# Future Health and Medical Care Spending of the Elderly

## Implications for Medicare

Policymakers face the challenge of understanding and managing future Medicare spending. Under current projections, it will rise from 2.6 percent of gross domestic product today to 9.2 percent in 2050. Demographics will be a key factor: The first wave of baby boomers turns 65 in 2010. But what if some biomedical advance revolutionizes medical practice? What if a cure were found for one of the deadliest diseases? What if the health status of the elderly continues to improve? Would such changes ease Medicare's financing problems?

To answer such questions, a team of economists and physicians from the RAND Corporation, Stanford University, and the VA [Veterans Affairs] Greater Los Angeles Healthcare System explored how changes in medical technology, disease, and disability would affect health care spending for the population age 65 and older. Their key findings: Medical innovations will result in better health and longer life, but they will likely increase, not decrease, Medicare spending. Eliminating any one disease won't save a great deal of money, but obesity might be an important exception.

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- Medical innovations will result in better health and longer life, but they will likely increase, not decrease, Medicare spending.

- Eliminating any one disease will not save Medicare money.

- Obesity might be an important exception to this rule.

### Modeling the Future

Economist Dana Goldman and his colleagues developed the Future Elderly Model (FEM), a demographic and economic model to predict future costs and health status for the elderly (see Figure 1). The model uses a representative sample of approximately 100,000 Medicare beneficiaries age 65 and over drawn from the Medicare Current Beneficiary Surveys, national surveys that ask Medicare beneficiaries about chronic conditions, use of health care services, medical care spending, and health insurance

**This Highlight summarizes RAND Health research reported in the following publications:**

Goldman DP, Shang B, Bhattacharya J, Garber AM, Hurd M, Joyce GF, Lakdawalla D, Panis C, Shekelle P. Consequences of Health Trends and Medical Innovation for the Elderly of the Future, *Health Affairs—Web Exclusive*, September 26, 2005, pp. W5-R3–W5-R15.

Joyce GF, Keller EB, Shang B, Goldman DP. The Lifetime Burden of Chronic Disease Among the Elderly, *Health Affairs—Web Exclusive*, September 26, 2005, pp. W5-R16–W5-R27.

Lakdawalla DN, Goldman DP, Shang B. The Health and Cost Consequences of Obesity Among the Future Elderly, *Health Affairs—Web Exclusive*, September 26, 2005, pp. W5-R28–W5-R39.

All of the above published articles are available at www.healthaffairs.org.
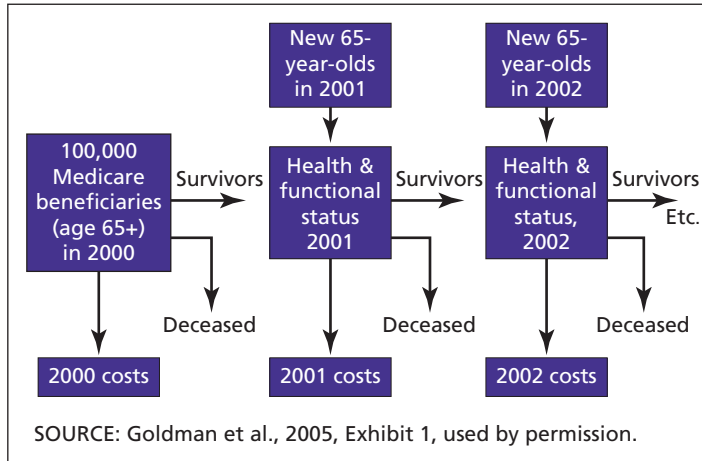
**Figure 1**
**Overview of the Simulation Model, Future Health and Spending of the Elderly**



SOURCE: Goldman et al., 2005, Exhibit 1, used by permission.

coverage. Each beneficiary in the sample is linked to Medicare claims records to track actual medical care use and costs over time.

The model begins with the health status of the sample in 2002; estimates the medical services they will use; and simulates the change in their health and functional outcomes, including death, over the course of the year. One of the important innovations of their model is to incorporate information about the health of younger cohorts that will eventually age into Medicare. Specifically, a new set of 65-year-olds is added every year through 2030, and their health is also predicted based on the health of younger cohorts as described in the National Health Interview Study, another national survey. Rolling the model forward year after year makes it possible to predict medical costs and health status far into the future.

