



June 19, 2018

Updating CBO's Health Insurance Simulation Model (HISIM)

Presentation at the Bipartisan Policy Center

Jessica Banthin, Deputy Assistant Director,
Health, Retirement, and Long-Term Analysis Division

Alex Minicozzi, Unit Chief, Health Insurance Modeling Unit

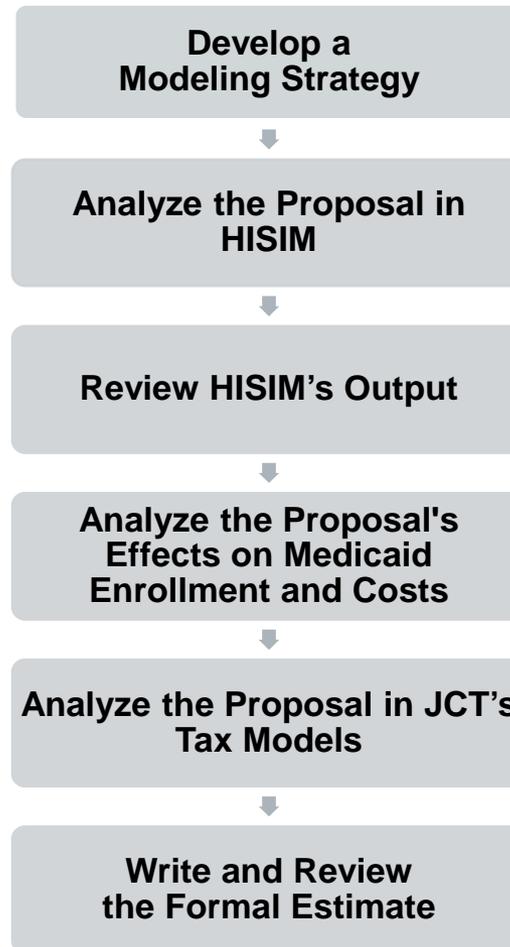
Overview of HISIM

What Is HISIM Used For?

HISIM generates estimates of health insurance coverage and premiums for the population under age 65.

The model is used to help develop baseline projections, which incorporate the assumption that current law generally remains the same, and also to model proposed changes in policies that affect health insurance coverage.

How Does CBO Use HISIM to Help Estimate the Cost of Proposals Affecting Health Insurance Coverage?



Step One: Develop a Modeling Strategy

In reviewing the proposal, CBO and the Joint Committee on Taxation (JCT)

- Read the legislative language in the context of current law,
- Identify how the proposal could affect the federal budget and sources of health insurance,
- Project potential actions by states under the proposal,
- Identify what regulations and infrastructure would need to be in place to implement the proposal, and
- Consider how quickly stakeholders would be able to respond to the proposal and how those responses might change over time.

Step Two: Analyze the Proposal in HISIM (Part 1)

CBO and JCT estimate changes in health insurance coverage and changes in premiums with HISIM—along with other models as needed.

HISIM models how individuals' and employers' choices about coverage might change on the basis of the relative price and generosity of the different health insurance options available.

The model incorporates a wide range of information—drawn from administrative and survey data—about a representative sample of individuals and families, including their income, employment, health status, and health insurance coverage.

Step Two: Analyze the Proposal in HISIM (Part 2)

When modeling a proposal with HISIM, analysts first set values for variables that are based on the proposal's specifications, such as changes in subsidies, tax penalties, or plans' characteristics.

Because HISIM simplifies how individuals and employers make coverage choices, CBO and JCT must then additionally account for complex aspects of the proposal that would affect

- States' behavior,
- The timing of individuals' and employers' responses, and
- Insurers' participation and market stability.

Step Two: Analyze the Proposal in HISIM (Part 3)

CBO and JCT use economic theory, historical evidence, and feedback from outside experts to evaluate the likelihood that insurers would participate in the nongroup market under the proposal. The agencies integrate the results of those assessments with HISIM's results.

If the proposal includes changes that would make the stability of the marketplaces more uncertain, CBO and JCT incorporate that information into their projections of premiums.

The agencies also consider whether HISIM's results show that premiums for certain groups would enter an unsustainable upward spiral.

Step Three: Review HISIM's Output

HISIM's output consists of changes in coverage and changes in premiums. CBO and JCT usually examine the changes in coverage by income group and source of coverage.

A dozen or more analysts review HISIM's output, first for a representative year and then for the entire 10-year projection period.

