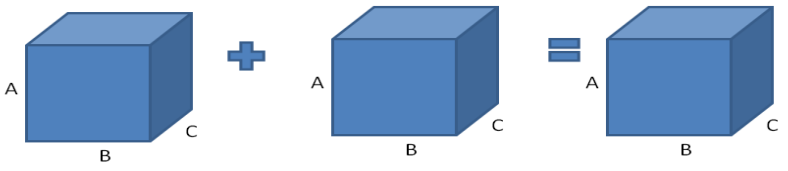
9/18/2013

PROJECTIONS OF NATIONAL HEALTH EXPENDITURES: METHODOLOGY AND MODEL SPECIFICATION

The Office of the Actuary (OACT) in the Centers for Medicare & Medicaid Services (CMS) produces short-term (11-year) projections of health care spending for categories in the National Health Expenditure Accounts (NHEA) on an annual basis. The starting point for the NHE Projections is the detailed actuarial projections of spending for the Medicare, Medicaid, and Children's Health Insurance Program (CHIP) estimated annually by OACT to incorporate estimates of the effects on projection spending of all current legislation, except for the Affordable Care Act (ACA), conditional on a set of macroeconomic assumptions generated by the Social Security Administration (SSA). Given these projections for the major public programs over an 11-year forecast horizon, the focus of these projections is largely on what can be expected for the private sector (as well as smaller publicly funded programs) conditional on a spending path for the largest publicly-funded health programs.

The role of the NHE Projections model has changed over the past three years in response to the passage of the ACA. Our standard NHE projections model is now used to produce a *baseline projection* of national health spending – a projection of NHE in the absence of the ACA legislation. This baseline scenario relies on a model estimated based on data adjusted to exclude historical effects of the ACA. Projections generated by this model are then adjusted for the effects of each individual provision of the ACA to produce a final current-law NHE spending projection.

The impact of individual provisions of the ACA is estimated using the Office of the Actuary Health Reform Model (OHRM). These estimates are then applied to the baseline model projection to produce a final projection that reflects the effects of the ACA. This change in methodology reflects the anticipation of substantial shifts in health care spending that are not reflected in historical trends and thus cannot be fully captured by models estimated based on historical data.



Baseline NHE Spending Projection | Change in spending Due to ACA | Final NHE Spending Projection

A = Types of service
B = Source of funds (direct payer)
C = Sponsor of payment

The output of the NHE Projections is a set of time series for all of the major spending categories in the NHEA. These projections embody our analysis of probable aggregate trends in medical spending, for the mix of medical services consumed, and for trends in sources of payment for these services. Detailed tables for the historical and projected NHEA are available on our website and a paper describing our results is published in Health Affairs on the release of these projections. [1]

The NHE Projections are inherently subject to uncertainty and are best used with this caveat. The models used to project trends in health care spending are estimated based on historical trends and relationships in health spending. These models therefore assume that projected spending within the baseline model will be consistent with this history except where adjustments are explicitly specified. These projections also rely on assumptions about macroeconomic and health sector conditions. The degree of uncertainty associated with the baseline projection increases with the projection horizon.

The methodology for the NHE Projection Model is presented below. The discussion is organized in the following sections:

1. *Overview of the Baseline NHE Projections Model*
2. *Data sources and exogenous inputs to model*
    a. Historical data sources
    b. Exogenous inputs to the NHE Projections
3. *Baseline NHE Model specification*
    a. Aggregate model for private personal health care spending
        - Overview and background
        - Model specification
    b. Non-PHC health care spending
    c. Submodels for sector, sources of funds, and sponsors of payment
    d. Health insurance enrollment model
4. *Incorporating effects of the Affordable Care Act (ACA)*
5. *Concluding note*

[1] Cuckler G et al., "National Health Expenditure Projections, 2012–22: Slow Growth until Coverage Expands and Economy Improves" Health Affairs 32, no. 10 (2013) (to be published online 18 September 2013).

1. OVERVIEW OF THE BASELINE NHE PROJECTIONS MODEL

The effects of changes to systems of health care financing resulting from the ACA will not be fully reflected in health care spending data for several years. Prior to the availability of direct evidence on the effects of ACA provisions, baseline projections for total National Health Expenditures (NHE) will involve two discrete steps. First, we produce a projection of private expenditures for the counterfactual scenario that we would anticipate in the absence of the ACA legislation. This projection is based on econometric models, which reflect relationships in historical time-series data. Second, we adjust this baseline projection using detailed actuarial estimates of the impact of the individual provisions of the ACA.

The NHE Projections focus on the health system as a whole, taking macroeconomic conditions and projections for Medicare and Medicaid spending as exogenous inputs. The most recent available macroeconomic and demographic assumptions from the Social Security Administration are used as exogenous inputs into the model. Actuarial projections for Medicare and Medicaid that exclude the estimated effects of the ACA are also exogenous inputs. The primary focus of the NHE projections is future health care spending by private payers excluding the effects of the ACA. We also project non-Medicare and Medicaid public spending, to provide a comprehensive projection of all spending within the NHEA. Projections for the combined spending by private health insurers, by consumers on an out-of-pocket basis, and by other private payers, are projected within a multi-equation structural econometric model that maintains consistency with exogenous Medicare and Medicaid projections. This model will be hereafter referred to as the *Baseline NHE Projections Model*.

Sections 1-3 of this methodology paper present the inputs and structure of the baseline model, with discussion of the data, assumptions, and model specification used to produce the forecast excluding effects of the ACA. Section 4 of this paper briefly describes how the results of the Baseline NHE Projection are adjusted to incorporate the estimated impacts of the ACA on health spending for all subcategories within the NHEA.

2. DATA SOURCES AND EXOGENOUS INPUTS TO THE BASELINE NHE PROJECTIONS MODEL

a. Historical data sources

National Health Expenditures (NHE) data

All historical data for health expenditures are derived from the NHEA compiled by OACT. The NHEA is a national level matrix of health spending data by type of service and source of funding. Information on the methodology used in producing these historical estimates can be found at http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.html.

Classification of spending by types of services and sources of funding projected in our model are listed below. In addition to projections of spending by type of service and payer, the NHE Baseline model has been expanded in recent years to generate projections based on the additional perspective of spending by 'sponsor' of spending – defined as the underlying source of financing for the sources of funds (direct payers) including private health insurance, Medicaid, and Medicare. Payer categories track the source of

direct payment for health care consumption (e.g. Medicare or PHI) but do not consider who is ultimately paying for each form of coverage – via taxes or premium payments for example. The Sponsor classification effectively takes a step back to look at where the funding for health consumption is actually coming from after accounting for the flows of funding to final payers. The objective is to take a look at the financial impact of projected trends by the households and businesses who ultimately pay for medical services. Categories of spending projected by 'sponsor' are shown in a third table below.

TYPES OF SERVICE
National Health Expenditures
Health Consumption Expenditures
Personal Health Care
Hospital Care
Professional Services
Physician and Clinical Services
Other Professional Services
Dental Services
Other Health, Residential, and Personal Care
Nursing Home and Home Health
Nursing Care Facilities and Continuing Care Retirement Facilities
Home Health
Retail Outlet Sales of Medical Products
Prescription Drugs
Durable Medical Equipment
Nondurable Medical Products
Government Administration
Net Cost of Private Health Insurance
Government Public Health Activities
Investment
Structures
Equipment
Research

PAYER

National Health Expenditures

- Out-of-Pocket
- Health Insurance
  - Private Health Insurance
  - Medicare
  - Medicaid
  - Children's Health Insurance Program (CHIP)
  - Department of Defense
  - Department of Veterans' Affairs
- Other Third Party Payers and Programs
  - Other Federal Programs
  - Other State and Local Programs
  - Other Private Expenditures

SPONSORS OF PAYMENT

National Health Expenditures

- Business, Households and Other Private
  - Private business
    - Employer contributions to private health insurance premiums
    - Other
  - Household
    - Household private health insurance premiums
    - Medicare payroll taxes and premiums
    - Out-of-pocket health spending
  - Other private revenues
- Government
  - Federal government
    - Employer contributions to private health insurance premiums
    - Employer payroll taxes paid to Medicare hospital insurance trust fund
    - Medicare
    - Medicaid
    - Other programs
  - State and local government
    - Employer contributions to private health insurance premiums
    - Employer payroll taxes paid to Medicare hospital insurance trust fund
    - Medicaid
    - Other programs

Medical Price Indexes

Data sources for medical price indexes are consistent with those used in the NHEA. The primary source data for medical price indexes are the series of Producer Price Indexes (PPI) and Consumer Price Indexes (CPI) published by the Bureau of Labor Statistics (BLS) The PPI indexes for health care services are available beginning in the 1990s, with the earlier historical price indexes based on the CPI. Additional adjustments are made to the source data in certain cases to ensure conceptual consistency where two or more primary indexes are used in combination to generate a longer-term historical series.

For physician and clinical services, we use a composite index of the Producer Price Index (PPI) for offices of physicians and clinical and diagnostic laboratories. This composite index provides a comprehensive deflator for the types of provider revenue covered under this NHE category. For inpatient hospital services in the period from 1993 forward, the NHEA uses the PPI for hospital services introduced in December 1992. To obtain a measure closer to a transaction price, the PPI uses a methodology that attempts to capture discounts and redefines the "items" included in the index. For the years prior to 1993, OACT estimates a transaction price measure based on an adjusted version of the CPI for hospital and related services. For nursing care facilities and continuing care retirement communities and home health spending, we now use the respective PPIs from BLS.

Our price measure for total personal health care spending is a chain-weighted deflator based on the indexes in the table below, with the weight for each index set equal to the share of personal health care expenditures accounted for by that type of service.

Price indexes continue to be used as an intermediate tool within our NHE Projection Model in the development of our pre-ACA baseline projection; we project medical price inflation to construct our baseline pre-ACA projection of nominal health care spending. However, our ACA spending impacts are calculated on a nominal basis – they are not explicitly broken out by quantity and price. These impacts are added to the nominal baseline to yield nominal current law projections. Since we can't break nominal ACA impacts into price and quantity components, we cannot yet generate a current-law projection of medical price inflation.

