Improving Health Care Cost Projections for the Medicare Population

Summary of a Workshop

Gooloo S. Wunderlich, *Rapporteur*

Committee on National Statistics
Division of Behavioral and Social Sciences and Education

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As chair of the steering committee, I wish to thank my colleagues on the committee for their helpful guidance and leadership in planning the workshop and moderating the sessions.

I acknowledge with appreciation the many people who participated in the workshop and contributed to its success. I thank all the presenters for their expert presentations and John N. Friedman for the background paper he prepared for the workshop. I also thank all the participants for their stimulating and insightful comments and discussion.

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This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the Report Review Committee of the NRC. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

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Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the content of the report nor did they see the final draft of the report before its release. The review of this report was overseen by Melvin Worth, Senior Institute of Medicine Fellow (retired), Sun City Center, FL. Appointed by the NRC, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the author and the institution.

Dana P. Goldman, *Chair*
Steering Committee on Improving Health Care
Cost Projections for the Medicare Population

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1

Introduction

In 2008, the Medicare program provided health insurance coverage for over 45 million people—37.8 million ages 65 and older and 7.4 million disabled people, with total Medicare expenditures of $468 billion (Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, 2009).[1] The 2009 Medicare Trustees report projected that, under its intermediate assumptions, expenditures will increase from 3.2 percent of gross domestic product (GDP) in 2008 to 11.4 percent by 2083, raising serious solvency issues for the program by 2017. Policy makers face significant challenges managing the program, given not only increases in the size of the beneficiary pool with the increasing size of the aging population, but also increases in average rates of spending per beneficiary resulting from factors specific to health status and health care, such as increasing rates of obesity and the development of new drugs, medical care technology, and medical treatments.

Likewise, policy analysts confront a difficult task in developing credible short-term as well as long-term projections of Medicare costs in the face of uncertainty with regard to the many factors that are likely to affect future costs. There is uncertainty not only in the underlying economic and demographic assumptions used in projection models, but also in what a policy

[1]The Medicare program has four major components or parts: Part A, which helps cover hospital costs; Part B, which helps cover costs of physicians and outpatient services; Part C, which covers enrollment in Medicare Advantage Plans (health maintenance organization type private plans); and Part D, which helps cover prescription drug costs (see http://www.medicare.gov/navigation/medicare-basics/medicare-benefits/medicare-benefits-overview.aspx).

modeler assumes about future changes in the health status of the population, the extent and pace of scientific and technological breakthroughs in medical care, the preferences of the population for particular kinds of care, the likelihood that policy makers will alter current law and regulations, and how each of these factors relates to health care costs. There is need for better understanding of the factors contributing to the growth of health care spending and how these factors might be moderated in the future. There is also need to consider for policy models the trade-offs between simplicity and comprehensiveness and what is required for short-term and longer term projections.

Given the substantial growth in the Medicare population, fueled by the aging of the baby boom generation and rising life expectancy at age 65, and the continued increases in Medicare, Medicaid, and private health insurance spending, the availability of well-specified models and analyses that can provide useful information on the likely cost implications of health care policy alternatives is critical for public- and private-sector policy planning. Current models for health care cost projections range from a simple projected rate of GDP increase plus a specified percentage, to dynamic microsimulation models that "age" population cohorts over time, to computable general equilibrium models of the health care sector of the economy and long-term health care spending (see examples in Box 1-1).

WORKSHOP FOCUS

It is therefore timely to review the capabilities and limitations of extant health care cost models and to identify areas for research that offer the most promise to improve modeling, not only of current U.S. health care programs, but also of policy alternatives that may be considered in the coming years. Understanding the factors that affect health care costs for the elderly and how to develop improved projection models for policy is an important area for the behavioral and social research program of the National Institute on Aging (NIA), given its concern with the health and socioeconomic well-being of the elderly, which could be significantly affected by changes in Medicare and other health care programs. NIA consequently asked the National Research Council's Committee on National Statistics (CNSTAT) to conduct a public workshop on needed research to improve health care cost projections for the Medicare population and on the strengths and weaknesses of competing frameworks for projecting health care expenditures for the elderly.

The workshop was to consider major classes of projection and simulation models that are currently in use and the underlying data sources and research inputs for these models. It was also to consider areas in which

BOX 1-1
Three Models for Projecting Medicare Costs

There are currently several models and data sources for projecting future health care expenditures that vary in their capabilities, complexity, and limitations, three of which are briefly summarized below.

1. Centers for Medicare & Medicaid Services (CMS) model—The actuaries who prepare 75-year Medicare cost projections at CMS begin with the economic and demographic projections that are developed by the Social Security Actuary, adding to them assumptions about growth in average spending per Medicare beneficiary and the responses of beneficiaries and employers to the new Part D prescription drug program (see further discussion in Chapter 2). The latest evaluation of the Medicare actuarial model, which uses a computable general equilibrium model for the out years, supported the reasonableness of continuing to assume that Medicare expenditures will continue to outpace GDP growth, but it recommended that CMS develop models with behavioral content and explore new approaches for projecting long-range Medicare expenditure growth (Technical Review Panel on the Medicare Trustees Report, 2004). The 2004 technical review panel also suggested that employer and beneficiary behavior in response to Part D may change over time in ways that require modifying the assumptions in the Medicare actuarial model about participation rates.
2. Congressional Budget Office (CBO) model—The CBO health insurance microsimulation model covers the entire population, using a database of individuals and families from the Survey of Income and Program Participation, supplemented with data from the Medical Expenditure Panel Survey. The model is designed to prepare 10-year projections. Although its focus is primarily to evaluate alternative proposals for extending health insurance coverage to the uninsured rather than Medicare and Medicaid program changes, it contains features that are relevant to Medicare and Medicaid cost modeling, including a simulation of employer responses to changing federal health insurance mandates (see Chapter 2).
3. The Future Elderly Model (FEM) of the Roybal Center for Health Policy Simulation at RAND—FEM is a microsimulation model designed to predict the future costs and health status of the elderly (Goldman et al., 2004). It is based on a sample of about 100,000 elderly Medicare beneficiaries from the 1992-1999 Medicare Current Beneficiary Surveys, updated with information from the National Health Interview Survey to predict the health of new Medicare entrants. The model controls for demographic and economic factors and allows analysts to explore the effects of current trends or future changes on health care costs. For example, a downward trend in old age disability might imply reductions in health care spending. Results from FEM show, however, that cost savings associated with declining disability rates are partially offset by spending growth among the least disabled. These results imply that the cost savings associated with declining disability rates will not dramatically slow Medicare spending in the long run (see further discussion in Chapter 4).

additional research and data are needed to inform model development and health care policy analysis more broadly, such as:

- The relative merits of various cost projection approaches with regard to short-term versus long-term projections, the ability to model what-if scenarios, and other features for the major modeling categories.
- Trends in socioeconomic status and in mortality and morbidity and how they affect health care cost projections.
- Medical technology as a driver of costs and the policy responses to this trend.
- Factors affecting health status, such as obesity, disability, and chronic diseases, that may affect costs over the longer term.
- Addressing uncertainty and bias in model projections.

WORKSHOP ORGANIZATION

In response to NIA's request, CNSTAT appointed a steering committee to plan a public workshop to identify research that can improve models for projecting health care costs for the population 65 years and older and, more broadly, address factors that drive health care spending. The workshop was structured to combine invited presentations and discussions among the participants to consider the uses and limitations of alternative modeling approaches, as well as factors that affect health care spending and suggest priorities for research that could support improved projection models, including a long-term research agenda in this area for NIA and others in the field. To set the context and provide background information for the workshop participants, the steering committee commissioned a paper on currently used models for forecasting health care costs for the Medicare population, including their strengths and limitations, their methodological approaches to forecasting, and their applications (see Appendix A). The workshop, held on January 13, 2010, drew people from a wide variety of disciplines and perspectives, from federal agencies, academia, and nongovernmental organizations. The workshop agenda and a list of presenters appear in Appendix B, and biographical sketches of steering committee members appear in Appendix C. The slides used in support of the presentations are available at http://www7.nationalacademies.org/cnstat/workshop%20Cover%20Page.pdf.

PLAN OF THE REPORT

This report is a summary of the presentations and the discussions flowing from the presentations during the sessions outlined in the agenda (see

Appendix B). Following this introduction, Chapter 2 opens with an overview of the technical background paper, then discusses the relative merits and limitations of several current models. Chapter 3 focuses on modeling medical technology as a driver of Medicare health care spending, and Chapter 4 addresses such factors as obesity, socioeconomic status, chronic diseases, and disability that affect health status as drivers of Medicare health care spending. Chapter 5 focuses on the future in terms of research areas that may advance the current efforts from the perspective of the participants attending the workshop.

It is important to be specific about the nature of this report prepared by the workshop rapporteur, which is a factual summary of what transpired at the workshop. It is therefore limited to the views and opinions of those participating in the workshop. It reflects the concerns and areas of expertise of the workshop participants and is confined to the material presented by the workshop participants. The presentations and discussions were limited by the time available for the workshop. Neither the workshop nor this summary was intended as a comprehensive review of research relative to Medicare cost projections, nor was it designed to generate consensus conclusions or recommendations. The workshop focused instead on the identification of issues in understanding Medicare cost projections and themes and considerations for future improvements in data and models. Workshops such as this, even though they are not designed to produce consensus recommendations and conclusions, can be very helpful in documenting what is happening in the field and providing a sense of where the field needs to move forward.

2

Current Models of Health Care Cost Projections

This chapter summarizes the first workshop session, which was designed to provide background on the relative merits of current models for projecting health care costs for the Medicare population. The session opened with an overview of a paper prepared for the workshop that describes the major modeling approaches currently used for policy analysis and research, their capabilities and weaknesses, and their uses (see Appendix A).

It was followed by presentations on the policy models and underlying data in use by three federal agencies:

1. Medicare cost modeling for health care spending at the Congressional Budget Office (CBO);
2. long-range health care expenditure projections by the Office of the Actuary (OACT) at the Centers for Medicare & Medicaid Services (CMS); and
3. the role of the Medical Expenditure Panel Survey (MEPS) of the Agency for Healthcare Research and Quality (AHRQ) as a resource for the government's economic models and projections of health care expenditures.

The CBO and CMS models are important to understand and assess, given the prominent role they play in policy analysis and formulation. By law, CBO must prepare 10-year estimates of the costs of health care reform proposals introduced in Congress, including changes to the Medicare and other government-supported health care programs (CBO also prepares

longer term projections). In turn, Congress must use the CBO estimates in assessing the estimated cost of a specific legislative proposal and its effects on the deficit. CMS OACT estimates are used by the Medicare Trustees to describe the projected financial condition of the program over the short, medium, and long terms out to 75 years. In turn, the Trustees' reports affect the policy debate on possible changes to the program that could affect benefits and costs. MEPS is a key source of data on many aspects of health care cost modeling, including estimates of people lacking health insurance coverage, provisions of employer-provided health care plans, and estimates of health care coverage and expenditures for the most populous states.

PREDICTING MEDICARE COST GROWTH

John Friedman (Harvard University) began by noting that over the past 45 years Medicare spending has grown faster than the gross domestic product (GDP). If allowed to continue without some change, by 2080 Medicare health care expenditures alone would reach 99 percent of GDP. Clearly that cannot be allowed to happen. The nation is faced with the questions of how and when cost growth will slow and what the consequences of this slowing will be. To solve this problem, academic and government researchers and policy analysts have been developing models for projecting Medicare cost growth.

Friedman provided a brief review of the three main approaches to projecting Medicare cost growth—extrapolation, microsimulation, and computable general equilibrium. He then briefly explained the assumptions, mechanics, strengths, and weaknesses of each and showed how policy makers use these methods.

Extrapolation

Extrapolation is the most direct approach to forecasting future growth. It uses historical patterns in aggregate spending as a guide for projecting future growth, relying entirely on a statistical or actuarial approach rather than an economic approach, and is essentially based on a regression. Its transparency is its strength. The end result is clearly the sum of its parts, and that is a real value in keeping things transparent. Extrapolation is best suited for short- to medium-run projections. Its long-run numbers may be accurate but without detailing what drives such numbers, correct or not, extrapolation leaves the researcher unsatisfied.

The fundamental problem with the extrapolation approach is that it does not address the fact that something has to change. In practice, however, researchers often do not simply extrapolate, but also impose some brakes on the system to limit growth. For example, a constraint used by the CBO as a brake on the system is that nonhealth care consumption cannot

decline. That seems like a reasonable restriction, although nothing in the data suggests that it is the right thing to do or what its costs are. Depending on the types of external assumptions made about how and when Medicare cost growth is going to slow down, one gets very different projections with different implications.

Microsimulation

Microsimulation has been used by several modelers. It is a form of extrapolation, but in a much more detailed, nonparametric form. For example, consider dividing the entire population into small groups defined by demographic, economic, and health conditions. The groups are defined to be mutually exclusive. The researcher then estimates the transition probability of moving from one group to another during a given year. Depending on the data available, one can estimate this in a fairly flexible way. Microsimulation models are well suited to study the effects of alternative policy scenarios or posited changes in health conditions or health care technology that affect particular aspects of the health care system. They account for heterogeneity in demographic transitions.

The RAND Future Elderly Model is a well-known health-related microsimulation model (Goldman et al., 2004). It uses the Medicare Current Beneficiary Survey of CMS and the Health and Retirement Study to estimate both demographic and health conditions.

The advantage of the microsimulation approach is its flexibility in modeling distributional impacts in the short or medium run. It is easy to consider various posited changes in policy or health conditions because the entire heterogeneity of the health care system is represented. Another strength is transparency: it is easy to see how the links flow. This is especially valuable in short- to medium-run projections.

Its weakness is conceptually the same as with extrapolation. There is no answer to the fundamental problem that something has to change, and one does not know when or how change will occur.

Computable General Equilibrium

The first two approaches above are primarily statistical or actuarial approaches to projecting. There is no sense of what the incentives are, that people have a demand function for health care. The complete opposite of that approach is a computable general equilibrium (CGE) model, which takes very seriously the incentives that drive the demand for and production of health care. It models the economic relationships that drive health care spending. Conceptually, CGE modeling is very rigorous and strong. There is demand for health care consumption or nonhealth care consumption;

there is the health care sector, which employs people and produces health; and the prices in the medical care market equate supply and demand. This approach takes head on the question of what will change and how. For example, if health care prices increase, then demand for it will be lower; if health care consumption increases, then perhaps on the margin the demand for it will be lower. This approach provides a direct answer to the question of what will happen and why.

However, the weakness of CGE models is that they tend to be highly dependent on external assumptions in an opaque way. These models are also too complex to allow consideration of heterogeneity in the population that is of interest for policy purposes. Moreover, without the need to be constrained in some way, these models often cannot be solved or have multiple equilibriums. Conceptually, however, the CGE approach is on the right track; the methodology needs further development so that such models can be used more independently.

Uses of Modeling Approaches

Briefly, different federal agencies combine these three modeling approaches in different ways for projections to guide policy. For example, CMS uses a combination of extrapolation with a CGE model, extrapolating over the first 10 years, interpolating years 11-24, and constraining growth between 25 and 75 years to an average of 1 percentage point in excess of the rate of per capita GDP growth (expressed as the GDP + 1 assumption). CMS assumes the long-run growth rate and then basically uses the CGE model to achieve asymptotic convergence over time. At some stage in the future, when CGE models are more developed, researchers may be able to use them to estimate what the long-term growth rate is, not just how it is going to be distributed over time.

CBO uses more of a constrained extrapolation approach in the long run, with a positive growth constraint on nonhealth care consumption.

AHRQ uses a microsimulation approach with data from the MEPS because the agency is more focused on heterogeneity of the population and because it does not really target the 75-year long-run projection.

The U.S. Department of Veterans Affairs uses microsimulation adapted to the veteran population to project in the short to medium run what veterans are going to need.

These different projection strategies provide very different estimates, especially over the long run. It is important to keep in mind that a tremendous amount of uncertainty accompanies long-term forecasting.

In closing, Friedman observed that technology, which is thought to drive much of the growth in health care costs, is totally absent from all of these models. There is a growing body of research on how technological

development responds to economic factors. Some examples are the development of vaccines and drugs as a response to market size (Acemozğlu and Linn, 2004; Finkelstein, 2004) and hospitals' response to reimbursement incentives when choosing their labor-capital mix (Acemozğlu and Finkelstein, 2008). Researchers should also try to understand how some technologies lower the cost of existing health care options, whereas others create new, more expensive options. Just asking people what is going to happen with technology is an underrated strategy. RAND researchers (Shekelle et al., 2005) use a Delphi panel approach, as does Weizman (2001).

MEDICARE COST MODELING FOR HEALTH CARE SPENDING AT CBO

Joyce Manchester (Congressional Budget Office) described the framework for CBO's long-term cost projections for Medicare and other federal health care programs, the outlook for the federal budget, and the assumptions regarding cost growth in Medicare and other health care spending.[1] She also identified some of the strengths and limitations of the CBO approach.

Framework for Long-Term Medicare Cost Projections

CBO examines the pressures facing the federal budget over the coming decades in the context of current law.[2] Most of Manchester's presentation was based on current law, which, among other things, assumes that many of the tax reductions passed early in the decade will expire and that Medicare's reimbursement rates for doctors will be constrained much more than has been true in the past.

Cost projections over the first 10 years are based on detailed program projections that underlie CBO's baseline. The Medicare projections that go into those 10-year projections are very detailed, looking at specific kinds of Medicare spending.

Beyond 10 years, CBO relies on its long-term model, CBOLT, to analyze the budgetary and distributional effects of the Social Security program and other federal policies and programs, to evaluate potential reforms to federal entitlement programs, and to quantify the nation's long-term fiscal challenges. CBOLT is primarily a microsimulation model, although an actuarial

[1]The projections discussed here are based on *The Long-Term Budget Outlook* (Congressional Budget Office, 2009) and do not include effects of the health care legislation of 2010.

[2]CBO operates under a long-standing statutory requirement (section 257 of the Balanced Budget and Emergency Deficit Control Act of 1985, Public Law 99-177, as amended; 2 U.S.C. 907). It requires that CBO assume, in its baseline projections, that laws are implemented as specified and that funding for entitlement programs is adequate to make all payments.

framework and an overarching macro model provide targets for certain subgroups of the population as well as aggregate values for some variables. For example, CBO does not have the ability to do detailed 75-year spending projections at the individual level for Medicare and Medicaid at this time. While its long-term detailed projections for Social Security are developed in the microsimulation model, its projections for Medicare, Medicaid, and other health care spending are developed at a more aggregated level in the actuarial framework. All other federal spending is assumed to grow with GDP. The CBO Tax Analysis Division calculates effective rates of major types of taxes for the first 10 years of the projection period, and those rates are used to project tax revenues over time at the aggregate level.

The value of longer term projections is to highlight trends; they also provide a baseline for policy changes. Limitations of the longer term projections include uncertainty, especially surrounding the health care programs. CBO cannot precisely quantify that uncertainty with statistical modeling in the Medicare and Medicaid program projections, although an attempt is made to do so for the Social Security projections.

Interactions with macroeconomic conditions present challenges to the CBO approach as well. The most prominent is very high ratios of debt to GDP projected in the future. However, CBOLT does not currently account for the effects of rising debt to GDP ratios on the economy. For example, CBO assumes that real interest rates stay fixed at 3 percent. CBO is aware that this assumption may not be realistic, but the goal is to provide a baseline against which, given a stable backdrop, Congress can examine reform proposals.

CBO is in the midst of ongoing discussions, both internally and with a panel of outside experts, to improve the long-term projections and especially to communicate the macroeconomic consequences of those projections.

Outlook for the Federal Budget

In the absence of significant changes in policy, the rising costs of health care and the aging of the population will cause federal spending to grow much faster than the economy, putting the budget on an unsustainable path. Based on its June 2009 analysis, CBO projects that by 2035 the share of total government spending for health care will more than double to about 13 percent of GDP, up from about 6 percent of GDP in 2008. Medicare alone will account for about 7 percent of GDP in 2035, up from 3.5 percent in 2008. The emphasis here is on the next 25 years, because so much uncertainty exists beyond that.

Assumptions Regarding Health Care Cost Growth

In CBO's current long-term budget projections, Medicare spending for the first 10 years, 2009-2019, follows the CBO March 2009 baseline. In 2020, CBO assumes that excess cost growth for Medicare is equal to the average historical rate of 2.3 percentage points. Excess cost growth is the amount by which per capita health spending (adjusted for age, sex, and time until death) is growing faster than per capita GDP growth; the historical average is based on the past 30 years.

CBO assumes that excess cost growth in Medicare, Medicaid, and other health care spending will begin to slow in 2021. With all the pressures that will be brought to bear on nonfederal spending, including the states' share of Medicaid spending, CBO assumes that part of the slowdown in non-Medicare spending will spill over to Medicare, causing excess cost growth in that program's spending to slow by one-third of the amount in the non-Medicare sectors.

Excess cost growth for other (non-Medicare and non-Medicaid) health care spending is projected to decline from 1.8 percentage points in 2020, which is the historical rate of growth, to 0.1 percentage point in 2083. That outcome is the result of an assumption that households will be unwilling to spend so much on health care that their real nonhealth care spending per capita will decline during the 75-year projection period. CBO has been using that assumption for about 3 years now and continues to evaluate its validity.

Strengths and Limitations of the CBO Approach

CBO connects its long-term projections to the detailed 10-year forecast from its Medicare analysis. As stated above, the long-term approach is based on historical excess cost growth in health care spending adjusted for age, sex, and time until death. It relies on a simple rule regarding patterns of household consumption—that is, households will not be willing to reduce real nonhealth care per capita spending at any time during the 75-year projection period. And it is designed to be consistent with CBO's overall long-term budget projections, providing a baseline for policy changes.

CBO's approach to modeling health care costs, including Medicare, is fraught with uncertainty. A tremendous amount of uncertainty surrounds health care spending growth over 25 years and even more so over a 75-year horizon. Currently the approach is implemented at the aggregate level only and not in the microsimulation model.

The current approach reflects no epidemiological or technological trends other than those reflected in history. Most of the growth in excess

cost has come from technological advances over time, but it is difficult to know how to model those changes going forward.

Finally, CBO's projections do not take into account the consequences of health care spending being equal to one-half of GDP by 2083, the end of the 75-year projection period. CBO has no forecasts about how labor supply would have to change to provide those services, for example, or what might happen to health care technology along the way.

LONG-RANGE MEDICARE HEALTH EXPENDITURE PROJECTIONS BY THE CMS OFFICE OF THE ACTUARY

Richard Foster (Centers for Medicare and Medicaid Services) described the long-range 75-year health care expenditure projections for the Medicare program developed by the CMS OACT, which are included in the annual report of the Medicare Trustees to Congress.[3] He focused on the long-range component of the projections, although CMS, like CBO, produces short-range (10-year) projections that vary by type of service, such as hospital, physician, or durable medical equipment, and involve far more detail than is the case with the long-range Medicare projections.

