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Does The Aging Of The Population Really Drive The Demand For Health Care?

Although it is not a trivial matter, population aging is nowhere near the strongest driver of demand for health care in the United States.

by **Uwe E. Reinhardt**

ABSTRACT: In the debate on health policy, it is widely believed that the aging of the U.S. population is a major driver of the annual growth in the demand for health care and in national health spending. This essay draws on the research literature and on data from the Medical Expenditure Panel Surveys (MEPS) to debunk that myth. Although in any year per capita health spending for people age sixty-five or older tends to average three to five times that for younger Americans, the aging of the population is too gradual a process to rank as a major cost driver in health care.

A POPULAR THEME RUNNING THROUGH THE DEBATE on U.S. health policy is that the aging of the population is a major driver of the demand for health care and thus of the annual growth in national health spending. In the face of the impending retirement of the baby-boom generation starting soon after 2010, this belief has lent great urgency to the search for a reform of Medicare, to assure the future financial sustainability of that program.

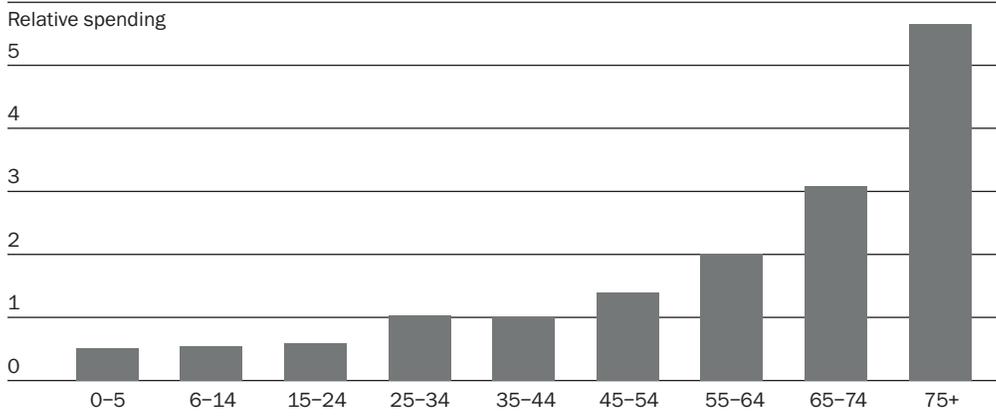
Exhibit 1 illustrates how sensible people might come to believe this.¹ Average per capita health spending for Americans age sixty-five and older was more than triple that for Americans in the benchmark cohort (ages 34–44) in 1999. It was more than five times as high for Americans age seventy-five and older, many of whom rely on costly nursing home care.

What is true for a cross-section of Americans at a point in time, however, is not a reliable guide to what happens when a country's entire population ages gradually over time. Research on the latter issue has shown consistently that the aging of a nation's population, by itself, tends to be only a minor determinant of the annual growth in aggregate health care use and spending, other things being equal.² Apparently, this insight has not been transmitted from the research community to the policy-making community as effectively as it should have been.

To be sure, if, say, 50 or 70 percent of a country's population were age sixty-five

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EXHIBIT 1
Relative Per Capita Health Spending, By Age Cohort (Age 35-44 Equals 1), 1999

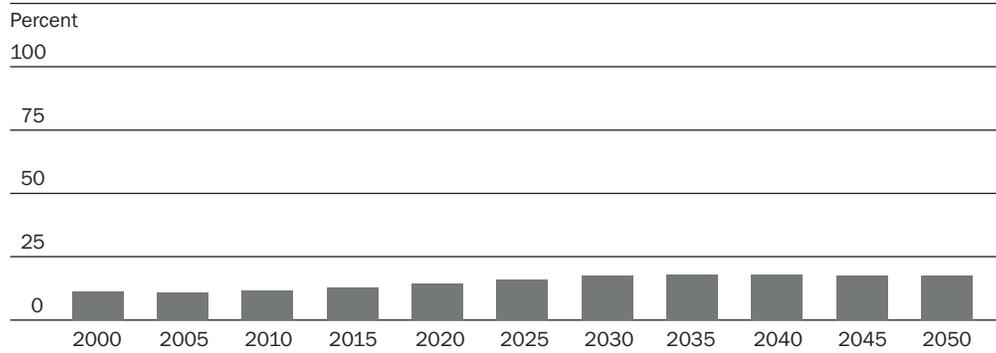


SOURCE: E. Meara, C. White, and D.M. Cutler, "Trends in Medical Spending by Age: 1963-1999" (Unpublished paper, Harvard University, 27 March 2003).

or older, that country's aggregate demand for health care would be considerably higher, other things being equal, than it would be if only 15 or 20 percent of its population were elderly. Those, however, are not the magnitudes actually faced by the United States in the next several decades. Between now and 2030 the fraction of the U.S. population age sixty-five and older will rise ever so gradually, by fewer than ten percentage points (Exhibit 2).

