

***C-TAM v0.1.3***

***CPS Transfer Augmentation Model***

**Technical Documentation**

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## **Preface**

Benefits and participation for welfare and transfer programs are systematically underreported in the Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC). For some programs, such as Medicaid and Medicare, participation is reported, but benefits are excluded entirely.

This report documents the open-source CPS Transfer Augmentation Model (C-TAM). C-TAM adjusts the CPS for the underreporting of welfare and transfer program participation and benefits, imputes benefits where they are excluded, and imputes marginal tax rates that stem from welfare and transfer programs.

Among other uses, a C-TAM-adjusted CPS file can serve as the basis for micro-simulating policy reforms that would replace existing welfare and transfer programs.

The code that implements C-TAM is available on [Github](#).

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## Overview

Benefits and participation for welfare and transfer programs are systematically underreported in the Current Population Survey (CPS). For some programs, such as Medicaid and Medicare, participation is reported, but benefits are excluded entirely.

This report documents the open-source CPS Transfer Augmentation Model (C-TAM). C-TAM corrects the CPS for the underreporting of welfare and transfer program participation and benefits, imputes benefits where they are excluded, and imputes marginal tax rates that stem from welfare and transfer programs.

Among other uses, a C-TAM-adjusted CPS file can serve as the basis for microsimulating policy reforms that would replace existing welfare and transfer programs with alternative policies.

The code that implements C-TAM is available on [Github](#). This report describes the model for users and highlights areas that could be improved by open-source contributions.

## Capabilities

C-TAM adjusts underreported coverage and benefits for the following programs:

- Supplemental Security Income (SSI)
- Supplemental Nutrition Assistance Program (SNAP)
- Veterans' Benefits
- Social Security

Additionally, C-TAM imputes benefits for the following programs:

- Medicare
- Medicaid
- Affordable Care Act Premium Tax Credits (ACA PTC)

C-TAM imputes marginal tax rates for the following programs:

- SSI
- SNAP
- Social Security
- ACA PTC

## I. Methodological Overview

C-TAM adjusts CPS files in three steps. First, it corrects the CPS for the underreporting of welfare and transfer program participation and benefits. Second, it imputes benefits where they are excluded entirely from the CPS. Third, it imputes marginal tax rates that stem from welfare and transfer programs.

This section provides a high-level overview of the methodologies employed at each step. Further details on individual programs and summary statistics captured before and after adjustment are included in the next section.

**Adjust Participant and Benefits Underreporting.** The CPS has micro-data on participation and benefits for several welfare and transfer programs. For these programs, we adopt a two-step procedure to ensure that the total number of participants and benefits conforms to administrative totals.<sup>1</sup>

The first step of the procedure imputes participation, ensuring the total number of participants in the CPS approximates administrative estimates. Specifically, we use a logit regression to estimate the probability of participation for each program, either at the individual or household level depending on the program's income rule. We then model simple representations of program eligibility rules. We add participants to the program by drawing from eligibility records based on their probability of participation obtained by the logit regression.

The second step of the procedure assigns newly imputed households or individuals an average benefit amount and adjusts the benefits using a uniform ratio for all participants. This ensures that the file total approximates administrative totals.

The total number of participants and benefits on the adjusted file remains lower than the administrative targets for many programs. This is because the institutional population is excluded in the CPS universe.

This two-step imputation procedure is straightforward in theory but more complicated in practice. We discuss many caveats and complications that affect individual programs in the following sections.

**Impute Missing Benefits.** For some programs, such as Medicaid and Medicare, the CPS reports program participation but not benefits. The CPS does not include benefit information because survey participants have limited knowledge of how much the benefits are worth.

For these programs, C-TAM imputes benefits from data sources where such information is provided by knowledgeable entities—for example, hospitals and insurance companies in the case of Medicaid and Medicare. More details on these imputations are outlined in the corresponding “Program Assumption” sections below.

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<sup>1</sup> Robert A. Moffitt and John Karl Scholz, “Trends in the Level of Distribution of Income Support” (working paper, National Bureau of Economic Research, 2009), <http://www.nber.org/papers/w15488>.

**Impute Marginal Tax Rates.** One foreseen use of C-TAM is to facilitate microsimulation analyses of reforms that replace existing welfare and transfer programs with alternative policies. Such reforms generally shift the after-benefit price of various forms of economic activity and affect recipient behavior.

To enable microsimulation modelers to capture behavioral effects, C-TAM imputes implicit current-law marginal tax rates (MTRs) that stem from existing welfare and transfer programs. A long-term goal is to impute MTRs with respect to several types of income, including savings and investment income. Currently we only impute MTRs with respect to earned income to capture the labor/leisure trade-off.

We define MTRs as the change in benefits at the family level for an additional dollar of earned income at the individual level. The decision to capture the change in benefits at the family level rather than the individual level rests on the assumption that individuals respond to family-level circumstances.

We estimate the MTR for primary and secondary earners separately based on program rules. As we will discuss, for some programs we use representations of the program eligibility rules, while for others we use the eligibility rules explicitly.

## **II. Program Assumptions**

### **Supplemental Security Income**

SSI is an income supplement that is designed to help the elderly, the blind, and people with disabilities with little or no income.<sup>2</sup> The CPS underreports both participation and benefits for SSI, and so we apply a two-stage adjustment as described in the “Methodological Overview” section.

**Participation and Benefits Adjustment.** According to our calculations, SSI participation is underreported by, at most, 2.4 million on the 2015 CPS,<sup>3</sup> and SSI benefits are underreported by, at most, \$11.2 billion.

We derive these estimates by subtracting the 2014 CPS participation and benefits totals from administrative totals for 2014. The raw 2015 CPS reports 6.9 million SSI participants and \$48.4 billion in benefits. The Social Security Administration (SSA) reports 9.3 million participants in 2014 and \$55 billion in federal benefits. Additionally, state governments supplement the federal-level benefit with roughly \$4.6 billion in state-administered benefits.<sup>4</sup>

The CPS question on SSI benefits does not distinguish between federal- and state-administered benefits, and so we assume that the file total should not exceed the federal and state total of \$59.2 billion. We also

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<sup>2</sup> Social Security Administration, “What Is Supplemental Security Income?,” 2017, <https://www.ssa.gov/ssi/>.

<sup>3</sup> The CPS Annual Social and Economic Supplement provides income data for the prior year. Therefore, we use the 2015 CPS for 2014 imputation.

<sup>4</sup> The most recent state-level benefits we could find were for 2010, and so we extrapolated the 2010 state-administered benefit levels to 2014 using the growth rate for federal individual-level benefits.

assume that no state-level benefits are administered to individuals who do not receive federal-level benefits, and so the file total should not exceed the 9.3 million participants reported by SSA. We generate our estimate of underreporting by subtracting 6.9 million from 9.3 million and \$48.4 billion from \$59.6 billion. We report these as an upper bound because the CPS does not contain the institutional population, meaning the adjusted CPS total should always be under the national total.

*Stage 1: Participation Adjustment.* To impute additional SSI participants onto the CPS, we first estimate the probability that an individual will participate in SSI according to his or her countable income, disability status, age, and an interaction term between age and disability. The following regression is used to perform this imputation.

$$y = \alpha + \beta_1 \text{Countable Income} + \beta_2 \text{Disability} + \beta_3 \text{age}_{\text{under } 18} + \beta_4 \text{age}_{65 \text{ or over}} + \beta_5 \text{age}_{\text{under } 18} \times \text{Disability} + \beta_6 \text{age}_{65 \text{ or over}} \times \text{Disability} + B \text{ welfare participation} + \epsilon$$

The countable income variable is a proxy for SSI countable income, constructed with income variables available in the CPS.<sup>5</sup> The disability variable is constructed as the union of work disability variables available in the CPS.<sup>6</sup> Two age dummy variables distinguish the SSI participation pattern among all three age groups, which may vary due to labor force participation. The following two terms are to capture the interactions between age and disability, since age may not always increase the possibility of participation in the presence of disability. The last term includes all welfare programs<sup>7</sup> available in CPS since enrollment in one program may indicate participation in another. Regression results are shown in Table A1.

When imputing SSI participants, we constrain the universe of CPS correspondents to those below the 95th percentile of annual family earned income among those reporting receipt of SSI. This truncation means that no families with incomes in excess of \$57,500 are imputed participants. Moreover, we replace existing participants with incomes greater than \$57,500 with imputed participants. We assume high-income families in the sample reported their SSI participation incorrectly or had eligibility during only part of the year, although the latter is likely rare. Close examination of the data reinforces this assumption; for example, one family with parents making \$200,000 and \$50,000 annually has their child enrolled in SSI and receives \$9,000 in benefits during the year.<sup>8</sup>

During the cell-based imputation, we impose three additional constraints on the candidates. The first two constraints are based on the state and age of SSI participants. In particular, we only impute participants

<sup>5</sup> Income variable used as countable income includes wages, self-employed income, Social Security benefits, pensions, unemployment compensation, disability payments, and interest income.

<sup>6</sup> US Census Bureau, “CPS Annual Social and Economic Supplement (CPS ASEC),” 2012, <https://www.census.gov/people/disability/methodology/cps.html>.

<sup>7</sup> SNAP, Public Assistance (including TANF), Social Security, Unemployment Compensation, Survivor’s Benefits, Veteran’s Benefit, Education Assistance, Child Support, Worker’s Compensation, Medicaid, Medicare.

<sup>8</sup> Center for Economic and Policy Research, “March CPS Documentation,” 2016, <http://ceprdata.org/cps-uniform-data-extracts/march-cps-supplement/march-cps-documentation/>. Some children are marked as participants but are recorded as receiving no benefits, suggesting that their benefits may be included on their parents’ records.

into state and age cells for which the CPS totals are lower than the administrative totals reported in administrative tables.<sup>9</sup> We derive the last constraint from the SSI program rules regarding income and disability. Specifically, prime-age workers have to be both disabled and low-income to qualify for SSI.<sup>10</sup> Those under 18 or over 65 need to fulfill only the low-income requirement.

These additional constraints limit the total number of SSI participants eligible. Eventually we impute 1.4 million participants and end up with 8.3 million participants in total.

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<sup>9</sup> Under 18, 18–64, and 65 or over age groups had participant totals at 1.299, 4.913, and 2.122 million, respectively, in December 2014. The three groups have annual participation totals of 1.401, 5.532, and 2.344 million, respectively. All aggregates are from the SSI annual report for 2014.

<sup>10</sup> We use current CPS SSI participants to define low-income, since the countable income variable that we construct from the CPS is only an approximation of true countable income for SSI eligibility. As different groups have dramatically different income ranges, we create fifth percentile countable income benchmarks for four groups according to age and disability: over 65 and disabled, \$0; over 65 and not disabled, \$0; under 65 and disabled, \$429; and under 65 and not disabled, \$15,607.



Descriptive statistics for participation before and after the imputation are included in Table 1 and Figure 1.

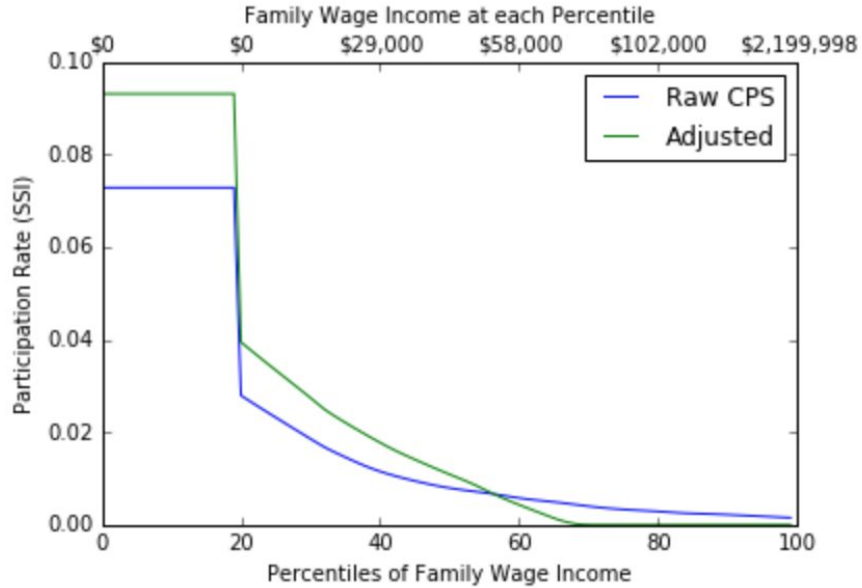
Table 1. Average SSI Participation Rate, by Family Wage Decile

| Decile | Decile Wage<br>Upper Bound | Raw CPS<br>Participation | Adjusted<br>Participation | Raw CPS<br>Participation<br>Rate | Adjusted<br>Participation<br>Rate |
|--------|----------------------------|--------------------------|---------------------------|----------------------------------|-----------------------------------|
| 1      | \$0                        | 2,164,508                | 2,771,340                 | 0.073                            | 0.093                             |
| 2      | \$0                        | 2,437,967                | 3,113,535                 | 0.073                            | 0.093                             |
| 3      | \$16,000                   | 853,046                  | 1,139,369                 | 0.027                            | 0.036                             |
| 4      | \$29,000                   | 453,242                  | 596,691                   | 0.014                            | 0.019                             |
| 5      | \$42,000                   | 294,721                  | 406,047                   | 0.009                            | 0.013                             |
| 6      | \$58,000                   | 221,243                  | 294,561                   | 0.007                            | 0.009                             |
| 7      | \$77,000                   | 165,180                  | 0                         | 0.005                            | 0.000                             |
| 8      | \$102,000                  | 113,253                  | 0                         | 0.004                            | 0.000                             |
| 9      | \$145,625                  | 88,560                   | 0                         | 0.003                            | 0.000                             |
| 10     | \$2,199,998                | 55,206                   | 0                         | 0.002                            | 0.000                             |
| Total  |                            | 6,846,928                | 8,321,543                 | 0.022                            | 0.026                             |

Note:

The original participants in the top three brackets are the top 5 percentile of participants whose family wages are more than \$57,500.

