Technical Appendix
March 2018 CPS Auxiliary Data

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Cathi Callahan and Rodelle Williams
Actuarial Research Corporation

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OVERVIEW OF THE 2018 CPS AUXILIARY DATA

The Current Population Survey Annual Social and Economic Supplement (CPS ASEC) (also called the March CPS) is the data source most often used for estimating health insurance coverage in the United States. The March CPS underwent major enhancements and revisions for 2014, but only some of these changes have been released to the research community, and none have been added to the basic March dataset released by Census.[1] Thus, several important characteristics of employer sponsored health insurance (ESI) remain either not captured by the survey or not publicly available. 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, and a bulletin with summary tables based on the enhanced data.

For the March 2018 Auxiliary Data, we have updated our data sources to reflect the newest available information. This technical appendix describes the current imputations and edits performed in order to provide detailed estimates of employer sponsored insurance for calendar year (CY) 2017.

The imputations performed can be broken down into two main categories: (1) access to coverage and (2) coverage characteristics. Access to coverage includes whether an employer provides coverage, as well as details about those that do, including employer size (number of employees) and sector (private, Federal, or state/local). Coverage characteristics include funding type, plan type, and estimates of retiree and COBRA coverage. Starting with the CY 2010 Auxiliary Data, we imputed a variable for actuarial value which is the average proportion of covered charges paid as benefits by insurance. This variable was imputed for active employees with health insurance in their own name.

In general, we imputed insurance and employment characteristics for employees and other persons with employer sponsored insurance coverage in their own name. ESI dependents were assigned the characteristics of the 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, Federal and state-based marketplace coverage was imputed for a likely subset of persons with individual (non-employer sponsored) health insurance. These imputations were 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 compared to coverage in prior year and which we 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.

Our starting data set was the March 2018 CPS. Below is a list of enhancements made and variables added to the Auxiliary Dataset.

- Source of coverage and employer offers of coverage: While the March CPS asks whether insurance coverage is provided by an employer, it does not distinguish whether the coverage is from a current or former employer. This distinction is imputed using the three most recent years (2014–2016) of data from the Medical Expenditure Panel Survey Household Component (MEPS-HC). We assigned employer offers of coverage 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: We imputed employer sector and size for persons with coverage from a former employer using the three most recent years of data (2015–2017) 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: We used data from the 2015–2017 MEPS-IC, along with partitions and trends from the Kaiser Family Foundation Employer Health Benefits Survey (EHBS) through 2017 to impute funding status and type of coverage for those with ESI and to partition coverage from a former employer into retiree and COBRA.

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

- Actuarial values: We used health plan details from the 2017 EHBS, actuarial value analysis done for EBSA using National Compensation Survey (NCS) health plan data from 2014 and 2015, and historical data from prior EHBS surveys to calculate actuarial values. We then imputed the values onto active policyholder records.

- Health spending: CPS introduced variables on out-of-pocket spending and person-paid health insurance premiums with the March 2011 CPS. After examining these variables and comparing them to other sources, EBSA decided to include them, beginning with the March 2012 Auxiliary Data and Health Insurance Coverage Bulletin.

- Union Sponsorship: We used data from the March CPS 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, was used to impute union sponsorship to persons with coverage from a former employer. For private sector retirees age 65 and over, union probability cells

were enhanced with trend data from the National Health Interview Survey (NHIS) for the 2010–2017 period and the SIPP for the 2010–2014 period.[2]

- Coverage through an Exchange: We used CMS data, by state, age, and income level, to impute individual exchange coverage for a likely subset of persons with non-employer sponsored private health insurance.[3] In mid-2014, Small Business Health Options Program (SHOP) plans became available for employees working for small businesses in a select number of states. We have not imputed SHOP coverage for 2017.

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

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

[3] While this information was collected in the March CPS, the imputation was necessary because exchange coverage is included with other (non-employer) private health insurance, and the breakout has not yet been released by Census.

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 2014–2016 data were averaged to calculate probabilities of coverage through a former versus current employer. The results were enhanced with data from the 2017 MEPS-IC, which provides policyholder counts from non-Federal employers for those with active, retiree or COBRA coverage. While the 2017 MEPS-IC data were used for private employers, a three-year average (2014–2016) was used for state and local employers because of a delay in availability, as well as large standard errors in the single-year estimates. Data from the FEHB Program were used to provide estimates at the Federal level.

