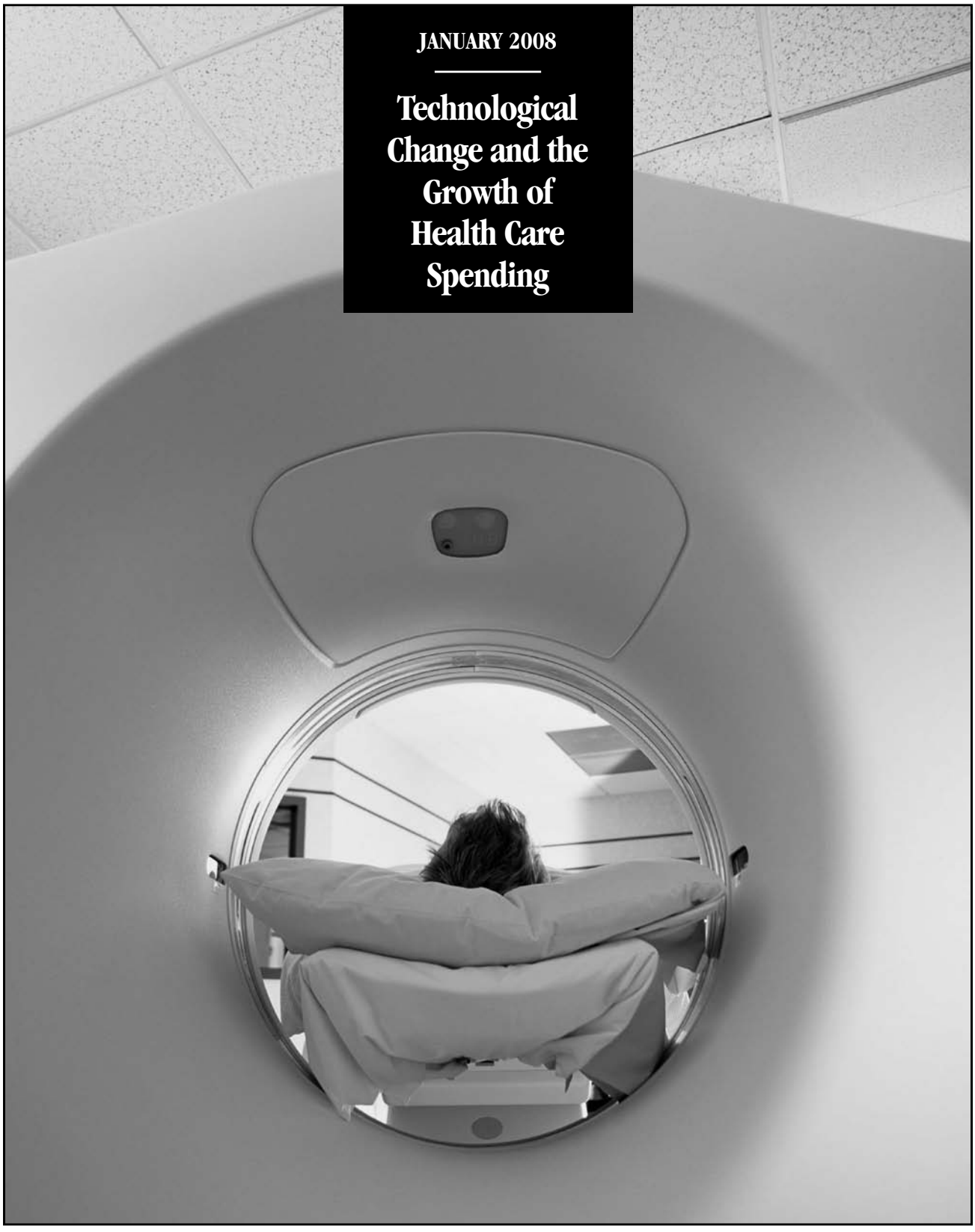
CONGRESS OF THE UNITED STATES
CONGRESSIONAL BUDGET OFFICE

A
CBO
PAPER

JANUARY 2008

Technological Change and the Growth of Health Care Spending



Pub. No. 2764

A

CBO

PAPER

Technological Change and the Growth of Health Care Spending

January 2008

The Congress of the United States ■ Congressional Budget Office

Notes

In this analysis, the Congressional Budget Office (CBO) defines technological advances broadly to include any changes in clinical practice that enhance the ability of providers to diagnose, treat, or prevent health problems.

Unless otherwise specified, historical spending data are for health care services and supplies, a subset of the national health expenditure accounts (Centers for Medicare and Medicaid Services).

Inflation adjustments are made using the gross domestic product implicit price deflator (Bureau of Economic Analysis).

All years are calendar years.

Unless otherwise specified, all spending amounts are in 2005 dollars.

References to the reports that were part of the literature review conducted for this analysis are referred to in footnotes by author's last name, a short title of the work, and the year of publication. Complete citations are given in the bibliography in the section titled "Reports Reviewed by CBO."

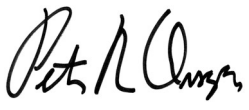
Preface

Health care costs in the United States have grown substantially for decades and are expected to continue to grow in the future. For the federal government, rising health care costs constitute the principal challenge of fiscal policy—no other single factor will exert more influence over the long-term balance of the federal budget. The effects of rising health care costs are not limited to public programs, however. Private payers have experienced similar growth in costs.

This Congressional Budget Office (CBO) paper—written at the request of the Chairman of the Senate Committee on the Budget—describes the historical growth in spending on health care in the United States. It examines the factors that determine health care spending and how they have contributed to spending growth over time. Special emphasis is given to the largest single factor driving spending growth—the greatly expanded capabilities of medicine brought about by technological advances in medical science over the past several decades. Finally, the paper discusses the implications of continued technological change for future growth of health care spending.

Colin Baker of CBO's Health and Human Resources Division wrote the study under the direction of Bruce Vavrichek and James Baumgardner. Noelia Duchovny contributed to the analysis. Tom Bradley, Keith Fontenot, Douglas R. Hamilton, Noah Meyerson, William Randolph, Robert Sunshine, Chapin White, and G. Thomas Woodward of CBO provided useful comments on drafts. The paper also benefited from comments from Joseph P. Newhouse of the Harvard University School of Medicine, Mark S. Freeland and Jeffrey A. Kelman, M.D., of the Centers for Medicare and Medicaid Services, and Jack D. Summer, M.D. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.)

Sherry Snyder edited the paper, and Christine Bogusz proofread it. Maureen Costantino prepared it for publication and designed the cover. Lenny Skutnik printed the initial copies, Linda Schimmel handled the print distribution, and Simone Thomas prepared the electronic version for CBO's Web site (www.cbo.gov).



Peter R. Orszag
Director

January 2008

Contents

Tables

Figures

Boxes

Technological Change and the Growth of Health Care Spending

Summary and Introduction

For nearly all of the past four decades, spending on health care in the United States grew more rapidly than the economy. As a result, the share of national income devoted to health care nearly tripled. This ongoing spending growth pervaded all parts of the health system—including the nation's public insurance programs.

Although many factors contributed to that growth, most analysts have concluded that the bulk of the long-term rise resulted from the health care system's use of new medical services that were made possible by technological advances, or what some analysts term the "increased capabilities of medicine." Major advances in medical science have allowed health care providers to diagnose and treat illness in ways that were previously impossible. Many new services are very costly; others are relatively inexpensive but raise aggregate costs quickly as ever-growing numbers of patients use them. Technological innovation can theoretically reduce costs and, for many types of goods and services, often does. Historically, however, the nature of technological advances in medicine and the changes in clinical practice that followed them have tended to raise spending.

Direct measurement of the impact of technological change on health care spending is difficult. The Congressional Budget Office (CBO), on the basis of a review of the economic literature, concludes that about half of all growth in health care spending in the past several decades was associated with changes in medical care made possible by advances in technology. The factors that account for most of the rest of the growth include rising income and changes in insurance coverage, which increased demand for medical care, as well as rising prices in the health care sector.

Many of the same forces affect both federal and private spending on health care. The growth in federal spending for Medicare and Medicaid that would result from a continuation of these trends constitutes the principal challenge of fiscal policy over the long term. Higher federal spending in the coming decades will result partly from the larger number of Medicare beneficiaries as the leading edge of the baby-boom generation turns 65 starting in 2010. In terms of magnitude, however, future growth in spending per beneficiary will be much more important in determining future spending. If spending per beneficiary is allowed to grow as projected under current law, future budget deficits will rise to levels that could severely jeopardize long-term economic growth unless policymakers sharply reduce other projected spending, substantially increase revenues as a share of gross domestic product (GDP), or do some of both.[1]