Figure 1. Participation Rate Before and After Imputation,  
by Family Wage Percentile<sup>11</sup>



Note:

Family wage percentiles are constructed with family wage and individual weight. The curves have been smoothed using local linear estimates.

The original participants in the top three brackets are the top 5 percentile of participants whose family wage is more than \$57,500.

*Stage 2: Benefit Adjustment.* After identifying SSI participants in Stage 1, we assign new participants benefits in Stage 2 and then adjust the benefits for all participants to approximately match administrative totals.

We assign benefit amounts to new participants with a cell-based approach, in which each cell is determined by state and age groups. The age-group categories are under 18, 18–64, and 65 and over. We assign new participants the average benefit of corresponding cells from administrative data.

After we have assigned benefits to new participants according to their residence state, we apply state-level ratios to approximately match the state-level targets. Ratios and targets are in Table A2. After applying the ratio, the total benefits on the file is \$59.6 billion.

<sup>11</sup> The participation rates are calculated at the individual level in each percentile. We used the total weights of all participants of one program over the total weight of people in that percentile as the participation rate.

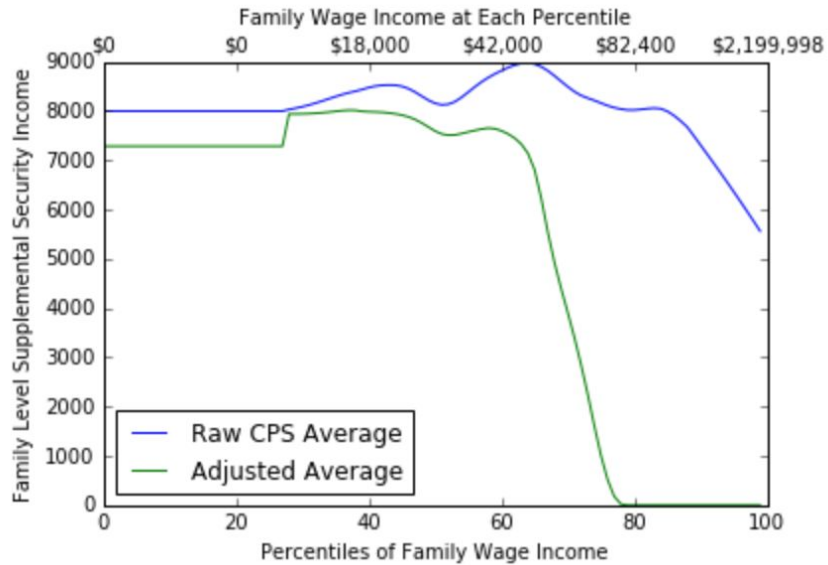
Descriptive statistics for SSI benefits before and after the imputation are included in Table 2 and Figure 2.

Table 2. Average SSI Benefits at Family Level, by Family Wage Decile

| Decile | Family Income<br>Upper Bound | Raw CPS<br>Average Benefit | Adjusted<br>Average Benefit | Raw CPS<br>Total<br>Benefits<br>(Millions) | Adjusted<br>Total<br>Benefits<br>(Millions) |
|--------|------------------------------|----------------------------|-----------------------------|--|---|
| 1      | \$0                          | \$7,996                    | \$7,285                     | \$14.22                                    | \$16.43                                     |
| 2      | \$0                          | \$7,996                    | \$7,285                     | \$12.18                                    | \$15.00                                     |
| 3      | \$2,625                      | \$8,020                    | \$7,320                     | \$11.54                                    | \$12.44                                     |
| 4      | \$18,000                     | \$8,081                    | \$7,909                     | \$4.51                                     | \$5.75                                      |
| 5      | \$30,000                     | \$8,642                    | \$8,048                     | \$3.20                                     | \$3.73                                      |
| 6      | \$42,000                     | \$8,262                    | \$7,724                     | \$2.23                                     | \$2.69                                      |
| 7      | \$60,000                     | \$8,956                    | \$8,058                     | \$1.92                                     | \$2.12                                      |
| 8      | \$82,400                     | \$9,369                    | \$0                         | \$1.57                                     | \$0   |
| 9      | \$123,000                    | \$8,165                    | \$0                         | \$0.91                                     | \$0   |
| 10     | \$2,199,998                  | \$6,253                    | \$0                         | \$0.59                                     | \$0   |
| Total  |                              | \$8,435                    | \$7,926                     | \$52.87                                    | \$58.15                                     |

Note: Weighted by family reference person's weight (fsup\_wgt), total benefit amount is \$58.15 billion after adjustment, which is different from the \$59.6 billion based on personal level weight (marsupwt). Income range is based on the entire CPS database. Average and total benefit amounts are based on SSI recipients.

Figure 2. Family-Level Benefit Before and After Imputation,  
by Family Wage Percentile



Note:

Family wage percentile is constructed based family wage and family weight. Benefits are averaged among participants.

The adjusted average is lower than raw CPS average because raw CPS is about one fourth (2.4/11.2) short on participation, but one fifth short (\$11.2/\$59.6) on benefits. We have to shrink both original and imputed participants' benefit to hit the target.

The curves have been smoothed using local linear estimates.

**MTR Imputation.** We impute MTRs for primary and secondary earners, defining the MTR as the change in benefits at the family level for an additional dollar of earned income at the individual level. Currently, we only impute MTRs with respect to earned income.

SSI benefits are reduced by one dollar for every dollar of a recipient's countable income. Countable income is defined by SSI program rules as excluding one-half of earned income, after subtracting various deductions.<sup>12</sup> We ignore the various deductions at the moment and assume that every SSI participant's MTR with respect to their own earned income is 50 percent.

<sup>12</sup> These deductions include the first \$20 of most income received in a month and the first \$65 of earnings.

Individuals who do not qualify for but have family members enrolled in SSI may also face nonzero MTRs from the program. Above a certain threshold, the income of nonparticipating family members is deemed to otherwise-eligible members in the family, meaning their income will reduce the family's total SSI benefits. There is no 50 percent deduction for deemed earned income, and so the MTR for nonparticipating family members with income over the threshold is 100 percent. The threshold is based on the living cost for SSI-ineligible family members. For simplification, we assume that the each nonparticipating family member will need the difference between the single and couple benefit amount, which is \$362<sup>13</sup> for each month.<sup>14</sup> When a nonparticipating individual's income is higher than the total annual living cost of all SSI-ineligible individuals of his or her family, we will assume this person's MTR is 100 percent; otherwise, this person will be given an MTR of zero.

Descriptive statistics for SSI MTRs are included in Table 3 and Figure 3.

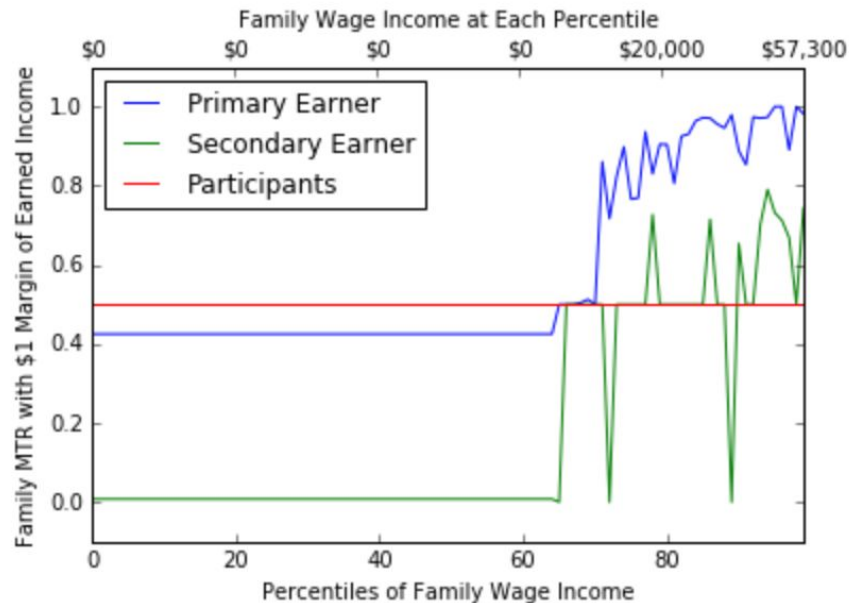
Table 3. Earned Income MTR at Family Level, by Family Wage Decile

| Decile | Primary Earner<br>MTR | Secondary Earner<br>MTR | Average<br>Participants MTR | Average Income |
|--------|-----------------------|-------------------------|-----------------------------|----------------|
| 1      | 0.425                 | 0.008                   | 0.500                       | \$0            |
| 2      | 0.425                 | 0.008                   | 0.500                       | \$0            |
| 3      | 0.425                 | 0.008                   | 0.500                       | \$0            |
| 4      | 0.425                 | 0.008                   | 0.500                       | \$0            |
| 5      | 0.425                 | 0.008                   | 0.500                       | \$0            |
| 6      | 0.425                 | 0.008                   | 0.500                       | \$0            |
| 7      | 0.464                 | 0.204                   | 0.500                       | \$6,000        |
| 8      | 0.801                 | 0.473                   | 0.500                       | \$20,000       |
| 9      | 0.935                 | 0.472                   | 0.500                       | \$33,000       |
| 10     | 0.953                 | 0.650                   | 0.500                       | \$57,300       |

<sup>13</sup> Social Security Administration, "OASDI Beneficiaries by State and County," 2015, [https://www.ssa.gov/policy/docs/statcomps/oasdi\\_sc/2014/index.html](https://www.ssa.gov/policy/docs/statcomps/oasdi_sc/2014/index.html). The benefit is \$1,082 per month for a single individual and \$721 for a couple.

<sup>14</sup> TRIM deducts the living expense from countable income, which has already excluded one-half of earned income and a few more items of disregard. We deduct the living expenses directly from earned income, so in practice, we double the difference to \$722 since no earned income deduction is considered in this section.

Figure 3. Marginal Tax Rate at Family Income Level for a \$1 Increase in Earned Income



Note:

This figure includes only participating families.

Primary earners are defined as the highest earner in a family. In most families, the primary earner is also the family head. But in some cases, the primary earner may be the spouse or an adult child who is not marked as the head in the CPS but has the most wage income. If there are several non-head family members who earn the same earned income, they are all counted as primary earners. All non-primary earners in a family are defined as secondary earners. Therefore, one family can have several secondary earners.

For zero-income families, the CPS head is marked as the primary earner, and the spouse is marked as the secondary earner. The average includes everyone (SSI participants and their nonparticipating family members) who are assigned a MTR.

Primary and secondary earners may not receive SSI but have their income deemed to family members who receive SSI. Non-earner SSI participants are assigned a 50 percent MTR.

## Supplemental Nutritional Assistance Program

SNAP provides benefits to low-income individuals and families for purchasing food. Most individuals and families must meet resource and net income limits, but households with disabled or elderly members are subject to only the net income tests.<sup>15</sup>

**Participation and Benefit Adjustment.** We estimate that original CPS SNAP benefits data are underreported by, at most, \$30.9 billion and that average monthly participation is underreported by 8.6 million participants in approximately 10.0 million households.

The US Department of Agriculture (USDA) reports roughly \$74.2 billion total expenditure in 2014 on SNAP, with \$70.0 billion spent on benefits. The raw CPS has only \$39.1 billion in total benefits on file, leaving a gap of \$30.9 billion at most. This is an upper bound on underreporting because members of the institutional population who are excluded from the CPS may receive some benefits.

The USDA administrative data show a monthly average of 46.5 million participants in nearly 22.7 million households in 2014.<sup>16</sup> The raw CPS reports 2014 annual participation of 43.1 million individuals in 14.3 million households. To compare the administrative monthly averages with the CPS annual counts, we convert the CPS annual participation numbers into monthly averages. Among the 43.1 million raw CPS participants, 10.4 million received benefits for fewer than 12 months, and the rest received SNAP for the full year. By weighing the CPS participants by the number of months they participated, we calculate the average monthly participation in the raw CPS is 37.9 million individuals in 12.7 million households. Subtracting the CPS monthly averages from the administrative monthly averages, we generate the monthly average underreporting estimate of 8.6 million participants and 10.0 million households.

*Stage I: Participation Adjustment.* SNAP is primarily a household-level benefit, and the CPS provides only household-level benefit data.<sup>17</sup> We impute both participation and benefits at the household level. We first approximate the net income of each household according to SNAP rules,<sup>18</sup> and then we use the following regression to determine the likelihood a household will enroll in SNAP. The model is shown below.