Components of personal health care expenditure chain-type annual-weighted price index

Industry/Commodity or Service	Price proxy	2011 weight
Personal health care		100.0
Hospital care	PPI, hospitals*	37.3
Physician and clinical services	Composite Index: PPI for Office of Physicians and PPI for medical & diagnostic laboratories	23.8
Other professional services	CPI services by other medical professionals	3.2
Dental services	CPI, dental services	4.8
Home health care	PPI home health care services	3.3
Other health, residential, and personal care	N/A	
Other (School Health, Worksite Health Care, Other Federal, Other State & Local, etc)	CPI physicians' services	
Home and community-based waivers (HCBW)	CPI care of invalids & elderly at home	
Ambulance	CPI-U All Items	
Residential Mental Health & Substance Abuse Facilities	PPI residential mental retardation facilities	
Nursing home care	PPI nursing care facilities	6.6
Prescription drugs	CPI, prescription drugs	11.5
Other non-durable medical products	CPI, internal & respiratory over-the-counter drugs	2.1
Durable medical equipment	Composite Index: CPI for eyeglasses and eye care and CPI nonprescription medical equipment and supplies	1.7

*Producer Price Index for hospitals, U.S. Department of Labor, Bureau of Labor Statistics. Used beginning in 1994 and scaled to 100.0 in 2000. Indexes for 1960-93 are based on a CMS developed output or transaction price index.

Insurance Coverage Data

Private health insurance enrollment data are compiled by OACT using a combination of raw data drawn from the National Health Interview Survey (NHIS) and the Current Population Survey (CPS). The level of the insured population is currently benchmarked to the 1997 NHIS. This base year level is then escalated using growth rates based on the insured population from the CPS to produce the historical time series.

b. Exogenous inputs to the NHE Projections

Exogenous inputs to the NHE Projections include assumptions for projections of real GDP growth, economy-wide inflation, labor market indicators, and demographic projections of the population by age and gender. Projections for macroeconomic and demographic assumptions are based on the annual projections of the Board of Trustees for OASDI (Federal Old-Age, Survivors, and Disability Insurance). These projections are produced annually by the Social Security Administration (SSA).[2] Adjustments are made to macroeconomic projections for the first one to three years of the projection where updated quarterly data implies substantive changes since the release of the most recent SSA assumptions.

A projection for disposable personal income (DPI) consistent with the economic assumptions from the 2013 Medicare Trustees Report is generated using the University of Maryland Long Term Interindustry Forecasting Tool (LIFT). The relationship between DPI and GDP is influenced by fluctuations in taxes and government transfer payments, depreciation of capital stock, and retained earnings and transfer payments of private business.

The Board of Trustees for Medicare reports annually to the Congress on the actuarial status of the Hospital Insurance and Supplementary Medical Insurance Trust Funds.[3] These projections, as well as the Medicaid and Children's Health Insurance Program (CHIP) projections, are produced by OACT and are also consistent with macroeconomic and demographic assumptions included in the OASDI Trustees Report.

Projections for input price indexes in each sector are based on projections from IHS Global Insight, Inc. Since these projections are generated conditional on macroeconomic assumptions for aggregate wage and price growth that differ from those incorporated in the OASDI Trustees report, price and wage proxies proxy included in these indexes are adjusted for consistency with OASDI macroeconomic assumptions.

The latest release of the NHE projections was produced in the summer of 2013. This forecast incorporates projections from the 2013 Trustees Reports issued in the spring of 2013, updated to reflect

[2] Board of Trustees, Federal Old-Age and Survivors Insurance and Disability Trust Funds, *The 2013 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds*, 31 May 2013, http://www.socialsecurity.gov/OACT/TR/2013/tr2013.pdf (accessed August 20, 2013).

[3] Board of Trustees, *2013 Annual Report of the Boards of Trustees of the Federal Hospital Insurance Trust and Federal Supplementary Medical Insurance Trust Funds*, 31 May 2013, http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/ReportsTrustFunds/Downloads/TR2013.pdf (accessed August 20, 2013).

additional macroeconomic, Medicare, and Medicaid data available through June 2013.[4]

3. BASELINE NHE MODEL SPECIFICATION

a. Aggregate model for private personal health care (PHC) spending

The NHE Projections model is primarily focused on growth in private health care spending It is composed of a set of econometric equations that define the relationship of private (and other public) spending trends relative to exogenous inputs to the model: assumptions for key macroeconomic variables and actuarial projections for Medicaid, Medicare, and the Children's Health Insurance Program (CHIP) spending.

The specification of the NHE Projections Model draws on standard economic theory and on the broader health economics literature. The equations in the model are re-estimated annually following the release of updated data for the NHEA. The fit and appropriateness of model specifications for individual series are reviewed and revised at this time.

Projections are generated separately for personal health care (PHC), which includes all medical goods and services consumed by individuals, and for several non-PHC categories (administrative costs, net cost of private health insurance, non-commercial research spending, investment spending on structures and equipment, and public health expenditures.

Overview and Background

Spending for medical care provided to patients, or personal health care (PHC), accounts for about 84 percent of total NHE. The remaining 16 percent of NHE includes additional costs such as the net cost of insurance, administration, non-commercial research spending, public health spending, and investment. The drivers of growth in spending for different types of personal health care services tend to be similar on the supply and the demand side, while the drivers of growth for the non-PHC categories are quite different, do not tend to be closely interrelated, and are generally more volatile.

The key focus of our aggregate model is growth in aggregate private PHC spending. Aggregate spending growth for private PHC spending is quite cyclical, and growth cycles can be extended in duration, lasting over a decade or more from peak to trough. Cycles in private PHC spending are closely linked to macroeconomic growth. However, this causal link is not immediately obvious when looking at the health share of GDP because:

1) The transmission of the effect occurs over a period of several years following the macroeconomic business cycle, and

2) There is a negative short-term relationship between private and public spending growth such that these trends can be offsetting when looking at aggregate spending. As a result, this short-term relationship contributes to volatility in growth when private spending is considered independently. Note that this is in contrast to the strong positive correlation between growth in

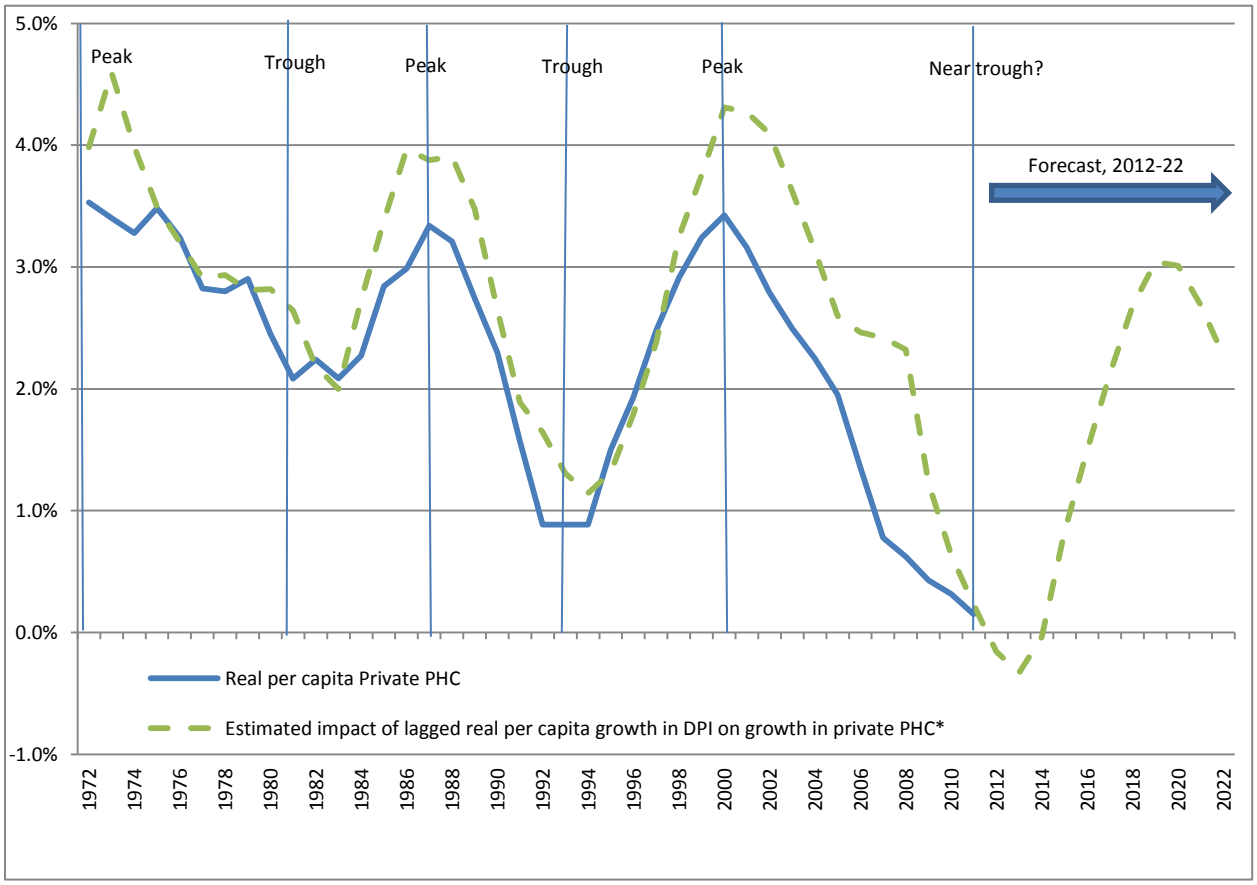
[4] The updated macroeconomic forecast comes from the July 2013 publication of the Blue Chip Economic Indicators, a survey of 50 of the top forecasts by different private companies and academic institutions. More information on this report is found at: http://www.aspenpublishers.com/blue-chip-publications.htm. The report does not incorporate the comprehensive revisions to GDP that were released on July 31, 2013.

public and private spending over the longer-term.