In thinking about the impact of this gradual aging of the U.S. population on national health spending, a distinction must be made, of course, between the causal flow from aging to health spending through the demand side of the health sector and that going through the supply side. In their 2003 report, the Trustees of the Hospital Insurance and Supplementary Medical Insurance Trust Funds project

EXHIBIT 2
Projected Percentage Of The U.S. Population Age 65 And Older, 2000-2050



SOURCE: U.S. Bureau of the Census, Population Division, Population Projections Program, "Projections of the Total Resident Population by Five-Year Age Groups, and Sex with Special Age Categories: Middle Series," various forecasting years, www.census.gov/population/www.projections/natsum-T3.html (24 September 2003).

that the number of workers per Medicare beneficiary will decline from its current level of about 3.9 to about 3.6 by 2010, 3.0 by 2020, 2.4 by 2030, and 2.2 by 2050.³ Unless an increase in fertility in the United States, more massive immigration, or important new labor-saving technology can offset this projected increase in the age-dependency ratio, any labor-intensive U.S. industry, health care included, will see the unit cost of its output increase. By driving up per capita health spending for all age groups, such increases in the unit costs of health care naturally will amplify somewhat the modest impact that aging by itself will have on health spending through the demand side.

This essay addresses the popular belief that the aging of the population will drive up health spending through the demand side of the health sector; I leave the supply-side effect and the problem of financing health care for the elderly in the future to a few remarks at the end of the paper. The essay begins with a brief review of pertinent literature on aging and health spending. Simulations based on more recent data are used thereafter to show that the aging of the U.S. population would add only about half a percentage point to the total annual increases in national health spending (currently projected to be around 7.3 percent over 2002–2012) if all age-specific health spending per capita did not rise for supply-side or other reasons.⁴ Furthermore, the demand-side effect of aging can be expected to remain a relatively modest contributor to the growth in health spending even during 2012–2030, when the baby-boomers join the ranks of the retired.

Prior Research On Aging And Health Spending

To explore what effect the aging of a country's population would likely have on the demand for health care, other things being equal, one projects what the per capita use of health care or per capita health spending would be in specific future years, if the age-specific use of health care were to remain constant at current levels over the entire forecast horizon and only the age composition of the population (not even the size of the population) were allowed to change in accordance with current demographic projections. Such hypothetical exercises are not to be confused with actual projections of future health spending, which must also take into account changes in all the other factors that influence health spending—including predictable changes in age-specific health care use and spending.

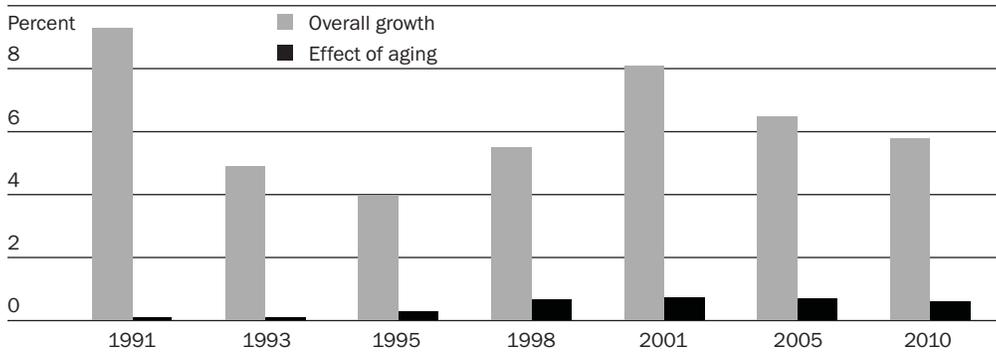
■ **Studies of U.S. data.** Sally Burner and colleagues used the approach described above in their 1992 projections of total national health spending for 1990–2030.⁵ Based on the then relatively high annual growth rates in total national health spending, Burner and colleagues projected that total national health spending in 2030 would be \$16 trillion, up from \$666.2 billion in 1990. This represents an average annual compound growth rate over the period of 8.3 percent. Personal health spending—about 90 percent of total national health spending in 1990—was projected to increase from \$585 billion in 1990 to \$14.8 trillion in 2030, at an average annual compound growth rate of 8.4 percent.