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<sup>15</sup> Center for Economic and Policy Research, “March CPS Documentation.”

<sup>16</sup> US Department of Agriculture, “Characteristics of Supplemental Nutrition Assistance Program Households: Fiscal Year 2014,” 2016, <https://www.fns.usda.gov/snap/characteristics-supplemental-nutrition-assistance-program-households-fiscal-year-2014>.

<sup>17</sup> SNAP is not a household-level benefit if grocery bills are not shared. However, these situations are rare.

<sup>18</sup> First we sum earned and unearned income from available variables including wages, self-employed income, Social Security benefits, pensions, unemployment compensation, disability payments, and interest income. We then subtract a 20 percent earned income deduction from combined earned income and a standard deduction according to household size. We also subtract child support expense, dependent care, shelter expenses, and medical expenses for elderly individuals over 65.

$$\begin{aligned} \text{Indicator} = & \alpha + \beta_1 \text{Net Income} + \beta_2 \text{Household Size} + \beta_3 \text{Disability} \\ & + \beta_4 \text{Number of Children} + \beta_5 \text{ABAWD} + B \text{Welfare Participation} + \varepsilon \end{aligned}$$

Able-Bodied Adults Without Dependents (ABAWD) are not allowed to stay on SNAP for more than 3 months in a 36-month time period. Thus, their households have lower chance to receive SNAP benefits compared to other households of same size. The last term adds a spectrum of welfare program participation<sup>19</sup>, that doesn't have collinearity issues with number of children or disability.

Regression results are shown in Table A2.

When imputing participation, we impose constraints based on income. In particular, only families with monthly income under \$5,490<sup>20</sup> are imputed.

In addition to income restraint, we attempt to maintain the ratio of individual participants and household participants in the file, which we control through the size of the households we impute.

Because we estimate that the average monthly underreporting on the CPS is almost the same for individual participants as it is for households (8.6 million participants in 10.0 million households), we add only one-person households to the file.

For simplicity, we assume all imputed participants are covered for the entire year. After the adjustment, the file has 51.5 million total annual participants in 23.8 million households.

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<sup>19</sup> SSI, Public Assistance (including TANF), Social Security, Unemployment Compensation, Survivor's Benefits, Veteran's Benefit, Worker's Compensation, Medicaid, Medicare.

<sup>20</sup> SNAP limits monthly income at \$5,490 for a 14-member family.

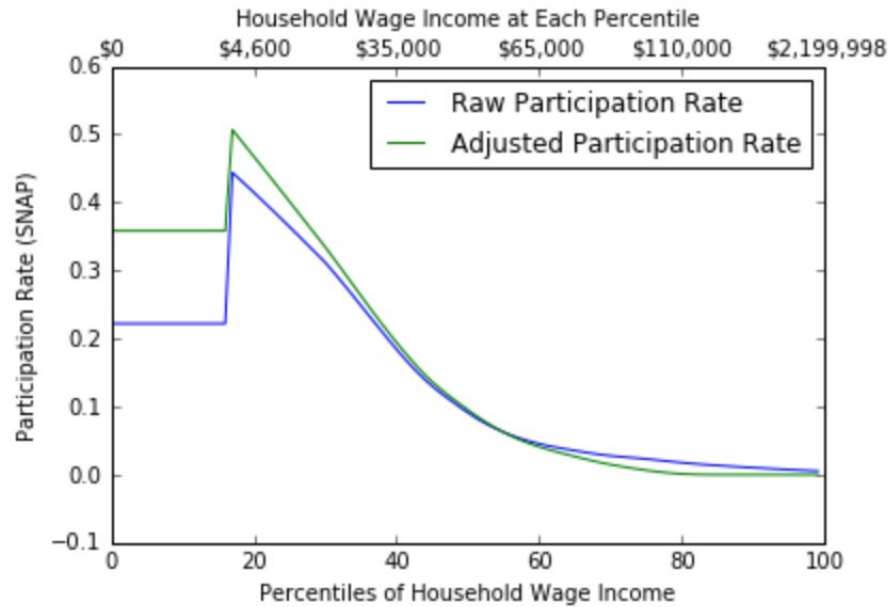


Descriptive statistics for annual SNAP participation before and after the imputation are included in Table 4 and Figure 4.

Table 4. Annual SNAP Participation, by Household Wage Decile

| 2014 Participants |                            |                    |                     |                   |                    | Participation Rates at Household Level |          |
|-------------------|----------------------------|--------------------|---------------------|-------------------|--------------------|--|----------|
| Decile            | Household Wage Upper Bound | Raw CPS Individual | Adjusted Individual | Raw CPS Household | Adjusted Household | Raw                                    | Adjusted |
| 1                 | \$0                        | 6,749,212          | 11,002,700          | 3,298,802         | 7,444,306          | 0.222                                  | 0.358    |
| 2                 | \$4,600                    | 8,619,125          | 12,569,282          | 3,762,664         | 7,518,183          | 0.264                                  | 0.387    |
| 3                 | \$22,000                   | 12,122,034         | 13,544,527          | 3,638,725         | 5,062,443          | 0.383                                  | 0.428    |
| 4                 | \$35,000                   | 7,290,153          | 7,613,769           | 1,818,032         | 2,196,741          | 0.231                                  | 0.241    |
| 5                 | \$50,000                   | 3,910,795          | 3,887,333           | 900,106           | 926,663            | 0.124                                  | 0.123    |
| 6                 | \$65,000                   | 1,833,589          | 1,779,959           | 406,665           | 396,910            | 0.058                                  | 0.056    |
| 7                 | \$85,000                   | 1,153,727          | 988,707             | 260,595           | 227,456            | 0.036                                  | 0.031    |
| 8                 | \$110,000                  | 708,488            | 158,729             | 141,418           | 33,400             | 0.022                                  | 0.005    |
| 9                 | \$150,165                  | 441,360            | -                   | 79,524            | -                  | 0.014                                  | 0.000    |
| 10                | \$2,199,998                | 254,385            | -                   | 57,487            | -                  | 0.008                                  | 0.000    |
| Total             |                            | 43,082,869         | 51,545,006          | 14,364,018        | 23,806,102         | 0.136                                  | 0.163    |

Figure 4. Participation Rate Before and After Imputation, by Total Household Income Percentile



Note:

Household wage income percentiles are constructed based on household wage and individual weight. Only families with monthly income under \$5,490<sup>21</sup> are imputed.

The curves have been smoothed using local linear estimates.

*Stage 2: Benefit Adjustment.* After identifying SNAP household participants in Stage 1, we assign the new participants benefits at the household level for each state in Stage 2 and then adjust the benefits for all participants to approximately match administrative totals.

We assign benefit amounts to new participants with a cell-based approach in which each cell is determined by state and age group. We assign new participants the average benefit of the corresponding cell from administrative data.

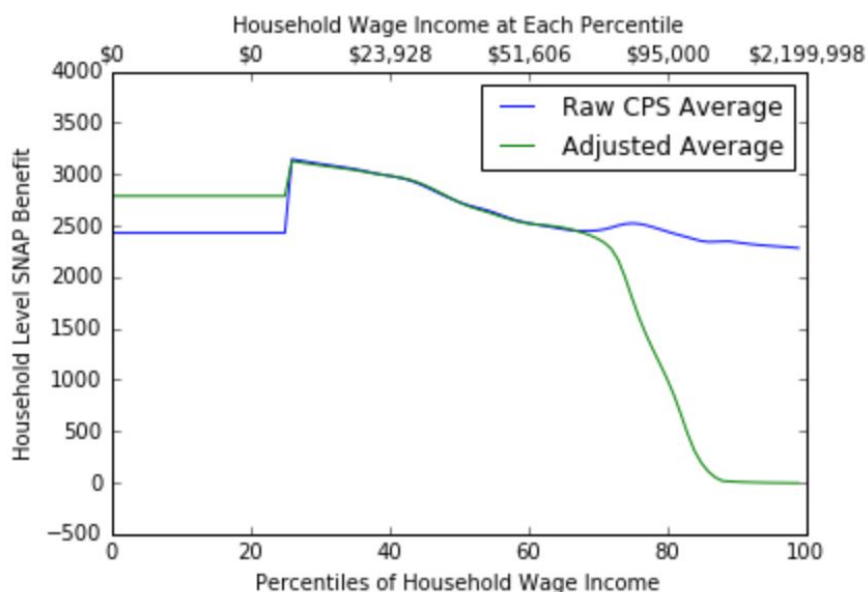
<sup>21</sup> SNAP limits monthly income at \$5,490 for a 14-member family.

Descriptive statistics for SNAP benefits before and after the imputation are included in Table 5 and Figure 5.

Table 5. Average SNAP Household Benefit, by Household Wage Income Decile

| Decile | Household Wage<br>Upper Bound | Raw CPS<br>Average | Adjusted<br>Average | Raw CPS Total<br>Benefit<br>(Millions) | Adjusted Total<br>Benefit<br>(Millions) |
|--------|-------------------------------|--------------------|---------------------|--|---|
| 1      | \$0                           | \$2,428            | \$2,787             | \$6,401                                | \$15,485                                |
| 2      | \$0                           | \$2,428            | \$2,787             | \$5,410                                | \$13,933                                |
| 3      | \$ 7,280                      | \$2,735            | \$2,936             | \$7,916                                | \$15,253                                |
| 4      | \$ 23,928                     | \$3,009            | \$3,010             | \$10,235                               | \$14,228                                |
| 5      | \$ 37,000                     | \$2,954            | \$2,963             | \$4,984                                | \$5,830                                 |
| 6      | \$ 51,606                     | \$2,590            | \$2,584             | \$2,164                                | \$2,218                                 |
| 7      | \$ 70,000                     | \$2,483            | \$2,502             | \$1,036                                | \$1,008                                 |
| 8      | \$ 95,000                     | \$2,476            | \$2,280             | \$632                                  | \$437                                   |
| 9      | \$ 135,000                    | \$2,446            | \$238               | \$308                                  | \$2                                     |
| 10     | \$ 2,199,998                  | \$2,097            | \$0                 | \$172                                  | \$0                                     |
| Total  |                               | \$2,733            | \$2,873             | \$39,258                               | \$68,395                                |

Figure 5. Household-Level SNAP Benefit Before and After Imputation, by Household Wage Percentile



Note:

Household wage income percentiles are constructed based on household wage and household weight. Only families with monthly income under \$5,490<sup>22</sup> are imputed.

The curves have been smoothed using local linear estimates.

**MTR Imputation.** According to SNAP rules, benefits are reduced in relation to a participating household's net income, which contains earned income and several other income sources. MTRs with respect to earned income for SNAP participants are influenced by two key income rules—the earned income deduction and the net income phaseout rate.<sup>23</sup> Both of these rules are based on household earnings.

The earned income deduction allows participants to deduct 20 percent of their earned income from their net income. The net income phaseout rate reduces benefits by 30 cents for each dollar of net income. By combining the earned income deduction and net income phaseout rate, we see that each extra dollar of earned income dollar will reduce benefits by 24 cents.<sup>24</sup> Therefore, we assign each individual in participating households an MTR of 24 percent.

<sup>22</sup> SNAP limits monthly income at \$5,490 for a 14-member family.

<sup>23</sup> Other income rules are not deemed as relevant to earned income MTR. US Department of Agriculture, "Supplemental Nutrition Assistance Program (SNAP)," 2017, <https://www.fns.usda.gov/snap/eligibility#Income>.

<sup>24</sup>  $0.8 * 0.30 = 0.24$

## Veterans Benefits

The US Department of Veterans Affairs (VA) administers a wide range of benefits and services to provide assistance to veterans, their dependents, and their survivors. The assistance includes but is not limited to compensation, education training, home loans, life insurance, and vocational rehabilitation.

**Participation and Benefits Adjustment.** We estimate that the CPS underestimates all categories of Veterans Benefits (VB) direct payments by, at most, \$35.3 billion and participants by, at most, 1.35 million participants. In addition to direct payments, we impute VB medical care benefits—which are entirely excluded from the CPS—to current and imputed participants by evenly splitting a total of \$59.4 billion of administratively reported expenditures.<sup>25</sup>

The CPS has five categories of VB available: disability compensation, survivors benefits, pension, education assistance, and other payments. Approximately 3.65 million out of 19.2 million veterans are receiving benefits in one of these five categories, for a total benefit amount of \$53.6 billion.

According to administrative data from the VA, the total benefit amount in 2014 is about \$161.2 billion,<sup>26</sup> which is broken down by expenditures on compensation and pension, construction, education and vocational rehabilitation or employment, general operation, and medical care.

The CPS categories are not perfectly aligned with VA expenditure categories. To find a proper target for CPS total VB benefits, we exclude expenditures on general operating and construction, as they are not direct payments to beneficiaries. Similarly, medical care is not considered a direct payment by the CPS and should not be counted as part of the target for the CPS aggregate.

Summing the two major categories of VA expenditure—compensation and vocational rehabilitation—we get a total benefits target of \$88.9 billion. Subtracting CPS benefits of \$53.6 billion from \$88.9 billion, we estimate underreporting at \$35.3 billion.

Since medical care expenditures are significant and excluded from the CPS, we impute them to recipients separately.

