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HISIM2—CBO's New Health Insurance Simulation Model

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Agenda

- Four Products About HISIM2 That CBO Released in April 2019
- Modeling Decisions by Consumers
- Data Underlying the Model
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- Example of the Code Segments Released
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Four Products About HISIM2 That CBO Released in April 2019

What Is HISIM2 Used For?

CBO's health insurance simulation model, HISIM2, is a new version of the model CBO uses to generate estimates of health insurance coverage and premiums for the population under age 65.

The model is used in conjunction with other models to develop baseline budget projections (which incorporate the assumption that current law generally remains the same).

It is also used to estimate the effects of proposed changes in policies that affect health insurance coverage.

For more information on CBO's analytical methods, see Congressional Budget Office, "Methods for Analyzing Health Insurance Coverage" (accessed March 2019), www.cbo.gov/topics/health-care/methods-analyzing-health-insurance-coverage.

HISIM2 Products Released

Congressional Budget Office, "HISIM2—The Health Insurance Simulation Model Used in Preparing CBO's Spring 2019 Baseline Budget Projections" (April 2019), www.cbo.gov/publication/55097.

Congressional Budget Office, "HISIM2 Code Segments, April 2019" (supplemental material for "HISIM2—The Health Insurance Simulation Model Used in Preparing CBO's Spring 2019 Baseline Budget Projections," April 2019), www.cbo.gov/publication/55097#data.

Jessica Banthin and others, *Sources and Preparation of Data Used in HISIM2—CBO's Health Insurance Simulation Model*, Working Paper 2019-04 (Congressional Budget Office, April 2019), www.cbo.gov/publication/55087.

Congressional Budget Office, *Health Insurance Coverage for People Under Age 65: Definitions and Estimates for 2015 to 2018* (April 2019), www.cbo.gov/publication/55094.

HISIM2 Code Segments

The code that CBO published illustrates key aspects of the simulation part of HISIM2. It was the version used in April 2019; updates are ongoing.

The segments are a subset of the entire code, which has the following routines:

- Data preparation
- Calibration
- Simulation
- Output statistics

Modeling Decisions by Consumers

Overview of HIUs' Behavior

What Is a Health Insurance Unit? An HIU is the decisionmaking unit in HISIM2. A single person is his or her own HIU. Otherwise, an HIU is the set of individuals who could be covered by a family plan—that is, any plan that covers two or more people—if an employer were to offer that plan.

What Decisions Do HIUs Make? An HIU collectively chooses the type of health insurance coverage in which to enroll each of its members. People within the same HIU may not be eligible for the same type of coverage and do not necessarily choose the same coverage option.

How Do HIUs Make Decisions? HIUs make decisions by maximizing utility in a random utility model. Each alternative in the choice set is assigned a probability derived from a statistical model.

HIUs' Insurance Options

HIUs select the type of insurance for each person in the unit:

- Employment-based coverage—single or family
- Nongroup coverage in the marketplaces—bronze, silver, or gold
- Nongroup coverage outside the marketplaces—bronze, silver, or gold
- Medicaid
- Children's Health Insurance Program (CHIP)
- Medicare
- None (Uninsured)

Employment-based coverage is coverage offered by a current or former employer—either one's own or a family member's. Firms are restricted to offer only one type of plan: a high deductible health plan (HDHP), health maintenance organization (HMO), or preferred provider organization (PPO). Nongroup coverage is coverage that a person purchases directly from an insurer or through a health insurance marketplace, rather than through an employer. Plans in the nongroup market are categorized into tiers (which are named after metals) on the basis of their actuarial value (the percentage of total average costs for covered benefits for which a plan pays). "Bronze" plans are those with an actuarial value of 60 percent, "silver" plans are those with an actuarial value of 70 percent, and "gold" plans are those with an actuarial value of 80 percent.

Choice Sets

The set of insurance choices available to each HIU is determined by the characteristics of that HIU (for example, income and members' ages).

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, subsidized marketplace insurance, and employment-based insurance.

CBO restricted the choice sets in the model to maintain as much realism as possible while keeping the model simple enough to limit the computing time that it takes to simulate coverage effects of proposed policies.