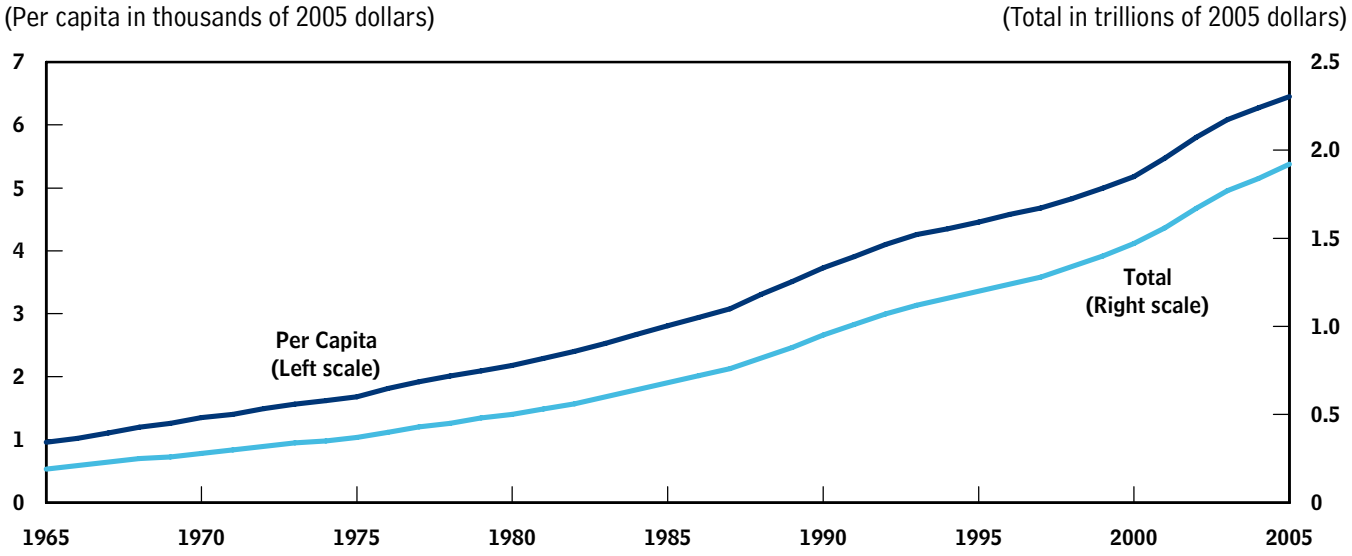
The effects of rising costs are not limited to public programs. For workers with employment-based coverage, the rising cost of health benefits can limit the growth of cash earnings. For people who lack group coverage and are not eligible for public programs, higher per capita health care spending can make individual private coverage prohibitively expensive.

Technological advances are likely to yield new, desirable medical services in the future, fueling further spending growth and imposing difficult choices between spending on health care and spending on other priorities. If the health care system adopts new services rapidly and applies them broadly in the future—as it has tended to do in the

1. For a discussion of long-term budget issues, see Congressional Budget Office, *The Long-Term Budget Outlook* (December 2007); and Congressional Budget Office, *The Long-Term Outlook for Health Care Spending* (November 2007).

Figure 1.

Total and Per Capita Spending on Health Care Services and Supplies, 1965 to 2005



Source: Congressional Budget Office based on data on spending on health services and supplies, as defined in the national health expenditure accounts, maintained by the Centers for Medicare and Medicaid Services.

Note: Spending amounts are adjusted for inflation using the gross domestic product implicit price deflator from the Bureau of Economic Analysis.

past—then large increases in health care spending are likely to continue. If new or existing costly services are used more selectively in the future, smaller increases in health care spending are possible. Because spending growth will depend largely on how the health care system responds to future technological changes, policymakers seeking to limit future cost growth may be particularly interested in the way in which new technologies are incorporated into common practice.

The health care system's rapid adoption of emerging medical technologies has, in many instances, provided enormous clinical benefits, such as prolonged life and improved quality of life. However, the added clinical benefits of new medical services are not always weighed against the added costs before those services enter common clinical practice. Newer, more expensive diagnostic or therapeutic services are sometimes used in cases in which older, cheaper alternatives could offer comparable outcomes for patients. And expensive services that are known to be highly effective in some patients are occasionally used for other patients for whom clinical benefits have not been rigorously demonstrated.

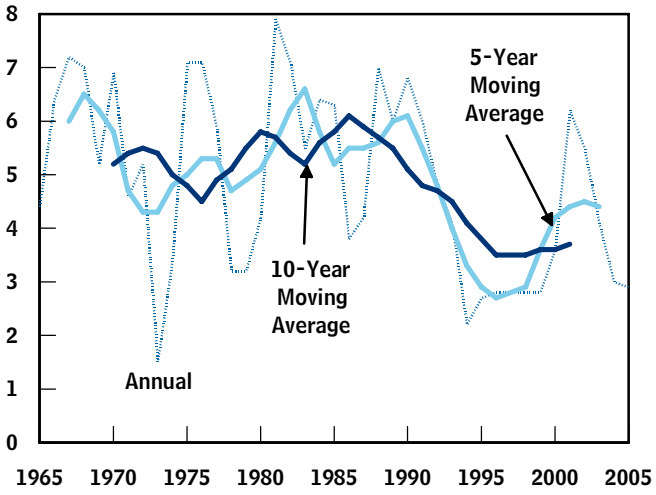
These findings suggest that some medical services could be used more selectively without a substantial loss in clinical value. Research on comparative effectiveness could provide a basis for applying costly new technologies only when they are likely to confer added benefits that are significantly greater than the benefits conferred by less expensive technologies. If placing greater emphasis on providing evidence-based care (encouraged, for example, by appropriate financial incentives for providers and consumers) resulted in the more selective use of some costly services, future spending levels would probably be lower than they would otherwise be—perhaps substantially so. Attaining significant cost savings, however, may require difficult changes to the ways in which providers and patients make decisions concerning medical care.

This CBO paper:

- Examines the growth in health care spending from 1965 to 2005 and projects its growth through 2082,
- Presents empirical evidence concerning the factors underlying the growth of health care spending and presents estimates of their contribution to that growth,

Figure 2.

Growth in Real Per Capita Spending on Health Care, 1965 to 2005



Source: Congressional Budget Office based on data on spending on health services and supplies, as defined in the national health expenditure accounts, maintained by the Centers for Medicare and Medicaid Services.

Note: Spending amounts are adjusted for inflation using the gross domestic product implicit price deflator from the Bureau of Economic Analysis.

The data represent compound moving averages. For example, for the five-year moving average series, the 1990 figure represents the average annual growth from 1987 to 1992; for the ten-year moving average series, the 1990 figure represents average annual growth from 1985 to 1995.

- Discusses selected advances in medical technology and how they affected health care spending, and
- Analyzes the implications of continued technological change for future spending.

Historical Growth in Health Care Spending

Spending on health care services in the United States has grown substantially over the past 40 years (see Figure 1). In 1965, that spending amounted to $187 billion (in 2005 dollars). It more than tripled in real (inflation-adjusted) terms over 20 years, reaching $666 billion in 1985. Over the next 20 years, spending nearly tripled again, reaching roughly $1.9 trillion in 2005.

Spending has also risen rapidly on a per capita basis, with growth averaging around 4.9 percent per year in real terms over the past four decades. By contrast, per capita GDP grew, on average, by only 2.1 percent per year during that period. As a result, health care spending now accounts for a much larger proportion of GDP—nearly 15 percent in 2005 compared with 5 percent in 1965.

Although the growth of health care spending has been continual, the pattern of growth in the mid- to late 1990s differed from that of previous decades (see Figure 2). From 1965 to 1990, annual growth in real per capita spending averaged about 5.5 percent. Despite brief periods of relatively slow growth during that time (for example, 2.4 percent from 1972 to 1974 and 3.2 percent from 1977 to 1979), growth rates never remained low for a sustained period. That pattern changed in the 1990s; from 1994 to 1999, annual growth never exceeded 2.8 percent. Notably, that period of relatively slow growth in health care spending coincided with sustained and relatively rapid overall economic growth, and the share of GDP devoted to health care during those six years remained virtually unchanged (see Figure 3). Since then, however, a combination of slower economic growth and accelerated spending on health care has led to a sharp increase in health care spending as a share of GDP—from 12.5 percent in 1999 to 14.5 percent in 2005.

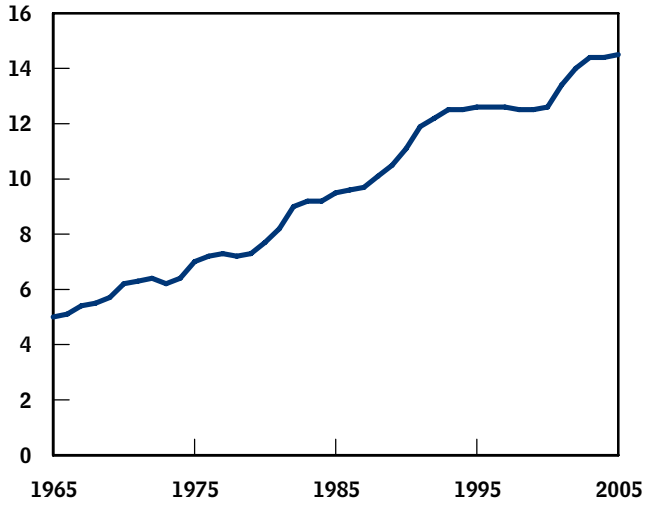
The United States spends more on health care per person than do other industrialized countries. Data from the Organisation for Economic Co-operation and Development (OECD) show that per capita health care spending in the United States in 2005 was nearly twice that in France, Canada, and Germany and roughly two-and-a-half times that in the United Kingdom, Italy, and Japan (see Table 1). The United States also devotes a far greater share of GDP to health care than do many other industrialized nations, even though national income per capita is substantially higher in the United States than in most other OECD countries.

The United States is clearly an outlier in its high level of per capita spending on health care, but other countries have also experienced a high rate of growth in such spending. Although growth rates vary by country and by period, most industrialized countries—even those with a financing system quite different from that in the United States—have experienced a substantial long-term rise in real spending on health care. In fact, growth rates in

Figure 3.

Total Spending on Health Care as a Percentage of Gross Domestic Product, 1965 to 2005

(Percent)



Source: Congressional Budget Office based on data on spending on health services and supplies, as defined in the national health expenditure accounts, maintained by the Centers for Medicare and Medicaid Services.

Note: Spending amounts are adjusted for inflation using the gross domestic product implicit price deflator from the Bureau of Economic Analysis.

per capita spending in some countries have exceeded those in the United States during some periods.