The research team used this model to explore how future Medicare costs might be affected by health status trends, medical innovations, reduction of chronic diseases, and the number of the elderly who are obese.

## How Might the Health Status of the Elderly Affect Medicare Spending?

The health of the population over age 65 has been improving since the early 1980s. However, diseases such as obesity and diabetes are increasingly prevalent among the young, and the resulting increases in disability suggest that future Medicare beneficiaries might be less healthy than current ones.

To understand the net effect of these trends on Medicare spending, the research team used the model to estimate the health of future Medicare beneficiaries under three sets of assumptions. In scenario A, they forecast the health of new beneficiaries using all the information available, including

the health of younger cohorts; this is the scenario the team deemed most credible. In scenario B, they assumed that entering cohorts would have the same constellation of diseases and disabilities as the healthy cohorts from the 1990s; this scenario ignores information about disease and disability in younger cohorts. In scenario C, they assumed continued improvement in the health status of the entire elderly population and of the entering cohort; this scenario has the most favorable assumptions for Medicare spending.

The team found that lower disability rates *do* translate into lower health care costs *per beneficiary* (see Table 1). Under Scenario A, where the estimate uses information about the health status of younger cohorts, spending is projected to be $11,206 per beneficiary in 2030. In the more optimistic Scenario C, spending per beneficiary is 8 percent lower at $10,275.

However, *total* Medicare spending under these three sets of assumptions does not differ very much. As Figure 2 shows, by 2030, Scenario A and Scenario B differ by only 2 percent per year. Even under the most optimistic assumptions (Scenario C), the cost savings are only 6 percent.

The reason is simple: Cumulative Medicare spending is relatively unaffected by the health status of new beneficiaries because healthier people live longer. Thus they have more years in which to accumulate costs.

## How Might Technological Innovation Affect Medicare Spending?

The discussion above assumes that the practice of medicine will not change significantly in the coming decades. But what if it did? How might technological innovation affect future Medicare spending?

To identify technologies to examine, the analysts conducted a systematic literature review and then elicited consensus from panels of distinguished experts in cardiovascular disease, cancer and the biology of aging, and neurologic disease—the three clinical domains in which innovations were judged to have the greatest potential effect on health status and costs. The team chose to analyze the 10 technologies that the experts thought were most likely to be widely adopted (see the side bar).
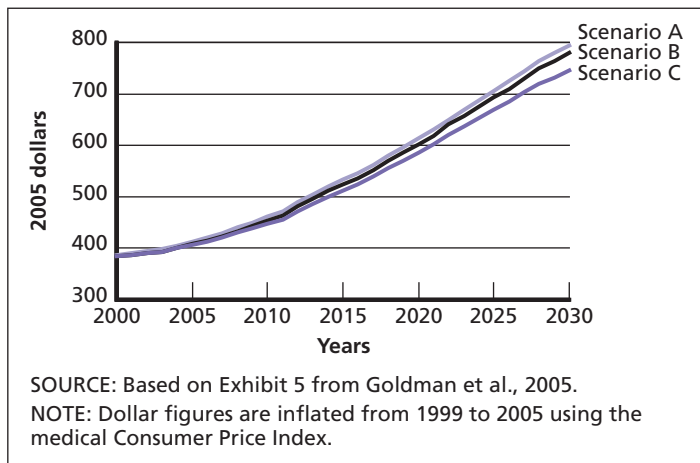
The team assessed how each innovation affected spending and life years saved over the period 2002–2030, assuming that each innovation was fully adopted by 2002. Table 2 highlights the researchers' key findings. Several striking patterns emerge.

**Some Technologies Will Be Extremely Expensive.** For example, intraventricular cardioverter defibrillators (ICDs) are very effective for patients with life-threatening arrhythmias. A recent coverage decision expands prophylactic ICD

– 3 –

**Table 1**
**Health Care Spending Per Medicare Beneficiary Under Three Sets of Assumptions**

| | Health Care Spending Per Medicare Beneficiary (2005 dollars) | | |
| --- | --- | --- | --- |
| | **2000** | **2015** | **2030** |
| **Scenario A** Uses information about the health of younger cohorts | $10,929 | $11,000 | $11,206 |
| **Scenario B** Assumes new cohorts have the same health status as 1990 cohorts | $10,852 | $10,725 | $10,850 |
| **Scenario C** Assumes continued improvement in the health status of the elderly | $10,852 | $10,459 | $10,275 |