Choice Set: Single-Person HIUs

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

Alternatives within the same nest are considered closer substitutes than alternatives in different nests.

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

Within the public-insurance nest, the choices between Medicaid and Medicare are mutually exclusive. CHIP is not an alternative for single-person HIUs because only children are eligible for CHIP and a child cannot be in an HIU by himself or herself.

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 alternative represents a combination of coverage types in which HIUs can enroll its members.
- Under each alternative, members of the HIU are sorted into different types of coverage on the basis of their eligibility.
- The generalized nested logit model used in HISIM2 allows an HIU's health insurance coverage choices to span multiple nests.

For more information about the generalized nested logit model, see Wen and Koppelman (2001) and Train (2009).

HIUs' Utility

The utility of choosing each alternative depends on the HIU's:

- Income;
- Health care spending (including premiums, an out-of-pocket spending distribution, and any applicable subsidies, taxes, and mandate penalties);
- Financial risk; and
- Unobserved factors.

Out-of-pocket spending is determined by the health status of each member of the HIU and by the cost-sharing characteristics of the insurance plan (deductible, coinsurance, and maximum out-of-pocket limit).

Utility Specification

The utility for HIU i from alternative n with multiple members $j = 1, \ldots, J_i$ (U_{in}), is the predicted value that the HIU places on the alternative, βV_{in}, and an idiosyncratic unobservable component, ε_{in}.

$$U_{in} = \beta V_{in} + \varepsilon_{in}$$

$$V_{in} = y_i - C_{in} - E_s[H_{in}] - \frac{1}{2}\rho_n Var_s(H_{in}) + \Delta_{in}\left(y_i, a_1, \ldots, a_{J_i}, e_1, \ldots, e_{J_i}\right)$$

y_i is income for HIU i, a_j is the age of member $j \in i$, and e_j is eligibility for coverage for member $j \in i$.

C_{in} is the cost to HIU i of alternative n, which includes premiums and applicable individual-mandate penalties.

$E_s[H_{in}]$ and $Var_s(H_{in})$ are the expectation and variance, respectively, of HIU i's out-of-pocket health care spending for each alternative n where the expectation and variance are taken over health states s. Out-of-pocket health care spending for the uninsured alternative is capped at a value that increases with income to capture uncompensated care and bankruptcy.

ρ_n is the coefficient of absolute risk aversion.

Δ_{in} is the alternative-specific constant for alternative n and is allowed to vary with age, eligibility, and income. If the HIU i's size is one, $\Delta_{in} = \delta_{1n}(y_i, a_j)$. If the HIU's size is greater than one, $\Delta_{in} = \sum_{j=1}^{J_i} \delta_{2n}(y_i, a_j, e_j)$.

Utility Specification (Continued)

The unobservable component is modeled so that it implies a generalized nested logit (GNL) model. For notation purposes, the GNL choice probability is:

$$P_{in} = \frac{\sum_{\ell}\left[(\alpha_{n\ell}\exp(\beta V_{in}))^{\frac{1}{\mu_\ell}}\left(\sum_{k\in B_\ell}(\alpha_{k\ell}\exp(\beta V_{ik}))^{\frac{1}{\mu_\ell}}\right)^{\mu_\ell-1}\right]}{\sum_{\ell}\left(\sum_{k\in B_\ell}(\alpha_{k\ell}\exp(\beta V_{ik}))^{\frac{1}{\mu_\ell}}\right)^{\mu_\ell}}$$

Nests (employment-based, public, nongroup marketplace, nongroup off-marketplace, and uninsured) are indexed by ℓ, and the set of choices in nest ℓ is denoted B_ℓ.

Estimation

CBO estimates most utility function parameters by fitting the model's equations to the data but sets the value of others on the basis of information from research and from experts on health insurance markets and this type of model.

The alternative-specific constants (Δ_{in}) and utility coefficients (β) are estimated.

There are two utility coefficients: one for single-person HIUs and the other for multiperson HIUs.

CBO estimates the alternative specific constants (Δ_{in}) by finding values that minimize the difference between coverage predictions from the model and coverage targets by type of insurance, age, and income. (That approach is called minimum distance estimation.)

