Technical Appendix:
March 2017 CPS Auxiliary Data

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OVERVIEW OF THE 2017 CPS AUXILIARY DATA

The March Annual Social and Economic Supplement to the Current Population Survey (known as the ASEC or alternatively as the March CPS) is the data source most often used for estimating health insurance coverage in the U.S. population. While the March CPS underwent major enhancements and revisions for 2014, only some of these changes have been released to the research community, and none have been added to the basic March dataset as released by Census.[1] Thus, several important characteristics of employer sponsored health insurance (ESI) are not captured by the survey or are not publicly available at this time. To address these limitations, the U.S. Department of Labor (DOL) Employee Benefits Security Administration (EBSA) annually produces an auxiliary data file which contains recoded and imputed employment and health insurance variables, as well as an annual bulletin with summary tables based on the enhanced data.

As part of the process in creating the March 2017 Auxiliary Data, we have updated our data sources to reflect the newest available information. This document describes the current imputations and edits performed in order to provide estimates of employer sponsored insurance in detail for calendar year (CY) 2016.

The imputations performed can be broken down into two main categories: those dealing with access to coverage and those that describe the coverage in detail. Access to coverage includes whether an employer provides coverage, as well as details about that employer, such as size (number of employees) and sector. Coverage characteristics include funding, plan type, and estimates of retiree and COBRA coverage. Starting with the CY 2010 Auxiliary Data, a variable for actuarial value (which represents the average proportion of covered charges paid as benefits by insurance) has been imputed for active employees with health insurance in their own name.

In general, insurance and employment characteristics were imputed for employees as well as for other persons with employer sponsored insurance coverage in their own name. ESI dependents were given the characteristics of their primary policyholder (when that person could be found). Links for up to two policyholders were maintained for each dependent on the March CPS file so that characteristics of the secondary coverage could also be identified. One policyholder link was maintained for ESI policyholders who were also dependents. In addition, coverage through the Federal and state-based marketplaces was imputed for a likely subset of those persons with individual (non-employer sponsored) health insurance, based on information reported by the Centers for Medicare and Medicaid Services (CMS).

[1] Research releases include (a) the release of a single point-in-time coverage variable ("Was person covered at time of questionnaire"), which can be looked at in comparison to coverage in prior year, and which we do present in this year's Health Bulletin, (b) a clarification on type of coverage (employer sponsored, individual private, or other) if coverage is provided from outside the household, and (c) point-in-time variables on employer offers of health insurance coverage for those who were employed but did not have employer sponsored coverage.

As mentioned above, our starting data set was the March 2017 Annual Social and Economic Supplement to the CPS. The following lists the enhancements made and variables added for inclusion into the Auxiliary Dataset:

- Source of coverage, employer offers of coverage: While the March CPS asks whether insurance coverage is provided by an employer, it does not distinguish whether this coverage is from a current or former employer. The most recent three years (2013-2015) from the Medical Expenditure Panel Survey Household Component (MEPS-HC) provides data that is the basis of this imputation. Employer offers of coverage were either assigned using information from the CPS point-in-time variable on employer offers of insurance, as released on one of the Census research files, or imputed using MEPS-HC data.

- Sector and size providing coverage: For persons with coverage from a former employer, it was necessary to impute both sector and size of the employer providing the coverage. This was done using the most recent three years of data (2014-2016) from the Medical Expenditure Panel Survey Insurance Component (MEPS-IC), as provided by the Agency for Healthcare Research and Quality (AHRQ).

- Funding status, plan type and COBRA/retiree partition: Data from the MEPS-IC from 2014 through 2016, along with partitions and trends from the KFF/HRET Employer Health Benefits Surveys (2005 through 2016) were used to impute funding status and type of coverage for those with ESI as well as to partition coverage from a former employer into retiree and COBRA.

- Federal estimates: Data, by type of plan, from the Office of Personnel Management (OPM) on employees (postal and non-postal), and dependents and annuitants covered under the Federal Employees Health Benefits (FEHB) Program were used to provide estimates at the Federal level.

- Actuarial values: Health plan details from the 2016 KFF/HRET Employer Health Benefits Survey, along with actuarial value analysis done for EBSA using National Compensation Survey (NCS) health plan data from 2014 and 2015, and historical data from prior HRET surveys were used to calculate actuarial values and impute these values onto active policyholder records. Also included is a set of actuarial values in the Auxiliary dataset that are based on the Minimum Value Calculator (MVC) from the Center for Consumer Information and Insurance Oversight (CCIIO).[2]

- Health spending: CPS variables on out-of-pocket spending and person-paid health insurance premiums were introduced beginning with the March 2011 CPS. After examination and

[2] In ARC's work with BLS, the MVC actuarial values were based on ARC automation of the CCIIO MVC Excel sheet in order to run multiple plans at once. As with last year, we have not included tabulations from them in the current Health Bulletin.

comparison to other data sources, it was decided to include the spending variables beginning with the March 2012 Auxiliary Data and Health Insurance Coverage Bulletin.

- Union Sponsorship: Data from the March CPS itself was used to identify current workers who obtain coverage through a union plan – directly for the portion of the sample asked this question and as the basis of the imputation for the remaining workers. Data from the Survey of Income and Program Participation (SIPP), 2008 Panel Wave 6 (2010), the most current available to us, was used to impute union sponsorship to persons with coverage from a former employer. For private sector, age 65+ retirees, union probability cells were enhanced with trend data from the National Health Interview Survey (NHIS) for the period 2010 through 2016 and the SIPP for the period 2010 through 2014.[3]

- Coverage through an Exchange: Data from CMS by state and income level, as well as 2015 MEPS data on plan participation, were used to impute individual exchange coverage for a likely subset of persons with non-employer sponsored private health insurance.[4] Coverage in Small Business Health Options Program (SHOP) plans for employees working for small businesses became available midway through 2014, but these plans were available only in some states. Due to a continued lack of available data, we have not imputed SHOP coverage for 2016.

The 13 steps we used to impute data are described in detail below.

[3] The more recent SIPP data did not have the same level of detail as found in the earlier survey, and needed for the imputation, but it was helpful to look at trends in union coverage.