Medicare projections are required by statute and must be made in the context of current law—that is, premised on the indefinite continuation of existing statutory provisions pertaining to the Medicare program.[4] So the Medicare Trustees report is premised on payment over 75 years of projected benefits as specified under current law and projection of program revenues also as scheduled under current law. In particular, regarding Medicare expenditures, CMS seeks to project the state of the world if benefits now promised under current law were maintained indefinitely. For Part A of the Medicare program, projections of full hospital insurance benefits are compared with revenues already available in the Part A trust fund and projected tax revenues yet to be deposited in the trust fund for payment of Part A benefits. The revenues likely to be available for payment of Part A Medicare benefits do not begin to keep up with the likely level of expenditures, but projected benefits are not reduced after

[3]The requirement for 75-year projections by OACT first appeared in U.S. statute in Section 801(b)(1)(B) of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003, which became effective for all reports of the Trustees starting in 2005. Before then, projection horizons were as agreed on between OACT and the Medicare Trustees.

[4]The annual trust fund report for Part A required by 42 U.S.C. 1395(i), and the annual trust fund report for Parts B and D by 42 U.S.C. 1395(t) make clear that the reports are to be made in conformity with actuarial standard (ASOP 32) about social insurance evaluations issued by the Actuarial Standards Board in the late 1990s. Section 3.6.3 of the standard provides: "The actuary should include all material aspects of expected future program income and costs under current law and regulation, within the time frame of the valuation."

the projected trust fund is exhausted, leading to a projection of a large Part A funding deficit. For Parts B and D, the annual long-range projection assumes that statutory provisions will remain in force that ensure the availability of revenues no matter how high the expenditures for those parts of the program.

The essential issue in projecting something as volatile as health care expenditures in a program as vast as Medicare over a 75-year horizon is what to assume about future expenditure growth rates. Historically, growth in the health care sector has been much faster than the growth of the overall economy—an almost uninterrupted trend. Cost growth at historic rates clearly cannot go on forever. Economies devoted solely to health care cannot exist. The implication therefore is that there will have to be a slowdown in health care cost growth rates compared with the past. But the question is when, how, and at what rate the excess cost growth will slow down.

Projection Background

Although OACT's approach for making long-range Medicare cost projections has evolved over a lengthy period going back to the late 1970s, most of the more interesting work started in the 1990s.[5] The long-range projection uses a core assumption about the average per beneficiary rate of health care expenditure growth (exclusive of adjustments for age and gender effects) in excess of the rate of growth of per capita GDP for the last 51 years of the 75-year projection horizon. A constant differential or excess cost growth rate of 1 percent above economy-wide per capita GDP growth is assumed on the basis of recommendations received from periodic Medicare technical advisory panels. In producing the final expenditure projection, the core excess cost growth assumption is refined using more complicated modeling methods based on a CGE model that allows the average rate of excess cost growth to be allocated along a more plausible path for the 51 years of the projection horizon to which it applies.

In other words, the idea is that Medicare costs per beneficiary, leaving aside demographic effects, will grow 1 percent faster than the per capita rate of GDP growth. For example, if the nominal GDP growth per capita is 5 percent, then the age- and gender-adjusted Medicare expenditure growth per beneficiary would be 6 percent. This projection method can be implemented with either nominal or real GDP. In practice, CMS does it with nominal dollar projections.

[5]CMS long-range projection methods for reporting years 2010 and beyond are being re-evaluated in light of the passage into law of major health care reform legislation.

Implementing the Method for the 75-Year Projections

CMS implements this method for the last 51 years of the 75-year projection horizon.[6] As noted earlier, for the first 10 years of the projection period, CMS uses far more detailed short-run projections broken out by types of service and other factors. For the first 10 years, therefore, there are projections for Part A, Part B, and Part D, with a distinct growth rate projection for each Medicare subpart. For years 11-25 of the projection horizon, the expenditure growth projections are based on a straight-line transition from A, B, and D excess cost ratios for year 10 to consolidated, program-wide excess cost ratios that begin in year 25. Projections for years 25-75 are based on excess cost ratios from the CGE model.

The OACT CGE model, a Ramsey-style general equilibrium macroeconomic model, allocates consumption through time for a representative agent. The model incorporates assumptions about technological change and cost effects for the health sector. The model is simple in the sense that there are only about three factors. One factor measures historically the impact of change in medical care technology on cost growth and assumes that the same historical rate of technology change continues in the future. The second factor has to do with substitution for new technology—to what extent does new medical technology substitute for existing technology?—in which case there is often a hope that it may be cost reducing, but not always. Or does technology provide something new in the way of treatments or drugs or devices?—in which case it typically adds to the costs. The third factor has to do with the representative agent's preference for health care—more health care (and, presumably, better health) versus other consumption opportunities—that is, everything that is not health care-related consumption.

One cannot use the CGE model to produce an unconstrained solution, such as a unique best forecast for the future. Based on the range of exogenous parameter estimates deemed to be reasonable, there is an infinite number of potentially reasonable solutions to the CGE model. Therefore, without some identifying constraint, one cannot directly get a usable long-range cost growth projection from the CGE model. A solution is identified by constraining the CGE model to produce a Part A actuarial balance that is financially equivalent in present value to the cumulative 75-year actuarial balance under a simple GDP + 1 excess growth rate assumption.[7]

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[6]For more detail about the CMS projection methods, see the Projections Methodology memorandum referenced in the 2009 annual report of the Medicare Trustees available at http://www.cms.hhs.gov/ReportsTrust Funds/downloads/projectionmethodology.pdf.

[7]For a detailed description of the structure of the model, see Borger, Rutherford, and Won (2008).

History of the GDP + 1 Excess Cost Growth Assumption

In the late 1970s, Medicare projections were not made for more than 25 years for Part A and not more than 3 years for Part B. Part D did not exist at that time. It then occurred to OACT that it would be useful to illustrate the impact of demographic factors on Medicare costs in the longer term. At that time there was no intention of depicting any type of excess cost growth, and the age-gender modeling initiative effectively assumed a rate of per beneficiary cost growth exclusive of age-gender effects equal to the rate of per capita economy-wide GDP growth. The idea was just to build in the demographic factors, prepare a longer range projection, and calculate the cost growth in such way that it was neutral, in the sense that cost growth was assumed to be consistent with economic growth or wage growth. The result was a projection method in which costs were increasing or decreasing at a rate different from the GDP growth rate only because of demographics, highlighting the impact of the demographic factors. Regarding the possibility of excess health care cost growth, this modeling approach was equivalent to a GDP + 0 assumption and was used in ad hoc projections for a number of years.

Through 2000, projections in the Medicare Trustees reports were implicitly based on a GDP + 0 assumption of no excess cost growth for projection year 26 forward. The 1991 Medicare Technical Review Panel suggested that this assumption was reasonable, but, as time went on, public and private enthusiasm for the approach diminished.

CMS charged a technical review panel convened in the year 2000 to make a recommendation concerning a long-range cost growth assumption, and that 2000 Medicare Technical Review Panel eventually recommended the GDP + 1 assumption, which was accepted by the Board of Trustees. On this basis, a pure GDP + 1 assumption for projection year 26 forward was implemented in 2001 and has been used in some form since then. The 2004 Medicare Technical Review Panel reaffirmed the GDP + 1 long-range cost growth assumption as "within the range of reasonable assumptions" (Technical Review Panel on the Medicare Trustees Report, 2000 and 2004). More recently, with the help of an informal panel of advisers, a method for refining the GDP + 1 assumption that uses the OACT's CGE model to "redistribute" average excess cost growth across the last 51 years of the projection horizon was adopted and implemented first in the 2006 Medicare Trustees report.

The OACT long-range expenditure projection method reflects an expectation of a substantial slowdown in the historical rates of excess cost growth. It also reflects the belief that technological change will remain an important driver of excess cost growth compared with the overall economy for most of the 75-year projection horizon. One other aspect of this core

assumption is that it is relatively easy to describe and to understand what causes what.

Rationale for the GDP + 1 Excess Cost Growth Assumption

CMS argues that three natural brakes on cost growth reconcile the idea of a spending slowdown with the idea of current law. (Note that CBO also assumes a spending slowdown but one that follows a somewhat different path, as described in the previous section.)

The first natural brake on excess cost growth is the cost-sharing and premium provisions in the current Medicare law. In the long run, it is expected that cost-sharing burdens in current law will make Medicare costs grow faster than the income and resources available to Medicare beneficiaries. For all parts of the Medicare program, out-of-pocket costs are growing at about the same rate as program costs, which is faster than people's incomes. Over time, cost-sharing and premiums for Medicare have grown and become an increasing share of burden on beneficiaries. If nothing happens to change these trends, medical care will become less and less affordable for many categories of beneficiaries. When that happens, and if no legislation has occurred in the meantime to address the issue, beneficiaries will begin to reduce their consumption of medical care, and people may even drop coverage under Parts B and D because they cannot afford the premiums, or they may simply drop their Medigap coverage because premiums have become unaffordable, leading to further scaling back in the level of medical care consumption. The contemplated situation has nasty implications: that the nation's primary social insurance program for health care could become ineffective because people cannot afford even their share of the cost for it. If that day comes—and it can—a slowdown in health care cost growth would be expected.

Another natural brake on excess cost growth is the spillover or diffusion of cost-saving practice patterns. For example, some innovation happens in the ways in which physicians treat patients who are insured by the private sector, and those innovations then spillover into the treatment of all patients, including Medicare patients. Spillovers have gone in both directions, from private insurance sector to Medicare and from Medicare to private insurance, and they can be helpful to both. For example, Medicare introduced the prospective payment system for hospitals, and soon almost all of the private health insurance plans adopted the same mechanism.

The third possible natural brake on excess health care cost growth involves regulatory changes implementable without statutory changes. One example might be the more selective adoption of new technology. This could be controversial, because there is a provision in the Social Security Act that suggests a little ambiguously that CMS ought not to be making decisions on coverage or approval of payments for new techniques of care on

the basis of whether money is saved or not. However, there have been some preliminary efforts toward greater restraint in the extension of Medicare coverage for new technology and treatment methods, and as time passes and the cost problem becomes more urgent, it is possible that social tolerance for more aggressive restraint on technology approvals will increase even without changes in current law.

OACT Research Efforts

OACT is engaged in research initiatives aimed at informing and improving the choice for the long-range cost growth assumption:

- OACT is working on development and refinement of a simple Medicare cost-sharing model. It is also following and advising an effort funded by the National Institute on Aging to incorporate features of Medicare cost-sharing provisions into the Urban Institute's microsimulation model.
- A contract to evaluate evidence for cost-saving spillovers among health care subsectors was recently concluded.
- A contract that examines the usefulness of time-series methods for long-term health care cost projections is in its final stages.
- OACT is also working on an interface to synthesize evidence pertaining to the excess cost growth assumption—all the literature, different models, different approaches, different perspectives—and using that set of information to inform the choice of a long-range growth assumption.

There are constraints on development of these long-range methodologies:

- The requirement to stay within the context of current law in producing projections. Current law necessarily involves scenarios in which the existing program is sustained into the indefinite future. The sustainability of such long-term scenarios is necessarily open to question, a point acknowledged in the annual report of the Medicare Trustees.
- The Code of Professional Standards (Actuarial Standard 32 pertaining to social insurance). For example, actuaries are required to model current law; they cannot make assumptions about what they think the law might look like or what it should look like.
- Stability in projection methods is desirable; erratic swings in long-term projections due solely to methodological brainstorms would send a confusing message to Congress and the public regarding the financial condition of the Medicare program.

- Ongoing tension between complexity and transparency. The CGE model was a big step forward, but it is nearly impossible for noneconomists or nonactuaries to understand. It is easier to explain GDP + 1.

Closing Observations

In concluding, Foster sounded a cautionary note. Projections in the Medicare Trustees report warn policy makers of the financing crisis for long-term social entitlements. One can discuss for a long time whether CBO or CMS produces a long-range Medicare cost growth projection that is closer to the true long-run magnitudes of the program. But looking at the Medicare Trustees report, the massive deficit for Part A, and the level of expenditures and revenues that would be required to pay for current law benefits under Parts B and D expenditures, both CBO and CMS projections make clear that there is a major financing problem. Although the CMS GDP + 1 assumption envisions a larger spending slowdown than some other projections, it still raises an unambiguous sustainability issue for policy makers. OACT continues research aimed at improving its projections.

MEPS AS A RESOURCE FOR ECONOMIC MODELS AND PROJECTIONS OF HEALTH CARE EXPENDITURES

Steven Cohen (Agency for Healthcare Research and Quality) began his presentation by observing that there are growing demands on data resources in support of health care policy formulation. His presentation covered an overview of a sentinel data resource—MEPS—and how it has been used to inform microsimulation models and public policy questions regarding health care. He also addressed the data capacity and statistical quality of modeling efforts and the underlying requirements for the validity and accuracy of health care cost projections.

The significance of health care expenditure trends is clear when one considers current estimates as well as future projections. One-sixth of U.S. GDP is going into health care spending at present, and the rate of growth exceeds other sectors of the economy. Even after recent cost moderation, the projected rate of expenditure growth will be increasing to 1 of every 5 dollars in the next couple of years. Health care expenditures are among the largest components not only of federal and state budgets, but also of consumer outlays. Cost containment is of continuing concern to both private and public payers.

The most recent information on national health care expenditures shows that in 2008 total expenditures were $2.3 trillion, amounting to 16.2 percent of GDP. This 4.4 percent increase over 2007 is the slowest

growth in 48 years. However, health care expenditures are projected to be $4.4 trillion in 2018 or 20.3 percent of GDP (Hartman et al., 2010; http://www/cms.hhs.gov/nationalhealthexpendData/).

Some of the important current issues in formulating public policy for which data are required include the acquisition of health insurance coverage by the uninsured and its implications in terms of expenditures; the structure of the insurance market; the tax treatment of insurance and the federal subsidy for employer-sponsored coverage; the cost of chronic diseases and prevention activities and how that factors into the long-term projections; and prescription drug costs.

MEPS

MEPS, sponsored by AHRQ, is an ongoing family of surveys. Cohen focused mostly on the household component, which is an annual survey of approximately 14,000 households covering about 30,000 individuals. The survey provides national information on health care use, expenditures, insurance coverage, sources of payment, access to care, and health care quality. In addition to aggregate estimates, MEPS permits studies of the distribution of expenditures and sources of payment, such as the concentration of expenditures among population groups; the role of demographics, family structure, and insurance coverage in health care costs; expenditures for specific conditions; trends over time, such as the persistence of the concentration of expenditures; and impacts of changes in employment and changes in insurance coverage on health care use and expenditures.

Key Features of the Household Component

The household component of MEPS is a survey of the civilian noninstitutionalized population. It is a subsample of respondents to the National Health Interview Survey, which is conducted by the National Center for Health Statistics. The survey oversamples minorities and other policy-relevant groups. The fact that it has an overlapping panel design allows for analysis over a 2-year window. A new panel is introduced each year and carried over into a second year; thus there are two representations of the population each year. Continuous data collection over a 2 1/2-year period includes 5 computer-assisted personal interviews. Data from the first year of a new panel are combined with data from the second year of the previous panel for estimation. This design is very helpful for short-run microsimulation modeling, in which one can use one panel and then validate the model and the predictions using the second.

The household component has a number of capabilities for projections and simulation:

- It provides estimates of annual health care use and expenditures.
- It provides distributional estimates.
- It supports both person- and family-level analysis.
- It tracks changes in insurance coverage and employment.
- The longitudinal design allows linkage to a prior year from the National Health Interview Survey.

Having obtained baseline information on health status, roughly a quarter of the sample is interviewed each year to obtain detailed demographic information. Particular attention is given to the sample of individuals with high health care expenditures or those who are likely to incur high levels of expenditures, both in terms of optimizing response rates and obtaining additional information on expenditures from their medical providers. That is critical, considering that the top 1 percent of users accounts for 27 percent of total health care expenditures and has a significant impact on the precision of overall survey estimates. These individuals include decedents and people who are in or likely to enter long-term care facilities and lengthy hospitalizations.

In addition, to correct for sampling error, the estimates of decedents are adjusted to national estimates for mortality, and the estimates of people admitted to nursing homes are adjusted to more precise survey estimates. One limitation, in terms of making national estimates, is that MEPS covers the civilian, noninstitutionalized population; it does not cover the nursing home or other institutionalized populations.

MEPS has been useful in estimating costs for chronic diseases in a given year and over time. This information is important for high-prevalence conditions for which there could be interventions and to calculate, at least in the short run, the impact in terms of health outcomes and expenditures. Some of the highest cost conditions in 2007 included cancer, trauma, heart disease, mental disorder, pulmonary conditions, diabetes, hypertension, osteoarthritis, hyperlipidemia, back problems, upper gastrointestinal disorders, cerebrovascular disease, kidney disease, skin disorders, and other circulatory conditions. The costs of these conditions for 2007 ranged from about $20 to $98 billion.

Medical Care Provider Component

MEPS does not rely solely on household data. It also includes a medical care provider component to obtain greater accuracy and detail on household expenditures provided by households, to compensate for household

item nonresponse, and to serve as a source for imputation for the remaining missing items. The medical care provider component supports methodological studies.

A targeted sample is drawn to reach all associated hospitals and associated hospital-based physicians, all associated office-based physicians, all associated home health agencies, and all associated pharmacies. (Associated hospitals and other medical care providers are those used by respondents to the household survey.) Data are collected on dates of visits, diagnosis and procedure codes, and charges and payments.

Insurance Component

Another part of the MEPS family of surveys is the insurance component, data from which are valuable for cost projections. This component is an annual survey of 40,000 establishments to obtain national and state-level estimates of employer-sponsored coverage, including availability, access, cost of health insurance, and benefit and payment provisions of private health insurance.

A number of questions can be answered by the health insurance component of MEPS:

- How does the cost and availability of coverage for workers vary in different economic and employment circumstances, and what are the implications of Medicare Part B coverage on the retiree benefits structure?
- How do payment policies affect employee decisions about the purchase and selection of health care services and health insurance?
- What are the implications of Medicare Part D prescription drug coverage on consumers, employers, and employees?

Uses of MEPS Data to Inform Health Policy

AHRQ has been able to provide Congress and others with research findings to inform health care policy on coverage trends and costs, such as national estimates of the long-term uninsured in terms of what the cost provisions would be of covering the uninsured, not just at a point in time but over a 2-year period; estimates of the number of uninsured children eligible for the State Children's Health Insurance Program; state estimates of the availability and cost of employer-sponsored coverage; concentration of health care expenditures; and premium percentiles of high-cost plans.

Some of the areas of research using MEPS data include access, use, and quality of health care services; levels and trends in expenditures; private and public health insurance; and health conditions and health behaviors. MEPS

is also used for microsimulation modeling and for research on survey and estimation methods.

Modeling and Simulation Efforts

In the prior decade, the National Medical Expenditure Survey, the predecessor of MEPS, was used in models of the impacts of proposed health care reforms, including the costs of reform to households, the costs to the nation, changes in coverage, and tax impacts. Today using MEPS data, these capabilities remain the survey's strength, with the addition of a Medicaid/Children's Health Insurance Program eligibility simulation model; data on expenditures by service, including prescription drug expenditures; estimates of coverage and expenditures for most populous states; improved tax simulation models; and data from the employer health insurance survey by state.

Attributes of Modeling

Cohen next addressed some of the statistical dimensions in health care modeling that are important to consider in deciding on a database and model specification and in determining the credence to give to the model results for short-term and longer term projections by policy analysts.

- **Selection of host analytical database/data capacity** for a particular underlying projection or microsimulation model—issues of content, national and subnational representativeness, sample size, data quality, timeliness, and accessibility, all would enter into the decision. For example, if one is looking for national estimates, such as a change in coverage and how that affects use, expenditures, and access to care, a survey like MEPS would be relevant, particularly for its strength of expenditure data. But if one is looking for state-specific differentials, one might turn to a survey like the Current Population Survey (CPS), which has state-level capability on insurance coverage. Because CPS does not have expenditure data, many modelers use CPS, with its strengths for insurance coverage, but impute all of the expenditure data.
- **Model specifications**—the decisions on specifications depend on whether the model is to address a distinct set of highly related health care policy questions (specificity) or whether it needs flexibility and utility for addressing a more expansive set of policy questions.
- **Analytical and statistical oversight**—the more a model is based on sound statistical theory and practice, the more the specifications

for the model are tested, and the more the products are subjected to rigorous statistical and substantive review, the more trustworthy its results.

- **Methodology**—documentation of models would include a description of the underlying approach, the survey methodology, the final model specifications, and the results of statistical tests for model fit and error. Static or dynamic approaches to aging would also be clearly described to facilitate understanding and replication.
- **Replication**—the more a model is subject to sensitivity testing and replication, the more credence can be given to its results and the more its limitations can be understood.
- **Precision**—error estimates associated with sampling, imputation processes, and nonsampling errors, which include errors associated with model specification, nonresponse measurement, coverage, and population projections, all need to be provided and documented.
- **Transparency and good documentation**—a summary of uncertainty of estimates, an evaluation of performance, and release of code and audit trails are essential.

Reconciling MEPS and the National Health Expenditure Accounts

The National Health Expenditure Accounts (NHEA), developed by CMS and MEPS, provide the two most comprehensive estimates of health care spending in the United States. Reconciling estimates from both sources serves as an important quality assurance exercise for each. This exercise is critical to development of an adjusted MEPS data set, consistent with NHEA.

The adjusted MEPS data yield a consistent baseline for policy simulation studies. The baseline reconciles MEPS and NHEA by service categories and sources of payment for the MEPS population; poststratifies to up-weight the Medicaid population and high-expenditure cases; closes the remaining gap by scaling expenditures by service categories and payment source; and adds back in selected NHEA components that were removed in the reconciliation.

Closing Observations

Cohen summarized his presentation by observing that to complement assessments of the current state of health and health care, policy makers depend on model-based estimates of the future state under alternative demographic, economic, and technological assumptions. These modeling efforts are major benefits of the existing investments in health and health care data collection, as well as initiatives to ensure that such collection yields efficient,

well-coordinated, integrated policy-relevant data sets. However, they also place additional demands on data capacity, research, model development, and statistical standards and rigor to better assess the impacts of revisions to existing health care policies.

He noted the importance of aligning projection modeling efforts with more conventional statistical analyses by providing metrics that convey levels of uncertainty in model outputs. The attributes he presented of the modeling process emphasize the need for standards of data quality and statistical integrity in support of modeling and microsimulation efforts that are comparable to those developed for "current state" analyses. This is essential to ensure that policy makers have a sound understanding of model assumptions, data limitations, and the level of uncertainty associated with model-based estimates, prior to the implementation of a new initiative.

Cohen also observed that, in recent years, AHRQ has been getting a number of calls not only for cost projections but also for analyses of health insurance coverage and access. In an attempt to be transparent, the agency posts on its website the requests and uses of AHRQ data, whether they are from Congress, the U.S. Department of Health and Human Services, or the White House.

DISCUSSION

Participants had comments and questions on CBO's assumptions on excess cost growth in the private and public sector, the issue of level of enrollment in Part B, the requirement for CBO and CMS to stay within current law, and the role of taxes as a constraint on the growth of health care spending.

Joseph Newhouse (Harvard University) asked what the basis was for CBO's assumption that excess cost growth rates in the private sector would slow down at three times the rate of excess cost growth for Medicare. Joyce Manchester responded that without a slowdown in excess cost growth rates, health care spending would amount to 100 percent of GDP by the end of the projection period, an untenable result. Both the private sector and the states would exert tremendous pressures to slow the growth rate of spending on nonfederal health care. Recall that CBO is constrained to look at current law or current policy for Medicare and cannot assume any major reforms. Under that assumption, only spillover effects from medical practice patterns in the private sector and Medicaid would reduce the rate of excess cost growth in Medicare.

