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How CBO Is Updating Its Health Insurance Simulation Model

Presentation to CBO's Panel of Health Advisers

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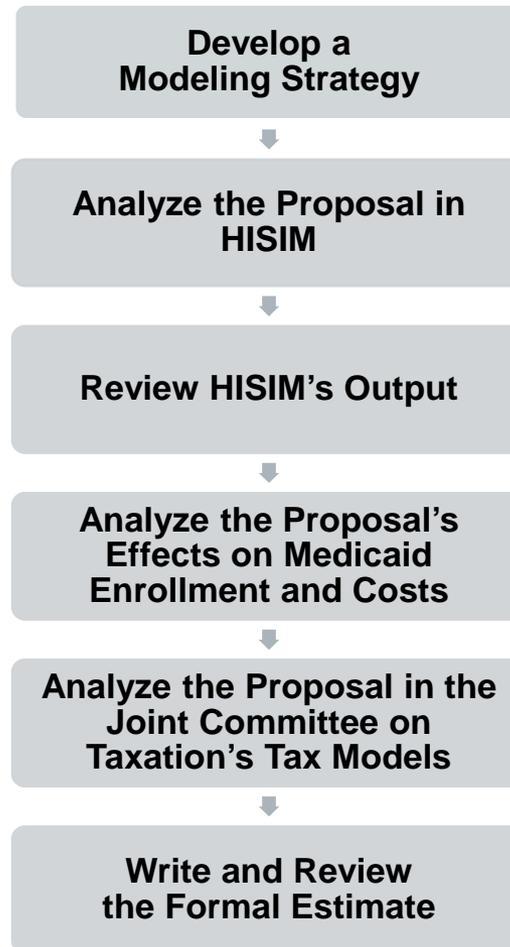
The Role of the Health Insurance Simulation Model (HISIM) at CBO

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?



Why Update HISIM?

CBO is creating a new version of HISIM to respond to continued Congressional interest in understanding the effects of legislative proposals that significantly affect health insurance coverage. The new model:

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

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

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.

CBO is incorporating feedback obtained during presentations like this one while the new model is in the development-and-testing phase.

The current model will be maintained to 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.

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.

How Will CBO Be Transparent About the New Model?

CBO has established a technical review panel to review the new model. The agency is also making presentations to various groups to solicit feedback.

Furthermore, CBO's annual report on federal subsidies for health insurance will include a discussion of differences between the spring 2019 baseline and the previous one.

And the spring 2019 baseline will be accompanied by:

- An updated slide deck describing the new model,
- Additional documentation describing the sources and preparation of input data, and
- Modules of computer code underlying the model's simulations of decisions about insurance choices.

Data Underlying the New Model

The Source of the Data

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

Those data have several advantages:

- They constitute a large, representative data set for the U.S. noninstitutionalized population;
- They represent reliable, timely information about income, employment status, employers' offers of health insurance, health status, and insurance coverage; and
- They are representative of states' populations.

Adjustments to the Data

CBO edited the following variables to align them with information from better sources:

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

Also, CBO imputed additional variables:

- Medicaid eligibility,
- 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.

Individual Health Spending Distribution

Because the new model uses an expected utility approach, it requires an estimate of each individual's expected health spending.

A single expected spending amount would be sufficient for a simple model, but CBO chose to impute a discrete probability distribution of potential health spending to each individual. Two advantages of that approach are that:

- The variance in health spending for a given insurance choice directly affects the expected utility resulting from that choice, and
- Out-of-pocket costs can be calculated to compare expected utility under plans with different cost-sharing attributes.

In this approach, an individual's health spending distribution is defined among 16 discrete health spending "states," which are defined by dollar-amount ranges (\$0, \$1–\$250, \$251–\$500, ..., \$20,001–\$25,000, >\$25,000) in 2015.

Synthetic Firms

CBO constructs synthetic firms to help model employers' decisions.