**Figure 2**
**Total Medicare Spending Under the Three Scenarios, 2002–2030 (2005 dollars)**



SOURCE: Based on Exhibit 5 from Goldman et al., 2005.
NOTE: Dollar figures are inflated from 1999 to 2005 using the medical Consumer Price Index.

use to patients at high risk of sudden death from ischemic cardiomyopathy. But if use is expanded to patients with other heart problems, then costs could rise very quickly. The research team simulated the effects of expanding ICD use to half of elderly patients with new cases of heart failure or heart attack. This would result in approximately 374,000 procedures annually in 2015 and 550,000 in 2030, and total treatment costs of $14 billion and $27 billion, respectively. The cost per additional year of life would be about $132,000.

**Some Technologies Improve Health but at a Very High Price.** For example, anti-angiogenesis, pacemakers for atrial fibrillation, and left ventricular assist devices (LVADs) are all costly relative to their known health benefits. If these technologies are broadly applied, costs per additional life year would be very high.

**Some Technologies May Have Modest Costs Per Additional Life Year, but They Increase Health Care Spending Substantially.** For example, an antiaging compound would increase health care spending by 14 percent in 2030 because, if the compound had been taken by healthy beneficiaries starting in 2002, there would be 13 million more Medicare beneficiaries in 2030. However, the cost per additional year of life is only $11,000. If the compound is keeping unhealthy people alive longer, total health care spending in 2030 would be 70 percent higher: There would be more elderly people in poor health. The cost per additional life year of $38,000 is still relatively modest.

The case of antiaging compounds underscores the tension inherent in medical innovations: They keep people alive longer, but as a result, people incur more health care costs. Overall, however, society would consider the additional years worth the additional dollars.

**Key Technologies Identified by the Panels of Experts**

**Intraventricular cardioverter defibrillators (ICDs):** devices implanted in the heart that apply a therapeutic shock when severe arrhythmias are detected.

**Left ventricular assist devices (LVADs):** devices implanted in the heart to help the left ventricle pump blood.

**Pacemakers to control atrial fibrillation:** devices implanted in the heart to control disturbances of the heart rhythm.

**Telomerase inhibitors:** molecules that prevent the expression of telomerase, an enzyme that allows cancer cells to replicate.

**Cancer vaccines:** compounds that stimulate the body's immune system to fight cancer cells.

**Anti-angiogenesis:** antigrowth factors that inhibit the development of new blood vessels, which tumors need to grow.

**Treatment of acute stroke:** drugs that would reduce a stroke's disabling effects by 50 percent.

**Prevention of Alzheimer's:** compounds to delay the onset of Alzheimer's.

**Prevention of diabetes:** drugs that would reduce health hazards associated with diabetes by 50 percent over 15 years.

**Compounds that extend life:** drugs that would increase life expectancy by about 10 (healthy or unhealthy) years.

**Table 2**
**The Effects of Selected Medical Technologies on Spending and Life Years**

| Technology | Annual Treatment Cost, 2030 (billions of 2005 dollars) | Percentage Increase in Health Care Spending in 2030 | Cost Per Additional Life Year (2005 dollars) |
|---|---|---|---|
| Antiaging compounds (healthy) | 93.1 | 13.8 | 11,245 |
| Cancer vaccines | 1.0 | 0.4 | 23,330 |
| Treatment of acute stroke | 5.6 | 0.4 | 28,024 |
| Antiaging compounds (unhealthy) | 93.8 | 70.4 | 38,105 |
| Telomerase inhibitors | 8.2 | 0.5 | 79,170 |
| Alzheimer's prevention | 62.8 | 8.0 | 102,774 |
| ICDs | 26.5 | 3.7 | 131,892 |
| Diabetes prevention | 26.4 | 3.2 | 188,316 |
| Anti-angiogenesis | 66.4 | 8.0 | 638,141 |
| LVADs | 18.2 | 2.3 | 654,968 |
| Pacemakers for atrial fibrillation | 17.4 | 2.3 | 1,795,846 |

## Would Reducing Chronic Illness Affect Medicare Spending?

Chronic illnesses such as heart disease, cancer, and diabetes are expensive to treat. As a consequence, the relatively small proportion of Medicare beneficiaries with such diseases account for a disproportionate share of Medicare spending—perhaps as much as three-quarters of the total. Could reducing the prevalence of chronic illness among beneficiaries improve Medicare's financial outlook?

