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Documentation of Premium Construction in the Urban Institute's Health Insurance Policy Simulation Model, New York Version (HIPSM-NY)

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Overview

HIPSM premiums are constructed within the model in each iteration, based upon the underlying distribution of expenditures of the individuals enrolled in each particular insurance pool, the insurance market regulations applicable to that insurance pool, and an appropriate administrative loading factor. The premiums in each insurance market (employer by size, non-group) are also benchmarked to averages from state-specific data to ensure that overall levels of premiums are reflective of the most current knowledge we have of the costs of coverage in New York. As policy changes are introduced in the model, workers, non-workers, and employers make new decisions as a function of new incentives, insurance market rules, and coverage options, and the model re-computes premiums in each market and within each insurance pool as a function of these new coverage decisions. All post-reform results reflect fully-phased in effects in equilibrium (i.e., once decisions by all households and employers have settled down between iterations of the model).

Baseline Construction

Survey Data

Key information for the HIPSM baseline comes from the CPS. The CPS is a monthly household survey that collects nationally representative data on employment, income, demographic, and socioeconomic characteristics, as well as health insurance status. The CPS interviews households in the civilian non-institutionalized population, as well as members of the armed forces living in civilian housing units in the United States or on a domestic military base. From its interviewees in March each year, it collects detailed information on income and health insurance from the previous year. The core microdata file that defines HIPSM's population base is a pooled data set of the March 2009 and 2010 CPS Annual Social and Economic Supplement (ASEC). The March ASEC is the largest CPS data set, and is the main national source of demographic characteristics and insurance coverage used by many analysts (and the media).[1]

The survey generally samples more than 78,000 households and contains 200,000 sets of observations on individuals. Information on age, sex, race, and household relationship is collected. In addition to the usual labor force data, the March ASEC also collects information on income, migration, work experience, and noncash benefits.

For HIPSM-NY, only ASEC data from the state of New York are used, and the two years of data (roughly 20,000 observations) are re-weighted to reflect the estimated 2011 population composition in the state. The data are aged for population growth and changes in the expected distribution of insurance coverage and income as a consequence of the economic changes between the data years and 2011.

Baseline Health Care Expenditures

Heath expenditures by individuals and families are central pieces of information necessary for computing health insurance premiums, evaluating the health insurance options facing families, and assessing the costs of the components of the ACA. The CPS does not collect data on health care expenditures, so we statistically match health care expenditure data from individuals in the Medical Expenditure Panel Survey—Household Component (MEPS-HC) to individuals in the CPS. A number of adjustments to the MEPS data are made as well, and these are described below.

MEPS is a survey of individuals and families, employers, and medical providers across the United States that provides information about health care expenditures and health insurance coverage. There are two major components of MEPS. The Household Component collects data from individuals, families, and their health care providers, while the Insurance Component collects information on employer-based insurance from employers.

We statistically matched health care expenditures, unique health insurance variables, and health conditions from three years (2006–2008) of pooled MEPS-HC data sets to our core CPS file, matching MEPS individuals and CPS individuals by insurance coverage, demographic, and other common characteristics in the two data sets. All expenditures from the three years of MEPS data are expressed in 2008 dollars. Using a propensity-weighting approach, we assigned a MEPS observation to each CPS observation, and we then appended the health expenditure data and information on health status and health conditions from the matched MEPS individuals to the records of their matched CPS individuals. We then confirmed that health expenditures in the appended CPS file maintained the statistical distributions and relationships with other variables that exist in the original MEPS data. Because there are no state identifiers on the public use files of the MEPS-HC and because of the need to maintain sufficient sample size to do credible analyses, observations from the full national file are used to create HIPSM-NY. As is explained below, adjustments to state-specific benchmark premiums are used in order to ensure that differences in health care spending levels in New York state relative to the rest of the country are taken into account.

For each observation, we include expenditure data for seven service categories: hospital, physician, dental, other professional care, home health care, prescription drugs, and other medical equipment. We create these categories to be consistent with the National Health Accounts (NHA) Personal Healthcare Expenditures data, which are maintained by federal actuaries. According to Sing et al., compared to the NHA, MEPS routinely underestimates the aggregate insured costs associated with Medicaid and privately insured individuals.[2] To correct for this discrepancy, we use adjustment factors to increase Medicaid and privately insured dollars, with the factors consistent with the relative differences in the two data sets identified by Sing et al. We apply these factors to each observation in our data set that reported positive Medicaid and/or privately insured expenditures. We then inflated our expenditures to the year 2011 using the NHA's per capita growth in each expenditure category, assuming that recent average annual growth rates would persist between 2008 and 2011.

To adjust for any MEPS underreporting of the high-cost tail of the health expenditure distribution, we looked to the Society of Actuaries (SOA) High-Cost Claims Database. This comprehensive survey examined seven insurers and all of their claimants. It is designed to be representative of the national distribution of all claims to private insurers. We found that the 97th to 99th percentiles of private expenditures among the nonelderly in the MEPS data fell below the same percentiles in the SOA. The discrepancy ranged from less than 1 percent (97th percentile) to 13 percent (99th percentile). We used these discrepancies as adjustment factors for all privately insured individuals with private expenditures above the 97th percentile. In order to keep total health expenditures in our MEPS-appended CPS file consistent with the NHA totals following the SOA adjustment of the tail of the distribution, we decreased the private expenditures of the privately insured individuals in the lower portion of the distribution by a fixed percentage.