Justin Trogdon (RTI International) questioned assumptions about the willingness of households to spend on health care versus other consumption. He asked what kind of utility maximization problem would lead to that kind of decision and suggested that some sort of multistage budgeting

would be another way to motivate the assumption. Manchester responded that CBO had adopted a simple rule but could spend more time motivating that rule if the agency wanted to justify it. An alternative approach would be to take a big step back and develop a different way to go about the problem.

Michael Chernew (Harvard University) commented on the requirement that CBO stay within current law. In a current law framework, how disastrous would it be if the forecast ultimately ends up being something that is essentially not sensible? Is it the case that the agency simply cannot go forward with that or is that in and of itself information?

Manchester observed that the current law framework affects all of CBO's long-term projections. For example, current law leads to sharply rising ratios of debt to GDP that could have disastrous consequences for the economy if left unchecked. To produce a baseline for policy reform, however, CBO makes the simplifying assumptions that the rise in the debt-to-GDP ratio will not have an effect on how the economy operates and, in particular, that the real interest rate will remain constant at 3 percent for 75 years. In addition, without the arbitrary rule on nonhealth care consumption that brings health care spending down to one-half of GDP, the health care sector by itself under current law would account for 100 percent of the economy. Again, current law produces an untenable situation, so something has to give. CBO's approach is one way of illustrating to Congress how the current situation is unsustainable and, at the same time, providing a baseline against which to measure reform. CBO is trying to develop better ways to illustrate the unsustainable nature of the current situation to Congress. Concentrating on the next 25 years and showing the consequences of the current path for 25 years may be an alternative way to present the information.

Richard Foster commented that, in contrast to CBO, which has an assumed long-range growth rate for Medicare that is greater than for both Medicaid and private health insurance, CMS assumes that all parts of the U.S. health care sector will grow at about the same rate before demographic effects come into play. The primary reason for this assumption is that while over the short-run health care costs have grown at different rates for different parts of the U.S. health sector, it is difficult to discern long-run differences in cost growth rates across the health care sector. Looking to the future, much of the future health care cost growth, other than demographics, relates to technology—that is, new technology. If that is the case and if, in the long-term future, for example, Medicare costs were to grow faster than private health insurance costs, then that would tend to suggest that Medicare beneficiaries would get all of the new technology that comes along and privately insured persons would not. That scenario is simply not plausible. That is a primary reason that CMS assumes that all parts of the health care sector grow at about the same rate.

In response to a question from Richard Suzman (National Institute on Aging) as to whether CBO has anything in its model on the macro implications of a growing fraction of GDP going into health care, Manchester stated that CBO does not explicitly model how the economy could allocate 50 percent of GDP to health care. That is an issue that warrants further attention.

Dana Goldman (University of Southern California) had two questions. First, he noted that increasing medical care spending presumably leads to better health and longevity. Is this information incorporated into any of the models? Second, with these projections of rising costs, there is concern that there may not be universal enrollment in Medicare Part B. At the present time, it is at about 97 percent. However, as the cost of premiums gets higher, people may opt out, and therefore spending may be lower. Has there been any effort to model that?

In response to the first question, Foster said that CMS has not explicitly taken into account improved health status and its effect on health care costs in the future, although it does that somewhat implicitly. Clearly, health status is improving generally. The question of what happens to health care costs with better health status is often posed. Does CMS sufficiently take account of possible improvements in the overall population health status in its projections? Under currently available methods, direct feedback of such effects into the projection models is not realistic because they have not been able to answer adequately the question: Is improved health status the cause of lower expenditures or is it the result of higher expenditures?

With regard to the question about Part B take-up—that is, the percentage of eligible people actually enrolled in Part B—Foster said that CMS has considered whether the gradual reduction of the take-up rate that has been observed is related to increasing costs. One would expect the reduction to continue and at some point become critical, but at present CMS does not have a good answer as to why less than 100 percent are enrolled in Part B.

Marilyn Moon (American Institutes for Research) suggested that some of the lack of take-up of Part B may be related to the fact that federal employees who are enrolled in health maintenance organizations do not need Part B. She asked Foster if he has a sense of the problem at this point. Foster responded that CMS did not have information at this time, but the question would be part of any study to figure out why people are not enrolled in Part B. Another aspect of this problem is that, with the introduction of the income-related Part B premium, some numbers of people are expected to drop out—if a beneficiary faces paying as much as 80 percent of the cost of premiums, then it may not be a good deal for such a person to continue Part B coverage.

Moon was struck by the emphasis Foster put on the assumption that over time some slowdown in Medicare spending would occur because of

higher cost-sharing. To some degree that seems to be fully consistent with CBO's assumption that people do not want to drop all spending on everything else. But CBO does not envision under current law a substantial slowdown in Medicare spending. Foster maintained that significant changes in health care expenditure growth may reasonably be assumed, even with no change in current law.

Chernew asked if MEPS or other data would make it feasible to track the availability of, and project going forward, the prevalence of retiree benefits that cover a lot of the cost-sharing gaps in Medicare.

Foster stated that it is not an area on which CMS focuses directly. He referred the question to Steven Heffler (Centers for Medicare & Medicaid Services) regarding the extent that OACT, in its private health insurance data, looks separately at retiree health care benefits. Heffler explained that most of the projections of coverage levels are relatively aggregated for, say, total private health insurance enrollment or employer-sponsored insurance. But in each category there is a mix of things occurring. He remarked that one lesson learned in doing the health care reform estimates has been a deeper appreciation of the potential impacts on different groups and a greater need to understand them. He expects there will be more efforts to disaggregate categories to better understand what is happening to different coverage groups.

Cohen pointed out that perhaps the best data resource to inform this issue would be an actual linkage from the MEPS household survey with its establishment survey; currently, they are separate entities. AHRQ staff internally have gone through an exercise of statistical matching. In the past they used the household survey, went to the employers, and got the benefit information. However, with all the problems in obtaining permission forms, they had concerns about the accuracy of the data. So there is quite a bit of capability with the data resources with statistical matching, but it does introduce another source of error. Still, it is the best resource available and certainly viable for answering some of the questions.

Miron Straf (National Research Council) asked how sensitive the cost projections are to the different ways of developing population projections, including those that look at trends in lifestyle, diet, and the like, and the later onset of disability and some diseases. Foster responded that one of the key sensitivities has to do with the different assumptions that have been made about improving life expectancy. If one looks at work by Lee and Tuljapurkar (Lee, 2004) compared with what is done by the Office of the Actuary at the Social Security Administration or by the Census Bureau, one does see some sensitivities to different assumptions, particularly for health care costs. It is one thing to look at the cost of a social insurance program relative to taxable payroll and GDP, in which the number of beneficiaries versus the number of workers is very important, so that faster or slower

declines in mortality affect the ratio of workers to beneficiaries. It is another thing entirely to look beyond that at the age pattern of health care costs. The costs are far higher at older ages, and that raises an interesting question: With longer life expectancy and more people living to older ages, will the future elderly have the same pattern of health care costs as today's elderly, or will their costs be more similar to today's younger beneficiaries of the Medicare program? The OACT has started to explore this issue based on a suggestion from David Cutler (Harvard University) to look at expenditures for survivors in a year versus decedents in a year as a gross approximation of health status. Progress was made in this effort, but the project eventually had to be put aside because of resource constraints.

Jonathan Skinner (Dartmouth College) questioned the role of taxes as a constraint on growth in health care spending. One of the things he and his colleagues found is that countries seem to bump up against tax constraints at about 40 percent of GDP. They do not like to tax more than that. Denmark and Sweden, which have very high tax rates to begin with, have held the line on health care spending in terms of keeping their growth in spending during the last 30 years to 1 or 2 percentage points of GDP increase, unlike the United States, where health care costs are growing at much faster rates. Have there been any thoughts in this country about constraining health care cost growth by holding the line for collecting no more than 40 percent of GDP in taxes?

Foster remarked that the OACT has had some interesting discussions along those lines. What is a tolerable or sustainable level of revenue collection? A few years ago, there was a rash of models developed by others about the long-term growth of government spending, and many of these ended up projecting unrealistic high levels.

Some of the questions raised in this session about the constraints imposed by assuming current law in cost projections and what brakes could be put on health care spending were also discussed in the next session (see Chapter 3).

3

Modeling Medical Technology

This chapter focuses on issues in modeling medical technology as a driver of Medicare spending. The presentations covered three topics:

1. The first presentation provided context by examining the implications for health care cost projections under the assumption of current law regarding payments and benefits. Given that health care costs are growing faster than the gross domestic product (GDP), the question is what factors will slow down that growth.
2. Innovation in medical technology, which has been estimated to account for about half of health care cost increases over the past 50 years, is a prime target for research to identify policy changes that could moderate cost growth. The second presentation focused on innovation in pharmaceuticals, the Future Elderly Model (FEM) was used to estimate the effects on rates of innovation and the consequences for health care spending and health outcomes from two policy scenarios designed to slow cost growth from prescription drugs.
3. The third presentation assessed the relative merits of different modeling approaches for estimating the effects of advances in medical technology as a driver of health care costs.

CURRENT LAW BRAKES ON HEALTH CARE COST GROWTH

Michael Chernew (Harvard University) addressed concerns about the assumption of current law in forecasting models, which does not square with the policy need to put brakes on runaway health care spending growth. He opened his presentation with a general statement that speeding objects clearly need something to slow them down, and the same applies to health care spending in this country. It is understood that the rapid growth in health care spending cannot continue and that if it does not slow down, there is a problem. The question is: What factors are likely to slow it down?

The Congressional Budget Office (CBO) and the Office of the Actuary (OACT) generate spending projections under the assumption of current law. Chernew emphasized that these are not forecasts in the sense that no one expects actual spending to match the projections. To treat them as forecasts does them a disservice. They are designed to show what would happen if current law did not change and to warn policy makers of the consequences of inaction. He observed that a fundamental issue is what is meant by current law. For example, is it the current benefit structure, that is, how much spending would go up under the current benefit structure? Or is it prices, the current payment rates, or, more broadly, the laws regarding payment rates?

In general equilibrium models, prices adjust and spending growth in any sector slows down because there is a budget constraint that individuals face. However, institutional features of the health care system that are embodied in current law, such as public financing of care and administratively set prices, weaken the budget constraint. As a result, although general equilibrium models may work well for forecasting in other sectors in which prices and incentives are not distorted, they may not work as well for the health care sector.

There are other questions regarding current law and financing. Even though it is understood that people are not going to spend 80 percent of GDP on health care and that the nation certainly cannot finance 80 percent of GDP for health care, making adjustments to projections to achieve a sustainable level of spending may do a disservice to policy makers by not warning them of impending danger.

The key point is that current law weakens many brakes on health care spending. The costs of care are heavily subsidized, and these subsidies weaken the budget constraints that individuals would otherwise face.

What Will Slow Medicare Spending Under Current Law?

Chernew identified two principal factors that may slow the rate of growth of health care spending in the future. The first is cost sharing—that

is, the effect of existing benefit limits on Medicare spending. The second is spillover—that is, the effect of cost containment in the private health care sector on Medicare spending. If cost growth in the private sector slows because it does not face current law, how will that influence Medicare spending? Will there be divergence, or will there not be convergence? And what will be the distributional effects?

Cost Sharing

The Medicare benefit package is incomplete. There are deductibles in Part A and coinsurance in Part B. There is cost sharing in the form of a set of copayments and the "doughnut hole" in Part D. Most people obtain supplemental coverage to shield them from the gaps in Medicare. Some of that supplemental coverage is provided by employers, some of it is individually purchased in the Medigap market, and some beneficiaries join a Medicare Advantage plan, which is able to finance coverage of many items not otherwise covered because these plans historically have been paid generously by the Medicare program. A beneficiary who is dually eligible for Medicare and Medicaid could also get around the gaps in Medicare benefits.

A series of laws exist that govern the payment to providers of the Medicare fee-for-service system, payment for health plans in the Medicare Advantage program, payment for prescription drugs in the Medicare Part D program, and eligibility for Medicaid. Under current law, spending will reflect equilibrium based on the law. As health care spending rises, participation in supplemental coverage may decline. For example, employers may drop coverage, exposing workers to a greater share of the cost of health care. Similarly, Medigap premiums may rise, which is likely to result in individuals dropping Medigap coverage. Finally, payments to Medicare Advantage plans may decline, resulting in dropped benefits.

The decline in supplemental coverage will expose individuals to gaps in coverage that are inherent in the Medicare program, forcing people to face more of the costs of health care. The question then becomes how much and when will these mechanisms slow spending growth in Medicare.

In theory, cost sharing generates income effects that slow spending growth as spending consumes more of income. This effect will be more pronounced among low-income beneficiaries who are not receiving large government subsidies. Chernew noted that he is working with Tom McGuire on a study funded by the National Institute on Aging attempting to quantify this effect, but results are not yet available.

Spillovers

The second major factor that will likely slow spending is spillover effects. The basic idea is that spending will slow in the non-Medicare health care sector, resulting in more conservative practice patterns and less abundant infrastructure. With the projected health care spending growth, it becomes infeasible for employers and others to continue to pay an ever-increasing share of the cost of health insurance. The question is how the slowdown in the private health care sector is going to affect Medicare.

There is a potential for positive spillover (in which slower non-Medicare health care spending reduces spending in Medicare) and cost shifting (in which providers try to recoup losses in the non-Medicare sector by increasing costs for Medicare). In the short run, predictions about the nature of spillover effects are ambiguous. Spillover models may reflect commonality in practice styles, in which slower non-Medicare health care spending also slows spending by Medicare. In contrast, cost shifting may apply in the short run, suggesting greater pressure on Medicare budgets as providers try to recoup losses in the commercial sector.

In the long run, infrastructure issues will become increasingly important. If the commercial sector becomes much less generous, the ability of hospitals and other organizations to invest in many types of infrastructure changes. This will tend to slow Medicare spending as non-Medicare spending slows.

Chernew emphasized that there is extensive evidence that positive spillover effects exist in health care spending (Baker and Shankarkumar, 1998; Baker, 1997, 1999, 2003; Chernew, DeCicca, and Town, 2008), in practice patterns (Baker and McClellan, 2001; Bundorf et al., 2004; Heidenrich et al., 2001), and in production functions. That is, as the Medicare Payment Advisory Commission has suggested (2009), if the commercial sector becomes less willing to fund increasing costs, hospitals may actually become more efficient. Regarding infrastructure spillover, there are a number of studies that indicate that the effects are going to be important (Baker and Wheeler, 1998; Chernew, 1995; Chernew, Gowrisankaran, and Fendrick, 2002; Finkelstein, 2007). Ultimately, however, there is not yet sufficient evidence to identify the magnitude of these spillover effects in the future.

Existing current law forecasts are therefore inherently speculative. OACT and CBO continue to refine models to incorporate these factors and provide a more accurate picture of what the future may hold to help guide policy makers.

PHARMACEUTICAL INNOVATION, SPENDING, AND HEALTH

Darius Lakdawalla (University of Southern California) focused on pharmaceutical innovations and the implications for health care spending and health outcomes in the population. He briefly described research undertaken by him and colleagues flowing from FEM.[1]

Technology is a major driver of health care spending. In the last 50 years, roughly half of the key factors behind increases in total medical spending are attributed to technology, while other factors, such as aging, income, insurance, and prices, have played smaller roles. A natural follow-on question to this is: What explains the advances in technology? The next step in the research frontier is to think about technology in the way one previously thought about spending and incorporate it into the process of modeling. Both health care spending and technology are determined by a host of underlying factors—demographic changes, economic growth, and health care policies among them. The challenge from a modeling perspective is to understand what policy choices lead to socially advantageous paths for both technology and spending. These are coevolving trends and understanding how they evolve together should help to clarify beneficial ways in which to influence both costs and technology.

Lakdawalla and colleagues analyzed this issue in the context of pharmaceutical innovation, spending, and health: What causes innovation in the pharmaceutical sector? How does government policy for pharmaceuticals affect innovation, spending, and health through its effects on pharmaceutical discovery and pharmaceutical utilization?

Innovation Creates Social Trade-Offs

Basic economic incentives have to be incorporated into a model of general innovation in the health care sector, not just pharmaceutical innovation. Innovation creates social trade-offs. Higher prices for innovations lead to more research. Innovators respond to incentives, working harder when they expect more rewards. However, higher prices strain public and private budgets and reduce the number of people who can use new inventions. This situation leads to a difficult trade-off between current and future generations. Lower prices save money and lead to higher use of today's technological advances by today's health care patients, while higher prices lead to more new technologies and treatments for tomorrow's patients.

The innovation trade-off is acute for pharmaceuticals. Maintaining high prices for drugs today may lead to more new drugs tomorrow, but

[1]The research team comprised Ze Cong, Han de Vries, Dana Goldman, Italo Gutierrez, Darius Lakdawalla, Robert Lempert, Pierre-Carl Michaud, and Neeraj Sood.

high prices today leave some of today's patients untreated. In some sense, this is a trade-off that pits current generations against future generations. In order to understand the implications for policy, it is essential to incorporate this trade-off into a model that includes innovation. What does this trade-off mean, on balance, for the right mix of incentives for innovation, development of technology, improvements in health, and containment of health care spending?

Regulatory Choices Have Global Effects

Innovation in pharmaceuticals and other medical technology spills across the entire globe, which makes the modeling of innovation challenging. Innovation is a global good, and the global nature of innovation creates linkages across markets. A new drug or therapy benefits patients around the world. A new drug discovered in Switzerland, for example, is going to benefit U.S. patients just as it benefits Swiss patients. High U.S. prices hurt today's U.S. residents but may help future Americans and Europeans; similarly, low prices benefit today's Americans but may have consequences around the globe for the future. A model that incorporates innovation therefore has to account for the fact that a country's policies have effects beyond its borders—that is, U.S. policy changes are going to have global effects just by virtue of the fact that changes in the rates of innovation affect the treatment of patients around the world.

Research Approach

The approach taken by the research team, as Lakdawalla described, included

1. Determining how changes in pharmaceutical policy affect the rate of new drug launches.
2. Inferring from the best available medical and economic evidence the effect of new drug launches on health outcomes and medical spending.
3. Building a tool that forecasts the impact of pharmaceutical policy changes on health, life expectancy, medical spending, and patient well-being.

As stated earlier, the starting point was FEM. The team analyzed two types of policy changes:

1. Lowering the prices paid to manufacturers, in which the United States adopts government price negotiations estimated to lower

manufacturer prices by 20 percent. That is similar to what European governments do, but it is not allowed under Medicare Part D as it is currently configured.

2. Lowering the price paid by consumers, in which, instead of changing manufacturer prices, the United States lowers consumer copayments by 20 percent. This is more akin to Medicare Part D, which was designed to affect out-of-pocket spending but not to have direct effects on prices paid to manufacturers.

Using these two types of policies—changes in manufacturer prices, all else being equal, and changes in consumer prices, all else being equal—the research team built a model based on FEM that incorporated the effects of new drug launches and the effect of pharmaceutical policy on the rates of new drug discovery.

Findings

The team found that when pharmaceutical manufacturer prices are lowered, global longevity is reduced. Over the next 50 years, a reduction of manufacturer prices by about 20 percent would likely reduce longevity for U.S. 55- to 59-year-olds by about three-quarters of a year and for European cohorts around the same ages by about a half year. This finding is not surprising, given that innovators are assumed to respond to lower profits by making fewer inventions.

These baseline forecasts of the policy effects raise an important issue: there is going to be inevitable controversy and debate over any set of assumptions that underlie a model and any set of parameters that are used to configure a model. They reflect fundamentally the uncertainty of the whole modeling enterprise.

The research team had the best available estimates from the medical and economic literature, although controversy exists even about those estimates. It is important to take a range of possible assumptions from the literature—not just the best or what seem to be the best available ones or the ones that most people vote for—indeed, the entire range of entire plausible assumptions. That helps to show which policies are better and worse and how risky certain policies are, because, ultimately, if modelers face uncertainty, that translates into risk faced by a policy decision maker. That decision maker has to decide how to act in the face of uncertainty. The key issue is the riskiness of one course of policy action compared with its alternatives.

More important than the baseline effect of the two policy alternatives was the research team's conclusion about the risk–reward trade-offs faced by policy makers looking at the pharmaceutical sector. On balance, lower-

ing pharmaceutical prices paid to manufacturers is probably a risky strategy. The cost is a potential decrease in life expectancy, both in the United States and around the world, which may be modest or very large and which will vary with the responsiveness of innovation to profits. The benefit is modest decreases in U.S. medical care spending.

In contrast, consumer copay reduction policies are robustly beneficial. Reducing patient out-of-pocket costs, without changing manufacturer prices, fosters innovation although it leads to modest increases in health care spending on pharmaceuticals. At the same time, there is a benefit in terms of increases in global life expectancy; the increases may range from modest to significant and are likely to vary with the responsiveness of innovation to profits. On balance, copay reductions appear at worst to risk modest costs, and at best to generate substantial and cost-effective gains in life expectancy.

Lessons for U.S. Policy and for Forecasting

From a policy point of view, Lakdawalla described some lessons learned from the analysis:

- The general thinking behind Medicare Part D was reasonable. It lowered prices for many elderly Americans who were previously uninsured without lowering manufacturing prices. On average, Part D lowered prices faced by elderly patients by far less than 20 percent, suggesting that increasing the generosity of Part D may benefit society.
- Extending drug insurance subsidies to the nonelderly may provide substantial benefits.

He further described some lessons for forecasting:

- When thinking through any forecasting exercise, it is important to recognize that the future path of technology is highly uncertain, along with a number of other parameters that influence the modeler's task. Policy makers must make decisions in the face of uncertainty, and modelers must account for the need to make decisions in the face of uncertainty. This requires analyzing the riskiness of different policy actions, rather than simply providing a single expected outcome associated with any given policy.
- The goal is to discover policies that limit risks but cultivate large potential gains. When such policies fail to exist, modelers can at least expose key trade-offs facing policy makers when they are

making decisions in an environment of radical uncertainty. That is another frontier that modelers need to push.

Finally, Lakdawalla emphasized two areas in which modelers need to make advances. One is pushing further on modeling the evolution of technology in addition to modeling the evolution of spending. Another is incorporating uncertainty in a much more fundamental way. Uncertainty is not just a nuisance parameter to a modeler; it is a fundamental part of decision making into the future. Every decision maker faces it, so it is essential to incorporate it into projection modeling and to try to come up with ways to expose the impacts of that uncertainty, so that policy makers have the information they need to try to do the best they can in the face of it.

MEDICAL TECHNOLOGY AS A COST DRIVER

Kenneth Thorpe (Emory University) spoke about the role of technology in rising health care costs and ways to estimate the effects on expenditures globally and for specific medical conditions. He noted that the impact of technology on health care costs is well recognized. Costs continue to increase due to treatment innovations as well as advances in detection and diagnosis of existing disease. However, for many reasons, the role of technology is difficult to measure accurately. Two general approaches have been relied on to date in an effort to determine technology's effect on medical expenditures: (1) residual analysis and (2) case studies.