[4] While this information was collected in the ASEC, exchange coverage is included with other (non-employer based) private health insurance and the breakout has not yet been released by Census which has necessitated the imputation.

Step 1: Imputing coverage from a current versus former employer

The March CPS captures whether insurance coverage is provided by an employer, but not whether the coverage is from the policyholder's current or former employer. To impute the employer status, MEPS-HC 2013-2015 data was averaged to calculate probabilities of having coverage through a former versus a current employer. The results were enhanced with data from the 2016 MEPS-IC, which provides policyholder counts from non-Federal employers for those with active, retiree, or COBRA coverage. Data from the FEHB Program were used to provide estimates at the Federal level.

All March CPS records were initially checked to see if current versus former employer status could be determined with certainty. That is, if a person did not work at all during a year but had ESI in their own name, then they were assigned coverage by a former employer. For all others, it was necessary to impute the source of the coverage. The 2013-2015 MEPS-HC was used to calculate probabilities of having coverage through a former employer by age, work status and presence of retiree income. These relative probabilities were adjusted in order to reproduce the target likelihood of coverage being from a former employer based on the MEPS-IC.

Valid codes for status were set as:

0 = no ESI
1 = coverage through a former employer
2 = coverage through a current employer

For CY 2016, this process resulted in 77.7 million ESI policyholders with coverage through their current employer and 12.4 million with coverage through a former employer.

The results of the imputation for source of coverage, for persons with ESI in their own names, are shown below.

Persons with ESI in Own Name
by Employment Status
(numbers in millions)

Employment Status	Number with ESI
Total	**90.1**
Worked in past year	**82.0**
Coverage from current employer	77.7
Coverage from former employer	4.3
Did not work in past year	**8.1**

Step 2: Imputing whether current employer offers ESI

While the March CPS captures whether individuals are covered by ESI, the public data does not reveal if an employee is offered insurance by his or her current employer.[5] The imputation of coverage through a current versus former employer (described in the previous step) resulted in a subset of persons who, by definition, have an employer that offered coverage.[6] For the subset of workers whose job looks to be the same as last year, and are not enrolled in ESI as a policyholder (either in prior year or currently), we used the March 2017 point-in-time offer status to inform our assignment of offer/ eligibility. The details on the point-in-time variables, and how they were used for these assignments, are found in the "Revisions" section at the end of this document, and are summarized as follows:

- If the person's employer did not offer a health insurance plan to any of its employees, then status was not offered;
- If the person's employer offered a health insurance plan to any of its employees and the person was deemed to be eligible, then status was set to "employer offered, eligible, not enrolled";
- If the person's employer offered a health insurance plan to any of its employees and the person was ineligible, then status was set to "employer offered, not eligible, not enrolled".

For all other workers, however, it was necessary to impute whether or not their employer offered health insurance[7] and, if so, whether or not they were eligible for it.

Data from the 2013 through 2015 MEPS-HC were tabulated to calculate three-year averages of offers and eligibility and projected to 2016 based on changes observed in published tabulations from the MEPS-IC. This allowed us to adjust for changes in employer offers and the Affordable Care Act (ACA). Once offer and eligibility rates were projected to 2016, we calculated the probability of working for an offering employer and being eligible for coverage based on sector (private, Federal, and state/local), firm size (<50, 50-99, 100-499, and 500+) and hours worked[8] (< 30 vs. 30 or more per week).

Valid codes for offer status at the person level were set to:

1 = Enrolled, coverage through current employer
2 = Employer offered, eligible, not enrolled

[5] The CPS does capture point-in-time offers of coverage for March 2017, which is released in a research file, but the Auxiliary Data is based on the calendar year 2016 employment and insurance variables.

[6] These were workers with coverage from their current employer.

[7] An employer is considered to offer coverage if it offers coverage to any employee, even if a specific employee is not offered the coverage due to eligibility issues.

[8] For imputation purposes only, hours worked was split at 30 to be consistent with the ACA.

3 = Employer offered, not eligible, not enrolled
4 = Not offered

Once this was completed, a final recode was performed such that Federal and state sector employees could not have the offer status set as "not offered" but were instead recoded to "offered, not eligible." These workers may have responded incorrectly by misinterpreting ineligibility for non-offering. For example, part time workers who might be ineligible for coverage may have incorrectly identified their employer as not offering coverage when they should have been coded "offered, not eligible."

The table below shows the results of the imputation, for all workers:

Coverage of Persons Who Worked
by Employer Offer Status
(numbers in millions)

Offer Status	Workers
Total	**164.8**
Employer offers coverage	**130.6**
Employee has coverage from employer	77.7
Employee offered (eligible), not enrolled	31.5
Employee offered (not eligible), not enrolled	21.4
Employer does NOT offer coverage	**34.2**

Step 3: Imputing the sector that provides coverage

Given that the CPS provides information on current (March and past year) employment status, but not former employment, it was necessary to impute both sector and size of employers that provided coverage for those who have health insurance from a former employer. For those individuals who receive pension or survivor's payments as reported in the March CPS, we used the sector of the employer that provided the payments to represent the sector providing insurance coverage. For those policyholders without such payments, the sector providing coverage was imputed based on geography (state) and age of policyholder (under 55, 55-64 and 65+). We used data from the 2013 through 2015 MEPS-HC as well as the MEPS-IC survey and 2016 FEHB Program data to determine target probabilities by these dimensions.

For dependents, the sector of the primary policyholder was used to determine the likely source of coverage. For those dependents without a link to a policyholder record, their own demographic characteristics (age, presence of survivor's income) were used to determine the sector providing coverage.

The table below shows the results of the imputation on sector, for all persons with ESI.

Coverage of all persons with ESI
by ESI Status and Sector
(numbers in millions)

ESI Status	Sector	Number with ESI
ESI In Own Name	**Total**	**90.1**
	Private Sector	67.1
	Current Employer	62.6
	Former Employer	4.5
	Public Sector	23.0
	Current Employer	15.1
	Former Employer	7.9
ESI as Dependents	**Total**	**88.4**
	Private Sector	67.4
	Current Employer	64.7
	Former Employer	2.6
	Public Sector	21.0
	Current Employer	16.9
	Former Employer	4.1

NOTE: Totals may not equal the sum of the components due to rounding.