The causal link between aggregate income growth and health spending is largely reflected in private PHC spending rather than spending on public programs; however, this relationship can be observed in the aggregated data as well.

The magnitude and length of the growth cycles that characterize private health care spending means that it is difficult to look at trends over a decade or shorter period without understanding the cyclical and macroeconomic context. For example, our models suggest that we are currently (2013) near the trough of a cycle in real per capita private PHC spending growth, following a cyclical downturn since a peak in about 2000-2002.[5] The cycle for public health spending does not always closely track the timing of the cycle for private spending; however, in this case OACT analysis suggests public spending is also near a cyclical trough in 2013.

Chart 1. Real per capita growth in private health care spending with estimated cyclical effects of macroeconomic growth
(7-year moving average centered on the current period)

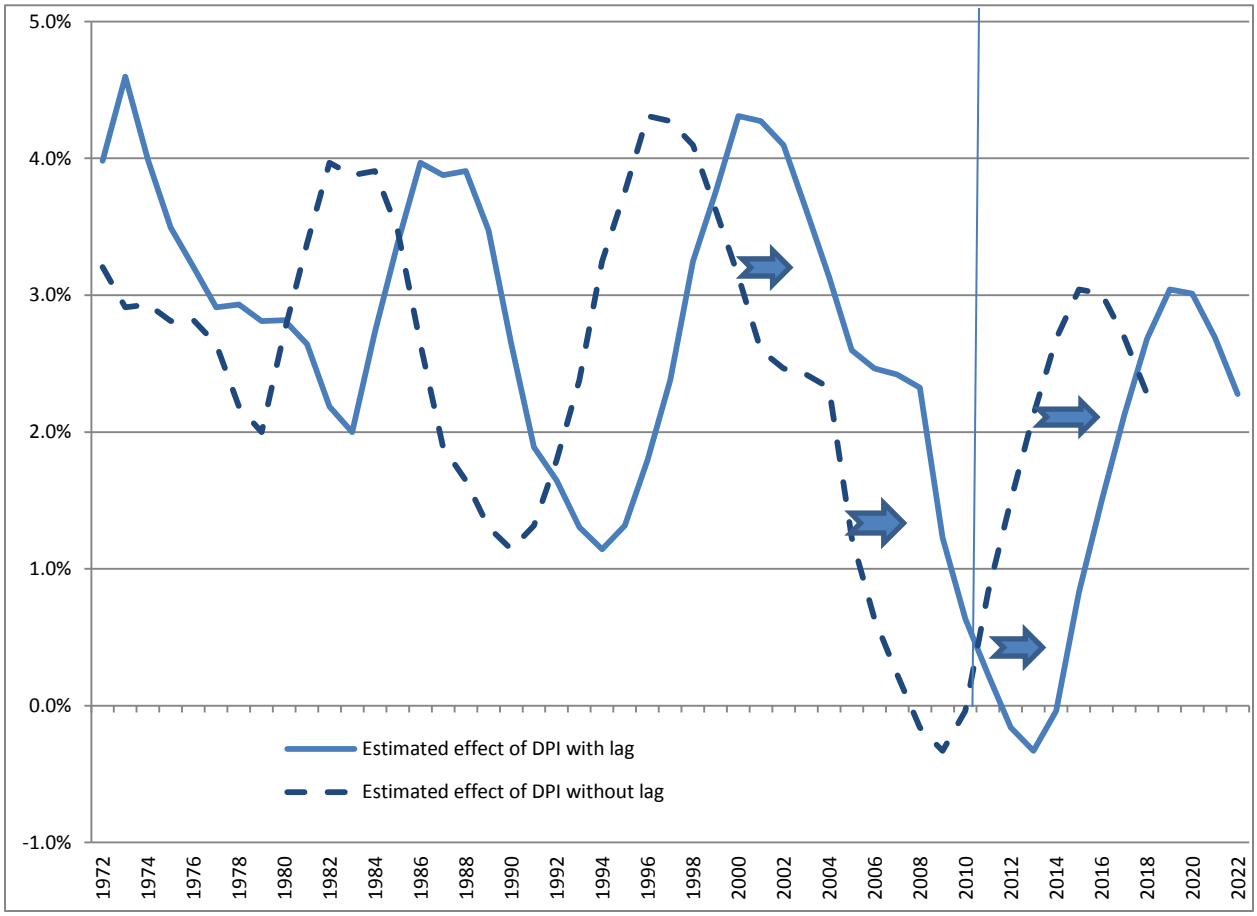


[5] The timing of cyclical peaks and troughs cannot be precise due to annual year-to-year volatility in the health care spending data.

*Estimated impact represents the historical and projected values of DPI applied to the estimated model coefficients in the NHE projection model. These coefficients reflect the lagged structure of the model, which are described in more detail on p. 16.

Chart 1 shows the estimated effect of lagged growth in real per capita income (DPI) on real per capita private PHC spending (growth is smoothed with a 7-year centered moving average of growth). As can be seen, the trend of this estimated effect mirrors that of the growth in real per capita private PHC spending. The explanatory power of lagged income growth for aggregate health spending is very strong. In particular, the aggregate model for private PHC spending growth has relatively high predictive power for the first few years of the projection because it relies on information that we already have in place: lagged growth in DPI over the past five years. Chart 2 illustrates the effect of the lag in the relationship between real per capita private PHC spending and the DPI. The dotted line shows the estimated effect centered on the current period, while the solid line shows the actual lagged effect that is incorporated in our model for private health spending (the mean lag in the effect is about three to four years).

Chart 2. Estimated impact of aggregate income growth on private health care spending,
Lagged effect in model versus coincident effect



Based on Chart 2, we make two observations:

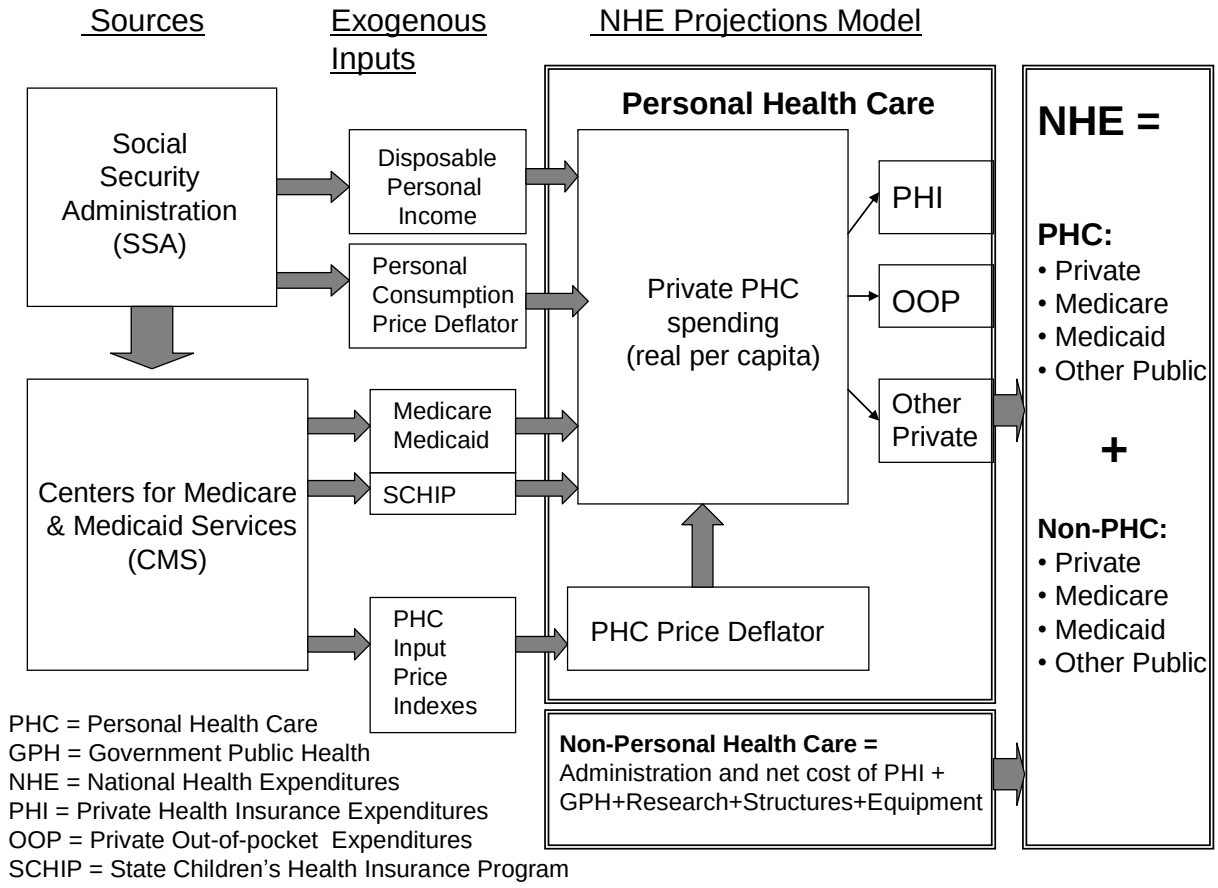
1) The depth and length of the current slowdown in private PHC spending growth is largely cyclical, and reflects the severity of the 2007-2009 recession. In fact, this severity and the extended period of sluggish growth following the recession has been anomalous relative to the rest of the historical period. Given that the coefficients in the model reflect an average over the entire historical period, we expect that the predicted depth of the cyclical trough in response to this unusually severe recession will overstate the weakness of health spending growth in the first two years of the projection. Therefore, we adjust our current projection for private PHC spending growth upwards for the initial years of the projection. This positive adjustment is consistent with initial data currently available for 2012 that suggests that spending growth may be coming in somewhat higher than our model predicts.