The utility coefficients, β, determine the degree to which HIUs' decisions are predicted by the value function specification and are estimated on the basis of how well the model fits the underlying data.

Specifically, the utility coefficients are estimated via a maximum-likelihood estimation in which the choices are insured and uninsured.

Data Underlying the Model

CPS Data

The microdata used by HISIM2 begin with the Current Population Survey (CPS).

- The CPS is a nationally representative survey of about 95,000 households. It provides reliable, timely, and detailed information about many of the key variables needed to model health insurance.
- Those variables include demographic and family characteristics, income, employment, the availability of employment-based insurance coverage, and self-reported health status.

For details, see Jessica Banthin and others, *Sources and Preparation of Data Used in HISIM2—CBO's Health Insurance Simulation Model*, Working Paper 2019-04 (Congressional Budget Office, April 2019), www.cbo.gov/publication/55087.

Modifications to CPS Data

CBO modifies the CPS data in three ways. First, CBO edits the following variables, which are likely to have been reported with some error, so that they better match other survey and administrative data:

- The size of firms,
- Self-employment income, and
- Whether a worker's employer offers health insurance.

Modifications to CPS Data (Continued)

Second, CBO supplements the CPS with additional variables necessary for modeling people's and employers' decisions about health insurance coverage, such as:

- Immigration status;
- Capital gains;
- Marginal tax rates;
- The probability distribution of health care spending for each individual;
- The characteristics of an employer's potential insurance offerings for three plan types (HDHP, HMO, and PPO) and two coverage types (single and family); and
- Eligibility for Medicaid and CHIP.

High-deductible health plans (HDHPs) allow the use of a tax-preferred health savings account to cover expenses not paid by the plans. Health maintenance organizations (HMOs) are insurance plans in which services obtained outside a specified network of providers are not covered. Preferred provider organizations (PPOs) tend to offer wider provider networks, cover services from providers outside of their network, and limit costs through cost-sharing arrangements and a deductible.

The characteristics of an employer's potential insurance offerings are assigned on the basis of its characteristics, such as its size, the state in which it operates, and the fraction of low-wage workers in it. Those characteristics include the plan's cost-sharing requirements and premium, the employer's contribution to the premium, and (for HDHP plans) whether and how much an employer contributes to a health savings account or health reimbursement account.

Modifications to CPS Data (Continued)

Third, CBO defines various units to help model consumers' and employers' behavior.

CBO groups household members to build three types of units used to calculate income and taxes, determine eligibility for subsidies, and define the coverage choices that are available to people. Those units are called tax filing units, marketplace units, and health insurance units.

CBO also builds a synthetic firm for each employed respondent consisting of an imputed set of coworkers whose characteristics match the actual characteristics of such an employee's coworkers. CBO assigns coworkers on the basis of the size of the worker's firm (using the agency's edited version of firm size as reported in the CPS); whether or not the firm offers health insurance; and the worker's wages, age, and state of residence.

Projecting Data Through the Entire Projection Period

After adjusting and supplementing the CPS data for a base year, CBO projects input data for each year through the end of the 11-year period covered by the agency's baseline budget projections.

CBO employs two main approaches to project population characteristics of the base-year data:

- The agency projects income, health care spending, and the characteristics of employment-based insurance offers to identify the growth patterns of those variables.
- CBO uses an optimization routine to simultaneously adjust the sample weights of people in the CPS sample during the period to match projections of population characteristics, including population growth and changes in patterns of employment.

The base year of data for CBO's spring 2019 baseline projections is 2015, and the 11-year period covered by those projections is 2019 to 2029.

Sources of Data Used to Estimate Utility Function Parameters

Coverage	Source
Employment-Based	Medical Expenditure Panel Survey—Insurance Component (MEPS-IC) and Household Component (MEPS-HC), OPM
Nongroup	CMS Medical Loss Ratio data, CMS quarterly effectuated enrollment reports, Healthcare.gov insurance marketplace data, MEPS-HC, Covered California data, New York State of Health Data
None (Uninsured)	MEPS-HC and NHIS
Medicaid and CHIP	Form CMS-64, MSIS, Medicaid Analytic Extract data, Statistics Enrollment Data System (for CHIP)

CHIP = Children's Health Insurance Program; CMS = Centers for Medicare & Medicaid Services; MSIS = Medicaid Statistical Information System; NHIS = National Health Interview Survey; OPM = Office of Personnel Management.