Growth of Various Categories of Health Care Spending

Although total spending on health care rose in real terms each year during the 1965–2005 period, growth rates varied substantially among different categories of health services and supplies identified in the national health expenditure accounts (see Figure 4). Those categories include hospital care, physician and clinical services, prescription drugs, nursing home care, home health care, other professional services, and administrative costs.[2] With the exception of one small category (home health care for a short period), each category has shown steady growth in real spending throughout the 40-year period.[3]

Hospital Care and Physician and Clinical Services. Growth in overall spending is especially sensitive to changes in the rate of growth in spending for hospital and physicians' care because they are the largest categories. Accordingly, most of the long-term growth in total health care spending has resulted from growth in either or both of those categories. Similarly, when spending growth has been relatively slow, it has mainly been the result of slower growth in one or both of those categories. The major slowdown in overall health care spending in the mid- to late 1990s, for example, was almost entirely attributable to slower growth in those two categories.

Prescription Drugs. For much of the past 40 years, spending on prescription drugs contributed only modestly to overall spending growth. The growth of spending on prescription drugs accelerated sharply around 1980, but its relatively small share of total spending at that time limited its effect on total spending. Since the mid-1990s, however, spending on prescription drugs has been a much more prominent component of growth in total spending. From 1995 to 2005, it grew by an average of about 10 percent per year.

Costs of Administering Public and Private Insurance. One notable change is the recent jump in spending for the administration of health insurance (see Figure 4). Growth rates for administrative costs have varied substantially over time, but this category was not a major contributor to overall spending until the late 1990s. From 1995 to 2005, spending on administrative services grew by about 7 percent per year.

Other Categories. Spending on nursing home care, other professional services, and home health care has had highly variable rates of growth, but they have not been major contributors to overall growth.

Projections of Health Care Spending

Total spending on health care has nearly tripled as a share of GDP over the past 40 years, reaching almost

2. The discussion in this section excludes the following categories from the national health expenditure accounts: dental services, durable medical equipment, other nondurable medical products, and other personal health care.

3. This discussion does not consider possible "spillover" effects in which a change in one type of medical spending, such as inpatient hospital care, leads to a partially offsetting change in another type of spending, such as physicians' care.

Table 1.

Expenditures on Health Care in Selected Industrialized Countries, 2005

	Per Capita (2005 dollars)	As a Percentage of GDP	Average Real Annual Growth (Percent)		
			1975 to 1985	1985 to 1995	1995 to 2005
United States[a]	6,401	15.3	4.9	4.2	3.7
Luxembourg	5,563	7.9	3.9	4.9	8.4
Norway	4,364	9.1	4.6	3.8	6.6
Switzerland	4,177	11.6	2.3	2.5	2.9
Austria	3,519	10.2	1.5	6.0	2.5
Iceland	3,443	9.5	5.4	1.7	4.3
Belgium	3,389	10.3	4.1	3.4	4.3
France	3,374	11.1	4.2	3.6	3.0
Canada	3,326	9.8	3.5	1.8	2.9
Germany	3,287	10.7	2.8	1.7	2.0
Australia	3,218 [b]	9.5 [b]	1.5	2.3	4.8 [c]
Netherlands	3,183 [b]	9.2 [b]	1.4	3.1	4.1 [c]
Denmark	3,108	9.1	2.2	0.9	3.3
Sweden	2,918	9.1	2.5	0	3.3
United Kingdom	2,724	8.3	2.4	3.6	4.9
Italy[d]	2,532	8.9	n.a.	1.3 [e]	2.9
Japan	2,426 [b]	8.0 [b]	4.5	2.6	2.9 [c]

Source: Congressional Budget Office based on data from the Organisation for Economic Co-operation and Development.

Notes: Spending amounts are adjusted for inflation using the gross domestic product implicit price deflator from the Bureau of Economic Analysis.

GDP = gross domestic product; n.a. = not available.

a. Corresponding U.S. data in the text differ slightly from those presented here because they are based on health care services and supplies, which omit spending on research and on structures and equipment.

b. Data are for 2004.

c. Represents growth for 1995 to 2004.

d. Data series begins in 1988.

e. Represents growth for 1988 to 1995.

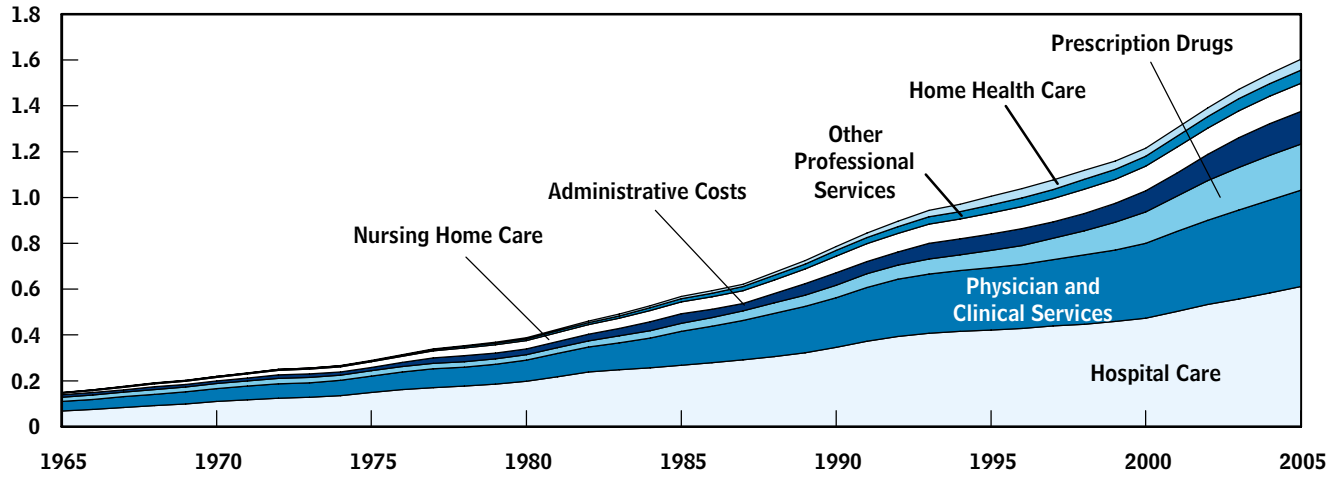
15 percent in 2005. In the absence of an unprecedented change in the long-term trend, health care spending will continue to grow as a share of GDP over the coming decades. According to CBO's projections, which are intended to reflect current federal law, the share of GDP devoted to health care will rise to 31 percent by 2035, 41 percent by 2060, and 49 percent by 2082 (see Figure 5).

Federal spending on Medicare and Medicaid is also projected to grow as a share of total spending on health care. Federal spending on those programs (net of beneficiaries' premiums) now accounts for about 4 percent of GDP. According to CBO's current-law projections, those figures will grow to 9 percent of GDP by 2035 and to 19 percent of GDP by 2082. Growth in per capita health care spending is the main factor underlying the projected increase in both national health care spending and federal spending on Medicare and Medicaid. The projected change in the age composition of the population, by itself, has only a modest effect on future health care spending.

Figure 4.

Real Spending on Health Care in Selected Categories, 1965 to 2005

(Trillions of 2005 dollars)



Source: Congressional Budget Office based on data on spending on health services and supplies, as defined in the national health expenditure accounts, maintained by the Centers for Medicare and Medicaid Services.

Note: Spending amounts are adjusted for inflation using the gross domestic product implicit price deflator from the Bureau of Economic Analysis.

CBO's projections of future spending on health care assume that current federal laws affecting Medicare or Medicaid do not change.[4] Those laws have been altered significantly in the past and are almost certain to be further modified in the future. CBO's current-law projections should therefore not be viewed as predictions of future health care spending but rather as illustrations of the fiscal consequences of existing policies. CBO's estimates are also subject to the inherent uncertainty surrounding any projection of future growth in health care spending, but they provide a useful basis for evaluating possible changes to policy.

Factors Underlying Historical Growth in Health Care Spending

From 1965 to 2005, real health care expenditures per capita increased nearly sixfold in the United States. That large increase was the combined result of many factors, and accounting precisely for all of them is difficult. Nonetheless, the general consensus among health economists is that growth in real health care spending was principally the result of the emergence of new medical technologies and services and their adoption and widespread diffusion by the U.S. health care system.[5]

Challenges in Measuring the Contribution of Technological Change to Rising Costs

Directly measuring the effects of advancing technology on total spending on health care is extremely difficult, for several reasons. One reason is the sheer complexity of