2) Historical macroeconomic data available as of mid-2013 is highly predictive of a cyclical resurgence in health care spending growth between now and 2016. This is a function of the recovery in aggregate income growth that, though moderate, we have already experienced since the low point of the business cycle in 2009. As a result, we expect projected health spending growth to reach a low point by 2014 (in the absence of reform), and then to accelerate substantially over the projection in response to the improvement in macroeconomic conditions to date and to the continued recovery anticipated over the projection.

Structure of private spending model

Aggregate private spending for PHC as a whole is far more predictable than is the case at the sectoral level. This reflects interrelationships in relative spending growth across types of care that may acts as substitutes in some circumstances (e.g. hospital, physician, etc.) are critical in explaining historical patterns of growth. Shifts across settings for the delivery of care (e.g. from hospital inpatient to outpatient and to physician offices) often occur in response to shifts in either government policy (e.g. the initial imposition of prospective payment for Medicare inpatient care in 1983) or to changes in incentives within private health insurance coverage (e.g. managed-care-related incentives in the 1990s). The effects of these event-driven shifts cannot be fully controlled for, with the result that trends at the sectoral level are more difficult to predict than those at the aggregate level (which subsumes the effect of such shifts). While similar factors drive demand and supply for medical services in different settings, the nature and timing of these effects differ. Models for prescription drugs differ from the general pattern of models for health services in that supply-side factors for these purchases differ markedly from those for services.

The diagram below provides a schematic view of the aggregate health sector within the Baseline NHE Projections Model and shows the linkages among the data sources, exogenous data, the personal health care (PHC) model, the non-PHC output, and the aggregate baseline NHE projections.



The Baseline NHE Projection Model can be characterized as a top-down, reduced-form model. It is a reduced form model in that both supply and demand factors are represented as drivers of growth, but without an explicit theoretical model framework. It is a top-down model in that spending and pricing trends are modeled at an aggregate level. Spending projections for all subcategories: types of medical care (sector), direct sources of funding for medical care (e.g. public and private insurance, out-of-pocket, and other), and for all sponsors of payment (ultimate sources of funding for insurance coverage) are constrained by aggregate trend projections. Models for spending by sector, source of funds, and sponsor are estimated historically both to maintain trends relative to the aggregate consistent with historical patterns, and to maintain consistency with exogenous projections of macroeconomic variables, actuarial projections of spending for the Medicare and Medicaid programs, and additional assumptions specific to the health sector. The core of our aggregate model of private personal health care (PHC) spending consists of two equations:[6]

- Real per capita PHC spending
- Personal health care price inflation

[6] Variables are expressed as log differences (growth rates).

Conceptually, these two equations represent the quantity of medical care and the relative price of medical care relative to other consumption goods. All variables are expressed as log differences (growth rates). Our focus on relationships in terms of growth rates, rather than levels reflects the relatively short forecast horizon of these projections; underlying relationships in terms of levels are not expected to change very much within the next decade. However, underlying relationships in terms of levels do matter for growth rates (particularly where growth is rapid) and we monitor this perspective as well in the process of evaluating and adjusting the projected growth.

The aggregate model for growth in personal health care spending incorporates factors that influence both the supply and demand for medical care. Real per capita PHC is effectively a measure of the quantity of medical care purchased by private payers.[7] In this model growth in quantity is driven primarily by factors that influence aggregate consumer demand: the effects of changes in aggregate income and in the relative price of medical care. Growth in real per capita public spending is included as a variable in this model as well because insurance under Medicaid and Medicare substitutes for private coverage; thus correspondingly, public spending substitutes for private spending.

Our model for relative medical price inflation is primarily a supply-side model. We assume that growth in the relative price of medical care will be driven by underlying growth in current and lagged growth in input costs for medical providers. Relative price growth also reflects trends in relative productivity growth, and these trends will be implicitly captured in the historical data.

The independent variables in our aggregate model of private personal health care spending (real per capita private PHC) are:

- Disposable personal income growth (less Medicare and Medicaid, real per capita)
- Structural change: lagged health share of GDP (PHC for all sources of funds as a share of GDP)
- Relative medical price inflation (PHC)
- Public spending growth (PHC, real per capita)

We discuss each of these model variables in turn below:

Disposable Personal Income

For the purpose of this model, income is defined as real per capita disposable personal income (DPI) excluding Medicaid and Medicare payments.[8] The exclusion of Medicaid and Medicare spending reflects the fact that these are income in kind that accrues to those with public coverage. Since we are attempting to approximate income growth primarily for those with private coverage, we exclude this income from our measure.

Real per capita DPI is a highly influential variable in our model of private health spending. The importance of this variable is consistent with a large body of literature examining the empirical

[7] The accuracy of real per capita spending as a measure of quantity is dependent on the accuracy of the medical price indexes that are used as deflators.

[8] The objective is to obtain a measure of income that applies to the population that accounts for private spending on medical care. Thus we exclude spending for Medicare and Medicaid, which are included in DPI but accrue to a population that is primarily publicly insured. Since private spending includes out-of-pocket and PHI spending for Medicare beneficiaries, the correspondence cannot be exact.

relationship between national income and health spending. A number of studies based on time-series cross-country data for Organization of Economic Cooperation and Development (OECD) economies confirm the importance of the link between health spending and income.[9] It has been repeatedly shown that variations in real per capita GDP (used as a proxy for income due to data availability) account for a substantial share of variation in health spending across countries and time.

In the Baseline NHE Projections Model, income has a lagged effect on health spending. Fluctuations in growth in aggregate income do have an effect on current period growth in private health spending; however, these initial effects are fairly small. The current period income elasticity is only about 0.2, which means that the change in growth for health spending in response to a change in income growth will be about 20 percent as large. The lagged effect increases to a peak at a lag of three years. The long-term income elasticity of private health care spending over six years is 1.4, which means that health care spending rises substantially faster than income growth in the longer term.

The long lags that are built into this model reflect several important characteristics of markets for health services. In particular, since private insurers or public payers account for the large majority of health spending, this spending is largely insulated from contemporaneous changes in household income. Furthermore, consumers generally do not pay for most medical expenses directly at the point of purchase. Thus, their decisions are not immediately affected in the short term by variations in income except where substantial parts of the expenditure are paid for out-of-pocket.[10] The importance and structure of out-of-pocket cost-sharing varies quite a bit across sectors and over time, and where the share paid out of pocket is higher, this can be expected to shorten the lag structure of the income effect. The growing importance of out-of-pocket health spending relative to household incomes might be expected to gradually increase the sensitivity of consumer demand to current fluctuations in income and relative medical prices. Out-of-pocket spending has grown modestly relative to household income since a trough in 1996 (in contrast to a declining trend seen over the long-term since 1960). However, it continues to grow at a pace slightly below that observed for private health insurance spending. Most of the aggregate impact on health spending occurs through the changes in the structure of health insurance coverage and the public regulatory environment that constrains this coverage.

The critical element that introduces the delay captured by the lag is the role of multiple intermediaries between consumers and medical providers. These intermediaries include employers or unions who negotiate on behalf of pools of employees, and governments at the Federal and state level who determine the nature of coverage and methods of payment for Medicare and Medicaid – as well as the structure of regulations that constrains private employers and insurers. Beyond the determination of coverage, providers will respond to changes in coverage and methods of payment in making choices on behalf of individual patients. Because so many decisions are contractual (or built into law) and are intended to apply to an underlying pool with varying preferences, it takes time for the system to respond – time to determine what decisions best fit the preferences of all members of the pool, to change the structure of coverage, and time for these changes to influence standards of medical practice at the point of service.

To capture the timing of these lags, the income term in our model of personal health care spending is

[9] For a review of this literature, see Chernew, Michael E., and Joseph P. Newhouse (2011) "Health Care Spending Growth" in *Handbook of Health Economics*, Vol.2., Mark V. Pauly, Thomas G. McGuire, Pedro P. Barros (eds.):1-43.

[10] Some current period effect can be expected in response to consumer cost-sharing and loss of employment, with the associated loss of employer-provided health insurance.

incorporated as a polynomial-distributed lag over six years (from five years previous through the current period), and our estimates imply that this effect rises to a peak at about three years lag.[11] The relationship between real per capita spending and real per capita DPI is assumed to be log-linear. The assumption of log-linearity implies that prices and income elasticities are constant over time. The income elasticity in our current model is 1.41, towards the upper end of estimates for macro-level elasticities of approximately 0.8 to 1.6 in the empirical literature.[12] However, we believe it is reasonable that our estimated income elasticity is above 1.0 because:

1) Elasticity estimates based on spending by all sources of funding, rather than on private spending alone like in our model, tend to be higher.
2) Elasticity estimates based on variation at a state or regional level, rather than at the national level like in our model, tend to be smaller.
3) Elasticity estimates that control for institutional characteristics of health systems that are correlated with variation in aggregate income tend to be lower. These factors, such as changes in medical technology, can be seen as endogenous functions of aggregate income but are not reflected in our model.