Measuring the Role of Technology

Residual Analysis Approach

The traditional approach for measuring the impact of technology on health care spending has been residual analysis. In this method, demand-side factors that are easily captured are accounted for (e.g., population demographics, insurance changes, income changes, prices, and administrative costs), and the remaining cost is attributed to technology. This method is limited, however, by its tendency to overstate the impact of technology on costs, as it fails to control for less apparent variables, such as changes in patient characteristics over time and trends in rising clinical incidence and disease prevalence that could affect growth in medical spending. For example, recent findings by Thorpe and colleagues point to the rising clinical incidence and prevalence of chronic disease in recent years, specifically among Medicare beneficiaries (Thorpe et al., 2010). The residual analysis method, which adjusts only for changes in the age and sex composition of

the population over time, is insufficient to detect important trends in disease prevalence and treatment. While the residual approach may be acceptable for measuring the impact of technology on costs over the past 50 years, it lacks the sensitivity required to explain changes in recent decades.

Another change that residual analysis would have failed to detect is the decline in the disability rate over the past decade. Thorpe observed that despite increases in disease prevalence, Medicare spending per capita decreased over the past decade in part due to lower disability rates among the elderly population.

The Case Study Approach

The case study approach involves looking at each medical condition separately, examining trends in treated prevalence of the medical condition over time, and then decomposing changes in spending over time into three parts: (1) changes due to treated prevalence of the disease, (2) changes due to spending per case, and (3) interactions between the two. The rationale underlying this approach is that any changes in costs due to spending per case can be attributed to changes in technology.

Using the case study approach to examine the growth in health care spending over the past two decades, Thorpe and colleagues found that spending increases are largely due to rising rates of treated prevalence rather than spending per case treated (Thorpe et al., 2004; Thorpe, Ogden, and Galactionova, 2010). Such a finding necessitates further investigation, as increases in treated prevalence can result from a number of factors. For example, treated prevalence can increase because the true clinical incidence of the disease has risen, which is the case for diabetes. Treated prevalence can also increase due to the implementation of new clinical guidelines about when medical personnel should intervene, which happened in the case of depression, or to improvements in disease detection that are unrelated to technology. Similarly, increases in spending per case can be attributable to a combination of factors: increases in clinical disease incidence and changes in treatment patterns, in addition to technological advances.

For example, using data from the 1987 National Medical Expenditure Survey and 2001 Medical Expenditure Panel Survey Household Component, Thorpe and colleagues examined the impact of obesity on rising medical spending. They found that the combined effect of changes in obesity prevalence and changes in spending per case accounted for 27 percent of the growth in inflation-adjusted per capita health spending between 1987 and 2001. The changes in spending per case over this period were largely due to the widened spending gap between obese and normal-weight adults—a difference that increased from about 15 percent in 1987 to 37 percent in 2001 (Thorpe et al., 2004). These findings

suggest that the cost increase in treating obese adults between 1987 and 2001 was not necessarily due to new technologies but rather to more intensive treatment patterns and changes in the clinical threshold for when to treat patients.

Data from the period 1987-2006 also highlight an increase in treated disease prevalence among the Medicare population. According to Thorpe and colleagues, important changes in a handful of chronic conditions (i.e., diabetes, kidney disease, hyperlipidemia, hypertension, mental disorders, arthritis) have driven the rise in spending among Medicare beneficiaries over time. The largest cost driver among these conditions is diabetes, which accounts for nearly 8 percent of rising Medicare costs over the past decade (Thorpe et al., 2010). To determine whether these rising costs were due to a growing incidence of treated prevalence among Medicare patients—which, for diabetes alone, increased from 11.3 percent in 1987 to about 20.5 percent in 2006—Thorpe and colleagues used the spending decomposition method to determine what percentage of the total change in spending from 1987 to 2006 was due to a change in the prevalence of treated disease. They found that, for most of these condition-specific case studies (heart disease notably excepted), increases in spending were a result of rises in treated prevalence rather than rises in the cost per treated case. Again, an important question left unanswered through use of the case study method was what factors drove the change in treated prevalence, which Thorpe notes as an important avenue for future research.

Suggested Advances in Modeling

In order to improve the predictive accuracy of health care spending projection models, Thorpe suggested supplementing the more traditional GDP-based approach, which relies largely on demand-side factors, with data that are traditionally built into epidemiological models, such as projected trends in disability, obesity, and smoking. These risk factors are typically tied to higher rates of medical spending. Accounting for these risk factors, along with changing population risk factors and health, will therefore result in more comprehensive spending models with improved predictive accuracy.

Thorpe and colleagues have used this modeling approach to determine the role that rising obesity prevalence has played in changes in medical spending, both among the Medicare population and the general population. In the two recent decades studied, the results consistently show changes in obesity prevalence to account for 25 to 30 percent of the growth in spending (Thorpe and Howard, 2006; Thorpe et al., 2004). This approach can also be used to explain the decline in Medicare spending over the past decade by taking into account such factors as declining disability rates and policy changes after the implementation of the Balanced Budget Act. Thorpe con-

cluded by emphasizing that epidemiological factors are clearly an important piece of the spending puzzle and that, going forward, researchers might examine whether adding them to GDP-based models enhances the ability to more accurately predict changes in medical spending.

DISCUSSION

Many participants had comments and questions on the topics of incorporating the supply side in projection models, the diagnosis of diseases, policy options relating to pricing, and various other issues related to technologies.

Supply Side in Projection Models

Dana Goldman observed that researchers working on the RAND FEM have tried to think about technology, starting with just asking people, but then incorporating technology and pharmaceutical spending into the process of modeling. Thorpe is doing the same from a disease perspective. Thinking about projecting forward, the only part that is missing in modeling is what goes on in a doctor's office. Goldman questioned if one of the answers is some sort of modeling on the supply side, for example, incorporating what goes on in a doctor's office, or some other approach.

Michael Chernew responded that in some of the forecasting work that has been done the question does arise; it is hard to think of it either as a purely demand-driven or purely supply-driven notion. The paradigm that has been dominant so far, although it may not be the correct one, has been that the demand side is dominant. If people demand different types of technologies and services, such as, for example, more time with the physician, the supply side will respond to that demand.

There are obviously other models that would be based, for example, on limitation in the amount of workforce that is needed. Members of the Technical Review Panel on the Medical Trustees Report were concerned about what would happen if there are not enough doctors to meet the demand projected by the models. But the panel thought that there will be innovations on the supply side to meet the demand one way or another. The technology would change in very much needed, endogenous ways, which Lakdawalla spoke about in his presentation.

Growth in the Diagnosis of Disease

Jonathan Skinner commented on Thorpe's work showing growth in the diagnosis of disease. When coupled with what seems to be evidence of the

decline in disability rates among the elderly, does that mean that there are more healthy people around who just happen to have more diseases? Or on the supply side, are physicians just a lot better at diagnosing? It should be noted that the diagnostic rates of magnetic resonance imaging and computerized tomography (CT) scans and other such developments are going up at double-digit rates. Understanding the issue of risk adjustment is important; it looks like doctors who do a lot of diagnostic tests and procedures also diagnose lots of disease.

Thorpe responded that it is both. This was not an issue before 1985 or earlier, because the percentage of the population that was obese, for example, was stable for 25 or 30 years. It was not accounting for much of the growth in spending at all. Since that time, the incidence of diabetes is way up; pulmonary disease is also way up, as is the price of their treatments. The detection rates of diabetes have not changed in 30 years: two-thirds of total diabetes is detected. The problem is not detection: hypertension and hyperlipidemia have exploded. These conditions would not have been treated 20 years ago, in part because statins did not exist, but also because the clinical thresholds for treating patients have changed over that time period. So true incidence increases that one can actually do something about in terms of changing the risk factors, changes in clinical thresholds for treating patients, and better detection all contribute to the growth in the diagnosis of disease.

Alan Garber (Stanford University) added that one of the problems is a technologically driven change in the diagnosis of various conditions. For example, the rise in coronary CT angiography also leads to increases in findings of conditions, and a certain percentage of those findings get worked up. That would not have happened 10 years ago. He suggested that one should look carefully at what data sets are needed that would make it possible to identify the issues and do the needed analysis. Electronic health records and baseline data sets will probably be needed.

Policy Options Relating to Pricing

Referring to Lakdawalla's presentation, Garber remarked that he did not understand the two policy options relating to pricing. One of these options was about reducing manufacturer prices. Is it assumed that somehow there is a policy that is going to accomplish a specific reduction without saying how to get to that target? The more important question is about the copayment reduction option. Is it a policy that says to change the coinsurance rate, or is it a policy that says somehow out-of-pocket payments will change by 20 percent?

Lakdawalla responded to the first question that the mechanism for lowering prices was price negotiations. Implementation of price negotia-

tion in European countries tended to lower prices paid to manufacturers by roughly 20 percent. In some sense what they are doing is comparing any number of polices that would have the effect of lowering manufacturing prices and policies that would have the effect of lowering out-of-pocket spending. In response to the next question regarding consumer prices, Lakdawalla stated that they were thinking about consumers paying 20 percent less out-of-pocket on a unit-adjusted basis.

Garber remarked that that is an outcome, not an instrument. To model a policy change, one does not assume the results of the policy change. There are many different ways to get to a 20 percent reduction in out-of-pocket costs for consumers with different implications for welfare.

Lakdawalla responded that it depends on the way the model is built. Behind the two scenarios they had in mind motivating policy. So on one hand, on the manufacturer price side, they had price negotiation as a motivating policy. On the other, the consumer price reduction side, they had subsidies for prescription drug insurance as a motivating policy.

Identifying Cost-Reducing Technologies

Cynthia Leibson (Mayo Clinic) asked how to find technologies that are in fact cost reducing and where can research provide some insight. From the clinical perspective, one of the new buzz words is individualized medicine. What that requires is characterization of the phenotype and the genotype at the level of the individual and then following individuals forward over long periods of time to see health outcomes, both the condition of interest and the outcomes following that condition of interest, and how the primary and secondary interventions impact those survival rates. There is not much research being done or much discussion of that approach with costs other than outside clinical trial settings, which is not very satisfactory. She questioned if there might be some room for looking at where one can intervene—that is, at what point along the life-course trajectory (from obesity to diabetes to cardiovascular disease to death) for life expectancy—as well as on whom to intervene. Who are the people that these technologies would benefit not only with respect to these clinical outcomes, but also with respect to saving costs?

Chernew responded that it is a challenge to think about what is happening now or in the next 5, 10, or 15 years in terms of technology and what will lower costs. There are many technologies that might lower costs at a single point in time; the challenge has been to lower them over time, for a number of reasons that involve not only treatment for diabetes, but also all of the competing risks in order to show that a lot of money is being saved.

Research needs to go into the basic question of what will lower spending. That question is dramatically different from the question of how to set up a system to have lower spending growth in the future that is going to have several new technologies. They are going to be interacting with spending in a range of complicated ways. Both types of studies are important.

Other Related Issues

Kenneth Feingold (Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services) asked Lakdawalla to elaborate the part of the model that goes from prices in drug launches to life expectancy. If there is a global market, why is there still a difference between the United States and Europe in life expectancy? Does this take into account the fact that some drugs that are launched are not expected to affect longevity, since they may be copy cats of existing drugs or may alleviate pain without actually extending life.

Lakdawalla explained that there are a couple of steps in the model. The first goes from drug revenues to the number of drug launches, and that is done on a disease-specific basis. So revenues changing in a particular disease have impacts on launches in that disease. That is one reason why the United States and Europe differ in their disease profiles. The next step is from drug launches to health. The vast majority of drug launches do not have an impact on health, so the research team went to the clinical literature, looked at top-selling drugs, and made the very conservative assumption that all of the other drugs have no impact on health. So every time a drug is launched, a question is asked, what is the probability that it will be a top-selling drug? If it is, then it gets assigned the mean effect for top-selling drugs. If it is not, and that probability is about 75 or 80 percent, then it has no impact on health. Most of the time it is a draw from the air and has no impact.

Mark Freeland (Centers for Medicare & Medicaid Services) observed that there are multiple causes of innovation, especially when one looks at the continuum of cost-increasing versus cost-decreasing innovation. For example, two of the most innovative, dynamic industries in the United States, computers and agriculture, have actually experienced declining increases in price. He questioned if Lakdawalla and colleagues looked at other industries or looked at the pharmaceutical industry for other causes of innovation, including the role of the National Institutes of Health (NIH) in a lot of basic research and development and the potential that they could have to focus on cost-decreasing as opposed to cost-increasing technologies.

Lakdawalla responded that one of their collaborators in this project has been doing a lot of work specifically on this question of how NIH funding affects private rates of innovation in health care. As one might guess, it is

fairly significant as a source of private innovation through the channel of funding universities.

Regarding the other part of the question, comparing cost-reducing innovation in health care with that of other industries, as a first approximation one looks at health care to say where are all of the cost savings inherent in desktop computers and so forth. In some sense one could argue that there is some cost savings going on. If increases in drug spending, for example, substitute for hospital stays, that is one source. But on balance it is becoming more expensive, even though people are getting more in return. Some people have identified the productivity slowdown in the pharmaceutical sector and in other areas of the medical care system as one contributor to that. But there are a lot of open research questions, and it is not well understood as to why that industry is so different.

4

Factors Affecting Health Status

This chapter examines some of the factors affecting health status that are driving health care spending among the Medicare population. The workshop presentations covered three such factors, which research shows are important to consider in projecting future Medicare costs:

1. health and health care cost consequences of obesity among the Medicare population;
2. the role of socioeconomic status and health-related behavior in driving medical care spending; and
3. the role of chronic diseases and disability in health care costs.

HEALTH AND HEALTH CARE COST CONSEQUENCES OF OBESITY

Justin Trogdon (RTI International) described the current costs of obesity in terms of health outcomes and spending among the Medicare population, presenting cross-sectional, lifetime, and recent trend estimates. He also reviewed different types of strategies that modelers have used to estimate costs and forecast the future, both for the prevalence and health consequences of obesity and how obesity impacts projections of Medicare spending.

Health Consequences of Obesity

Obesity has the attention of researchers and policy makers. It is associated with increased risk for many chronic conditions, such as hypertension, high cholesterol, cardiovascular disease, and cancer, among others. Obesity impacts nearly every major system in the body. It is, in itself, an outcome of several different behavioral and policy decisions; it is also an input into chronic disease.

Improved treatment for many of the conditions associated with obesity means that, in some sense, an obese person in 2010 is "healthier" than an obese person in 1950 or probably even 1980. That is good from a morbidity and health status point of view, but such improvements have been achieved often at increased health care cost. Statins to reduce cholesterol and other drugs to lower blood pressure, for example, are not cheap. Also, improved treatment may or may not lead to major changes in health outcomes such as mortality.

Years of Life Lost

Does obesity shorten life expectancy? Trogdon summarized research he and colleagues conducted in which they calculated years of life lost associated with obesity using life tables by weight categories[1] and smoking status. They found that overweight and moderate obesity (obese I) will not shorten a person's life. Severe obesity (obese II and III) will take years off one's life. At age 65, a typical age at which people enter the Medicare program, being an obese II person (about 40 pounds overweight) is associated with 3 years of life lost for whites, while being an obese III person (a little over 100 pounds overweight) is associated with 4 to 6 years of life lost across gender and race (Finkelstein et al., 2009a). These findings indicate that although rates of chronic conditions, such as diabetes and hypertension, are higher among obese people, they do not necessarily translate into a shorter life span.

Health Care Costs of Obesity

How much does obesity increase health care costs at a given point in time? To answer this question, Trogdon reported on the findings from a recently published update of national estimates of annual medical spending attributable to obesity (Finkelstein et al., 2009b). Comparing a Medicare beneficiary who is obese to one who is not obese and controlling for other

[1]Obesity categories: overweight = 25-29 body mass index (BMI); obese I = 30-34.9 BMI; obese II = 35-39.9 BMI; and obese III = 40+ BMI.

differences between those two groups, Trogdon and colleagues estimated that obesity increases per capita Medicare expenditures by about $1,723 per year. Those dollars, for the most part, go to treating all of the chronic diseases that obesity is associated with and not just direct treatment for obesity. This estimate means that the annual medical burden of obesity is nearly 8.5 percent of total annual Medicare expenditures. If the 8.5 percent estimate, generated using data from the Medical Expenditure Panel Survey (MEPS), is applied to all of the national health expenditure accounts, assuming the institutionalized population has a similar share of medical spending going toward obesity, the Medicare costs associated with obesity could be as high as $85 billion per year in 2008 dollars.

Another way to look at the cost of obesity is to ask the question: How do medical care costs associated with obesity vary over a lifetime? This question points to the importance of preventing obesity for the Medicare population. Using the life tables described above along with MEPS data, Trogdon and colleagues estimated survival-adjusted lifetime obesity cost estimates (Finkelstein et al., 2008). One of the major conclusions as a result of that work is that, compared with the private insurance market, Medicare has potentially a greater incentive to prevent obesity because costs attributable to it are near their peak around the age of entry into the Medicare program (ages 60 to 65). What that means for the private insurance market is that, often, the major costs of obesity are not likely to be its problem. The likelihood that a potential cohort of employees would still be on the company's health insurance rolls after 5 years might be relatively low.

Thorpe and colleagues (2004) examined recent trends in the health care costs of obesity. To answer the question of how much of the increase in medical care spending over the last 10 to 20 years is due to obesity, they estimated medical costs and obesity-attributable health care costs in 1987 and 2001. They found that obesity-attributable costs increased per capita medical care spending by about $300, accounting for about 27 percent of the increase in per capita medical care spending between 1987 and 2001. This percentage has been relatively stable over the past 5 or 6 years.

Forecasting the Future of Obesity Prevalence

Currently, obesity is important to the Medicare program from a cost perspective, both on an annual basis and as each cohort of Medicare beneficiaries ages through the system. Obesity has contributed greatly to increases in health care costs.

The current prevalence of obesity in the adult population is about 30 percent. What is going to happen to the prevalence of obesity moving forward in time? This is a much trickier question. Unlike predictions of health care spending, obesity prevalence has a natural limit—100 percent. Models

that merely project recent trends into the future will predict that everyone will be obese, and it is just a matter of when. That does not seem to be the most likely occurrence, but one has to think about when and how those trends would turn around.

Several recent attempts have been made to project obesity prevalence, but none is specific to Medicare. For example, in California, obesity rates are projected to increase from 24 to 35 percent of the adult population between 2010 and 2020 (van Meijgaard et al., 2009). At the national level, there are other estimates that have been published over the last 2 to 3 years. The predicted prevalence of obesity in 2020 is estimated at around 42 percent (Ruhm, 2007) and 44 or 45 percent (Wang et al., 2008). That amounts to about a 10 to 15 percentage point increase in obesity prevalence, which is an additional 50 percent increase over the current level.

Thorpe, in a recently released report (2009), also projected the estimated prevalence of obesity for the period 2008 to 2018. His midpoint estimates of the prevalence rates for the 10-year period are also around 42 to 44 percent of the adult population. Projecting the obesity-attributable costs over a 10-year time horizon using extrapolation, he found that obesity-attributable health care spending could range from $864 per capita in Colorado to $1,906 in Oklahoma. It should be noted that these are total and not Medicare-specific costs. Total obesity-attributable health care spending in the United States was projected to increase from $79 billion in 2008 to $344 billion in 2018. If one is willing to extrapolate past trends forward, these estimates suggest that the United States may be in for a much higher obesity prevalence and increased costs in the future.

Factors Influencing Future Obesity Rates

Most forecasts of obesity, both for prevalence and costs, are extrapolation of past trends. Even when a microsimulation model is used, there is still an assumption of past trends continuing on. Whether that is a reasonable assumption will depend on policy and technological changes in the food supply and medical care systems or both, all of which will influence the future of obesity over the next several years.

Food system changes include policies on food prices, taxes, subsidizing certain products, labeling requirements, and nutrient rules such as trans-fat bans. The question is: If there are structural changes in some of these underlying policies, how would that impact obesity prevalence rates? A simple extrapolation is not going to answer that question.

Changes to the medical care system could change the prevalence rates of obesity. However, such changes are not necessarily going to slow the growth in obesity prevalence—some changes might actually accelerate them. Some examples are technologies to treat obesity with surgery and lap bands, sev-

eral prescription drugs specifically for weight control that are being tested for federal approval, and even some of the technological advances that would treat obesity comorbidities. These could have behavioral impacts on incentives for people to control their weight. For example, if it is relatively cheap for a person to be treated for hypertension and cholesterol by just taking a pill, there is less of an incentive to be concerned about weight and diet. These behavioral impacts will have implications, especially for Medicare, when all of the obesity-attributable costs start coming in.

Trogdon concluded his presentation by stating that, based on current knowledge, it is likely that there will be continued increases in obesity over the next 10 or 20 years.

SOCIOECONOMIC STATUS AND HEALTH-RELATED BEHAVIOR AS FACTORS IN MEDICAL CARE SPENDING

Eileen Crimmins (University of Southern California) opened her presentation by observing that socioeconomic status (SES) is a fundamental cause of health differences in the population. The United States is a society of haves and have-nots. Large differences exist between these two groups, and the SES distribution of the population relates to people's health status. Socioeconomic differences in health exist all over the world; they tend to be larger in the United States than in other countries. They are omnipresent over geography, and they also have been present over time.

Some differentials by SES in health outcomes have been relatively stable over time. People with lower SES—low education or low income or low occupation—have worse health by almost all health indicators. They have more diseases, physiological risk indicators, disability, and physical and cognitive functioning problems. Socioeconomic status in and of itself is a fundamental cause of health problems that works through many mechanisms to affect health. It can affect health outcomes through health-related behaviors, knowledge and skills obtained through education, and the ability to use income and wealth to purchase things that affect health. People with higher incomes are more likely to have access to care, a regular provider of medical care, and health insurance coverage. Social-psychological differences, differences in depression and stress, and health care access affect health. Thus, health outcomes differ by SES, and these differences affect differences in health care costs.

In models of use of health care services, the inclusion of such health indicators as disability and diseases tends to eliminate, or greatly reduce, the effect of SES variables. Cost is yet another issue because costs are affected by geographic location and the characteristics of the environment in which a person lives, not just the characteristics of the individual. To a large extent, most of the differences in costs for people with different SES come from either observed health differences or the different places they get care.

Incorporating SES in Projection Models

Is there some way to consider SES in order to make better cost projections? For example, are changing education levels in the population, or a changing set of differentials within the population, something that needs to be incorporated in models in order to make better projections?

Crimmins presented research findings to show the significance of SES differences in health outcomes. Using data from the Health and Retirement Study (HRS), Banks and colleagues (2006) looked at the prevalence of a set of diseases by three levels of education—low, medium, and high—among non-Hispanic whites ages 55-64. For heart problems, hypertension, stroke, diabetes, chronic lung disease, heart attack, and all of these conditions combined, lower education status was associated with higher prevalence.

This association holds for all kinds of measured risks. Using data from the National Health and Nutrition Examination Survey (NHANES) for the period 2001-2006, Karlamangla and colleagues (no date) looked at SES differences in metabolic syndrome and 10-year global chronic heart disease risk and found a much higher prevalence of poor scores among low SES people. In terms of risk factors, the data from HRS on the percentage of people ages 50 and older who were obese, current smokers, and heavy drinkers by education level showed that those at the highest education level had the lowest number of risk factors and those at the lowest education level had the highest number.

