all eight countries. The mix of public and private funding for long-term care varies across the eight countries; however, in most countries the majority of long-term care funding is public (Exhibit 3). New Zealand and the United States have the highest proportion of private funding. Private expenditures are generally made out of pocket; private long-term care insurance is not a significant source of funding for long-term care services in any of the eight countries.<sup>18</sup>

## Retirement

In all eight countries there has been a trend over the past forty years toward earlier retirement. The age of retirement has important public policy implications for two reasons. First, it changes the number of retirees, and second, it changes the number of workers contributing to programs financed through workers' contributions. Although the age of retirement in part reflects value judgments of elderly workers, it also is affected by public policies.

■ **Retirement age.** In 1995 the average age of retirement ranged from a high of 66.5 years for men in Japan to a low of 57.2 years for women in Australia (Exhibit 4). In all eight countries the average age of retirement for women was younger than for men.

During 1960–1995 the average age of retirement declined in all eight countries. In Japan the decline was less than one year for both women and men. In the United States, the United Kingdom, and

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### EXHIBIT 4

#### Retirement And Income Indicators In Eight Countries, Various Years, 1960–2020

Country	Average age of retirement (years)				Percent of labor force age 60 and older, 1995	Income at age 67 as a percent of income at age 55, 1995	Percent of GDP spent on public pensions, 1995	Ratio of population ages 15–64 to population age 65 and older	
	Female		Male					2000	2020
	1960	1995	1960	1995					
Australia	62.4	57.2	66.1	61.8	3.6%	73%	2.5%	5.6	3.9
Canada	64.3	58.8	66.2	62.3	4.2	– <sup>a</sup>	4.3	5.4	3.6
France	65.8	58.3	64.5	59.2	2.5	82	7.6	4.1	3.2
Germany	62.3	58.4	65.2	60.5	2.9	81	7.7	4.2	3.0
Japan	64.6	63.7	67.2	66.5	12.5	77	3.9	4.0	2.3
New Zealand	62.5	58.6	65.1	62.0	3.3	– <sup>a</sup>	5.6	5.6	4.2
United Kingdom	62.7	59.7	66.2	62.7	5.3	68	4.7	4.1	3.1
United States	65.1	61.6	66.5	63.6	5.8	68	3.3	5.3	3.9

**SOURCES:** Average age of retirement: S. Scarpetta and S. Blondal, *The Retirement Decision in OECD Countries* (Paris: Organization for Economic Cooperation and Development, 1998). Labor-force participation: OECD, *Work Force Ageing: Consequences and Policy Responses* (Paris: OECD, 1998). Relative income: P. Scherer, M. d'Ercole, and R. Disney, *Resources during Retirement* (Paris: OECD, 1998). Public pension expenditure: OECD Social Expenditure database. Dependency ratio: United Nations Demographic Indicators 1950–2050 (data diskette, 1998 revision), medium estimate.

**NOTE:** GDP is gross domestic product.

<sup>a</sup> Not available.

New Zealand the decline for both men and women was between three and four years. In France, Australia, and Canada the reductions were between 4 and 7.5 years.

Early-retirement provisions in pension plans have been shown to contribute greatly to early retirement.<sup>19</sup> In all but Japan the average age of retirement was less than the standard age of entitlement to full public benefits in 1995. The standard age is likely to serve as an upper barrier to time spent in employment, since the opportunity cost of continuing employment after this age is high.<sup>20</sup> Some countries are in the process of raising the age of eligibility for full pensions. The United States, for example, will be gradually raising the age of eligibility for full Social Security benefits from sixty-five to sixty-seven over the next two decades.<sup>21</sup> Disability and unemployment policies also affect retirement patterns in some countries.<sup>22</sup> If the trend toward earlier retirement could be reversed so that the average age of retirement were similar to that in 1960 or 1970, some of the effects of population aging would be reduced.

■ **Labor-force participation.** A relatively small proportion of the workforce is age sixty and older in all eight countries (Exhibit 4). Japan has the highest percentage of workers in this age group and France, the lowest. Between 1970 and 1995 the percentage of workers age sixty and older declined in all countries except Japan.<sup>23</sup> However, from 1995 to 2030 it is expected to increase in all eight countries. In 2030 one of every five Japanese workers are projected to be age 60 and older; one of every ten U.S. workers will be age sixty and older; and one of every twenty-five French workers will be in that age group, if today's retirement patterns continue.

■ **Labor patterns of individuals.** Because of earlier retirement, additional time spent in education, and greater life expectancy, the balance between working and not working outside the home is constantly changing. The trend is different for women than for men.

The OECD has projected that the average amount of time spent in and out of employment in its twenty-nine member countries based on labor-force participation data.<sup>24</sup> In 1960 men worked outside the home for the majority of their life (fifty out of sixty-eight years). In 2000 men will spend an equal number of years working and not working outside the home (thirty-seven years each). By 2030 it is projected that men will work outside the home for less than half of their lives (thirty-three out of seventy-six years). Women show different patterns. The number of years women spend working outside the home increased from 1960 to 1990 (from twenty-one out of seventy-three to twenty-nine out of eighty); this number is projected to level off from 2000 to 2030.