Structural change: Lagged health share of GDP

Our models are expressed in terms of relative growth rates. However, as mentioned, short-term growth in private health spending is not independent of underlying relationships in terms of levels. In particular, the relationship between current growth in private health care spending and aggregate growth in disposable income can be expected to change as health spending accounts for a rising share of consumption. As the aggregate share of consumption accounted for by health care spending rises, demand will tend to become more responsive to rising relative medical prices, and the income elasticity of demand for health care must ultimately decline towards a value of one, where health spending grows at the same pace as income. As this adjustment in consumer preferences occurs, the rise in the share of income allocated to health care (versus other goods) can be expected to slow down. Given the dominant role of insurance as direct payer for health care, we can expect this effect to influence growth at the aggregate level for an aggregate pool of health consumers covered by insurance. Functionally, this restraint on growth reflects an underlying multistep process whereby budget constraints are set for insurers by the employers, insurers, and governments that are the ultimate source of funding (sponsors)

The negative impact of rising health share of consumption on growth in private PHC spending has long been represented mechanistically by the inclusion of a negative time trend in our model for real PHC spending growth. The current version of the model eliminates the time trend and introduces a new variable intended to capture the substantive impact of rising health share of consumption on health care spending growth. This additional variable is defined as the lagged ratio of total PHC spending to GDP. It captures the long-term effect on health spending growth of underlying changes in the model variables when evaluated in terms of relative levels. The negative coefficient on the health share of GDP implies

[11] Estimates that allow coefficients to vary across this five-year period based on a polynomial distributed lag (PDL) show no statistically significant improvement in explanatory power over a moving average.
[12] Chernew, Michael E., and Joseph P. Newhouse (2011) "Health Care Spending Growth'in *Handbook of Health Economics*, Vol.2., Mark V. Pauly, Thomas G. McGuire, Pedro P. Barros (eds.):19-20.

that the income elasticity tends to decline over time.[13]

In defining the variable that we use to capture the effect of the long-term rise in the health share of total spending, we use aggregate spending on medical care by all payers (not solely private payers), and we use GDP rather than income or consumption for this measure. This definition reflects the theoretical basis for the effect.[14] Health spending is fundamentally subject to a budget constraint just as any other form of consumption, but where insurance coverage severs the connection between individual decision-making and individual income, this budget constraint is binding at the level of the insurance pool.

The binding budget constraint that is applicable will be defined at the level of a population pool that is relevant for decision-making processes that influence the delivery of health care within our current system.[15] Decisions with systemic implications for the delivery of medical care are made both by private and public insurers. Medicare and Medicaid policy influence private insurers, particularly through the structure of payment rates for medical providers. Thus the appropriate definition of the pool that is relevant to the definition of a budget constraint that is binding in its effect is national in scope. We use GDP (rather than DPI) as a measure of this binding budget constraint because it abstracts away from short-term fluctuations due to fiscal policy and to public and private borrowing. More fundamentally, GDP is a measure of the total resources available for production for the domestic economy as a whole. It therefore dictates the budget for aggregate national health spending that is the ultimate long-term constraint on health spending growth.[16] While we can expect consumers to form short-term preferences on health versus non-health consumption based on short-term fluctuations in their own income, the long-term budget constraint on payment for health care (public and private) cannot exceed growth in GDP.

[13] The addition of the lagged health share of GDP as a dependent variable in our model of current period private health care spending growth adds an element of circularity to this model: health share of GDP is also a function of growth in private health spending. This element requires that the model be solved iteratively to maintain internal consistency.

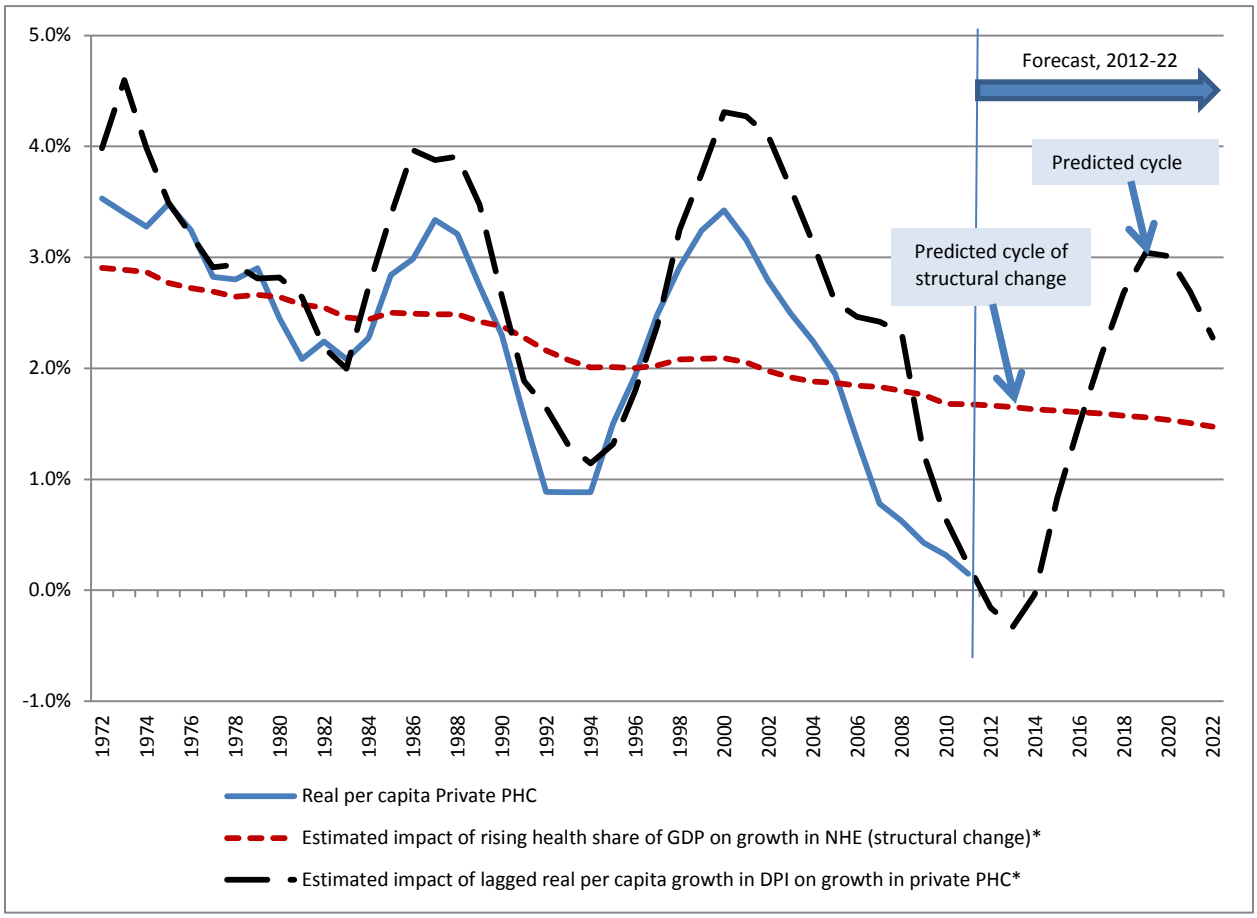
[14] Getzen, T.E., "Health Care is an Individual Necessity and a National Luxury: Applying Multilevel Decision Models to the Analysis of Health Care Expenditures," *Journal of Health Economics*, 2, (2000): 259-270.

[15] Ibid.

[16] Ibid.

Chart 3 below expands on the discussion of cycles presented in Chart 1, showing growth in real per capita private PHC along with the estimated effect of lagged growth in real per capita DPI (a six-year polynomial distributed lag with a peak effect at three years) and the estimated negative impact on real per capita private PHC growth of structural change in response to a rising health share of GDP. Note that the negative effect of structural change in response to the rising health share will tend to vary in response to recent experience; a period of slower health spending growth will tend to relieve some pressure from the system and will result in a pause in the dampening effects of structural change for growth.

Chart 3: Real per capita growth in private health care spending with estimated effects of structural change
(Centered 7-year moving average)



Relative Medical Price Inflation

Economic theory predicts that consumers adjust their spending on different goods and services in response to variations in the relative price of these alternatives. However, the existence of third-party payers for medical care complicates the response to price variation. Consumers bear only a fraction of the actual price of medical services at the time of purchase. Thus, in short-term consumption decisions, they respond to the marginal out-of-pocket price rather than to the actual price, generally determined by a combination of deductibles, cost-sharing requirements, and out-of-pocket maximums.

The price to consumers can be roughly approximated by the fraction of total costs paid out-of-pocket multiplied by the actual price. However, the approximation is very poor; for decision-making purposes the important question is the marginal price, the amount that the consumer pays for an additional dollar of medical care. The broad use of copayments, deductibles, and out-of-pocket maximums, combined with the fact that the majority of health care consumption is accounted for by high-cost cases, means that the marginal price paid by consumers is most often zero. The analysis of micro data confirms that variations in the out-of-pocket price paid by patients has sizable effects on health care spending, however, at an aggregate level the indicator is too flawed to use as a single measure of the generosity of insurance coverage within an aggregate time-series model. We do adjust projections for spending growth where indicated based on the analysis of the effects of specific types of cost-sharing (e.g. tiered copays, deductibles) for individual types of service.

However, the effects of out-of-pocket prices on consumer choices are only one potential avenue for price effects in markets for health care. Medical prices also influence demand for care in two additional ways. First, the price of health insurance is effectively the price of the bundle of medical goods and services an enrollee is expected to consume (plus administrative costs and profits). Consumers' decisions to purchase health insurance (primarily through their employers as agents), and the generosity of the coverage selected are therefore influenced by the relative price of medical care as well. Second, the relative price of medical care affects demand for services across types of medical care through the price sensitivity of health insurers' coverage and provider selection decisions, and in some cases through the structure of cost-sharing (as with tiered copays).

Within our model, relative medical price inflation has a significant negative coefficient, as we expect. The price elasticity of demand for private health care in our updated and revised model is −0.4. This price elasticity is well above micro-level estimates of price elasticity of demand for medical care (−0.1 to −0.2 based on the Rand Health Insurance Experiment).[17] This difference reflects the fact that micro-based studies use household-level data on the relationship between consumer out-of-pocket spending below out-of-pocket maximums and effective price given coinsurance rates, and the scope of these studies tends to cover relatively short periods of time.

Medical price inflation is an endogenous variable in our model (i.e. it is determined within the baseline NHE Projections Model). The dependent variable in our model is OACT's price deflator for personal health care spending. This is estimated as a function of a lagged measure of input price inflation (IPI) for medical goods and services.[18] Coefficients for lagged IPI are fitted along a linear path over a lag

[17] Manning, W.G., et al., "Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment," *American Economic Review*, Vol. 77, No. 3, June 1987.