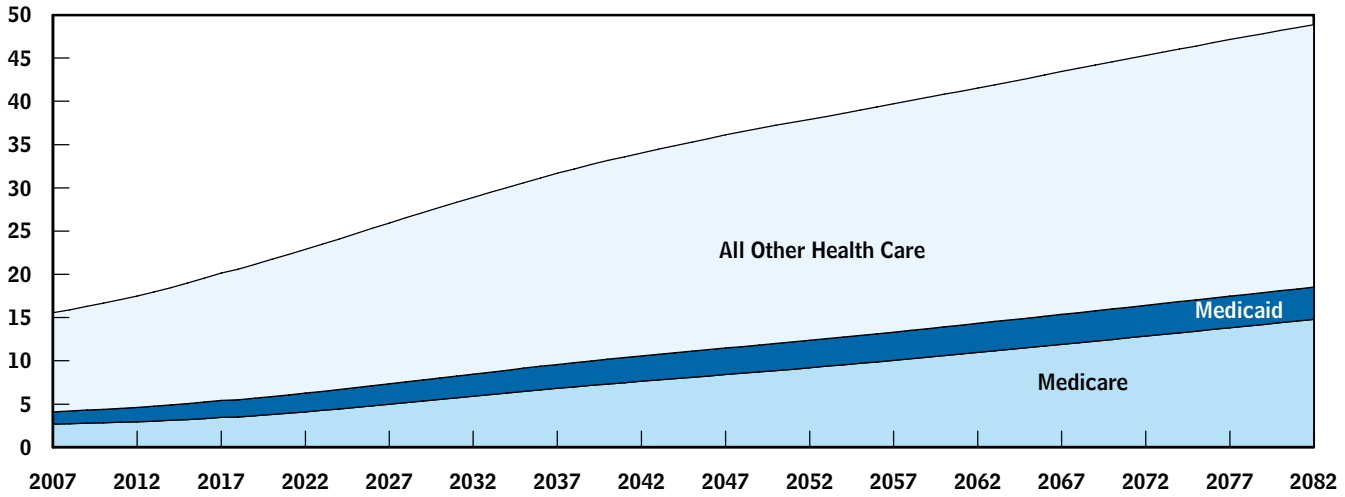
4. CBO's projections for Medicare also assume that the program will continue to pay for benefits as currently scheduled, notwithstanding the projected insolvency of the Medicare Hospital Insurance Trust Fund. Moreover, CBO assumes that future Medicare spending will not be affected by the law that requires the Medicare trustees to issue a "Medicare funding warning" if nondedicated sources of revenue—primarily general revenues—are projected to account for more than 45 percent of the program's outlays; that law does not require the Congress to respond to such a warning by enacting legislation that would reduce Medicare spending. For a detailed discussion of CBO's long-term projections of health care spending, see Congressional Budget Office, *The Long-Term Outlook for Health Care Spending*.

5. This conclusion has been reached by Schwartz, "The Inevitable Failure of Current Cost-Containment Strategies" (1987); Weisbrod, "The Health Care Quadrilemma" (1991); Newhouse, "Medical Care Costs" (1992); and Cutler, "Technology, Health Costs, and the NIH" (1995). See Fuchs, "Economics, Values, and Health Care Reform" (1996), for a discussion of the views of economists on technological change and growth in health care spending.

Figure 5.

Projected Spending on Health Care as a Percentage of Gross Domestic Product, 2007 to 2082

(Percent)



Source: Congressional Budget Office.

Note: Amounts for Medicare are net of beneficiaries' premiums. Amounts for Medicaid are federal spending only.

medical science and its unusually rapid pace of change. Also, technological change occurs simultaneously with changes in other factors that affect health care spending, such as personal income and third-party payment. And those factors themselves influence the pace of technological development, making it difficult to identify exactly how technological change itself affects spending growth.

One way to examine how a specific technological development—and the associated changes in clinical practice—affected spending on specific types of patients is to use a case-study approach. That approach, however, does not allow a comprehensive analysis of how total spending on health care changes with advances in technology.

Another way to approximate the effect of technological change is to do so indirectly, using the "residual" method. Certain demographic and economic factors, such as the aging of the population and rising personal income, are determinants of health care spending; using estimates of the relationships between those factors and spending levels, analysts can estimate how changes in those factors contributed to changes in spending, assuming no changes in medical technology. After accounting for the contributions of as many measurable factors as possible, analysts attribute the unexplained portion of spending growth, or the residual, to technological change and the changes in clinical practice associated with it. This approach yields findings that can be sensitive to assumptions concerning the effects of the various factors. In addition, studies using this approach generally do not account for dynamic interactions between growth of personal income, health insurance coverage, and technology development. Nonetheless, this approach can yield a reasonable approximation of how technological change relates to long-term growth in total health care spending.[6]

6. Another indirect way to measure the effect of technological change on spending is to identify a measurable factor that can serve as a proxy for technological change. For example, some analysts use spending on research and development as a representation of technological change. Each of the various approaches has advantages and disadvantages. Generally, analyses using all of these methods support the finding that most of the long-term rise in health care spending is associated with the use of new medical technologies. For analyses that employ an approach that differs from the one used in this discussion, see Albert A. Okunade and Vasudeva N.R. Murthy, "Technology as a Major Driver of Health Care Costs: A Cointegration Analysis of the Newhouse Conjecture," *Journal of Health Economics*, vol. 21 (2002), pp. 147–159; and Livio di Matteo, "The Macro Determinants of Health Expenditure in the United States and Canada: Assessing the Impact of Income, Age Distribution and Time," *Health Policy*, vol. 71 (January 2005), pp. 23–42.

Table 2.

Estimated Contributions of Selected Factors to Growth in Real Health Care Spending Per Capita, 1940 to 1990

(Percent)

	Smith, Heffler, and Freeland (2000)	Cutler (1995)	Newhouse (1992)
Aging of the Population	2	2	2[a]
Changes in Third-Party Payment	10	13	10[b]
Personal Income Growth	11–18	5	<23
Prices in the Health Care Sector	11–22	19	*
Administrative Costs	3–10	13	*
Defensive Medicine and Supplier-Induced Demand	0	*	0
Technology-Related Changes in Medical Practice	**38–62**	**49**	**>65**

Sources: Congressional Budget Office based on Sheila D. Smith, Stephen K. Heffler, and Mark S. Freeland, "The Impact of Technological Change on Health Care Cost Increases: An Evaluation of the Literature" (working paper, 2000); David M. Cutler, "Technology, Health Costs, and the NIH" (paper prepared for the National Institutes of Health Economics Roundtable on Biomedical Research, September 1995); and Joseph P. Newhouse, "Medical Care Costs: How Much Welfare Loss?" *Journal of Economic Perspectives,* vol. 6, no. 3 (Summer 1992), pp. 3–22.

Notes: Amounts in the table represent the estimated percentage share of long-term growth that each factor accounts for.

< = less than; > = greater than; * = not estimated.

a. Represents data for 1950 to 1987.

b. Represents data for 1950 to 1980.

Empirical Estimates of the Impact of Selected Factors on Cost Growth

Breaking down the long-term growth in spending into its various components leaves much of the increase unaccounted for by measurable factors such as the aging of the population or rising personal income. Table 2 shows estimates from three studies of the contributions of selected factors to the long-term growth of health care spending in the United States. Overall, those factors appear to account for no more than half of that growth. Analysts generally attribute the rest of the growth to increases in the technology-related changes in medical practice.

Aging of the Population. Although elderly people generally incur higher costs for health care than younger people and much of the spending on health care goes toward treating the elderly, the contribution of an aging population to the *growth* in that spending over the long term is smaller than is commonly perceived. The elderly fraction of the population grew during the past four decades, but the growth was too gradual and insubstantial to account for much of the increase in per capita spending. Increased longevity raises average per capita spending, but that effect appears to be modest.[7] CBO estimates that changes in the age distribution from 1965 to 2005, if unaccompanied by changes in other factors affecting health care spending, would have increased total spending by roughly 16 percent, or about 3 percent of the cumulative increase that occurred during that period. Other estimates are generally consistent with this finding (see Table 2).

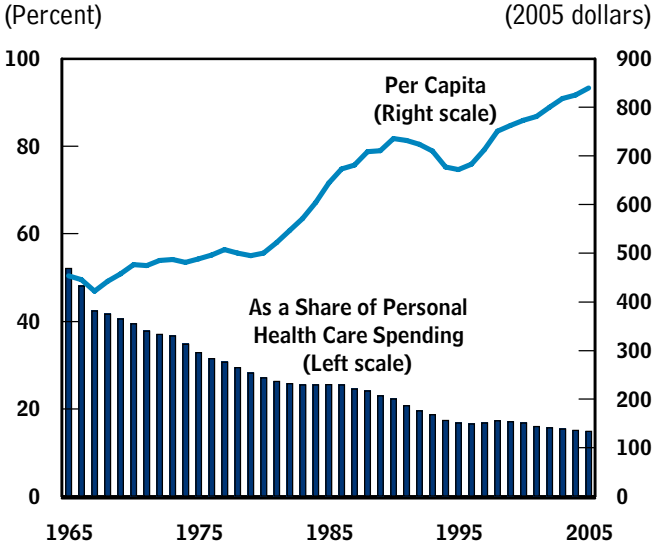
Another population factor—the rising share of the population who are overweight or obese—has also probably contributed to the growth in health care spending. (See Box 1 for a discussion of obesity and its effect on spending growth.)

Changes in Third-Party Payment. More generous third-party payment—from the creation of Medicare and

7. Increased longevity—an improvement in life expectancy at age 65, for example—does lead to higher average Medicare spending per beneficiary but by a relatively small amount. For a discussion of the effects of longevity, see James Lubitz, James Beebe, and Colin Baker, "Longevity and Medicare Expenditures," *New England Journal of Medicine*, vol. 332, no. 15 (1995), pp. 999–1003.

Figure 6.

Out-of-Pocket Spending Per Capita and as a Share of All Personal Health Care Spending, 1965 to 2005



Source: Congressional Budget Office based on data on spending on personal health care, as defined in the national health expenditure accounts, maintained by the Centers for Medicare and Medicaid Services.

Medicaid and subsequent changes to these programs, for example—effectively reduced the average out-of-pocket cost of health care over the past several decades, leading to higher health care expenditures. As a share of all per capita spending on personal health care, consumers' out-of-pocket costs have fallen sharply, from 52 percent in 1965 to 15 percent in 2005 (see Figure 6). Empirical analyses suggest that under an assumption of no change in medical technology, the expansion of insurance coverage can account for 10 percent to 13 percent of the long-term rise in health care spending (see Table 2). That expansion, in turn, could have had a larger effect on spending by hastening the adoption of cost-increasing new technologies.[8]

The effect of health insurance on health care spending is complex. First, expanded third-party coverage fosters greater spending at any point by insulating consumers from part of the cost of medical services, thus encouraging them to consume more services than they otherwise would. That increased demand for services, in turn, contributes to rising health care costs, which further increase consumers' demand for third-party coverage.