## Income Of The Elderly

■ **Relative income.** At age sixty-seven people have an average of 70–80 percent of their income at age fifty-five, when all sources of income are considered and direct taxes are incorporated (Exhibit 4). Income at age sixty-seven relative to income at age fifty-five is somewhat greater in France and Germany and less in the United States and United Kingdom. When cost-of-living differences between workers and retirees are taken into account, most of the income difference is eliminated. Country-level means, however, mask income differences within countries by income strata.

Sources of income at age sixty-seven vary across the eight countries. British and American retirees are more likely to receive private income support, while German and French retirees are more dependent on public sources. Germany and France spend the highest percentage of their GDP on public old-age benefits, while the United States and Australia spend the least (Exhibit 4). In general, private retirement benefits are prefunded, and public retirement benefit programs are financed on a pay-as-you-go basis, meaning that private pension systems are likely to be less affected by population aging.

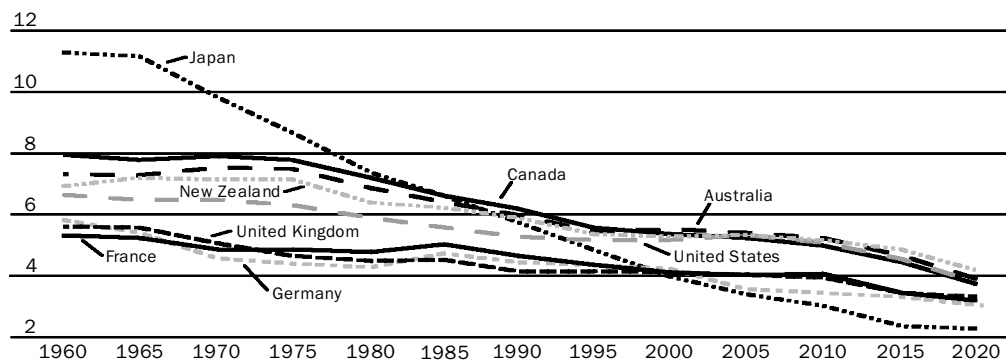
Private sources of income support are more dependent on personal contributions than public sources are. In countries with available data, private income support was more commonly received by higher-income households.<sup>25</sup> Countries with more public funding generally show a smaller drop in income from age fifty-five to age sixty-seven (correlation coefficient = 0.75).

Income distribution and poverty also vary widely across countries. In the United Kingdom and the United States (the countries with the highest levels of relative poverty among the elderly) more than one of every five persons age sixty-five or older live in relative poverty, compared with fewer than one of every ten in Canada, the country with the lowest levels. Single elderly women are particularly likely to live in relative poverty.<sup>26</sup>

■ **Relative number of working-age persons.** The number of potential workers per elderly person has been decreasing steadily since 1960 in all eight countries (Exhibit 5). As already noted, population aging will cause a decrease in revenues for public pay-as-you-go programs for the elderly (such as Medicare and Social Security) because of a decrease in the relative size of the working-age population and an increase in the relative number of elderly beneficiaries. In 2000 there will be between four and six potential workers (ages fifteen to sixty-four) for every person age sixty-five or older in the eight countries. The level will decline from 2000 to 2020, when there will be between two and four potential workers for every elderly person. In 2020 the United States and Australia will have a potential

**EXHIBIT 5****Number Of Potential Workers Per Elderly Person In Eight Countries, 1960–2020**

Ratio of persons ages 15–64 to persons age 65 and older



SOURCE: United Nations Demographic Indicators 1950–2050 (data diskette, 1998 revision), medium estimate.

worker-to-elderly-person ratio similar to Japan's in 2000.

## Insurance Coverage

Public insurance coverage for hospital and physician services is nearly universal for the elderly in all eight countries. One area of difference is coverage for pharmaceuticals. The United States provides considerably poorer access to public drug coverage than the other countries. All of the countries, except the United States, provide some level of public drug coverage for all of the elderly, while the United States provides such coverage only for the low-income elderly and some beneficiaries in Medicare managed care plans. Some elderly Americans also obtain private drug coverage through employer-sponsored retiree health benefits or through privately purchased Medigap plans. Considering all sources of coverage, 65 percent of Americans age sixty-five and older have drug coverage, compared with nearly 100 percent in the other countries.

Drug insurance policies in the eight countries differ in the amount of cost sharing, the maximum amount of coverage, and what specific pharmaceuticals are covered. As a result, some persons might have to pay for prescriptions even though they have coverage. A recent survey of the elderly in five countries reported concerns about out-of-pocket payments for pharmaceuticals in spite of universal drug coverage in four of the countries.<sup>27</sup>

## Policy Implications

Between 2000 and 2020 the populations of all eight countries will grow older, although countries are at different stages of the aging cycle. In the countries with the highest proportion of residents age sixty-five and older—Japan and Germany—policymakers are faced with an age distribution similar to what will be seen in Australia,

New Zealand, and the United States in 2020. The experiences of these countries, presented elsewhere in this volume of *Health Affairs*, should be helpful as other countries search for their own solutions.