For more details on the data used for calibration, see Jessica Banthin and others, *Sources and Preparation of Data Used in HISIM2—CBO's Health Insurance Simulation Model*, Working Paper 2019-04 (Congressional Budget Office, April 2019), www.cbo.gov/publication/55087.

Model Fit

Calibration Results for Employment-Based Coverage, 2015

Percent	HIU = 1		HIU > 1	
Description	Difference From Target	Take-Up Rate	Difference From Target	Take-Up Rate
PPO—Family, HIU > 1			<.01	53.8
HMO—Family, HIU > 1			<.01	48.8
HDHP—Family, HIU > 1			<.01	47.2
Nondependent Child, HIU > 1			<.01	22.6
PPO—Single, HIU = 1	<.01	77.7	<.01	24.6
HMO—Single, HIU = 1	<.01	85.2	<.01	24.4
HDHP—Single, HIU = 1	<.01	85.1	<.01	48.2
Employment-Based Coverage + Medicaid Children			<.01	22.4

Calibration Results for Nongroup Coverage, 2015

Percent	HIU = 1		HIU > 1	
Description	Difference From Target	Take-Up Rate	Difference From Target	Take-Up Rate
Marketplace Bronze Subsidized FPL 0-69				
Marketplace Bronze Subsidized FPL 70-250	<.01	7.2	<.01	7.6
Marketplace Bronze Subsidized FPL 251-400	<.01	7.0	<.01	10.2
Marketplace Bronze Subsidized FPL 401+				
Marketplace Silver Subsidized FPL 0-69				
Marketplace Silver Subsidized FPL 70-138 age < 30	<.01	18.3	-0.01	35.2
Marketplace Silver Subsidized FPL 70-138 age 30-50	<.01	53.8	<.01	30.1
Marketplace Silver Subsidized FPL 70-138 age > 50	<.01	64.8	-0.01	57.2
Marketplace Silver Subsidized FPL 139-250 age < 30	<.01	14.4	<.01	55.8
Marketplace Silver Subsidized FPL 139-250 age 30-50	<.01	31.6	<.01	38.8
Marketplace Silver Subsidized FPL 139-250 age > 50	<.01	57.9	<.01	60.4
Marketplace Silver Subsidized FPL 250-400	<.01	7.6	<.01	12.5
Marketplace Silver Subsidized FPL 401+				
Marketplace Gold Subsidized FPL 0-69				
Marketplace Gold Subsidized FPL 70-400	<.01	2.1	<.01	4.2
Marketplace Gold Subsidized FPL 401+				
Marketplace Bronze Unsubsidized	<.01	1.3	0.01	0.2
Marketplace Silver Unsubsidized	<.01	1.7	<.01	0.3
Marketplace Gold Unsubsidized	<.01	0.7	0.01	0.1
Nongroup Outside-the-Marketplaces Bronze	<.01	3.4	<.01	0.6
Nongroup Outside-the-Marketplaces Silver	<.01	12.0	<.01	2.5
Nongroup Outside-the-Marketplaces Gold	<.01	1.1	<.01	0.3

FPL = federal poverty level.

Calibration Results for Public Coverage, 2015

Percent	HIU = 1		HIU > 1	
Description	Difference From Target	Take-Up Rate	Difference From Target	Take-Up Rate
Medicaid Children			<.01	90.2
Adults Made Eligible for Medicaid by the Affordable Care Act	<.01	58.5	<.01	70.6
Adults Otherwise Eligible for Medicaid	<.01	90.0	<.01	90.6
CHIP			<.01	48.5
Medicare With Offer of Employment-Based Coverage	<.01	59.5	<.01	54.5

Calibration Results for the Uninsured, 2015

Percent	HIU = 1		HIU > 1	
Description	Difference From Target	Take-Up Rate	Difference From Target	Take-Up Rate
Uninsured FPL < 70	<.01	32.9	<.01	14.1
Uninsured 70 ≤ FPL ≤ 138	<.01	34.1	<.01	17.6
Uninsured 138 < FPL ≤ 250	<.01	25.0	<.01	12.5
Uninsured 250 < FPL < 400	<.01	14.7	<.01	6.1
Uninsured FPL ≥ 400	<.01	6.0	<.01	3.0

FPL = federal poverty level.

