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The Society of Actuaries

Modeling Long Term Healthcare Cost Trends

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The purpose of the SOA project *Modeling Long Term Healthcare Cost Trends for Valuation* is to provide a benchmark projection of medical cost increases as one element in the estimation of retiree health benefits liabilities and premium increases for the next 5 to 75 years, and to provide a user-friendly model for making alternative projections. It does not attempt to encompass all of the elements needed for cost projections (benefit limits, numbers of eligibles and dependents, mortality rates, age and tenure classes, tax considerations, etc.) but only the future percentage increases in per-person medical costs.

A long-run model designed for estimating costs and liabilities twenty to fifty years in the future is not intended or appropriate for refining short-run estimates for the next few years. The model and the baseline projection are based on an econometric analysis of historical U.S. medical expenditures and the judgments of experts in the field. The model, long run (2011 – 2099) baseline projection and suggested high-low ranges for input variables have been developed by the author with the assistance of an SOA project oversight group of distinguished actuaries with expertise in the area. The project oversight group, while diverse in its opinions, considers the baseline projections and ranges to be reasonable. To bridge the gap between the 2011 baseline of the model projection and current per person medical costs, an arbitrary set of placeholder values are used ($10,000 and 7.5% growth per year) which can be readily changed by the user.

Various elements of the model, and of the statistical analysis and assumptions required, are described below so that users can replicate the results and refer to the relevant source materials. Obviously, any such modeling exercise begins with the assumption that the past trends provide a reasonable basis for future projections, and that techniques found useful in the projection of other economic variables will be useful in this case. A major part of the project is providing the technical documentation and source footnotes to establish the reliability and range of uncertainty regarding the projections, comparisons with existing projections by consultants and government agencies, and the grounds for consideration of alternative projections and scenarios. The model (a Microsoft Excel file) with baseline input and output worksheets, charts, tables and provision for interactive user specification of alternative input assumptions, is an integral part of this document and available in downloadable form on the SOA web site.

I. Sample Output from the Model.
II. Technical Documentation of the Model, Formulas and Input Values.
III. FAQ – Questions and directions about how to use and evaluate the model.
IV. Review of the Literature and References.

I. Sample Output

Using the historical data and the baseline assumptions the following annual rates of increase are reported/projected:

Year(s)	Baseline %		alternate1	alternate2
1980-2000	**7.6%**		#	#
2000-2006	**6.7%**		#	#
2008-2011	*7.5***	*(short-run placeholder)*	#	#
2012	7.2		8.1	5.8
2013	7.2		8.0	5.7
2014	7.1		7.9	5.7
2015	7.1		7.8	5.7
2020	7.0		7.7	5.6
2025	6.9		7.4	5.5
2030	6.7		7.0	5.4
2040	6.4		6.4	5.3
2050	6.0		6.0	5.0
2060	5.8		5.8	4.8
2070	5.7		5.7	4.7
2080	5.5		5.5	4.5
2090	5.2		5.2	4.2
2100	5.2		5.2	4.1

The baseline trend rates above were developed using SOA LongTerm Healthcare Cost Trend Resource Model with the following assumptions for input variables:

Rate of Growth in Real Income / GDP per capita	1.9%
Rate of Inflation	3.2%
Income Multiplier for Health Spending	1.4
Extra Trend due to Technology and other factors	1.2%
Health Share of GDP in 2011	17.5%
Health Share of GDP Resistance Point	25.0%
Year for Limiting Cost Growth to GDP Growth	2075

The SOA LongTerm Healthcare Cost Trend Resource Model and its baseline projection are based on an econometric analysis of historical US medical expenditures and the judgments of experts in the field. The long-run baseline projection and input variables have been developed under the guidance of an SOA Project Oversight Group. The above schedule represents a reasonable medical trend projection for the current plan provisions and demographics of most company retiree welfare benefit plans, and no changes to these baseline assumptions are necessary.

The "alternate" cost increases in the third column show annual rises are projected when one of the input variable assumptions is changed – in alternate***1*** illustrated above, the "extra

trend due to technology and other factors" is increased from 1.2% to 2.0%. Note that there is no change for 1980-2006 (history, already recorded) or for 2008-2011 (the 1980-2005 average of 7.5% is used to project short run growth (subject to user modification), and changes in parameter assumptions affect *long run* projections only. Allowing for more technology causes a significant rise in the annual rate of costs increases (up from 7.2% to 8.1% in 2012) but this excess increase fades out over time as the rising share of total economic output (GDP) becomes increasingly burdensome and unsustainable, so that the "GDP restriction" becomes binding. Conversely, in alternate***2*** which changes the assumed rate of growth in per capita incomes from 1.9% to 1.0% (and keeping the technology excess rate at the baseline 1.2%) the lack of spending keeps the growth of medical costs lower throughout the period –although unfortunately this restraint comes from the lack of wage growth to pay for much improvement in medicine or any other consumer services.

Built-In Assumptions: The model is a projection based on past trends, and like all trend projections inherently incorporates many unacknowledged assumptions (primarily that the major growth factors in the future will be similar to those in the past). In addition to the five input parameters and two restrictions explicitly noted as inputs, the model makes background assumptions such as that the basic structure of medical practice will not suddenly undergo radical change, that expenditures paid out of pocket by patients and their families (currently about 15% of the total will not be doubled or cut in half. An examination of how the trend in insurance premiums was affected as personal payments were reduced over the last forty years will find a sample projection incorporating this effect in Section II – 5A- "*Change in co-pays and deductibles*."

The biggest sources of uncertainty with regard to long run medical costs are political and economic. With regard to the politics of Medicare and health insurance regulation, there is much that can be said but little that can be reliably quantified –except that to say that the politics are variable and uncertain. Economic trends are more reliably analyzed and projected. However, many government agencies and private firms already undertake that task so that little can be added here with regard to projection of underlying wage or CPI price trends. The SOA model simply takes the best of existing projections (particularly those of the CBO and CMS) and builds upon them, focusing on the few major variables that determine the accuracy and understanding of long run medical cost trends.

II. Technical Documentation

1) MODEL STRUCTURE AND FORMULAS

Five input parameters are required by the model to project annual growth in medical costs:

1. **Inflation** (ordinary increase in prices).
2. **Income** (per capita rate of growth).
3. **Multiplier** (income effect on medical demand and labor cost).
4. **Trend** (extra increase due to Technology and other factors).
5. **2011 baseline Health SHARE of GDP** (currently estimated at 17.5%).

There are two optional parameters that can be used to place limitations/restriction on the growth of medical cost and change the shape of future trends.

6. **{option} Resistance Point** (SHARE above which resistance to growth starts).
7. **{option} Limit Year** (further medical cost increases limited to growth in per capita income).

While most users will want to maintain the same parameter values for the entire projection period, some may wish to make use of the increased flexibility provided by the model to shift parameter values for the time periods 2020-2030 and 2030+.

8. **{option} change parameter values in 2020-2030 and 2030+**

The short-term rate of growth in medical costs is not modeled in the spreadsheet, but rather the choice of individual users for consistency with their plans to be valued. However, a bridge set of annual estimates is needed to connect the model projection (for 2011 and beyond) to current cost levels. The default used is 7.5% for each of the next four years, but this can be changed by the user.

9. **{option} change Short-Run Annual %'s** (growth rates for 2008, 2009, 2010 and 2011).

Changing the per person baseline medical cost arbitrarily set at $10,000 will move the reported dollar cost for each year up or down proportionately, but has no affect on the model or the projected annual % rates of growth. Note that the user must change the 2011 baseline $ cost in order to match desired 2007 or 2008 per-person medical cost levels rather than attempting to change the 2007 or 2008 cost cells directly.

10. **{arbitrary} baseline $ per-person medical costs**

The first step in the model is the projection of the annual long-run increase in the share of income accounted for by health care costs. This is calculated as follows:

Annual Increment = [(Technology/Trend %) + (Multiplier -1)*x*Income%)]*x* Share Base

.00343 = [1.2% + (1.40 - 1) *x* 1.9%] *x* .1750

In the baseline projection which inputs an incremental technology trend of 1.2%, an income multiplier of 1.40, and a baseline 2011 share of .**1750**, this implies a annual increment of +.00343 in the share of income devoted to medical costs, so that the projected 2012 share is .**17843**. The 2013 share would be **.17843** + .00343 = **.18186**, and share increases in equal increments each year thereafter until the resistance% or limit year is reached. The percentage increase in dollars spent is the product of the underlying per capita nominal income increase of 5.2% (the compound effect of 3.2% inflation and 1.9% real wage growth) and the increase in the share (.00343/.1750 = 2%) or **7.2%**.

Note that the since the model generates a constant annual increment in "share," the projected percentage increase in nominal dollars slowly falls as "share" rises. In 2030, with a

health share of .2400 the .00343 annual increment represents just a 1.4% rise, so that the percentage increase in nominal dollar spending is 6.68% in that year.

Resistance Point: The model allows users to specify a share above which increased growth becomes more and more difficult. In the baseline projection, the resistance point is set at .2500 (i.e. when health expenditures exceed 25% of GDP). The annual increment of share growth is reduced by the square root of the distance from the resistance point as indicated in the formula below (illustrating baseline share increase for year 2041):

Reduced Increment = Annual Increment [1-√[(Share(t-1) - Resistance Point)/Resistance Point]]

.00246 = .00343 x [1-√[(.2700 - .2500)/.2500]]

Thus in year 2041 when the prior year share is .**2702** and the resistance point is .2500 the annual increment is reduced from .00343 to .00246, meaning that the year 2041 share rises just to **.2726**. Note that this formula creates greater resistance to further growth as the farther the share income spent on medical care rises above the resistance point, and asymptotically limits medical cost share to no more than twice the specified resistance point.