HISIM's output does not represent the final estimate for a proposal because

- HISIM is not well suited to model certain aspects of some proposals (in which case other models are used to analyze those aspects) and
- The proposal's budgetary effects are estimated by the Medicaid cost and coverage model and JCT's tax models, using HISIM output.

Step Four: Analyze the Proposal's Effects on Medicaid Enrollment and Costs

CBO's Medicaid cost and coverage model uses HISIM output (estimated changes in coverage) to determine the proposal's budgetary effects on Medicaid.

It does so on the basis of an analysis of historical per capita spending—yielding different per capita costs for different groups of people, depending on why they are eligible for Medicaid.

Step Five: Analyze the Proposal in JCT's Tax Models

Subsidies for coverage purchased through the nongroup and employment-based markets, as well as penalties associated with the individual and employer mandates, are implemented through the Internal Revenue Code.

JCT uses its tax models to determine how the changes in coverage and premiums produced by HISIM affect tax liability. Examples include

- Changes in the total cost of premium tax credits for eligible taxpayers purchasing coverage through the nongroup market and
- Changes in the share of employees' compensation that is taxable resulting from changes in the number of them enrolled in health insurance through their employer.

Step Six: Write and Review the Formal Estimate

All cost estimates go through extensive internal review by a group of analysts, senior staff, and managers from CBO and JCT. The review ensures that the final point estimate represents the middle of the distribution of potential outcomes. CBO and JCT strive to

- Write a clear explanation of the proposal's net budgetary effect and effects on coverage and premiums and
- Make the estimate accessible by providing context, explaining technical terms, and using tables, graphs, and figures.

But CBO and JCT make no recommendations about policy choices.

The New HISIM

Why Update HISIM?

The new model responds to continued Congressional interest in understanding the effects of legislative proposals that significantly affect health insurance coverage by

- Incorporating new data into early stages of the modeling process,
- Better accounting for consumers' selection of types of insurance plans, and
- Allowing easier simulation of new insurance products.

The new model is in a development-and-testing phase.

Incorporating New Data Into HISIM

The new model's base data are from the Current Population Survey (CPS) and were collected in years after the implementation of the Affordable Care Act (ACA).

Tax data on the earnings of employees within firms (records from Form W-2 about individuals linked to records from Form 941 about firms) allow the new model to construct improved “synthetic firms.”

Also, more detailed administrative data on coverage in the marketplaces established under the ACA are incorporated into the model at an earlier stage and thus allow it to more accurately reflect patterns of enrollment.

Accounting for Consumers' Selection of Plans

In the new model, individuals and families sorted into health insurance units (HIUs) choose health insurance coverage by maximizing their expected utility.

Each individual has an imputed health spending distribution (which shows the probability that the individual will spend certain amounts on health care during a year).

Employers decide what kind of coverage to offer, if any, on the basis of their workers' average preferences.

Coworkers within synthetic firms are sampled from clusters of similar firm types.

Accounting for Consumers' Selection of Plans (Continued)

In the marketplaces, enrollees can select one of three types of plans (bronze, silver, and gold).

In the employment-based market, firms can choose to offer one of three types of plans (HMO, PPO, and HDHP) on the basis of their employees' preferences.

HMO (health maintenance organization): Plan with a low deductible and tight management of enrollees' spending

PPO (preferred provider organization): Plan with a medium-size deductible and loose management of enrollees' spending

HDHP (high-deductible health plan): Plan with a high deductible and loose management of enrollees' spending

Allowing Easier Simulation of New Insurance Products

In the new model, insurance plans are characterized by four parameters: deductibles, predeductible benefits, coinsurance rates, and maximum out-of-pocket payments.

Individual health spending distributions allow better modeling of products that are medically underwritten.

Final estimates are at the national level, but state-level regulations can be modeled more accurately than before, because CPS data provide reliable estimates at that level for most states.

When Will the New Model Replace the Current One?

The new model will be used to help develop CBO's spring 2019 baseline projections and subsequent cost estimates.

The model's current development-and-testing phase includes study by a technical review panel and the publication of documentation.

CBO is incorporating feedback obtained during presentations such as this one.

The current model will serve as a point of reference in 2019.

How Will the New Model Change CBO's Cost Estimates?

Between now and the publication of the spring 2019 baseline, CBO will examine how the current model's estimates of effects on health insurance coverage differ from the new one's. At this point, it is too early to tell.

Underlying relationships among individuals, families, employment, income, and insurance coverage are different in the new model because of new data, so the new model may yield different coverage decisions and budgetary costs—just as the technical improvements that CBO makes to its models every year have yielded differences.

Also, the new model simulates more types of decisions than the current model does.