Several factors indicate that population aging-related issues could be manageable from a public policy perspective. For example, rapid growth in health care costs due to aging is frequently predicted. However, analysis of past health spending trends has shown that aging has a small impact on health spending growth.<sup>28</sup> In addition, cross-sectional analysis shows that the age distribution of a country is not associated with the level of health spending per capita. These factors suggest that population aging does not necessarily lead to higher levels of overall health spending.

Shifting age distributions will lead to fewer potential workers per elderly person. This trend will continue for the next sixty years because of low fertility rates in all eight countries. This will increase the strain on both formal and informal support systems for the elderly. The number of potential workers per older person is projected to decline at approximately the same rate between 2000 and 2020 as it did between 1960 and 2000. One way to alleviate some of the effects of this trend is to increase the workforce participation rates of the elderly. Research has shown that public policies have a strong effect on the decision to retire. Despite increased longevity, the average age of retirement has fallen in all eight countries.

The United States seems relatively well positioned to cope with population aging, although some adjustments will be necessary, particularly in the area of health care. After Japan, the United States has the highest workforce participation rate for the elderly and the highest average age of retirement. Older Americans are more likely to draw retirement income from both private and public sources, and the private sources are generally prefunded. The federal budget is in surplus, and the economy continues to grow to unprecedented levels, providing opportunities to make the adjustments to the Medicare and Social Security programs necessitated by the aging of the baby-boom generation. The United States is relatively young, enjoying relatively high levels of fertility but lower longevity than most of the other seven countries.

However, a number of concerns exist. First, the heavy reliance in the United States on private-sector funding for retirement means that there will be income inequalities between those who have been able to finance their retirement and those who have not. Second, the United States is an outlier with respect to drug coverage for the elderly. Third, the United States finances a high percentage of long-term care privately. Unlike most of the other countries, U.S. public provision of long-term care services requires Americans to use

nearly all of their assets and income before they qualify for public financing. All of these factors suggest that population aging will require certain adjustments but that the demography is not cause for despair, at least not in the United States.

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## NOTES

1. Organization for Economic Cooperation and Development, *Maintaining Prosperity in an Ageing Society* (Paris: OECD, 1998); and P. Peterson, *Gray Dawn* (New York: Random House Times Books, 1999).
2. The rate of increase in relative size of populations age sixty-five and older will be slower in Germany and the United Kingdom than in the United States.
3. The scope of these projections was limited to the year 2020. After 2020 the UN medium-variant projections are that the rate of growth of the population age eighty and older will generally be greater than the rate of growth of the population age sixty-five and older in all eight countries through 2050.
4. United Nations Demographic Indicators 1950–2050 (data diskette, 1998 revision), medium estimate.
5. See, for example, D. Banks and M. Fossel, "Telomeres, Cancer, and Aging: Altering the Human Life Span," *Journal of the American Medical Association* 278, no. 16 (1997): 1345–1348. The UN assumptions are that life expectancy will increase by 2 percent in each of the eight countries between 2000 and 2020.
6. R. Pear, "Panel Advises Adding to Life Expectancies," *New York Times*, 7 December 1999, A19.
7. UN Demographic Indicators 1950–2050, medium estimate.
8. *Ibid.* Immigration rates in eight countries for 1995 (number of immigrants per 1,000 population): Australia, 4.3; Canada, 5.6; France, 0.7; Germany, 2.9; Japan, 0.0; New Zealand, 2.7; United Kingdom, 0.7; United States, 2.8.
9. Peterson, *Gray Dawn*, 141–145.
10. UN Demographic Indicators 1950–2050), medium estimate.
11. This was calculated by applying the ratio of health spending on the population age sixty-five and older to the population under age sixty-five to 1997 data on total health spending and the percentage of the population over age sixty-five.
12. Spending ratios are from various years: 1993 for France and the United Kingdom; 1994 for Australia, Canada, Germany, and New Zealand; and 1995 for Japan and the United States.
13. The ratio of spending on the elderly compared with nonelderly was assumed to have remained constant. Calculations use population and overall spending data from 1997 with age-specific spending ratios from 1993 for France and the United Kingdom; 1994 for Australia, Canada, Germany, and New Zealand; and 1995 for Japan and the United States. All monetary figures are adjusted for cost-of-living differences using purchasing power parities (PPPs).
14. J.P. Newhouse, "An Iconoclastic View of Health Cost Containment," *Health Affairs* (Supplement 1993): 152–171.
15. For Australia, see S. Jacobzone, "Ageing and Care for Frail Elderly Persons: An Overview of International Perspectives," OECD Labor Market and Social Policy Occasional Paper no. 38 (Paris: OECD, 1999); and A.L. Howe, "Rearranging

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