Limit Year: The model also allows a user to specify a year after which share growth is slowed to the point where the rate of increase in medical costs is just equal to the rate of growth in per capita income. Such a limit is similar to that imposed on Medicare physician reimbursement under the sustainable growth rate (SGR) formula. This limit is phased in over time by reducing the annual increment toward 0 by use of the following formula (illustrated for year *2078* with Limit Year set to *2075*):

Reduced Increment = Annual Increment [1/((*current year* – *Limit Year* +1.5)^1.5)

.00036 = .00343 x [1 / ((*2078* – *2075* + 1.5) ^1.5)]

The annual share increment is reduced to ¼ of its initial size in the first year post-*Limit*, and after three years (as calculated above), it is about 1/10 as large. A decade past the *Limit* growth in health expenditures is restricted to approximately equal the rate of growth in per capita income.

Logic Imposing Resistance and Limit within the Formula: In order to impose the share resistance point and Limit Year within the cell formula, a reverse Boolean logic is used with sequential if statements. If (*year* > *Limit Year*) then that limit takes precedence and is imposed. If the year limit does not apply but (share > restriction point) the resistance formula is imposed. If neither of these statements is true, or if the cells are left blank, then no restrictions are imposed and the formula defaults to the initial annual share growth increment as determined by the input parameters.

2) DATA SOURCES

Although many elements of income and expenditure are used in analysis, and may be used for subsequent refinements of the model (e.g., spending by components such as pharmaceuticals, hospitals, etc., or by categories such as elderly, disabled, etc.), in the base model only three series are provided as output: "per capita expenditures on health (H$)" "real

(inflation-adjusted) per capita expenditures on health (rH$)" and "share of GDP spent on health (SHARE)." In turn, these are compared to and based upon historical data on per capita income and the health share of GDP. Sources for the series are described below.

INCOME Per Capita = GDP/Population

SHARE = NHE / GDP

H$ = SHARE x (GDP/Population)

realH$ = SHARE x (realGDP/Population)

GDP: GROSS DOMESTIC PRODUCT. The historical nominal and real GDP 1929-2006 are from the National Income and Product Accounts maintained by the Commerce Department's Bureau of Economic Analysis accessible at http://www.bea.gov/bea/dn/gdplev.xls accessed May 15, 2007. **Inflation** is measured by the **GDP deflator** (obtained by dividing nominal GDP by real GDP) and set for a year 2000 base (so that the deflator is 1.00 in year 2000). Although the consumer price index (CPI) is the most commonly discussed measure of inflation, the CPI does not encompass many non-consumer expenditures (capital, government) and thus does not accurately reflect the economic resources available. Indeed, while the 2006 health share of GDP is more than 16%, the weight of medical care in the 2006 CPI is only 6.2%. To obtain GDP and real GDP denominators for the short-run 2007-2010 period, it is assumed that nominal GDP growth will average 5.1% per year, and that the GDP deflator change (inflation) will average 2.2% per year. This would be consistent with approximately the same rate of growth in real per capita GDP as has been experienced during the previous twenty-five years 1980-2005 (2.02%), and a decline in the rate of inflation (from 2.9% to 2.2%) consistent with the expectations of most economic forecasters and government agencies. Note that in the long-run projections for which this model is designed *per capita GDP* and per capita growth rates are utilized. Nominal and real *total* GDP would have to be calculated by multiplying the per-capita amounts by the projected population (or equivalently, that rates of growth would have to be increased by approximately 0.76% per year for *national totals* to account for the growth in the population base--see POPULATION below).

POPULATION: The historical and projected U.S. Population is from the U.S. Census Bureau Table 2 "Population: 1960 to 2004" and Table 3 "Resident Population Projections: 2005 to 2050" as published in the *Statistical Abstract of the United States: 2007* (accessed May 15, 2007). Population growth from 2050 to 2100 is assumed to maintain the same annual percentage rate (0.76%) as growth from 2015 to 2050.

NHE: NATIONAL HEALTH EXPENDITURES. The historical and projected NHE are taken from the National Health Accounts as provided by the Office of the Actuary, CMS, and accessible at the web site http://www.cms.hhs.gov/NationalHealthExpendData/. Actual NHE are used for 1960 - 2004 and projected NHE for 2005-2010 (accessed May 15, 2007). NHE projections for 2011-2100 are calculated as (Projected GDP in year *Y*) x (Projected SHARE in year *Y*).

3) INPUT PARAMETER VALUES AND RANGES

Inflation. *Baseline 3.2% (range 1.5% -5.5%)*. During the last twenty five years (1980-2005) the rate of increase in the GDP deflator has averaged 3.0% while the rate of CPI increase has averaged 3.5%. Inflation has been about 0.5%-1.0% lower over the most recent years, but averaged 0.5%-1.0% higher over the last fifty years. Most forecasters assume that inflation is more likely to edge higher (due to budget deficits) than to fall. During the last century inflation has occasionally dipped below 1% and soared above 12%, although no decade has seen an average that low or that high. The GDP deflator is used in this model in preference to the CPI because this maintains neutrality of purely nominal changes--inflation of 3.2% implies an increase in average price levels of 3.2%, but has no effect on the share of income spent in any particular category. Since the CPI counts only consumer out-of-pocket expenses rather than all expenditures, and in particular excludes employer paid health insurance premiums and government spending on Medicare, adjustment using the CPI can provide a distorted measure of real changes in the share of expenditures--a problem avoided here by using the more inclusive GDP deflator.

Forecasters generally agree that long run inflation is among the most difficult of economic variables to forecast, and that little certainty can be attached to any forecast beyond three years. It is fortunate therefore that inflation has a purely nominal role in this model -- affecting the reported dollar amounts but not the projection of real rates of increase in medical costs or share of GDP. A lower bound for reasonable projections is probably 1.5% given that inflation has never remained below that rate for any significant period during the last half-century. Although inflation above the indicated 5.5% upper bound is clearly plausible, entering higher values into the model only shifts *nominal* spending and obfuscates the real uncertainty. If inflation were to rise, and remain, above a 6% annual rate, then the primary problems would occur in the adjustment of wages, reserves and investment returns to this monetary shock --not to changes in nominal price increases for medicine.

Income *Baseline 1.9% (range 0.8% - 3.0%)*. Growth in real per capita income is the major driver of increasing health care costs (Bodenheimer 2005; CBO 2006; Chernew 2003; Fogel 1999; Gerdtham and Jonsson 2000; Getzen 1990, 2000a, 2007; Medicare Trustees Technical Review Panel 2000, 2004; Newhouse 1977, OECD 2006; Smith et al 1998). Increasing incomes push costs upward from the supply side by raising the per-hour costs of physicians, nurses and all of the other professionals working in this labor-intensive service industry, and from the demand side by making patients, public agencies and employers willing and able to pay more. The relatively steady growth of medical costs is attributable both to the steadiness of income growth and the fact that medical consumption is inertial--depending more on average income over five or even twenty-five years rather than fluctuations that last only a year or two. While medical wages are also somewhat inertial, they tend to adjust to macroeconomic conditions within two or three years (Kendix and Getzen, 1994).

During the last twenty-five years (1980-2005) real per capita income has averaged a 2.02% annual rate of increase. Rates of growth have rarely been below 1% or above 3% for any extended period of time, except for the major disruptions caused by the great depression and World War II. Hence 0.8% to 3.0% are probably appropriate upper and lower boundaries for projection.

Income Elasticity Multiplier *Baseline 1.4 (range 1.0-1.6)*. Use of an income elasticity multiplier less than 1.0 would imply a shrinking share of spending on health as the nation became wealthier, and seems clearly counter-factual. The United States has had significantly higher rates of growth than the majority of the other developed countries, consistent with a higher elasticity, perhaps as large as 2.0 (Bodenheimer 2005; CBO 2006; Chernew 2003; Fogel 1999; Gerdtham and Jonsson 2000; Getzen 2000b, 2006; Medicare Trustees Technical Review Panel 1991, 2004; Newhouse 1977, OECD 2006; Smith et al 1998). However, many analysts would argue that the rapid growth characteristic of the USA is due more to a stronger desire by patients and providers to use the latest technology than to income effects per se. As Peden and Freeland (1998) point out, the income and technology effects are not independent as the high rate of medical spending in the USA has fueled the rapid development of new technologies.

The more above 1.0 the income elasticity is judged to be, the less "residual" excess growth is left for the unmeasurable technology and organizational factors in the historical time series 1960-2005.An upper value of 1.6, as used here, is consistent with a rather strong growth in medical technology, and consistent with that reported by Nobel Laureate Robert Fogel (1999) in his comprehensive and influential studies of economic growth and development.

Technology Trend (excess) *Baseline 1.2% (range 0.0%-2.5%)*. The technology trend or "excess growth" can only be measured as a residual, and thus must be considered in the context of the other variables in the model, and in particular with the income effects. The combined (income+technology) effects ought to be consistent with actual rates of "excess" growth above incomes/wages in prior periods. The baseline input value of +1.2% accomplishes this (combined with baseline 1.9% growth in real per capita income and an income elasticity multiplier of 1.40 it yields an excess growth of 2.1% for 2012-- almost identical to the average for the 1980-2005 period). Using a high value such as 2.5% attributes more of the underlying trend to residual factors, and yields excess growth projection in the 3% - 4% range which would be at the upper limit of a reasonable projection. Conversely, use of a very low value such as 0.1% places the excess growth rate at less than 1%.

Methodological Note: Distinguishing "trend" from "technology" and "income"

An econometric model must try to parcel out what parts of the growth in medical cost are due to technology, health systems organization, and pure income effects. Given that neither technology nor organization can be directly quantified and measured, these factors must be implied from the residual after income effects are accounted for. Medical costs have steadily risen by about 2% to 3% more than wages and incomes in the U.S. The more of this growth that is attributed to income, the less that is left as a residual to be attributed to technology and organizational factors.