Second, health insurance also affects spending through its influence on the development of new technologies over time. Broader access to health insurance coverage, as well as the greater generosity of health insurance plans on average, allows larger financial returns to investment in new medical technologies because both factors contribute to demand for new medical services. Accordingly, a falling share of out-of-pocket health care spending should hasten the development of new technologies, which can lead to higher spending overall.

Rising Personal Income. Economists agree that rising personal income leads to higher spending on health care. Because medical care is a desired service, people naturally demand more of it as their income rises; other things being equal, rising income will lead to an increase in the quantity of medical care demanded and therefore higher total spending. (A relatively high per capita income in the United States, for example, is often cited by economists as explaining a large part of the difference in per capita health spending between the United States and other developed nations.)

There is some uncertainty about how responsive health care spending is to changes in income, however, so reasonable estimates of the contribution of rising income cover a fairly wide range.[9] Published estimates suggest that growth in average income per capita could account for anywhere from 5 percent to approximately 20 percent of long-term spending growth.

8. See Finkelstein, "The Aggregate Effects of Health Insurance" (2005); and Peden and Freeland, "Insurance Effects on U.S. Medical Spending (1960–1993)" (1998).

9. Income elasticity estimates from studies within the United States yield estimates ranging roughly from 0.2 to 0.4; that is, a 10 percent increase in income raises health spending by between 2 percent and 4 percent. Such estimates may not fully reflect the impact of a broad increase in income, though, because people with better health tend to have higher income but lower health spending than people with worse health. As a result, analyses that examine health care spending and incomes across individuals tend to find a smaller increase in spending as incomes rise than would be the case if incomes increased across the board. Analysis of per capita income and health care spending across countries tends to yield (national) income elasticity estimates of 1 or higher; that is, a 10 percent increase in income raises health spending by 10 percent. The difficulty of undertaking cross-country comparisons, however, may bias these estimates upward.

Box 1.

Rising Prevalence of Obesity and Its Impact on Health Care Spending

The fraction of Americans who are overweight or obese has increased in recent years. Obesity raises an individual's risk of serious illnesses such as cardiovascular disease and diabetes, and obese people incur greater health care costs. In 2001, for example, spending for health care per person of normal weight was $2,783, compared with $3,737 per obese person and $4,725 per morbidly obese person (in 2001 dollars; see the table below). A rise in the prevalence of obesity is therefore a likely contributor to the growth of health care spending.

One method for estimating that contribution is to ask how much spending on health care would have risen if the prevalence of obesity was the only factor that changed over time. If health care spending per capita remained at 1987 levels for each category of body weight but the prevalence of obesity changed to reflect the 2001 distribution, health care spending would have risen by only 1.4 percent per capita on average. Because actual spending per capita rose by 34.6 percent, this estimate would imply that the change in the prevalence of obesity could account for about 4 percent of all spending growth from 1987 to 2001. (Note that "prevalence of obesity" here refers to changes in the fraction of people in all categories of body weight, including those who are underweight. The fraction of underweight people—who incur costs that are slightly higher than those of people of normal weight—actually fell during this period.)

Another way to examine the effect of obesity on spending is to ask how much would be saved if the prevalence of obesity returned to that of 1987, given the 2001 levels of spending for each respective category of body weight. That approach implies that changes in the prevalence of obesity account for around 12 percent of the spending growth between 1987 and 2001. The different results generated by the two methods reflect the change in the relative magnitude of spending on obese people compared with spending on people of normal weight. In 1987, spending per morbidly obese person was about 18 percent higher than spending per person of normal weight, but by 2001 it was 70 percent higher.

Distribution of Population Aged 19 or Older and Health Care Spending by Weight Category

	1987		2001	
	Percentage of Population	Spending Per Capita (2001 Dollars)	Percentage of Population	Spending Per Capita (2001 Dollars)
All People	100.0	2,352	100.0	3,166
Underweight	3.6	2,695	1.8	3,092
Normal	51.6	2,259	38.6	2,783
Overweight	31.4	2,322	35.8	3,103
Obese	12.2	2,655	20.7	3,737
Morbidly Obese	1.3	2,674	3.1	4,725

Source: Congressional Budget Office analysis using the National Medical Expenditure Survey (1987 data) and the Medical Expenditure Panel Survey (2001 data).

Note: Weight categories are defined using the body-mass index (BMI)—a measure of body fat based on height and weight that applies to adult men and women—as follows: underweight (BMI is less than or equal to 18.5); normal (greater than 18.5 and less than 25); overweight (greater than or equal to 25 and less than 30); obese (greater than or equal to 30 and less than 40); and morbidly obese (greater than or equal to 40).

Prices in the Health Care Sector. Some analysts suggest that a rise in the prices of medical goods and services relative to prices outside the health care sector is a source of growth in real per capita spending, although the magnitude of its contribution is highly uncertain. Available estimates suggest that rising prices in the health care sector can account for at most about one-fifth of the long-term real increase in health care spending.

Measuring the impact of price changes on spending for health care presents particularly difficult methodological challenges because many of the available measures of price changes are misleading. For example, the average cost of a day in the hospital has risen dramatically, and many commonly prescribed drug products are far more expensive than their counterparts from past decades. These figures do not provide a meaningful illustration of price changes, however, because they obscure vast improvements in the value and quality of care. The medical care component of the consumer price index may not account sufficiently for changes in the quality of medical services over time.

If productivity growth in the health care sector is slower than that in other sectors of the economy, then the price of medical care may rise relative to the overall price level. Such an increase is especially likely if the demand for medical care is relatively insensitive to changes in price, as most analysts believe it is. In certain parts of the health care sector, productivity gains are relatively hard to achieve; examples include nursing home-related services or basic care delivery. Rising prices may therefore have contributed to higher real spending for these needed services. Other parts of the health care sector, however, have probably experienced rapid productivity growth, which may have lowered prices, so it is difficult to say how productivity and prices have changed for the health care sector as a whole. The estimates of the contribution of price changes to real spending growth shown in Table 2 reflect assumptions of relatively slow growth in productivity in the health care sector and therefore may overstate the contribution of prices in that sector to long-term spending growth.

Administrative Costs. Estimating the contribution of changing administrative costs to growth in overall health care spending is complicated, for several reasons. First, reliable, comprehensive data are difficult to find.[10] The national health expenditure accounts provide data on the costs of administering government health programs and on net spending on private insurance policies (revenues from premiums minus medical payments).[11] These data, however, omit clerical work performed by providers or their staff.

Even if reliable comprehensive data were available, they would be difficult to interpret because certain types of administrative activity probably help reduce health care spending, making the net effect on total cost growth unclear. More intensive review of the use of medical services for clinical appropriateness, for example, may help deter the provision of costly services that confer little clinical value. The largest estimate shown in Table 2—13 percent of aggregate cost growth—reflects an attempt to gauge the maximum possible impact that administrative costs could have had on long-term spending growth. Other estimates range from 3 percent to 10 percent.

Defensive Medicine and Supplier-Induced Demand. "Defensive medicine" refers to services that have little or no clinical value but that physicians order or perform at least partly to avoid lawsuits. Although this type of practice is often cited as a factor underlying rising health care costs, most empirical analyses conclude that its contribution to the long-term growth of health care spending has been negligible (see Table 2).

The costs imposed by defensive medicine are difficult to measure. One reason is that estimates of the extent of that practice often rely on conjectural surveys of providers, and what one provider may consider to be defensive medicine may be deemed prudent medicine by another.[12]

Some analysts have suggested that changes in medical malpractice law, such as limits on noneconomic damages, could reduce the practice of defensive medicine and thereby lower health care spending by reducing the use of medical services. Several states have imposed various

10. For a discussion of the challenges of measuring administrative costs, see Henry J. Aaron, "The Costs of Health Care Administration in the United States and Canada—Questionable Answers to a Questionable Question," *New England Journal of Medicine*, vol. 349, no. 8 (August 21, 2003), pp. 801–803.

11. As a percentage of all spending on health services and supplies, "administration and net cost of private health insurance" has grown from 4.9 percent in 1965 to 7.7 percent in 2005.

12. For a discussion of this point, see U.S. Congress, Office of Technology Assessment, *Defensive Medicine and Medical Malpractice*, OTA-H-6O2 (July 1994).

types of tort limits. A recent CBO analysis examined whether those state policies affected health care spending. Although CBO found some links between tort limits and health care spending in those states, the results were inconsistent and sensitive to the specifications of the model.[13] Overall, there is little reliable evidence suggesting that defensive medicine is a major cause of increasing medical care costs. (In contrast, perceptions of malpractice liabilities may cause physicians to be more sensitive to the practice norms in their local areas than would otherwise be the case. And variations in those norms may contribute to the significant regional variation observed in the level of health care costs across the United States. That variation will be explored in a forthcoming CBO study.)

Providers who are paid on a fee-for-service basis are able to affect their own income by exerting influence over the volume of services they provide. Physicians may respond to fee reductions, for example, by increasing their supply of services to offset some of the lost revenue—a practice referred to as supplier-induced demand.[14] Many economists believe that induced demand affects health care spending, but there is no consensus on the magnitude of the effect. Even if induced demand accounted for a substantial part of the *level* of health care spending at any point in time, analyses of long-term spending *growth* have not found it to be a large factor. In a recent CBO analysis that examined the sources of growth in Medicare spending on physicians' services from 1997 to 2005, physicians' behavioral responses to changes in fees were found to account for only a small part of that growth.[15]

Contribution of Technological Change to the Growth of Health Care Spending

On the basis of a review of the economic literature, CBO concludes that roughly half of the increase in health care spending during the past several decades was associated with the expanded capabilities of medicine brought about by technological advances.