Step 4: Imputing the size of employer that provides coverage

The March CPS provides information on current employer size. This means that for those individuals covered by a former employer, the size of the employer providing the health insurance had to be imputed. This imputation was done in a manner similar to the sector imputation.

The first step was for those with sector equal to either state or Federal government to be assigned the largest CPS size category (1,000+). Next, all other persons were assigned a size based on state, age (under 55, 55 to 64, or 65+) and sector. As with sector, data from the MEPS-IC was the primary source. If a policyholder was not found, person characteristics of the dependent were used instead. Dimensions were essentially the same as those used for the policyholder imputation, except that the age category for dependents included younger groupings.

The following table shows the results of the imputations for size of employer providing coverage.

Coverage of all Persons with ESI
by ESI Status and Employer Size
(numbers in millions)

ESI Status	Size	Number with ESI
ESI In Own Name	**Total**	**90.1**
	Employer Size < 100	20.1
	Current Employer	19.7
	Former Employer	0.4
	Employer Size 100+	70.0
	Current Employer	58.0
	Former Employer	12.0
ESI as Dependents	**Total**	**88.4**
	Employer Size < 100	18.2
	Current Employer	18.0
	Former Employer	0.2
	Employer Size 100+	70.1
	Current Employer	63.6
	Former Employer	6.6

NOTE: Totals may not equal the sum of the components due to rounding.

Step 5: Imputing whether coverage was fully insured or self-insured

The March CPS contains no information about health insurance plans held by survey respondents, including funding status: whether an employer sponsored insurance plan is fully insured (the employer contracts with another organization to assume financial responsibility for the enrollees' medical claims and administrative costs) or self-insured (the employer assumes some or all of these costs directly). All information on plan funding for individuals with ESI has been imputed for the Bulletin as part of the Auxiliary Data.

Data on funding status, as well as plan type,[9] for persons in non-Federal plans were obtained from tabulations of the 2014 through 2016 MEPS-IC files provided by AHRQ. The tabulations performed were at the state (or geographic) level for each year, and while states vary in the proportion of persons covered by each plan type and funding, the relative values for each state compared to the national average are consistent. In addition to the MEPS-IC information, we also looked at the KFF/HRET Employer Health Benefits Survey for 2015 to determine the appropriate penetration levels of self-insurance by size of employer.

The 2016 MEPS-IC levels of self-insurance were used by sector (private vs. state/local), along with the three-year state averages, to determine state specific targets for persons with ESI. All persons enrolled in Federal plans were assumed to be in fully insured plans.

The results of the implementation for funding status are shown in the following table:

Funding Status:
Self- vs. Fully Insured
(numbers in millions)

Funding Status	Number with ESI
Total	**178.5**
Self-Insured	100.6
Fully Insured	77.9

NOTE: Totals may not equal the sum of the components due to rounding.

[9] Plan types were Health Maintenance Organization (HMO), Preferred Provider Organization (PPO), Point-of-Service Plan (POS) or high deductible health plans (HDED), the latter which includes, but are not limited to, IRS qualified HDHP plans.

Step 6: Imputing type of plan

As noted in the prior step, the March CPS does not contain information on the details of the health plan in which an individual is enrolled. As with plan funding, all details on the type of plan held by a person were imputed for those covered by ESI. Prevalence of coverage by plan type (HMO, PPO, POS, or HDED) was based on data from the 2016 MEPS-IC and the change in prevalence from 2015 to 2016 as noted in the KFF/HRET Employer Health Benefits Survey. This data was presented by funding status (self-insured vs. fully insured) and geography.[10] Imputations were made along these dimensions as well as by size of employer.

For Federal plans, the allocation was based on actual FEHB Program data from 2016, as obtained from the OPM, for employees (postal vs. other), annuitants (retirees) and dependents by plan type (HMO vs. PPO).

The table below shows the results of the imputation by funding and plan type.

Persons with ESI
by Funding Status and Type of Plan
(numbers in millions)

Funding Status	Total	HMO	PPO	POS	HDED
Total	**178.5**	**25.3**	**93.7**	**14.0**	**45.4**
In Self-Insured Plans	100.6	7.6	59.6	3.5	29.9
In Fully Insured Plans	77.9	17.8	34.2	10.4	15.5

NOTE: Totals may not equal the sum of the components due to rounding.

[10] Three years of unpublished MEPS-IC data provided by AHRQ were averaged to obtain target percentages by plan type for each state. In cases where sample size was small, we used three years of data by geographic region rather than state.

Step 7: Imputing the partition of COBRA versus retiree coverage

The March CPS does not distinguish between ESI coverage provided by a current or former employer, and it lacks information on whether coverage by a former employer is retiree coverage or COBRA. We imputed retiree versus COBRA coverage for the Bulletin as part of the Auxiliary Data.

Our 2016 "target" counts of persons with either COBRA or retiree coverage were obtained from AHRQ, based on the 2016 MEPS-IC, and from OPM data for the FEHB Program. Partitioning persons assigned with coverage from a former employee into retiree or COBRA coverage was based on person characteristics, using the CPS data itself as well as data from the MEPS-HC.

In general, policyholders were allocated first, with their dependents allocated according to policyholder characteristics. Dependents without policyholders (usually those with coverage from outside the household) were partitioned into retiree or COBRA coverage based on their own characteristics. In our allocation, the following March CPS characteristics were used: age, presence of pension income, sector providing coverage, and categorical amount paid by employer towards coverage (all/some/none).

Age groups used were as follows: under 55, 55-64, and 65 and over. Presence of pension income is based on the March CPS variable "source of retiree income" (or survivor's income, if a dependent), with this income assumed to be pension related if the source was either company or union pension, Federal government retirement, state or local government retirement, or U.S. railroad retirement.[11] The amount paid by an employer towards coverage is captured by the March CPS and includes the following categories: all, some, or none.

Some persons were assigned to either COBRA or retiree with "certainty" (that is, person level characteristics alone determined the type of coverage held), while others were assigned based on the likelihood of coverage being either COBRA or retiree along with the desired total counts of each type of coverage.