Uncompensated Care

Uncompensated care (donated or free care) associated with the uninsured is not fully captured by MEPS expenditure data. For each uninsured person, we now have estimates of out-of pocket health care expenditures and total expenditures were that person to receive private coverage. We lower the total expenditures under private coverage to capture the moral hazard effect of the additional out-of-pocket spending resulting from being uninsured. The result is an estimate of the total expenditures of the uninsured person. We then calculate the difference between these expected costs and the original out-of-pocket costs for each uninsured person. This difference is a person's uncompensated care. The estimates are calibrated to produce a total amount of uncompensated care consistent with the findings of Hadley et al.[3]

Spending Under Different Coverage Types

The same individual will incur different levels of health expenditures when insured differently (e.g., employer coverage versus Medicaid, or Medicaid versus uninsured). This is because out-of-pocket costs and costs covered by insurance will vary depending upon plan cost-sharing requirements (e.g., deductibles, copayments, out-of-pocket maximums) and benefits covered, effectively altering the price an individual will face when consuming medical care. The higher the out-of-pocket price faced, the less the individual is apt to consume. Thus, in order to understand the value of care an individual will obtain under various coverage options pre-and post-reform, we compute health care spending for each observation under several alternate "states" or statuses of health coverage: uninsured, insured by Medicaid/CHIP, insured under a typical comprehensive employer-sponsored insurance (ESI) package, and insured under a typical non-group (individual) package. In this way if an individual's coverage situation changes as a result of reform, we will have computed the appropriate level of health care spending for that individual in their new coverage situation based upon their characteristics, health status, and health conditions.

For the uninsured, we divide total spending into out-of-pocket and uncompensated care. For the other statuses, we divide spending into insured expenses and out-of-pocket costs. Each of our CPS observations is either insured or uninsured in the baseline. For the uninsured, expenditures in their uninsured state are obtained from the MEPS-HC, as was described above, but we need to estimate what they would spend if insured (an alternate "state" that may occur under reform). Conversely, we need to know what the insured would spend if they were uninsured. To simulate spending under insurance (and, conversely, under no insurance), we estimated two-part models using MEPS-HC data. For example, consider an uninsured person:

Step 1: Estimating the probability of having any health expenditures:

- *Probability of having any expenditures if privately insured* is computed using a sample of the privately insured and controlling for an array of socio-demographic characteristics, health status, and health conditions.
- *Probability of having any expenditures if enrolled in Medicaid* is estimated similarly, but using a sample of those reporting Medicaid coverage.
- *Uninsured individuals are deemed to have expenditures or not if they become privately insured or enrolled in Medicaid* by comparing the probabilities computed to a random number from a uniform distribution.

Step 2: For those deemed to have expenditures if insured in step 1, the change in total expenditures after gaining coverage is estimated as follows:

- *Expenditures if gaining private coverage* are computed using a sample of the privately insured incurring health care expenses and controlling for an array of socio-demographic characteristics, health status, and health conditions.
- *Expenditures if gaining Medicaid coverage* are computed similarly, but using a sample of those with Medicaid coverage.

We impute expenditures if uninsured and if enrolled in Medicaid for those with private coverage, and we impute expenditures if uninsured and if privately insured for Medicaid enrollees.[4]

Construction of Insurance Packages

At this point, each individual in the file has been assigned health expenditures consistent with having private coverage – some have been statistically matched on from MEPS-HC observations with similar characteristics and some have been imputed using the process described in the section: Spending Under Different Coverage Types. These total health expenditures, however, are reflective of the particular benefit package that the matched MEPS individual had at the time of the survey (in the case of those with statistical matches), or the average package of those with private insurance coverage (in the case of those with imputed expenditures). For example, if two identical people were given two different health insurance policies, one with a high deductible and one with a low deductible, the person with the low deductible would have total health expenditures that were higher than would the one with the high deductible. Higher out-of-pocket liability lowers the expected spending (an effect referred to as moral hazard). To remove as much of the benefit package effect on total spending as possible, we standardize spending to be consistent with a typical benefit package for the ESI market and one for the nongroup market based on data from the Kaiser Health Research and Educational Trust (HRET) for employer plans and NY specific information on non-group plans from the Department of Financial Services. In HIPSM-NY these typical benefit packages have the following characteristics:

- $550/$1100 deductible for single/family policies;
- 20 percent co-insurance;
- $2,500/$5,000 out-of-pocket maximum for single/family policies.

New York is atypical in that it has a standard benefit package in the standardized non-group market which makes the policies in the non-group market more comprehensive and similar to average employer-based policies than is seen in other states. Healthy NY benefit packages are not subject to the standard benefit package, however.

Each individual has his or her private health expenditures adjusted so that he or she has a calculated level of health expenditures consistent with each of the defined typical benefit packages.[5] Induction factors provided by actuaries are used to incorporate a behavioral response for those individuals/families who would have different levels of out-of-pocket spending under the standardized policies than they are assumed to have had at the time of the MEPS. Those with decreases in out-of-pocket expenses are presumed to respond by increasing use and total expenditures, while those with increases in out-of-pocket expenses are presumed to decrease use and total expenditures. High spenders (those observed to have high medical needs) will respond less to changes in out-of-pocket expenses than will those who are lower in the spending distribution.

Once such packages are created, they can be modified to achieve a given actuarial value (i.e., the average share of spending on covered benefits paid for by the insurer). For example, under the ACA, packages in the small group and non-group markets will include the same essential benefits but will differ in actuarial value due to different cost-sharing requirements. Also, today, average cost□sharing requirements in smaller group plans are higher than in large group plans. The actuarial adjustment factors mentioned earlier can be used to compute individual spending under alternative insurance packages that might be offered under reform.