[18] The input price index used is a weighted average of OACT's input price indexes for hospital services, physician services, home health services, nursing home services, and pharmaceuticals.

extending from the current year to two years previous. Approximately 60 percent of the effect of changes in input price inflation is estimated to occur within a year. The effects of other factors (economy-wide price inflation, productivity growth, industry profitability) are captured indirectly through their influence on IPI, and through a first-order autocorrelation adjustment.

Our measure of input price inflation is based on the cost structure of health providers as estimated in input price indexes by type of medical providers. The effect of each component of provider costs is represented by a proxy series that is selected to track the input prices of each individual service and commodity. The effects of other factors (economy-wide price inflation, productivity growth, industry profitability) are captured indirectly through their influence on IPI, and through a first-order autocorrelation adjustment.

However, due to the limited coverage of the available time-series data available for medical providers, this input price index has historically excluded compensation for self-employed workers, including a substantial fraction of physicians and other medical professionals. Thus, true input price inflation will be under or overstated depending on the growth differential between compensation for employed versus self-employed workers. For this reason, we include growth in physician income in our model as a proxy for supervisory and self-employed provider compensation not covered by our input price indexes.[19] This substantially improves the fit of the model. Our data indicate that physician incomes have been generally growing at a slower pace in comparison with other inputs to medical care since the early 1990s, a finding that is consistent with a concurrent slowdown in output price inflation relative to our index of input price inflation. Notably, this pattern has reversed in data for 2009-2011, with physician incomes growing faster than both our aggregate input price index for PHC. Growth in physician incomes based on this measure is included in our model for medical price inflation as a proxy for the variation in input costs paid to the (heavily self-employed) medical professionals whose compensation is not reflected in our input price indexes.

Physician income is projected based on the assumption that rates of increase in physician income will tend to track rates of compensation for alternative occupations over long periods of time (we use the BLS employment cost index (ECI) as a proxy for income of all professional and technical workers. We also include real private physician spending as a proxy for approximate change in the volume of services that are reflected in our measure of physician income, in order to approximate a wage measure.

Real per capita public PHC spending

In our model of real per capita private spending growth, the denominator that we use is the total population (rather than the pool of privately insured). In our model of growth in real per capita private spending on PHC, the use of total population as a denominator means that that the effect of real per capita public spending will be negative, capturing the effects of shifts in the insured population across public and private forms of coverage. In addition to the effects of shifts in enrollment between private and public coverage, the negative coefficient on public health care spending can be expected to capture any

[19] We estimated an historical physician income series through 2011. Source data include the IRS Statistics of Income (SOI), Bureau of Labor Statistics (BLS), and the Medical Group Management Association (MGMA) data. This series reasonably tracks growth in physician income historical series from other sources.

effects on private spending growth of any cost-shifting (private to public, or public to private) that may occur.[20]

b. Non-PHC health care spending

Models for health care spending for:

- Administration and Net Cost of PHI
- Non-Commercial Research
- Government Public Health
- Structures and Equipment

Projections for administrative overhead are split into government costs and private costs. Government administration is projected based on available budgetary information, with trend-based econometric models for residual categories.

Administration and net costs for private payers can be divided into two parts: the overhead costs associated with administering private health insurance, and the profit margins that accrue to private health insurers (Net cost of PHI). Most of the time-series variation in this series is attributable to net costs of PHI, which tends to move in cyclical patterns (this is called the underwriting cycle). Projections for net costs of PHI have two major inputs. First, we have an autoregressive model that effectively extrapolates forward the pattern of historical cycles in growth. Secondly, we use several sources of survey data on current and expected price health insurance premiums to evaluate and adjust the timing of the underwriting cycle.

NHE non-commercial research spending growth is projected based on relationships to economic growth as represented by a four-year lagged moving average of growth in real per capita GDP. Specific adjustments are made where federal budgetary information is available.

Government public health spending growth is extrapolated based on historical trends, with specific adjustments where budgetary information is available.

Spending on health system structures is dominated by hospital construction. This is projected as a function of growth in hospital spending and macro indicators. Where we have additional information (e.g. surveys of hospital construction), this is incorporated via adjustments to the projection. Equipment

[20] The choice of denominator reflects consistency issues in the underlying enrollment series for private health insurance, and cyclical fluctuations in the demographic mix of those with public versus private coverage. While it would be conceptually preferable to estimate a model based on growth in spending per enrollee, there are serious flaws in the available data for this purpose. Data for private enrollment is defined to include all persons with private coverage. This includes Medicare beneficiaries with private supplementary coverage, so that there is a substantial overlap between the series. Since private spending reflects only the supplementary spending for these enrollees, this tends to distort per enrollee trends. In addition, the history for private health insurance enrollment stems from multiple sources. Prior to 1987, the time series is subject to inconsistencies over time due to variations in survey questions. Another issue concerns the effect of linked fluctuations in Medicaid and PHI enrollment over the business cycle. Slower economic growth lead to an influx of a population (e.g. children and non-disabled adults) that is relatively low-cost relative to the existing Medicaid population (which is relatively heavily weighted towards the institutionalized). This shift distorts per enrollee growth both for private spending and for Medicaid.

purchases are projected as a function of lagged spending for hospital services by Medicare and private payers.

c. Submodels for sector, sources of funds, and sponsors of payment

Models for health care spending for:

- Type of service (sector)
- Source of funds (direct payer)
- Sponsor of payment (ultimate payer)

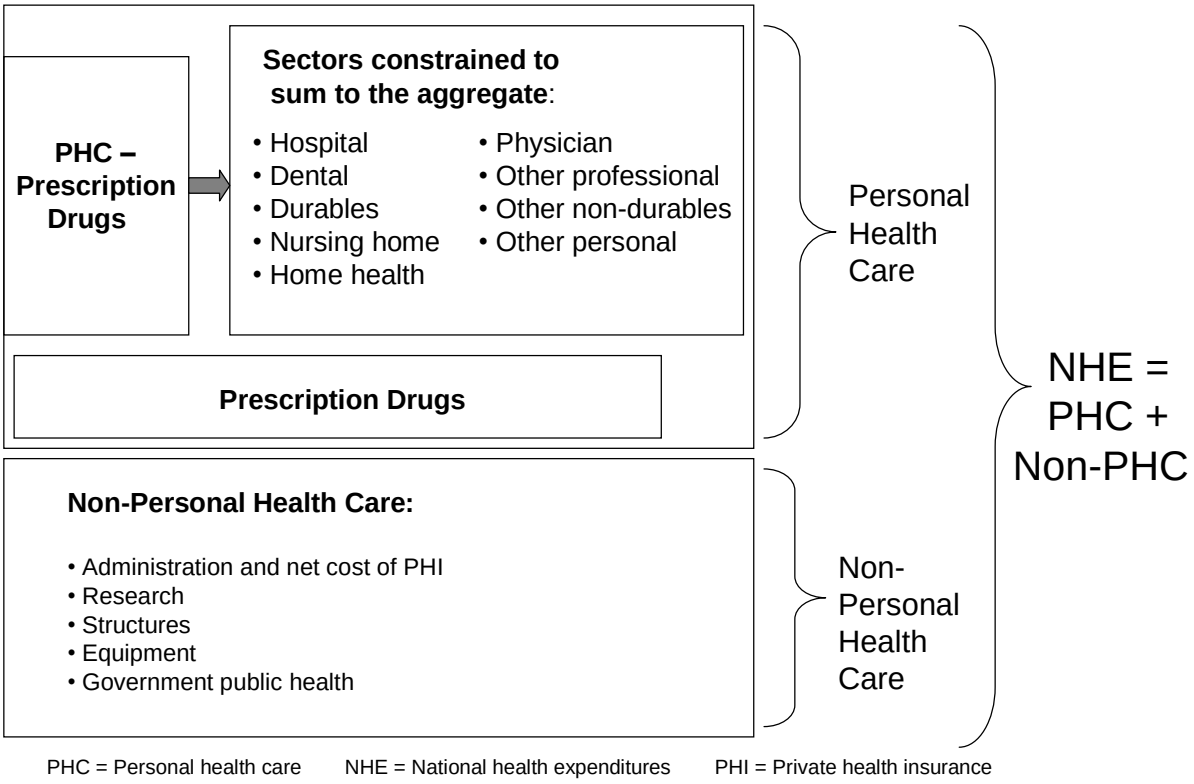
Models for health care spending by type of service

Models for spending growth and price inflation for individual types of medical services are similar in specification to the aggregate model. Spending projections generated for each of the types of services are then constrained for consistency with the aggregate spending projection.[21] Our choice of this type of model reflects our finding that the model is substantially more robust at the aggregate level.[22] Key variables in most sector models follow the specification of the aggregate model for personal health care spending growth, however, since sectoral models are constrained for consistency with aggregate trends, we do not separately attempt to control for the effects of long-term structural change at the sectoral level.

[21] See discussion of sectoral constraints under 'Type of Service.'

[22] There are several possible reasons for this finding. First, spending for the different types of services is interdependent. Conceptual and measurement issues with the data make it difficult to convincingly capture complementary and substitutive relationships across types of services. When shifts across services are believed to have occurred on a large scale, it is difficult to accurately capture the effect on patterns of growth. For example, such a shift occurred following the introduction of Medicare's prospective payment (PPS) system for most inpatient hospital services. The magnitude and timing of the impact of PPS on hospital and physician spending is not straightforward, and the selection of proxies to capture this effect is difficult. However, the manner in which such events are specified matters, since it affects the coefficients obtained on the model variables. Working with aggregate growth rates captures the net effect on health spending of factors that cause sectoral shifts. Second, data on relative prices across types of medical services are somewhat flawed for our purposes and are not always consistent across services; thus, obtaining reasonable cross-price elasticities is difficult. Third, health services tend to be purchased as bundles that incorporate types of services extending across several different sectors, while the data are not measured in such a way that we can track the behavior of the market for these linked bundles. Aggregation across all types of medical care ameliorates these problems.