*Stage 1: Participation Adjustment.* We targeted 5.0 million total recipients from all categories instead of each category of benefits separately. Similar to other imputation procedures, we first constructed a regression to estimate the probability of receiving VB.

$$y = \alpha + \beta_1 \text{ age} + \beta_2 \text{ sex} + \beta_3 \text{ income} + \sum_{i=1,2,\dots,6} \beta_{i+3} d_i + \beta_{10} \text{ active} + \beta \text{ welfare participation} + \varepsilon$$

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<sup>25</sup> We overestimate the amount of benefits by not downward adjusting the total benefits according to the amount spent on the institutional population.

<sup>26</sup> The expenditure table for 2014 is used. US Department of Veterans Affairs, “National Center for Veterans Analysis and Statistics,” 2016, <https://www.va.gov/vetdata/Expenditures.asp>.

In this regression, we consider veterans' age, gender, income,<sup>27</sup> disability severity, past active-duty experiences, and participation in other welfare programs<sup>28</sup>. The level of disability will affect the amount of eligible benefits, so we added all six types of disabilities as dummies in the regression (d1 to d6). The *active* variable indicates whether this veteran ever participated in active duties during his or her service. Please refer to Table A5 for the regression results.

Using the probability estimated, we imputed 5.0 million total recipients.<sup>29</sup>

Table 6. Average Veterans Benefit Participation Rate Before and After Imputation,  
by Total Individual Income Decile

| Decile | Decile Wage<br>Upper Bound | Raw CPS<br>Participation | Adjusted<br>Participation | Raw CPS<br>Participation Rate | Adjusted<br>Participation Rate |
|--------|----------------------------|--------------------------|---------------------------|-------------------------------|--------------------------------|
| 1      | \$0                        | -                        | 6,944                     | 0.000                         | 0.000*                         |
| 2      | \$0                        | -                        | 1,205                     | 0.000                         | 0.000*                         |
| 3      | \$2                        | 185                      | 3,023                     | 0.000                         | 0.000*                         |
| 4      | \$8,401                    | 126,011                  | 191,948                   | 0.004                         | 0.006                          |
| 5      | \$15,031                   | 184,178                  | 425,752                   | 0.006                         | 0.013                          |
| 6      | \$24,000                   | 438,451                  | 789,367                   | 0.014                         | 0.025                          |
| 7      | \$34,725                   | 559,027                  | 763,717                   | 0.018                         | 0.024                          |
| 8      | \$50,000                   | 715,028                  | 867,434                   | 0.023                         | 0.027                          |
| 9      | \$75,135                   | 811,851                  | 977,513                   | 0.026                         | 0.031                          |
| 10     | \$1,712,933                | 814,554                  | 946,197                   | 0.026                         | 0.030                          |
| Total  |                            | 3,649,285                | 4,973,101                 | 0.012                         | 0.016                          |

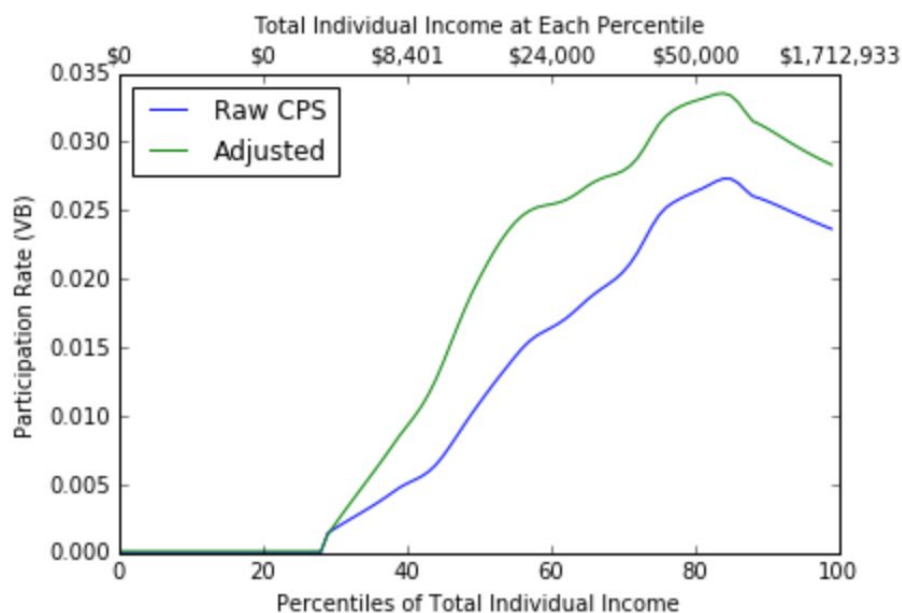
Note: Adjusted participation rates are 0.0004 for the first three deciles.

<sup>27</sup> Income includes wages, self-employed income, Social Security benefits, pensions, unemployment compensation, disability payments, and interest income.

<sup>28</sup> SSI, SNAP, Public Assistance (including TANF), Social Security, Unemployment Compensation, Survivor's Benefits, Education Assistance, Child Support, Worker's Compensation, Medicaid, Medicare.

<sup>29</sup> The CPS has about 19.7 million veterans on file, which does not include institutionalized veterans. In theory, the adjusted total number of participants should be below 5.0 million since some of them may live in nursing homes or other type of public institutions. Our current imputation misrepresents a portion of noninstitutional veterans as institutional. We hope to improve this in the future.

Figure 6. Veterans Benefit Participation Rate Before and After Imputation,  
by Total Individual Income Percentile



Note: CPS personal total income includes not only earned income but also payments from various federal- and state-level programs. Thus, if a person has zero total income, then he or she does not receive any benefits from any of those programs.

The curves have been smoothed using local linear estimates.

*Stage 2: Benefit Adjustment.* For the direct payments portion of benefits, we assign an average benefit amount to each imputed participant according to his or her state of residence. We adjust the total benefit amount by state to match the geographic distribution reported in VA's state-level aggregate tables for compensation and vocational training.<sup>30</sup>

For medical care, we evenly split the \$59.4 billion so that each participant is assigned a medical benefit of roughly \$11,647.<sup>31</sup>

<sup>30</sup> US Department of Veterans Affairs, "National Center for Veterans Analysis and Statistics."

<sup>31</sup> An improvement for later versions may be to exploit variations in health spending by age, state, gender, and disability status from an external data source to assign benefits.

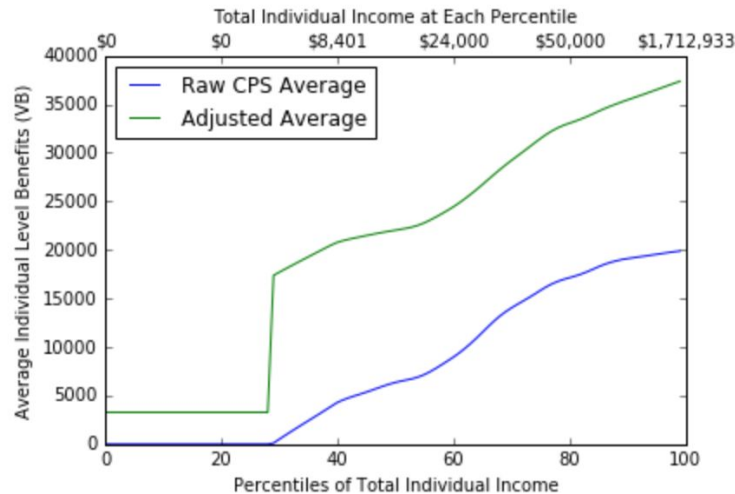
Table 7. Average Veterans Benefits, by Total Individual Income

| Decile | Individual Income<br>Upper Bound | Raw CPS<br>Average<br>Benefit | Adjusted<br>Average<br>Benefit | Raw CPS Total<br>Benefit<br>(Millions) | Adjusted Total<br>Benefit<br>(Millions) |
|--------|----------------------------------|-------------------------------|--------------------------------|--|---|
| 1      | \$0                              | \$0                           | \$3,278                        | \$0                                    | \$57                                    |
| 2      | \$0                              | \$0                           | \$3,278                        | \$0                                    | \$30                                    |
| 3      | \$2                              | \$0*                          | \$4,405                        | \$0                                    | \$125                                   |
| 4      | \$8,401                          | \$2,624                       | \$19,487                       | \$417                                  | \$3,870                                 |
| 5      | \$15,031                         | \$4,759                       | \$21,409                       | \$989                                  | \$9,136                                 |
| 6      | \$24,000                         | \$7,240                       | \$22,601                       | \$3,240                                | \$17,818                                |
| 7      | \$34,725                         | \$11,770                      | \$27,027                       | \$6,116                                | \$20,156                                |
| 8      | \$50,000                         | \$16,121                      | \$31,982                       | \$11,317                               | \$27,754                                |
| 9      | \$75,135                         | \$17,180                      | \$32,921                       | \$14,831                               | \$33,200                                |
| 10     | \$1,712,933                      | \$20,217                      | \$36,196                       | \$16,703                               | \$34,616                                |
| Total  |                                  | \$14,685                      | \$29,503                       | \$53,612                               | \$146,762                               |

Note: Participants with income between \$0 and \$2 have raw benefits averaged at \$0.1.



Figure 7. Veterans Benefits Before and After Imputation,  
by Total Individual Income Percentile



Note:

Adjusted average benefit includes medicare care value, so adjusted average is significantly higher than raw CPS average.

The curves have been smoothed using local linear estimates.

## Social Security

Old-Age, Survivors, and Disability Insurance (OASDI) provides benefits to insured workers and their families at retirement, death, or disability.<sup>32</sup> The benefit imputation for Social Security includes payments for OASDI. MTRs are estimated for working-age adults between 18 and 65 and capture the interaction between current earnings and future benefits. As with all other programs, MTRs associated with financing the programs are excluded.

<sup>32</sup> The Board of Trustees, Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds, *The 2016 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds*, June 22, 2016, <https://www.ssa.gov/OACT/TR/2016/tr2016.pdf>.

**Participation and Benefits Adjustment.** We estimate that the CPS underestimates annual OASDI benefits by, at most, \$136.9 billion and total participants by, at most, 7.7 million. In 2014, the SSA reports total benefit payments at \$848.5 billion<sup>33</sup> and total recipients at 57.4 million.<sup>34</sup> The raw CPS has \$711.6 billion in benefits and 49.7 million recipients. The administrative totals include benefits for the institutionalized population, whereas the CPS universe does not contain the entire institutional population. However, we have not been able to collect reliable statistics on institutional portion benefits and participation and therefore impute participation and benefits to match the overall totals. This suggests OASDI participants are overrepresented in the adjusted file.

*Stage 1: Participation Adjustment.* We estimate an individual's likelihood of receiving OASDI benefits according to three characteristics: age, disability, widow status, and participation in other welfare programs<sup>35</sup>. The disability indicator used here refers to health problems or disabilities that prevent working.<sup>36</sup> After fitting the regression with all current participants, we applied the model to nonrecipients and added the records by states to the participation pool according to the estimated probability. The regression model is below.

$$SS\ indicator = \beta_0 + \beta_1 Aged + \beta_2 Disabled + \beta_3 widowed + \beta welfare\ participation + \varepsilon$$

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<sup>33</sup> Social Security Administration, "Old-Age, Survivors, and Disability Insurance Trust Funds, 1957-2016," 2016, <https://www.ssa.gov/oact/STATS/table4a3.html>.

<sup>34</sup> Social Security Administration, "OASDI Beneficiaries by State and County."

<sup>35</sup> SSI, SNAP, Public Assistance (including TANF), Veteran's Benefit, Unemployment Compensation, Survivor's Benefits, Education Assistance, Child Support, Worker's Compensation, Medicaid, Medicare.

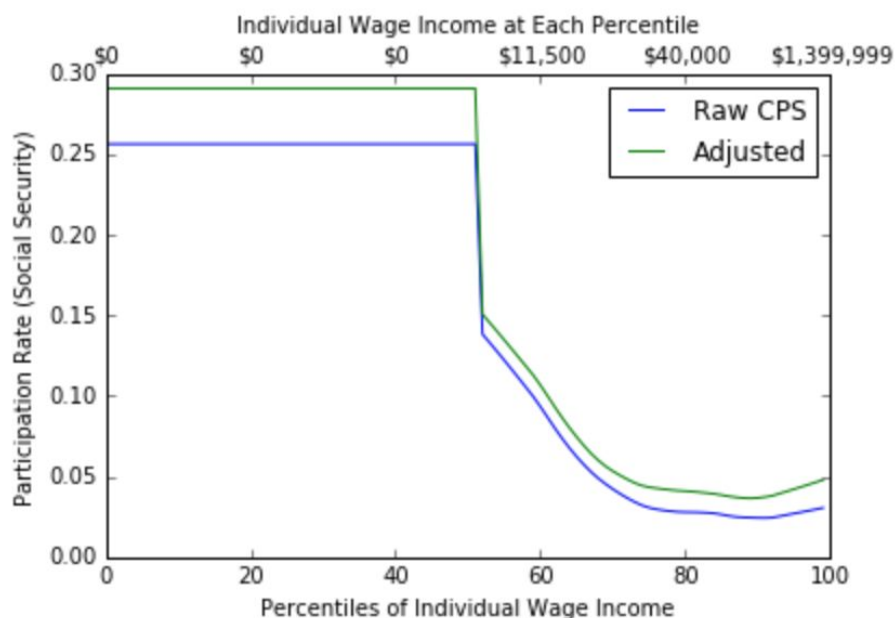
<sup>36</sup> Marked as dis\_hp = "Yes" in the CPS.