Expenditures in HIPSM cannot be disaggregated into spending on individual benefits, such as pharmaceuticals or visits to particular types of providers. The process described above gives three benefit packages which can be adjusted to any actuarial value: an average comprehensive ESI package, an average non-group package, and Medicaid benefits. A bulletin has been issued by the US Department of Health and Human Services[6] that describes the options available to states in choosing their essential health benefits under the ACA, but at the time of this writing New York has yet to make such a decision. The available options are, however, consistent with current comprehensive ESI coverage, and so we construct exchange packages by taking the standard ESI package and adjusting it to the various actuarial value tiers. The relevant stop losses are also applied.

Aging of Data to the Current Year

The model as discussed above is based on the latest two years of available survey data (currently 2009 and 2010 CPS). We, however, present model results as if reform were fully phased in in 2011. In order to do this, we apply estimates from Holahan and Garrett to estimate the impact of more recent changes in unemployment rates on changes in employer coverage, public coverage, non-group coverage, and the uninsured over that period.[8] To project the unemployment rate for the current year, we use forecasts from the Congressional Budget Office (CBO), Blue Chip (a consensus of 50 private forecasters), and Economy.com. We make further adjustments to ensure consistency with Census estimates of population growth, by age and gender cell. Wages and income grow at rates consistent with the Consumer Price Index-Urban, and health care costs grow at rates of growth projected by the National Health Expenditure Accounts.

Correcting the Tail of the Income and Wage Distributions

Income and wages on the CPS are top□coded. Thus, the total income and distribution of high incomes are very different from tax data such as the Statistics of Income. While many health reform policies focus exclusively on lower-income families, other important factors such as the ESI tax advantage require getting the distribution of higher-income individuals right. We use the income distribution in the Statistics of Income (SOI) to modify the tail of the CPS income distribution so that it converges with the tail of the SOI distribution and the total income matches the total income of the United States according to tax data. A related adjustment is made to wages for the highest earners so that total wages in our data match tax data.

The Flow of a Policy Simulation

HIPSM coordinates behavior by iterating a sequence of steps. Each iteration involves a sequence of four stages. At the beginning of an iteration, the health insurance industry sets premiums for all available health insurance plans given information observed in the last period (or in the baseline for purposes of the first iteration) and any policy changes that become effective in that period. In the second stage, based on these premiums and information about their employees, employers decide whether to offer an employer-sponsored health insurance plan, and if so, the plan to be offered and the employees' cash wages.[9] In the third stage, individuals choose their optimal health insurance option given their available alternatives and associated premiums, income, and relevant tax incentives. Once the iteration is complete, the next period begins and the process repeats. Coverage decisions in the previous period are used to update premiums based on current risk pools, and so on. Iterations continue until coverage decision changes from the previous iteration fall below a specified level; in other words, until an equilibrium state has been reached.

The details of these stages are as follows:

Stage 1: Calculate Health Insurance Packages and Premiums

HIPSM calculates health insurance premiums using information on risk pools relevant to health insurance plans. For example, to calculate non-group premiums in the current period, we rely on information of people who bought a non-group health insurance plan in the last period, accompanied by information on any policy changes that may affect the risk pool in the current period.[10] This feature ensures that self-selection into a specific coverage type will be reflected in the premiums.

Under this mechanism, any policy change that affects individuals' health insurance decisions has the potential to affect premiums of all available coverage types. For example, a policy to expand public health insurance coverage will in general cause some people who formerly chose other types of coverage, such as non-group health insurance, to become insured under the public program. Given the change in non-group risk pools, non-group premiums will change accordingly.[11] Likewise, providing subsidized coverage in the non-group market and putting in place requirements that most residents obtain insurance coverage will tend to increase demand for non-group coverage (as well as other forms of coverage). If the increased interest in non-group coverage is from a population of individuals with lower average health care costs than pre-reform enrollees, the average costs of those covered in the non-group market post-reform will fall, as will average premiums.

For example, in the Standard Implementation policy option simulated using HIPSM-NY, with merged small group and non-group markets, small employer group size defined at less than or equal to 100 employees, and Medicaid eligibility level at 138 percent of the federal poverty level (no maintenance of effort for Family Health Plus Parents), the post-reform non-group market is very different from both the standardized nongroup market and Healthy New York. Most of the current nongroup enrollees end up with nongroup coverage post-reform, but they are a small minority of the total market. In Table 1, we show the characteristics of covered lives in the post-reform nongroup market, both inside and outside the exchange.

In all simulations done for the state of New York thus far, we assume that the state's pure community rating rules in the small group and non-group insurance markets will remain in place. In simulations that expand the small group market to employers of 100 or fewer workers (from the current 50 employee small group size) we extend the pure community rating rules to that expanded small group market.