The existence of a trend, and the fact that all three factors tend to trend in the same direction (called collinearity) makes such an analytical division of effects quite difficult and imprecise in practice. The effects of income, separate from trend, are measured in two main ways: cross-section and time-series. In cross sections, one analyzes the difference in the amount spent on medical care across geographic units, especially across countries. Numerous studies over the last 30 years have established the basic result that higher average per capita income is associated with more than proportionately higher medical expenditures. In economists' terms, the income elasticity is greater than 1.0. In less technical terms, the % share of income spent on health rises as per capita income rises, e.g., high income countries spend a larger % of GDP on

health than low income countries. The magnitude of the effect varies depending upon the particular group of countries and time period studied, but usually is in the range of 1.1 to 1.8.

This cross-sectional result of national income elasticity greater than 1.0 has been confirmed in time series where the variations in the rate of growth in spending from year to year are correlated with variations in the rate of growth in real per capita income. A major econometric problem is that the "income effect" is not instantaneous but takes many years to be fully expressed in medical spending. Thus if a country enters a recession in 2020, spending cannot immediately adjust, but will be depressed in 2021, 2022 and thereafter. Indeed, the effects of income shifts appear to continue for many decades (thus we find that the U.S. is still influenced by the creation of Medicare in the go-go 1960's while the UK and Japanese postwar restraints still limit growth in those countries). In order to get better estimates of secular "trend" and income effects, it has become common to combine cross-section and time-series analysis with "panel" data that includes many countries over many years.

A different econometric problem arises from the failure to recognize that individual and national income effects are different. As average per capita income rise, average medical costs rise. However, any particular individual's expenses may rise or fall. Within an employee group that has similar insurance coverage and low co-pays and deductibles, personal income differences will account for very little of the differences in medical spending (see Getzen 2002 and Getzen 2006 for more complete discussions). Indeed, it is common to find higher medical expenditures among poor patients than rich patients (because they are usually sicker), but poor countries can never spend more on health care than rich countries. Thus estimates of income effects based on comparisons across individuals, or even counties or states, will provide very different answers than will estimates made using nations as the relevant unit of observation. To project the growth rates in average medical costs over time, one needs to look at the effect of changes in per capita income, technology and organization on **average** per capita medical costs. This is apt to be quite different from the variation in medical costs between two people in the same firm, or even between two firms in the same state.

2011 Health Share of GDP. *Baseline 17.5% (range 16.0% - 18.5%).* The baseline estimate for the share of GDP spent on health is almost identical to the 17.49% provided in the most recent CMS projection (Borger et, al. 2006). Since the current share of GDP spent on health already matches or exceeds 16.0%, a lower estimate below that seems unjustified. To exceed the upper range estimate of 18.5% by 2011would require rapid and sustained spending growth well in excess of the averages for the last twenty-five years.

Limits to Growth

The rate of increase in medical costs cannot continue indefinitely to exceed the rate of growth in per capita income without facing the logical contradiction of spending that exceeds 100% GDP. Historically, growth was relatively modest. From 1929-1955 the share of GDP spent on health care rose by less than .0004 annually. Growth sped up rapidly and the rate was five times as fast from 1955-1960 (.0019). This rapid growth in medical expenditure continued throughout the 1960's (.0020) and the 1970's (.0019) and exceeded .0032 during the 1980's. From 1988 to 1993 the health share rose from 11% of GDP to 14% (.0049 annually). In the 1990's cost increases moderated, and from 1993 to 1999 the health share of GDP actually declined. This was unprecedented in U.S. health services, although similar declines have been observed in a number of other OECD countries (usually after a recession). Following the

unprecedented dip, spending rebounded sharply, rising a bit more than two points from 2000 - 2004. It would be very useful to have another ten years of observation to confirm the inflexion point, but the evidence is suggestive that the most rapid rise in the share of GDP spent on health is behind us (early 1990s) and that the long run spending trend is best described by a logistic "S" curve that has an upper and lower bound similar to that of many other growth processes. It appears to be a straight line if one looks only at the middle section (1960-2000) but a longer perspective would show it as curved, with limits above and below.

Since there is not enough data to use statistics to determine the shape and inflexion points of the spending curve, this Model allows the user to generate the appropriate "S" shape by imposing two restrictions: a share of GDP above which increases in spending become more and more difficult (**Restriction Point**) and a year after which the growth of medical costs is limited to the rate of growth in income (***Limit Year***). Virtually all analysts reject the simple linear trend extrapolation because it forces the implausible result of health spending that is 60% or 90% or even more than 100% of GDP. However, exactly what the limits and restrictions are is at present a judgment call for which statistical analysis can provide only limited guidance.

Resistance Point. The choice of a resistance point for share of GDP is essentially an informed judgment call, here tentatively set at 25%. It is hard to justify significant resistance starting much below 20% since spending has already risen from 5% to 16% with only hints of any real resistance to further excess growth. Accepting unconstrained growth above 35% does not seem unjustified, but probably should be left to the user. If one accepts 50% (half of GDP) as possible, then the resistance feature of the model does not come into play.

Limit Year. Again, the understanding that at some point spending must be brought under control so that the rate of growth is no greater than the rate of growth in GDP is almost universal, as is the lack of consensus on when that control will or should occur. Allowing the user to specify the year in which constraints are imposed seems most reasonable. Note that the limit phases in over time but effectively reduces the share growth to a small amount within three years, and a negligible amount within a decade.

Short-Run Annual % Growth Estimates: *Baseline 7.5% (range - unspecified)*. The project is focused on the projection of *long run* medical costs. Short-run costs fluctuate widely, and vary substantially for different groups or benefit packages. In the model, short-run growth estimates for 2008 to 2011 are used as a bridge between current costs and long-run trends, but have no effect on the long-run trend. The baseline default for the short-run growth estimates (7.5%) is approximately equal to the average growth rate in per-person medical costs over the prior twenty-five years.

In the model users can specify a different annual growth rate for each year (2008, 2009, 2010 and 2011) in the short-run. It is important to note that user changes in the short-run growth estimates do not have any effect on the long-run medical cost trend projection. The short-run estimates are there to fill in the gap, and will move the dollar cost per person up or down a bit, but do not change the estimate of the long-run medical cost trend. Changing the baseline 2011 dollar cost (currently set at $10,000) merely moves future (and prior) cost levels up and down proportionately, and has no affect on the model, or on any of the annual percentage growth rates.

Note that while the Model allows user specification of single annual yearly percentage growth rates, no guidance is given here as to how such estimates should be made, or should

differ from the baseline default value of 7.5%. Similarly, no guidance is given as to whether the ten-year or the twenty+ year parameter estimates should vary up or down, or by how much. While an analyst may have strong feelings or priors about how such parameters will change over decades in the future, there is not at present a reliable scientific consensus upon which to base such modifications.

4) MAKING RETIREE HEALTH LIABILITY PROJECTIONS

Medical cost trends are only one component of future health insurance premium projections. Any estimate of liability must take account of the number of beneficiaries covered, the benefit package, specified limits, caps and co-pays, demographic and utilization changes, rates of return on reserve funds, etc. The SOA-Getzen model is one component the actuary can use to project future premiums and cumulative liabilities, not a set of answer functions that can be applied mechanically without thought or adjustment. The model can, however, be extended to answer some of these questions as illustrated below.

5) MAKING ALTERNATE USER PROJECTIONS: VARYING INPUT ASSUMPTIONS

A) Change in co-pays and deductibles.

The projected trend will be below(above) the baseline if the fraction of total costs paid for through co-pays and deductibles is rising(falling). Health insurance premiums per enrollee increased by 10.7% annually from 1970-2005 (CMS NHE Web Tables (pdf) accessed June 30, 2007 -Table 13). Expansion of coverage to new services (vision, dental, pharmaceutical) accounted for almost a full percentage point of the annual rise, but even when the comparison is limited to common benefits, average per person premiums rose by 9.8% annually while medical costs rose by just 8.7% annually. The disparity in growth rates is due to the progressive decline in out-of-pocket costs. In 1970, patient out-of-pocket payment accounted for 40% of total health care expenditures, while by 2005 that fraction had fallen to just 15%. Thus for each $1000 of medical costs, the covered share rose from $600 to $850 over this thirty-five year span, and is thus responsible for approximately a +1% annual increase. If one were to speculate that the arrival of consumer-driven healthcare would reverse this process, causing out-of-pocket payments to rise from 15% back up to 40% by 2040, then a minus one percent (-1%) reduction in the annual growth could be applied to the model by changing the "excess growth rate" (technology) input from **1.2%** to **0.2%,** yielding projected 2040 spending of $55,008 per person, almost one-fifth lower than the baseline of $66,425. Note that with a lower rate of growth rate assumption the 25% of GDP resistance point would not be reached until the year 2056.

B) Productivity gains create continuous prosperity and allow for higher health spending.

While one should not count upon it, it is possible that the productivity burst associated with the development of information technology could continue indefinitely, raising the rate of economic growth by half a percent or more. The cumulative effect of such prosperity over time would be substantial, increasing both the amount spent on health care and the ability to pay for it. Modifying the model to reflect such prosperity (raising the real income growth rate from 1.9% to 2.4%) means that spending would rise to exceed .2500 of GDP by two years earlier than under the baseline (2031 instead of 2033) and by 2040 spending would rise to $78,581 (compared to

baseline $66,425) even though the fraction of total income devoted to health would only be slightly larger (.2773 compared to .2702).

C) Changing short-run annual growth rate estimates.

Changing the short-run "gap-filling" annual medical cost growth rates makes no change in the long run share and growth trend projections. A larger growth rate for the intervening years means that the cumulative gap is larger, and therefore the reduction from the arbitrary nominal benchmark of $10,000 in year 2011 must be greater. Raising short-term annual growth rates for each of the years to 9% from 7.5% implies a 2007 spending level would be $7,084 (-29%) rather than $7,488 (-25%). Conversely, a lower intervening growth rate (such as 6%) would imply a smaller gap and thus relatively higher 2007 spending around $7,921 (-21%).