After reviewing the various factors that drive this growth rate in spending—medical care price inflation; greater resource intensity of treatments, including the availability of new technology; overall population growth; and so on—Burner and colleagues concluded that “the aging of the population adds another 0.5 percent per year to expenditure growth,” which means that the aging of the population explains only a fraction of about 0.06 of the total projected annual spending growth of 8.4 percent. In other words, these researchers came to the remarkable conclusion that the projected aging of the U.S. population, by itself, would have raised total personal health spending from \$585 billion in 1990 to only \$714 billion in 2030, rather than to the \$14.8 trillion actually projected by the authors for that year.⁶ Evidently, this finding puts population aging into the minor league of demand drivers in health care.

In a more recent analysis, Bradley Strunk and Paul Ginsburg use a similar approach to focus on the effect of aging on health spending for only the population under age sixty-five, which they refer to as the “non-Medicare” population.⁷ The objective of their analysis was to isolate the fraction of the overall growth in health spending for this broad age cohort (financed largely through employment-based health insurance) that can be accounted for strictly by aging within that cohort. Exhibit 3 shows that this fraction never reached one percentage point of the total annual growth during the 1990s. The authors concluded that “despite widespread belief to the contrary, aging baby boomers are not a major driver of rapidly rising health care costs for Americans under age 65.”

Finally, for the Medicare population only, David Cutler and Louise Sheiner explored, among other effects, the future effect on “Medicare acute care expenditures” of projected changes in the age structure of the population only—that is, on the assumption that age-specific spending per capita would be constant throughout the forecast horizon.⁸ They found that on this assumption, average acute care

EXHIBIT 3
Effect Of Aging By Itself On The Growth Of Health Care Spending For The Non-Medicare Population, Selected Years 1991–2010



SOURCE: B.C. Strunk and P.B. Ginsburg, “Aging Plays Limited Role in Health Care Cost Trends,” Data Bulletin (Washington: Center for Studying Health System Change, 23 September 2002), Figure 1.

Medicare spending per enrollee would rise from \$3,232 in 1992 to only \$3,342 by 2010, \$3,727 by 2030, and \$3,510 by 2050. This represents an average annual compound increase of only 0.14 percent over 1992–2050.

The authors next simulated the effect on Medicare spending per enrollee of a projected increase in life expectancy, and they built into their projection a 1 percent decrease per year in disability as well, which appears plausible in light of earlier research by Kenneth Manton and colleagues.⁹ Both factors—longer life expectancy and declining disability—were found to swamp the mild effect of aging by itself on Medicare spending, as acute care Medicare spending per enrollee was projected to fall slightly, from \$3,232 in 1992 to \$2,903 in 2030 and \$2,947 in 2050.¹⁰

■ **Studies in Canada and Australia.** The proposition that the aging of the population by itself does not constitute a major driver of annual changes in the demand for health care has been explored also by health services researchers in other countries. For example, in their paper “Apocalypse No: Population Aging and the Future of Health Systems,” Robert Evans and colleagues cited a number of earlier Canadian studies on the link between aging and health care use.¹¹ They conclude their paper with this remark: “All studies come to the same conclusion. Demographic trends by themselves are likely to explain some, but only a small part, of future trends in health care use and costs and in and of themselves will require little, if any, increase in the share of national health resources devoted to health care.”

Evans and colleagues next applied the approach described earlier to disaggregated data on health care use (hospital days, physician services, and pharmaceuticals) in British Columbia, assuming that age-specific utilization rates over the forecast horizon 1969–2030 would remain at their actual 1969 levels. They concluded from these exercises that “the evidence from British Columbia is quite clear. Changes in the age structure of the overall population have not in the past been major contributors to trends in the per-capita utilization of these three categories of health care services, and they will not be in the future.”¹²

For the period 1969–1999, for which actual data on utilization were on hand, the authors observed that for both physician care and pharmaceuticals actual utilization greatly exceeded the almost flat time path of spending predicted with constant age-specific use rates. On the other hand, for hospital care the actual use rates were far below the almost flat time path of use one would have predicted with constant 1969 age-specific hospital use rates. This finding leads to an important point predicting future health spending: For particular types of health services, age-specific use rates of health care can and do rise or fall over time.

Jeff Richardson and Iain Robertson surveyed similar studies for Australia and reported on their own research into the link between aging and health spending under various assumed future scenarios.¹³ In a scenario that assumed constant 1994 age-specific per capita spending over the period 1995–2051, an unchanged total population, and future changes only in the fraction of the fixed population that

will be in each age cohort, they found that total health spending in Australia would grow by only about 0.6 percent per year over that forecast horizon.¹⁴ From their simulations on the Australian data, the authors offered this overarching conclusion: “Health expenditures are not driven mechanistically by demography. This, in turn, implies that future health care costs will be determined by other factors. Some of these will be responsive to policy but not others. In the latter category is the impact of technology. The former include incentive structure of the health care sector and the supply of physical and human resources.”