Table 1. Demographic Characteristics of Non-Group Enrollees in New York, Under Reform

	Non-Group Enrollees (100 Merge)*				Non-Group Enrollees (100 Split)*			
	Post-Reform*				Post-Reform*			
	Non-Exchange		Exchange		Non-Exchange		Exchange	
	N	%	N	%	N	%	N	%
Total Population	**270,026**	**--**	**615,336**	**--**	**303,531**	**--**	**556,933**	**--**
Age Group								
<19	8,774	3.2%	18,085	2.9%	17,398	5.7%	9,024	1.6%
19-24	14,052	5.2%	82,368	13.4%	16,409	5.4%	77,982	14.0%
25-44	132,468	49.1%	263,084	42.8%	144,403	47.6%	242,788	43.6%
45-64	114,732	42.5%	251,799	40.9%	125,321	41.3%	227,139	40.8%
Gender								
Male	134,065	49.6%	307,054	49.9%	146,859	48.4%	277,299	49.8%
Female	135,959	50.4%	308,282	50.1%	156,672	51.6%	279,634	50.2%
Health Status								
Excellent, Very Good, or Good	242,905	90.0%	569,490	92.5%	272,551	89.8%	516,153	92.7%
Fair or Poor	27,119	10.0%	45,847	7.5%	30,981	10.2%	40,780	7.3%
Race/Ethnicity								
Hispanic	41,364	15.3%	140,838	22.9%	41,865	13.8%	132,940	23.9%
White (Non-Hispanic	181,209	67.1%	304,882	49.5%	201,382	66.3%	275,685	49.5%
Black (Non-Hispanic)	17,526	6.5%	101,062	16.4%	19,966	6.6%	96,828	17.4%
Other	29,925	11.1%	68,555	11.1%	40,318	13.3%	51,481	9.2%
Tobacco Use								
Non-Smoker	214,071	79.3%	443,944	72.1%	241,973	79.7%	398,522	71.6%
Smoker	55,953	20.7%	171,392	27.9%	61,558	20.3%	158,412	28.4%
HIU Income								
Under 200% FPL	25,858	9.6%	319,042	51.8%	42,166	13.9%	292,065	52.4%
200% - 400% FPL	41,340	15.3%	178,358	29.0%	53,738	17.7%	171,836	30.9%
Above 400% FPL	202,826	75.1%	117,937	19.2%	207,628	68.4%	93,033	16.7%
Average Total Costs ($)**	$9,189	--	$5,014	--	$8,367	--	$5,163	--

Source: *Urban Institute analysis, HIPSM 2011.*

Notes: *We simulate the provisions of the Affordable Care Act fully implemented in 2011.*

"100 Merge" refers to the simulation scenario where the small group market is defined as employers of 100 or fewer workers and the small group and nongroup markets are merged for premium rating purposes. "100 Split" refers to the scenario where the small group and non-group markets are kept separate for rating purposes and the small employer definition is 100 or fewer workers.

**Average total costs include those that are reimbursed by carriers, those paid out-of-pocket by the insureds themselves, and those paid by the federal government through cost-sharing subsidies to the low-income. The average costs are higher outside the exchange because those with current non-group coverage (a very high cost group) are assumed to have a stronger preference for non-exchange coverage post-reform, since they are already accustomed to purchasing coverage that way. Post-reform premiums will be computed consistent with ACA rules, however, by averaging together the reimbursable health care costs of those in the exchange and non-exchange markets as a single risk pool, making any difference in exchange and non-exchange enrollee costs irrelevant for premium determination purposes.

Calculation of Employer-Sponsored Insurance Premiums

We compute single and family ESI premiums faced by each employee and each firm for both standard and high-deductible ESI packages. We base our premium computations on the expenses of the covered lives within each synthetic firm.[12] Premiums are calculated based on a blend between the weighted averages of actual and expected insured costs. From these blended costs we calculate expected values for the individual firm and for ESI groups defined by firm size, industry, and self-insured status. From these blended and expected costs, an average insured cost is calculated that is a blend of the firm's average cost and the ESI group's average cost. An administrative load that varies by firm size and industry is then applied. The worker's share of premiums is then computed based on the firm contribution rates calculated previously. Our baseline national ESI premium estimates are calibrated to be compatible with New York specific premiums in the most recent MEPS-Insurance Component (MEPS-IC). Average premiums by firm size are calibrated by adjusting the actuarial value of ESI plans. Under reform, rating rules can change although, as noted previously, we assume that New York's pure community rating rules remain in place post-reform. Medical Loss Ratio (MLR) requirements cap administrative loads at 20 percent, though this is binding only for the smallest firms. Small group is also defined as employers of 100 or fewer workers by the year 2016, instead of the pre-ACA norm of 50 or fewer workers. These changes affect the type of rating factors that HIPSM uses and the definition of employer group types and their associated risk pools.

We also simulate pre-reform enrollment in Healthy New York's group coverage option based upon characteristics of enrollment provided in the Healthy New York annual report. Enrollment in this program must be simulated since individuals do not have an opportunity to report Healthy NY enrollment specifically on the CPS. Healthy NY group coverage enrollees were drawn from those reporting ESI coverage.

Calculation of Non-Group Premiums

We compute single and family non-group premiums in each iteration. The initial premiums computed to begin a simulation are based on insured expenditures of those insured in the non-group market at the baseline. In the following iterations, those individuals simulated to enroll in non-group coverage in the immediately preceding period are used. We model the non-group market regulations and rating rules specific to New York, and simulate enrollment in non-group coverage through the Healthy NY program based upon characteristics of enrollment data provided in the Healthy NY annual report. Simulated enrollees in Healthy NY non-group coverage are drawn from CPS individuals reporting non-group enrollment.

Baseline national non-group premium estimates are calibrated to data provided to us by the state Department of Financial Services.