III. FAQ: *QUESTIONS* (Responses/Answers listed below)

1) *What is the difference between "Long Term Medical Cost Trends" and*
   a) projected health insurance premium increases?
   b) projected retiree health benefits liability under FAS106 and GASB 43 & 45?

2) *What are the biggest sources of uncertainty with regard to Long Term Medical Cost projections?*

3) *How does the SOA model differ from the CBO, Medicare and other projections?*

4) *What is the difference between "a projection" and "an estimate?"*

5) *Is Technology the main driver of costs? Can it be predicted?*

6) *Are more detailed models more accurate?*

7) *Are cost trends significantly different for under/over age 65 retirees?*
   a) for different industry groups?
   b) for pharmaceuticals or other specific components?

8) *Can the Federal government solve the Medicare problem without reducing HC cost trends?*

9) *How important is Legislation likely to be in controlling future costs?*

10) *What types of plan benefit changes are anticipated and incorporated in this SOA-Getzen model?*

11) *Are there particular scenarios that are apt to be more or less likely (and if so, how likely)?*

12) *How well can we really predict future medical costs?*

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1) *What is the difference between "Long Term Medical Cost Trends" and*
   a) projected health insurance premium increases?
   b) projected retiree health benefits liability under FAS106 and GASB 43 & 45?

a) Percentage increases in health insurance premiums are expected to track medical cost trends in general. For long run trend projections, the annual rate of percentage increase should be almost the same. However, there may be wide divergence in rates over one, two or three years or more. Short run changes due to the underwriting cycle, cost-shifting across payer categories, benefit structure, or contractual rigidities can overwhelm the long run trend convergence (see Section II – 5A above). Therefore many one, two or five year forecasts for

NHE and premiums, or even premiums for specific products (HMOs, Medicare Advantage, etc.) may be quite divergent.

b) Liabilities for future retiree health benefits under FAS106 or GASB 43 & 45 depend upon many factors, of which medical costs are only one. Changes in benefit structure and eligibility have been much more important in raising and reducing liabilities over the last ten years than fluctuations in medical cost trends. Many retiree plans have been eliminated or replaced with defined contribution pools. There are a growing number of plans with no funding (i.e., retiree must pay 100% of premiums). Demographic structure (projected numbers of beneficiaries in each age/sex group) is of great importance in determining total liability, but is independent of medical costs per person within each of those categories.

The specifics will differ for each firm or governmental entity, but the following generalizations are likely to hold true. ***FAS 106 liabilities are likely to be strongly constrained by changes in benefits and for many private firms liabilities will actually decline as a percentage of total firm revenues, or be eliminated entirely***. The greater prevalence of union contracts, political sensitivities, and the more deliberate pace of public decision-making implies that ***GASB 45 liabilities will tend to increase much more rapidly than private FAS 106 liabilities, and create greater long run funding problems in most cases.***

2) *What are the biggest sources of uncertainty with regard to Long Run Medical Cost projections?*

The economy is by far the biggest source of uncertainty with regard to long run medical costs. Nominal dollar amounts per person are mostly a function of inflation. Even with that distortion removed by the use of "real" inflation-adjusted expenditures, the largest single factor determining spending is how much money is available (i.e., per-capita GDP). A deep recession could retard the growth of medicine for years, and a depression could reverse it. Apparently minor differences such as that between 2% economic growth and 2.5% would result in a more than 40% difference in per person costs after compounding for 75 years.

The budget, simply put, matters more than anything else in determining spending. While aging and demographic changes have been the source of much angst and analysis, they do not actually cause much uncertainty in medical cost estimates. Most demographic changes are stable trends that are easy to forecast --everyone who will be over the age of 21 in 2025 has already been born. Future death rates are log-linear trends, easily applied to the current population structure. Only a few elements (total fertility, immigration, delays in birthing) are subject to much uncertainty. Furthermore, previous analyses have shown that even major changes in age structure account for very little of the change in medical costs.

"Medical technology" or, more precisely, the willingness of the American public to spend on new technology, is the other big source of uncertainty. Unfortunately, that is virtually impossible to predict (and also strongly conditional upon the budget available). Not only is there no way of knowing what new discoveries will occur, it is hard to know how they will be valued. Will smoking, obesity and AIDS be viewed as self-destructive behaviors beyond the range of insurance coverage, or as a result of unfortunate genetic and social dispositions that clearly require risk-pooling to manage? The trends of the last 100 years have encompassed some major technological and organizational shifts, and may be a reliable guide to the future--or not. In the SOA-Getzen model, these factors show up in two ways, as the residual "technology" increase (currently assumed to be 1.2%) and indirectly in the "income multiplier" (currently set at 1.40).

Perhaps the largest source of uncertainty, other than the rate of future economic growth, is whether the nation will continue to maintain a relatively uniform standard medical care for all (see response to *question 11 - Scenarios* below). If instead the medical market were to fragment into segments by income class, then the rich could be spending thousands of percent more than poor, creating medical services as different as public bus transport is from a Maserati. Fragmentation removes the "sustainability" constraint, and thus could allow costs to spin out of control. It would certainly mean radical changes in or the end of existing employee health benefits.

3) *How does the SOA model differ from the CBO, Medicare and other projections?*

The SOA-Getzen, CBO and Medicare CMS models all use the same ten-year National Health Expenditure projections developed and published annually by the Office of the Actuary, but use somewhat different transitional and long-run projections. The CBO and Medicare Trustees use a single future percentage growth rate estimate for per-capita GDP with no allowance for fluctuation or uncertainty (and which is somewhat below the historical growth rate 1950-2005), and no multiplier effect on spending. Instead, both make use of a simple "excess growth rate" add-on to per-capita income. This long-run rate is examined, and potentially revised whenever the Medicare Trustees Technical Review Panel meets (GDP+0% in 1991, GDP+1% in 2000, and retained at same level in 2004--see "Data and Federal Budget Reports" in the Annotated Bibliography). The CBO, like the Medicare Trustees report, is a "current law" projection, and makes use of the same long-run percentage growth estimate. However, the CBO is making increased use of "alternative" budgetary presentations --usually assuming a 1% or 2% change up or down in future growth rates in revenues or expenditures.

The SOA model transitions to a long-run trend after five years (with provision for user input of specific alternative growth rates during the first five years). It is based on the actual historical growth rate in per-capita GDP of 2.0% (with provision for alternative user input) and builds in an income multiplier effect so that the "excess growth rate" will be higher with robust economic growth than under recessionary conditions or stagflation. The SOA "technology" factor is in this way somewhat different than the CMS and CBO "excess growth rate." However, what accounts for the largest differences are that CMS and CBO defer the transitions to constant long-run trends for 25 years, thus allowing for an "intermediate" growth rate in years five to twenty-five that is much higher. From 1960-2006 growth in medical costs averaged 2.56% above GDP. Assuming a long-run "GDP+1%" can be considered "reasonable" only because it implicitly assumes some cost-cutting reductions to maintain affordability and sustainability, even though the text of the Trustees Report explicitly eschews incorporating such elements. The SOA model makes the imposition of assumed cost controls explicit: they show up as "*health share of GDP above which resistance occurs*" (currently assumed to be 25%) and "*year after which growth in costs is limited to the rate of growth in GDP"* (currently assumed to be 2075). The SOA-Getzen model is able to better reflect actual experience because it does not have to meet the unrealistic federal mandate of conforming to "current law" in those cases where current law is recognized to be untenable or has been repeatedly modified (e.g., SGR for physician reimbursement).

4) *What is the difference between "a projection" and "an estimate?"*

Estimates are based on statistical analysis of historical experience, combined with expert judgments about what is likely to happen in the future. A projection is based on a specified set of assumed conditions that may or may not reflect the uncertainties or the estimates of experts. For example, a "current law" projection must assume that Medicare will impose the previously legislated SGR limits on physician reimbursement although Congress has voted every year to over-ride them. A projection may be based on an unrealistic assumption (assume medical cost growth of GDP+0%) simply in order to illustrate the effects of or on other factors (aging, budget deficits). The analyst may use a projection, or set of projections, to illustrate a point, but would normally consider an "estimate" to reflect the best judgment about what would actually happen. In practice, the words are often used interchangeably, and reported "estimates" or "projections" often combine statistical analyses based on relevant data, expert judgment, and arbitrary assumptions included solely for convenience or illustrative purposes. That is why knowledgeable or careful users always search through the technical documentation after looking at the graphic or tabular presentation to find out what the lines and trends really mean.

5) *Is Technology the main driver of costs? Can it be predicted?*

Economic and technologic growth are inextricably intertwined--they affect each other. More problematically, the effects of technologic change cannot really be predicted, or even measured (which is why economic estimates of "technologic growth" use a residual rather than a direct measure--see "Technology" in the Literature Review). Future developments in medical technology could suddenly make it cheap and easy to achieve an 80 year lifespan, but no more, and thus reduce costs. Or, they could make drug cost rise to consume all of the available discretionary income.

6) *Are more detailed models more accurate?*

No. While it is always the case that historical data can be better "explained" (goodness of fit statistics) by adding more variables, the opposite tends to be the case as one turns from the past to the future. As noted recently by *The Economist* (July 14, 2007; page 76) with regard to investors "The more information they received, the more confident they became about their answers. But the success of their predictions was actually worse." Many successful forecasting models contain no explanatory variables (purely trend and seasonal variation). For an explanatory variable to add value to a forecast, it must be the case that its effect will continue, and that one can predict the future data points. Sometimes this is the case (rainfall, underwriting cycle) but often it is hard to know the future path of the explanatory variable. In forecasting medical costs, only one factor, income, has been reliably demonstrated to have a persistent, independent and robust effect that can be predicted in advance.