Regression results are shown in Table A6. Descriptive statistics for participation before and after the imputation are included in Table 8 and Figure 8.

Table 8. Participation Rates of Social Security, by Individual Wage Decile

| Decile | Decile Wage Upper Bound | Raw CPS | Adjusted | Raw CPS Participants | Adjusted Participants |
|--------|-------------------------|---------|----------|----------------------|-----------------------|
| 1      | \$0                     | 0.255   | 0.291    | 9,001,075            | 9,964,174             |
| 2      | \$0                     | 0.255   | 0.291    | 6,461,408            | 7,538,639             |
| 3      | \$0                     | 0.255   | 0.291    | 8,356,182            | 9,714,439             |
| 4      | \$0                     | 0.255   | 0.291    | 8,591,907            | 9,497,737             |
| 5      | \$0                     | 0.255   | 0.291    | 8,261,509            | 9,443,370             |
| 6      | \$11,500                | 0.128   | 0.149    | 4,392,810            | 4,958,971             |
| 7      | \$25,000                | 0.058   | 0.073    | 1,995,982            | 2,389,022             |
| 8      | \$40,000                | 0.034   | 0.048    | 983,434              | 1,386,237             |
| 9      | \$65,000                | 0.025   | 0.039    | 873,297              | 1,285,735             |
| 10     | \$1,399,999             | 0.026   | 0.038    | 825,972              | 1,280,404             |
| Total  |                         | 0.157   | 0.182    | 49,743,575           | 57,458,728            |

Figure 8. Participation Rates of Social Security, by Individual Wage Income Percentile



Note: The curves have been smoothed using local linear estimates.

*Stage 2: Benefit Adjustment.* For each imputed participant, we assign an average benefit according to age, gender, and eligibility type (retirement or disability). Among many tables provided by SSA, we use two average benefit tables,<sup>37</sup> one for retirement and the other for disability, both by age and gender. The retirement table starts from age 62 and covers all the way to age group 95 and over. The disability table starts from the age group under 20 and goes to age 65. We currently assign the average disability benefit to individuals under age 65 with work disabilities and assign average retirement benefit by age and gender to the rest of imputed individuals.

After the benefit assignment, we get \$816.3 billion in benefits for both current CPS participants and imputed individuals. Then we apply a uniform ratio of 1.039 to every participant to augment the total benefits to \$848.5 billion.

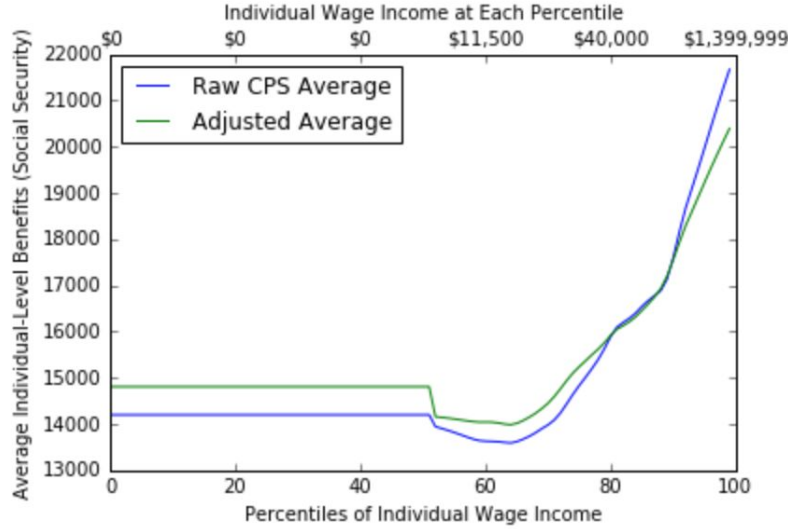
<sup>37</sup> Social Security Administration, “Annual Statistical Supplement,” 2015, Tables 5.A.1.1 and 5.A.1.2, <https://www.ssa.gov/policy/docs/statcomps/supplement/2015/5a.html>.

Descriptive statistics for average Social Security benefits before and after the imputation are included in Table 9 and Figure 9.

Table 9. Average Benefit of Social Security, by Individual Wage Income Decile

| Decile | Individual Income<br>Upper Bound | Raw CPS<br>Average | Adjusted<br>Average | Raw CPS Total<br>Benefits<br>(Billions) | Adjusted Total<br>Benefits<br>(Billions) |
|--------|----------------------------------|--------------------|---------------------|---|--|
| 1      | \$0                              | \$14,199           | \$14,807            | \$121.07                                | \$139.75                                 |
| 2      | \$0                              | \$14,199           | \$14,807            | \$120.14                                | \$141.46                                 |
| 3      | \$0                              | \$14,199           | \$14,807            | \$118.40                                | \$139.12                                 |
| 4      | \$0                              | \$14,199           | \$14,807            | \$114.21                                | \$132.44                                 |
| 5      | \$0                              | \$14,199           | \$14,807            | \$109.54                                | \$129.45                                 |
| 6      | \$11,500                         | \$13,885           | \$14,279            | \$55.49                                 | \$65.53                                  |
| 7      | \$25,000                         | \$13,520           | \$13,953            | \$26.98                                 | \$33.29                                  |
| 8      | \$40,000                         | \$14,826           | \$15,275            | \$14.90                                 | \$21.53                                  |
| 9      | \$65,000                         | \$16,712           | \$16,704            | \$14.24                                 | \$21.12                                  |
| 10     | \$1,399,999                      | \$19,788           | \$19,006            | \$16.63                                 | \$24.77                                  |
| Total  |                                  | \$14,305           | \$14,929            | \$711.59                                | \$848.44                                 |

Figure 9. Average Benefit of Social Security, by Individual Wage Income Percentile



Note: The curves have been smoothed using local linear estimates.

**MTR Imputation.** We rely on a detailed benefits calculator provided by SSA to estimate MTRs with respect to earned income for Social Security retirement income. According to program rules, Social Security benefits depend on past, current, and future earnings.

We estimate past earnings according to current earnings, years of education, and years of work experience. We project past earnings backward according to the following Mincer function.

$$\ln(y) = \ln(y_0) + r * S + \beta_1 * X + \beta_2 * X^2$$

In this equation,  $y$  is earnings,  $y_0$  is the earnings of somebody with no education or experience,  $S$  is years of education, and  $X$  is years of work experience.

We project future earnings based on two scenarios, one with constant current-year wages and the other with projected earnings based on the Mincer regression. After getting the entire lifelong earnings vector, we scale the earnings with the ratio of CPS wages in 2014 to projected earnings in 2014 to ensure earnings stay coherent between the two systems.

Finally, we feed the lifelong earnings profile and other demographic information into the SSA calculator twice, the first time using current-year wages and the second time adding a \$500 margin to the current-year wages. We use \$500 as the margin because it is the lowest margin that affects Average Indexed Monthly Income (AIME). The difference between the two calculated Primary Insurance Amounts (PIA) represents the amount of benefit change due to the margin.

We have made several assumptions in addition to those mentioned above. First, people who are out of the labor force are not included in this process since it is harder to project their future incomes. Second, everyone is assumed to retire at 65 and live until 78, which is the average life expectancy in the US.<sup>38</sup>

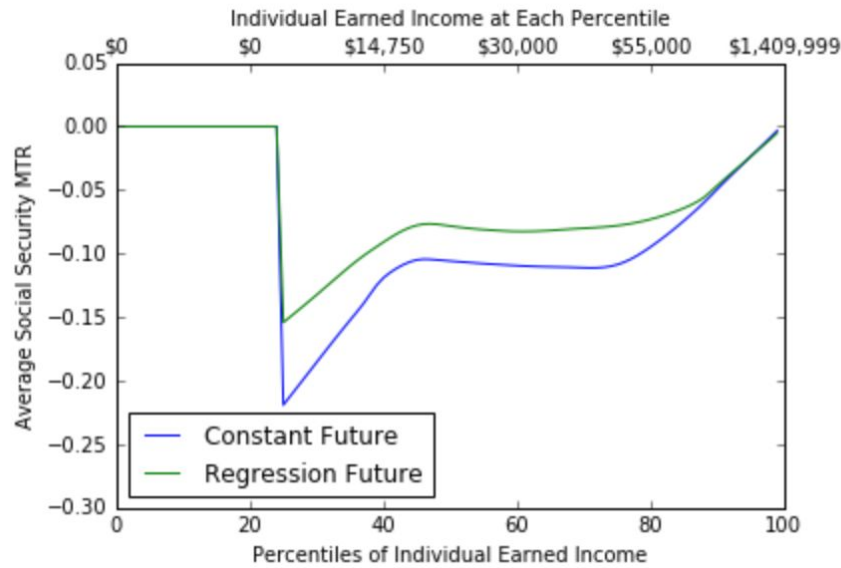
Table 10. Average MTR by Individual Earned Income Decile,  
for Primary Earners and Secondary Earners

| Individual Income Deciles |             | Future Earnings Projected by Regression |                  |         | Future Earnings Constant |                  |         |
|---------------------------|-------------|---|------------------|---------|--------------------------|------------------|---------|
|                           | Income      | Primary Earner                          | Secondary Earner | Average | Primary Earner           | Secondary Earner | Average |
| 1                         | 0           | 0                                       | 0                | 0       | 0                        | 0                | 0       |
| 2                         | 0           | 0                                       | 0                | 0       | 0                        | 0                | 0       |
| 3                         | \$4,600     | -0.085                                  | -0.062           | -0.069  | -0.123                   | -0.095           | -0.103  |
| 4                         | \$14,750    | -0.127                                  | -0.111           | -0.118  | -0.195                   | -0.170           | -0.181  |
| 5                         | \$22,099    | -0.074                                  | -0.075           | -0.074  | -0.104                   | -0.103           | -0.103  |
| 6                         | \$30,000    | -0.081                                  | -0.083           | -0.081  | -0.108                   | -0.107           | -0.108  |
| 7                         | \$40,600    | -0.082                                  | -0.086           | -0.083  | -0.110                   | -0.112           | -0.111  |
| 8                         | \$55,000    | -0.077                                  | -0.081           | -0.078  | -0.112                   | -0.112           | -0.112  |
| 9                         | \$80,000    | -0.066                                  | -0.066           | -0.066  | -0.074                   | -0.075           | -0.074  |
| 10                        | \$1,409,999 | -0.029                                  | -0.031           | -0.029  | -0.031                   | -0.032           | -0.031  |

Note: Includes everyone between age 18 and 65. Some are not in workforce.

<sup>38</sup> US life expectancy was about 78.74 in 2012, according to Google Public Data, Life Expectancy, 2017, [https://www.google.com/publicdata/explore?ds=d5bncppjof8f9\\_&met\\_y=sp\\_dyn\\_le00\\_in&idim=country:USA:GBR:JPN&hl=en&dl=en](https://www.google.com/publicdata/explore?ds=d5bncppjof8f9_&met_y=sp_dyn_le00_in&idim=country:USA:GBR:JPN&hl=en&dl=en).

Figure 10. Average Social Security MTR, by Individual Wage Income Percentile



Note:

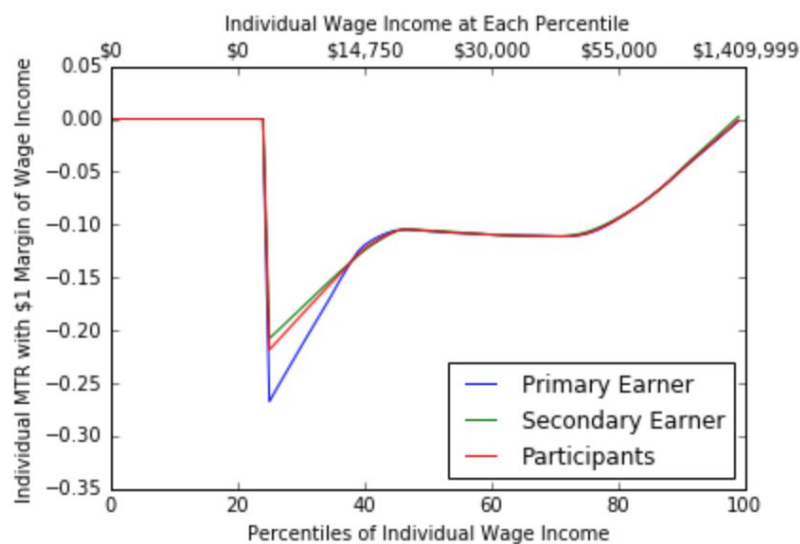
Only includes people between age 18 and 65. PIA is a step function on AIME. The first step has a rate of 0.9 for AIME below \$816, the second step has a rate of 0.32 for AIME between \$816 and \$4,917, and the third step has a rate of 0.15 for AIME higher than \$4,917. Thus, the MTR curves, under both scenarios, are relatively low on the low-income range since a large portion of people's AIMEs in this range are subject to 0.9 step rate. The MTR curves bend upward and eventually end up at zero because wage income beyond the maximum taxed earning (\$117,000 in 2014) will not further increase Social Security benefits.