Enrollment in Medicaid, 2016

Percent

Modified Adjusted Gross Income as a Percentage of the Federal Poverty Level	Share of Medicaid Enrollees (Full-year-equivalent full-benefit enrollment of the non-elderly)	
	As Estimated by HISIM2	As Estimated by the Treasury (Form 1095-B)
Under 100	55	53
100–150	20	20
150–200	12	11
200–250	7	6
250–300	4	3
300–400	2	3
400–600	1	2
Above 600	1	1
Total	100	100

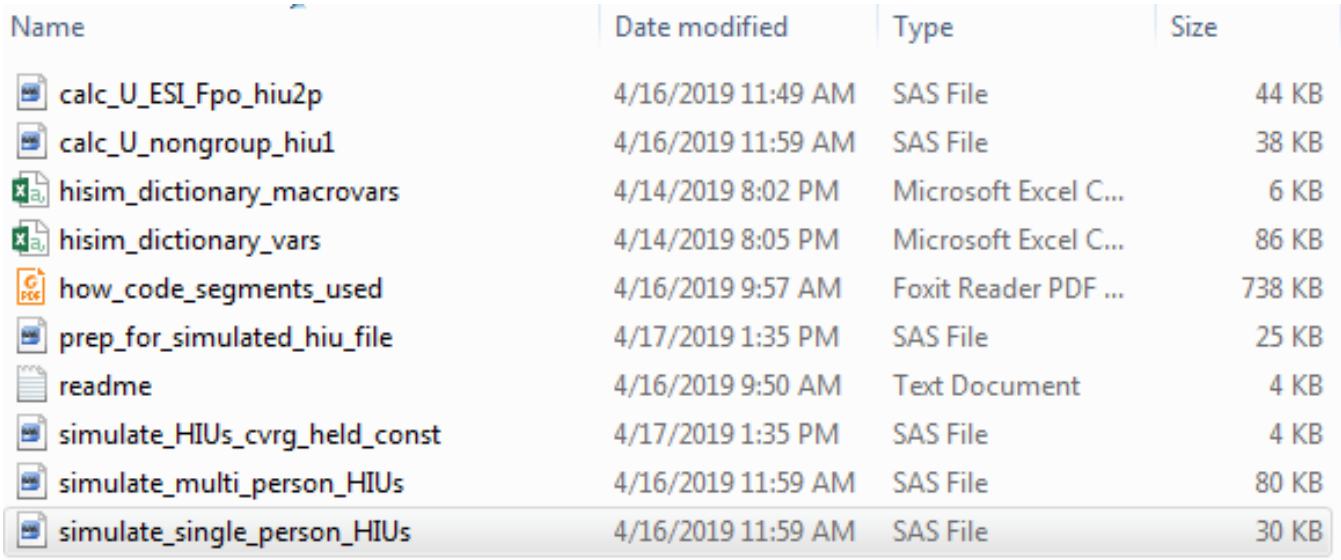
Enrollment in Employment-Based Coverage, 2016

Percent	Employment-Based Coverage	
Modified Adjusted Gross Income as a Percentage of the Federal Poverty Level	**As Estimated by HISIM2**	**As Estimated by the Treasury (Covered life years)**
Under 100	7	6
100–150	5	5
150–200	7	7
200–250	7	8
250–300	9	8
300–400	15	16
400–600	21	22
Above 600	28	28
Total	100	100