7) *Are cost trends significantly different for under/over age 65 retirees?*

a) for different industry (employer) groups?

b) for pharmaceuticals or other specific components?

While the medical costs of persons over age 65 increased rapidly after the implementation of Medicare, it appears that per-person costs of the elderly have now begun to grow at approximately the same rate as overall medical costs for persons aged 15-64 (Hartman et

al 2007). Indeed, the most recent data suggest that the rate of growth may be even slower than average among the most advanced age groups (75-84, 85+) for hospital care.

Health insurance premium trends have varied across industry employer groups, but most of this is due to differences in benefit structure (e.g., auto manufacturing v. retail, municipalities v. agriculture). There does not appear to be any evidence that any one industry will have persistently higher or lower rates of medical cost/premium growth than another.

There is some evidence that the cost trends for pharmaceuticals have exceeded those for medical services over the last twenty years. In the U.S., about 10% of total health spending is for pharmaceuticals, but the share is much higher in many other countries, suggesting that further growth is possible. It is not unreasonable to expect more rapid increases in pharmaceutical costs to continue for some time, but the subject does require further investigation to estimate by how much, and for how long, pharmaceutical costs can continue to outpace other medical costs.

8) *Can the Federal government solve the Medicare problem without reducing HC cost trends?*

Probably not. Government already accounts for 47% of medical expenditures (55%+ if tax subsidies for EBHI are included) and Medicare is the dominant payer. There are many examples of costs being shifted government to employers, and then back from employers to government (BBA 1997, TEFRA, etc.) but the long run trends converge because both government and employers are paying for one health system. Only if one part of health care were isolated under a specific payer (as appears to happen with some state Medicaid programs) would a significant divergence in cost trends over time be expected.

9) *How important is Legislation likely to be in controlling future costs?*

While the Balanced Budget Act of 1997 created major shifts in payments, most legislation is more incremental, more a response to shifting budgetary realities than a cause. With a long run perspective, even such major legislation as BBA 1997 and Medicare Part D can be seen as efforts to bring spending into line with public expectations and fiscal reality. In the long run, the budget must be (more or less) balanced. If spending is too far out of line forcible adjustments (runaway inflation, default) wrench it back. If the public does change its mind about how much of the economic growth should be devoted to medical care, or how that spending should be distributed across interest groups (the elderly, the unemployed, investment advisors) then legislation will be used to nudge spending (and hence premiums) in the appropriate direction. With that perspective, legislation is seen as the instrument of expenditure control, not a random cause like earthquakes or scientific discovery.

10) *What types of plan benefit changes are anticipated and incorporated in this SOA-Getzen model?*

Benefit packages have been continually modified since health insurance first became widespread in the 1950s. The model assumes that evolution will continue, and that the trend in costs over the last five decades reflects those changes, and will continue to do so. There is one major exception to this expectation of continuation of underlying adjustments – a slowing or reversal in the fraction of total costs paid by employers. From 1950 through 2001, the share of medical costs paid by employees steadily fell, but recently this trend has stopped. Only 15% of medical spending is currently paid out of pocket and those patients, especially retirees, who have

been forced to pick up a larger part of the tab may well find themselves carrying even more of the burden by 2050. The model "freezes" the fraction of self-payment at the current amount (15%) so that the trend in premiums matches the trend in average per capita medical costs (the cost shifting to employers over the previous four decades caused the premium increases to average about +1% more than the underlying medical cost increases). If anything, it is more likely that in the future retiree personal payments will rise faster than employer premiums as cost-shifting moves the other way. Yet this adverse impact afflicting most retirees is much less likely to occur among executives or unionized municipal workers whose benefit packages are often strongly protected.

11) *Are there particular scenarios that are apt to be more or less likely (and if so, how likely)?*

To simplify and organize the vast array of variables affecting the future, forecasters often construct *scenarios*, particular combinations of events or values likely to cluster together, and then evaluate the impact of each scenario on the outcome of interest. The likelihood that each scenario will occur may then be estimated in quantitative terms, particularly when the analyst is confident that the scenarios span the full range of likely outcomes. That exercise of scenario construction was thwarted by the realization that one scenario – splitting the medical care market and unraveling employer health insurance – influenced and probably dominated all of the others. Briefly put, the tacit promise of approximately equal standards of medical care (and costs) across patients regardless of reimbursement has started to unravel. For retirees, the unraveling is now well advanced, with many being forced to bear most of the cost of their premiums or to pay out-of-pocket for some types of services. "Crisis" is the word most commonly used, but the more significant number is the fraction of total cost paid for by employment based health insurance -- currently about 35% and falling. A tipping point may already have been passed where equalization across reimbursement categories is no longer possible, short of some kind of universal coverage. It is less and less plausible to expect that those with incomes in excess of $100,000 will be satisfied with the kind of care that those at two or three times poverty rate can afford (even with subsidy), or to willingly bear a tax burden for medical benefits that exceed half the annual income of those in the bottom quartile. When family medical benefits exceed the annual earnings of minimum wage workers, there is no way to keep everyone in the same hospital using the same services through voluntary redistribution alone.

The likelihood of replacing the current mixed health insurance system with either universal coverage or consumer-directed (and funded) healthcare is low—probably less than 10% for either of these extreme scenarios. That leaves 80% probability for some breakdown that splits the current employer-based health insurance system apart, but which one, and into how many parts? Some seem to expect a chasm to open up between the insured and the uninsured (and expect to find themselves on the right sight of the divide commiserating with those poor unfortunates who must do without), but a tripartite split that places a bare-bones Medicaid HMO at the bottom, with a constricted coverage for most of the middle, and an expensive layer on top limited to high-wage (or well-protected) earners is probably more likely. Then come the questions –exactly where do the splits occur? Which benefits (drug, behavioral, rehab) get equalized or separated? How extensive is the cost shifting, and in which directions (most revolutions end up favoring bondholders after all).

The scenario under which employer based coverage comes apart and must be reconfigured seems so likely as to dominate all others –and yet to leave many of the most relevant questions unanswered, particularly for retirees. The existence of Medicare for all

elderly (although perhaps at a more advanced age) is not in doubt, but the extent of coverage, and the breadth of supplemental coverage, seems very likely to shrink. The opposing forces make retirees the most and least susceptible to changes in reimbursement.

12) *How well can we really predict future medical costs?*

We can predict the share of national income that will be spent on medical care reasonably well – certainly better than we can predict how much will be spent on movies, or oil, but probably not nearly as well as we can predict how much will be spent on housing. A lot depends upon what one means when asking "how well can we predict?" The work of forecasters is largely devoted to narrowing the range of uncertainty –maybe moving it from ± 38% to ± 32%. While this is seen as a substantial improvement by professional forecasters (reducing uncertainty by one-fifth!!) many who are less familiar with the task want certainty. Moving the trends and managing operations to meet a number is a task for management (or, occasionally, the accountants), not the forecaster. The analyst's only real expertise lies in delineating the range of uncertainty, not in divining or affecting the outcome.

IV. Literature Review & References

1) Data and Federal Budgets
2) Aging
3) Income Effects
4) Technology
5) Retiree Health Benefits
6) Sustainability, Affordability and Limits
List of References
Notes on Selected Sources

Data and Federal Budget Reports

The most important sources for understanding trends in medical costs are Federal budgetary documents, the core of which for the current purpose (forecasting LT trends) are:

- "*National Health Expenditures: Historical* and *Projections*" Office of the Actuary, CMS
- *Medicare Trustees Report* (2006 and prior years)
- *Technical Review Panel on Medicare Trustees Report* (1991, 2000, 2004)
- *CBO Long Term Budget Outlook* (2006)

While the "costs" of medical care and the percentage increase (or trend) had been addressed as far back as the earliest cost-of-living reports in 1918, the kind of rigorously constructed and validated measure of medical costs that we use today were not available prior to the development of national health accounting in the 1960s. Future trends, while intermittently discussed with projections being made on an ad hoc basis, were first consistently published in 1998 (Smith et al, 1998) and annually thereafter. The initial effort to measure national health costs was made by a private foundation in 1929-1933 (estimating spending for the year 1929) and became the foundation for a continuing governmental effort to develop a consistent measure of public and private health care costs culminating in the development of national health accounts that applied to national health expenditures (NHE) in 1965. These estimates were subsequently extended back to 1960, and have been revised several times to improve consistency. There are incomplete estimates that are somewhat reliable for the years 1929, 1935, 1940, 1950 and 1955. The NHE estimates 1929-2005 are among the best available anywhere in the world, and along with the OECD health care data form the basis for virtually all estimates of long-term medical cost trends. Of course, there are many other instances and sources of estimates for short-term (less than 10 year) trends (various report published by *Modern Healthcare,* Blue Cross, Milliman, Towers-Perrin, Watson-Wyatt, etc.; see also GAO 2007b, Kaiser 2006b, PriceWaterhouseCoopers 2007, etc.) but these are less relevant to the current LT model.

The technical review documentation for the Medicare Trustees Report makes it clear that a tripartite division is made between

a) **Short-Term** Projections (0 to 12 years) {detailed}
b) **Intermediate** (13-25 years) {transitional}
c) **Long-Term** Trend (25-75 years) {single estimate for all categories, now GDP+1%}

The "projections" published annually by the CMS Office of the Actuary (OACT) are short-term detailed projections rather than long-run trend estimates. They deal with an immense amount of data regarding sources of payment, types of provider, and contractual provisions, and provide

hundreds of detailed item growth percentages. In contrast, the long-run projections use a single annual percentage increase (GDP+1%) for all costs. The "intermediate" projections are crafted to create a smooth transition between the detailed short-term matrix of many items and the uniform single annual percentage long-run growth rate (which is also modified in the 2006 and subsequent reports to incorporate a transitional smoothing function). The bulk of the work done by OACT involves short-run detailed projections, rather than the long-run trend which is of most interest here. Conceptually, the short-term detailed projections incorporate the rather simplistic GDP+1% trend along with a mass of other information on providers and payers. No suitable methodology has been found to scientifically determine the long-term trend percentage, and thus the OACT accepts a judgment of a "reasonable estimate" as determined by the external technical review panel for Medicare.