We assume that individuals with zero income have not fulfilled the 40-quarter-eligibility requirement for Social Security, and we therefore assign their MTR as zero. We will reexamine this assumption in future versions.

The curves have been smoothed using local linear estimates.

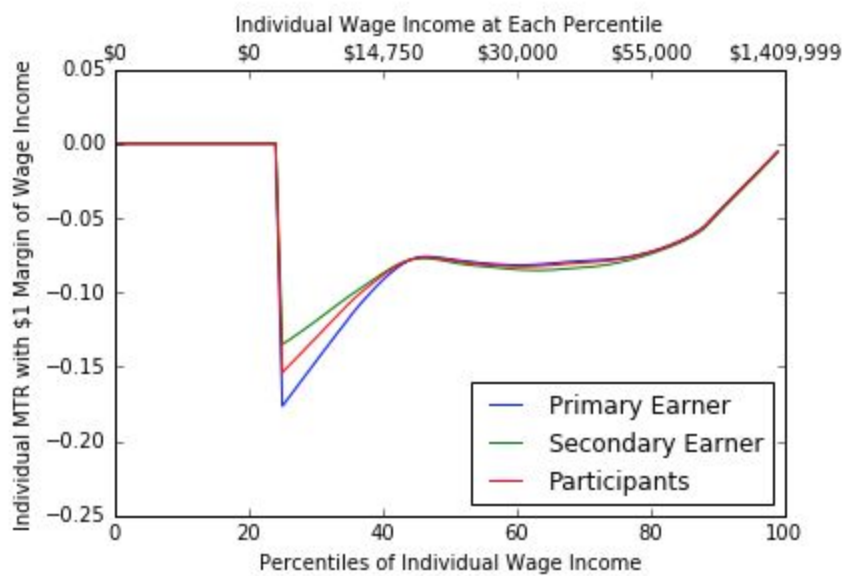


Figure 11. Average Social Security MTR for Primary and Secondary Earners, by Individual Wage Income (Assumes Constant Future Earnings)



Note: The curves have been smoothed using local linear estimates.

Figure 12. Average Social Security MTR for Primary and Secondary Earners, by Individual Wage Income (Future Earnings Estimated Through Regression)



Note: The curves have been smoothed using local linear estimates.

## Housing Assistance

Numerous federal and state programs provide housing assistance to low-income families. In this imputation, we focus on three major federal rental subsidy programs<sup>39</sup>: Housing Choice Voucher (HCV), Project-Based Rental Assistance (PBRA), and Public Housing. HCV can be used to pay for housing in the private market, while PBRA provides assistance on federally contracted or designated units. Public Housing provides assistance in public-owned and -operated units.

**Participation and Benefits Adjustment.** We estimate that housing assistance, contrary to other benefit programs, overestimates total participants by about 1.5 million families and underestimates total benefits by \$19.8 billion. Administrative data obtained from the Housing and Urban Development (HUD) show 4.5 million participant units, and \$36 billion benefits.<sup>40</sup> CPS ASEC provides participation in HCV and PBRA<sup>41</sup> separately from Public Housing<sup>42</sup>, all three of which total 6 million participant families, with corresponding total benefit totals at \$16.2 billion.

This participation-over-reporting issue is not unique to the 2015 CPS. In the 2013 CPS, 5.4 million households reported receiving housing assistance but HUD only has five million on file<sup>43</sup>. Although state and local programs could partially explain this overreporting issue, mis-reporting and incorrect imputation of housing benefits also contribute to this issue as well. Thus, for this version of adjustment, we remove current families by state if CPS totals exceed administrative data for that state, and we add families otherwise.

The benefit amount available in the CPS is the market value of housing assistance that the Census Bureau imputed based on four regions, three income categories, and three-bedroom options.<sup>44</sup> This is a reasonable imputation but may lack of heterogeneity, so Census provides a more detailed imputation on housing assistance in their Supplemental Poverty Measurements (SPM) project. We adjust housing assistance micro-dataset based on both imputation.

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<sup>39</sup> Congressional Budget Office, “Federal Housing Assistance for Low-Income Households,” 2015, <https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/50782-lowincomehousing-onecolumn.pdf>.

<sup>40</sup> Office of Policy and Research, “Picture of Subsidized Households,” Department of Housing and Urban Development, <https://www.huduser.gov/portal/datasets/assths.html>.

<sup>41</sup> Marked as HLORENT = ‘Yes’ in the CPS. The corresponding question asks whether survey participants paid low rent because federal, state, or local government is paying part of the cost. Given the question, some of the state and local programs expenditure is possibly included in this variable, but due to lack of data, we have not include them in the aggregate targets.

<sup>42</sup> Marked as HPUBLIC = ‘Yes’ in the CPS

<sup>43</sup> Trudi Renwick and Joshua Mitchell, “Estimating the Value of Federal Housing Assistance for the Supplemental Poverty Measure,” 2015, <https://www.census.gov/library/working-papers/2016/demo/SEHSD-WP2016-01.html>.

<sup>44</sup> Sharon Stern, “Valuing Housing Subsidies: A Revised Method for Quantifying Benefits in a New Measure of Poverty,” <https://www.census.gov/content/dam/Census/library/working-papers/2000/demo/jsm00.pdf>.

*Stage 1: Participation Adjustment.* HUD defined general income eligibility rule as family gross income below 50 percent of county average income<sup>45</sup>. Since the CPS does not provide county code for every record, we use state averages to approximate this average. In addition to HUD’s income cap, each Public Housing Agency (PHA) must ensure that 75 percent of its admissions are for families with incomes below 30 percent of median county income<sup>46</sup>. Besides income, we consider food stamp reciprocity and Medicaid coverage as good indicators of low income. Last but not least, citizenship, disability, and seniority are added in the regression due to their contribution to the likelihood of receiving housing assistance.

$$\begin{aligned} \text{Housing Indicator} = & \alpha + \beta_1 \text{family size} + \beta_2 \text{under30inc} + \beta_3 \text{under50inc} + \beta_4 \text{elderly} \\ & + \beta_5 \text{citizenship} + \beta_6 \text{Foodstamp} + \beta_7 \text{family net income} \\ & + \beta_8 \text{disability} + \beta_9 \text{medicaid} + \xi \end{aligned}$$

In this equation, *under30inc* and *under50inc* respectively represent income below 30 percent and 50 percent average state income. *elderly*, *citizenship*, and *disability* indicate presence of each type of individual in the family.

The regression results are attached in Appendix A7. Descriptive statistics for participation before and after the imputation are included in Table 11 and Figure 13.

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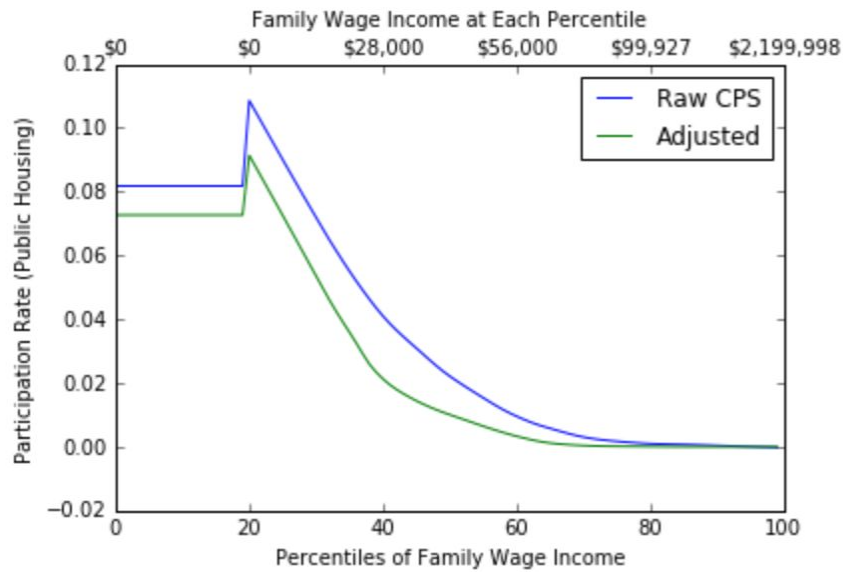
<sup>45</sup> Department of Housing and Urban Development, “HUD’s Public Housing Program,” [https://portal.hud.gov/hudportal/HUD?src=/topics/rental\\_assistance/phprog](https://portal.hud.gov/hudportal/HUD?src=/topics/rental_assistance/phprog).

<sup>46</sup> Department of Housing and Urban Development, “Housing Choice Vouchers Fact Sheet,” [https://portal.hud.gov/hudportal/HUD?src=/program\\_offices/public\\_indian\\_housing/programs/hcv/about/fact\\_sheet](https://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/hcv/about/fact_sheet).

Table 11. Participation Rates of Housing Assistance, by Family Wage Decile

| Decile | Decile Wage<br>Upper Bound | Raw CPS | Adjusted | Raw CPS<br>Participants | Adjusted<br>Participant |
|--------|----------------------------|---------|----------|-------------------------|-------------------------|
| 1      | \$0                        | 0.082   | 0.073    | 2,527,667               | 2,314,650               |
| 2      | \$0                        | 0.082   | 0.073    | 2,599,808               | 2,242,067               |
| 3      | \$15,500                   | 0.098   | 0.079    | 3,081,183               | 2,480,573               |
| 4      | \$28,000                   | 0.049   | 0.03     | 1,541,303               | 938,252                 |
| 5      | \$40,000                   | 0.028   | 0.01     | 888,839                 | 305,617                 |
| 6      | \$56,000                   | 0.017   | 0.007    | 519,587                 | 205,010                 |
| 7      | \$75,000                   | 0.006   | 0.001    | 174,546                 | 22,568                  |
| 8      | \$99,927                   | 0.001   | 0        | 36,177                  | 5,923                   |
| 9      | \$140,000                  | 0.001   | 0        | 27,732                  | N/A                     |
| 10     | \$2,199,998                | 0       | 0        | 3,457                   | N/A                     |
| Total  | N/A                        | 0.040   | 0.027    | 11,400,299              | 8,514,660               |

Figure 13. Participation Rates of Housing Assistance, by Family Wage Decile



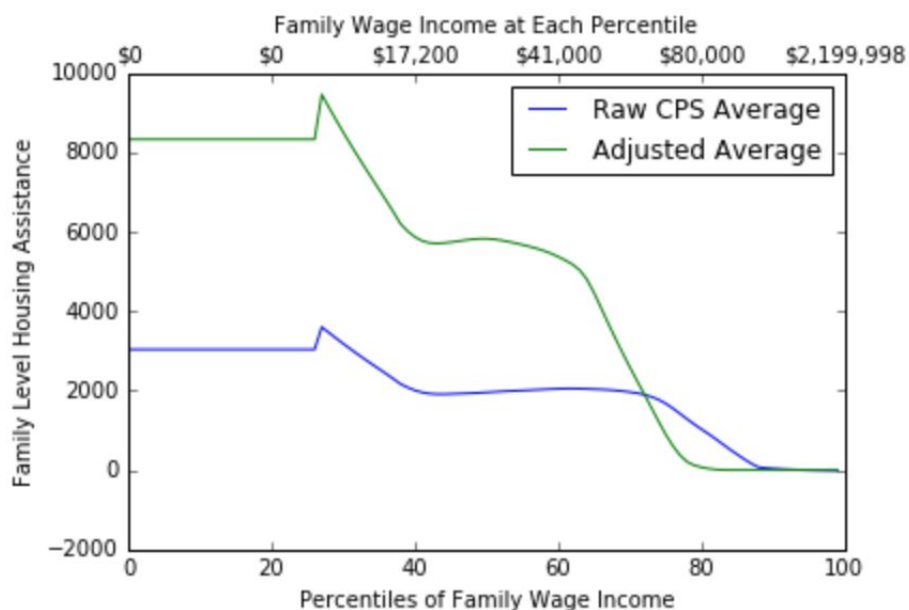
*Stage 2: Benefit Adjustment.* For each impute recipient, we assigned a state-level average benefit amount calculated from administrative total benefits and participation. The adjustment ratios for each state, after benefit assignment, are quite large compare to other programs, because original participants' average benefits are very low, and we have low imputation rate.

Descriptive statistics for housing benefits before and after the imputation are included in Table 12 and Figure 14.

Table 12. Family-Level Benefit of Housing Assistance, by Family Wage Decile

| Decile | Decile Wage<br>Upper Bound | Raw CPS<br>Average | Adjusted<br>Average | Raw CPS Total<br>Benefits<br>(Millions) | Adjusted Total<br>Benefits<br>(Millions) |
|--------|----------------------------|--------------------|---------------------|---|--|
| 1      | \$0                        | \$3,036            | \$8,325             | \$3,965                                 | \$10,501                                 |
| 2      | \$0                        | \$3,036            | \$8,325             | \$3,862                                 | \$9,321                                  |
| 3      | \$3,200                    | \$3,146            | \$8,778             | \$3,382                                 | \$8,350                                  |
| 4      | \$17,200                   | \$2,356            | \$6,693             | \$2,796                                 | \$5,842                                  |
| 5      | \$29,000                   | \$1,903            | \$5,671             | \$1,042                                 | \$1,431                                  |
| 6      | \$41,000                   | \$2,057            | \$6,239             | \$638                                   | \$543                                    |
| 7      | \$58,000                   | \$2,095            | \$4,140             | \$369                                   | \$329                                    |
| 8      | \$80,000                   | \$1,725            | \$2,455             | \$126                                   | \$61                                     |
| 9      | \$119,000                  | \$1,011            | \$700               | \$27                                    | \$8                                      |
| 10     | \$2,199,998                | \$397              | \$0                 | \$9                                     | \$0                                      |
| Total  |                            | \$2,681            | \$8,013             | \$16,221                                | \$36,390                                 |

Figure 14. Family-Level Benefit of Housing Assistance, by Family Wage Decile



## Unemployment Compensation

Unemployment Compensation (UC) is a social insurance program for workers who get laid off due to no fault of their own.<sup>47</sup> The UC programs are based on federal law but administered by states; thus each state has its own eligibility rules, benefit amounts, and duration.