SES Differences in Health Outcomes and Age

There is no question that higher rates of ill health are found among people with low SES; however, these differences vary by age. The age at onset of the deterioration in health varies by SES; problems arise earlier among those with low SES. The maximal point of difference is at older working ages; at very old ages, they disappear or are reduced, at least partly because of mortality.

One of the more important points that comes out of RAND's Future Elderly Model (FEM) is that people who survive to old age are different from those who do not survive. People with relatively high SES survive longer and people in better health survive longer; people with low SES and those with poor health do not survive as long. That is the key to thinking about how one needs to incorporate changes over time in a model that projects health care costs. For purposes of modeling, one has to think about the timing aspect and a life-cycle effect aspect, rather than just looking at prevalence and modeling it forward.

Health events are age related; for most health problems, at the age of Medicare eligibility, low SES people are going to have more health prob-

lems but a shorter expected length of life. Crimmins observed that life expectancy at age 60 for people with low, medium, and high SES shows a difference of about 5 years. In order to understand health differentials and their ability to change overall costs, one has to figure out how long people in different SES groups live, how many years of that life are spent unhealthy by a variety of definitions, and the cost of an unhealthy year. Costs need to be determined to understand how technology and policies will change the age at onset of health conditions, the length of survival with conditions, and the overall length of life.

SES and Healthy Life Expectancy

Data from various sources show that social and economic differences in health and mortality result in more years of ill health, fewer years of healthy life, and lower life expectancy overall, for people with low SES status. These differences arise from a process of earlier onset of health problems and higher mortality. The effect of this process of health deterioration on differential population health depends on where in the process of health deterioration the change occurs. Increasing the average length of life can have relatively little change on the distribution of population health. If healthy and unhealthy life are both increased at the same time, population health may not change much at all. At the same time, the length of an individual's healthy life may increase.

Crimmins explained that changes in population health characteristics and the life-cycle characteristics of individuals can be different, and they tend to get mixed up when people think about improving population health. For example, reducing deaths from heart disease may increase the prevalence of heart disease in the population, as well as its costs. The prevalence of disease in the population can increase because of success in lengthening the life span of people with disease.

To improve the health of the population, what needs to be done is to delay the age of onset of conditions and reduce the time with health problems. This has not happened much yet; instead, the time with health conditions has been increased. That is one of the reasons it is important to think about years with conditions and years in good health.

Trends in Health

Both the incidence and the prevalence of disease in the population have increased. In most cases, the prevalence of disease has increased because of the decline in mortality, with little or no change in the incidence or rate of disease onset. Diabetes may be a different case because the rate of onset has increased. Changes in every disease need to be looked at differently.

The prevalence of diagnosed risk factors, such as hypertension and high cholesterol, has increased. Yet disability has declined in the older population; physical and cognitive functioning and ability to work have improved. Although for some people who have disease, the progression to either becoming disabled or dying has been delayed, the underlying diseases have not been eliminated.

Rising education has been a major force for improvement in health over time, primarily in the area of disability. A number of recent papers have essentially attributed at least 50 percent of the decline in disability to change in the education composition of the population (see, for example, Freedman and Martin, 1999; Schoeni, Freedman, and Martin, 2008). This means that health processes have not changed in the population, but that the composition of the population has changed, with more people in the better educated group. Over the long run, that has been an important factor in increasing life expectancy. It is not clear, however, that this factor will continue to operate in the same way into the future, because in recent years the increase in education at older ages (60-69) is starting to slow down in the younger population (ages 50-59).

Crimmins and a colleague found that in the 10-year period, 1997-2007, the number of people unable to work and those limited in their ability to work at age 60 have declined (Reynolds and Crimmins, 2009). Rising education has been a force for improvement in disability. In general, SES differences have not changed much over long periods of time, but over time the more educated population comprises a greater percentage of the total population. There is also some evidence of widening of SES differentials in mortality in recent years, which could be a short run or long run trend (Jemal et al., 2008). That is one reason why it is important to understand changes in how SES is linked to health outcomes, because there is now a wide difference between the lowest and the highest SES groups. If the lowest group were to change to be like the highest group, there would be a substantial increase in the number of people who would need to be covered by Medicare, increasing the health care costs for the total population.

In summary, Crimmins emphasized that an important national aim is to reduce health differentials. Reducing mortality differentials and reducing differentials in age at onset could have different effects for population health. A lot more detail on the processes of health change is needed to better understand what is underlying the observed differences in the population prevalence of health problems.

Microsimulation can be used to address these processes. That does not mean one has to incorporate a simulation of changes in health status into major national projection models. Yet to understand the role of a given factor for health status, microsimulation of all of the processes involved is

needed, and the more detailed the simulations, the more one can understand the processes.

Finally, Crimmins observed that some things are known about cohort change in SES, but this research relies on cross-sectional, time-related data rather than cohort data. Clearly, there is need for more information on lifetime health circumstances to understand changes in health outcomes. Today many diseases have a life span of 20, 30, or 40 years, with long spans of treatment. The onset of risk factors and treatment can start very early in life. For example, the implications of being treated for hypertension or high cholesterol for 30 or 40 years, in terms of mortality and cardiac events, are not understood. In order to better understand the future implications of cohort characteristics and experiences, it is necessary to have more lifetime models of health rather than models that are based only on recent cross-sectional data.

DISABILITY, CHRONIC DISEASE, AND MEDICARE SPENDING

Jay Bhattacharya (Stanford University) opened his presentation with two general observations. The first purpose of forecasting models of health care expenditures is to alert Congress and other policy makers about problems in the outlying years. A second and related purpose is to answer counterfactual questions about what will happen if various events (such as the development of new medical technologies) should occur. Both purposes, but especially the second, require that the forecasting apparatus adopt an underlying theoretical idea about the primary drivers of health care spending. In his presentation, Bhattacharya proposed the development of chronic disease and the competing risks phenomenon as the theoretical ideas driving health care expenditures. A forecasting apparatus centered on these ideas is well positioned to answer counterfactual questions about the effect of changes in health status on future health expenditures.

Bhattacharya mentioned a working paper by White (2006, later published in 2008) that noted a slowdown in the growth of Medicare expenditures between 1997 and 2005 relative to previous years. The paper attributed this slowdown to a new prospective payment system for hospitals and postacute care providers and to limits on the growth of payments to physicians. If these reforms could be maintained and extended, then the future financing of Medicare would not be so bleak. However, Medicare expenditures grew at more than 8 percent, compared with 4.4 percent growth in overall health care expenditures nationwide, despite the continuation of payment reforms. When looking forward into the future, it is therefore important to understand the underlying processes that drive health care expenditures.

Ken Manton and his colleagues at Duke University, in a series of papers, have shown that disability rates among the elderly have been declining since the 1980s and that disability is an important driver of health care costs. In their analysis of data from the National Long-Term Care Survey, Manton, XiLiang, and Lamb (2006) found that, in 1982, 5.7 percent of the elderly population was unable to perform instrumental activities of daily living (IADLs), whereas in 2004, this proportion was only 2.4 percent. With the exception of the prevalence of severe disability (inability to perform 3+ activities of daily living, ADLs), a similar and even more dramatic decline was observed for ADLs (Manton et al., 2006). These findings show a reversal of the trends of the 1970s, during which disability prevalence was increasing, and the decline accelerated in the 1980s and 1990s. Combined with increasing life expectancy, these declines yield a compression of morbidity. If these trends toward declining disability among the elderly continue, then Medicare expenditures could be substantially lower than is currently expected. But will these trends continue?

Bhattacharya argued that there is good reason to believe that the trend toward decreasing disability will not continue. He and his colleagues have found that disability is increasing in the under-65 population (Lakdawalla, Bhattacharya, and Goldman, 2004). Their analysis of data from the National Health Interview Survey (NHIS) on disability prevalence for 1982 to 1996 replicated the findings of Manton and colleagues of declines in disability among the elderly. At the same time, they found that younger populations, ages 50-59, 40-49, and 30-39, were experiencing substantial increases in disability.

What caused the change in disability prevalence among older people? Was it chronic disease prevention? Or was it better management of chronic disease, such as the availability of breakthrough technologies and assistive devices? Or was it more educated people? Which of these factors was more important?

He explained that chronic disease is directly relevant to policy. The chronically ill are more likely to become disabled. The policy choice for focusing resources is between reducing the prevalence of chronic illness or, once people are chronically ill, preventing them from developing disabilities. Understanding which of these approaches has played an important role in past improvements of disability trends may therefore inform what could be expected in the future.

A lifetime perspective is essential to understand the implications for medical care expenditures. For example, a decline in the prevalence of chronic disease would reduce the prevalence of disability and lead to declines in associated medical expenditures per year. But longer life may lead to greater expenditures. The costs are higher for prevention, which is more expensive in part because one does not know who is going to get a disease.

Chronic disease management, in contrast, leads to a decline in disability prevalence among the chronically ill, but incurs higher expenditures on assistive technologies.

Disability, Survival, and Medical Expenditures

Bhattacharya next described the relationship between disability, survival, and medical care expenditures (Bhattacharya, Garber, and MaCurdy, 2010). He and his colleagues analyzed data collected annually from 1992 to 2003 in the Medicare Current Beneficiary Survey for people ages 65 and older with and without disabilities. They linked these data to Medicare administrative records for comprehensive measures of all medical care expenditures except prescription drugs. They found that survival of a person with disabilities is affected by the age (65, 75, or 85) at onset of disability. Medical care expenditures of elderly people with a disability are considerably more than those without disabilities, thus raising lifetime Medicare expenditures. Yet the disabled elderly have higher mortality rates, which would lower lifetime Medicare expenditures. The timing of disability onset therefore has a major effect on survival as well as Medicare expenditures.

Disability and Chronic Disease

Disability prevalence can be decomposed into two parts: one part attributable to the chronically ill population and a second part attributable to the nonchronically ill population. Changes in disability prevalence among the chronically ill can be decomposed further into two parts: changes in disability prevalence among the chronically ill and changes in the prevalence of chronic disease (Aranovich et al., 2009). Bhattacharya cautioned, however, that disease-by-disease decomposition may double count people with multiple chronic conditions, leading to an overestimate of the importance of chronic conditions in explaining disability trends. He argued that his research team's estimates adjust for this double counting for the most common chronic diseases.

In their analysis of data from NHIS, Aronovich and colleagues considered the most common chronic conditions afflicting elderly populations: arthritis, chronic obstructed pulmonary disease, diabetes, hypertension, heart disease, stroke, and obesity. They found that based on data from NHIS, except for overweight and obesity (which increased sharply), chronic disease prevalence rates stayed mostly about the same or improved between 1982 and 1996 and hence did not contribute substantially to the decline in elderly disability over that period. For example, in 1999 there were fewer people with arthritis per 10,000 elderly individuals than there were in 1982. Similarly, prevalence rates for hypertension and heart disease were lower

in 1999 than in 1982. By contrast, the rise in obesity prevalence over that period, if not countered by some other factor, would have led to a rise in disability in the elderly population.

Unlike overall chronic disease prevalence, disability prevalence among the chronically ill elderly improved substantially between 1982 and 1999. This decline more than countered the increase in disability due to increases in obesity prevalence and led to the overall decline in disability observed in the elderly population. Advances in medical technology played an important role in managing and reducing disability among the elderly. For example, new pharmaceutical products that control the progress of arthritis, better pain relievers, and joint replacement surgery helped reduce disability. Likewise, more intensive medical and surgical management of heart disease, reduced smoking rates, newer portable supplemental oxygen tanks, and specialized pulmonary rehabilitation centers may have contributed to declines in disability.

How much of the overall disability trends is attributable to the prevalence of chronic disease and how much is attributable to disability prevalence conditional on chronic disease? The analysis of Bhattacharya and colleagues suggests that disability declines among the elderly are mostly not due to improvements in primary prevention of chronic disease, but rather to preventing disability among the chronically ill. Much of the decline in disability among the chronically ill involves IADLs. Such declines, which often involve the purchase of expensive assistive devices, can result in higher Medicare expenditures.

Disability and Chronic Disease in Younger Populations

Younger populations tell a different story. Bhattacharya and colleagues used the same methods they used for the elderly for decomposition of disability trends among the younger population (Bhattacharya, Chowdhry, and Lakdawalla, 2008). They found that, between 1984 and 1996, disability prevalence among people under age 65 had increased, in sharp contrast to the decline in disability prevalence among the elderly over this period. About half of this increase in disability was attributable to prevalence of chronic diseases, much of which was in turn attributable to obesity. The remainder was attributable to an increasing rate of disability among the chronically ill, including people with hypertension or chronic obstructive pulmonary disease. Among the nonchronically ill, disability rates actually fell. The main implication of this work is that younger populations are not becoming healthier. Disability prevention efforts, if they are to be successful, should focus on reductions in obesity prevalence and limiting disability among chronically ill populations.

Predicting Future Medicare Expenditure

What will be the health care status of the population 30 years from now, and how is medical technology going to affect it? What effect is that going to have on medical care expenditures?

Bhattacharya turned to projections from RAND FEM, commenting that the model is ideally suited to answer questions like this. FEM is theoretically oriented toward chronic disease and health care costs and has been used to look at three prevention interventions in this context—smoking cessation, obesity control, and diabetes prevention—to project cost savings to Medicare. It also includes information on disability. The researchers found that disability declined sharply among the elderly between 1982 and 1999, similar to the findings noted above. Prevention of disability among the chronically ill played an important role in the decline; primary prevention of chronic disease was less important.

Among the younger population, disability increased over the same period. Higher prevalence of obesity and higher rates of disability among the chronically ill contributed to the increase. Consequently, future Medicare expenditures may not decline by much, even if future disability rates decline.

Bhattacharya concluded that disability is a major driver of health care costs, but eliminating it is not necessarily a major way to improve future health care expenditures for the Medicare population. Also, primary disease prevention is not a major cost saver in future health care expenditure projections. Preventing disability may nonetheless be the right thing to do, as it will allow people to live in a nondisabled state for a longer time and improve their quality of life.

DISCUSSION

Several participants expressed their views on the various issues flowing from the presentations. Most of the discussion was broadly on measuring socioeconomic status in modeling, projecting costs of medical treatment, and data for improved health care cost estimates.

Measuring Socioeconomic Status in Modeling

Referring to the discussion by Crimmins about socioeconomic status, which focused mainly on education and her statement that it did not matter much whether one measured SES by education, income, or occupation, Joseph Newhouse (Harvard University) interpreted that to suggest that the measures were treated as causal. He had a two-part question: First, what is known about causality? Second, from the point

of view of modeling the future, and assuming that there will be changes in the distribution of the population by education as well as by income and occupation, would it matter which of those measures are causal, or are they all causal?

Crimmins responded that she views education as a fundamental cause that determines income. Income is a lot more complex as a variable because the causal relationship is much more likely to be a two-way street. As one gets sick and leaves the labor force, or one does not work as long, one's pension will be reduced. Particularly at older ages, there is a lot of reverse causation in the income and health relationship. There certainly is some reverse causation using education in terms of people who become ill before the period when educational attainment ends, which tends to be in the twenties. These people have less educational attainment, but the effects on health tend to be small and not to lead to the diseases and conditions of old age.

The differences among population groups are always there, but they look slightly different depending on the SES measure used. Current occupation is a pretty useless measure for older people because most of them do not have one, and a lot of women never had one, although that is changing. The relationship with health is easier to understand if SES is indexed by education. Certainly going forward with a time path, one knows the educational attainment of the older population for the next 50 years, so it is a reasonably stable variable; in contrast, one does not know about income and how that is going to change over time.

Richard Suzman (National Institute on Aging) observed that not enough attention has been given in the presentations or discussions to people's work patterns. Given the trend of being healthier and living longer, people are going to have to work longer. He therefore thought that combining Medicare projections with retirement modeling in both the United States and cross-nationally might be useful.

He mentioned that there was a lot of talk at the workshop about the short-term and long-term advantages of prevention coupled with costs. Essentially, longer life is not free; it has to be financed in some way, but there are relatively few data sets that look at the downstream impact of prevention or major medical investments over the rest of the life course. That is an important area to consider.

Bhattacharya commented that issues relating to work are important, especially in the context of disability and changes in disability trends in the younger population because disability has effects both on health care expenditures and on financing. So if a larger share of the younger population is disabled and therefore less able to work and retires earlier, the financing models are going to be off in addition to the expenditure models.

Projecting Cost Estimates of Medical Treatment

Referring to Bhattacharya's discussion of predicting future medical expenditures, Michael Chernew (Harvard University) wanted to know, when forecasting medical spending and looking at cost effects, if the cost estimate of, say, treating a hypertensive patient or a disabled patient in 2020 is like a life table, using the cost of treating that hypertensive patient today, or if there is some growth rate beyond regular inflation to get to that point. If so, how does one inflate the cost of treating a current hypertensive to treat the hypertensive in 2020? To project the number of people with disabilities for a short time period, say 20 years, one can use the number with disabilities who are age 20 now and project out. But for longer term time periods, how does one project out the number of people with disabilities in 2050 or 2070?

Bhattacharya responded that in FEM the researchers assume that there is existing technology for everything. So they do not change anything other than the probability of transiting into obesity, for example.

In response to Chernew's second comment, Bhattacharya explained that the method used in FEM is to look at the whole population—the transitional probabilities from age X to age X + 1 are fixed—and then age people forward. So if there are higher rates of disability among 30-year-olds today, that means there are going to be higher rates of disability for the entering cohorts at age 65, 35 years from now. But the transition probabilities from age 30 to 31, 30 to 32, etc., are just as in a life table based on today's estimates.

Data for Improved Health Care Cost Estimates

Dana Goldman (University of Southern California) observed that the work of Crimmins and other research suggest that early determinants matter for future morbidity and mortality. That highlights the need for longitudinal panels. In addition, better cost estimates are needed, because trying to get self-reported cost information is almost impossible and leads to the need for linked data. HRS has linkage with Medicare records, but it is difficult to get those data. Although the Medicare Beneficiary Survey is available, it does not ask any of the SES questions that go back in years. It is very hard to link the household component of MEPS, and it does not include the institutionalized population. So the question is, What is needed in terms of data to improve these health care cost forecasts?

Liming Cai (National Center for Health Statistics) responded that the National Center for Health Statistics (NCHS) has provided several unique data sets that can be used for forecasting purposes. NCHS has linked data

in the national surveys, NHIS, and NHANES, to the National Death Index (NDI), Social Security, Medicare, and Medicaid down to the end of this year. So one has the health measures, the socioeconomic and demographic measures, and all of the other survey measures available in a particular panel, and these panels are linked down the road through the mortality records, the claims records of the Centers for Medicare & Medicaid Services (CMS), the Social Security earnings record, and the Medicaid claims records. The impact of trends in health, by demographic and socioeconomic factors for the entire set of entitlement programs, can thus be estimated.

These useful data sets are currently available at NCHS, but the user has to submit a research request to an NCHS research data center to use them. There are research data centers across the United States; the user does not have to go to NCHS in Hyattsville, Maryland, to do the research.

Crimmins countered that she has used the NHANES extensively, but many of the important variables are not there. Neither cognition nor depression are measured in NHANES. Early life is not measured at all. NCHS has relatively poor measures of lifetime experiences. So there is intensive information from the National Death Index and Medicare, but the independent variables are lacking. The answer to Goldman's question is therefore a composite of data sets, because no existing data set is perfect. Lifetime information is needed, but several early life measures are missing from current data sets.

Cai responded that there are certainly some topics missing from the surveys. At the same time, for some important research topics, such as obesity, no matter what disability status a person has, lifetime health care spending is probably the same (Lubitz et al., 2003). Cai and his colleagues looked at obesity status at around age 45, using the first NHANES follow-up survey linked to Medicare and the NDI, and obtained their lifetime Medicare expenditures. While more obese 45-year-olds will die before reaching age 65, their lifetime spending from age 65 on for Medicare is still significantly higher than normal-weight 45-year-olds who survive to age 65 and beyond.

Crimmins remarked that some of the emphasis on obesity makes her nervous. The link between obesity and socioeconomic status was extraordinarily strong in the past, and so some of what is being interpreted as an effect of obesity could be an effect of low SES. Without a comprehensive model that includes both obesity and SES, there is a risk of misallocating the effect.

Cai further pointed out that measures of SES, such as education, are not available in census population projections from 2002 to 2050. So although education is important to understand the relationship, when projecting out 50 years, that variable is not available for a projected population.

Bhattacharya noted that a theoretical idea is key to forecasting. If the

idea is an extrapolation, then one can make do with expenditure cross-sections. If the idea is changes in disability, in obesity, in educational status, then one needs some sort of longer panel. There is a fundamental trade-off in that the longer the panel, the less representative it is of the population as a whole. So ideally one would want a long panel refreshed routinely to make it look more like the population at large.

Todd Caldis (Centers for Medicare & Medicaid Services Office of the Actuary) pointed out that the long-term models of both the Office of the Actuary and the Congressional Budget Office already include crude adjustments for the level of population health risks. In principle, it would be feasible to incorporate into those models more sophisticated measures.

5

Participants' Views on Needed Research

The workshop brought together a large group of participants from many different disciplines and interests. During the course of the day, participants discussed several issues and ideas for improving the projection models for health care costs for the Medicare population. In the final session, they discussed their perceptions of some of the major research areas and priorities that surfaced in the course of the day.

Two workshop presenters—Eileen Crimmins and Darius Lakdawalla—led the discussion to stimulate the wrap-up, briefly outlining some of their ideas on areas for further research. A general discussion followed on what many participants viewed as some of the more fruitful priorities for needed research on aging-related issues with the goal of improving health care cost projections.

OPENING REMARKS

Eileen Crimmins (University of Southern California) opened the discussion by highlighting two areas for further research. She noted that in discussing the various factors influencing health care costs the participants did not deal with, and not much research has been done on, end-of-life costs. People die only once, and this period in life can be a very intensive and expensive one in terms of health care costs. It is important to learn how end-of-life decisions are made. Do individual characteristics affect these decisions, or are decisions basically made in hospitals by physicians and not affected by individual characteristics? She emphasized that in her

opinion the end of life is the point when costs are very high and potentially more controllable.

The second area she mentioned is based on her comparison of the United States and other countries. She questioned why the United States gets so little for what it spends. Looking at cross-national comparisons of health status and the associated costs, the United States spends more money and yet has poor health relative to other countries—worse obesity and worse hypertension at a lower age, for example. Part of the expenditure difference results from worse health, but the United States is also spending money that is not buying better health. She concluded that these two examples point to the need to directly study costs.

Darius Lakdawalla (University of Southern California) noted that when thinking about the problem of modeling, for a long time the view was that there would be only one model of the economy. But the experience of the 1970s departed radically from model forecasts and cast considerable doubt on the notion of a single, unified model that could explain all economic phenomena. Similarly, it is no longer thought that one model will unify everything one needs to know about the health care system. But it is important to push the frontiers of the modeling enterprise. Several such areas have surfaced already during the workshop, he observed.

Lakdawalla emphasized three specific areas that need to be pursued. First is to build models that push the frontier in modeling medical technology. Second is to build models that advance the frontier on pricing and in particular understanding all relevant prices, not just explicit prices in the system. Part of the problem in health care, from a modeling point of view, is that all of the relevant prices are not observed. There are many shadow prices that are extremely hard to measure when there is public involvement in the system. For example, when health insurance is publicly provided, it is hard to observe its true price to consumers. So how does one go about thinking through price responses in a mixed public–private system when, as Michael Chernew pointed out, prices are one of the most important brakes on health care spending growth and may be one of the mechanisms by which projections go from being ridiculous to being reasonable. So understanding how to build those mechanisms into the model is another first-order challenge. Third is dealing with uncertainty in a more plausible manner as decision makers are often rightfully skeptical of any given model because they think there are too many assumptions built in that are artificial.