Merged Versus Separate Small Group and Non-Group Markets and Risk Adjustment

In simulations where the non-group and small group markets are merged, the two markets are treated as one large risk pool. In simulations where the markets are not merged, they remain as two separate risk pools. Post-reform, we simulate perfect risk adjustment both within the exchange market(s) and across the exchange and non-exchange small group and non-group markets. If the markets are merged, we risk adjust the combined small group and non-group markets, otherwise risk adjustment is done across all non-group plans and separately across all small group plans.

HIPSM does not simulate competing insurers. Insurance plans of different characteristics and actuarial value are simulated, and employers and individuals make choices among the options available to them, but there is no simulation of multiple carriers offering the same types of plans and competing for their own market share.

Stage 2: Employers' Decisions to Offer Health Insurance

In HIPSM, employers take into account their employees' gains or losses from having a health insurance offer and perceived offering costs to decide whether to make an offer. The costs of offering coverage are calculated as:

- The employers' premium contributions;
- Plus any assessments to which the employer is liable under reform based on whether or not it offers coverage deemed affordable to its workers;
- Plus a fixed administrative cost to employers of offering ESI;
- Minus any tax incentives due to employers' tax exclusions; and
- Minus any employer tax credits under reform.

Employers (HIPSM's synthetic firms) will make an offer when they anticipate that (i) the employees' combined value of the offer exceeds the offering costs, and (ii) there are enough employees who gain from having the offer.[13] By an individual worker's value of the offer, we mean the difference in his or her family's expected utility with and without an offer. The utility function is described in Stage 3 below. Our utility is dollar-valued, so it can be summed over workers. We assume that employers distribute offering costs back to their employees in the form of wage offsets. That is, employees' cash wages are lower when they have an employer-provided health insurance offer.[14] This wage change is not individual; employer costs and savings are distributed across the wages of all workers.[15]

Choice Between Exchange and Non-Exchange plans

Under the ACA, small employers will have the choice of offering coverage through the Small Business Health Options Program (SHOP) exchange or through coverage offered outside it. The same benefit tiers and essential benefits are required across the exchange and non-exchange markets, and risk adjustment across them is required. The default value of the exchange administrative load is 15 percent in our simulations. Administrative loads outside the exchange vary in our model by firm size and industry, up to the state's current Medical Loss Ratio requirement. Loads are generally above 15 percent for firms below 50 and less than that for firms above 50 outside the exchange.

Choice between non-group coverage inside and outside the exchange is governed by the difference in expected utility between the plans and a latent preference term whose distribution can be set to simulate behavior such as inertia, making individuals already purchasing coverage in the pre-exchange non-group market less likely to switch to the exchange. Subsidies for premiums (non-group market and small group market, and cost sharing in the non-group market) are available only in the exchange, and eligibility for these will change the costs facing potential purchasers. Note that, absent subsidies, we assume administrative costs create the only difference in expected utility between the exchange and non-exchange plans, assuming perfect risk adjustment. By default, we assume full risk adjustment, as that is the intent of the law. When more regulatory guidance is available on exactly which risk adjustment methodologies will be used and their effectiveness is assessed, we will be able to implement less than full adjustment between the exchange and non-exchange plans as an option.

Stage 3: Individuals' Optimal Health Insurance Decisions

We adopted a utility-based approach to modeling individual and family demand for health insurance coverage. With this approach, workers value different insurance options based on premiums, expected out-of-pocket payments, risk of high out-of-pocket expenditures, and how much they value health care. Workers convey their valuation to employers, who decide whether and what to offer their workers based on whether the sum of the workers' valuations for an option is greater than its cost. We model individuals as being in one of four possible insurance coverage states—ESI, non-group coverage, public coverage, or uninsured. We allow both high-deductible plans and more comprehensive coverage under the ESI and non-group options.

Health Insurance Units. A health insurance unit is defined as a collection of individuals whose health insurance decisions are interrelated and cannot be separated distinctly. A health insurance unit is classified into one of the following four types: (i) single without dependents, (ii) single with dependents, (iii) married couple without dependents, and (iv) married couple with dependents. Dependents are defined as individuals who can obtain health insurance coverage through a parent's policy.[16]

Utility Functions. The utility functions are the metric for valuing different insurance options available to individuals and health insurance units. The value of each type of coverage takes into account (1) out-of-pocket health care expenses; (2) premiums; (3) the uncertainty of out-of-pocket health care expenses; and (4) the value of differences in the amount of health care consumed when insured vs. uninsured, and the comprehensiveness of coverage a plan provides. The utility functions also capture aspects of family preferences including aversion to public program participation (e.g., due to welfare stigma) and socio-demographic characteristics. Key inputs to the utility calculations include the expected total and out-of-pocket health care spending that individuals and health insurance units would incur under each of the health insurance options, as well as the variance of expenditure under each option. Our utility u is a function of disposable income (C), health care spending paid out-of-pocket (m), and health care spending paid for by insurers, the government, or uncompensated care (s). The function has the following mathematical and economic properties:

1) Utility is additively separable into a function of disposable income and a function of health care spending, whether out of pocket or other.
2) Both individuals and firms exhibit constant relative risk aversion (CRRA). Whereas several papers in the literature use absolute risk aversion (ARA), HIPSM uses CRRA in order to achieve decreasing absolute risk aversion (DARA).[17,18,19] We chose this for the following reasons:
   - As is well known in the literature, DARA incorporates two theoretically desirable behaviors. First, not only does the marginal utility of wealth decrease with wealth, but the percentage decrease also decreases. Second, the willingness to tolerate risk varies directly with wealth.
   - Many of the studies that chose constant ARA were based on data from a limited income range (e.g., the Rand Health Insurance Experiment). HIPSM uses income and wages adjusted to match SOI data from tax returns in its utility computations. The resulting amounts are not top-coded. We therefore model a much larger range of wealth.
   - The utility model in HIPSM is not used only for individual health insurance units. Sums of health insurance unit utility are the basis of the utility functions for firms. With constant ARA, there is no benefit to the pooling of risks. This is why DARA utility functions are generally chosen for modeling insurer behavior.[20]
   - Beyond DARA, there is significant empirical evidence in support of CRRA.[21,22]
3) We use the standard form of a CRRA utility function for risk aversion constant, $\sigma \neq 1$, which is generally set to 2, e.g.,
$$u(C) = \frac{C^{1-\sigma}}{1-\sigma}$$
4) The following elasticities are constant: $\left.\frac{\partial u}{\partial C}\right/\frac{\partial u}{\partial m} \equiv \gamma_m$ $\left.\frac{\partial u}{\partial C}\right/\frac{\partial u}{\partial s} \equiv \gamma_s$

   Further, these do not depend on the health insurance option under consideration. This is fairly standard in the literature.
5) Out-of-pocket and insured costs are valued differently, i.e. $\gamma_m \neq \gamma_s$. This is an important component of some models in the literature,[23] but is absent from others. We believe the difference in valuation between costs paid directly by the health insurance unit and those paid on its behalf to be important. Based on a review of the literature, we set the out-of-pocket elasticity to 1 and the insured cost elasticity to 0.5.

6) The coefficients of relative risk aversion are the same for C, m, and s. Different estimates of this coefficient in different papers were done for different types of risk with comparable results.[25,26] Our choice of coefficient is within the ranges estimated. Empirical estimates of the coefficients for m and s would be very difficult, and there is no a priori reason why they should be substantially different from the coefficient for *S*.

7) We must be able to aggregate measures of individuals' utility to a group utility for purposes of computing the best available option for health insurance units and for employer groups. In particular, the utility of a firm can be represented by either the mean or median of the utilities of its workers modified by the overall costs of offering coverage.

Refinement of Utility Measures and Benchmarking to Behavioral Parameters from the Literature. Because our method converts utilities to dollar values, we can examine whether the valuations that families have for various insurance options are reasonable. We adjust the utility values for individuals by adding a latent preference term so that the baseline insurance coverage choice that they make in a HIPSM simulation is consistent with what they are observed to have chosen in the core data. This adjustment captures unobserved reasons why people might not choose the coverage type that appears to be their best option given what we can observe. We continue to refine our utility parameters and components so that the model will reflect what is known about the sensitivity of workers' behavior to different incentives such as price responsiveness to changes in premium.

ESI Price Elasticity. We use the following elasticity targets by firm size, drawn from the literature.[27]

Firm size	Elasticity
<10	-1.16
10–25	-0.45
25–50	-0.4
50–100	-0.3
100–500	-0.21
500–1,000	-0.047
1,000+	Not available from the literature.

Nongroup Price Elasticity. For the price responsiveness of nongroup coverage, we use calculations and targets introduced by CBO.[28] We separately calibrate single and family coverage by income group.

Public Coverage Expansions. HIPSM models the effects of additional outreach and the stigma of public coverage on enrollment for Medicaid and CHIP. Expansions of public programs have often led to additional enrollment from those who were already eligible. Large expansions, such as CHIP or health reform in Massachusetts, are often accompanied by major outreach efforts that alter societal attitudes toward public coverage. Expansions of coverage in HIPSM increase take-up rates for those previously eligible for public programs, and our modeling is calibrated to three policy simulations. First is an expansion of Medicaid to 400 percent of the federal poverty level. We have targets for take-up of both those newly made eligible and those eligible under pre-reform rules but not enrolled; these are distilled from the literature and expert consensus within the Health Policy Center. Second is a Massachusetts-like reform, duplicating the gains in coverage that were observed in that state. Third is a simulation of opening Medicaid eligibility to all, but without an individual mandate. This third simulation is an extreme one, in which essentially free, comprehensive coverage is open to all. No social stigma attaches to such coverage, so take-up rates should be very high. These are three points on a continuum of expansions that can be modeled.

Public Coverage Take-Up. We calibrate the behavior of our model so that a standard expansion of Medicaid and CHIP achieves take-up rates consistent with the empirical literature. These baseline take-up rates for the uninsured are between 60 and 70 percent, depending on person type and income group. The ACA contains

important provisions that would increase take-up. States are required to establish a web site capable of determining eligibility for Medicaid and automatically enrolling eligibles. Hospitals would be able to make presumptive eligibility determinations. There would be other new requirements for simplifying enrollment and renewal of Medicaid and CHIP. We estimate a take-up rate of about 73 percent for the uninsured who become newly eligible under the ACA. This rate is higher than the baseline rate due to outreach and enrollment simplification provisions in the law, as well as a modest indirect effect of the individual mandate as observed in health reform in Massachusetts.

Crowd-Out. To ensure reasonable levels of displacement of private coverage by expanded public insurance (a.k.a. crowd-out), we calibrate the decrease in private coverage as a share of total increase in Medicaid enrollment at 22 percent, following the literature.[30]

Individual Mandates. To model the individual mandate, we begin with the baseline HIPSM model, in which behavior is calibrated to agree with results from the empirical health economics literature. The resulting model behavior is applicable for a voluntary health insurance regime. To model behavior under an individual requirement to obtain insurance, we rely heavily on empirical evidence from the only similar requirement already implemented, the Massachusetts reforms.[31] Our simulation of how behavior would change under the mandate has three components:

1) *The applicable financial penalty*. A computation of whether the penalty is applicable and the amount of the penalty as defined by the law (i.e., the fully phased in amount discounted to present dollars).