Although Richardson and Robertson focused most of their work on Australian data, they included a cross-sectional analysis of spending patterns in twenty-one Organization for Economic Cooperation and Development (OECD) countries and found no discernible relationship between the fraction of a country’s population age sixty-five or older and the fraction of gross domestic product (GDP) it spends on health care, after controlling statistically for the powerful effect of per capita GDP on per capita health spending. Idiosyncratic characteristics of national health systems appear to dominate the age structure of populations as an explanatory variable for cross-national differences in health spending. As I argue in the conclusion of this paper, much the same appears to be true across regions within the United States.

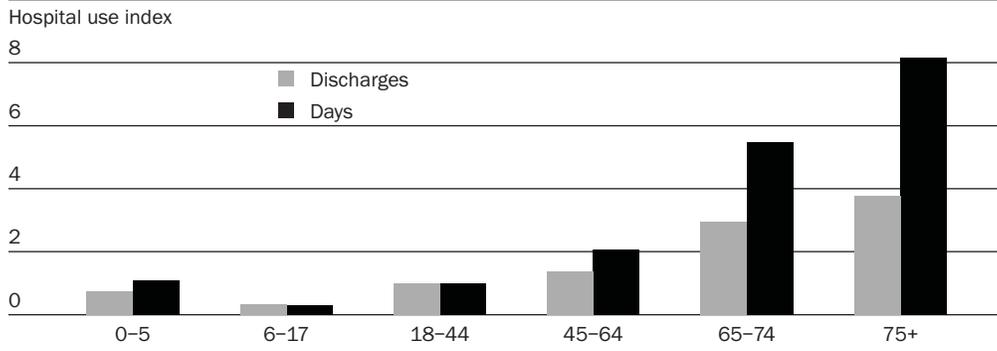
In their more extensive cross-national regression analysis of the effect of aging on social spending in general, Jonathan Gruber and David Wise similarly did not find any statistically significant relationship between the percentage of a nation’s population age sixty-five and older and total national health spending as a percentage of GDP, even after controlling for a full set of country and year fixed effects that might affect such spending as well.¹⁵

Simulations Based On MEPS Data

Exhibit 4 presents data on the age-specific use of hospital care in the United States in 2000. The number of “discharges” includes those involving “zero nights of stay,” which are counted also as one day in the variable “days.”¹⁶ These data are based on the Medical Expenditure Panel Surveys (MEPS) conducted periodically by the Agency for Healthcare Research and Quality (AHRQ).¹⁷

The number of hospital discharges per capita has a relatively steep age gradient at higher ages, but the age gradient for the number of patient days per capita is even steeper. Once again, these data might persuade one to predict sizable annual increases in the use of hospital care as the U.S. population ages inexorably over time. In his research brief *Health Care Services by the Numbers*, for example, Merrill Lynch financial analyst A.J. Rice wrote: “Our analysis of Census Bureau forecasts suggests that demographic changes over the period 2000–2015 will drive average annual hospital admissions growth of 3.7% annually.”¹⁸ If one deducts roughly one percentage point for overall population growth, then the remaining 2.7 percentage points of the annual growth in hospital admissions Rice predicted would have to

EXHIBIT 4
Age-Specific Use Of Hospital Care In The United States, By Age Cohort (Values For
Ages 18–44 Equal 1), 2000



SOURCE: Author's calculations based on data supplied by Julie Hudson, Agency for Healthcare Research and Quality, April 2003.

reflect changes in the age and sex composition of the population.

Application of the previously described methodology to the MEPS data suggests that Rice's projection is much too high. These simulations show that if only the age structure of the U.S. population varied during the next three decades then, other things being equal, the projected average number of U.S. hospital discharges would rise from 0.1018 per capita in 2000 to merely 0.1069 in 2012 and 0.1169 in 2030.¹⁹ The average annual compound growth rates implied by these projections is only 0.41 percent for 2000–2012. It is only 0.50 for the longer period 2000–2030, within which the percentage of the population over age sixty-five will rise more rapidly. Similar calculations for the number of hospital days per capita yield somewhat higher annual compound growth rates: 0.7 percent for 2000–2012 and 0.77 percent for 2012–2030.²⁰ Even these growth rates, however, are quite low.

Finally, a similar simulation applied to the MEPS data on total health spending per capita indicates that if only the age structure of the U.S. population changed over the period 2000–2030, then average annual per capita health spending would be projected to grow at an average annual compound rate of only 0.4 percent over this long forecast horizon. That estimate is roughly consistent with Burner and colleagues' previously cited estimate of 0.5 percent, although the definition of "expenditures" in the MEPS database differs greatly from the National Health Accounts (NHA) series published annually by the Centers for Medicare and Medicaid Services (CMS) and used by Burner and colleagues.²¹ Because the differences between these two data series are systematic, the simulations based on the MEPS data are at least internally consistent and, in terms of projected growth rates, most likely roughly to be comparable to the simulations based on the NHA data.²²

Overall, then, simulations on recent MEPS data confirm the general proposition found elsewhere in the literature that the aging over time of a nation's population by itself is not likely to be a major driver of increases in the demand for health

care and of national health spending.