It is hard to push all three frontiers at the same time. It is hard to build a model that, for example, includes a really sophisticated supply-side evolution of technology and sophisticated accounting for prices along with changes in aging and health and takes uncertainty seriously. That seems like a very daunting task and may be fundamentally impossible, but it certainly is possible to take different approaches and get at pieces of the problem.

That might be the best way forward at this point, at least along these three dimensions.

GENERAL DISCUSSION

Participants identified several areas for enhancing the current efforts to project health care costs. Most of the discussion focused on three areas: the need for a plurality of models, data collection versus research, and the value of cross-national comparisons.

Policy Versus Research Needs

Dana Goldman opened the discussion by commenting that there is a 14-year difference in life expectancy between a black man with 0 to 8 years of education and a white man with 13 or more years of education. So the distributional consequences of policy changes, while they may not be necessary for a projection done for Congress, are of enormous interest to most researchers. How one looks at distributional effects of policy change are therefore paramount.

John Haaga (National Institute on Aging) pointed out the need for a plurality of models and mentioned the possibility of building in a number of different assumptions with the microsimulation approach. Others have mentioned scenarios as something they would like to see more of. He questioned if people could either develop different microsimulation models or do scenario modeling, neither of which has really been explored.

Goldman responded by pointing out the tensions between policy and research needs for models. Policy modeling involves forecasts or projections, and research modeling involves scenarios for the future; from a research perspective, scenarios are clearly more important. The tension suggests that more communication is needed between the policy side and the research side, so it is gratifying that people from both government agencies and the research community are participating in the workshop. It may be that some more structured forums, like this workshop, would allow comparison of policy scenarios. For example, one could give modeling groups around the country some parameters around a scenario, say disease management. The groups could go off and do their thing and then get together and discuss what the scenarios would look like.

Crimmins commented that people who are developing models for policy have no choice but basically to forecast or project based on past trends and to use relatively simple models so that they are transparent. But then the question is what factors are going to change the trends? For this, one needs to model a whole set of indicators to understand the implication of

changes in them. Focused microsimulation models might show that some things do not matter and some things do. Their results might inform more general models. There is no single model that meets all needs, as stated by both Lakdawalla and Jay Bhattacharya. A generalized model is needed that is as simple as possible, informed by underlying studies that are realistic in laying out what the alternatives are.

Regarding the issue of what the models do and what people want them to do, Marilyn Moon observed that the Centers for Medicare & Medicaid Services (CMS) and the Congressional Budget Office (CBO), for example, will always have the challenge of looking at government spending, because that is the central issue they are supposed to look at. Others propose additional models and may ask that they be included as supplements in some way, along with other key issues. But these tend to get ignored when looking at government costs. For example, a change in policy that shifts costs back onto the public may look good from the government perspective but bad from society's perspective. Similarly, two equal expenditures might look the same in terms of government costs, but one extends life substantially and the other does not, and the two would be treated the same to some extent, but in fact they should be differentiated.

Distributional impacts are another issue. Perhaps societal and distributional impacts should be outside the big government cost models, but they should be elevated to a similar kind of status somewhere in terms of discussion. One of the things that has always been a frustration for people at CBO, for example, is that they are answering only part of the question. Therefore, the kinds of discussion at the workshop and perhaps the role of the independent research community could make it possible to think about some of those other needed models and develop some consensus around them so that they could be elevated in policy discussions.

Victor Miller (Government Accountability Office), who has worked with state governments, had two suggestions for consideration on a policy agenda. The first is that there has been no discussion of the current recession, which has both short-term and long-term impacts. More people are receiving disability income and Social Security disability income and therefore are also on Medicare. The long-term impacts of what are called short-term recessions need to be taken into consideration.

The other suggestion relates to the comprehensive impact of tax policy. He mentioned that Sibley Memorial Hospital in Washington, DC, was planning to add more beds and make all rooms singles, saying that it is a standard of care. Defining single rooms as a standard of care seems to be consumption, and consumption is financed in a number of ways: through tax-exempt financing of all hospital construction, through flexible health benefit plans, or through the tax exemption of employer insurance. Adding it all up would be a useful endeavor.

Data Collection Versus Research

Bhattacharya brought up the issue of relative investment in research funds, which are limited. If one has to choose between dollars spent on data collection and dollars spent on research and model development, it is much easier to get funding for data collection efforts. Research is under consideration at the National Institute on Aging (NIA), the Office of the Actuary (OACT), and other similar organizations. He asked which the participants thought would be more valuable to them.

Richard Suzman's response was to say both. NIA has to maintain some programmatic balance in terms of reducing low-quality investments in data. There has to be a limit on how much it can invest in data, although if the data are very well cared for and documented, the start-up costs for using them for research are lower. However, improving a data set tends to make it go on living longer, so it uses up more resources.

NIA is also trying to leverage funds. For example, the Social Security Administration has co-funded some of NIA's retirement modeling efforts, and there is good collaboration between the two agencies. Suzman has hopes that they will be able to generate investment across the National Institutes of Health (NIH) in this area.

Steven Heffler remarked that the priorities depend on what one wants to accomplish with the money. In most of the presentations during the course of the day, the findings were based on historical analysis of very detailed data. In most cases, there were not many answers about what would happen in the future, given all of those trends. It is the application of what one learns through the analysis of the historical data that is really relevant for projecting future spending.

The question is: Do you spend the money learning what happened in the past, or do you spend the money building tools and vehicles and models to predict what is going to happen in the future even if you do not know what has happened in the past? To the extent that some of these other models can help inform the cost projections, help to identify what some of the drivers are, and can be used in some applied way, that applied research is the most important thing. He remarked that one thing the OACT staff talks about when building models is to be careful what goes into the model because it will have to be projected. One can build the greatest model in the world to explain what happened in 2008, but if there are 10,000 variables, and they have to be projected to 2050, then it is not going to be a very good or a very reliable projection. For OACT that is always the issue, and the agency feels very strongly that, wherever the resources are put, if the idea is to eventually use models in cost projections, then they need to be used so that the information can actually be applied, even if it is in some models

that currently do not have the capabilities and the details on some of the dimensions discussed here.

Goldman responded that aggregate cost projections are certainly important, but, for example, suppose someone had asked, What is going to be the impact of health care reform on low socioeconomic status populations? That is probably not something that current models are ready to answer. That is an issue that some researchers have devoted their lives to studying and would like to know the answer, not just from a research perspective. That is where some two-way communication is needed.

In that particular example, Heffler pointed out, one is trying to understand and model the behavior of a specific group. Data are needed that are representative of that group, and the modeler has to understand what the drivers for that group are, and so forth. When the model is built and it all fits, the question will be whether all of the detail for that group was needed in order to develop the correct aggregate projection. If not, then perhaps a model can be built that is unique to that group that answers the specific question. But one has to accept the fact that it does not add up or build up to one that is broader. Heffler commented that CMS is in the same situation as CBO: the costs of certain things are going to be very difficult to estimate, whether that is a group or policy or whatever, because of the information that is available and its relevance for the total.

Jonathan Skinner asked how to predict what is going to happen out in the future. All of these ideas about better data sets and integrated data sets are not going to help. There is no way to collect the information—even if all of it available anywhere in the United States today was collected—that would really help that much in trying to make those kinds of conjectures for the future. For the shorter term, there are important issues for health care reform, for the effect on disparities, for example. It is remarkable how little is actually known about the U.S. health care system. Something is known about Medicare, but there are no good answers to such questions as: What are the principal reasons why health care costs have gone up and have doubled in the last 12 years? People are obese, for example, but that does not really answer the question.

Furthermore, very little is known about health care beyond the Medicare population and some of the population under age 65 and what is going on in various micromarkets. It is remarkable how little is known about costs in the United States except for the aggregate. It is also remarkable how little is known about the Medicare-equivalent data sets in other countries, which often are not available to researchers. There is very little idea, for example, about what doctors do in Germany that is different from the United States. Cross-country comparisons of physicians per capita and hospital beds per capita show the United States trailing the countries of the Organisation for Economic Co-operation and Development (OECD). It

turns out that in Germany, for example, chemotherapy is administered as an inpatient procedure. In the United States, chemotherapy is administered on an outpatient basis.

With regard to the differences in spending between the United States and the OECD, Mark Freeland mentioned an analysis by Victor Fuchs over a decade ago that found that, for the non-aged, the United States and the other countries spend about the same per capita; all of the differences come basically with the aged.

Freeland also observed that much has been said during the day about the health care system but not much about the production of health—in other words, all of the nonhealth care interventions that cause changes in health status. Studies have shown that these are more important than health care per se. Mentioning Goldman's point that black men with less than 8 years of education have a much shorter life span, Freeland thought that a major reason is deaths associated with violence, drug trafficking, accidents, stabbings, HIV, and such.

Crimmins emphasized that people in the United States have poor health relative to other countries, not necessarily poor health care, and it is important to understand why. For example, there are major differences in how end-of-life care is treated across countries. That care is expensive and it would be interesting to understand the different health systems.

Michael Chernew made two comments. First, apart from getting new data, getting access to the data already available and putting them together would be a reasonable first step. Second, a one-time reduction in spending is not the same as change in a trend. This issue is very important for a lot of the modeling work. Doing research on changing trends over time requires long panels of people in different settings and getting a detailed sense of what is happening over that longitudinal context. Longer panels of data and databases allow relating the longer panel data to the policy variables of interest. Collecting those data or at least compiling them, which is even better than just collecting, would be extremely useful to begin to understand if in some settings there are changes in the slope, not just the level, of spending growth.

Value of Cross-National Comparisons

Suzman asked the participants their views on the value of cross-national comparative studies projecting health care costs. He asked if one can look at OECD countries and get actual expenditures and outcomes for health and health care. Does that give some range of confidence intervals that one can project between countries, for example, the United States and Canada?

Crimmins responded that it is invaluable to understanding the issues

discussed at the workshop to put them in the context of other countries that are like the United States. She is only beginning to understand what the differences in health are. The process ranges from health, to the treatment of a given condition, to control of the severity of the condition, and to the outcome of mortality. Understanding that process—how money is spent, what kinds of treatment are provided to people with a given condition, and who survives or does not survive for how long and at what cost—is really invaluable in understanding the potential for reducing or changing costs.

Lakdawalla agreed, adding that a theoretical perspective needs to be developed, which was heard as an undercurrent throughout the day. An example would be models of political economy. Much of what the cross-country variation is driven by—differences in institutions, political incentives, and the like—has not yet been built into the models, but it needs to be.

Suzman remarked that NIA had done just that some time back. It funded a study some years ago at OECD to learn about what works best for a few specific diseases, at what cost, and with what impact. That needs to be repeated, he said, but it has become very difficult to get funds to OECD.

Goldman observed that many researchers had given up on international studies because good microdata were not available. Now, with NIA's investments, very good microdata are available; the irony is that now the policy variables to relate to the institutional differences are not available. Surveys such as the Health and Retirement Study (HRS) and the Survey of Health, Aging, and Retirement in Europe (SHARE) have a lot of information about health in different countries, but figuring out which country has reference pricing for pharmaceuticals or what they do on disease management is another story. Some effort would be worthwhile to harmonize the policy variables so that these comparisons can be made.

CLOSING REMARKS

Richard Suzman (National Institute of Aging) informed the participants that NIH and NIA do not, and should not, undertake policy research but will conduct research that is valuable for policy. Secondly, although the workshop focused on Medicare costs, NIH's main concern is with health, and increasingly with value. There has been a heavy investment in the Department of Health and Human Services in comparative effectiveness research, much of which is heavily constrained by definitions that exclude costs and cost effectiveness. But NIA certainly does work on costs and cost effectiveness.

Suzman next provided his assessment of the workshop discussions and what he got out of the day's deliberations. Clearly, a large number of research issues surfaced over the course of the day, ranging from the macro issue of the impact of growing investment in the health care sector on the

overall economy and comparative disadvantage or advantage in terms of trade, to cross-country comparisons. Some of the impact has got to depend on what that investment is buying, for example, does it allow people to work longer. He stressed that at some point certainly one must connect these issues with retirement issues and forecasting retirement and labor force participation.

The value of international comparative studies seems incontrovertible based on the Gruber-Wise papers and volumes on comparing the impact of public pensions on how long people stay in the workforce and whether, in fact, old people staying in the workforce reduce jobs available for younger people (Gruber and Wise, 1999).

Studies exploring the implications of single variables, such as obesity, smoking, low birth rate, disability, in terms of short-term interventions or long-term costs, are going to be valuable.

There are multiple views on the value of studying prevention and interventions and their current and future cost. NIA has tried to stimulate research in this area but more is needed. There are some apparently effective interventions at a corporate level that reduce costs and seem to improve health risks within the space of a year. Also, CMS is in the middle of a demonstration project in that area.

Many issues around data, including costs, can only be studied incrementally. He suggested, for example, that it would be useful if the National Health and Nutrition Examination Survey had a simple telephone longitudinal component, and the Medicare Current Beneficiary Survey, which is a panel survey, had a panel of longer duration.

He noted that following the ending of the National Long-Term Care Survey, NIA has started a new study, the National Health and Aging Trends Study. Judith Kasper at Johns Hopkins University is the principal investigator. He is hopeful that it will have good economic data.

Regarding other areas and ideas that surfaced during the day, he observed that there is great value in finding out what are the NIA-appropriate long-term research needs of our sibling agencies. NIA is not very good at filling short-order requests but would certainly want to hear the long-range needs and see which of those would make sense for NIA to consider for research initiatives. He gave as an example a research project on one-time and serial high-cost users.

Finally, Suzman commented that when he considers all the topics presented and discussed during the course of the day, there perhaps needs to be a more integrated view of the issues. For example, he would include the issues related to disability and retirement and their interaction with Medicare as well as nursing home costs. So any follow-up to this workshop might perhaps have a slightly broader perspective that also includes long-term

care, Medicaid, and interrelationships with retirement policy, and perhaps even an international perspective.

He closed by thanking the presenters for the collection of short, succinct presentations that illuminated the field of health care costs for the Medicare population.

Connie Citro (Committee on National Statistics) agreed with Suzman that the presentations were uniformly interesting, informative, and clear, as well as often provocative. The workshop presentations and discussions showed that CBO and OACT are in a certain kind of business, namely, forecasting, that is not the same as the business of researchers, but there ought to be more opportunities like this workshop for these kinds of conversations.

She stated that she was particularly struck by the importance of education as a factor in health. Crimmins showed that there are some people with very poor health prospects, and low education appears to be related to poor health. Moreover, education has so many implications for so many aspects—physical health, cognitive and mental health, and the social health of the nation—that it could be very useful to build educational attainment projections into the actuarial models. Similarly, there is a body of evidence about the importance of family structure and social contacts, which could provide additional variables that could ultimately relate to health care costs.

One thing the research community can do is to assist modelers in the design of data collection. In the situation in which there is a lengthy battery of questions about, say, health status that one wants to ask in a large, observational survey, but the need to be parsimonious in the data collected as part of Medicare health care claims, researchers can identify the best one or two boiled-down questions that still carry a good deal of the explanatory power of the longer version. That is a very useful function the research community can perform.

Citro also observed that she heard very clearly, on the supply side, that better data are needed on how doctors, in particular, function, comparable to the detailed information that is available on individuals and families. Although there are surveys of business establishments, with information on payroll, number of employees, and the like, not much is known about how business organizations, including health care businesses, operate with regard to innovation, adoption of electronic records, making decisions about end-of-life care, and similar topics. That is actually a daunting agenda.

Even more daunting is capturing diversity in the population, but that is an area that NIA and other research funders might well consider. In addition, obtaining information on policy variations within the country, let alone between the United States and other countries, is a very daunting but needed task.

In conclusion, Citro noted that there was a great deal of synergy during the day with ideas and sparks bouncing off each other. Perhaps some of the agencies that attended, not only NIA, but also other agencies, will seek out opportunities to continue these kinds of discussions in terms of research and development, toward improving health care cost projections for the Medicare population. The passage of health care reform is really the beginning and not the end of all of the issues that will be coming up as people try to see what does and does not work.

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Appendixes

Appendix A

Predicting Medicare Cost Growth*

John N. Friedman

Spending on Medicare has grown 2.4 percentage points faster than gross domestic product (GDP) over the last 30 years. If growth at these rates were to continue, Medicare alone would account for 31 percent of GDP by 2082, and health care expenditures in total would reach 99 percent of GDP. In order to generate more reasonable projections, researchers and policy analysts in the government have explored a number of different approaches. This paper reviews and evaluates these methods and suggests directions in which the literature must go in order to account for other unmodeled cost drivers.

INTRODUCTION

Health care spending is projected to be just over $2.6 trillion in 2010, accounting for 17.7 percent of GDP. This burden is split almost equally between private payers and the government, making the $912 billion price tag the largest single item of the federal budget and outpacing even the cost of Social Security. In turn, Medicare is the largest single item within government health spending, projected to be $500 billion for 2010, or about 13 percent of the federal budget.

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The prodigious level of spending makes health care important, but it is the fearsome growth of health care costs that has put health care reform on the national agenda. Medicare spending has grown 2.4 percentage points per year faster than GDP over the past 30 years, more than tripling as a share of GDP since 1960. If costs continue to grow at current rates relative to GDP, then Medicare alone will account for 8 percent of GDP by 2030, 14 percent by 2050, and 31 percent by the end of the 75-year budget projection window. This would imply that Medicare would be more than 50 percent larger than the current size of the entire federal budget. While these numbers are absurdly large, a similar projection would forecast total health care spending to account for an impossible 99 percent of GDP by 2082 (Congressional Budget Office, 2007).

But if health care spending does not continue to rise at historical rates, then what will happen instead? How drastic must reform be to avert this looming fiscal crisis? The magnitude of the situation requires people to understand the possible paths forward for health care spending as never before. But the sheer speed of past cost growth that demands a policy intervention has simultaneously rendered moot the most direct and widely used forecast strategy of projecting forward past growth.

In order to solve this forecasting problem, both the academic literature and relevant government agencies have devoted considerable time, creative energy, and resources to developing models of Medicare cost growth. In the academic literature, researchers have developed a number of strategies to forecast cost growth. Below I discuss three main approaches: extrapolation, microsimulation, and computable general equilibrium models. I review the mechanics of each approach, as well as their strengths and weaknesses. I pay particular attention to the assumptions on the dynamics of health care demand, health care supply, and technological growth as factors driving costs. Extrapolation and microsimulation are fundamentally statistical or actuarial in nature, while general equilibrium models focus instead on the economic dynamics of health care cost growth. Each forecasting approach also has different strengths over the long and short run.

I then discuss the particular applications of one or more of these forecasting methods in important policy contexts. Each government agency combines these three methods in different ways when producing the numbers on which policy is formally based. For instance, the Office of the Actuary (OACT) combines extrapolation with a computable general equilibrium model, whereas the Congressional Budget Office (CBO) relies on constrained extrapolation. Drawing on the more abstract methodological discussion of the literature, I discuss the practical implications, as well as strengths and weaknesses of each approach. Since each approach from the literature presents different strengths and weaknesses, policy makers often modify the precise forecasting strategy depending on the particular context

of the forecast. For instance, microsimulation models provide an extremely flexible tool for analyzing the total impact of a specific reform or innovation or a group of innovations on the entire distribution of health care costs and outcomes in the population. But the numerous constancy assumptions of the method tend to break down over the long run. As a result, policy agencies (such as the Agency for Healthcare Research and Quality [AHRQ]) that focus on short- or medium-run projections tend to use microsimulation models. In other settings, such as the Medicare Trustees report, that focus more on the long run, modelers rely less on microsimulation.

I then develop a number of criticisms of the forecasting literature as a whole. First, current forecasting methods tend to obscure the real consequences of the underlying assumptions driving the models. For instance, many extrapolation models build in an exogenous slowdown in long-run cost growth to prevent the health care costs from consuming all of GDP. But these models do not focus on the cuts that would be necessary simply to achieve baseline growth, instead assuming (contrary to past evidence) that the long-run steady state growth is just lower than it has historically been. A first improvement would be to identify exactly what these assumptions imply for such variables as access and quality. A second and subtler step would be to think not only about the magnitude of the implied cuts, but also how those changes would propagate through the model to affect other aspects of health care.

Despite the methodological diversity in both academic and policy forecasting literatures, a number of key determinants and implications of future health care spending remain either absent or unmodeled. In this paper I discuss two such issues: technology and politics. Technological progress, though perhaps accounting for the largest share of past health care spending growth, remains unmodeled in most forecasts. Instead, most researchers implicitly or explicitly assume that growth continues at a constant rate throughout the forecast period. But technological growth often does not proceed as a purely secular trend; rather, innovations are driven by scientists and engineers and business leaders who respond to conditions in the health care market. Both the rate of growth and the nature of growth matter. For instance, research focused on lowering the costs of current technologies may have a different impact on cost growth than research that discovers new technologies.

Politics is almost entirely absent from current forecasting methods. But the fundamental question is often: What would happen in the absence of current reform? And future policy surely plays a crucial role in the proper answer. While some forecasts explicitly maintain current policy and thus exclude the possibility of political change, politics are a crucial element in the more general question of predicting the shape of the future policy world in the absence of current change. Due to the difficulty of explicitly

modeling such political behavior, formally incorporating the political sector into forecasting methods is probably impossible. However, most forecasting methods ignore the implications of the increased tax burden, and thus increased tax rates, that become necessary to support a growing health care sector. In addition, it is likely to be political pressure from high tax rates, rather than consumer pressure from reduced nonhealth care spending, that eventually drives reform. Such politics of health care policy seem an important yet underresearched factor in health care cost growth forecasting.

The remainder of this paper proceeds as follows. The next section reviews the various methodological approaches developed in the literature and reflects on their advantages and drawbacks. The following section examines the particular projection methods used by various government agencies, such as CBO and OACT in the Centers for Medicare & Medicaid Services (CMS). I comment more broadly in the next section on the elements missing from current forecasting methods, and the final section concludes.

APPROACHES TO MEDICARE FORECASTING

The literature on Medicare cost growth forecasting contains several distinct approaches. This section reviews these methods.

Extrapolation

Literature

The most direct approach to forecasting most economic phenomena is to use the past as a guide. Extrapolation does just this. By using past growth to predict future growth, one applies a best linear predictor model to the forecasting exercise.

In its simplest guise, extrapolation regresses a measure of health care cost on lagged instances of health care cost to predict growth. In the Medicare context, some papers analyze expenditures as a fraction of GDP, while others work with growth in expenditures. Fewer papers use total cost as the dependent variable for econometric reasons. Researchers also have estimated the time path of excess growth, which is the growth rate of Medicare above and beyond that of GDP.

There are a number of ways to include external projections in the model. For instance, the age distribution of the population evolves in a highly regular (though nonlinear) way. One way to control for such external factors is to add control variables to the right-hand side of the projection regression. By controlling directly for the number or fraction of seniors in the population, for instance, researchers essentially age-adjust their extrapolations for

known deviations from current trends. Alternatively, the researcher can estimate cost per Medicare enrollee, separating enrollees by age, and then use the external demographic projections to aggregate these per-enrollee costs back to total cost. In another example, Getzen (2000) includes both lagged inflation and growth in health employment as control variables in a simple regression. (In fact, Getzen notes that, since most short-run [i.e., 1-year] growth in health expenditures comes from inflation and employment growth, one could do nearly as well predicting cost growth with only these two variables as with a long distributed lag structure.)