Almost from the very first Medicare Trustees report, it was apparent that the short-term growth rate was large--too large to be realistically incorporated into long-term federal budget projections. In the early years, there was substantial interest in the effects of Medicare itself upon the growth of medical prices and wages. Over time, these concerns were lessened, but the growth rate still exceeded that possible for long-run federal outlays. Cost controls, beneficiary expansions, service expansions, and other factors have all been examined over the years. Over time, attention was directed more specifically at the effects of aging. The 1991 Technical Review arbitrarily chose a neutral (GDP+0%) long-run growth rate for medical prices and expenditures per person, not because it matched the historical evidence (which of course showed much higher growth) but in order to focus the attention and analysis on how the affects of an aging society (more beneficiaries over the age of 65, fewer workers, and ever-larger fractions of the population in more-expensive advanced age groups 75-80, 80-85, 85+) would affect Medicare. In a sense, one might say that the 1991 Trustees report, reflecting the most prevalent concerns of the time, addressed the issue "what will be the long-term financial impact of an aging U.S. Population on Medicare (assuming health care costs remain constant).

During the 1990s a substantial body of research made it increasingly apparent that while aging per se might be a problem, most financial problems were attributable to secular increases in the cost of medical care --not because of more old people. This altered perception is apparent in the introductory section of the 2006 CBO report:

"These scenarios suggest that the nation's broad financial stance through 2050 will depend mainly on two factors: the growth rate of health care costs and the willingness of the population to be taxed." [CBO (2006) The Long-Term Budget Outlook].

The CBO recognizes that the challenges presented by an aging population are manageable, while confessing that the difficulties of somehow restraining health care costs, and also raising taxes, must be left to the future.

The 2000 Medicare Technical Review Panel attempted to move away from the unrealistic long-term trend neutrality (GDP+0%) assumption, setting a benchmark of GDP+1% intended to capture the affects of technology and other factors, and discussing at length (but without resolution) the "sustainability" of federal and private spending growth rates. The Panel suggested using time-to-death as an initial step toward disease and health-status based projections, asserted that much of the "technology effect" was captured by changes in case-mix (giving the treatment of myocardial infarction 1994-1994 as an illustrative example [p.34]), and pointedly noted the inadequacy of the current scientific basis for projecting medical cost trends, suggesting further research be undertaken both by CMS and extramurally.

The 2004 Medicare Technical Review Panel abruptly changed course, holding that considerations of "sustainability" were outside the purview of the Trustees Report (since it mandates a "current law" basis) and thus should *not* be incorporated into projections, but rather perhaps placed in footnotes or alternative scenarios --even when deviations from current law are overwhelmingly probable (as in the case of SGR). Having said that there was no economic model upon which "sustainability" could be based; the 2004 Panel then simply accepted the benchmark "GDP+1%" proposed by the 2000 Panel (which presumably did incorporate in some way considerations of sustainability) as "reasonable." Consistent with the decision to not consider sustainability, the 2004 Panel urged that the Trustees Report, even in its summary overview and press releases, emphasize "Hi/Low" projections and the existence of uncertainty. The Panel, while recognizing uncertainty and the inadequacy of current scientific research, suggested that OACT develop a model of the form:

Recommendation 1-2: *Long-Range Cost Growth per capita* $= \alpha * GDP + \beta * (X)$

Where (X) represents technology and all of the other factors, once the pure income effect α is accounted for. The 2004 Panel recognizes that the use of GDP+1% "was not based on a detailed analysis of how income, technological change, health status, and productivity in the health care sector would evolve to determine spending [p.10]" and that such factors are all "simultaneously determined" and require further research before something other than the existing (2000) consensus judgment could be deemed "reasonable."

Summary (Budget Reports) As of 2007 the OACT has developed a set of very good, even excellent, detailed short-run projections of NHE with extensive detail by provider and payer category based on an extensive base of current information. While some other short-run forecasts such as those by major actuarial firms or trade publications that may be more useful for estimating a particular figure, such as HMO premiums or hospital revenues, none that have the consistency and detail of the NHE projections. However, the OACT has not yet been able to arrive at any suitable methodology for estimating long-run trends, and still relies on the "judgment" (guess-estimate) of the Technical Review Panel (and many other knowledgeable experts) that GDP+1% is "not unreasonable," and that at present we do not have any better or more scientific methodology for making long-run cost estimates.

Aging

Several phases can be discerned regarding expert opinion and studies of the impact of aging on medical cost trends: largely ignored (1950-1975), feared and exaggerated (1980s), empirically evaluated (1990s) and subsequently assessed as a significant but manageable issue (2000's) of secondary importance. The following reports provide some sense of how the evidence and professional judgments regarding age effects have evolved over time, and the current status of the assessment.

- *The impact of ageing on public expenditure:…2004-2050*. European Commission (2006).
- *Ageing of Population and health care expenditure: a red herring?* Zweifel et al(1999)
- *Population Aging and the Growth of Health Expenditures*. Getzen (1992).
- *Trends in the Use of Medical Service by the Elderly…* Barer et al (1989).
- *Trends in Medical Spending By Age 1963-2000.* Meara, et al (2004).
- *Age Estimates in the National Health Accounts.* Keehan et. al (2004)
- *Aging and aggregate costs of medical care:* Chernichovsky and Markowitz 2004.

- *U.S. health spending by age:* Hartman et. al. (2007).

In the 1960s and 1970s, there was an increasing worry that the approaching "age wave" of baby boomers threatened the economy. The rapid increase in health care costs was often blamed on "aging" (although none of the baby boomers had yet reached retirement, and the age structure of the U.S. was actually quite stable during this time). It was commonly observed that 1) medical care of old people cost more than that of young people and 2) increasing lifespans implied a lot more old people and thus it seemed reasonable that 3) much of the growth in health spending could be attributed to the greater number of old people, and that this problem would be much worse in the future. This led to a large number of simulation "studies" projecting future expenses based on the age/sex composition of the population at a future date, assuming the relative health spending amounts in each age/sex category reflected that measured today.

The first crack in the "age wave" explanation came as studies of the actual growth in medical expenditures over time (Barer, 1989) revealed that most of the increase was due to spending more on each old person, not on increasing numbers of old people. Data analysis across countries revealed a second flaw; nations with older populations did not spend more, and those nations that started young but were rapidly ageing (such as Japan) did not show higher rates of cost growth (Getzen, 1992). It was then pointed out that a substantial part of the excess spending on older people was attributable to approaching death rather than age per se, and since each person only dies once, this "death related excess cost" would not grow as life-span was extended. Finally, counts of the increase of the actual number of old people shows that such "aging" effects could account for only a small percentage (less than 0.5%) of the observed increase in costs, and thus that other explanations were needed.

While fears about the "overwhelming effects of aging" are still being encountered in 2007, as are demographic age/sex projections of future medical costs, the consensus among knowledgeable observers and experts is that ageing per se may account for a small but significant amount of the current and future increase in medical costs (about 0.2% annualized) benefit, etc.) but that the increase in costs per person is of much greater importance, and of much greater concern. The news on this front is mixed. Prior to the implementation of Medicare, per-person costs of the over-65 were about 40% above that of younger people in the 15-64 age group. Spending on older people surged with the increase in funding, +187% in 1966, up to +239% in 1970, +316% in 1980 and +360% in 1995, but have moderated and possibly even declined since then (Meara et al, 2004). In the most recent period for which detailed data are available (1996-2000), it appears that per-person medical spending of those 65-74 continues to increase a bit more rapidly (+1.5% annual), for those age 75 and over growth is less than average, indeed flat or actually down (Hartman et. al. 2007). While it is hard to base conclusions upon a single study, it should be recognized that the bulk of the evidence supports a presumption that growth in medical spending for the elderly will parallel that of younger persons.

Summary (Aging). Changes in the age/sex composition of the U.S. population added about 0.2% annually to the growth in medical expenditures 1960-2000, and will probably add about 0.5% annually over the next fifty years. While there were rapid increases in the rate of spending on the elderly relative to the young 1960-1980, the growth disparity slowed over time, and since 1995 medical costs per person for both young and old have grown at about the same rate. Although evidence is limited, it appears that both the young and old will continue to experience growth trends in medical costs at approximately the same rate for the foreseeable future.

Income Elasticity Multiplier Effects

- *Medical care expenditure: A cross-national survey* Newhouse (1977).
- *Catching up with the economy*. Fogel (1999)
- *Macroeconomics of Medical Care* Chapter 13 in Getzen (2007).
- *Aggregation and the Measurement of Health Care Costs* Getzen (2006).
- *Comparing Projected Growth in Health Care Expenditures & the Economy*. KFF (2006).

The most common citation for the observation that spending on health care rises as income rises is Newhouse's (1977) cross-national study of health spending, although this paper was in fact a replication of earlier studies by Brian Abel-Smith in 1964 and 1967, and indeed a similar observation was made as far back as 1850 when Frederick Engel first proposed his famous "law" (that the percentage of income spent on food falls as income rises). Since the OECD health data became available in the 1980's, there have been more than a hundred studies of "income effects." Two important results have been established. First, it takes time for changes in GDP to be reflected as changes in the financial structure of the health system. Thus some measure of lagging or "permanent income" (Freidman, 1957) is required (Getzen, 1980, 2007). Secondly, the scale of measurement matters: national health spending is always strongly related to per capita GDP, but individual health spending is strongly related to personal income only if the funds come largely from personal funds (dentistry, cosmetic surgery, counseling) since most personal medical expenditures (hospital, surgical, physician) are covered by insurance and thus can be high or low without regard to how much income that particular individual earns (Getzen 2007, 2000b). These two empirical facts constrain the ability to make forecasts. First, it takes a long time series to observe the long run effects of changes in per capita income; and second, only national averages rather than data on individual spending can be used to project trends (since medical costs depend upon the rate of growth in average health spending for all Americans, not on how much spending goes up or down in a single family).