All March CPS records were initially checked to determine whether it was possible to accurately identify employer status (current versus former). If a person did not work at all during a year but had ESI in their own name, they were assigned coverage by a former employer. For all others, we needed to impute the source of the coverage. The 2014–2016 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 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 2017, this process resulted in 80.9 million ESI policyholders with coverage through their current employer and 10.9 million with coverage through a former employer.

Table 1 shows the results of the source of coverage imputation, for persons with ESI in their own names.

Table 1. Persons with ESI in Own Name by Employment Status (numbers in millions)

Employment Status	Number with ESI
Total	91.8
Worked in past year	83.9
Coverage from current employer	80.9
Coverage from former employer	3.0
Did not work in past year	7.9

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 whether the respondent's employer offers insurance.[4] Imputing coverage through a current versus former employer (described in the previous step) creates a subset of persons who, by definition, have an employer that offered coverage.[5] For the subset of workers who appear to have the same job as they had the previous year and are not insured through their employer (either in prior year or currently), we used the March 2018 point-in-time offer status to inform the assignment of offer/eligibility. Details on the point-in-time variables, and how they were used to create the offer/eligibility assignments, are found in the "Revisions" section of this document and 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, we needed to impute whether the employer offered health insurance, and if so, whether the worker was eligible.[6]

Using data from the 2014–2016 MEPS-HC, we calculated three-year averages of offers and eligibility, then projected them to 2017 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 2017, 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 (less than 50, 50–99, 100–499, and 500 or more), and hours worked (less than 30 versus 30 or more per week).[7]

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

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

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[4] The CPS does capture point-in-time offers of coverage for March 2018, which is released in a research file, but the Auxiliary Data is based on the calendar year 2017 employment and insurance variables.

[5] These were workers covered by their current employer.

[6] An employer is considered to offer coverage if it offers coverage to any employee, even if a specific employee is ineligible for the coverage.

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

4 = Not offered

Federal and state employees whose offer status was set as "not offered" were recoded to "offered, not eligible." These workers may have responded incorrectly by misinterpreting the "not offered" category. For example, part-time workers who were ineligible for coverage may have incorrectly identified their employer as not offering coverage, when, in fact, the employer offered coverage to at least some workers, and so should have been coded as "offered, not eligible."

Table 2 shows the results of the coverage imputation for all workers.

Table 2. Coverage of Persons Who Worked by Employer Offer Status (numbers in millions)

Offer Status	Workers
Total	166.4
Employer offers coverage	133.7
Employee has coverage from employer	80.9
Employee offered (eligible), not enrolled	31.3
Employee offered (not eligible), not enrolled	21.5
Employer does NOT offer coverage	32.7

Step 3: Imputing the sector that provides coverage

Because the CPS provides information on current (March and past year) employment status, but not former employment, we needed to impute both sector and size of employers that provided coverage for those who have health insurance from a former employer. For 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 policyholders without such payments, we imputed the sector providing coverage based on geography (state) and age of policyholder (under 55, 55–64 and 65 and over). We used data from the 2014–2016 MEPS-HC, the MEPS-IC survey, and the 2017 FEHB Program to determine target probabilities.

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

Table 3 shows the results of the sector imputation for all persons with ESI.

Table 3. 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	91.8
	Private Sector	69.3
	Current Employer	65.2
	Former Employer	4.0
	Public Sector	22.5
	Current Employer	15.7
	Former Employer	6.8
ESI as Dependents	Total	89.2
	Private Sector	68.8
	Current Employer	66.3
	Former Employer	2.5
	Public Sector	20.4
	Current Employer	17.3
	Former Employer	3.1

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

Step 4: Imputing the size of employer that provides coverage

As noted above, because the CPS provides information on current (March and past year) employment status, but not former employment, we needed to impute the size of employers that provided coverage for those who have health insurance from a former employer. This imputation was done in a manner similar to the sector imputation.

We imputed employer size for covered persons, including both policyholders and dependents, based on the prior sector imputation. First, we assigned all covered persons with sector equal to either state or Federal government to the largest CPS employer size category (1,000 or more). Next, all other covered persons were assigned an employer size based on state, age (under 55, 55–64, or 65 and older), and sector. As with the sector imputation, MEPS-IC was the primary data source. Dependents linked to a policyholder were assigned the same status as the policyholder. If a policyholder was not found, we used characteristics of the dependent. Dimensions were essentially the same as those used for the policyholder imputation, except that the age category for dependents included younger groupings.

Table 4 shows the results of the employer size imputations.