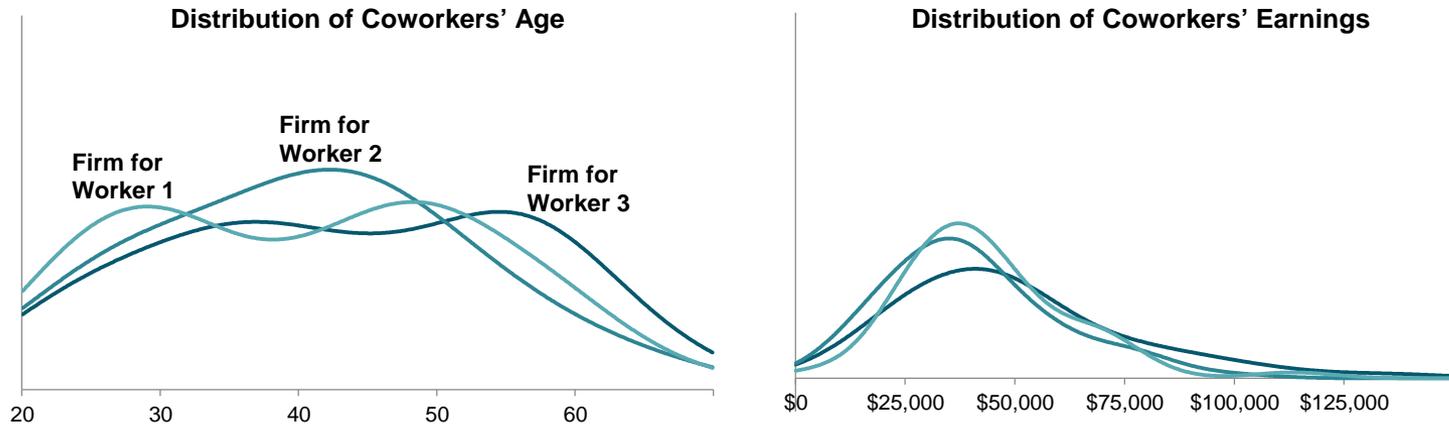
A synthetic firm is constructed for each worker in the data on the basis of that worker's profile. It consists of a set of randomly drawn coworkers matching a distribution of age and earnings that is based on that worker's profile. For example, a firm could consist of mostly young, low-earning employees, or it could have employees with a mix of ages and earnings.

In the new model, newly accessible administrative tax data (from Form W-2s linked to Form 941s) provide more accurate information about the earnings and ages of workers within actual firms.

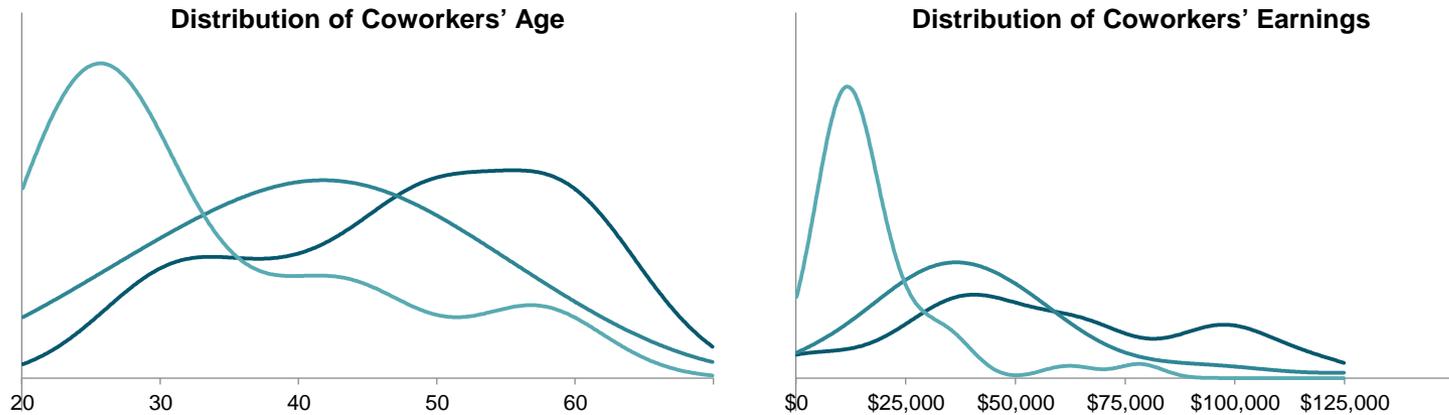
Thus, in the new model, synthetic firms' decisions will vary for workers with similar age and earnings profiles, reflecting heterogeneity in the age-earnings distribution among actual firms.

Variation in Age and Earnings Among and Within Synthetic Firms

Previous Method



New Method



Constructing Premiums Within the Model

In the new model, premiums are endogenously constructed within the model by means of individual-level health spending distributions, plan characteristics, and load factors.

Premiums for employment-based coverage are constructed to closely match average premiums by plan and coverage type in the Medical Expenditure Panel Survey–Insurance Component (MEPS–IC).

Premiums for marketplace coverage are aligned to match actual national average premiums.

Because premiums within the model are constructed on the basis of the individuals who are enrolled in each type of coverage, the model can better project changes in premiums that would result from proposed policies.

Modeling Decisions by Consumers

Overview of Health Insurance Units' Behavior

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

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 assumed to decrease with risk as measured by variance in out-of-pocket spending. Many utility-function parameters are estimated under the constraint that the predictions from the model must be close to the distribution of coverage in the base year of data. Other parameters are set on the basis of CBO's assessment of the research literature.