In a widely read presidential address to the American Economic Association, Robert Fogel (1999) stated that the income elasticity multiplier was 1.6. Other studies show moderately lower income elasticities, in the range of 1.2 to 1.4. Virtually every cross national comparison shows that the average share of GDP spent on health rises as per capita income rises (i.e., that the income elasticity multiplier is above 1.0), although there are occasional difficulties in measurement--especially with accounting for long-term care and rehabilitative expenses (Maxwell, 1980). Note that while there are a plethora of studies estimating much lower income elasticities, 0.2 or even 0 or below, all of these are based on data concerning individuals or small groups rather than national averages, or fail to account for the important international cross-sectional evidence, or are econometrically mis-specified so that most of the income effect is attributed to trend.

Summary (Income Effects). Virtually all studies suggest that trends in medical costs depend most strongly upon growth in per capita GDP, and that the multiplier is positive (above 1.0). Therefore the GDP+0% assumption used by the 1991 Medicare Trustees was certainly too low for long-run projections.

Technology

- *Impact of Technological Change on Health Care Cost Increases: A Brief Synthesis of the Literature* Freeland et al (1998)
- *How Changes in Medical Technology Affect Health Care Costs.* KFF (2006).
- *Insurance effects on U.S. Medical Spending 1960 - 1993.* Peden and Freeland (1998).
- *High and Rising Health Care Costs: Technologic Innovation* Bodenheimer (2005)
- *The End of Medicine: How Silicon Valley…will reboot your Doctor.* Kessler (2006)
- *Is Technological Change in Medicine Always Worth It? The case of acute myocardial infarction."* Skinner et al. (2006).
- *The Value of medical Spending in the United States, 1960-2000."* Cutler et al (2006)

Traditional econometric studies measure the effect of technology indirectly as a *residual,* whatever is left over once the effects of all other productive factors (increased labor, capital, weather, taxes, etc.) are accounted for. This procedure may not seem very elegant or satisfying, and occasionally leads to anomalies such as "negative growth technology," but it has usually provided the best (and often the only) economic measure of the impact of technology. Some specific items such as corn production, car transmissions, or cardiac surgery have been the subject of detailed engineering studies that provide more direct estimates, but direct measurements are the exception rather than the rule, are limited to those few goods and services for which such engineering studies have been or can be carried out, and least applicable where there is unobserved quality change or rapid transformation--the very characteristics which make most of medicine so difficult to quantify in the first place. Predicting the future effects of technological change on medical costs presents an even more formidable barrier, since it would not be enough to have a measure of technology, one would also have to have a good prediction about how that measure would change over the next 10 or 20 years, and whether that it would still be a reliable indicator.

Much of the increase in health care spending is routinely attributed to "technology" without further explanation.** However, the measurement procedure is essentially the same as for the rest of the economy: --the "technology effect" is a residual. Thus the estimate depends crucially upon what "other factors" are considered, and in particular on whether the econometrician allows for a secular "trend" and how income effects are treated. It is impossible to fully disentangle the effects of economic growth, technological growth, and health system change. Consider the counter-factuals: technology growth with no growth in the economy for twenty years or, conversely, regular economic development for decades with no new medical technology, or the advance of modern medical technology with its elaborate long-term R&D funding in the absence of health insurance. It would perhaps be possible to sort out the separate effects of "income" and "technology" if either caused identifiable sharp, sudden and reliable shifts in spending. Instead, like the flows of water and silt in the Amazon, they are strong, slow currents that move beneath the surface. Income is at least well quantified and easily measured, while technology is not. The enumerations which do exist (numbers of patents, R&D, speed of diagnostic imaging) are not able to adequately reflect the dynamics of technological value in medicine.

An observation that the growth of health care costs has averaged GDP+2.5% from 1960 to 2006 can be explained by any one, or combination of, the following:

- *rising per-capita income*
- *secular trend due to unobservable factors*
- *advances in valuable medical technology*

Since fluctuations in per-capita income have been found to affect spending rather slowly, with a lag that is usually several years and sometimes endures for decades (Getzen 1990, Smith 1998, Bodenheimer 2005), most of the income effect over the 1960-2006 span would show up as an almost linear trend. Ignoring income effects would leave a large residual that could be interpreted as a "technology effect" but would have no empirical base since the rate of change in technology is unmeasurable. Finally, a "secular" trend due to some still-unknown and unobserved factors could be responsible for cost increases -- what we do know is that "secular trend" is simply a way of giving a name to some steady growth for which we have no scientific explanation. In a major analytic contribution Peden and Freeland (1995, 1998) examined how the flow of technology depends upon insurance, and how insurance depends upon GDP. Many other authors have contributed to increasing the awareness that the major variables responsible for growth in health care costs are not additive and separable, but rather a confluence of factors expressed in the current configuration and funding of the U.S. health care system with all its intertwined complexity and cost-shifting.

The Medicare Trustees probably felt comfortable using a formulation like "GDP+2%" since the effects of income are so large, so consistent with theory, and so similar to the effects on non-medical spending. The large number of published econometric studies allows them to be relatively confident about the scale and reliability of estimates. The often-replicated finding of international comparative studies that the magnitude of the income elasticity is greater than 1.0 implies a rate of growth in excess of GDP (although a multiplicative formulation like (1+X)*GDP% more accurately reflects income elasticity). However, the fact that the U.S. is such a substantial outlier in international comparisons means that some other explanation than "per-capita income" alone must be used. Whether that is the somewhat subjective assertion that Americans love new technology and are willing to pay dearly for it, or a more nuanced historical argument (The U.S. congress crafted Medicare during the boom of the 1960's, while the British Parliament crafted the NHS while post-war deprivation was still the norm), or something else, none of these explanations can at present be empirically verified.

Medical technology requires billions of dollars each year in research and development spending based on the uncertain prospect of future advances. As macroeconomic forecasters have become increasingly aware, it is *expectations* that drive spending, rather than current conditions. This insight may provide a path for forecasting the future effects of medical technology, or rather, the expectations of medical technology, on medical cost trends. The willingness to pay so much for the newest medical technology in the USA is based on a strong belief in the efficacy of new technology to save lives and improve health. If that belief weakens, then the desire to spend (and hence the future cost growth trend) will also weaken.

Recent research on the **value of medical technology** has refuted some old doubts, but also raised some new ones. The estimate by William Nordhaus (2003) that improvements in health have made as much contribution to the welfare of Americans as all other economic advances combined during the 20th Century was widely reported in *The New York Times*, *Wall Street Journal*, and elsewhere. The (2004) book by economic historian Robert Fogel was even more influential among demographers and population researchers, while a series of articles by Cutler (2001, 2004, 2006) and other authors focusing particularly on the immense gains due to advances in cardiology have been most influential among physicians. Murphy and Topel (2006) estimate gains due to medical technology during the last century were worth $1.2 million to the average American in the year 2000. There is a thus a growing consensus that spending on medicine, even

the very high rates of per-capita spending experienced in the USA, have been "worthwhile" in terms of lives saved, and with improvements in functioning, have clearly generated net gains.

The consensus that investments in medical technology and trillions in spending have thus been worthwhile is growing, and has been provided with more methodologically rigorous support in the recent research. However, some questions regarding future value have also begun to be raised.

- *Can the gains from medical technology continue as life-span advances?*
- *Would less spending focused on particular diseases and patient groups provide better value and even more benefits?*

For example, Skinner et al (2006) accept the basic average value results of earlier studies, but goes on to show that areas of the country with the highest and most rapid growth in spending on myocardial infarction actually have worse outcomes. Careful analysis of earlier studies shows that most of improvement in cardiac mortality came from low-cost routine treatments such as aspirin, beta-blockers, ACE inhibitors and thrombolytics rather than invasive high-cost medical technology (Heidenrich and McClellan 2001), a concern reinforced by the several recent studies on stents, surgery, and other invasive cardiac procedures (Boden et al, 2007). And even Cutler hedges his assessment by emphasizing *"However, temporal trends suggest that the value of health spending is decreasing over time, particularly for older age groups (2006, p.926)."* Public expectations and willingness to pay for expensive new technologies thus may hinge on whether most consumers consider only the overall averages (medicine is good) or the more nuanced marginal results (further gains are getting harder and harder to come by, and are significantly less valuable for advanced age groups --which is where I will find my future self).

A wild card in any discussion of technology is the possibility of radical transformative advance so that most medicine becomes commonplace simple and cheap, rather similar to the way that the internet has shifted celebrity watching and comedy from the Paris Opera to YouTube (Kessler, 2006). While such a giant productivity leap reducing medicine to a dimestore commodity has been a subject of science fiction (and occasional commentary) since the 1950s, most analysts would suggest that as with communications via the internet, some previously expensive aspects get commoditized but new goods and services continue to arise absorbing an ever greater share of consumer income. Cost reductions from the "end of medicine as we know it" through technological advance are more realistically associated with the added difficulty of increasing health for added years as lifespan is extended.