Expanded Capabilities of Health Care From Technological Change

CBO defines technological advances as changes in clinical practice that enhance the ability of providers to diagnose, treat, or prevent health problems. Technological advances take many forms. Examples include new drugs, devices, or services, as well as new clinical applications of existing technologies (providing a particular service to a broader set of patients, for example). Other technological changes are newly developed techniques or additions to knowledge.

Medical breakthroughs occasionally create new types of therapies that enable providers to treat conditions they previously could not treat or could not treat effectively or aggressively. In such cases, new financial costs are incurred where little or no costs had been incurred before. Other advances in knowledge or technical capabilities bring the benefits of existing methods or services to much wider patient populations, increasing spending. Even when technological innovation leads to a decline in the cost of a given service, net spending rises if the use of services increases sufficiently. Innovation can also make older treatments more costly than they would otherwise be.

New curative therapies with one-time costs could reduce spending if they obviated the need for costlier treatments. (See Box 2 for a discussion of possible future advances in medical science that could affect health care spending.) Many advances in medical science, however, do not fall into that category. In fact, many of the most notable medical advances in recent decades involve ongoing treatments for the management of chronic conditions such as diabetes and coronary artery disease.

Advances in Medical Technology That Increase Health Care Spending

Advances in medical science during the past several decades have greatly increased the set of available medical services, allowing practitioners to treat patients in ways that were not previously possible. Most health policy analysts agree that the long-term increase in health care spending is principally the result of the health care system's incorporation of these new services into clinical

13. Congressional Budget Office, *Medical Malpractice Tort Limits and Health Care Spending* (April 2006).

14. See Thomas G. McGuire and Mark V. Pauly, "Physician Response to Fee Changes with Multiple Payers," *Journal of Health Economics*, vol. 10 (1991), pp. 385–410.

15. Congressional Budget Office, *Factors Underlying the Growth in Medicare's Spending for Physicians' Services* (June 2007).

Box 2.

Can New Technology Reduce Spending?

Advances in medical care can reduce spending in some instances. Some vaccines, for example, may offer the potential for savings, and certain types of preventive medical care may help some patients avoid costly hospitalizations for acute care. But, overall, examples of new treatments for which long-term savings have been clearly demonstrated are few. Many medical advances to date have increased spending because they made treatments available for conditions that were previously impossible to treat or were not aggressively treated. Furthermore, improvements in medical care that decrease mortality by helping patients avoid or survive acute health problems paradoxically increase overall spending on health care because surviving patients live longer and therefore use health services for more years.

Future advances—in molecular biology and genetics, in particular—may one day offer the possibility of savings if they make curative therapies available. Continued advances in understanding the genetic origins of disease offer the credible possibility that future providers will accurately predict the health risks faced by individual patients and design therapies tailored specifically to them. Some therapies may involve the insertion of healthy genes into tissue in order to compensate for damaged or missing genes; others might be aimed at the signaling processes within and between cells that initiate cell growth or metabolic activity. Major illnesses such as cancer, Lou Gehrig's disease, Huntington's disease, epilepsy, cystic fibrosis, and glaucoma may be targeted at their genetic origins. Treatment for coronary artery disease may include therapies that target the genes that regulate cholesterol; other therapies may stimulate repairs to damaged heart muscle or new vessel growth for vascular disease. Compared with some existing therapies that manage—often over many years—the effects of chronic disease, new therapies that target the genetic origins of disease may yield savings, but predicting how they would affect spending is very difficult. And most of these therapies are not likely to be a practical reality in the near term.

Note: For a discussion of technological advances and their implications for future medical therapies, see Schwartz, *Life Without Disease* (1998); Schwartz, "In the Pipeline" (1994); and Potts and Schwartz, "The Impact of the Revolution in Biomedical Research on Life Expectancy by 2050" (2004).

practice. Although compiling an exhaustive list of technological advances that have affected medical costs is not possible, a qualitative discussion of selected major scientific advances and the changes in clinical practice that followed them can help illustrate how technological progress has been accompanied by more spending.[16]

Revascularization for Coronary Artery Disease. In the 1950s and much of the 1960s, caring for patients with coronary artery disease was inexpensive because physicians could do little to help them. A typical treatment for patients suffering a heart attack was prolonged bed rest and morphine. Discomfort from chest pain was treated with nitroglycerin, with limited results. Since then, major advances in medical technology have provided an array of treatment options.

One such major advance was coronary angiography, which enabled physicians to observe blood flow and assess blockages. This new procedure greatly improved the diagnosis of heart disease, but it also increased the average cost of care for patients with that ailment. The number of angiographies per year has risen dramatically over the past few decades (see Figure 7).

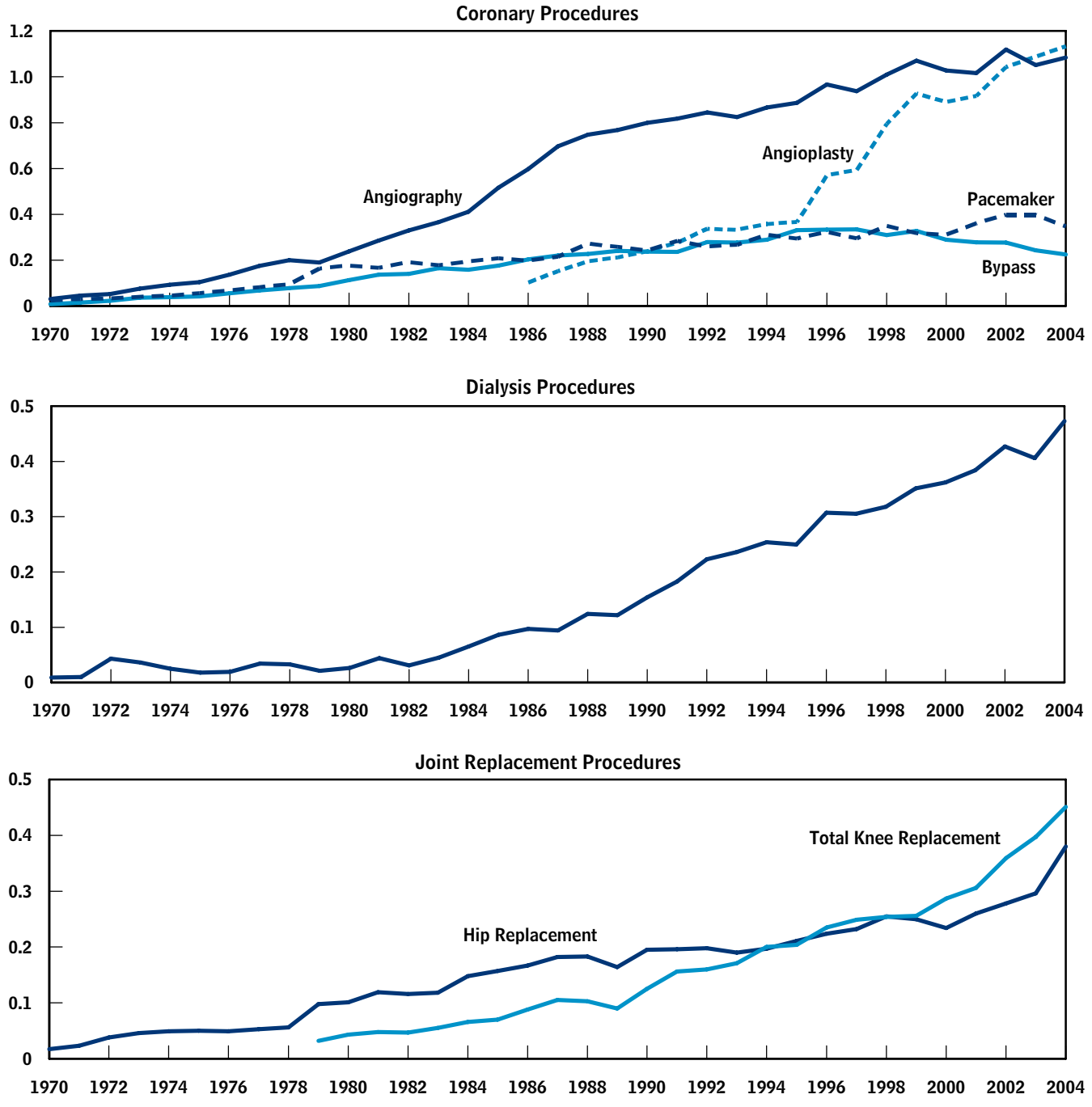
The invention of the heart-lung machine and other advances enabled physicians to perform coronary bypass surgery starting in the 1960s. That procedure increased costs by introducing an entirely new category of highly beneficial therapy for many patients. Although bypass

16. For a detailed discussion of technology-related changes in medical care that have affected spending, see Aaron and Schwartz, *Can We Say No?* (2005); and Cutler, *Your Money or Your Life* (2004).

Figure 7.

Use of Selected Health Care Procedures by People Aged 50 or Older, 1970 to 2004

(Millions)



Source: Congressional Budget Office based on data from the National Center for Health Statistics.

surgery was initially quite risky, advances in technique over time eventually allowed it to be performed on patients who were previously considered too frail for the procedure. As a result, more patients underwent bypass surgery, thereby increasing total spending. The number of bypass surgeries per year rose steadily throughout the 1970s and 1980s (see Figure 7). In recent years, the number of bypass surgeries has tapered off, possibly in part because of an increasingly common treatment alternative—coronary angioplasty.