A criticism of simulations based on assumed constant age-specific per capita use or spending levels is that age-specific health spending per elderly person might grow systematically faster over time than that for the young, which would lead one to underestimate systematically the aging-only effect on health spending. In their 1997 study of changes in the age-spending profiles of Americans, for example, Cutler and Ellen Meara found that “between 1953 and 1987, medical spending increased disproportionately for infants, those under 1 year, and the elderly, those 65 and older.”²³ In a subsequent update, they report that trend to have continued between 1985 and 1995.²⁴

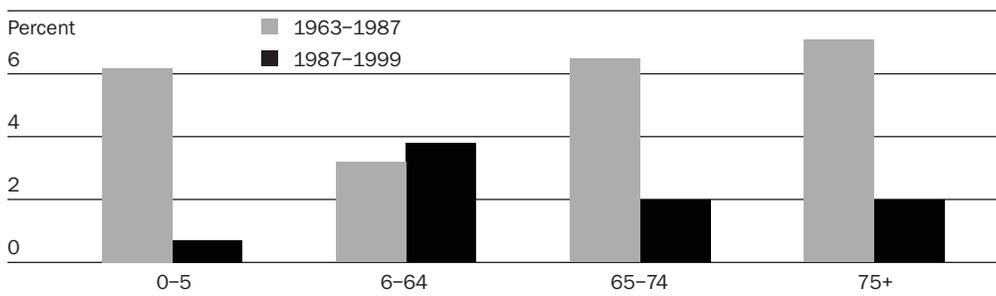
In an even more recent paper, however, Meara, Chapin White, and Cutler report data that lead to quite the opposite conclusion, as is apparent from Exhibit 5.²⁵ While over the period 1963–1987 the average annual growth rate in per capita health spending was, indeed, higher for children below age six and for the elderly than for the age cohort 6–64, the pattern appears to have reversed itself during 1987–1999. Over the past decade and a half, health spending for very young and elderly Americans actually appears to have been better controlled on average than that for Americans in the middle.

Incidentally, the data in Exhibit 5 are consistent with recent research by Cristina Boccuti and Marilyn Moon on growth rates in health spending in Medicare and in the private sector.²⁶ The empirical record belies the widespread notion that relative to health spending for younger Americans, health spending for the elderly in America has been “out of control.”

Aging And The Supply Side Of The Health System

Although the main focus of this paper is the effect of population aging on the future demand for health care, I noted earlier that aging can also affect total national health spending through the supply side of the health sector, as the ratio of workers to retirees falls. For a traditionally labor-intensive sector such as health care,

EXHIBIT 5
Average Annual Growth In Health Care Spending Per Capita, By Age Cohort, 1963–1987 And 1987–1999



SOURCE: E. Meara, C. White, and D.M. Cutler, “Trends in Medical Spending by Age: 1963–1999” (Unpublished paper, Harvard University, 27 March 2003).

this decline is likely to drive up the unit labor cost of its product unless the sector finds ways to reduce its heavy reliance on labor.

One effective response to this economic pressure from the labor market will be the development and use of labor-saving technology that can reduce the health sector's traditional reliance on labor. Some of that technology has not yet been developed—for example, in the field of genomics and nanotechnology.²⁷ Other potentially labor-saving technology already exists—for example, information technology (IT)—but so far has been sparingly used in U.S. health care.

In a cross-national survey on the use of IT, for example, Harris Interactive found that some European health systems now lead the U.S. health system in the use of IT.²⁸ In 2000, for example, only 17 percent of U.S. general practitioners were linked to their patients' electronic medical records. The comparable numbers for other countries were 90 percent in Sweden, 88 percent in the Netherlands, 62 percent in Denmark, 58 percent in the United Kingdom, 56 percent in Finland, and 48 percent in Germany.²⁹

Furthermore, while most other countries have relatively simple health insurance contracts and payment structures with standard nomenclatures that can easily be operated electronically, much of the highly pluralistic U.S. health insurance system—especially in the private sector—remains paper-based and imposes huge administrative overhead on hospitals and other providers (not even to dwell on the time patients must devote to claims processing). In a study published in 1996, for example, the McKinsey Global Research Institute reported that after appropriate adjustments for demographic factors and prices, in 1990 Americans used \$390 less in health care services per capita than did Germans, but spent \$360 more on administration, much of which reflects the added labor cost of administrative overhead.³⁰ The study suggests that there remains in the U.S. health system a large reservoir of hitherto untapped labor-saving economies that could be harvested, with smarter standardization and the use of IT.