**Participation and Benefits Adjustment.** We estimate that CPS under-reported recipients by 5.3 million, and benefits by \$13 billion. The raw CPS reports 4.6 million recipients and \$22.6 billion benefits claimed in 2014. Both statistics are on an annual basis, which means people who obtained their first UC payment in 2013 are included with 2014 participants.<sup>48</sup>

The Department of Labor (DOL) provides both weekly and monthly UC first payments and continued weeks claimed<sup>49</sup>. First payments include number of recipients who received their first UC payment and the amount they received. Continued weeks claims collect the total number of weeks claimed by people already on UC programs. Since UC payments are on a weekly basis in many states, we aggregate the

<sup>47</sup> Department of Labor, “Unemployment Insurance,” <https://www.dol.gov/general/topic/unemployment-insurance>.

<sup>48</sup> Department of Labor, “ETA reports,” <https://workforcesecurity.doleta.gov/unemploy/DataDownloads.asp>.

<sup>49</sup> Weekly claim data are included in ETA 539; monthly claim data are included in ETA 5159.

weekly first payment count to obtain the total number of recipients. To count for spilled-over 2013 recipients, we added the number of continued weeks from the first week of 2014 to the total recipients. Thus, we estimated 10 million recipients<sup>50</sup> from the DOL administrative data. In terms of total benefits, we sum up the monthly continued weeks claimed benefits, which is commonly used for budget analysis, and find that the total benefit target is at \$36 billion.

*Stage 1: Participation Adjustment.* We estimate the likelihood of receiving UC through a logit regression model with independent variables including base salary, job-searching activities, reason for unemployment, disability, and food stamp market value at family level. DOL requires individuals to have a significant base period of salary to be eligible for unemployment insurance.<sup>51</sup> The base period in most states is defined as a one-year span that consists of the last four working quarters. We set this base-period threshold at \$5,200. Job-searching activities are characterized by the total number of weeks and the stretches of search. Disabilities disqualify people from UC.

$$UC\ Indicator = \alpha + \beta_1 ptotval + \beta_2 weuemp + \beta_3 lkweeks + \beta_4 lkstrch + \beta_5 pruntype \\ + \beta_6 a\_explf + \beta_7 f\_MV + \beta_8 disability$$

We create a total income indicator, *ptotval*, for people who have income lower than \$5200 to reflect the base-period income requirement. Job-searching activities are characterized by four variables: *weuemp* is an indicator whether one is full-year worker or not; *lkweeks* is an indicator whether this person spends at least one week searching for jobs; *lkstrch* is the number of stretches of job searching; *a\_explf* is whether this person is unemployed or not. *pruntype* labels individuals lost their jobs not at their own faults, and *f\_MV* is the market values of food stamps.

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<sup>50</sup> The total 10 million is based on recipients who received their first payments in 2014 and recipients who received their first payments in 2013 and continue to receive payment sin 2014.

<sup>51</sup> Department of Labor, “State Unemployment Insurance Benefits,” <https://workforcesecurity.doleta.gov/unemploy/uifactsheet.asp>.

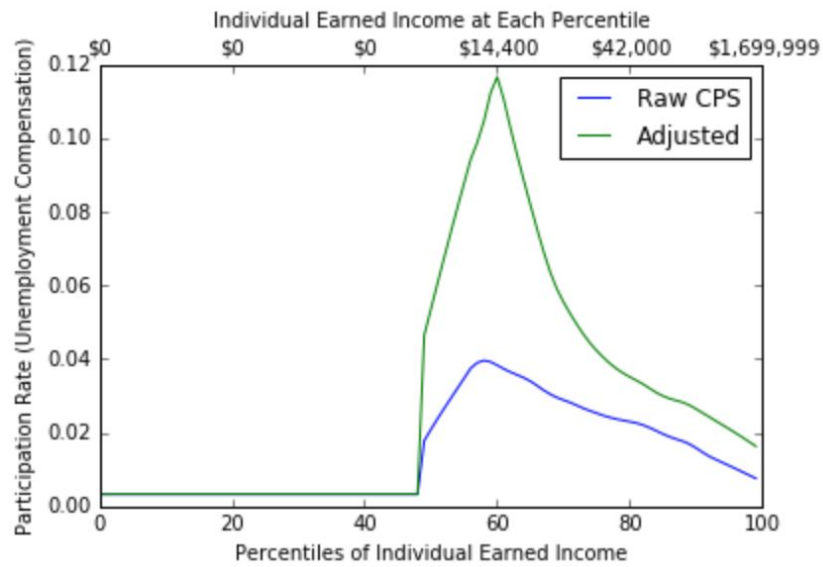


The regression results are attached in Appendix A8. Descriptive statistics for participation before and after the imputation are included in Table 13 and Figure 15.

Table 13. Participation Rates of Unemployment Compensation, by Individual Earned Income

| Decile | Decile Wage<br>Upper Bound | Raw CPS | Adjusted | Raw CPS<br>Participants | Adjusted<br>Participant |
|--------|----------------------------|---------|----------|-------------------------|-------------------------|
| 1      | \$0                        | 0.003   | 0.003    | 114,155                 | 118,229                 |
| 2      | \$0                        | 0.003   | 0.003    | 105,786                 | 106,339                 |
| 3      | \$0                        | 0.003   | 0.003    | 112,944                 | 112,944                 |
| 4      | \$0                        | 0.003   | 0.003    | 80,484                  | 80,484                  |
| 5      | \$500                      | 0.004   | 0.005    | 114,411                 | 152,365                 |
| 6      | \$14,400                   | 0.036   | 0.120    | 1,137,420               | 3,796,588               |
| 7      | \$27,000                   | 0.035   | 0.080    | 1,101,523               | 2,529,952               |
| 8      | \$42,000                   | 0.025   | 0.044    | 803,449                 | 1,403,318               |
| 9      | \$67,000                   | 0.020   | 0.030    | 639,103                 | 945,188                 |
| 10     | \$1,699,999                | 0.012   | 0.022    | 367,635                 | 697,587                 |
| Total  | N/A                        | 0.014   | 0.031    | 4,576,912               | 9,942,992               |

Figure 15. Unemployment Compensation Participation Rate, by Individual Earned Income Decile

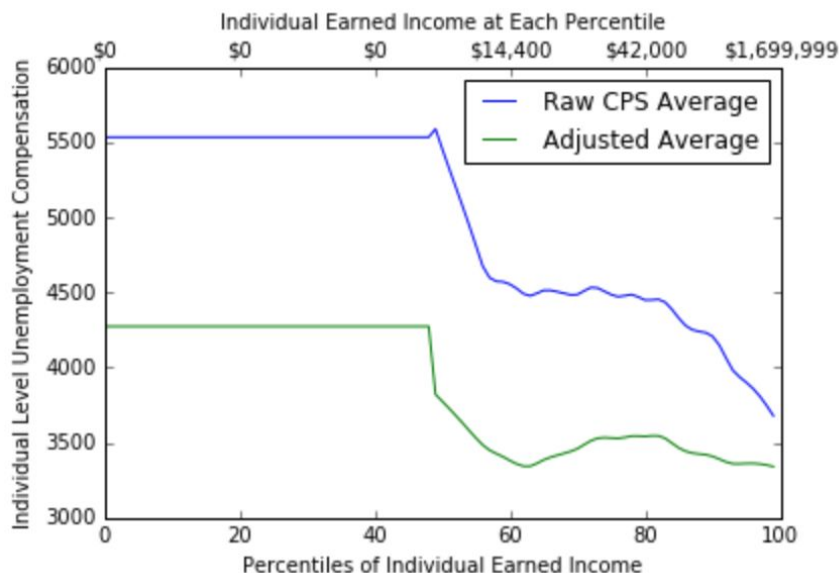


*Stage 2: Benefit Adjustment.* For each impute recipient, we assigned a state-level average benefit amount calculated from administrative total benefits and participation. Descriptive statistics for benefits before and after imputation are included in Table 14 and Figure 16.

Table 14. Benefit of of Unemployment Compensation, by Individual Earned Income

| Decile | Decile Wage<br>Upper Bound | Raw CPS<br>Average | Adjusted<br>Average | Raw CPS Total<br>Benefits<br>(Millions) | Adjusted Total<br>Benefits<br>(Millions) |
|--------|----------------------------|--------------------|---------------------|---|--|
| 1      | \$0                        | \$5,533            | \$4,274             | \$351                                   | \$312                                    |
| 2      | \$0                        | \$5,533            | \$4,274             | \$556                                   | \$454                                    |
| 3      | \$0                        | \$5,533            | \$4,274             | \$645                                   | \$526                                    |
| 4      | \$0                        | \$5,533            | \$4,274             | \$767                                   | \$677                                    |
| 5      | \$500                      | \$5,582            | \$4,237             | \$653                                   | \$668                                    |
| 6      | \$14,400                   | \$5,833            | \$3,578             | \$6,914                                 | \$13,724                                 |
| 7      | \$27,000                   | \$4,521            | \$3,386             | \$4,885                                 | \$8,457                                  |
| 8      | \$42,000                   | \$4,482            | \$3,557             | \$3,621                                 | \$5,051                                  |
| 9      | \$67,000                   | \$4,320            | \$3,548             | \$2,748                                 | \$3,316                                  |
| 10     | \$1,699,999                | \$4,037            | \$3,502             | \$1,530                                 | \$2,464                                  |
| Total  | N/A                        | \$4,955            | \$3,585             | \$22,676                                | \$35,651                                 |

Figure 16. Unemployment Compensation Benefit, by Individual Earned Income Decile



### Temporary Assistance for Needy Families

Temporary Assistance for Needy Families (TANF) provides cash and service assistance to low-income families. Services include childcare, job training, and any service that reduces out-of-wedlock pregnancy and encourages forming two-parent families.<sup>52</sup> TANF is funded through federal block grants and state-level Maintenance of Effort (MOE) funds.

**Participation and Benefits Adjustment.** We augmented CPS TANF total benefits by \$25.05 billion, and total participation by 1.81 million to hit the annual total expenditure and participations targets. In 2014, total expenditure on cash and service benefits was \$29.35 billion<sup>53</sup> and the average monthly

<sup>52</sup> Department of Health & Human Services, Office of Family Assistance, “About TANF”, <https://www.acf.hhs.gov/ofa/programs/tanf/about>.

<sup>53</sup> Office of Family Assistance, “Fiscal Year 2014 Financial Data,” Total Fed & State Expenditure, <https://www.acf.hhs.gov/ofa/resource/tanf-financial-data-fy-2014>.

participation was 3.41 million<sup>54</sup> in 1.48 million families, which is roughly converted to 3.97 million participants in 1.69 families annually according to our estimate.<sup>55</sup>

The 2015 CPS ASEC has about 0.97 million family participants, which includes 1.21 million individuals with total benefits at \$4.3 billion<sup>56</sup>. This gap is huge because The United States Department of Agriculture (USDA) administrative data list expenditure for assistance or non-assistance,<sup>57</sup> instead of cash or service. Although CPS survey participants are often not aware of non-cash benefit they receive, we assume in this version of imputation that the TANF targets both cash and service benefits.

We make a few edits to TANF data in the CPS ASEC before imputation because of the extremely low number of children participants. About 61 thousands of children receives benefits from TANF in CPS, while USDA data suggest 2.6 million participate for an average month. Although it is possible that some children are get labeled under their parents' benefit, the total aggregate is way too low. Therefore we allocate all children of current TANF adults as TANF participants, given TANF is designed for families with children. After this edit, the total number of children participants is 0.92 million. In addition, we convert annual CPS data to monthly data through the number of months covered, because administrative participation data are provided on a monthly basis rather than an annual basis.

*Stage 1: Participation Adjustment.* We rely on a logit regression model to estimate the probability of participation in TANF for each person. TANF program rules vary by state, but every state requires income below a certain benchmark. Thus, we add earned income and unearned income as independent variables. In addition, participation in SSI and SNAP are added to the model because both are good indicators of income levels. Last but not least, we include indicators of children under 6 (*child1*) and children between age 6 and 18 (*child2*), because presence of children would increase the chance of participation.

$$\begin{aligned} TANF\_indicator = & \alpha + \beta_1 * age + \beta_2 * gender + \beta_3 * child_1 + \beta_4 * child_2 + \\ & \beta_5 * earned\_income + \beta_6 * unearned\_income + \beta_7 * Family\_member + \\ & \beta_8 * unemployed\_indicator + \beta_9 * SSI\_indicator + \\ & \beta_{10} * SNAP\_indicator + \beta_{11} * marriage + \varepsilon \end{aligned}$$

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<sup>54</sup> Office of Family Assistance, "TANF Caseload Data 2014," 2014\_15months\_tan.csv, <https://www.acf.hhs.gov/ofa/resource/caseload-data-2014>.