2) *An additional "disutility" of not complying with the mandate*. The mandate is more than a dollar amount, it is a legal requirement. Desire to comply with the law, or at least to avoid enforcement and the stigma of noncompliance, can lead to behavioral responses much stronger than the amount that the nominal penalty would suggest, as appears to be the case in Massachusetts. The mandate has the effect of making being uninsured less desirable. We operationalize this in the model by applying an additional "psychic penalty" to being uninsured.[32]

3) *A relatively small "spillover" disutility of being uninsured on populations not bound by the mandate*. The mandate in Massachusetts was also associated with an increase in coverage among those not actually bound by the mandate (those for whom no penalty for noncompliance would apply). We assume that this association was driven, in part, by a spillover effect of the mandate by those who either mistakenly assumed they were subject to a penalty, or who reacted to a new social norm to have coverage. People may make judgments about whether they will lose their mandate exemption in the future due to rising income during the course of a year. However, for those exempt from the mandate, the amount of additional disutility of being uninsured is far smaller than for those bound by the mandate.

Individual and Family Decisions. Once each coverage option (including being uninsured) for each individual and family has been valued, HIPSM can make enrollment decisions among the coverage options available to each. For example, in our simulation of the ACA, a single adult can choose among the following:

- No insurance;
- Medicaid/CHIP (if eligible);
- ESI (if offered), may be in exchange or outside of exchange, depending upon employer decisions;
- Non-group
    - Exchange
        - ◊ Subsidized coverage (if eligible)
        - ◊ Benefit tiers: bronze, silver, gold, platinum
    - Outside the exchange
        - ◊ Benefit tiers: bronze, silver, gold, platinum

Coverage decisions for families are more complicated. HIPSM does not model all possible combinations, but the following are modeled:

- All family members either uninsured or enrolled in public coverage;
- Family policy purchased
    - ◊ ESI and non-group options as shown above
    - ◊ Some family members may enroll in Medicaid or CHIP
- One or two single policies purchased by adults
    - ◊ ESI and non-group options as shown above
    - ◊ The remainder of the family is either uninsured or enrolled in public coverage

Choice between exchange and non-exchange plans. This choice is governed by the same factors as the choice between exchange and non-exchange in the small group market discussed above.

As noted earlier, policy changes may change coverage options available to individuals and employers (e.g., exchanges are introduced, Medicaid eligibility rules change, employers change offer decisions, etc.) and the policy changes may also change the value of different options for different people (e.g., as subsidies are introduced, premiums change, small group definition changes, etc.). HIPSM takes all of these changes into account and allows coverage decisions, risk pools, and premiums to adjust as a consequence.

Limitations

While behavior within HIPSM is calibrated to the best empirical economic literature on employer and household responses to price changes and the availability of new coverage options, some behavioral decisions are more uncertain than others. The split between exchange and non-exchange enrollment in small group coverage carries particular uncertainty. Although it is modeled here as if eligible employers are essentially neutral between exchange and non-exchange coverage at the same price, the actual decision by small employers will depend upon a number of unknowns. These include how small group plans will differentiate their offerings inside and outside the exchanges (states can require that the offerings be uniform, but this is not required by the ACA), whether states will make all regulatory rules in and out of the exchange uniform in this market, the effectiveness of the risk adjustment methodology, the role of brokers, and so on.

At this time, HIPSM does not model changes in employer contributions to workers' coverage or an employee choice option in the SHOP exchange. In addition, the simulations of health reform assume a fully effective risk adjustment system, while the actual system is likely to fall short of that ideal.

As the regulations associated with the ACA are being released on a rolling basis, some uncertainties about the final rules remain. To the extent that rules emerge that are different than expected, the results could be affected. One example is the final treatment of affordability computations, subsidy eligibility, and penalty exemptions for family members of workers with affordable employer-based insurance offers. Here we have simulated results using the interpretation of the Joint Committee on Taxation that affordability is based on single coverage.[33]

Endnotes

1. The American Community Survey (ACS) has a much larger sample, but lacks data such as firm size and many detailed income components used in the construction of the HIPSM pre-baseline data.

2. M. Sing, J. S. Banthin, T. M. Selden, C. A. Cowan, and S. P. Keehan, "Reconciling Medical Expenditure Estimates from the MEPS and NHEA, 2002," Health Care Financing Review 28(Fall 2006): 25–40. Also, T. M. Selden and M. Sing, "Aligning the Medical Expenditure Panel Survey to Aggregate U.S. Benchmarks," Agency for Healthcare Research and Quality, Working Paper No. 08006, July 2008,http://gold.ahrq.gov/projectsearch/staff_summary.jsp?project=IM05209, accessed June 28, 2010.

3. Jack Hadley, John Holahan, Teresa Coughlin, and Dawn Miller, "Covering the Uninsured in 2008: Current Costs, Sources of Payment, and Incremental Costs," Health Affairs Web Exclusive, August 25, 2008.