Financing Health Care For The Elderly

The declining future ratio of workers to elderly Americans will also cause stresses in the political economy of transferring financial and real resources to the elderly.³¹ Regardless of how health care for the elderly is financed, the aging of the population implies that a gradually increasing fraction of the nation's output of real goods and services will have to be allocated to the elderly. That much is certain. The elderly attract these goods and services into their households with their endowment of financial resources, which move real resources, just as a magnet moves paper clips. The question is how the elderly should be endowed with these financial resources: (1) through private, individually held, prefunded pension and medical savings accounts; (2) through a prefunded, collectively held, and publicly administered social insurance system; or (3) through a pay-as-you-go tax-and-transfer Social Security system.³²

Under the first approach the elderly would receive financial resources through a system of private financial contracts (pensions, mutual funds, titles to real estate, and so on) through which the elderly, in effect, would directly or indirectly own productive capital that they would then rent to the working population, in return for interest, rental income, and profits. Thus, the elderly would have the financial resources needed to attract real resources for their health care.

By contrast, under the third approach the elderly would receive financial resources through a compulsory tax-and-transfer system. This is the system that the United States has chosen to adopt. The federal budget surpluses starting to accrue in the late 1990s might have made it possible to move at least partially toward the second approach, a partially prefunded, publicly administered social insurance system. At the beginning of 2001, for example, the federal government's projected, cumulative, unified budget surplus for the ensuing decade stood at \$5.6 trillion, which included the cumulative surpluses in the Medicare and Social Security trust funds (the latter amounting to \$2.5 trillion).³³ These trust-fund surpluses could have been invested in Euro bonds (dollar-denominated bonds held by foreigners) to support future Social Security and Medicare spending. When these bonds matured a decade or two later, foreign taxpayers, not U.S. taxpayers, would have to pay off the bonds to support the then elderly Americans. The trust-fund surpluses also could have been used to retire or repurchase federal debt held by Americans (chiefly pension funds). Most of these funds would then have been recycled by the pension funds and other investors into private investments in the United States, which would have enhanced the capital stock and productivity of future workers and make supporting the elderly less burdensome. Either way, the need for compulsory levies on future U.S. workers would have been lowered.

The current administration and Congress evidently have made the decision not to prefund either Medicare or Social Security in these ways. Instead, they have decided to use the projected surpluses in these programs' trust funds to pay for massive tax cuts and for normal government operations, including defense spending and farm subsidies. (The private-sector analogy would be a firm's using the assets in its pension fund to cover current payroll and the acquisition of raw materials.) That decision undoubtedly will complicate the political economy of future transfers from the working population to the elderly, but that problem should not be attributed to the aging of the population. It is a matter of contemporary fiscal policy.

Concluding Comments

The objective of this essay has been to deconstruct the popular myth that the aging of the population by itself is a major contributor to the annual increase in the demand for health care and, thus, to total national health spending. Although the projected increase in the fraction of elderly in the total population from the current 12.7 percent to about 20 percent by 2030 is not a trivial matter in health policy—especially in its impact on the labor market and the political economy of fi-

nancing health care for the elderly—the bulk of the rapid annual growth in national spending in the past has been driven by other factors that increase per capita spending for all age groups. Key factors include rising per capita incomes, the availability of promising but costly new medical technology, workforce shortages that can drive up the unit cost of health care, and the asymmetric distribution of market power in health care that gives the supply side of the sector considerable sway over the demand side.³⁴ These other factors will be the dominant drivers of health spending in the future as well. Blaming Medicare's future economic pressures mainly on demographic factors beyond policymakers' control is an evasion of more important challenges.

Both Evans and colleagues in their Canadian study and Richardson and Robertson in their Australian study make the important point that there is nothing fixed or clinically imperative about currently prevailing, age-specific health care use or spending levels, nor do countries need to accept as an unalterable fact that age-specific per capita health spending in the future must necessarily go up for all age groups, and especially for the elderly.³⁵ Indeed, within the United States nothing more powerfully underscores this point than the work of John Wennberg and his associates at Dartmouth.³⁶ Their research has shown per enrollee Medicare spending in various regions of the country to vary by a factor of about three, even after statistical adjustments for interregional variations in the age-sex composition of the Medicare population, practice costs, and case-mix. The use of specific health care services, such as visits to medical specialists or hospital discharges per statistically adjusted Medicare enrollee, also shows wide and clinically inexplicable variations across the country.³⁷

In a recent analysis of these data, Elliot Fisher and colleagues conclude from their analysis of these “Wennberg variations” that they do not seem to be associated with commensurate differences in access to care, its quality, or outcomes.³⁸ This remarkable conclusion makes the very gradual future increases in the fraction of the U.S. population age sixty-five and older appear as one of the lesser health policy challenges now confronting American society.