What remains the same, even when CBO updates its models, is its reliance on evidence. The new model, like the current one, will be aligned with the latest available evidence about consumers' and employers' responses to health insurance subsidies.

The New Model's Specifications

The Two Components of a Microsimulation Model

Microdata. In the new HISIM, these are detailed observations about individuals and families and the relationships between key variables (such as income, health status, employment status, and insurance coverage).

Simulation of Behavior. The new model uses theoretical and empirical research to structure simulations of how those individuals and families would respond to changes in economic conditions and changes in law.

The Source of the Microdata

The base data are from the CPS. Those data have several advantages:

- They were collected in years after the implementation of the ACA.
- They are a large, representative data set for the U.S. noninstitutionalized population.
- They constitute reliable, timely information about income, health status, employment status, and insurance coverage.

Adjustments to the Microdata

The microdata were edited to align certain variables with information from higher-quality sources. Those variables included

- Medicaid coverage,
- Firm size,
- Self-employment income, and
- Whether employers offered insurance.

CBO also made some imputations to certain variables, including

- The characteristics of employers' insurance offers (the type of plan offered and the employers' contribution),
- Marginal tax rates, and
- The health spending distribution for each individual.

Synthetic Firms

In the new model, a synthetic firm is constructed for each worker in the data. The synthetic firm consists of a set of randomly drawn coworkers matching a distribution of age and earnings based on that worker's profile.

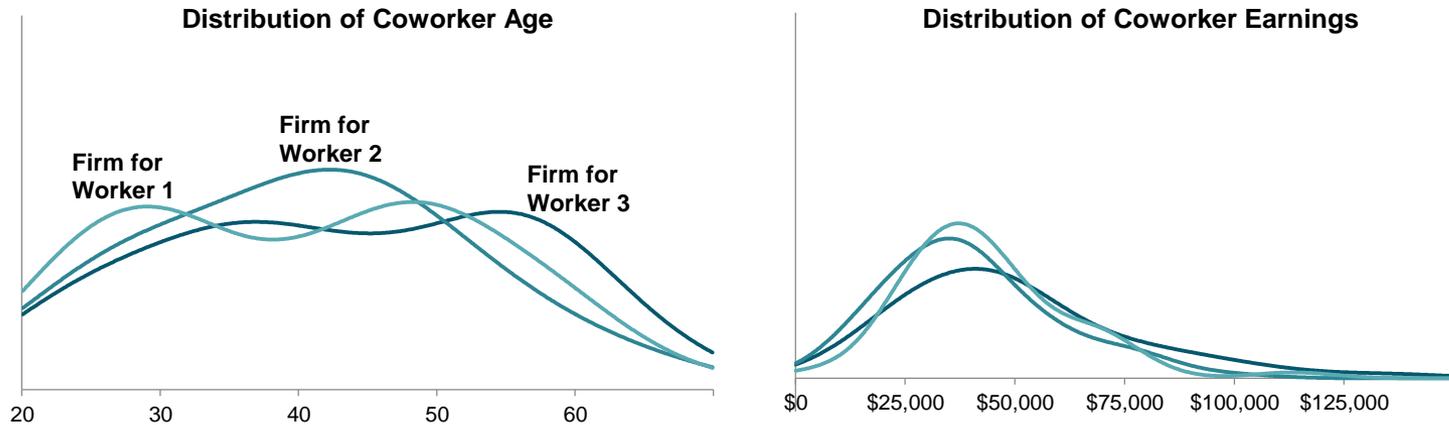
Newly accessible administrative tax data (Form W-2s and Form 941s) link information about earnings and age for employees of the same firm.

Workers with the same profile can be assigned to many different types of synthetic firms. For example, a firm could consist of mostly young, low-earning employees or employees, or it could have employees with a broad mix of ages and earnings.