Overview 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: preferred provider organization (PPO), health maintenance organization (HMO), or high-deductible health plan (HDHP)
- Employment-based coverage, nonsingle: PPO, HMO, or HDHP
- Nongroup in the marketplaces: bronze, silver, or gold plan
- Nongroup outside the marketplaces: bronze, silver, or gold plan
- Medicaid
- Children's Health Insurance Program (CHIP)
- Medicare
- Uninsured

Choice Sets

The choice set is determined by the characteristics of an HIU and by CBO's decision to keep the model relatively simple.

- Single-person and multiperson HIUs have different choice sets.
- The choice set of an HIU is restricted by the eligibility of its members for public insurance and subsidized private insurance.
- The choice sets of the model are restricted to maintain as much realism as possible while simplifying the model to a manageable level, limiting the computational time it takes to simulate coverage effects of proposed policies.

Choice Set: Single-Person HIUs

The choice set for single-person HIUs consists of options that are categorized into one of five “nests.”

Options within the same nest are considered closer substitutes than options in different nests.

Nest	Options
Uninsured	Uninsured
Nongroup outside the marketplaces	Bronze, silver, gold
Nongroup in the marketplaces	Bronze, silver, gold
Employment-based coverage	Employment-based coverage
Public insurance	Medicaid, CHIP, Medicare

Choice Set: Multiperson HIUs

Multiperson HIUs have a larger choice set than single-person HIUs do because different members of an HIU can have different types of coverage.

Each nest represents a combination of different types of coverage that CBO allows an HIU to enroll its members in.

Under each option within a nest, members of the HIU are sorted into different types of coverage on the basis of their eligibility.

Choice Set: Multiperson HIUs (Continued)

There are eight nests in the choice set for multiperson HIUs:

- Uninsured
- Nongroup outside the marketplaces, public insurance, and uninsured
- Nongroup in the marketplaces, public insurance, and uninsured
- Employment-based coverage
- Employment-based coverage and public insurance
- Employment-based coverage, public insurance, and uninsured
- Employment-based coverage and uninsured
- Public insurance

Data Used to Calibrate Utility-Function Parameters

Coverage	Source
Employment-Based	Medical Expenditure Panel Survey (MEPS–IC and MEPS–Household Component)
Nongroup	Robert Wood Johnson Foundation HIX Compare database, state-level data, Centers for Medicare and Medicaid Services (CMS), and National Association of Insurance Commissioners
None (Uninsured)	National Health Interview Survey (NHIS) and MEPS–Household Component
Medicaid and CHIP	CBO’s estimates on the basis of CMS Form 64 and Medicaid Statistical Information Statistics (MSIS)

Modeling Decisions by Firms

Overview of Firms' Behavior

In the new model, firms make decisions about whether to offer coverage and what type of plan to offer on the basis of their expected utility from each option.

Firms may only offer one type of plan: an HDHP, HMO, or PPO.

Firms make decisions before HIUs do, so their choices are deterministic. The assumption that firms make decisions before HIUs makes the HIU choice set smaller and greatly decreases computational time.

The utility of each option is a function of a firm's expected premium contributions, tax liabilities, and penalty payments under the option and its employees' willingness to pay for it.

Parameters are calibrated on the basis of CBO's assessment of the research literature and simulations of firms' responses to changes in premiums.

Firms' Characteristics

CBO constructs a synthetic firm for each employee in the model.

Each firm consists of a set of coworkers sampled on the basis of their traits and the traits of the worker for whom the firm is being constructed.

The traits of a firm's employees influence the firm's expected utility from each of its options.

CBO imputes the premiums and cost-sharing characteristics for each type of plan that a firm can offer and the share of premiums that a firm would pay for single and nonsingle plans of any type.

Firms' Decisions

For the base year of the model, CBO imputes firms' decisions.

- A firm's decision about offering coverage is informed largely by CPS data and is calibrated to MEPS–IC estimates of offer rates.
- If a firm offers coverage, the type of plan that it offers is imputed on the basis of a preliminary estimate of its workers' valuation of the plan and MEPS–IC data on the share of firms offering each type of plan.

For subsequent years, firms make decisions on the basis of their expected utility.

- If the calculated probability of a firm's offering coverage is greater than or equal to one-half, the firm offers coverage.
- Firms then offer the type of plan that maximizes their expected utility.

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' ages 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 Publications by CBO

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

Federal Subsidies for Health Insurance Coverage for People Under Age 65: 2018 to 2028 (May 2018), www.cbo.gov/publication/53826.

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.