Developed in the 1970s, coronary angioplasty increases blood flow through narrowed or blocked arteries. Like bypass surgery, it is a revascularization procedure intended to improve blood flow to the heart. Its basic purpose is similar to that of bypass surgery, but because it can be provided at a lower cost per procedure, angioplasty offered a theoretical possibility of reducing costs for certain patients. The availability of angioplasty, however, did not reduce total costs, for several reasons. Because the procedure offered clinical benefits without the trauma of open-heart bypass surgery, patients who otherwise might not have undergone revascularization did so. Also, recurrence of artery blockage following angioplasty was frequent at first, leading to many repeat procedures, and some unsuccessful angioplasties were followed eventually by bypass surgery anyway. Although its availability may have averted more costly bypass procedures in some cases, total spending for heart disease patients increased after angioplasty was introduced.[17] Growth in the number of angioplasties per year has been especially rapid since the mid-1990s.

In some cases, the costs of treating coronary disease rose not just because of more frequent procedures but also because of rising costs per procedure. One notable cost-increasing change in angiography, for example, involved the contrast media used to view the arteries. In the early 1990s, newer "nonionic" contrast media reduced the risk of adverse reactions compared with older materials, but its use was controversial because of its far greater cost. Eventually, use of the more expensive contrast media became essentially universal in the United States.[18]

Angioplasty has also evolved to include adjuncts such as coronary stents, which have also increased the average cost per procedure.

Some patients with acute heart disease undergo thrombolytic therapy, which is aimed at dissolving a clot that is blocking blood flow in a diseased artery. In the 1990s, a new thrombolytic product called alteplase offered a small but significant benefit compared with an older thrombolytic agent, streptokinase. The cost of the newer product was many times more than that of the older one, but its use eventually became a virtual standard for thrombolytic therapy.

Renal Replacement Therapy for Kidney Failure. Until techniques and devices were developed that could perform the waste-removing functions of the kidneys (renal replacement therapy), patients who suffered severe kidney failure tended to die quickly. The development of renal dialysis therapy and the many improvements made to it over the past several decades have vastly improved the ability of providers to care for these patients.

Over time, new techniques and improved, costlier devices have made it possible for dialysis therapy to clean blood more quickly and thoroughly, thereby reducing treatment times and side effects. These advances increased costs in two ways. First, they led to higher costs per treatment. Second, they enabled more patients to remain in treatment longer, accumulating greater total costs.

Improved survival among patients with end-stage renal disease, for example, has meant that more individuals are undergoing dialysis therapy for longer periods. Also, the clinical criteria governing who may undergo renal replacement therapy have expanded over time. For example, patients with renal failure who also had diabetes were not considered eligible for renal replacement therapy 20 years ago; today, nearly half of all dialysis patients are

17. David M. Cutler and Robert S. Huckman, "Technological Development and Medical Productivity: The Diffusion of Angioplasty in New York State," *Journal of Health Economics*, vol. 22, no. 2 (2003), pp. 187–217.

18. See B.J. Barrett and others, "A Comparison of Nonionic, Low-Osmolality Radiocontrast Agents with Ionic, High-Osmolality Agents During Cardiac Catheterization," *New England Journal of Medicine*, vol. 326, no. 2 (February 13, 1992), pp. 431–436; and K.J. Mortele and others, "Universal Use of Nonionic Iodinated Contrast Medium for CT: Evaluation of Safety in a Large Urban Teaching Hospital," *American Journal of Roentgenology*, vol. 184 (2005), pp. 31–34.

diabetic.[19] The number of dialysis treatments per year rose dramatically over the past 25 years (see Figure 7).[20]

Improved survival through dialysis therapy means that patients now have a longer wait for another costly treatment for renal failure—kidney transplantation. A number of technical advances in recent decades, including new drug products to prevent rejection of donor kidneys, have led to substantial improvements in the prospects for patients undergoing kidney transplantation.

Bone Marrow (Stem Cell) Transplantation. A number of illnesses can prevent the body from producing vital platelets and blood cells. One such condition, aplastic anemia, was treated successfully with bone marrow transplantation for the first time in the late 1960s. A bone marrow transplant, or stem cell therapy, involves transferring healthy cells from donors into patients whose bodies cannot produce blood cells. [21] Initially, this procedure was used in treating the relatively small number of patients with aplastic anemia, as well as some patients with leukemia or certain disorders of the immune system, and few patients over the age of 40 were viewed as candidates for the procedure. Over time, technological advances have broadened the set of patients who can be treated to include those with multiple myeloma, lymphoma, sickle cell disease, and other conditions. One major advance in the 1990s was the development of autologous transplantation, which enables providers to obtain "donor" cells from the patient. This advance has greatly expanded the set of patients who are candidates for this type of therapy.

Neonatal Intensive Care. Many years ago, the health care system spent very little on low-birthweight babies because few effective therapies were available. Today, many valuable treatments are available. Ventilators suitable for infant care have been improved. Delivery of nutrition to very sick infants has been aided by advances in intravenous methods. Clinical monitoring of the heart, blood pressure, and other vital indicators is far more advanced today than in decades past. Estimated costs for low-birthweight infants today are about 10 times those for infants of normal weight, principally because of the use of advanced treatments.[22]

Joint Replacement. Since the introduction of the first successful hip replacements in the 1960s, newer metals and plastics have allowed the development of stronger, longer-lasting materials that are less subject to corrosion and produce better long-term outcomes. In part because of the availability of better artificial joints and improved outcomes, surgery for total or partial hip replacement and knee replacement is increasingly common in the United States. During the 25 years from 1979 to 2004, the number of hip and knee replacements per year increased substantially (see Figure 7).

Diagnostic Imaging. Before today's noninvasive diagnostic imaging methods became available, reliable diagnoses often required exploratory surgery, which posed clinical risks and caused patients considerable discomfort. Recent technological advances, however, have led to powerful new diagnostic imaging capabilities. Newly developed diagnostic scans may be far less costly per procedure than exploratory surgery, but by their nature they invite much greater use and therefore tend to increase total spending compared with previous methods.

Computed axial tomography imaging, which produces a digital cross-section image, or "slice," of the body, came into use in the 1970s. The imaging process was slow at first, but subsequent improvements in computing power and imaging speed made it possible to create hundreds of images in just seconds. Magnetic resonance imaging, which can produce images of superior quality in some cases, became available in the 1980s.

The introduction and continual improvement of these imaging techniques effectively reduced the cost of producing a diagnostic image of any given level of quality. Improvements in quality and rapid growth in the use of those techniques, however, led to higher total spending on diagnostic services. To understand how these new imaging techniques affected health care spending, it is instructive to draw a comparison with personal computer technology and information technology in general. As technological innovations enabled more powerful computer processing at a fraction of the previous cost, total

19. See Aaron and Schwartz, *Can We Say No?* (2005).

20. These data, which are from the National Center for Health Statistics, represent hospital discharges with dialysis listed among the procedures.

21. This procedure was renamed stem cell therapy because the relevant cells may be obtained from blood as well as from bone marrow.

22. See Cutler and Meara, *The Technology of Birth* (1999).

spending on computers did not decrease. Instead, it increased dramatically as more consumers made greater use of what became available. Similarly, continued innovation in imaging technology tended to increase total spending, even as the effective cost of diagnostic imaging fell.

Advances in diagnostic capability, by furnishing more detailed clinical information, may also indirectly increase spending by spurring the provision of a greater quantity of therapeutic services than would have been provided otherwise.

Implications for Future Spending on Health Care

The nation's long-term fiscal balance will be determined primarily by future growth in health care costs. Current policies governing spending on Medicare and Medicaid will be unsustainable in the decades to come if historical patterns of rising health care costs continue. Straightforward changes to the Medicare and Medicaid programs, such as more stringent eligibility criteria, greater cost sharing, or changes in provider payments, could reduce federal spending in part by shifting costs from the federal government to households. Ultimately, however, such cost-shifting approaches are unlikely to be sustainable, and controlling federal spending on health care while maintaining broad access to care under these programs will therefore almost certainly need to be associated with slower cost growth in the health care sector as a whole.

Efforts to control health care spending can have two distinct possible effects: One is to lower the level of current spending; the other is to reduce the rate at which spending grows. Because one type of effect is easily mistaken for the other, formulating cost-control policies for the long term requires a clear distinction between components of the spending *level* and factors that drive spending *growth*. One-time spending reductions, such as those achieved by eliminating wasteful or inefficient practices, help relieve cost pressures. For example, managed care organizations have traditionally reduced spending by lowering hospital admission rates, thus eliminating putatively unnecessary or low-valued hospitalizations. Although this reduces expenditures, it does not affect the factors that tend to increase spending over time, such as technological change. Controlling spending by targeting waste requires ever-greater efficiencies, and once attainable savings have been exhausted, faster spending growth will resume if other factors affecting growth are not addressed.[23]

According to available estimates, the main factors underlying long-term spending growth are technology-related changes in clinical practice, a growing share of funding from third-party payers (and thus a declining out-of-pocket share of medical spending), rising income, and rising prices in the health care sector. Among these factors, technological change and cost sharing are perhaps the most amenable to changes in policy. Since technological change is the biggest contributor, an effective long-term strategy for controlling health care spending will probably have to address the health care system's way of incorporating new technologies into practice.

Future increases in spending could be moderated if costly new medical services were adopted more selectively in the future than they have been in the past and if diffusion of existing costly services was slowed. Although this approach would mean that fewer medical services were available, evidence suggests that savings are possible without a substantial loss of clinical value. Current financial incentives facing both providers and patients tend to encourage or at least facilitate the adoption of new, expensive medical services, and the added clinical benefits of new services are not always weighed against added costs before these services enter common clinical practice. Newer, more expensive services are sometimes used in cases in which older, cheaper alternatives could offer comparable outcomes for patients; costly services that are known to be highly effective in some types of patients are sometimes provided to other patients for whom clinical benefits have not been rigorously demonstrated.