Table 4. 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	91.8
	Employer Size < 100	20.6
	Current Employer	20.3
	Former Employer	0.3
	Employer Size 100+	71.2
	Current Employer	60.6
	Former Employer	10.5
ESI as Dependents	Total	89.2
	Employer Size < 100	18.6
	Current Employer	18.4
	Former Employer	0.2
	Employer Size 100+	70.6
	Current Employer	65.2
	Former Employer	5.4

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 does not include details about a person's health plan, including information indicating funding status. Therefore, we do not know whether an ESI 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 persons with ESI has been imputed for the Bulletin as part of the Auxiliary Data.

Data on funding status and plan type for persons in non-Federal plans were obtained from tabulations of the 2015–2017 MEPS-IC files provided by AHRQ.[8] The tabulations were performed 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 EHBS for 2017 to determine the appropriate penetration levels of self-insurance by size of employer.

The 2017 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.

Table 5 shows results of the funding status implementations.

Table 5. Funding Status: Self- vs. Fully Insured (numbers in millions)

Funding Status	Number with ESI
Total	181.0
Self-Insured	101.2
Fully Insured	79.8

[8] Plan types were Health Maintenance Organization (HMO), Preferred Provider Organization (PPO), Point-of-Service Plan (POS), and high deductible health plans (HDED), the latter of 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 detailed information on 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 2017 MEPS-IC and the change in prevalence from 2016 to 2017, as noted in the EHBS. These data were presented by funding status (self-insured versus fully insured) and geography.[9] Imputations were made along these dimensions as well as by size of employer.

For Federal plans, the allocation was based on FEHB Program data from 2017, as obtained from the OPM, for employees (postal vs. other), annuitants (retirees) and dependents, by plan type (HMO versus PPO).

Table 6 shows the results of the funding and plan-type imputations.

Table 6. Persons with ESI by Funding Status and Type of Plan
(numbers in millions)

Funding Status	Total	HMO	PPO	POS	HDED
Total	181.0	27.6	89.8	14.2	49.5
Self-Insured Plans	101.2	5.9	58.6	5.8	30.9
Fully Insured Plans	79.8	21.7	31.2	8.4	18.5

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

[9] 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.

We obtained 2017 "target" counts of persons with either COBRA or retiree coverage from AHRQ, based on the 2017 MEPS-IC, and from OPM data for the FEHB Program. Assignments of retiree or COBRA coverage were based on person characteristics, using CPS data and data from the MEPS-HC.

In general, we assigned coverage for policyholders first, then made the same assignment for their dependents. Dependents without policyholders, usually those with coverage from outside the household, were assigned based on their own characteristics. In our allocation, we used the following March CPS characteristics: 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). We assumed the income to be pension-related if the source was company or union pension, Federal government retirement, state or local government retirement, or U.S. railroad retirement.[10] The amount paid by an employer towards coverage is captured by the March CPS and categorized as either all, some, or none.

Some 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 probabilities as discussed below, along with the desired total counts of persons with 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.

[10] The redesign of the income questions, which began with the split panel design of the March 2014 CPS and became standard for the entire sample starting with the March 2015 survey, has 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 coverage was assigned 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 versus COBRA coverage for this remaining group by age, employer payment, and sector (for private, state and local coverage), while FEHB Program data were 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 age 65 and under were permitted to be assigned COBRA as part of the transition to Medicare.

Table 7 shows the results of the COBRA and retiree assignments, for persons with coverage from a former employer (policyholders and dependents combined).

Table 7. 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	4.0
	Private Sector	2.3
	Retiree Coverage	0.3
	COBRA Coverage	1.9
	Public Sector	1.7
	Retiree Coverage	1.4
	COBRA Coverage	0.3
Aged 55–64	Total	4.7
	Private Sector	1.5
	Retiree Coverage	0.9
	COBRA Coverage	0.6
	Public Sector	3.3
	Retiree Coverage	3.2
	COBRA Coverage	0.1
Aged 65+	Total	7.7
	Private Sector	2.8
	Retiree Coverage	2.7
	COBRA Coverage	0.1
	Public Sector	4.9
	Retiree Coverage	4.9
	COBRA Coverage*	0.0

NOTE: * represents under 50k with this coverage.
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 on employer size for the job held longest 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 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 to partition end points at sizes 10, 50, and 100, whereas the previous breakpoints were 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. We used data from the three most current MEPS-HC files 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.[11] 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.[12] 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.