The allocation rules and guidelines for assigning individuals to "retiree" or "COBRA" coverage are listed below, based on whether there is certainty or probability involved.

If the person is under 40 years old, COBRA was assigned with certainty, otherwise if pension income is present, status was decided with certainty as follows:

- If person has pension (or survivor's) income and coverage is from public sector, then coverage was deemed retiree.

[11] Revisions made to the income questions on the March CPS have improved identification of pension income and decreased the amount of retiree imputations necessary.

- If person has pension (or survivor's) income and coverage is from private sector and employer payment was anything (including unknown) except "none," then coverage was deemed retiree.

- If person is under 65, has pension (or survivor's) income, coverage from private sector, and employer payment is "none," then coverage was deemed "COBRA."

- If person is aged 65 or over, coverage was deemed retiree.

If no pension (or survivor's) income is present, then the partition between retiree and COBRA was determined as follows:

- The count of persons allocated to retiree or COBRA coverage based on presence of pension income was subtracted from the target counts of retiree and COBRA persons by sector and age.

- Data from the MEPS-HC and MEPS-IC were used to develop probabilities of retiree vs. COBRA coverage for this remaining group by age, employer payment and sector (for private, state and local coverage), while FEHB Program data was used to determine the probability of retiree coverage for those with Federal coverage.

- Persons age 66 and older who had Medicare were assigned to retiree coverage, while persons aged 65 and under were permitted to be assigned COBRA as part of the transition to Medicare.

The table below shows the results of the COBRA and retiree assignments, for persons with coverage from a former employer (policyholders and dependents combined).

Coverage of Persons with ESI
from a Former Employer
by Age, Sector and Retiree vs. COBRA
(numbers in millions)

Age	Sector	Total ESI
Under Age 55	**Total**	**4.5**
	Private Sector	2.4
	Retiree Coverage	0.3
	COBRA Coverage	2.0
	Public Sector	2.1
	Retiree Coverage	1.8
	COBRA Coverage	0.4
Aged 55-64	**Total**	**5.6**
	Private Sector	1.8
	Retiree Coverage	1.2
	COBRA Coverage	0.6
	Public Sector	3.8
	Retiree Coverage	3.7
	COBRA Coverage	0.1
Aged 65+	**Total**	**9.1**
	Private Sector	3.0
	Retiree Coverage	3.0
	COBRA Coverage	0.0
	Public Sector	6.1
	Retiree Coverage	6.1
	COBRA Coverage	0.0

NOTE: Totals may not equal the sum of the components due to rounding.

Step 8: Editing and imputing employer size for current workers

The March CPS contains an interval variable for size of employer for longest job held during the year. This variable refers to the size of the firm rather than that of the establishment or workplace, although tabulations suggest that not all respondents answer appropriately. While it is impossible to determine whether responses by workers in the private sector include all employer locations when reporting their employer size, we have assumed that persons working for a state or the Federal government should fall into the largest employer size category. Responses were edited accordingly.

Starting with the March 2011 CPS, Census revised the employer size categories so that there are partitions at 10, 50 and 100, whereas there had previously been partitions at 10, 25 and 100. Although we have modified our analysis to use these new size categories, it was necessary to include an additional partition at size 20 in order to determine Medicare secondary payer splits. Data from the three most current MEPS-HC files were used in order to determine the likely split for full-time and part-time workers.

Step 9: Imputing Medicare Secondary Payer (MSP)

When assigning primary coverage to individuals with more than one source of coverage during the year, the Bulletin generally ranks employer sponsored insurance (ESI) above all other sources. However, when a person has both Medicare and ESI, this is not always the case. For workers, certain employer sponsored health insurance plans are primarily responsible for payment. The Medicare Trust Funds are protected by the 1980 Congressional legislation that makes Medicare the secondary payer in specific instances, thus shifting costs away from the Medicare program.[12] Under MSP rules, non-workers (retirees) with ESI always have Medicare as the primary payer. For workers, the primary payer depends on the size of the employer and whether the individual qualifies for Medicare due to age or disability. Since the March CPS does not ask which of these two insurers is the primary payer, we imputed this variable in accordance with Medicare secondary payer rules.

For active employees (and their dependents), a determination of primary payer depends on age and employer size. For workers or their spouses who are age 65 or over, ESI is the primary payer if the employer size is 20 or more, while Medicare is the primary payer if employer size is under 20. For those younger than 65, ESI is the primary payer if the employer size is 100 or more, while Medicare is the primary payer if employer size is under 100.

As noted in the prior step, the March CPS does not have an employer size split at 20, but rather a category for size 10 to 49. Thus, we used partitions based on the MEPS-HC to determine probabilities for persons in this group, randomly assigning them to employer size under 20 or size 20 or greater.[13] For dependents with both Medicare and ESI coverage, the dependent's age is used, but the size category is obtained from the policyholder. A variable is included in the Auxiliary Data file for all persons with both ESI and Medicare to indicate primary payer.

The table below shows the results of the MSP imputation for persons with Medicare and ESI.

Medicare Secondary Payer Coverage
by Age
(numbers in millions)

Age	MSP Status	Total ESI
Age under 65	**Total**	**1.2**
	Medicare Primary	0.7
	Medicare Secondary	0.6

[12] CMS explanation of Medicare Secondary Payer can be found at http://www.cms.gov/Medicare/Coordination-of-Benefits-and-Recovery/Coordination-of-Benefits-and-Recovery-Overview/Medicare-Secondary-Payer/Medicare-Secondary-Payer.html.

[13] We have made this assumption only for the determination of MSP coverage.

Age	MSP Status	Total ESI
Age 65 and over	**Total**	**11.3**
	Medicare Primary	8.8
	Medicare Secondary	2.6

NOTE: Totals may not equal the sum of the components due to rounding.

Step 10: Imputing actuarial values (AVs)

While the March CPS includes limited data on the cost of health insurance and annual medical expenditures, it does not collect the information required to determine the "actuarial value" of an individual's health insurance plan. AV represents the fraction of covered medical expenses paid for by a health insurance plan, calculated as an average over a standard population. Variables that represent the actuarial value of an active employer sponsored health insurance plan have been imputed to active employees with health insurance in their own name and are included in the CPS Auxiliary Data.