The more pressing challenge—one amenable to health services research and public policy—is to determine what real resources actually would be required to provide all elderly Americans with high-quality, cost-effective health care and then to act on those insights. If the gradual aging of the U.S. population over the next three decades could be accompanied by a gradual switch in medical practice styles from those now preferred in the high-cost regions (many of the Sunbelt states) to the more conservative practice styles preferred in the lower-cost regions (such as in Wisconsin, Minnesota, and Oregon), then the United States might be able to manage the impact of its retiring baby-boom generation on its health sector as successfully as have other countries, whose populations already have the age structure that the U.S. population will reach only in 2020–2025.³⁹

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 An earlier version of this paper was presented at the conference, "The American Hospital: What Does the Future Hold?" in Washington, D.C., 21 April 2003. The author is grateful to Julie Hudson of the Agency for Healthcare Research and Quality (AHRQ), for running the simulations based on the Medical Expenditure Panel Survey (MEPS) data presented in this paper. The exercise demonstrated once more AHRQ's remarkable analytic capability and the usefulness of its rich database.

NOTES

1. E. Meara, C. White, and D.M. Cutler, "Trends in Medical Spending by Age: 1963–1999" (Unpublished paper, Harvard University, 27 March 2003). Chapin White provided some of the data used in their paper in spreadsheet format (by e-mail, 28 April 2003).
2. See, for example, R.G. Evans et al., "Apocalypse No: Population Aging and the Future of Health Care Systems," *Canadian Journal of Aging* 20 (Supplement 1, 2001): 160–191; J. Richardson and I. Robertson, "Ageing and the Cost of Health Services," Working Paper no. 90 (Sydney: Centre for Health Program Evaluation, May 1999); and U.E. Reinhardt, "Health Care for the Aging Baby Boomers: How Serious a Problem?" in *Economic Policy for Aging Societies*, ed. H. Siebert (Berlin: Springer Verlag, 2002), 235–262.
3. Centers for Medicare and Medicaid Services, *2003 Annual Report of the Board of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds*, Figure II.B5, 17 March 2003, cms.hhs.gov/publications/trusteesreport/2003/figiib5.asp (13 August 2003).
4. S. Heffler et al., "Health Spending Projections for 2002–2002," 7 February 2003, www.healthaffairs.org/WebExclusives/Heffler_Web_Excl_020703.htm (13 August 2003).
5. S.T. Burner, D.R. Waldo, and D.R. McKusick, "National Health Expenditures Projections through 2030," *Health Care Financing Review* (Fall 1992): 1–30.
6. \$585 billion \times 1.00540, or \$585(1.22).
7. B.C. Strunk and P.B. Ginsburg, "Aging Plays Limited Role in Health Care Cost Trends," Data Bulletin (Washington: Center for Studying Health System Change, 23 September 2002), 1–2.
8. D.M. Cutler and L. Sheiner, "Demographics and Medical Care Spending: Standard and Non-Standard Effects," NBER Working Paper no. W6866 (Cambridge, Mass.: National Bureau of Economic Research, December 1998).
9. See K. Manton, L.S. Corder, and E. Stallard, "Chronic Disability Trends in Elderly United States Population: 1982–1994," *Proceedings of the National Academy of Sciences* 94 (1997): 2593–2598.
10. Cutler and Sheiner, "Demographics and Medical Care Spending," Table II.
11. Evans et al., "Apocalypse No"; J.A. Boulet and G. Grenier, "Health Expenditures in Canada and the Impact of Demographic Changes on Future Government Health Insurance Programs," Discussion Paper no. 123 (Ottawa: Economic Council of Canada, 1978); Canadian Institute for Health Information, *National Health Expenditure Trends: 1976–2000* (Ottawa: Canadian Institute for Health Information, 2000); and M.L. Barer, R.G. Evans, and C. Hertzman, "Avalanche or Glacier? Health Care and Demographic Rhetoric," *Canadian Journal on Aging* 14, no. 2 (1995): 193–224.
12. Evans et al., "Apocalypse No," 176.
13. Richardson and Robertson, "Ageing and the Cost of Health Services."
14. Ibid. Table 2, Line A shows that total health spending in Australia was predicted to rise from A\$37.5 billion in 1995 to A\$52.6 billion in 2051.
15. J. Gruber and D. Wise, "An International Perspective on Policies of Aging Societies," in *Policies for an Aging Society*, ed. S.H. Altman and D.I. Shactman (Baltimore: Johns Hopkins University Press, 2002), Table 2.3.
16. Such "zero night" discharges are relatively rare in the data. Excluding them from "days" would change that number by only about 0.5 percent.
17. Data supplied to the author by Julie Hudson, AHRQ. The numbers for "days" represent the sum of "nights in the hospital for discharges" and "zero-night hospital stays." Exclusion of the latter would not greatly alter the numbers. For a detailed description of the MEPS data, see Medical Expenditure Panel Survey, "What Is MEPS?" June 2001, www.meps.ahrq.gov/whatis.htm (13 August 2003).
18. A.J. Rice, *Health Care Services by the Numbers* (New York: Merrill Lynch Global Securities Research, September 2002).
19. The author is deeply indebted to Julie Hudson, AHRQ, for running these simulations on the MEPS data. Her quick and flexible response to this request demonstrates the richness of the database assembled by