More information on the comparative effectiveness of alternative medical treatments could offer a basis for ensuring that future technologies and existing costly services are used only in cases in which they confer clinical benefits that are superior to those of other, cheaper services.[24] A greater emphasis on evidence-based delivery of health care (encouraged, for example, by appropriate

23. Growth rates of spending in managed care plans have historically resembled those in other types of plans. See Glied, "Managed Care" (2000).

24. For a discussion of comparative effectiveness, see Congressional Budget Office, *Research on the Comparative Effectiveness of Medical Treatments: Issues and Options for an Expanded Federal Role* (December 2007).

financial incentives for providers and consumers) might allow future spending levels to be lower than they would otherwise be if that emphasis resulted in some costly services being used more selectively. To affect medical treatment and reduce health care spending, the results of comparative effectiveness analyses would ultimately have to change the behavior of doctors and patients—that is, to get them to use fewer services or less intensive and less expensive services than are currently projected. Bringing about those changes would probably require action by public and private insurers to incorporate the results into their coverage and payment policies in order to affect the incentives facing doctors and patients. Such actions are likely to be difficult to implement and might prove controversial among both providers and patients.

The Medicare program has not taken costs into account in determining what services are covered and has made only limited use of data on comparative effectiveness in its payment policies; but if statutory changes permitted it, Medicare could use information about comparative effectiveness to promote higher-value care. For example, Medicare could tie its payments to providers to the cost of the most effective or most efficient treatment. If that payment was less than the cost of providing a more expensive service, then doctors and hospitals would probably elect not to provide it—so the change in Medicare's payment policy would have the same practical effect as a coverage decision. Alternatively, enrollees could be required to pay for the additional costs of less effective procedures (although the impact on incentives for patients and their use of care would depend on whether and to what extent they had supplemental insurance coverage that paid some or all of Medicare's cost-sharing requirements).

Bibliography

The references cited in this Congressional Budget Office (CBO) paper fall into three categories:

- Reports that were part of the literature review conducted for this analysis;
- CBO publications that have focused on the long-term growth of spending on health care; and
- Related studies and publications.

Reports Reviewed by CBO

Aaron, Henry J., and William B. Schwartz. *Can We Say No?* Washington, D.C.: Brookings Institution Press, 2005.

Cutler, David M. "Technology, Health Costs, and the NIH." Paper prepared for the National Institutes of Health Economics Roundtable on Biomedical Research, September 1995.

———. *Your Money or Your Life: Strong Medicine for America's Health Care System*. New York: Oxford University Press, 2004.

Cutler, David M., and others. "Are Medical Prices Falling?" *Quarterly Journal of Economics*, vol. 113, no. 4 (1998), pp. 991–1024.

Cutler, David M., and Ellen Meara. *The Technology of Birth: Is It Worth It?* Working Paper No. 7390. Cambridge, Mass.: National Bureau of Economic Research, October 1999.

Finkelstein, Amy. *The Aggregate Effects of Health Insurance: Evidence from the Introduction of Medicare*. Working Paper No. 11619. Cambridge, Mass.: National Bureau of Economic Research, September 2005.

Fuchs, Victor. "Economics, Values, and Health Care Reform." *American Economic Review*, vol. 86, no. 1 (1996), pp. 1–24.

Glied, Sherry. "Managed Care." In *Handbook of Health Economics*, vol. 1A, ed. by Anthony J. Culyer and Joseph P. Newhouse, pp. 707– 753. New York: Elsevier Science, 2000.

Newhouse, Joseph P. "An Iconoclastic View of Health Cost Containment." *Health Affairs*, vol. 12, Supplement (1993), pp. 154–171.

———. "Medical Care Costs: How Much Welfare Loss?" *Journal of Economic Perspectives*, vol. 6, no. 3 (Summer 1992), pp. 3–22.

Peden, Edgar A., and Mark S. Freeland. "Insurance Effects on U.S. Medical Spending (1960–1993)." *Health Economics*, vol. 7, no. 8 (1998), pp. 671–687.

Potts, John T., and William B. Schwartz. "The Impact of the Revolution in Biomedical Research on Life Expectancy by 2050." Chap. 1 in *Coping with Methuselah: The Impact of Molecular Biology on Medicine and Society*, ed. by Henry J. Aaron and William B. Schwartz. Washington, D.C.: Brookings Institution Press, 2004.

Schwartz, William B. "The Inevitable Failure of Current Cost-Containment Strategies: Why They Can Provide Only Temporary Relief." *Journal of the American Medical Association*, vol. 257, no. 2 (1987), pp. 220–224.

———. *Life Without Disease: The Pursuit of Medical Utopia*. Los Angeles: University of California Press, 1998.

———. "In the Pipeline: A Wave of Valuable New Medical Technology." *Health Affairs,* vol. 13, no. 3 (1994), pp. 70–79.

Smith, Sheila D., Stephen K. Heffler, and Mark S. Freeland. "The Impact of Technological Change on Health Care Cost Increases: An Evaluation of the Literature." Working paper, 2000.

Weisbrod, Burton A. "The Health Care Quadrilemma: An Essay on Technological Change, Insurance, Quality of Care, and Cost Containment." *Journal of Economic Literature*, vol. 29 (1991), pp. 523–532.

CBO Publications

Research on the Comparative Effectiveness of Medical Treatments: Issues and Options for an Expanded Federal Role (December 2007).

The Long-Term Budget Outlook (December 2007).

The Long-Term Outlook for Health Care Spending (November 2007).

Factors Underlying the Growth in Medicare's Spending for Physicians' Services (June 2007).

Medical Malpractice Tort Limits and Health Care Spending (April 2006).

Related Works

Aaron, Henry J. "The Costs of Health Care Administration in the United States and Canada—Questionable Answers to a Questionable Question." *New England Journal of Medicine*, vol. 349, no. 8 (August 21, 2003), pp. 801–803.

Aaron, Henry J., and William B. Schwartz. *The Painful Prescription: Rationing Hospital Care*. Washington, D.C.: Brookings Institution Press, 1984.

Barrett, B.J., and others. "A Comparison of Nonionic, Low-Osmolality Radiocontrast Agents with Ionic, High-Osmolality Agents During Cardiac Catheterization." *New England Journal of Medicine*, vol. 326, no. 2 (February 13, 1992), pp. 431–436.

Baumgardner, James R. "The Interaction Between Forms of Insurance Contract and Types of Technical Change in Medical Care." *RAND Journal of Economics*, vol. 22, no. 1 (1991), pp. 36–53.

Bodenheimer, Thomas. "High and Rising Health Care Costs Part 2: Technologic Innovation." *Annals of Internal Medicine*, vol. 142, no. 11 (2005), pp. 932–937.

Cutler, David M. "Equality, Efficiency, and Market Fundamentals: The Dynamics of International Medical Care Reform." *Journal of Economic Literature*, vol. 40, no. 3 (2002), pp. 881–906.

Cutler, David M., and Robert S. Huckman. "Technological Development and Medical Productivity: The Diffusion of Angioplasty in New York State." *Journal of Health Economics*, vol. 22, no. 2 (2003), pp. 187–217.

Cutler, David M., and Mark McClellan. "Is Technological Change in Medicine Worth It?" *Health Affairs*, vol. 20, no. 5 (2001), pp. 11–29.

di Matteo, Livio. "The Macro Determinants of Health Expenditure in the United States and Canada: Assessing the Impact of Income, Age Distribution and Time. *Health Policy*, vol. 71 (January 2005), pp. 23–42.

Goddeeris, John H. "Insurance and Incentives for Innovation in Medical Care." *Southern Economic Journal*, vol. 51, no. 2 (1984b), pp. 530–539.

Goldman, Dana, and others. "Consequences of Health Trends and Medical Innovation for the Future Elderly." *Health Affairs*, Web Exclusive (September 26, 2005), pp. R5–R17.

Kling, Arnold. *Crisis of Abundance: Rethinking How We Pay for Health Care*. Washington, D.C.: Cato Institute, 2006.

Lubitz, James, James Beebe, and Colin Baker. "Longevity and Medicare Expenditures." *New England Journal of Medicine*, vol. 332, no. 15 (1995), pp. 999–1003.

McGuire, Thomas G., and Mark V. Pauly. "Physician Response to Fee Changes with Multiple Payers." *Journal of Health Economics*, vol. 10 (1991), pp. 385–410.

Mortele, K.J., and others. "Universal Use of Nonionic Iodinated Contrast Medium for CT: Evaluation of Safety in a Large Urban Teaching Hospital." *American Journal of Roentgenology,* vol. 184 (2005), pp. 31–34.

Okunade, Albert A., and Vasudeva N.R. Murthy. "Technology as a Major Driver of Health Care Costs: A Cointegration Analysis of the Newhouse Conjecture." *Journal of Health Economics*, vol. 21 (2002), pp. 147–159.

Peden, Edgar A., and Mark S. Freeland, "A Historical Analysis of Medical Spending Growth, 1960–1993." *Health Affairs*, vol. 14, no. 2 (1995), pp. 235–247.

Project HOPE Center for Health Affairs. *The Impact of Medical Technology on Future Health Care Costs: Final Report*. Bethesda, Md.: Project HOPE, February 28, 2001.

Reinhardt, Uwe. "Does the Aging of the Population Really Drive the Demand for Health Care?" *Health Affairs*, vol. 22, no. 6 (2003), pp. 27–39.

Technological Change in Health Care (TECH) Research Network. "Technological Change Around the World: Evidence from Heart Attack Care." *Health Affairs*, vol. 20, no. 3 (2001), pp. 25–42.

U.S. Congress, Office of Technology Assessment. *Defensive Medicine and Medical Malpractice*, OTA-H-6O2 (July 1994).

CONGRESS OF THE UNITED STATES
CONGRESSIONAL BUDGET OFFICE
WASHINGTON, DC 20515

INSIDE MAIL