Economist Geoffrey Joyce and his colleagues used FEM to examine how seven of the most common chronic illnesses affect average life expectancy and health care spending among Medicare beneficiaries from age 65 until death. The diseases they focused on were hypertension, diabetes, cancer (lung, breast, prostate, colon, uterine, throat, bladder, kidney, and brain), chronic obstructive pulmonary disease (COPD) (chronic bronchitis, emphysema, and some forms of asthma), acute myocardial infarction, coronary heart disease, and stroke.

Table 3 highlights their key policy findings.

Chronic diseases clearly affect both life expectancy and health care costs. Reduction in life expectancy ranges from 0.3 years for a beneficiary with hypertension to about 3 years for a beneficiary with stroke or diabetes.

All of these diseases increased annual health care costs over the cost incurred by a similar individual without the disease. However, cumulative health care spending is only modestly higher for those with chronic diseases, ranging from about $5,000 to $18,000. Put another way, beneficiaries with chronic disease do not cost Medicare a great deal more than those without such diseases because the chronically ill live fewer years.

Chronic illness has a similar effect on Medicare payments, although the level of spending is slightly lower. Annual Medicare expenses increase by about $750 to $2,000 for persons with a serious chronic illness at age 65, while cumulative Medicare expenses increase by $2,500 to $15,000 across the seven chronic conditions.

There are two primary reasons why cumulative expenditures are only modestly different for those with and without the disease at age 65. First, many beneficiaries without a condition at age 65 will develop it in subsequent years. Thus

**Table 3**
**Changes in Average Life Expectancy and Medical Spending Associated with Selected Chronic Conditions at Age 65**

| Disease Condition at Age 65 | Average Reduction in Life Expectancy (years) | Average Increase in Total Health Care Spending (2005 dollars) | |
|---|---|---|---|
| | | Annual | Lifetime |
| Stroke | 3.0 | 1,777 | 4,870 |
| COPD | 2.8 | 1,951 | 7,878 |
| Hypertension | 0.3 | 878 | 12,343 |
| Coronary heart disease | 0.6 | 1,078 | 14,957 |
| Cancer | 2.1 | 1,787 | 15,709 |
| Diabetes | 3.1 | 2,469 | 16,672 |
| Acute myocardial infarction | 2.3 | 1,966 | 17,574 |

SOURCE: Based on Exhibit 6 in Joyce et al., 2005.
NOTE: Dollar figures are inflated from 1999 to 2005 using the medical Consumer Price Index.

the cost savings from better health at age 65 do not accrue indefinitely. Second, the costs incurred in the final year of life are substantial and largely unchanging in relation to disease condition or age. Extending life by several years reduces the high (discounted) costs incurred prior to death, but they cannot be avoided altogether under the current system of care.

Many of these chronic diseases are preventable or their burden can be greatly reduced. Prevention and screening for these conditions could be effective public health measures. However, such efforts will only modestly reduce Medicare's future health care costs.

## What About Obesity?

Analysis using FEM suggests that eliminating any one disease will not dramatically affect future health care costs. But obesity might be an exception to this rule. If it is, then combating obesity could have important implications for Medicare since close to half of the U.S. population is overweight. Obesity is a "double whammy" for Medicare, because it raises annual health care expenditures but does not affect longevity and thus the number of years spent in the Medicare system.

Darius Lakdawalla and his colleagues used FEM to track the health conditions, functional status, and Medicare and total health care spending for obese and nonobese 70-year-old Medicare beneficiaries. The team divided the sample into four categories, based on body mass index (BMI): underweight (BMI 20 or less), normal (BMI 20–24.9), overweight (BMI 25–29.9), and obese (BMI 30 or more). (BMI is weight in kilograms, divided by height in meters squared.) For each weight class, they predicted three sets of health indicators: expected years spent healthy or frail, prevalence of disease in old age, and medical spending in old age.

The research team found no difference in overall life expectancy between an obese 70-year-old and one of normal weight. However, weight has a strong effect on the numbers of disability-free years that a 70-year-old can expect (see Figure 3). The obese can expect only four disability-free life years. They will spend 40 percent more time disabled than their normal weight counterparts, who can expect nearly seven years without disability.

Greater disability translates into higher health care spending. Figure 4 highlights the high costs to Medicare of obese beneficiaries.