Table 8 shows the results of the MSP imputation for persons with Medicare and ESI.

[11] 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.

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

Table 8. Medicare Secondary Payer Coverage by Age
(numbers in millions)

Age	MSP Status	Total ESI
Age under 65	Total	1.1
	Medicare Primary	0.6
	Medicare Secondary	0.5
Age 65 and over	Total	11.3
	Medicare Primary	8.0
	Medicare Secondary	3.3

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. We imputed variables that represent the actuarial value of active employer sponsored health insurance coverage by sector, plan type, and funding, for employees with health insurance in their own name from a current employer.

Work done by Actuarial Research Corporation (ARC) in calculating AVs from the 2005 National Compensation Survey (NCS) is the original basis for the AV calculations in the CPS Auxiliary Data. Using the NCS, ARC calculated AVs for 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,[13] using the distributional results from the NCS dataset 113, which includes plans collected from June 2014 through July 2015.[14]

Plan level detail from the 2015–2017 EHBS, and the AVs calculated from the survey data, were used to move the NCS-based AVs forward to 2017, consistent with the NCS distributions. For private sector active employees, the 2017 EHBS data were used at the plan level but re-weighted within plan type and funding status to reproduce both the averages and distributions from the NCS work. For public sector employees, the 2017 EHBS data was not adjusted.

While there was a slight modification to the prescription drug information that was collected in the 2016 EHBS survey, at that point it did not have a substantial effect on our actuarial value calculations.[15] In the 2017 survey, information requested and reported concerning prescription drug (as well as other) benefits was again modified such that the new data are not comparable to previous years' findings. Specifically, cost-sharing was only asked for those tiers that did not exclusively cover specialty drugs. To reduce the length of the survey, only the cost sharing for the largest overall employer plan (rather than a plan of each type) was reported for hospital admissions, outpatient surgery, and emergency room visits. While these changes appear to only

[13] "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/default/files/ebsa/researchers/analysis/health-and-welfare/analysis-of-actuarial-values-and-plan-funding-using-plans-from-the-national-compensation-survey.pdf.

[14] 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 13).

[15] When making a similar change to the 2015 EHBS survey data, 92 percent of plans had unchanged AVs and the overall resulting mean AV differed by just 0.01 percentage points.

have minor effects on the raw AVs and on the averages and distributions by plan type when compared to the prior year, the data are no longer comparable to that of prior years.

We have imputed both "cell-based actuarial values" – averages by sector, plan type, and funding – and "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 EHBS also reports whether high deductible plans have health savings accounts (HSAs) or health reimbursement accounts (HRAs). We have maintained the HSA/HRA partition from the data and, along with the imputed AVs for high deductible plans, have imputed a flag noting whether the plan was considered an HSA or an HRA.

Table 9 shows the resulting plan-specific average actuarial values. Averages shown below include HSA/HRA partitions as subsets of the high deductible plan type.

Table 9. Average Actuarial Values for Persons with Active ESI in Own Name by Sector and Type of Plan

Sector	Total	HMO	PPO	POS	HDED		
					ALL	HRA	HSA
Private Sector Plans	0.837	0.895	0.839	0.881	0.789	0.795	0.786
Public Sector Plans	0.871	0.915	0.876	0.907	0.814	0.798	0.822

In addition to the AVs calculated and discussed above, in prior years, we 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).[16] The MVC, released in February of 2013, has been 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 a lack of updates to either the MVC or its underlying data, we have not included this second set of AVs on the Auxiliary Data this year.

[16] 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.

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 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.[17] 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, these variables are excluded from the Auxiliary Data Set and the current Health Bulletin.[18]

We examined levels of out-of-pocket spending and have found them compatible with estimates from the MEPS-HC, by age and insurance status. In addition, we examined the distribution of spending for those with out-of-pocket 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 2018 Auxiliary Data set and tables. The out-of-pocket variable included in the Auxiliary Data is the sum of the CPS variables on over-the-counter purchases and medical care. No edits or imputations beyond this summation are performed on the CPS values.

Table 10 shows averages for out-of-pocket spending.

[17] [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.)

[18] 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.