Sectoral Composition of NHE Projections Model



PHC = Personal health care NHE = National health expenditures PHI = Private health insurance

Major variables in sector models:

- Disposable personal income growth (excluding Medicare and Medicaid, real per capita)
- Relative medical price inflation (PHC)
- Public spending growth (PHC, real per capita)

Models for individual sectors of the NHE Projections Model are discussed below. Sectors are broken into personal health care (PHC) and non-personal health care (Non-PHC) categories.

Differences across the models for different types of services include varying lag structures for the income effect, the relative importance of the three variables, the inclusion of dummy variables to capture phenomena specific to the sector. In a few cases, the additional independent variables are included that are specific to the individual sector where relevant data is available.

The lag on the income term in the models for each type of service generally tend to vary with the share of spending that is accounted for by consumers' out-of-pocket expenses: the greater the out-of-pocket share, the shorter the lag, as consumers respond more quickly to changes in their income.

The table below summarizes the independent variables used to model real per capita spending growth for

each of the personal health care sectors. For the sectors with the greatest share of NHE, we have provided some additional descriptive information about their sector models.

SECTOR	DEPENDENT VARIABLE	INDEPENDENT VARIABLES
Hospital services	Real private hospital services per capita	Real disposable personal income (PDL, 7 years) (+) Relative price(−) Real per capita public spending growth (−) Dummy, 1984 (−) Dummy, 1984 * time trend (+) Time trend (−)
Physician and Clinical services	Real private physician services per capita	Real disposable personal income (PDL, 5 years) (+) Real per capita Medicare spending growth (-) Relative price (−) Dummy, 1983-85 (+) Dummy, 2007-2010 (−)
Other Professional services	Real private other professional services per capita	Real disposable personal income (+) Real per capita public spending growth (−) Dummy, 1992– (−) Autoregressive term (−)
Prescription Drugs	Real aggregate drug spending per capita*	Real disposable personal income (3 year moving average) (+) Relative drug price * Share paid out-of-pocket (−) New drug introductions (+) Generic dispensing rate (−)
Over the Counter Drugs and Other Nondurables	Real private other nondurables spending per capita	Real disposable personal income (2 year moving average) (+) Relative price (−) Real per capita other non-durables spending, lagged one year (+)
Durables	Real private durables spending per capita	Real disposable personal income (PDL, 2 years) (+) Relative price (−) Public spending growth (−)
Dental services	Real private dental services per capita	Real disposable personal income (PDL, 4 years) (+) Relative price (−) Dummy, 1981 (+)
Nursing Care Facilities and Continuing Care Retirement Communities	Real private nursing home services per capita	Real per capita public spending (−) Time trend (−) Dummy, 1990 (+) Dummy, 1995 (+) Dummy, 1999 (−)
Home health services	Real private home health services per capita	Real per capita Medicare spending growth, lag 2 years (+) Dummy, 1988 (+) Dummy, 1998 (+)

*The prescription drug model is based on aggregate expenditures rather than private expenditures, due to complications in projecting shifts in payments associated with the introduction of Medicare's Part D prescription

drug coverage. See the Prescription Drug section below.

Sector Model: Hospital Services

Real per capita growth in private hospital spending is well explained by the variables in our template model specification. Given the low out-of-pocket share on average for hospital services (inpatient and outpatient), we anticipate a long lag between a change in household income and the time of impact on hospital spending. Our results are consistent with this expectation we estimate coefficients on lagged income growth with a polynomial distributed lag, which indicates the peak effect of income fluctuations occurs with a lag of 3 to 4 years. Public real per capita spending has a negative coefficient as expected, capturing shifts in enrollment between private and public coverage, as well as any short-term cost-shifting effects between private and public payers.

The combined effect of historical fluctuation in the effects of managed care and the Medicare prospective payment system (PPS) for this sector are represented in the current model as a structural change in the relationship of growth to price and income variables that is largely one-time in nature, beginning after the introduction of PPS (from 1984). The alterations in provider incentives associated with PPS, coupled with similar pressures from the expansion of managed care in the late 1980s through the 1990s, produced an initial reduction in growth that tapers off gradually over time. This reflects diminishing potential for additional reductions in inpatient utilization over time.

Sector Model: Physician Services

The estimated lag structure for the income term in the physician model indicates an effect which extends over five years, with a peak effect at 2-3 years lag. This is effectively a shorter average lag as compared with the hospital model, where the peak income effect occurs at a lag of 3-5 years. The fit of relative price inflation is weaker in this model compared with PHC. Growth in real per capita Medicare spending on physician services is included (rather than total public spending), and has a smaller estimated negative effect than the aggregate model.

In general, our template specification fits real per capita growth in physician spending somewhat less well than hospital spending. This primarily reflects two outlying periods: much higher than predicted growth in 1984 and 1985 and much lower than predicted growth in 1993 through 1996. Absent these periods, the pattern of growth implied by the income and relative price term produces a fairly good fit. We have included a dummy variable to capture the period of rapid growth from 1983 through 1985, while the faster growth later in the decade is consistent with the lagged effects of the income term. Our interpretation of this variable is that it captures a non-recurring substitution effect of professional services for inpatient care. This period saw a major shift in provider incentives associated with the introduction of inpatient PPS under Medicare (spillover effects for private spending) and the initial surge in managed care enrollments. In this sense this pattern of growth is a counterpart of the changes in inpatient utilization generated by these developments. The effect of the inclusion of this dummy is that the resulting model will tend to project a pattern of growth for physician services that is more consistent with the near-stable share of PHC in the pre-1984 and post-1994 data rather than the more rapid growth of the mid-1980s.

Sector Model: Prescription Drug Services

Prescription drugs differ in important ways from other types of medical care. First, it is a product, not a

service, so the cost structure of the industry differs substantially from sectors such as hospital, physician, or nursing home, where labor costs play a critical role in driving price. Second, historically, prescription drug spending has had a much larger consumer out-of-pocket share than other types of medical care, so that demand tends to be more sensitive to price. Third, the public sector has historically played a relatively small role in funding prescription drug spending. We also have access to additional information on supply and demand factors for this sector, in the form of data on new drug introductions, generic dispensing rates, research spending, patent expirations, and direct-to-consumer (DTC) advertising. As a result, our model for prescription drugs is somewhat different from those developed for other sectors.

As opposed to the other sectors, the dependent variable in the prescription drug model is real aggregate per capita drug spending (not private only). This change was made because the start of Medicare drug coverage in 2006 produced a massive shift in the source of payments for drugs, resulting in a sharp drop in private drug spending growth in 2006, but otherwise had little estimated effect of overall growth in drug spending. Therefore, our model projects total prescription drug spending without simulating an explicit effect for Part D. We use data from the President's FY 2014 Budget to adjust the projections to incorporate the effects of Medicare drug coverage and to produce forecasts for private, Medicaid, and Medicare spending that are consistent with actuarial estimates of the magnitude of the shift in spending due to Part D.

Our income variable fits with a shorter lag than in our aggregate model. This is the expected result based on the larger share paid on an out-of-pocket basis historically. Relative price inflation has a strong fit. A recent change to this model was the redefinition of the price variable as the product of the out-of-pocket prescription drug share and the prescription drug price index. This change is intended as a conceptual change to account for the fact that consumers' out-of-pocket share has declined steadily over the last twenty years. However, the fact that available data does not distinguish out-of-pocket spending by the uninsured and by Medicare beneficiaries from the fixed co-payments often required within managed care limits our ability to capture this effect. Public spending growth is not included as a variable in this model due to its relatively minor role in the historical period (prior to 2006) and because the dependent variable is overall drug spending and not private drug spending.

Patterns of growth over the most recent ten to fifteen years of data are difficult to explain as the effects of several different factors must be disentangled. The out-of-pocket share of spending by consumers dropped sharply as privately insured patients moved into managed care plans that generally have lower co-payments (this phenomenon largely did not apply to Medicare beneficiaries, who continued to pay a relatively large share of drug costs out-of-pocket). Also, changes to regulations in 1997 dropped some of the earlier restrictions on television advertising for prescription drugs. In addition to income and relative price terms, our model for real per capita drug spending includes a four-year moving average of the number of new prescription drugs introduced. In addition, the rising generic dispensing rate, which has played an increasing role in depressing growth in prescription drug spending in recent years, is now included in our model.

Models for health care spending by source of funds (direct payer)

In contrast to our model for private PHC spending as a whole, our model for health care spending by payer or source of funds (e.g. private health insurance (PHI), out-of-pocket spending (OOP), and other private spending) is "bottom-up" in nature: the projection is adjusted and finalized at the most detailed sectoral level, and the aggregate composition of spending for personal health care by source of funds is

determined by the sum of trends for each type of service. This sectoral focus reflects the fact that the nature of patient cost-sharing differs greatly depending on the setting where services are provided and the type of service. In some important areas, we have additional information (anecdotal or otherwise) that is useful in projecting probable trends. On the issue of out-of-pocket/PHI/Other private shares of payment, in particular, aggregation can be expected to obscure trends that apply to specific types of services. Prescription drugs, physician services, nursing home care, and dental services account for about two-thirds of out-of-pocket spending. Each of these sectors is influenced by a different mix of factors. Shifts in the composition of PHC spending across sectors have important effects on aggregate trends.

For each type of service (hospital, physician, etc.) the projection of the growth in spending for PHI and out-of-pocket in comparison relative to total private spending is based on econometric models for growth in real per capita spending. For example, PHI spending on prescription drugs is projected as a share of total spending on prescription drugs as a function of growth in total private spending by type of service, and trends in insurance coverage (growth in enrollment in PHI, Medicaid and Medicare). Trends in insurance coverage (private, Medicaid, and Medicare enrollment, and the uninsured population) also influence the composition of private spending by payer, since the fraction paid out of pocket differs substantially across these groups. In addition, growth in disposable personal income may have an impact on the relative pace of growth in out-of-pocket spending through its influence on discretionary medical spending.