Work done by Actuarial Research Corporation (ARC) in calculating AVs from the 2005 National Compensation Survey (NCS) is the original basis for the actuarial value calculations in the CPS Tool. Using the NCS, ARC calculated actuarial values for the private sector plans based on the plan specifications (cost sharing and covered services) provided in the survey and presented the distributional results by plan type, funding, and employer size. This work was updated by ARC in 2017,[14] using the distributional results from the NCS dataset 113, which includes plans collected from June 2014 through July 2015.[15]

Plan level detail from the 2015 and 2016 KFF/HRET Employer Health Benefits Survey, and the AVs calculated from the survey data, were used to move the NCS-based AVs forward to 2016, consistent with the NCS distributions. For private sector active employees, the 2016 KFF/HRET Employer Health Benefits Survey data was used at the plan level but re-weighted within plan type and funding cell to reproduce both the averages and distributions from the NCS work. For public sector employees, the 2016 KFF/HRET Employer Health Benefits Survey data was used unadjusted.

While there was a slight modification in the prescription drug information that was collected in the 2016 KFF/HRET Employer Health Benefits Survey, which is explained in more detail later, it did not have a substantial effect on our actuarial value calculations.[16] In addition, given the actuarial values for private sector employees were anchored to the NCS distributions, the slight change in raw AVs from the KFF/HRET Employer Health Benefits Survey data had no impact on the final results.

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[14] "Final Report: Analysis of Actuarial Values and Plan Funding Using Plans from the National Compensation Survey," compiled for the Office of Policy and Research (OPR), Employee Benefits Security Administration (EBSA), Department of Labor (DOL) by Actuarial Research Corporation, May 12, 2017. https://www.dol.gov/sites/dolgov/files/EBSA/researchers/analysis/health-and-welfare/analysis-of-actuarial-values-and-plan-funding-using-plans-from-the-national-compensation-survey.pdf.

[15] The NCS microdata is generally not publicly available, and our work drew on the most recent dataset available to ARC, per our analysis of actuarial values and plan funding (see footnote 14).

[16] When making a similar change to the 2015 KFF/HRET Employer Health Benefits Survey data, 92 percent of plans had unchanged AVs and the overall resulting mean AV differed by just 0.01 percentage points.

We have imputed both "cell-based actuarial values," which are averages by sector, plan type and funding, as well as "plan-specific actuarial values" onto the Auxiliary Data. While the cell-based values are useful at the aggregate level, they are not helpful for performing detailed analyses of partitions beyond these broad cell groupings. For this reason, we imputed plan-specific values using a plan-to-person, record-by-record match prioritized by size.

The resulting plan-specific average actuarial values are shown in the table below.

Average Actuarial Values for Persons with Active ESI in Own Name
by Sector and Type of Plan

Sector	Total	HMO	PPO	POS	HDED
Private Sector Plans	0.842	0.892	0.850	0.870	0.794
Public Sector Plans	0.880	0.928	0.878	0.901	0.830

In addition to the AVs calculated and discussed above, we have also included a set of actuarial values in the Auxiliary Data that were calculated by automating the most recent Minimum Value Calculator (MVC) from CMS's Center for Consumer Information & Insurance Oversight (CCIIO).[17] The MVC is a tool for large employers to evaluate a health plan's actuarial value based on its cost sharing, ensuring it complies with the ACA's minimum value requirement to cover 60 percent of total allowed costs. Due to the exploratory nature of the AVs, they are not included in the Health Bulletin at this time but are being made available in the Auxiliary Data.

As noted above, these MVC actuarial values use a version of the CCIIO Excel workbook that has been adapted in order to run large numbers of health insurance plans through in an automated manner. The MVC is based on large employer data, as opposed to the individual market focus of CCIIO's Actuarial Value Calculator (AVC), and so more closely aligns with the type of plans for which actuarial values were calculated. Once calculated, each plan output was then linked back to the same set of CPS records that had the original actuarial values imputed to them, as described above. In general, the MVC actuarial values are consistent with those calculated by our internal methodology.

The resulting approximated MVC average actuarial values are shown in the table below.

[17] The MVC is "mv-calculator-final-4-11-2013.xlsm," as found at

https://www.cms.gov/cciio/resources/regulations-and-guidance/downloads/mv-calculator-final-4-11-2013.xlsm.

Average Approximate MVC Actuarial Values
for Persons with Active ESI in Own Name
by Sector and Type of Plan

Sector	Total	HMO	PPO	POS	HDED
Private Sector Plans	0.815	0.870	0.827	0.849	0.757
Public Sector Plans	0.855	0.910	0.855	0.887	0.793

Step 11: Examining CPS variables on health spending

Starting with the March 2011 CPS, Census has included information on health insurance premiums (FHIP-VAL and PHIP-VAL) as well as out-of-pocket spending for both over the counter purchases (POTC-VAL) and medical care and equipment (PMED-VAL).

The question on health insurance premiums[18] is both broadly worded and too restrictive; it mentions multiple examples of insurance types beyond traditional health insurance, but does not include insurance that is paid by a union or employer. Given the lack of specificity of what is contained in the answer, as well as a lack of detail of how this was asked for persons without ESI,[19] these variables are excluded from the Auxiliary Data Set and the current Health Bulletin.

Levels of out-of-pocket spending have been examined and are compatible with estimates from the MEPS-HC by age and insurance status. In addition, we examined the distribution of spending for those with spending and found these distributions to be robust at both the high and low ends. As a result, we included the CPS estimates of out-of-pocket spending in the March 2017 Auxiliary Data set and tables. The out-of-pocket variable included in the Auxiliary Data is the sum of the two CPS variables (over-the-counter purchases and medical care). No edits or imputations beyond this summation are performed on the CPS values. Averages for spending are shown below.