Table 10. Mean Out-of-Pocket (OOP) Spending by Hierarchical Insurance

Insurance	Counts (millions)	Mean OOP
Total Population	323.2	$ 832
Insured	294.6	$ 871
ESI		
Policyholder	85.4	$ 1,112
Dependent	87.0	$ 758
Medicare	51.8	$ 1,250
Other Private Health Insurance		
Policyholder	13.0	$ 1,224
Dependent	9.9	$ 596
Other Public	47.5	$ 192
Uninsured	28.5	$ 430

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 did not 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. For this reason, we imputed union membership for all other private and public sector workers and we imputed union coverage to all persons with ESI, creating three imputed variables: 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), we imputed union membership. We calculated the likelihood of union membership using CPS records that had a valid set of responses to the union questions. The resulting probabilities were based on age (under 35, 35–54, 55–64, 65 and over), 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), and public sector), size of employer (under 50, 50–499, 500 and over), hours worked (under 30 and 30 or more, per week), 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 2010–2017 and 2010–2014 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 were 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 and over with private sector retiree coverage. The 2010 SIPP data were 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 whenever 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.

Table 11 shows assignments for workers, ESI policyholders, and ESI dependents to union arrangements.

Table 11. Union Membership or Coverage (numbers in millions)

Population	Union Status	Total ESI
All Workers (with or without ESI, no self-employed)	Total	150.9
	Union Members	17.6
	Not Union	133.2
All Persons with ESI (workers and nonworkers)[19]	Total	176.6
	Union Coverage	32.2
	Not Union	144.4

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

[19] 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

Since October 2013, individuals have been able to purchase health insurance coverage for the following calendar year through state or Federal health insurance exchanges, in addition to purchasing directly. Open enrollment sign-up for exchange coverage for CY 2017 took place between November 1, 2016 and January 31, 2017, with special enrollment permitted outside this window.

Beginning in mid-2014, small employers (those with between 1 and 50 full time employees) in some states could 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. For 2017, CMS has provided enrollment information through both the federally facilitated and state-based programs. There were 7,554 employers and 38,749 covered persons from 33 states in the federally facilitated program, and 19,651 employers with 193,949 covered persons from 18 states (including the District of Columbia) in the SHOP program, for a total of 232,698 covered persons.[20] The counts by state, however, are so small that imputation is a challenge. For many states, perhaps no more than a single record would be allocated to the SHOP program. In addition, since 2018, employers can only enroll in SHOP through an insurance company or with the assistance of a SHOP-registered agent or broker, so detailed enrollment data may not be available in the future.[21]

Because there were several million people who purchased private insurance through the individual exchanges, we imputed coverage in the individual exchange. Our starting point was average monthly effectuated enrollment data by state and income level for 2017, as released by CMS.[22] We classified income levels as follows: under 250 percent of the federal poverty level (who received both the cost-sharing reductions (CSR) and advanced premium tax credits (APTC, or premium subsidies)), between 250 and 400 percent of the poverty level (who received premium subsidies only), and over 400 percent of the poverty level (who were unsubsidized). CMS also reported enrollment by age and state, and these combined data reports provided us with a target of just over 10 million exchange enrollees to be imputed on the CPS.

Of the 51.8 million persons on the March 2018 CPS with individual private health insurance, we found 18.0 million to be potential individual exchange enrollees. These 18.0 million people excluded policyholders (and their dependents) who either (a) worked most of the year (more than 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, we adjusted these probabilities based on the distribution of enrollees by age, with the goal of

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[20] https://www.cms.gov/CCIIO/Resources/Data-Resources/Downloads/SHOP-Marketplace-Enrollment-Data.pdf.

[21] https://www.cms.gov/CCIIO/Programs-and-Initiatives/Health-Insurance-Marketplaces/SHOP.html.

[22] Average Effectuated Enrollment Data https://www.cms.gov/CCIIO/Programs-and-Initiatives/Health-Insurance-Marketplaces/Downloads/2017-12-13-2017-Effected-Enrollment-Data.pdf.

keeping family members together as much as possible. We imputed exchange enrollment by age of the oldest person in the family, from the oldest age group (65 and over) to the youngest (age 18 through 34), using modified state and poverty probabilities adjusted at each step for the number enrolled in the prior step. Our final results came fairly close to the distribution of enrollees in the CMS data by both age and income.

Table 12 shows the age and income distributions.