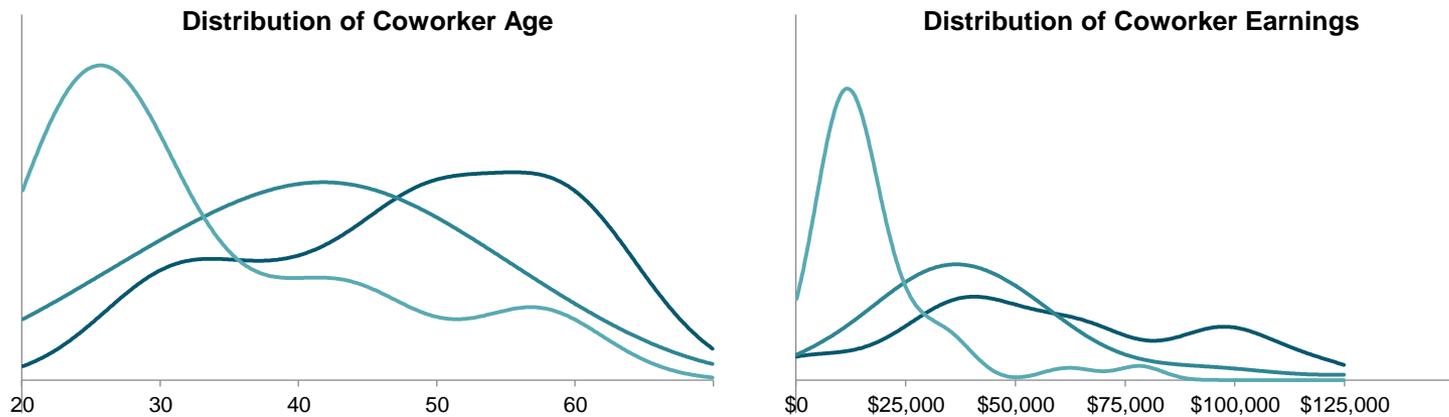
Thus, synthetic firms' decisions will vary for workers with similar age and earnings profiles, reflecting heterogeneity in the age-earnings distribution among actual firms.

Variation in Age and Earnings Among and Within Synthetic Firms

Previous Method



New Method



Simulation of HIUs' Behavior

In the new model, HIUs make decisions about health insurance coverage on the basis of the expected utility of all options available to them.

The decisions are probabilistic and maximize utility in a random utility model.

The utility of each option is a function of the HIU's total income minus health care spending, including premiums, out-of-pocket spending, subsidies, taxes, and mandate penalties. (Out-of-pocket spending is determined by the health status of each member of the HIU and by plan parameters.)

Utility is also affected by nonmonetary factors, such as risk aversion.

Many utility function parameters are estimated with the generalized method of moments, so that the predictions from the model are close to the distribution of coverage in the base year of data. Some parameters are set on the basis of CBO's assessment of the research literature.

Simulation of HIUs' Behavior (Continued)

HIUs select the type of insurance for each person in the unit from choices such as these:

- Employment-based coverage, single: PPO, HMO, or HDHP
- Employment-based coverage, nonsingle: PPO, HMO, or HDHP
- Nongroup in the marketplaces: bronze, silver, or gold
- Nongroup outside the marketplaces: bronze, silver, or gold
- Medicaid
- Children's Health Insurance Program (CHIP)
- Medicare
- Uninsured

Data Used to Calibrate Utility Function Parameters

Coverage	Source
Employment-Based	Medical Expenditure Panel Survey (MEPS-IC and MEPS-HC)
Nongroup	Robert Wood Johnson Foundation HIX Compare database, state-level data, Centers for Medicare and Medicaid Services, and National Association of Insurance Commissioners
None (Uninsured)	National Health Interview Survey (NHIS) and MEPS-HC
Medicaid and CHIP	CBO's projections, which are based on administrative data

Employers' Behavior

In the new model, employers' decisions to offer a type of plan (PPO, HMO, or HDHP) are made on the basis of their workers' willingness to pay for that offer (which is defined, in dollar terms, as the workers' change in expected maximum utility from the addition of that offer to their set of choices).

Employers' decisions to offer a type of plan also incorporate their own expected costs (their expected contributions to premiums and any applicable mandate penalties).

In other words, an employer selects the coverage option that maximizes workers' valuation of an offer net of the expected cost to the employer.

Summary of the New Model's Specifications

Its base data are from the CPS.

Those base data are edited, and several key variables are imputed.

Synthetic firms are constructed to match the distribution of workers' age and earnings within and among firms.

Simulated coverage behavior depends on how much utility is derived from each coverage option.

Many parameters in the utility functions are estimated within the model; some are set on the basis of CBO's assessment of the research literature.

Employers select the coverage option that maximizes workers' valuation of an offer net of the expected cost to the employer.

Related Discussion

See the following CBO publications:

How CBO and JCT Analyze Major Proposals That Would Affect Health Insurance Coverage (February 2018), www.cbo.gov/publication/53571.

“The Health Insurance Simulation Model Used in Preparing CBO’s 2018 Baseline” (February 2018), www.cbo.gov/publication/53592.

How CBO Defines and Estimates Health Insurance Coverage for People Under Age 65 (May 2018), www.cbo.gov/publication/53822.