Mean Out-of-Pocket Spending (OOP)
by hierarchical insurance

Insurance	Counts (millions)	Mean OOP
Total Population	320.4	$ 807
Insured	292.3	$ 841
ESI		
Policyholder	83.1	$ 1,022
Dependent	86.0	$ 687
Medicare	50.2	$ 1,367
OPHI		
Policyholder	14.0	$ 1,130
Dependent	11.0	$ 663

[18] [Earlier I recorded that (your/name's) employer or union did not pay for (your/his/her) entire health insurance premium.] Last year, how much did (you/name) pay out-of-pocket for ALL health insurance premiums [covering (yourself/himself/herself) or others in the household]? Include both comprehensive and supplemental plans (such as vision and dental insurance). [What about (you/name)?] (Include prescription drug insurance such as Medicare Part D premiums and Medicare Advantage premiums. DO NOT include Medicare Part B premiums.)

[19] Even if we restrict the population to persons with ESI, it is still not clear that the resulting dollars are at all useful to discussions of the cost of employer sponsored coverage since the amounts may (or may not) include other types of insurance.

Insurance	Counts (millions)	Mean OOP
Other Public	48.1	$ 207
Uninsured	28.1	$ 453

NOTE: Totals may not equal the sum of the components due to rounding.

Step 12: Imputing whether coverage was provided through a union arrangement

For workers age 15 or older, the March CPS provides limited information on whether a person is a member of a labor union or of an employee association similar to a union (CPS person variable: A-UNMEM). For nonmembers, the March CPS asks if the person is covered by a collective bargaining agreement (CPS person variable: A-UNCOV). For simplicity, we summarize the two CPS union variables into a single variable which was coded to have values of either "1" (union) or "2" (not union). All persons who indicate either union membership or coverage through a collective bargaining agreement were considered "union." Those who respond in the negative to both questions were categorized as "not union." However, the usefulness of these questions is limited by the fact that they are asked to only one quarter of the working population (those who were in their fourth or eighth month in the survey) and exclude the self-employed. As a result, it was necessary to impute union membership to all other private or public-sector workers and union coverage to all persons with employer sponsored insurance coverage. This was done by creating three imputed variables for union status: one for all workers (union membership), one for ESI policyholders (union coverage), and one for ESI dependents (union coverage).

We began the assignment process by looking at private and public sector workers. If the March CPS union variables give a valid union status, we assigned union membership (yes or no) with certainty. For all other persons (those without a valid CPS union status), it was necessary to impute whether or not the worker belongs to a union. Probabilities of union membership were calculated using those CPS records with a valid set of responses to the union questions. These probabilities were based on age (<35, 35-55, 55-64, 65+), collapsed industry/sector of employment (private sector and likely union (mining, construction, manufacturing, transportation, utilities), private and not likely union (agriculture/forestry/fishing, wholesale, retail, finance/insurance/real estate, services, healthcare), public sector), size of employer (<50, 50-499, 500+), hours worked (<30, 30+) and geographical region.

Next, we assigned with certainty, union coverage status for ESI policyholders with coverage through their current employer based on their union worker status. This step was straightforward, as these records kept their assignment from the prior step.

We then imputed union coverage for those ESI policyholders with coverage from a former employer, whether or not they work. The purpose was to reflect the status of the employer providing coverage, while the union variables described above were based on the characteristics of the current employer. Probability cells from the 2008 Wave 6 panel of the SIPP (2010 data) are used for those with coverage through COBRA or as a retiree. Probability cells for COBRA coverage include age (under 55, 55 and over), size of employer providing coverage (under 100 and 100 or more), employer sector (private, Federal, state/local) and work status (work and no work). Probability cells for retirees include an additional age break at 65 and omit work status.

Additional tabulations from the National Health Insurance Survey (NHIS) and newer SIPP panel data, for the 2010-2016 and 2010-2014 time periods, respectively, were run by age, work and retirement status for coverage identified as specifically obtained through either an employer or union. While the newer data was not able to replicate the level of detail needed and obtained

from the older SIPP, it did allow us to look at trends in union coverage over time. The only cell with a discernable trend from both sources was for persons age 65+ with private sector retiree coverage. The 2010 SIPP data was adjusted in this one cell based on the trends observed in both the NHIS and newer SIPP panel data.

For ESI dependents (including those who were also policyholders), we created a variable with the same categories as those for policyholders. We used the affiliation of the primary policyholder wherever a link was available. In the absence of a direct link, the status was imputed based on sector of coverage, size of employer providing coverage, age of dependent and whether coverage is active, COBRA or retiree.

As a result of the union assignments and imputations, workers, ESI policyholders and ESI dependents are partitioned as follows:

Union Membership or Coverage
(numbers in millions)

Population	Union Status	Total ESI
All Workers (with or without ESI, no self-employed)	**Total**	**149.5**
	Union Members	18.3
	Not Union	131.3
All Persons with ESI[20] (workers and non- workers)	**Total**	**174.0**
	Union Coverage	33.4
	Not Union	140.7

NOTE: Totals may not equal the sum of the components due to rounding.

[20] This includes both policyholders and dependents, but excludes those with coverage only through self-employment.

Step 13: Imputing whether coverage was provided through a health insurance exchange

Beginning in the fall of 2013, individuals have been able to purchase health insurance coverage for the following calendar year through either state or Federal health insurance exchanges, in addition to purchasing directly. Open enrollment sign-up for exchange coverage for CY 2016 took place between November 1, 2015, and January 31, 2016, with special enrollment permitted outside this window. In addition, small employers had the option, beginning in some states in mid-2014, to purchase coverage for their employees through the SHOP. As there was very low enrollment in SHOP coverage in CY 2016, and no good reporting on enrollment either in total or by state, we did not impute coverage under this program. There were, however, several million people who purchased private insurance through the individual exchanges, and so we did impute for coverage in the individual exchange.

Our starting point was average monthly effectuated enrollment data for 2016, as released by CMS[21] by state and income level. The income levels were for those under 250% of poverty (who received both the cost-sharing reductions (CSR) and advanced premium tax credits (APTC, or premium subsidies)), those between 250 and 400% of poverty (who received premium subsidies only), and those over 400% of poverty (who were unsubsidized). The 2015 MEPS-HC included coverage in an exchange as one type of private insurance and was tabulated by type of family[22] (single, couple, one adult + kid(s), and two adults + kid(s)), age of oldest person in family, and income as percent of poverty. We compared exchange coverage in MEPS to the pool of persons in the CPS likely to be in an exchange (those with individual insurance), with emphasis on keeping family members together to be consistent with what was found in the MEPS data. The CMS data provided us with a target of just over 10 million exchange enrollees, to be represented via imputation on the CPS.