Table 12. Exchange Imputed vs. Targets (counts in millions)

Income and Age Band	Imputed	Percent of Imputed Population	Target	Percent of Target Population
Total Exchange	9.9		10.1	
With CSR and APTC (<250% FPL)	5.6	57%	5.8	56%
APTC only (250%–400% FPL)	2.6	26%	2.7	28%
Not subsidized (>400% FPL)	1.7	17%	1.6	16%
Age < 18	1.0	10%	0.9	9%
Age 18–34	2.9	30%	2.8	27%
Age 35–44	1.4	14%	1.6	16%
Age 45–54	2.0	20%	2.1	21%
Age 55–64	2.6	26%	2.7	27%
Age 65+	0.1	1%	0.1	1%

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

In a change from prior year imputations, we found the 2016 MEPS-HC data to be inconsistent with the CMS data by age and income level. While ARC still prioritized keeping families together, the MEPS-HC data was not used to inform the CPS imputation. State-level data were used for the initial probabilities, but the probabilities were adjusted, as described above, during imputation. Thus, the imputed data at the state level may not accurately reflect the exchange enrollment.

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 employer offers of health insurance and insurance take-up rates.

The revised questions have been recoded into the prior years' format to present an improved picture of coverage levels during the year. However, most of the data from the newly added questions have not yet been released or have only been released as research files, so we continue to impute for those items not yet available. As a result, our methods for producing the CPS Auxiliary Data remain similar to that of prior years. 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 were added to the Auxiliary Data in 2016, including 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 2017).

For 2017 and 2018, 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, workers, not self-employed, who do not answer the offer question (PEOFFER = -1) must thus have current (PIT) ESI as a policyholder.

Variables Enhanced

As noted in the section on actuarial value, the high deductible plan variable for active policyholders has been updated (split) to reflect whether the plan is considered an HRA (Health Reimbursement Account) or HSA (Health Savings Account), based on the 2017 EHBS data.

Variables Removed

As noted in the section on actuarial value, the two variables based on the CCIIO Minimum Value Calculator (MVC) are no longer part of the Auxiliary Data.

Methodological Revisions

The methodology used to create the March 2018 Auxiliary Data is mostly consistent with previous years. This year, we changed how exchange enrollees were imputed to the subset of persons with individual private health insurance. Last year, the largest revision was to incorporate the point-in-time variables for ESI offer and take-up. The process we used to incorporate these variables is described below. The full list of revisions follows.

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 enroll (if eligible) 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 those who responded "contract or temporary employees not allowed in plan" or "haven't yet worked for this employer long enough to be covered" as "ineligible." 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 have been made in the last few years:

- 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 in Step 10 above, in the 2017 EHBS prescription drug (Rx) benefit detail was collected only for the plan with the most enrollment, and the service specific cost sharing for specialty drug only tiers, as well as for hospital admissions, outpatient surgery and emergency room visits, was no longer collected. Results may not be comparable to prior years.
- This year, consistent with last 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.
- Beginning last year, 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.
- Last year, additional refinements were made to the imputation process, including:
    - 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 for family demographics in the exchange.
- This year, CMS data by age and state was also used, but the MEPS-HC information was no longer a basis for imputation as the demographics reported on that survey did not line up with reported exchange enrollment.

Useful Links

Current Population Survey's Annual Social and Economic Supplement (March CPS)

- The main CPS Page is found at https://www.census.gov/programs-surveys/cps.html. It contains links to details such as methodology, data, definitions, and technical documentation.
    - The codebook for the March 2018 CPS, which includes mention of survey changes, is found at https://www2.census.gov/programs-surveys/cps/techdocs/cpsmar18.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 at https://www.census.gov/content/census/en/topics/health/health-insurance/library/publications.All.html/.
    - The main report from the March 2018 survey, "Health Insurance Coverage in the United States: 2017," contains information collected in both the March CPS and the American Community Survey (ACS). Most tables in the report are from the CPS, but state-level tables are from the ACS, which has a larger sample size and can give better estimates for smaller geographic areas.
        - The report itself can be found at https://www.census.gov/content/dam/Census/library/publications/2018/demo/p60-264.pdf.
    - 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 at 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 at http://meps.ahrq.gov/mepsweb/, with background information available at 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 at https://www.census.gov/programs-surveys/sipp/about.html.
- Reports based on SIPP data can be found at 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.

Kaiser Family Foundation Employer Health Benefits Surveys (EHBS)

- Archive of surveys from 2017 and earlier can be found at http://kff.org/health-costs/report/employer-health-benefits-annual-survey-archives/.
- 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.
- ARC's report on actuarial values on the National Compensation Survey can be found at https://www.dol.gov/sites/default/files/ebsa/researchers/analysis/health-and-welfare/analysis-of-actuarial-values-and-plan-funding-using-plans-from-the-national-compensation-survey.pdf.
- 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.