4. Similar work in the past has helped UI estimate the costs of uninsurance in many states and nationally, and what savings would occur after health coverage reform. See for example: John Holahan, Randall R. Bovbjerg, and Jack Hadley, Caring for the Uninsured in Massachusetts: What Does it Cost, Who Pays and What Would Full Coverage Add to Medical Spending? (Boston, MA: Blue Cross Blue Shield of Massachusetts Foundation, November 16, 2004), http://bluecrossfoundation.org/Policy and Research/Initiatives/Roadmap to Coverage.aspx and http://www.urban.org/url.cfm?ID=1000981.

5. Our computation of moral hazard throughout the model is based on analysis by Actuarial Research Corporation.

6. Center for Consumer Information and Insurance Oversight. "Essential Health Benefits Bulletin," December 16, 2011. Available at: http://cciio.cms.gov/resources/files/Files2/12162011/essential_health_benefits_bulletin.pdf

7. The bulk of project work for the state of New York was done in 2011. HIPSM will be updated to 2012 in future work.

8. John Holahan and Bowen Garrett, Rising Unemployment, Medicaid and the Uninsured (Washington, DC: The Urban Institute, 2009).

9. Worker wages adjust to reflect changes in decisions employers make about their contributions to employer-based insurance. Consistent with the economic literature, HIPSM employers "pass-back" their costs for employer-based coverage to workers in the form of reduced wages.

10. To be specific, we predict who would have bought a non-group health insurance policy last period had the policies effective this period been in effect last period.

11. If the expansion results in higher-than-average-cost people leaving the non-group market, the updated premiums will be lower. Lower premiums then induce more people into the non-group market, and the premiums may increase if the new enrollees are of higher than average cost. The adjustment process will go on until an equilibrium has been reached.

12. Construction of synthetic firms will be described in the full documentation.

13. We built in an inertia factor that can be switched on to slow down changes in offering decisions.

14. We also built in an inertia factor that can be switched on to slow down wage-offset adjustments.

15. Jonathan Gruber, "The Incidence of Mandated Maternity Benefits," The American Economic Review 84(3) (1994): 622–41.

16. For example, a married couple with children who are all under 19 is considered a health insurance unit. Prior to implementation of the ACA in 2010, only adult children who were full-time students between the ages of 18 and 23 could obtain private health insurance through a parent's policy. Today, adult children under age 26 can obtain coverage as dependents, regardless of student status. Because the CPS is a household survey, only those dependents living in the home are included; consequently, HIPSM's health insurance units only include children living in the home.

17. Roger Feldman and Bryan Dowd, “A new estimate of the welfare loss of excess health insurance,” The American Economic Review 81(1) (1991): 297–301.

18. Daniel Zabinski, Thomas M. Selden, John F. Moeller, and Jessica S. Banthin, “Medical savings accounts: microsimulation results from a model with adverse selection,” Journal of Health Economics 18 (1999) 195–218.

19. Sherry Glied, “Health insurance expansions and the content of coverage: Is something better than nothing?” Forum for Health Economics & Policy 6 (2003): Article 4.

20. Gary G. Venter, “Utility with decreasing risk aversion,” Casualty Actuarial Society, 1983 Discussion Paper Program.

21. Pierre-Andre Chiappori and Monica Paiella, “Relative Risk Aversion is Constant: Evidence from Panel Data,” Discussion Paper No. 5 (Naples, Italy: University of Naples, Department of Economic Studies, 2008).

22. George G. Szpiro, “Measuring Risk Aversion: An Alternative Approach,” RE Stat [[spell out title]]68 (1986): 156–59.

23. Glied, 2003.

24. Zabinsky, Selden, Moeller, and Banthin, 1999.

25. Szpiro, 1986.

26. Irwin Friend and Marshall E. Blume, “The demand for risky assets,” American Economic Review 65 (1975): 900–22.

27. Linda Blumberg, Len M. Nichols, and Jessica S. Banthin, “Worker Decisions to Purchase Health Insurance,” International Journal of Health Care Finance and Economics 1 (2001); L. Nichols, L. Blumberg, P. Cooper, and J. Vistnes, “Employer Decisions to Offer Health Insurance: Evidence from the MEPS-IC Data,” Paper presented to American Economic Association meetings, New Orleans, LA, 2001; J. Gruber and M. Lettau, “How Elastic Is the Firm’s Demand for Health Insurance?” Journal of Public Economics 88 (2004): 1273–93.

28. Congressional Budget Office, The Price Sensitivity of Demand for Nongroup Health Insurance, Background paper (Washington, DC: Congressional Budget Office, August 2005).

29. See, for example, Bowen Garrett, John Holahan, Allison Cook, Irene Headen, and Aaron Lucas, The Coverage and Cost Impacts of Expanding Medicaid (Washington, DC: The Urban Institute, 2009), http://www.kff.org/medicaid/upload/7901.pdf.

30. D. M. Cutler and J. Gruber, “Does public insurance crowd out private insurance?” The Quarterly Journal of Economics 111: 391–430.

31. Sharon K. Long, Allison Cook, and Karen Stockley, Access to Health Care in Massachusetts: Estimates from the 2008 Massachusetts Health Insurance Survey (Washington, DC: The Urban Institute, 2010), http://www.urban.org/url.cfm?ID=1001403.

32. Behavior in HIPSM is modeled using an expected utility framework. This “penalty” is thus the disutility of not complying with the law.

33. Joint Committee on Taxation, “Technical Explanation of the Revenue Provisions of the ‘Reconciliation Act of 2010, as Amended,’ in Combination with the Patient Protection and Affordable Care Act” (JCX-18-10, March 21, 2010).