Of the 52.0 million persons on the March 2017 CPS with individual private health insurance, we found 19.8 million to be potential individual exchange enrollees. These 19.8 million people excluded policyholders (and their dependents) who (a) worked a full year (>39 weeks) and either had ESI in their own name or an offer of ESI, or (b) had Medicare coverage. While initial probabilities were based on enrollment by state and poverty level, adjustments to these probabilities were then made based on the distribution of enrollees by age and family type.

Exchange Targets vs. Imputed
in millions

Income Band	Targets	Imputed
Total Exchange	**10.0**	**10.0**
With CSR and APTC (<250% FPL)	5.6	5.5
APTC only (250%-<400% FPL)	2.8	2.8

[21] Average Effectuated Enrollment Report https://downloads.cms.gov/files/effectuated-enrollment-snapshot-report-06-12-17.pdf.

[22] In this instance, families included only those persons with the same type of individual private health insurance.

Income Band	Targets	Imputed
Not subsidized (>=400% FPL)	1.6	1.6

Revisions to the March CPS and our Methodology

Beginning with the March 2014 CPS, Census introduced substantial revisions and additions to the survey, particularly in the areas of income and insurance. The health insurance questions were completely redesigned in order to better estimate coverage during the prior calendar year. In particular, the source of insurance from outside the household has been clarified. New questions were added to look at coverage through health insurance exchanges, subsidies through the exchanges, as well as questions on employer offers of health insurance and insurance take-up rates.

While the revised questions have been recoded into the prior years' format and thus present us with an improved picture of the levels of coverage during the year, most of the data containing the newly added questions have not yet been released, or have only been released as research files, and so we continue to impute for those items not yet available. As a result, our method to produce the CPS Auxiliary Data has not differed substantially from prior years' efforts. As with last year, a single "yes/no" point-in-time (PIT) insurance variable, for coverage at time of survey questionnaire, was released by Census and has been included without edit in the Auxiliary Data. Tables examining this variable are included in the current Health Bulletin.

Variables Added:

New fields that were added to the Auxiliary Data in 2016 included OUTTYP (coverage from outside the household), OLDSTATE (the state variable that had been variable GESTCEN (1960 Census State Code), now recoded from the variable GESTFIPS (state FIPS code)), EXCHANGE (a flag with imputed exchange coverage), and MCDEXPANSION (a state level flag to denote if the record was from a state with a Medicaid expansion program, updated for CY 2016). For 2017, we have added a constructed variable to indicate point-in-time employer sponsored insurance coverage as a policyholder (NOWESI). While this variable is collected on the CPS it is not released. The Census Bureau confirmed that the offer question (PEOFFER) was asked of all workers who were employed (PEMLR = 1, 2) but not self-employed and did not have current (PIT) ESI as a policyholder. Therefore, those who do not answer the offer question (PEOFFER = -1) but are workers who are employed but not self-employed must thus have current (PIT) ESI as a policyholder.

Methodological Revisions:

The methodology used in creating the March 2017 Auxiliary Data is mostly consistent with previous years. The largest revision was to incorporate the point-in-time variables for ESI offer and take-up. This is described below, with the full list of revisions following.

Point in time offers:

As indicated above, workers (not self-employed) not currently (PIT) enrolled in ESI as a policyholder, were asked if their employer offered health insurance. If the worker responded no, ARC coded the record under "not offered." In addition, the Census Bureau asked those who were offered insurance if they could have enrolled and why they chose not to or why they were ineligible for enrollment.

The variable PECOULD indicated whether a person was eligible or ineligible to purchase an employer's health plan if one was offered. We combined the response to PECOULD with the reasons for not taking or not eligible when assigning values to our recoded OFFER variable.

The raw responses available for not taking insurance when eligible (PEWNTAKE1-8) were as follows:

PEWNTAKE1: Covered by another plan
PEWNTAKE2: Traded health insurance for higher pay
PEWNTAKE3: Too expensive
PEWNTAKE4: Don't need health insurance
PEWNTAKE5: Have a pre-existing condition
PEWNTAKE6: Haven't yet worked for this employer long enough to be covered
PEWNTAKE7: Contract or temporary employees not allowed in plan
PEWNTAKE8: Other/specify.

When not eligible, the raw responses for why the individual was ineligible for coverage (PEWNELIG1-6) were:

PEWNELIG1: Don't work enough hours per week or weeks per year
PEWNELIG2: Contract or temporary employees not allowed in plan
PEWNELIG3: Haven't yet worked for this employer long enough to be covered
PEWNELIG4: Have a pre-existing condition
PEWNELIG5: Too expensive
PEWNELIG6: Other/specify.

Respondents were allowed to choose more than one reason for declining coverage or for ineligibility. ARC chose to recode to "ineligible" those who responded with reasons for declining of "contract or temporary employees not allowed in plan" or "haven't yet worked for this employer long enough to be covered". In addition, if "too expensive" was the only reason given for ineligibility, ARC recoded the record to eligible, not enrolled. It should be noted that the response "have a pre-existing condition" is listed under both variables (PEWNTAKE5 and PEWNELIG4). If this was the only response in both cases, ARC did not make any recodes and PECOULD was used to assign eligibility.

Our specific recoding was as follows:

If PEOFFER = 2 (PIT not offered): Not offered
If PEOFFER = 1 (PIT offered)

If (PECOULD = 1 and PEWNTAKE1-5, 8 = 1) or (PECOULD = 2 and PEWNELIG5 = 1 and PEWNELIG1-4, 6 = 2 (PIT eligible)): Employer offered, eligible, not enrolled

If (PECOULD =1 and PEWNTAKE = 6-7) or (PECOULD =2 and PEWNELIG1-4, 6 =1 (PIT ineligible)): Employer offered, not eligible, not enrolled.