Example of the Code Segments Released

HISIM2 Code Segments, April 2019

www.cbo.gov/publication/55097#data



Name	Date modified	Type	Size
calc_U_ESI_Fpo_hiu2p	4/16/2019 11:49 AM	SAS File	44 KB
calc_U_nongroup_hiu1	4/16/2019 11:59 AM	SAS File	38 KB
hisim_dictionary_macrovars	4/14/2019 8:02 PM	Microsoft Excel C...	6 KB
hisim_dictionary_vars	4/14/2019 8:05 PM	Microsoft Excel C...	86 KB
how_code_segments_used	4/16/2019 9:57 AM	Foxit Reader PDF ...	738 KB
prep_for_simulated_hiu_file	4/17/2019 1:35 PM	SAS File	25 KB
readme	4/16/2019 9:50 AM	Text Document	4 KB
simulate_HIUs_cvrg_held_const	4/17/2019 1:35 PM	SAS File	4 KB
simulate_multi_person_HIUs	4/16/2019 11:59 AM	SAS File	80 KB
simulate_single_person_HIUs	4/16/2019 11:59 AM	SAS File	30 KB

HISIM2 Code Segments, April 2019 (Continued)

```
/*=============================================================================================
/   Module Name : simulate_single_person_HIUs.sas
/   Purpose     : To calculate the probability of choosing each available alternative for single-person HIUs and
/                     calculate the enrollment by coverage type
/   Inputs      : Data file "hiu_size_1" from prep_for_simulated_hiu_file.sas
/                 Data file "apply_model_base_hiu2p" from simulate_multi_person_HIUs.sas
/   Outputs     : Data file "apply_model_base_hiu1" containing simulated HIUs' choices at the HIU-level for single-person HIUs
/   Summary     :
/   (1) Calculate the probability of choosing each available alternative
/       (1-a) Calculate HIU's utility from choosing each available alternative
/       (1-b) Calculate HIU's probability of choosing each alternative
/             (Refer to Section 4.4.2. in Train 2009 for the probability formula )
/   (2) Calculate policy-related variables: (e.g., individual mandate penalty, premium tax
/       credits, excise tax, cost-sharing reduction payment)
/       Notes:  For single-person HIUs, the calculations of probabilities of choosing alternatives
/               are based on the Nested Logit (NL) model and
/               the utility from choosing an alternative is defined in the slide deck.
/           For the functional form of the probabilities in NL model, refer to
/               Kenneth Train, "Discrete Choice Methods with Simulation", Cambridge University Press
/               Second edition, 2009.
/           For the utility function, see Congressional Budget Office, "HISIM2—The Health Insurance
/               Simulation Model Used in Preparing CBO's Spring 2019 Baseline Budget Projections"
/               (April 2019), www.cbo.gov/publication/55097.
//  The code is written in SAS, version 9.4.
/=============================================================================================*/
```

HISIM2 Code Segments, April 2019 (Continued)

```
/*****************************************************************************
/   Calculate the utilities from choosing the alternatives of non-group plans (in and
/   outside the marketplace)
/*****************************************************************************/
%if &Marketplace_Exists.=yes %then %do;
    %calc_U_nongroup_hiu1(firm_u=no,hiu_u=yes);
%end;

/*****************************************************************************
/   Calculate the utilities from choosing the alternatives of ESI plans
/*****************************************************************************/
%calc_U_ESI_S_hiu1(firm_u=no,hiu_u=yes);

/*****************************************************************************
/   Calculate the utilities from choosing the alternatives of public insurance if
/   eligible
/*****************************************************************************/
%calc_U_public_hiu1(firm_u=no,hiu_u=yes);

/*****************************************************************************
/   Calculate the utilities from choosing to be uninsured
/*****************************************************************************/
%calc_U_uninsured_hiu1(firm_u=no,hiu_u=yes);
```