- AHRQ and the superb analytic capacity residing in the agency.
20. Hospital days per capita were 0.5973 in 2000. If only the age composition of the population changed, the number would rise to 0.6492 by 2012 and to 0.7459 by 2030.
 21. Burner et al., "National Health Expenditures Projections through 2030."
 22. In general, the MEPS spending data are much lower than the NHA data, because the former exclude many categories of services included in the NHA data, such as the services of nursing homes and other long-term care facilities. For a reconciliation of these differences, see T.M. Selden et al., "Reconciling Medical Expenditure Estimates from the MEPS and the NHA, 1996," *Health Care Financing Review* (Fall 2001): 161–177. Because these differences between MEPS and the NHA data are systematic and only growth rates are sought in the spending simulations reported here, the latter are likely to be meaningful and roughly comparable to studies based on NHA data.
 23. D.M. Cutler and E. Meara, "The Medical Costs of the Young and Old: A Forty-Year Perspective," NBER Working Paper no. 6114 (Cambridge, Mass.: NBER, July 1997).
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 26. C. Boccuti and M. Moon, "Comparing Medicare and Private Insurers: Growth Rates in Spending over Three Decades," *Health Affairs* (Mar/Apr 2003): 230–237.
 27. See, for example, R.A. Freitas, *Nanomedicine, Volume 1: Basic Capabilities* (Georgetown, Tex.: Landes Bioscience, October 1999).
 28. H. Taylor and R. Leitman, "European Physicians, Especially in Sweden, Netherlands, and Denmark, Lead U.S. in Use of Electronic Medical Records," *Health Care News* (8 August 2002).
 29. *Ibid.*, Table 1.
 30. McKinsey Global Institute, *Health Care Productivity* (Los Angeles: October 1996), Executive Summary.
 31. V. Fuchs, "The Financial Problem of the Elderly: A Holistic View," in *Policies for an Aging Society*, ed. Altman and Shactman, 378–389.
 32. On prefunded accounts, see M.S. Feldstein, "Prefunding Medicare," NBER Working Paper no. W6917 (Cambridge, Mass.: NBER, January 1999); and T.R. Saving, "Making the Transition to Prepaid Medicare," *Journal of Economic Perspectives* (Spring 2000): pages?
 33. Congressional Budget Office, *The Budget and Economic Outlook: Fiscal Years 2001–2011* (Summary), January 2001, www.cbo.gov/showdoc.cfm?index=2727&sequence=1 (15 September 2003).
 34. Growth in GDP per capita is a strong driver on the demand side of the health care market because, in economic parlance, health care appears to be a "superior good." This means that that the percentage increase in the demand for health care tends to exceed the percentage increase in per capita GDP that has triggered the increase in demand. See, for example, J.P. Newhouse, "Medical Expenditure: A Cross National Survey," *Journal of Human Resources* 12, no. 1 (1977): 115–127; and U.E. Reinhardt, P.S. Hussey, and G.F. Anderson, "Cross-National Comparisons of Health Systems using OECD Data, 1999," *Health Affairs* (May/June 2002): 169–181. On technology's role, see J.P. Newhouse, "An Iconoclastic View of Health Cost Containment," *Health Affairs* (Supplement 1993): 152–171.
 35. Evans et al., "Apocalypse No"; and Richardson and Robertson, "Ageing and the Cost of Health Services."
 36. J.H. Wennberg and M.M. Cooper, eds., *The Dartmouth Atlas of Health Care in the United States 1999* (Chicago: American Hospital Association Press, 1999), chap. 1.
 37. *Ibid.*, chap. 3.
 38. E.S. Fisher et al., "The Implications of Regional Variations in Medicare Spending, Part I: The Content, Quality, and Accessibility of Care," *Annals of Internal Medicine* (18 February 2003): 273–287.
 39. This includes virtually all of the European countries and Japan.