Other revisions:

In addition, the following revisions were made either this year or last:

- The actuarial value calculations and imputation algorithms for this year are consistent with earlier Auxiliary Data efforts (March 2015 and earlier); however, they are now based on more current plan data from the National Compensation Survey for 2015.
    - As noted briefly in Step 10 above, in the 2016 KFF/HRET Employer Health Benefits Survey prescription drug (Rx) benefit information was collected only for the plan with the most enrollment, whereas previously the survey collected drug benefit detail for every plan offered. In order to determine the effect of this change on plan AVs, ARC used the 2015 KFF/HRET Employer Health Benefits Survey data and compared AV raw output (each plan having own drug detail) with an AV calculated using the drug detail from the largest plan for each employer for all of an employer's plans. Overall, the AVs were unchanged for 92% of the records. The resulting mean AV (across all plans) differed from the original mean AV by 0.01 percentage points. ARC concluded that the effect on AV was minimal, and the Rx benefits for the employer's largest plan could be used as a proxy for all of that employer's plans.
- This year, the imputation for whether an employee was offered health insurance coverage was changed slightly to make use of the point-in-time information as released in the CPS research file where possible.
- In addition, a floor of age 40 was placed for assigning retiree coverage, with all persons under age 40 with prior coverage being assigned to COBRA with certainty.
- Finally, the industry cells for imputing union coverage were collapsed, as listed in Step 12.
- As of last year, the renewed availability of data from AHRQ on the most current MEPS-IC enabled us to no longer need to project estimates for plan funding by plan type and state from a prior year using an additional data source.
- Additional refinements to the imputation process last year included changing the full-time/part-time number of hours worked from 35 to 30, to be consistent with the ACA, and improving the exchange imputation using CMS data by state and income, and the most recently available MEPS-HC data for family demographics in the exchange.

Useful Links:

Current Population Survey's Annual Social and Economic Supplement (ASEC, or March CPS):

- The main CPS page is found here: https://www.census.gov/programs-surveys/cps.html with links to details such as methodology, data, definitions and technical documentation.
    - The codebook for the March 2017 CPS, which includes mention of survey changes, is found at: https://www2.census.gov/programs-surveys/cps/techdocs/cpsmar17.pdf.
    - Health insurance estimates from the CPS are from the Annual Social and Economic Supplement, with the main publication page for health insurance reports found here: https://www.census.gov/content/census/en/topics/health/health-insurance/library/publications.All.html/.
    - The main report from the March 2017 survey, "Health Insurance Coverage in the United States: 2016", contains information collected in both the Current Population Survey Annual Social and Economic Supplement (CPS ASEC) and the American Community Survey (ACS). For the most part, tables in the report are from the CPS. State-level tables, however, are from the ACS, which has a larger sample size and can give better estimates by smaller geographic areas.
        - The report itself can be found at: https://www.census.gov/library/publications/2017/demo/p60-260.html.
    - Working papers on health insurance can be found at https://www.census.gov/topics/health/health-insurance/library/working-papers.html.
    - Further explanation of the changes and enhancements to the March 2014 CPS can be found in: https://www.census.gov/topics/health/health-insurance/guidance/cpsasec-redesign.html.
    - Point-in-time insurance coverage variable information, and information on refinements to coverage from outside the household, can be found at: https://www.census.gov/data/datasets/time-series/demo/health-insurance/cps-asec-research-files.html.

Medical Expenditure Panel Survey (MEPS):

- The main MEPS page is found here: http://meps.ahrq.gov/mepsweb/ with background information here: http://meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp.
- Two of the main components are the Household Component (MEPS-HC) and Insurance Component (MEPS-IC). Links to those are found at: http://meps.ahrq.gov/mepsweb/survey_comp/household.jsp for the HC and http://meps.ahrq.gov/mepsweb/survey_comp/Insurance.jsp for the IC.

Survey of Income and Program Participation (SIPP):

- The Survey of Income and Program Participation, a longitudinal panel survey, is conducted by the Census bureau. Information on the SIPP can be found here: https://www.census.gov/programs-surveys/sipp/about.html.
- Reports based on SIPP data can be found here: https://www.census.gov/programs-surveys/sipp/library/publications.html.

National Health Interview Survey:

- The main NHIS page can be found at: https://www.cdc.gov/nchs/nhis/index.htm.
- Data, questionnaires and documentation can be found at: https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm.
- Survey reports from the NHIS can be found at: https://www.cdc.gov/nchs/nhis/nhis_products.htm.

KFF/HRET Employer Health Benefits Surveys:

- Archive of surveys from 2016 and earlier can be found at: http://kff.org/health-costs/report/employer-health-benefits-annual-survey-archives/.
- The 2015 Survey, with data used for this report, can be found at: http://kff.org/health-costs/report/2015-employer-health-benefits-survey/.
- The 2016 survey page can be found at: http://kff.org/health-costs/report/2016-employer-health-benefits-survey/.
- The most recent survey, 2017, is found at: https://www.kff.org/health-costs/report/2017-employer-health-benefits-survey/.

Federal Employees Health Benefits (FEHB) Program

- An overview of the program can be found at: http://www.opm.gov/healthcare-insurance/healthcare/.
- Frequently asked questions, including about Medicare and the FEHB Program, are at: http://www.opm.gov/FAQS/topic/insure/index.aspx?cid=3d961dac-81d1-44e2-998c-ed80029feb70.

National Compensation Survey:

- The NCS home page is at: http://www.bls.gov/ncs/.
- The report "Employee Benefits in the United States" can be found at: http://www.bls.gov/news.release/ebs2.toc.htm.
- An ASPE Research Brief on "Actuarial Value and Employer-Sponsored Insurance," which mentions the NCS actuarial values, is found at: http://aspe.hhs.gov/health/reports/2011/av-esi/rb.shtml.

Minimum Value Calculator (MVC) from the Center for Consumer Information and Insurance Oversight:

- Standards Related to Essential Health Benefits, Actuarial Value, and Accreditation is found at: http://www.gpo.gov/fdsys/pkg/FR-2013-02-25/pdf/2013-04084.pdf.
- The Minimum Value Calculator with links to methodology and the Excel sheet is found at: http://www.cms.gov/CCIIO/Resources/Regulations-and-Guidance/.