HISIM2 Code Segments, April 2019 (Continued)

```
/*****************************************************************************************
/   Calculate the probability of being in each nest:
/   ESI, non-group (in and outside the marketplace), Public insurance, and uninsured
/*****************************************************************************************/
denom       = sum((sum_Nst_esi)**(mu_esi),
                  (sum_Nst_onmarket_hiu1)**(mu_onmarket),
                  (sum_Nst_offmarket_hiu1)**(mu_offmarket),
                  (sum_Nst_public)**(mu_public),
                   exp_U_UN_HIU1);
P_ESI       = (sum_Nst_esi)              **(mu_esi)          /denom;
P_onmarket  = (sum_Nst_onmarket_hiu1)    **(mu_onmarket )    /denom;
P_offmarket = (sum_Nst_offmarket_hiu1)   **(mu_offmarket )   /denom;
P_public    = (sum_Nst_public)           **(mu_public )      /denom;
P_UN        = (exp_U_UN_HIU1)                                /denom;

/*****************************************************************************************
/   Calculate the choice probability of a specific coverage type
/*****************************************************************************************/
P_ESI_nstESI    = P_ESI*exp_ESI_nstESI /sum_Nst_esi;

%if &Marketplace_Exists.=yes %then %do;
    P_onB_Nst_onmarket  = P_onmarket*exp_U_B_Nst_onmarket   /sum_Nst_onmarket_hiu1;
    P_onS_Nst_onmarket  = P_onmarket*exp_U_S_Nst_onmarket   /sum_Nst_onmarket_hiu1;
    P_onG_Nst_onmarket  = P_onmarket*exp_U_G_Nst_onmarket   /sum_Nst_onmarket_hiu1;

    P_offB_Nst_offmarket= P_offmarket*exp_U_B_Nst_offmarket /sum_Nst_offmarket_hiu1;
    P_offS_Nst_offmarket= P_offmarket*exp_U_S_Nst_offmarket /sum_Nst_offmarket_hiu1;
    P_offG_Nst_offmarket= P_offmarket*exp_U_G_Nst_offmarket /sum_Nst_offmarket_hiu1;
%end;

P_public_Nst_public     = P_public*exp_U_public_Nst_public_hiu1 /sum_Nst_public;

P_UN_nstUN      = P_UN;
```

HISIM2 Code Segments, April 2019 (Continued)

```
/*****************************************************************************************
/   Calculate the number of people who enroll in ESI single plan by plan type
/*****************************************************************************************/
P_PPO_HIU1  = P_ESI_nstESI*Nw_ESI_PPO_HIU1 ;
P_HMO_HIU1  = P_ESI_nstESI*Nw_ESI_HMO_HIU1 ;
P_HDHP_HIU1 = P_ESI_nstESI*Nw_ESI_HDHP_HIU1 ;

cvrg_ESI_S_PPO_hiu1  = sum(P_PPO_HIU1);
cvrg_ESI_S_HMO_hiu1  = sum(P_HMO_HIU1);
cvrg_ESI_S_HDHP_hiu1 = sum(P_HDHP_HIU1);

/*****************************************************************************************
/   Calculate the number of people who enroll in non-group plans in and outside
/   the marketplaces (subsidized vs unsubsidized)
/*****************************************************************************************/
%if &Marketplace_Exists.=yes %then %do;
    cvrg_B_onmarket_hiu1    = P_onB_Nst_onmarket*Nw_nongroup_HIU1;
    cvrg_S_onmarket_hiu1    = P_onS_Nst_onmarket*Nw_nongroup_HIU1;
    cvrg_G_onmarket_hiu1    = P_onG_Nst_onmarket*Nw_nongroup_HIU1;
    cvrg_B_offmarket_hiu1   = P_offB_Nst_offmarket*Nw_nongroup_HIU1;
    cvrg_S_offmarket_hiu1   = P_offS_Nst_offmarket*Nw_nongroup_HIU1;
    cvrg_G_offmarket_hiu1   = P_offG_Nst_offmarket*Nw_nongroup_HIU1;

    if GET_SUB ne 1 then GET_SUB=0;
        cvrg_B_onmarket_sub_hiu1    = sum(cvrg_B_onmarket_hiu1)*GET_SUB;
        cvrg_S_onmarket_sub_hiu1    = sum(cvrg_S_onmarket_hiu1)*GET_SUB;
        cvrg_G_onmarket_sub_hiu1    = sum(cvrg_G_onmarket_hiu1)*GET_SUB;

        cvrg_B_onmarket_nosub_hiu1  = sum(cvrg_B_onmarket_hiu1)*(1-GET_SUB);
        cvrg_S_onmarket_nosub_hiu1  = sum(cvrg_S_onmarket_hiu1)*(1-GET_SUB);
        cvrg_G_onmarket_nosub_hiu1  = sum(cvrg_G_onmarket_hiu1)*(1-GET_SUB);

        cvrg_B_offmarket_hiu1          = sum(cvrg_B_offmarket_hiu1);
        cvrg_S_offmarket_hiu1          = sum(cvrg_S_offmarket_hiu1);
        cvrg_G_offmarket_hiu1          = sum(cvrg_G_offmarket_hiu1);
%end;
```

Baseline Projections

How Does CBO Use Its Health Insurance Simulation Model to Develop Baseline Projections?