Extrapolation, broadly defined, also includes a number of more complex time-series techniques, primarily developed by macroeconomists to forecast economic growth. For instance, researchers looking to forecast several variables simultaneously can use a vector auto-regression (VAR) model. The literature also includes a number of techniques to deal with the problems that arise when allowing a very long and flexible lag structure or to remove seasonality or cyclicality from the data. While the details of these techniques are beyond the scope of this paper, it should be noted that researchers have ample tools to apply to the problem of Medicare cost growth. For instance, Lee and Miller (2002) applied sophisticated time-series methods to project Medicare cost growth. That paper and others also use the empirical fluctuations in past cost growth to estimate the uncertainty in cost projections, as recommended by Tuljapurkar and Boe (1998). For instance, Lee and Miller generate a 95 percent confidence interval with 4 to 18 percent cost growth of Medicare in 2050, an extremely wide range that underscores the tremendous uncertainty in these models.

Extrapolation is technically the same over almost any horizon, but the longer the time period of interest, the more one must push the model out of sample to complete the projection. This is the case whenever one uses extrapolation in any context. Getzen (2000) shows that the average mean absolute percentage error (MAPE) for total cost growth using extrapolation models grows from ± 1 percent over one year to ± 3.7 percent over 5 years. In the very long run, the range for estimates is very wide. There is a key difference here too between the medium- and long-run projections using extrapolation. Even when projecting over 10 to 20 years, historical data provides a number of 20-year periods over which one can examine growth. Thus, one can redefine 20 years as one period, for the sake of the model, and estimate as one otherwise would. In the very long run, however, no such direct extrapolation is possible. Going back more than 40 years runs beyond the current system of accounting for national health expenditures; beyond 60 years, medical insurance existed in a very different form, and the data are scarcely available, if at all.

In any extrapolation exercise, the key implicit assumption is that existing relationships remain constant over the projection window. If this is

an acceptable assumption, then the reduced-form prediction functions as a sufficient statistic for all of the many complex economic dynamics that may be operating in the background. But since there are different dynamics over the short versus the long term, this assumption applies differently. For instance, in the short run there is also no variability from population growth or technological development. Instead, economic conditions (and therefore demand for health care) may change, or the health care workforce may grow faster or more slowly. Over the long run, however, population changes become very important, though predictable, whereas technological change is perhaps the key factor driving per capita cost growth. Assuming that technological growth remains constant over 75 years, however, is a very strong assumption. In the case of Medicare cost forecasting, as the projection window grows, the extrapolation method also runs into the fundamental issue of Medicare cost-growth forecasting, which is that projected costs would grow so quickly that total spending on Medicare would grow to an infeasible share of GDP. This further reinforces the implausibility of the constant trends assumption embedded in long-run extrapolation.

In order to deal with the implausibly high level of spending projected far in the future, researchers often augment extrapolation by imposing external constraints on cost growth. For instance, Getzen (2007) begins with pure cost growth extrapolation but then includes a "resistance point" at which health care cost growth begins to slow and a "limit year" when growth finally reaches the rate of GDP growth (and stays there typically forever after). Modelers at CBO assume that consumption of nonhealth care goods never declines.

However, these long-run assumptions are quite ad hoc. Given that one cannot assume an unchanged rate of technological growth, nor can one project using extrapolation how the slowdown will occur so far out of sample, extrapolation is best suited for the short to medium run. One example of this in the literature is Bhattacharya and colleagues (2004), who applied an extrapolation approach to estimate the impact of the increase in the chronically disabled population on Medicare cost growth through 2030.

In the literature, extrapolation is also used to estimate subsets of relevant parameters instead of total cost growth. In many ways, extrapolation is the basic forecasting approach when authors prefer to concentrate their prediction efforts elsewhere. Because most papers take some version of this partial extrapolation approach, the better question is not whether a paper extrapolates, but where. No matter what methodology a paper eventually uses to estimate Medicare cost growth, it probably relies on some extrapolation. For instance, most papers do not separately model GDP growth. In order to control for it, then, these analyses typically rely on extrapolation

(whether their own or someone else's). Borger and colleagues (2008), for instance, take GDP growth assumptions from outside the model.

Discussion

One strength of extrapolation is transparency. Since the projection essentially relies on a set of regressions, it is relatively easy to determine what factors drive different aspects of the projection. It is also easy then to shut down a channel by imposing restrictions on the coefficients from the regressions. For instance, suppose one wanted to understand the impact of the growth of the elderly population on Medicare cost growth. One would simply vary the demographic projections in the X_{t+1} control variables, comparing the projected cost growth under a high versus low population growth scenario. This transparency allows the researcher to easily break down the projections and understand which factors are more or less important.

Extrapolation relies entirely on a statistical or actuarial rather than an economic approach. This represents both its strength and its weakness. Because the method includes no economic assumptions, one need not rely on outside estimates of such parameters as risk aversion or discount rates. One need not know the form of the utility function or rely on particular assumptions about economic behavior, such as perfect optimization or market clearance. Thus, extrapolation makes no direct assumptions about demand, supply, or any other economic factor.

The assumptions implicit in extrapolation are instead about the reduced-form patterns in the world—that past patterns and relationships will stay constant into the future. Over short periods of time, this is probably a reasonable assumption. But over longer time horizons, it becomes problematic. For instance, past trends for health care demand are most likely to be reasonable approximations for future demand growth over the next 10 years, but perhaps less so thereafter.

The lack of explicit economic assumptions is also a weakness of extrapolation. By implicitly assuming that existing trends stay constant, this method avoids the key question in Medicare cost forecasting: What will eventually have to change to slow the growth? This same issue also applies to extrapolation that is augmented by external constraints on cost growth. One might agree with such a restriction, but by imposing it in reduced form, the method once again avoids specifying what economic factor adjusts to meet the constraint. For instance, will demand be rationed? Will technological growth slow, either independently or because of demand restrictions?

Extrapolation thus avoids the hardest long-run questions. This method is most appropriate in the short run, and its long-run numbers may be accurate. But without detailing what drives such numbers, correct or not, extrapolation leaves the researcher unsatisfied.

Microsimulation Models

Literature

Microsimulation is a highly flexible, essentially nonparametric, demographic projection technique. To understand this approach, consider dividing the population into small cells defined by demographic, economic, and health conditions. One group could be 44-year-old employed white married men earning $100,000 per year who have prostate cancer. Another group could be 45-year-old employed white divorced men earning $80,000 per year with a history of prostate cancer. The groups are defined so that they are mutually distinct and form an exhaustive catalog of the population. The modeler then estimates the probability of moving from one cell to any other cell during a given year using some data set.

These transition probabilities are the heart of a microsimulation model. Of course, many of these transition probabilities will be zero—an individual cannot move from being 44 years old one year to being 43 the next—but by estimating the transition model without many parametric restrictions, microsimulation provides an extremely flexible and accurate model of the evolution of the population over time. Instead of estimating the full transition matrix, microsimulation models often break down the transition from year to year into several steps. For instance, the model might first estimate the probabilities of demographic and socioeconomic transitions, such as income, unemployment, and divorce, as a function of past demographic and socioeconomic variables and past health status. A second stage would then estimate the transition matrix between various health status conditions, including death. For instance, for an individual in any given demographic and socioeconomic state, the modeler would estimate the probability of contracting any given health condition in the next year, the probability of recovering if sick, as well as various combinations of diseases. Breaking the model into these stages severely reduces the dimensionality of the estimation.

After estimating this transition matrix, the researcher can simulate the "path" of any given cohort moving forward in time with random draws to determine various transitions. Researchers usually simulate many different paths forward for each cohort to understand the distribution of possible future paths for each cohort. Microsimulation can also be used to study an entire population over time. Since all individuals either age or die, the modeler must augment the simulated population with new cohorts. For instance, a researcher interested in modeling the Medicare-eligible population might begin with those age 55 in a base year 0. One could follow these individuals through to year 1 using the estimated transition matrix, while adding a new cohort of 55-year-olds to complete the population.

After projecting health status, the next step for a microsimulation model is to project health expenditures. These models typically use large regression models to predict expenditures for individuals in each potential health and demographic status group. Depending on the complexity of the model, one may break down the cost estimates by cost categories (hospital, outpatient care, prescriptions, etc.) and payer (Medicare Part A, Medicare Part B, private payer, etc.). Finally, one must project cost growth. Some models inflate costs at prevailing rates, and others assume constant prices over projection periods.

The researcher then specifies particular assumptions for technological development or perhaps even a single innovation to be analyzed. Innovations in this model can change either or both of the transition probabilities for health statuses and the costs associated with each health status. Some policy changes can also be modeled in this way, such as legislation to change reimbursement rates in Medicare.

RAND Future Elderly Model

The largest and most commonly used microsimulation model in the literature is the RAND Future Elderly Model (FEM), developed by Dana Goldman and colleagues. This model uses the Medicare Current Beneficiary Survey (MCBS) and the Health and Retirement Survey (HRS) to estimate both demographic and health transitions, as well as costs. The model begins with individuals at age 41, so after each simulated year the researchers refresh the model with a new cohort of 41-year-olds.

Goldman and colleagues have applied FEM to study a wide variety of impacts on health care costs. Some studies have focused on the impacts of particular treatments, such as telomerase inhibitors and a potential cancer vaccine. Other studies have focused instead on demographic impacts, such as increases in education or the rise in the Hispanic population in the United States. Finally, researchers have applied this model to policy changes, such as the impact of the potential 1997 Balanced Budget Amendment (Goldman et al., 2005). Lakdawalla, Goldman, and Shang (2005) analyzed the impact of obesity on Medicare spending using FEM. Joyce and colleagues (2005) analyzed the impacts of chronic disease among the elderly, and Goldman and colleagues (2005) considered the impact of improved health status among the elderly on Medicare costs, arguing that the 10 most prominent innovations are more likely to raise costs than to lower them.

Discussion

Microsimulation models are well suited to study the effects of policy or research innovations that impact particular aspects of the health care

system. Since prices are fixed (or relatively fixed, at best), this analysis is a partial equilibrium exercise. The constant price assumption therefore applies best for smaller interventions, while larger system-wide interventions are likely to have significant general equilibrium effects that this method will not capture. Microsimulation methods also offer the best model of the future demographic transition to a permanently older population in the United States. Lee and Miller (2002) projected that demographic changes account for half of the growth in Medicare spending (in absolute terms) through 2050. Furthermore, microsimulation models account for heterogeneity in demographic transitions, as some subgroups in the population may experience larger increases in life expectancy than others (a fact demonstrated in Congressional Budget Office, 2008). Understanding these forces is no small feat.

Although microsimulation may not capture the impact of innovations on prices, the method has several key advantages in capturing not only the direct but also the indirect effects of prospective changes. To see this, suppose one is interested in the effect of new cancer treatments on elderly Americans. The direct impact will be an increase in the treatment rate for that particular cancer, but there are many indirect effects (both positive and negative). For instance, the incidence of cardiac arrest would increase as fewer individuals die from cancer. More generally, as the population survives more disease, one should find that the prevalence of many diseases increases (Crimmins, 2004). Extrapolation models could account for this indirect effect, but a researcher would have to control explicitly for it. Instead, microsimulation models automatically correct for the offsetting effect on heart attacks. Similarly, one could model the simultaneous impact of many different health care reforms or technological innovations by simply changing multiple elements of the transition matrix at once. The model automatically adjusts for the many potential interaction effects.

Microsimulation models also provide a natural approach to predicting not only the average but also the entire distributional impact of a given intervention. Since the model follows each individual through her entire life, no additional work is needed to analyze any aspect of the entire population.

Microsimulation models implicitly rely on extrapolation to estimate and predict many aspects of the health care market. The model adjusts for demand shifts due to demographic transitions or stipulated technological innovations, but not the broader general equilibrium effects on prices. Supply of health care resources is assumed to stay constant or progress at current rates within the study period. Similarly, the model does not endogenously generate technological progress, so any forecast generated through microsimulation must make an exogenous assumption. For instance, Cutler (2005) argues that the technological progress analyzed by Goldman and

colleagues (2004) focuses too exclusively on cost-increasing rather than cost-saving technological innovations. But since these assumptions are outside the model, microsimulation per se does not say what kinds of technological progress to expect, only the consequences of a predetermined path of research improvement.

The model also implicitly assumes that the supply of health care remains unchanged (although Goldman and colleagues are working to incorporate supply-side responses into RAND FEM). As a result, long-term forecasting involves the same out-of-sample issues as extrapolation. (RAND FEM usually sticks to projections only over 25 years or so, rather than the full 75-year budget window.)

Computable General Equilibrium Modeling

Literature

Whereas microsimulation and extrapolation are statistical rather than economic models, computable general equilibrium (CGE) models provide a diametric alternative for Medicare cost growth forecasting. This approach directly models the key economic relationships in health care cost growth: demand for health care, supply of health care, and technological growth. For instance, consumers optimally demand health care and nonhealth care goods to maximize utility. Firms providing medical care optimally hire workers based on demand. Prices in the medical market equate supply and demand. These models were developed largely in response to the actuarial nature of the models in use in the 1990s for cost projection that did not capture any of the key incentive effects that may determine health care cost growth.

The assumptions in CGE models are economic parameters. For instance, one must specify the discount rate, the elasticity of substitution for demand of medical versus nonmedical goods, the intertemporal elasticity of substitution, the elasticity of substitution in the health care production function between technology and market inputs, and the health production function technology share parameter. Most researchers calibrate their models to match historical patterns of health care spending and health care employment and therefore assume values for these numbers, rather than estimate them independently; however, these assumptions rely on long literatures investigating the relevant parameters. These models can then vary the input parameters to generate robustness checks on the outputs.

Without constraints, CGE models often feature multiple equilibria that generate a wide variety of cost predictions. To resolve these indeterminacies, researchers impose constraints on the model to match other parameters from the literature. For instance, one might choose the cost projection path

displaying an effective price elasticity of health care demand to match empirical estimates. Similarly, one might try to match the income elasticity of health care demand. Other options to constrain such models are to impose particular time patterns on the equilibrium cost projection (such as the GDP + 1 assumption of the Medicare Trustees; see below).

Such constraints notwithstanding, the projections still provide a wide range of potential cost growth paths. These paths all tend to have a concave time pattern, relative to methods that rely on extrapolation, since the CGE model correctly captures the endogenous growth reduction as health care takes up a larger portion of income in the future.

Empirically detailed CGE models are relatively recent to the literature because of the computational requirements to solve the model. Warshawsky (1994, 1999) presents a two-sector model, for instance, that breaks the economy into the health and nonhealth sectors. Hall and Jones (2007) also calibrate a general equilibrium model of health expenditure, although with the goal of projecting optimal rather than actual spending. The most recent CGE model is that of Borger, Rutherford, and Won (2008). This paper focuses on the demand and supply factors involved in health care provisions; it assumes a constant rate of expansion of the state of medical knowledge, that is, constant technological growth. The paper derives equilibrium conditions from the maximization decisions of consumers (who are workers and capital owners), medical firms, and nonmedical firms.

Discussion

CGE models present the only approach in the literature that takes seriously the economic relationships involved in health care spending. If health care cost growth will slow one day as a result of natural economic factors, then this type of model is the only current option for predicting such a change. Furthermore, these economic relationships are almost surely the dominant dynamic factor in the very long run other than the demographics of population growth, which can be modeled separately. Therefore, an ideally specified CGE model fits the needs of long-run prediction well. Since these economic factors are less important in the short run, the approach is less suited to the projections there.

Nevertheless, CGE models have a number of weaknesses. First, the models tend to be very opaque. It can be extremely difficult to disentangle the precise link between input factors and cost growth projections, since the general equilibrium effects can operate in highly nonlinear ways. Furthermore, these models tend to be quite sensitive to particular assumptions (often about quite uncertain parameters).

Another drawback of these models is the lack of heterogeneity in the population. In order to solve the model, the researcher must simplify away

many if not all of the differences in preferences or institutions across the population. Many CGE models explicitly use a representative agent approach. Thus, these models are not well suited to answer questions that focus on subpopulations or relative health care developments. In fact, no one actually gets sick in the model, they just optimally consume more health care as a result of expanding budgets and technological possibilities. For instance, it would be difficult to trace the impact of the spread of HIV/AIDS on the population, since it directly affects only a small fraction of the population.

A related drawback is that CGE models tend to abstract away from many of the institutional or economic concerns that make health care so empirically and conceptually challenging. For instance, Borger and colleagues (2008) assume that a representative agent has a constant elasticity of substitution utility function for medical and nonmedical consumption. The model does not deal with the moral hazard from insurance, adverse selection and its effect on health care prices, or supply-side incentive issues (such as capitation versus cost-plus reimbursement). In other words, these models treat health care like a standard good, despite the fact that people have known since at least 1963 that it is not (Arrow, 1963). These papers do calibrate the model to match the actual history of medical spending, which of course does reflect all of these phenomena. Therefore, the CGE models may begin at the right level of cost. But if there are any interactions of future demand or supply changes with any of the subtler economic issues involved in health care, these models will not account for it. Similarly, these models cannot allow for changes in the institutional environment, since the model assumes away all but the most basic features of the health care market.

POLICY APPLICATIONS

I have now discussed a range of methods developed in the literature for projecting Medicare cost growth. Each has its own strengths and weaknesses. Such forecasts are not made in a vacuum, however; real policy decisions with billions of dollars of funding at stake rely on one or more of these approaches to set policy. I now review the methods currently used by various official agencies to project future costs.

Office of the Actuary

By law, CMS must produce 75-year projections of Medicare expenditures for the annual report of the Medicare Board of Trustees. OACT, which is responsible for such projections, splits the forecast into three

periods: the short run (0-10 years), the medium run (11-24 years), and the long run (25-75 years).

For the first 10 years, OACT projects each category of medical spending forward. These projections are essentially demographically adjusted extrapolations of past cost growth. For the final 51 years of the forecast (the long run), the projection occurs in two steps. First, the forecasters assume that the excess growth in health care costs will be 1 percent on average (an assumption denoted GDP + 1). The forecasters then estimate the CGE model of Borger and colleagues (2008) to solve for the time path of this growth, constraining the solution to the model with the GDP + 1 assumption. During this long-run period, all subcategories of health care are assumed to have the same growth rate relative to GDP. The forecasters then fill in the medium term by linearly interpolating the evolution in growth rates between year 10 and year 25. Since growth rates differ across the various subcategories in year 10 but not year 25, the medium-term projections involve a convergence of growth rates relative to GDP. OACT takes as inputs to this model a number of assumptions on the future rates of GDP growth, the real wage differential, the real interest rate, total fertility rates, and death rates. By varying these numbers, the actuaries produce high-cost and low-cost scenarios, in addition to the headline number. However, all of these scenarios apply the same GDP + 1 rule to average excess cost growth over the long-run period between 25 and 75 years into the future.

The GDP + 1 assumption resulted from a recommendation made by the 2000 Medicare Technical Review Panel. Medicare costs have never grown slower than GDP + 1 over any extended period, although regressions isolating permanent drivers of cost, such as technological growth, tended to produce estimates between 0.8 and 1.5 above GDP. Furthermore, the GDP + 1 assumption remains consistent, with continued growth in nonhealth care spending throughout the 75-year window, and is thus not obviously too large. The use of the Borger and colleagues (2008) CGE model (also known as the OACT CGE model) was recommended by the Medicare Technical Panel in 2004. However, it is important to reinforce that the CGE model does not help with the total cost growth forecast; rather, it simply reallocates growth earlier in the time path (U.S Department of Health and Human Services, 2009).

Why did the Medicare Technical Review Panel settle on GDP + 1? Given the low accuracy of long-run forecasting with current methods, the panel believed that the transparency of a GDP + X rule trumped the added realism of a more complex rule. The committee most likely also chose X in this rule to be a round number (or at least a multiple of 0.25 percent) and so was left with only a few choices. Choosing X = 1 percent seemed like the best such rule, according to members of the 2000 technical review panel. Certainly the existing method has the advantage of transparency,

as well as long-run consistency. Other methods might allow the long-run growth rate, an imprecisely estimated parameter at best, to bounce around from year to year in ways that would confuse changes in this projection with other policy changes.

There are a number of drawbacks to this approach. The model assumes that excess cost growth across the different areas of Medicare begin to converge in the 11th year out, sharply reversing the existing trend of divergence. Next year, however, this convergence process will not begin until year 12 (from today's perspective), which is of course inconsistent. Therefore, net present-value Medicare expenses for years 11-75 ratchet upward from year to year as the actuaries factor in an additional year at current excess growth rates.

The approach of CMS also obscures the true costs of the assumptions necessary to limit projected growth. The model assumes that cost growth must slow from current rates to GDP + 1 on average during the period between 10 and 25 years in the future. But the model does not specify how this slowdown would occur. Would the growth rate of demand for medical services slow as prices rise? Would the supply of doctors increase so as to exert pressure on cost counter to the current growth rates? While these changes may accurately reflect the future realities if no policies change (see below), the automatic adjustment obscures the cost that would somewhere be borne in order to generate such savings. Depending on the source of this slowdown, we might consider the resulting slower growth a good thing or a bad thing. For instance, if the supply of doctors expanded to decrease the rate of cost growth, that is more likely to be welfare enhancing than a fall-off in consumer demand growth due to increased prices or a fall in technological growth.

The obscuring of policy choices is worsened by the policy-neutral baseline used by CMS (and other nonpartisan agencies). By law, these forecasts must assume current legislation is to hold. But current law is updated every year, for instance by raising Medicare physician reimbursement rates. The current law benchmark thus represents a hopelessly optimistic projection of actual law. Thus, the projections assume future unspecified cost savings on top of an optimistic baseline, giving doubly the impression that less must be done to actually bring Medicare cost growth in check. While CBO typically provides a scenario that includes realistic policy updates, OACT does not (or at least does not publicize it as CBO does).

Congressional Budget Office

CBO operates under a similar current law environment as the OACT, but the forecasting methodology differs greatly. CBO instead relies more

heavily on a pure extrapolation of current growth rates in cost. As a result, CBO projects Medicare costs to grow much faster than does OACT.

CBO applies two brakes to the otherwise unchecked forecast growth of Medicare. First, CBO assumes that unspecified policy changes would reduce Medicare cost growth by one-fourth of the reduction in non-Medicare growth. For instance, if spending growth rates for health care outside Medicare (or Medicaid) fell from 2 to 1 percent, the growth rate for Medicare would fall to 1.75 percent. The only brake on cost growth in the CBO forecasts is the requirement that nonhealth consumption never decline. The projection hits this bound, so by the end of the 75-year window all income growth is channeled into increased health care spending.

In the end, Medicare grows much faster in CBO's projections than in those from OACT, especially in the long-run window. Cost growth 75 years out still remains 1.1 percent above GDP growth. The implications on the flow cost of Medicare at the end of the window are substantial. For instance, in the base scenario presented by the OACT, gross Medicare expenditures grow from about 4 percent of GDP today to 12 percent in 2082, while CBO projects growth to 17 percent of GDP by that time period.