**Frequently one will come across statements such as "technological changes accounting for at least half of the growth" (Lubitz 2005) or "more than half of the 6.8 per cent per capita real health spending growth in 2002 is accounted for explicitly by technology" (Pauly 2005). Once one tracks down the references, they in turn refer to other assertions (rather than empirical studies) or, in some well-researched cases, to a survey of health economists' opinions about the causes of cost increases (Fuchs 1996). Many of these assertions are made by sophisticated economists and medical scholars who know that such statements are at best incomplete, and likely unfounded, but find describing the unsatisfying state-of-the-art with regard to productivity measurement as a residual either too difficult or just more than the usual reader is willing to stand for. Scholars therefore hedge such assertions with caveats and qualifiers ("use of technology and devices rather than technological advances per se," "complex causality," "multiple factors," "intensity and utilization," etc.). These qualifiers get dropped by more casual commentators, and after several decades the often repeated assertion has become a simplified "factoid" that no longer requires nuance or empirical support.

Summary (Technology). The rate of technological change is perhaps the most important, but also the most speculative, of approaches to forecasting medical costs. A crucial econometric weakness is the lack of a good quantitative measure of the rate of technological change, so that the "technology effect" must be obtained as a "residual" --what is left over after

other trends and factors have been accounted for. This weakness applies to studies of the economy as a whole as well as of health spending specifically. The value, and *expected* value, of future advances in medical technology may play the largest role in determining future medical costs, but there is no agreed upon methodology for predicting those trends today.

Retiree Health Insurance

- *Trends in Retiree Health Insurance 1997-3003.* Buchmueller (2006).
- *Trends and Indicators in the Changing Healthcare Marketplace*. (Kaiser FF 2006).
- *Retiree Health Benefits Examined.* (Kaiser Family Foundation 2006b).
- *Health Insurance Coverage for Retirees.* (Congressional Research Service 2006).
- *Analysis of Public Sector Health Care Costs in California*. (Calif. HC Found. 2006).

Retiree health benefits vary widely. Average per-retiree medical costs in school districts across the state of California varied from $780 (San Jose) to $8,602 (Manteca), and for city employees from $530 (Loma Linda) to $12,468 (Stockton) (California Healthcare Foundation, 2006). Most of the variation is due to variation in eligibility and benefit packages rather than differences in per-person medical costs. Furthermore, many employers not constrained by union contracts are reducing, capping, or eliminating retiree health benefits, and even in the presence of contractual obligations are using "fiscal exigency" clauses or bankruptcy in order to do so (Cauchon 2006). The prospect of exponentially increasing payments for services to individuals who are no longer even working for the organization is sufficiently daunting that much of the retiree health benefit system is unraveling (Buchmueller 2006). From 1988 to 2006, the share of large employers offering retiree health benefits fell from 65% to 35% (Kaiser 2006b). Of this reduced number, 15% made retirees shoulder the full cost of the benefit, and 50% had already placed a maximum cap on firm contributions. Given the adverse marketplace adjustments of the last ten years, it is likely that only the most favored or protected of workers (e.g., executives, municipal unions or legacies) are likely to continue to have generous defined-benefit medical plans throughout retirement with premiums that increase annually at or above the trend rate for NHE.

Traditional defined benefit medical insurance premiums track the trends in national health expenditures fairly reliably. Retiree health benefits do not. Estimates of future liabilities are almost unique to each organization, and even to each employee group within an organization (for example, benefit caps or eliminations may apply to new hires, or benefits may be available on to certain categories or those hired prior to a certain date). However, while defined contribution or capped health plans may be entirely independent of medical cost trends, actuarial projections for other retiree health plans must consider the role of future medical costs.

Early retirement health benefits are often identical to regular employee medical benefits, and thus future percentage increases can be expected to track NHE trends similarly. Similarly, some union contracts mandate what are in effect defined benefits even for those who are Medicare eligible. Wrap-around benefits coordinated with Medicare pose an extra problem in that future shifts in the Medicare benefit structure are likely, and some employers may have considerable latitude regarding contractual obligations. The later is firm-specific, but Medicare changes will affect all employees. Given current projections (see sections on Federal Budgets above and Sustainability below) it is more likely that Medicare spending will be restrictive, than expansive. Yet if we could confidently predict a cut in future Medicare spending, the effect upon retiree health benefits is not necessarily evident, and could well be very different in the short

versus long run. A freeze or cut in Medicare, given continuously rising medical costs, would probably lead to immediate calls for additional spending on retiree health benefits to make up some of the deficit. However, the long run effect of restricting Medicare might be a reduction in the medical cost trends for the elderly. Consider the historical evidence. Before the implementation of Medicare, per-person medical costs of the over 65 were about 50% higher than for 15-64 year olds. During the next three decades medical spending for the elderly rose to 350% above the average (Meara, 2003). Medicare clearly caused a tremendous rise in the intensity and expense of treatment for the old relative to the young. Thus it is reasonable to expect that a reduction in the rate of growth in Medicare relative to NHE might well cause some reversal, leading to a lower rate of cost growth among the elderly, and particularly among those 75-84 or 85+.

Summary (retiree benefits). Long-run medical cost trends will play a role in estimating future retiree health liabilities, but eligibility rules, cost-shifting, benefit modifications, caps and other factors are likely to become of overwhelming importance within any specific plan. Only special groups (municipal unions, industrial legacy retirees, executives) are likely to continue to experience rapid cost growth. Changes in Medicare funding have the potential to cause either offsetting or amplifying shifts in retiree medical payments, differing in the short and long run.

Sustainability, Affordability and Limits

- *Increased Spending on Health Care: How Much Can the US Afford? (*Chernew (2003).
- *Who's going broke? Comparing HC Costs in Ten OECD Countries. (*Kotlikoff 2005).
- *Medicare Reform: Fundamental problems: Incremental Steps. (*McClellan 2000).
- *Savings Needed to Fund Health Ins. and HC Expenses in Retirement.* (Fronstin 2006).
- *Forecasting Health Expenditures: Short, Medium & Long (long) Term. (*Getzen 2000a).
- *Long-Run Forecasting.* (Armstrong, 1985).

"Sustainability" has been variously defined as "long-run rates of growth no faster than the rate of growth in GDP," "GDP+1%," "GDP+2%%" and "growth in health expenditures that takes most of the growth in real GDP, but not so much that non-health consumption must be reduced." Concerns regarding sustainability arose first with regard to the Medicare program, as it became quickly clear that the rise in expense would far outpace growth in the sources of revenues. Indeed, it is possible to analyze federal budgets and conclude that most of the deficit since 1965 is due to excess Medicare & Medicaid cost growth. As noted in the section on Federal Budgets above, the Medicare trustees technical panels have not been able to achieve a consensus about what level of growth is sustainable, and in the most recent (2004) reports conclude that the term lacks any precise meaning or analytic content, and thus that discussions of "sustainability" should be replaced a presentation showing large and expanding deficits, along with alternative scenarios which might bring revenues and expenses back into balance. However, it becomes clear from reading the many papers on the future of health insurance and medical costs that some notion of a limit --be it a restriction on growth, a share of total income, or some other constraint--is relevant to any reasonable analysis of future spending. Some excess growth is expected, and can continue for a long time, but eventually the rate of growth must slow, perhaps match or even fall below the rate of growth in per capita income (and presumably thus also below the rate of growth in tax revenues).

> *"Healthcare spending is systemwide. The path we are currently on is the single largest fiscal challenge facing the country over the next several decades. We can grow out of it,*

can't tax our way out of it, and can't legislate our way out of it." Medicare Trustee John Palmer "(Dobias, 2007, p.16).

The possibility that higher rates of growth could be sustained by shifting more and more of the costs to individuals and private health insurance has been examined and largely rejected. The trend has been in the other direction, with government now accounting for 47% of expenditures -- well over half if tax subsidies are counted. The employer-based health insurance system is slowly unraveling, with fewer firms offering benefits, and many young and healthy individuals opting out to avoid premiums. The conundrum of rising productivity accompanied by falling real wages is most frequently blamed on the rising cost of health benefits. Employee benefit health insurance premiums have become a part of the problem, not the solution. Personal out-of-pocket payments are already considered a burden (identified, for example, as a leading cause of personal bankruptcy) and are likely to be reduced, rather than expanded to cover losses elsewhere. The term **"affordability"** is used most often to discuss limits on personal spending, and has variously been assessed as a percentage of income (perhaps 10%) or a fraction of financial wealth that could be spent in a peak year for medical expenses, with occasional discussions about affordability of particular categories such as pharmaceuticals or long-term care (Skinner 2007). Shifting the cost of benefits to employees has caused co-pays and deductibles to rise, increasing out-of-pocket payments for most families.

What has become increasingly clear is that while firms may sometimes reduce the cost of benefits by raising co-pays, deductibles and the employee premium contribution percentage, under no conditions can they cut wages or take-home pay. This limit becomes a constraint that is more and more binding and difficult to meet in current conditions of low productivity gains and low inflation. Moreover, the "no cuts" constraint is asymmetric across workers since the fixed costs of family health benefits are harder to carry among low-income employees earning $35,000 per year than among managers and professionals earning $85,000 a year or more. **Distributional** disparities are creating stress points where rising health care costs threaten to fracture the political economy of health care. Sustainability measured as a percentage of GDP is less of an issue that "who gets care" and "who pays?"

When routine medical costs are affordable to most families, and rarely amount to more than two or three times per capita GDP, gaps can be covered by charity, safety net providers, and free medical insurance for the poor. When medical costs rise above $10,000 per person (currently projected by the OACT to happen by 2012) such band-aids will no longer suffice to plug the holes, and the likelihood that a single parent low income family can afford premiums and out-of-pocket expenses that are likely to exceed half of take-home pay is not credible. The analytics are simple: By whatever measure, family premiums+payments of $1,000 per month (or more) is quite feasible for those earning six figures, but out of reach for someone earning two or three times minimum wage, even with a second job. Yet the American public believes in the value of medicine (see "Technology" above; Cutler 2006, Murphy and Topel 2006) and is willing to go to great lengths to make new medical technology available to all who need it. Indeed, a budget solution that rests on systematic discrimination by income or family status that reduces access by enough to make a real dent in aggregate costs is probably not politically acceptable right now, although it could be in the future.

####end####

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