Starting at age 70, an obese person will cost Medicare about $149,000, the highest level of any group. Medicare spending on an obese person is 20 percent higher than for the next closest group, the overweight, and 35 percent higher
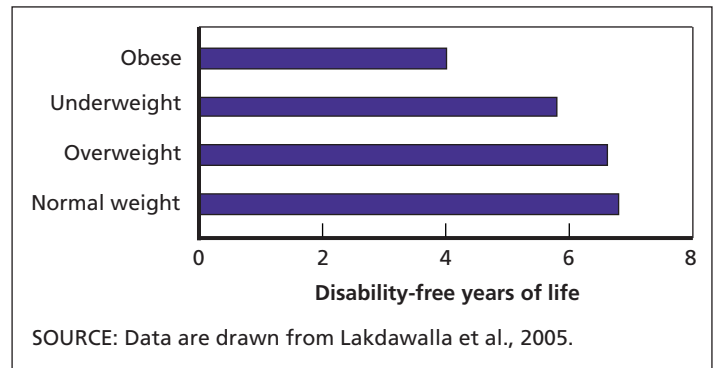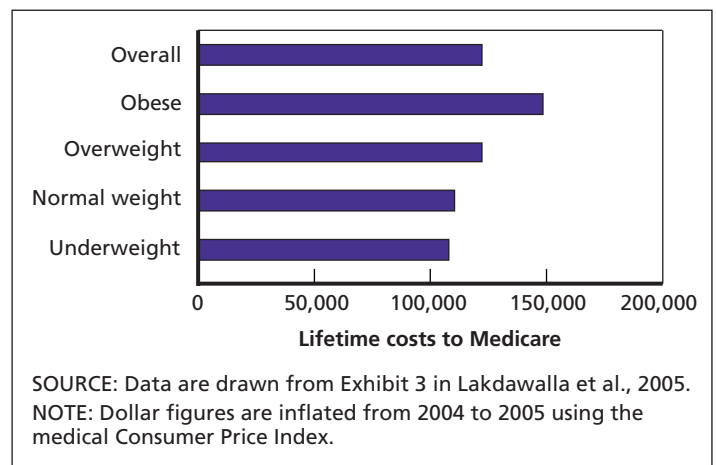
**Figure 3**
**How Weight Affects Disability**



SOURCE: Data are drawn from Lakdawalla et al., 2005.

**Figure 4**
**Projected Lifetime Costs to Medicare (2005 dollars)**



SOURCE: Data are drawn from Exhibit 3 in Lakdawalla et al., 2005.
NOTE: Dollar figures are inflated from 2004 to 2005 using the medical Consumer Price Index.

than spending on a person of normal weight. Thus, Medicare could experience considerable financial burden from the increase in obesity nationwide, spending about $38,000 more over the lifetime of an obese 70-year-old than it will spend on a beneficiary of similar age and normal weight.

However, Lakdawalla and his colleagues argue that the effects of disability from obesity, rather than increased spending, might be the more important component of the social burden of obesity.

Whether treating obesity could lower medical costs and improve health outcomes depends on whether obesity is responsible for the health differences between the obese and their nonobese counterparts. If the relationship is causal, then preventing or curing obesity in any one person would return that person's health care spending level to that of a normal weight person. Given the growing number of obese Americans, the resulting savings to Medicare could be substantial.

## Medicare's Financial Future

The Future Elderly Model is not a clinical management device. Rather, it is a tool that provides a macro view of Medicare's financial future, enabling policymakers to ask "what if" questions about the effects of health status, medical innovation, and chronic disease.

As with past changes in medicine, new technologies will increase health care expenditures because the reduction in spending resulting from better health will be outweighed by the costs of the technologies themselves and by health expenditures during the additional years of life that the technologies may make possible. In addition, technologies with a low per-patient cost may turn out to be very expensive as they are applied to a broader population. Eliminating chronic diseases doesn't save money: The chronically ill are responsible for higher Medicare expenditures, but they do not live as long as beneficiaries without chronic illness. Obesity might be the exception, but the causal links between obesity and the health differences between the obese and the nonobese have yet to be established.

All of these calculations are not meant to imply that innovation is not valuable. Many of these health improvements will allow people to live longer, in better health, and with greater productivity. However, analyses based on FEM suggest that there are no silver bullets for Medicare's fiscal crisis on the foreseeable horizon. ▪

# HEALTH

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