The process has six main steps. In the first three steps, CBO:

- Updates its health insurance simulation model at least once a year to incorporate new information, specifically:
  - The most recent administrative and survey data on enrollment and premiums;
  - Recently enacted legislation, judicial decisions, or changes in regulations; and
  - CBO's most recent macroeconomic forecast (including demographic projections).
- Projects coverage estimates through the end of the period covered by the agency's baseline budget projections and reviews the model's output.
- Adjusts the model's coverage projections using CBO's Medicaid enrollment model and separate models that analyze aspects of current law that are simplified in the health insurance simulation model.

For details, see Congressional Budget Office, *How CBO and JCT Analyze Major Proposals That Would Affect Health Insurance Coverage* (February 2018), www.cbo.gov/publication/53571.

How Does CBO Use Its Health Insurance Simulation Model to Develop Baseline Projections? (Continued)

In the remaining three steps, CBO:

- Estimates spending for Medicaid, the Children's Health Insurance Program (CHIP), and the Basic Health Program, using models for those programs.
- Determines net costs of federal subsidies for work-related coverage and coverage through the nongroup market, as well as taxes and penalties related to coverage, using the Joint Committee on Taxation's tax models.
- Reviews final baseline budget projections and writes a report.

Health Insurance Coverage for People Under Age 65, 2019 to 2029

Millions of People, by Calendar Year

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Total Population Under Age 65	273	273	273	274	274	275	275	276	276	276	277
Employment-Based Coverage	159	159	159	159	158	158	158	158	158	159	159
Medicaid and CHIP[a]											
Blind and disabled	7	7	7	7	7	7	7	7	7	7	7
Children	30	30	30	30	30	30	30	30	30	30	30
Adults made eligible for Medicaid by the ACA	12	12	12	13	13	13	14	14	14	14	14
Adults otherwise eligible for Medicaid	13	12	12	12	13	13	13	13	13	13	13
CHIP	7	7	7	7	7	7	7	7	7	7	7
Subtotal	69	68	68	69	70	70	70	71	71	71	71
Nongroup Coverage and the Basic Health Program											
Nongroup coverage purchased through marketplaces[b]											
Subsidized	8	8	7	7	7	7	7	6	6	6	6
Unsubsidized	1	1	1	1	1	1	1	1	1	1	1
Subtotal	9	9	8	8	8	8	8	7	7	7	7
Nongroup coverage purchased outside marketplaces	5	5	4	4	4	4	4	4	4	4	4
Total, nongroup coverage	14	13	13	12	12	12	12	12	12	11	11
Coverage through the Basic Health Program[c]	1	1	1	1	1	1	1	1	1	1	1
Medicare[d]	8	8	8	8	8	8	8	8	8	8	8
Other Coverage[e]	3	3	3	3	3	3	3	3	3	3	3
Uninsured[f]	30	32	33	33	34	34	34	34	35	35	35
Memorandum:											
Number of Insured People	242	241	240	240	241	241	241	241	241	241	242
Insured as a Percentage of the Population											
Including all U.S. residents	89	88	88	88	88	88	88	88	87	87	87
Excluding noncitizens not lawfully present	91	90	90	90	90	89	89	89	89	89	89

See Congressional Budget Office, *Federal Subsidies for Health Insurance Coverage for People Under Age 65: 2019 to 2029* (May 2019), Table 1-1, www.cbo.gov/publication/55085.

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Congressional Budget Office, *Federal Subsidies for Health Insurance Coverage for People Under Age 65: 2019 to 2029* (May 2019), www.cbo.gov/publication/55085.

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CBO's Publications (Continued)

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