Sector-level spending for PHI, out-of-pocket, and other private funds are adjusted for consistency with aggregates across two dimensions. First, the sum of spending for all private sources of funds by sector must equal total private spending for all sources of funding. Second, spending for PHI across all types of services must equal the aggregate spending for PHI. Spending at the level of type of service by source of funds is adjusted for consistency with aggregates based on iterative proportional fitting.[23]

In addition to our model of private sources of funds, we also project sources of public funds other than Medicare and Medicaid. These sources account for approximately 25 percent of total public spending. The largest of these other sources of funding are the Veterans' Administration (VA) and the Department of Defense (DoD). Methodology for these payers is discussed below. Residual Federal and other state and local spending for smaller programs are projected based on econometric models similar to those used to project real per capita private spending models.

Spending Projections for Department of Defense (DOD) and Department of Veterans' Affairs (VA) Health Insurance Programs

The NHE projection model includes the separate econometric type of service equations for both the VA and DOD healthcare systems. Projections based on these models are then adjusted using data from published federal budget requests for the upcoming fiscal year. Within these aggregate projections, iterative proportional fitting is utilized to control spending within benefit categories to the aggregate spending totals for each program to produce more reasonable type of service totals.

Expenditures for both the VA and DoD are mainly driven by fiscal policy, demographics, economic conditions, and to a lesser extent overseas military operations. VA spending is expected to exhibit

[23] "Iterative proportional fitting, also known as iterative proportional scaling, is an algorithm for constructing tables of numbers satisfying certain constraints." From Speed, T.P., "Abstract: Iterative Proportional Fitting," *Encyclopedia of Biostatistics*, 15 July 2005, http://mrw.interscience.wiley.com/emrw/9780470011812/eob/article/b2a10027/current/abstract (accessed 22 February 2008).

countercyclical elements as eligibility is in part determined by income as well as the presence of other insurance coverage along with a myriad of other factors. Beneficiary populations within both the VA and DOD tend to be less healthy and more costly to care for than the general population on a per-beneficiary level. In addition, these enrollees are faced with significantly less cost sharing and enrollment fees than in other sources of healthcare leading to an expected faster growth in per beneficiary spending. The implementation of the Federal sequester in March 2013, other fiscal policy issues, and military issues associated with world events all add to uncertainty for the projections for both of these programs.

Models for Spending by Sponsor of Payment

Sponsor of payment categories define what group holds the ultimate responsibility for financing or supplying the funds needed to support healthcare spending by direct payers. A major focus here is the relative spending for households and business that support payment for insurance coverage – trends at the level of payment for premiums that may be masked by focusing on the direct source of payment for care. For example, NHE spending by payer for PHI contains premiums paid to insurance companies financed through multiple sources, including employers and employees (households contributions to premiums), and households as the source of dedicated tax revenues including the payroll tax that is the major source of funding for Medicare Part A.

Employee sponsored health insurance (ESI) premiums and other private health insurance (OPHI) are projected for households and employer for types of insurance (group and individual) and sector of employment (public or private). Additionally, payments by employers for workers compensation and temporary disability insurance to state and local governments are forecast econometrically using macroeconomic trends and were applied through the model's accounting identities.

To maintain consistency within total expenditures across sponsor and payer estimates, iterative proportional fitting is used to adjust the matrix of spending for each cell relative to totals. For example, projections of ESI and OPHI must be adjusted to sum to total PHI spending.

A number of categories of spending are projected exogenously based on the current trustees' report financing assumptions for both Medicare and Medicaid.

. These categories include:

- Worker contributions to HI trust fund and Taxation of Benefits
- Employer contributions to HI trust fund
- SMI Part B and D Premium revenues
- Medicaid Buy-Ins for Medicare premiums
- State Medicaid Phase Down payments

For additional information on the accounting identities used to produce these estimates please see the historical NHE sponsor methodology paper.[24]

[24] "Methodology for Estimates by Sponsor" http://www.cms.gov/NationalHealthExpendData/downloads/bhg_methodology_09.pdf

d. Private Health Insurance Enrollment Model

In projections of private health insurance enrollment, we take trends in Medicaid, Medicare, and SCHIP enrollment as exogenous inputs. Current projections of enrollment for these programs are based on the 2013 Trustees Report with updates for recent data.

Growth in enrollment in private health insurance per capita (PHI) is projected as a function of macroeconomic indicators, which capture fluctuations in private coverage due to unemployment and real income growth, and in response to changes in enrollment in Medicaid, Medicare, and other forms of public coverage.

The variables in our current model are lagged values of two macroeconomic indicators:

- *Civilian unemployment rate.* Increased unemployment reduces PHI enrollment with a lag of zero to one years. Since variation in Medicaid enrollment growth tends to be positively correlated with the unemployment rate, this variable also tends to act as a proxy for the effect of shifts from PHI to Medicaid enrollment that occur in periods of rising unemployment.
- *Real disposable personal income (DPI).* The model includes a polynomial distributed lag on growth in DPI. A three-year lag is included, with the current and previous year's income growth account for almost all of the impact on PHI enrollment.

Econometric models for private spending growth and private health insurance enrollment are separately estimated and solved. However, projections of spending and enrollment are linked in that both are primarily driven primarily by common macroeconomic trends and by shifts between the private and public roles in funding health care spending. The model for PHI enrollment places greater emphasis on labor market conditions than the model for spending growth, and changes in enrollment tend to respond to macroeconomic fluctuations with a much shorter lag than does aggregate PHI spending. The implications of our analysis of enrollment feed back into spending projections as trends in private spending per enrollee and private health insurance spending per enrollee are monitored and adjusted during the projections process.

4. EFFECTS OF THE AFFORDABLE CARE ACT (ACA) ON NHE PROJECTIONS

Impact Estimates for ACA coverage expansions, Immediate Reforms, Non-Expansion Modifications to Medicare and Medicaid, the Excise Tax on High-Cost Insurance Plans, and Industry Fees

The Office of the Actuary Health Reform Model (OHRM) and related actuarial cost estimates are used to estimate the impact of the ACA coverage expansions, Immediate Reforms, Non-Expansion Modifications to Medicare and Medicaid, and the Excise Tax on High-Cost Insurance Plans. The OHRM simulates the impact of health reform legislative provisions on both household and employer decision-making in regard to health insurance coverage and health spending. The impacts of reform generated by the model are then combined with actuarial cost estimates prepared by the Office of the Actuary for the Medicare and Medicaid provisions unrelated to the coverage expansions. These combined impacts are then applied to the baseline nominal NHE projections calculated as described in prior sections.

ACA Impacts on the Net Cost of Private Health Insurance, Government Administration, Government Public Health Activity, Non-Commercial Research, and Structures & Equipment

The OHRM model output and actuarial cost estimates cover many of the ACA's provisions; however, the impact for a subset of provisions was estimated separately using differing methods based on nature of each provision.

Our estimates of the impact of the ACA on the net cost of insurance take into account two important factors. First, we constrain our estimates to reflect the minimum medical loss ratio provisions of the ACA. Secondly, we apply different net cost assumptions for each type of available coverage through the projection period. This method allows us to capture the effect on net cost of the expansion of health insurance coverage and shifts in coverage that will take place under ACA.

Our estimates of government administration reflect the ACA impact on Medicaid administrative costs, the costs to the federal and state governments to initialize and operate Health Insurance Marketplaces, administrative costs associated with the Early Retiree Reinsurance Program (ERRP) and Co-ops, and the HHS Implementation Fund authorized by the ACA. The Medicaid administrative costs are based on actuarial budget projections; the estimates for the ERRP and Co-ops are also based on budget data. The estimate associated with the HHS Implementation Fund reflects the ACA appropriation for the fund ($1 billion) which is split over the 2010-2014 period based on budget data. For subsequent years, we extrapolated the 2013 allocation by projected growth in the consumer price index.[25] The estimates associated with Marketplace start-up and operations are based on budget data and the HHS-published user fee for funding Marketplace operations.

The ACA also appropriated or authorized sums for a number of other programs that fall under the scope of the NHE. These programs include (but are not limited to) funding for non-commercial research endeavors (including patient-centered outcomes research), the Prevention and Public Health Trust, and investments in community health centers. Specific dollar value appropriations were then assigned to the proper NHE sector and payer categories. Provisions that authorized "sums as necessary" were excluded, given the lack of specificity on which to base an estimate. These estimates are updated annually using federal budget data.

ACA Impact on Sponsor Analysis

In order to overlay the effects of the Affordable Care Act, projected healthcare reform payer impacts from the OHRM were estimated on a sponsor basis for each provision. Final Post-ACA payer and sector quantities for Medicare, Medicaid (Federal/State), Other Public (Federal/State), and Other Private are utilized without the need to split impacts over multiple sponsors. However, impacts to PHI are an exception, as private businesses, households, governments all participate in this portion of the health economy. Spending impacts associated with ESI drops and take-ups must be then split among non-government employed sponsors in order to get the final impact of the introduction of Marketplaces to ESI on a sponsor basis. Lastly, the impact of increased insurance spending by Marketplace enrollees is added to total household spending along with other private health insurance (with the effects of the ACA) in order to get the final PHI spending effect due to the introduction of the Marketplaces and Medicaid expansion.

[25] The projections of the CPI used in this estimate are the same as used in the baseline projections.

Moreover, premium subsidies for employees, as well as premium tax credits for small employers are subtracted from the total Marketplace premium cost and private business health insurance spending respectively. These are then added into other federal spending to reflect the source of the subsidy's funding. In addition, PHI spending impacts from dependent coverage provisions, high risk pools, early retiree reinsurance program, and excise tax were allocated between the sponsors in a comparable manner. Finally, the impact of industry fee provisions to PHI is distributed in a dollar weighted fashion among the sponsors after the rest of the NHE impacts of the ACA had been taken into account.

5. CONCLUDING NOTE

Our projection process combines to give us a sound and defensible projection methodology based on accepted econometric and actuarial projection techniques. As with any projection, we are constantly reviewing the accuracy of our projections and working to make improvements in the methodology. Please e-mail DNHS@cms.hhs.gov with any comments, feedback, or suggestions on our NHE Projection Model.