On balance, CBO's forecasts represent a less optimistic approach than OACT, but both approaches rely heavily on constrained extrapolation. As a result, many of the same critiques above apply here as well. For instance, by imposing reduced-form restrictions to limit growth, the model obscures the true costs of the status quo. To be fair, CBO does not deny this, and in fact it explicitly writes in the most recent detailed report on Medicare spending that under the scenario that CBO presents, the slowdown in excess cost growth would not be painless and would not occur simply through improved efficiencies given the current structure of the health sector (Congressional Budget Office, 2007). But writing such language in a methodological report is different from explicitly projecting either sharp health care rationing (under their baseline forecasts) or declining nonhealth spending (should the reforms needed to generate their numbers not occur).

Agency for Healthcare Research and Quality

AHRQ is not charged directly with long-term cost projection. The agency therefore focuses instead on projecting the more detailed impact of various reforms over a shorter time horizon. In keeping with this mission, the agency maintains a microsimulation model for this purpose, managed by the Agency for Health Care Policy and Research. The model is similar in concept to RAND FEM, but instead uses the Medical Expenditure Panel Survey (MEPS) data to estimate health expenditures conditional on health status. (MEPS is administered by AHRQ.)

It should be noted that, unlike MCBS, MEPS provides spending infor-

mation for all of health care in the United States, rather than just Medicare spending. However, the quality of the data falls off substantially due to presumed underreporting. For instance, the Agency for Health Care Policy and Research must significantly reweight the data (beyond the "nationally representative weighting" in the data) to match the aggregate national health expenditure figures from CMS in the baseline case to get comparability of estimates. This divergence also presents interesting issues, beyond the scope of this paper, in the difference between Medicare cost growth and spending for all health care (e.g., Boccuti and Moon, 2003).

Such a microsimulation approach, of course, does not speak to long-term health care growth rates, nor does it account for the economic implications of the various reforms studied. (In fact, the agency takes growth rate projections from the OACT model described above.) But the model does allow for studies of heterogeneous effects across the population and thus provides the capacity for more subtle impact analyses. For instance, this approach would allow the agency to study the impact on health care costs of obesity, which some have estimated at $147 billion per year (Finkelstein et al., 2009), accounting for 27 percent of past spending increases (Thorpe et al., 2004). This is an excellent example of an agency using the best modeling tool for the specific job at hand, a nuanced prediction of the distributional impact of a number of current or proposed health reforms.

Department of Veterans Affairs

The Department of Veterans Affairs (VA) provides complete coverage for nearly 13 percent of the population (according to the 2000 census). As a result, the VA maintains a microsimulation model crafted explicitly toward projecting the health care costs of veterans. This model is known as the Enrollee Health Care Projection Model (EHCPM). Of all the policy alternatives, this is most similar to RAND FEM. It includes two of the three components of RAND FEM (health status projections and health expenditure projections), but instead of modeling incoming Medicare cohorts, it models new cohorts of veterans.

The precise algorithms within the VA model are considered proprietary, so it is difficult to know more closely how the methods used differ from those at AHRQ or RAND. RAND evaluated the VA projection model in U.S. Department of Veterans Affairs (2008) and concluded that it provided accurate and appropriate short-run modeling of VA costs and potential reforms but was less useful for long-run planning. This conclusion follows from the strengths and weaknesses of microsimulation models discussed above.

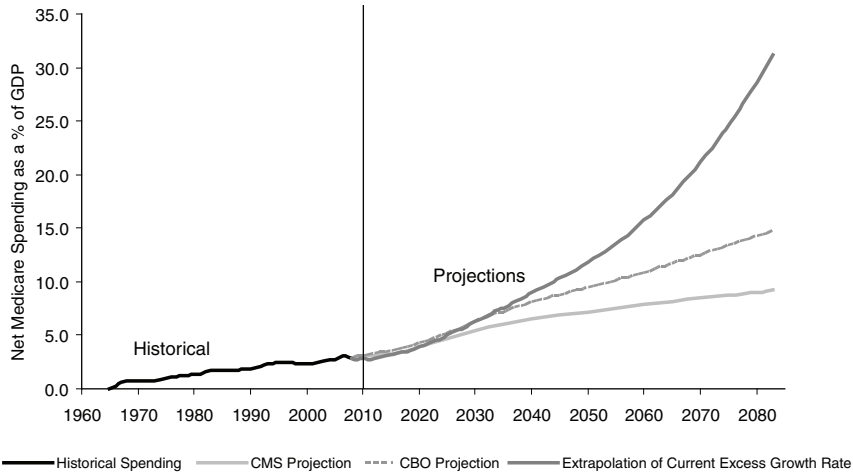

FIGURE A-1 Historical and projected Medicare spending, net of enrollee premiums, as a fraction of GDP. CMS projections are adjusted from Table III.A2 of the 2009 Medicare Trustees Report. CBO projections are from Figure 1-2 of the June 2009 Long-Term Budget Outlook. Extrapolation of current growth rates are the author's calculations.

Summary

Figure A-1 summarizes the major government cost forecasts discussed in this section. On it I plot the path of Medicare spending as a fraction of GDP from 1965 through 2083. The first 44 years of the sample are the actual fractions of GDP spent, according to the National Health Expenditure data. I then plot three distinct projections forward: extrapolation of past growth rates relative to GDP growth, the CBO projection, and the projection from the CMS OACT. If current trends continue, Medicare spending (net of premiums) would exceed 30 percent by the end of the 75-year projection window. CBO and CMS each project a slowdown in growth even without policy change, so that Medicare would roughly triple under the CMS projections and quintuple under the CBO projections. These three projections methods are actually quite close for the first 20 years, after which the differing assumptions on long-term growth begin to bite.

UNMODELED FACTORS IN HEALTH CARE COST GROWTH

This paper has reviewed a number of methodologies for forecasting the cost growth of Medicare. These approaches have different strengths and weaknesses. Some approaches, such as CGE models, better capture

the economic forces at play in determining health care cost growth. Others take a more reduced-form statistical approach. But across these various approaches, there are some important factors that are never fully addressed. This section discusses some of the most important unmodeled factors in forecasting Medicare cost growth.

Technology

Many papers regard technological change as the key driver of health care costs. Newhouse (1992) identified technological growth as explaining one-half to two-thirds of health care cost growth. Okunade and Vasudeva (2002) found similar numbers to Newhouse after modeling more intricately the time-series dynamics of different factors, and Smith, Newhouse, and Freeland (2009) compared cost growth across a range of countries and concluded that technological development drives between one-quarter to one-half of worldwide cost growth, a somewhat smaller figure than in the United States. Similarly, Cutler (2004) argues that technological improvement, while providing large net benefits, has driven most of cost growth in the past half-century, while Cutler and colleagues (1998) show that the costs of treating heart attacks has fallen by roughly 1 percent annually, even as the quality of treatment has improved.

Yet despite the almost universal agreement of the importance of technology, none of the modeling strategies outlined above, either in the academic literature or the policy world, makes any attempt to actually forecast technological growth and its implications for Medicare costs beyond simple extrapolation. (Ironically, of all the economic forces that the OACT CGE model incorporates, technological cost is one of the exogenously driven factors.) RAND FEM, as well as others, can model the impact of particular technological developments, or even a range of such developments at once. But these models make no attempt to model the economic feedback on the rate of technological growth.

What is more, the forecaster must predict not only the level of technological development but also its type. Weisbrod (1991) decomposes technological change into innovations that cheapen existing procedures or products and ones that develop new procedures or products. Interestingly, Chandra and Skinner (2009) argue that both can be either good or bad for cost growth, depending on usage. New developments could increase cost growth if previously untreated patients may be saved or if already treated patients move to a more expensive (though perhaps more effective) course of treatment. More counterintuitively, innovations that cheapen existing technologies may also add to health care cost if the decline in price is offset by an increase in quantity, either by being on an elastic part of the demand curve or because the improved procedure also offers fewer side-effects or restrictions. In

particular, Chandra and Skinner argue that technologies that impose few side-effects and thus can be applied to everyone (or even multiple times to a given patient, as in the case of medical imaging) account for much of the cost growth in health care. A third form of technological improvement to consider is administrative or information technology that may both increase the quality of care and lower the administrative burden. For instance, despite an ongoing multibillion dollar push to digitize medical records, for instance, few models incorporate the costs or savings involved here.

This is undoubtedly a difficult area for prediction. But economic research has shown in a variety of contexts that research innovations respond to important economic aspects of the market. Many researchers have followed the macroeconomics literature and treated technological growth as a residual remaining after controlling for other factors (i.e., the Solow residual). But medical research is more concentrated than technology for the entire economy, and some researchers have made large strides in understanding the interplay between market demand, institutional conditions, and technological growth. For instance, Acemoğlu and Linn (2004) show that the development of pharmaceutical products responds to the underlying size of the market, using demographic shifts over time for identification. Similarly, Acemoğlu and Finkelstein (2008) demonstrate that the Medicare prospective payment system affected hospitals' use of capital versus labor-intensive technologies. Finkelstein (2004) shows how the innovation of vaccines responds dynamically to market conditions. A number of papers have also specifically explored the profit increases and resulting increase in spending on research and development by pharmaceutical firms following the passage of Medicare Part D in 2003 (Blume-Kohout and Sood, 2008; Friedman, 2009; Lakdawalla and Sood, 2009).

Another approach is to use expert Delphi panels to rate the likelihood of particular technological improvements in the future. Experts in medical subfields meet to discuss and then individually estimate the probabilities of specific technological improvements. By integrating over these estimates, one can implement a metadistribution of future technology. This approach is very close to the gamma discounting approach of Weizman (2001) to estimate the appropriate discount rate for the social welfare function. Shekelle and colleagues (2005) take this approach in the subfields of cardiology, cancer, the biology of aging, and neurological disease. This analysis combines expert panels and a literature review with RAND FEM to estimate not only the likelihood but also the potential impact of a host of future technologies. Ex post, the predictions generated by these panels were fairly accurate over the past 5 years, for instance correctly predicting the spread of implantable defibrillators. Further into the future, however, the expert panels come to less of a consensus and so the predictions become far more diffuse. While not a panacea, this

approach could be a valuable complement to the use of economic factors to predict technological growth, especially in the short to medium term.

Politics

A second important omitted factor for Medicare cost growth is the political process. Unlike technological growth, which models treat (however unsatisfactorily), politics is left entirely out of the picture. Furthermore, some of the forecasters (such as CBO and CMS) have an explicit mandate to evaluate the long-term consequences of current policy, which by definition excludes the possibility of future adjustment. However, even CBO assumes that unmodeled future policy changes will drive some of the reduction in cost growth rates.

Politics could enter into cost growth forecasting in a number of ways. Of course, potential future political changes do not resolve the fundamental inconsistency of current growth rates with long-term affordability. But the political reality suggests two alternative ways in which research and forecasting could help predict how and when the current system will finally change.

The most important political implication of current policy is the rising tax burden required to support the government share of health care expenditures. Currently, government spends about 6.2 percent of GDP, or 22 percent of all tax revenues collected on Medicare and Medicaid. Under even the optimistic projections from the Medicare Trustees, this fraction would rise to 23 percent of GDP by 2082, more than the entire current federal budget. Such growth would require substantial increases in the tax burden. This is a related, though conceptually distinct brake on the growth of health care costs to that in other models. CBO and other forecasters relate the growth of health care costs to the demand for other services, and thus it is individuals' demand for other goods that eventually limits health care growth. Here, it is the political reality of a sharply increasing tax burden that limits the growth. This political brake on the system may occur even while demand for health care is rising, since ever-increasing marginal tax rates have an independent effect on both the economic and the political situations. However, most CGE models do not model the government sector, so they do not account for the tax burden of rising health care costs.

There is some evidence of such political limitations of health care cost growth. Getzen (1992) shows that, in cross-country panel regressions, it is income rather than the fraction of the population that is elderly that explains the variation in health care spending. Chandra and Skinner (2009) point out that health care growth rates since 1985 are negatively correlated across countries with the level of the tax burden at the beginning of the period. Of course, such cross-sectional comparisons may suffer from sub-

stantial omitted-variable bias. Marginal tax rates have also fallen sharply in the United States in the past 30 years, although the total tax burden has remained largely unchanged, as the base for taxation has broadened. Relative to European countries, the United States is an outlier for having such a low tax burden. This might suggest that the United States has a way to go before the tax burden pressures seen in Sweden and Denmark kick in to restrain health care spending growth. Still, the particular political history of the United States may imply that these political pressures would appear instead much sooner if tax preferences forbid a return to the top tax rates of the pre-Reagan era.

CONCLUSION

The problem of forecasting Medicare cost growth is an important yet difficult endeavor. Researchers in the academic literature have developed a number of techniques for forecasting, including extrapolation, microsimulation, and computable general equilibrium models. The many government agencies tasked with projecting health care expenditures in different settings choose from these broad methods in their particular cases. But regardless of the specific case in which these methods are applied or even the details of the particular method used, one always returns to the same deep question that arises whenever attempting to predict the future path of health care: What will be different in the future? Since health care cannot continue to grow as it has, an answer to this question should lie at the heart of any long-run forecast. Forecasters should not only answer this question but also make the answer clear so that others can judge the model on its merits.

I end on a positive note. It is impressive that, despite the many problems with existing methodologies, each agency matches its projection approach quite well with the purpose of its projections. For instance, the VA and AHRQ use their projections for a more detailed but short-run estimate of health care costs. Appropriately, these two agencies use microsimulation at the heart of their forecasting models. In contrast, long-term fiscal solvency is the goal of the CBO and CMS projections, so their focus is on very long-run projections of cost growth. The 75-year budget window for entitlement programs imposes a unique challenge for modelers at CBO and CMS. Accordingly, these agencies use extrapolation constrained by either restrictions on the decline of nonhealth goods or a CGE model. The CGE model itself is a recent addition, and modeling the economic dynamics better, as understanding of health care and computational ability increases, should allow CMS (and perhaps CBO) to make fuller use of this approach.

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Appendix B

Workshop Agenda and Presenters

AGENDA

Workshop on Improving Health Care Cost Projections
for the Medicare Population

January 13, 2010

9:00–9:30 a.m.	**OPENING SESSION**	
	Welcome and Introductions	Dana Goldman, University of Southern California
	Welcoming Remarks on Behalf of the National Academies	Constance Citro, Committee on National Statistics
	Welcome and Sponsor's Perspectives	Richard Suzman, National Institute on Aging
	Background and Context of the Workshop	Dana Goldman

9:30–11:00	**SESSION ONE**	**Moderator:** Marilyn Moon, American Institutes for Research
	Relative Merits of Current Models for Health Care Cost Projections for the Medicare Population	
		Presenters:
	A Brief Overview of Background Paper on Current Models for Health Care Cost Projections for the Medicare Population	John Friedman, Harvard University
	Medicare Cost Modeling for Health Care Spending at CBO: Capabilities, Strengths, and Weaknesses	Joyce Manchester, Congressional Budget Office
	OACT Long-Range Health Expenditures Projections: Assumptions, Methods, and Purposes	Richard Foster, Centers for Medicare & Medicaid Services
	Role of MEPS as a Resource for the Nation's Economic Models and Their Projections of Health Care Expenditures and Use	Steven Cohen, Agency for Healthcare Research and Quality
	Comments and General Discussion	
11:00–11:15	*Break*	

11:15–12:30 p.m.	**SESSION TWO**	**Moderator:** Jonathan Skinner, Dartmouth Medical School
	Modeling Medical Technology as a Driver of Medicare Health Care Spending	
		Presenters:
	Current Law Brakes on Health Care Spending Growth	Michael Chernew, Harvard University
	Pharmaceutical Innovation, Future Health, and Spending	Darius Lakdawalla, University of Southern California
	Medical Technology as a Driver of Health Care Costs	Kenneth Thorpe, Emory University
	Comments and General Discussion	
12:30–1:30	*Working Lunch—continuation of discussion*	
1:30–3:00	**SESSION THREE**	**Moderator:** Joseph Newhouse, Harvard University
	Factors Affecting Health Status as Drivers of Health Care Spending and Cost Projections for the Medicare Population	

		Presenters:
	Health and Health Care Cost Consequences of Obesity Among the Medicare Population	Justin Trogdon, RTI International
	Role of Socioeconomic Status and Health-Related Behaviors in Driving Cost Projections for the Medicare Population	Eileen Crimmins, University of Southern California
	Role of Chronic Diseases and Disability in Medical Spending Among the Medicare Population	Jay Bhattacharya, Stanford University
	Comments and General Discussion	
3:00–3:15	*Break*	
3:15–4:15	**SESSION FOUR**	**Moderator:** Dana Goldman
	Needed Research on Aging-Related Issues Toward the Goal of Improving Health Care Cost Projections for the Medicare Population	
	Panel of two key participants will lead off the discussion	Eileen Crimmins, Darius Lakdawalla
	Comments and General Discussion	All participants
4:15–5:00	Closing Remarks	Constance Citro, Richard Suzman, Dana Goldman
5:00	*Adjourn*	

PRESENTERS

Jay Bhattacharya is an associate professor in the Center for Primary Care and Outcomes Research, Stanford University School of Medicine.

Michael Chernew is professor in the Department of Health Care Policy at the Harvard Medical School.

Constance F. Citro is director of the Committee on National Statistics, in the Division of Behavioral and Social Sciences and Education, National Research Council.

Steven Cohen is director of the Center for Financing, Access, and Cost Trends at the Agency for Healthcare Research and Quality in the U.S. Department of Health and Human Services.

Eileen Crimmins is associate dean of the Davis School of Gerontology and professor of gerontology and sociology at the University of Southern California.

Richard Foster is chief actuary in the Office of the Actuary of the Centers for Medicare & Medicaid Services in the U.S. Department of Health and Human Services.

John N. Friedman is assistant professor of public policy at the Kennedy School of Government at Harvard University.

Dana P. Goldman is professor and Norman Topping chair in medicine and public policy and director of the Leonard D. Schaeffer Center for Health Policy and Economics at the University of Southern California.

Darius Lakdawalla is associate professor in the School of Policy, Planning, and Development and director of research in the Leonard Schaeffer Center for Health Policy and Economics at the University of Southern California.

Joyce Manchester is unit chief of the Long-Term Modeling Group in the Health and Human Resources Division of the Congressional Budget Office.

Richard Suzman is associate director for behavioral and social research at the National Institute on Aging of the National Institutes of Health.

Kenneth Thorpe is Robert W. Woodruff professor and chair in the Department of Health Policy and Management of the Rollins School of Public Health at Emory University.

Justin Trogdon is a research economist in the Public Health Economics Program at RTI International.

Appendix C

Biographical Sketches of Steering Committee Members

Dana P. Goldman (*Chair*) is professor and Norman Topping chair in medicine and public policy and director of the Leonard D. Schaeffer Center for Health Policy and Economics at the University of Southern California. He is also a senior economist at the RAND Corporation and a research associate with the National Bureau of Economic Research. Prior to 2009, he was the director of the RAND Center on Health Economics and the RAND Roybal Center for Health Policy Simulation, designed to provide better estimates of the impact of health policy changes. His areas of expertise are the economics of chronic disease, health care reform, health care organization, economics, finance, pharmaceutical regulation and innovation, and pharmacy benefit design. His research interests combine applied microeconomics and medical issues with a special interest in the role that medical technology and health insurance play in determining health-related outcomes. He is a member of the Institute of Medicine. He received the National Institute for Health Care Management Research Foundation award for excellence in health policy and the Alice S. Hersh new investigator award. He has a B.A. (summa cum laude) from Cornell University and a Ph.D. from Stanford University.

Alan M. Garber is the Henry J. Kaiser Jr., professor, professor of medicine, and director of the Center for Health Policy and Center for Primary Care and Outcomes Research in the School of Medicine at Stanford University. His research has focused on methods for improving health care delivery and financing, particularly for the elderly, in settings of limited resources; health care expenditure growth; effectiveness and cost-benefit analysis;

international comparisons of health care financing and delivery; evaluation of new health care technologies; and improving processes for making medical decisions. He leads the Global Healthcare Productivity Project, which includes collaborators from 19 nations. He is principal investigator of the Center for Demography and Economics of Health and Aging at Stanford University. He is also a research associate with the National Bureau of Economic Research and a member of the Institute of Medicine. He has M.A. and Ph.D. degrees in economics from Harvard University and an M.D. from the Stanford School of Medicine. He completed a residency in medicine at Brigham and Women's Hospital in Boston.

Marilyn Moon is vice president and director of the Health Program at the American Institutes for Research in Silver Spring, Maryland. An economist with expertise on Medicare, aging, consumer health issues, and health care financing, she has also served as a senior fellow at the Urban Institute and as a public trustee for the Social Security and Medicare trust funds. She has been an associate professor of economics at the University of Wisconsin, Milwaukee, a senior analyst at the Congressional Budget Office, and the founding director of the Public Policy Institute of the American Association of Retired Persons. Her work has focused on health care financing and public policy issues, with a particular emphasis on the Medicare cost of health care and its impact on access to care. She has written extensively on health policy, reform issues in Medicare health financing, and other social insurance issues. She has served on a number of boards for nonprofit organizations, the Medicare Rights Center, and the National Academy of Social Insurance. She is a member of the Institute of Medicine. She has a Ph.D. in economics from the University of Wisconsin, Madison.

Joseph P. Newhouse is John D. MacArthur professor of health policy and management and chair of the Committee on Higher Degrees in Health Policy in the Malcolm Wiener Center for Social Policy at the Kennedy School of Government of Harvard University. He is a member of the faculties of the John F. Kennedy School of Government, the Harvard Medical School, the Harvard School of Public Health, and the Faculty of Arts and Sciences, as well as a faculty research associate of the National Bureau of Economic Research. Newhouse spent the first 20 years of his career at RAND, where he designed and directed the RAND Health Insurance Experiment, a project that from 1971 to 1988 studied the consequences of different ways of financing medical services. From 1981 to 1985 he headed the RAND Economics Department. He has expertise in health care financing, health research policy, health services research, health care quality and outcomes, and general economics and health economics. He is a member of the Institute of Medicine and has a Ph.D. in economics from Harvard University.

Jonathan S. Skinner is the John Sloan Dickey third century chair of economics at Dartmouth College and professor of community and family medicine in the Dartmouth Medical School and the Dartmouth Institute of Health Policy and Clinical Practice. He is a research associate at the National Bureau of Economic Research and a former editor of the *Journal of Human Resources*. His research has focused on the causes and consequences of regional variation in health care expenditures; the economics of government transfer programs, such as Medicare; technology diffusion in health care, racial disparities in health outcomes and health care; and the importance of out-of-pocket health care expenditures in financial security. He is a member of the Institute of Medicine and has M.A. and Ph.D. degrees in economics from the University of California, Los Angeles.

COMMITTEE ON NATIONAL STATISTICS

The Committee on National Statistics (CNSTAT) was established in 1972 at the National Academies to improve the statistical methods and information on which public policy decisions are based. The committee carries out studies, workshops, and other activities to foster better measures and fuller understanding of the economy, the environment, public health, crime, education, immigration, poverty, welfare, and other public policy issues. It also evaluates ongoing statistical programs and tracks the statistical policy and coordinating activities of the federal government, serving a unique role at the intersection of statistics and public policy. The committee's work is supported by a consortium of federal agencies through a National Science Foundation grant.