<sup>55</sup> For each current participant, the CPS ASEC provides a variable, *paw\_mon*, indicating how many months this participant is covered by public assistance (including TANF) during the survey year. We divide *paw\_mon* by 12 and apply the resulting ratio to the weight of participant to obtain a monthly participation statistic.

<sup>56</sup> In the CPS ASEC survey, the TANF benefit was reported along with other public assistance programs including Diversion Payments, Refugee Cash and General Assistance Indian Affairs. Even though participants identify whether their benefit is from TANF/AFDC or other programs, there are participants receiving benefits from 'both', which totals about 50,000 in 2015 CPS. Compared to the total self-identified TANF/AFDC-only recipients of 1.21 million, the portion of participants receiving multiple programs benefits is quite negligible. We add "both" to participation and benefit aggregates.

<sup>57</sup> Assistance includes benefits for basic needs (clothes, food, etc.), child care, and transportation for unemployed families. Non-assistance refers to expenditure that fulfills one of the four purposes of TANF but doesn't meet the definition of assistance.

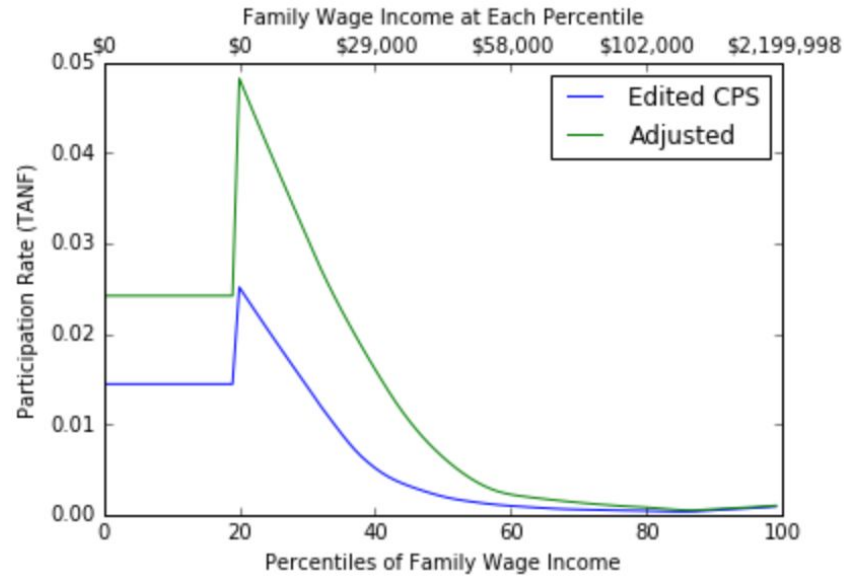
The results of this regression are attached in Appendix A10. Because total children participants are still under the administrative total after the edits, we imputed children only based on the probability estimated in the regression.

Descriptive statistics summary for TANF before and after adjustments are included in Table 15, and Figure 17.

Table 15. Participation Rates of TANF, by Family Wage Decile

| Decile | Decile Wage<br>Upper Bound | Raw CPS | Adjusted | Raw CPS<br>Participants | Adjusted<br>Participant |
|--------|----------------------------|---------|----------|-------------------------|-------------------------|
| 1      | \$0                        | 0.014   | 0.024    | 406,783                 | 633,105                 |
| 2      | \$0                        | 0.014   | 0.024    | 506,124                 | 896,721                 |
| 3      | \$15,500                   | 0.021   | 0.039    | 658,342                 | 1,219,192               |
| 4      | \$28,000                   | 0.008   | 0.019    | 264,595                 | 610,634                 |
| 5      | \$40,000                   | 0.004   | 0.011    | 111,983                 | 348,305                 |
| 6      | \$56,000                   | 0.002   | 0.004    | 65,133                  | 120,148                 |
| 7      | \$75,000                   | 0.001   | 0.002    | 42,239                  | 71,166                  |
| 8      | \$99,927                   | 0.001   | 0.001    | 17,985                  | 36,608                  |
| 9      | \$140,000                  | 0.000   | 0.001    | 12,700                  | 18,095                  |
| 10     | \$2,199,998                | 0.001   | 0.001    | 22,738                  | 22,738                  |
| Total  | N/A                        | 0.007   | 0.013    | 2,108,622               | 3,976,712               |

Figure 17. Participation Rates of TANF, by Family Wage Decile



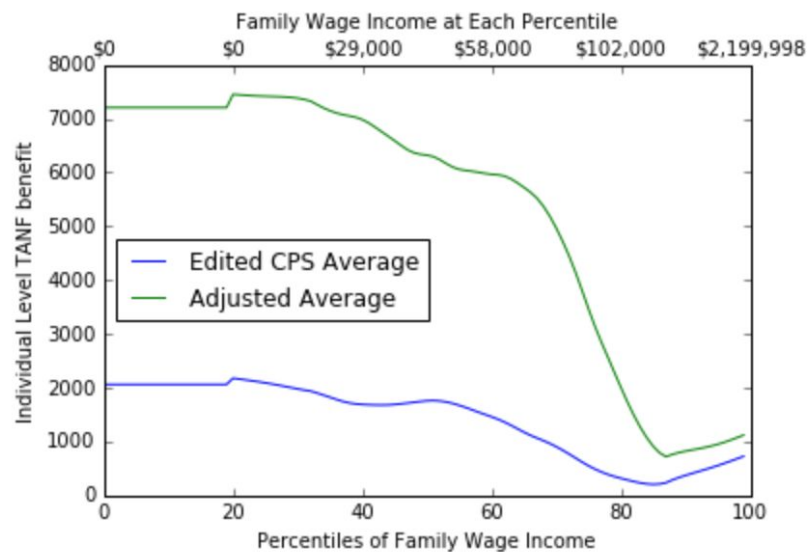
*Stage 2: Benefit Adjustment.* For each impute recipient, we assigned a state-level average benefit amount calculated from administrative average benefits. Descriptive statistics for benefits before and after imputation are included in Table 16 and Figure 18.

Table 16. Family-Level Benefit of TANF, by Family Wage Decile

| Decile | Decile Wage<br>Upper Bound | Raw CPS<br>Average | Adjusted<br>Average | Raw CPS Total<br>Benefits<br>(Millions) | Adjusted Total<br>Benefits<br>(Millions) |
|--------|----------------------------|--------------------|---------------------|---|--|
| 1      | \$0                        | \$2,061            | \$7,203             | \$1,167                                 | \$6,913                                  |
| 2      | \$0                        | \$2,061            | \$7,203             | \$881                                   | \$4,664                                  |
| 3      | \$3,200                    | \$2,166            | \$7,293             | \$1,420                                 | \$8,970                                  |
| 4      | \$17,200                   | \$1,964            | \$7,778             | \$443                                   | \$4,708                                  |
| 5      | \$29,000                   | \$1,766            | \$6,640             | \$176                                   | \$2,126                                  |
| 6      | \$41,000                   | \$1,502            | \$6,971             | \$113                                   | \$779                                    |
| 7      | \$58,000                   | \$2,156            | \$8,864             | \$73                                    | \$584                                    |
| 8      | \$80,000                   | \$811              | \$7,034             | \$28                                    | \$261                                    |
| 9      | \$119,000                  | \$1,303            | \$7,037             | \$37                                    | \$226                                    |
| 10     | \$2,199,998                | \$949              | \$2,390             | \$34                                    | \$120                                    |
| Total  |                            | \$2,073            | \$7,380             | \$4,373                                 | \$29,351                                 |



Figure 18. Benefit of TANF before and after Adjustment, by Family Wage Decile



### Women, Infants and Children

Women, Infants and Children (WIC) provides supplemental food, health care referrals, and nutrition education for pregnant or breastfeeding women, infants, and children under 5 years old who are subject to nutrition risk in low-income households<sup>58</sup>. This program is administered at the federal level by the Food and Nutrition Service (FNS) and funded by federal grants.

**Participation and Benefits Adjustment.** We estimate that the CPS underestimate WIC participants by 1.74 million, which comprises 0.33 million women, 0.74 million infants, and 0.87 million children.

USDA administrative data show that \$4.1 billion benefits were claimed by 8.06 million participants in total, including 1.93 million women, 1.93 million infants, and 4.20 million children under age 5 in 2014<sup>59</sup>.

<sup>58</sup> Department of Agriculture, “About WIC”, <https://www.fns.usda.gov/wic/about-wic>.

<sup>59</sup> USDA Food and Nutrition Service, “Annual State Level Data FY 2009-2016”, <https://www.fns.usda.gov/pd/wic-program>.

Before we calculate the aggregates in the CPS, we make a few edits on the microdata because the 2015 CPS reports 4.2 million female participants while the USDA administrative data only have 1.9 million.<sup>60</sup> First, we exclude current women participants who are under 15 or over 44, because it might be reporting errors in those cases. Second, we only keep current women participants with infants at age 0 or who do not have children. Presumably they were either pregnant or breastfeeding during the prior year. Third, we label all infants or children of the leftover women participants. After these edits, we end up with 1.6 million women participants, 3.37 million children (age 1 - 4), and 1.19 million infants (age 0) in the edited CPS, which totals at 6.22 million.

By deducting the CPS-edited participants from administrative data, we obtain the gap of 0.33 million women, 0.74 million infants, and 0.87 million children. The CPS does not have benefit amount available, so we assign state averages to participants.

*Stage 1: Participation Adjustment.* Eligible individuals not only need to meet income requirements but also are subject to nutritional risk according to the USDA.<sup>61</sup> In our model, we focus on income-related factors. We first approximate income eligibility by comparing calculated earned and unearned income with USDA guidelines by family size and state of residence.<sup>62</sup> Then we add indicators of enrollment in Medicaid, SNAP or TANF since participation in these three programs guarantees income eligibility for WIC. We estimate probability of participation separately for infants, children, and women.

Regression equation for children and infants:

$$WIC\_Indicator = \alpha + \beta_1 hfdval + \beta_2 cov\_hi + \beta_3 ch\_mc + \beta_4 fwsval + \varepsilon$$

where *hfdval* is an indicator of food stamp, *cov\_hi* is an indicator of health insurance coverage, *ch\_mc* is children Medicaid or Medicare coverage, and *fwsval* is family wage income.

Regression equation for women:

$$WIC\_Indicator = \alpha + \beta_1 rsnotw + \beta_2 has\_child + \beta_3 hfdval + \beta_4 mcaid + \beta_5 income\_eligibility + \beta_6 fwsval + \beta_7 paw\_typ + \varepsilon$$

In addition to the variables contained in the children and infants regression, this regression for women also includes several variables: *rsnotw* as an indicator of stay-at-home mothers who chose not to work, *has\_child* is an indicator of children, *income\_eligibility* is the USDA income-eligibility guideline, and *paw\_typ* is participation in TANF.

The regression results are attached Appendix Table A9.

<sup>60</sup> This could be that some children's benefit gets labeled on their mother.

<sup>61</sup> USDA Food and Nutrition Services, Eligibility Requirements, <https://www.fns.usda.gov/wic/wic-eligibility-requirements>.

<sup>62</sup> USDA Food and Nutrition Services, Income Eligibility Guidelines, <https://www.fns.usda.gov/wic/wic-income-eligibility-guidelines>.

*Stage 2: Benefit Adjustment.* For each impute recipients, we assigned a state-level average benefit amount calculated from administrative total benefit and participation. Descriptive statistics for benefits and participation before and after imputation are included in Table 17, Figure 19, and Figure 20.

Table 17. WIC Participation Rate Before and After adjustment, by Individual Earned Income Decile

| Decile | Decile Wage Upper Bound | Edited CPS | Adjusted | Raw CPS Participants (Thousands) | Adjusted Participants (Thousands) | Average Imputed Benefit |
|--------|-------------------------|------------|----------|----------------------------------|-----------------------------------|-------------------------|
| 1      | \$0                     | 0.023      | 0.036    | 687                              | 1,047                             | \$932                   |
| 2      | \$0                     | 0.023      | 0.036    | 752                              | 1,214                             | \$932                   |
| 3      | \$16,000                | 0.053      | 0.066    | 1,673                            | 2,082                             | \$851                   |
| 4      | \$29,000                | 0.038      | 0.047    | 1,199                            | 1,493                             | \$839                   |
| 5      | \$42,000                | 0.026      | 0.030    | 827                              | 958                               | \$802                   |
| 6      | \$58,000                | 0.014      | 0.017    | 450                              | 526                               | \$782                   |
| 7      | \$77,000                | 0.009      | 0.011    | 291                              | 334                               | \$789                   |
| 8      | \$102,000               | 0.004      | 0.005    | 137                              | 169                               | \$737                   |
| 9      | \$145,625               | 0.004      | 0.004    | 132                              | 141                               | \$693                   |
| 10     | \$2,199,998             | 0.002      | 0.002    | 76                               | 76                                | \$695                   |
| Total  | N/A                     | 0.020      | 0.025    | 6,223                            | 8,040                             | \$851                   |

Figure 19. WIC Participation Rate, by Family Wage Income Decile

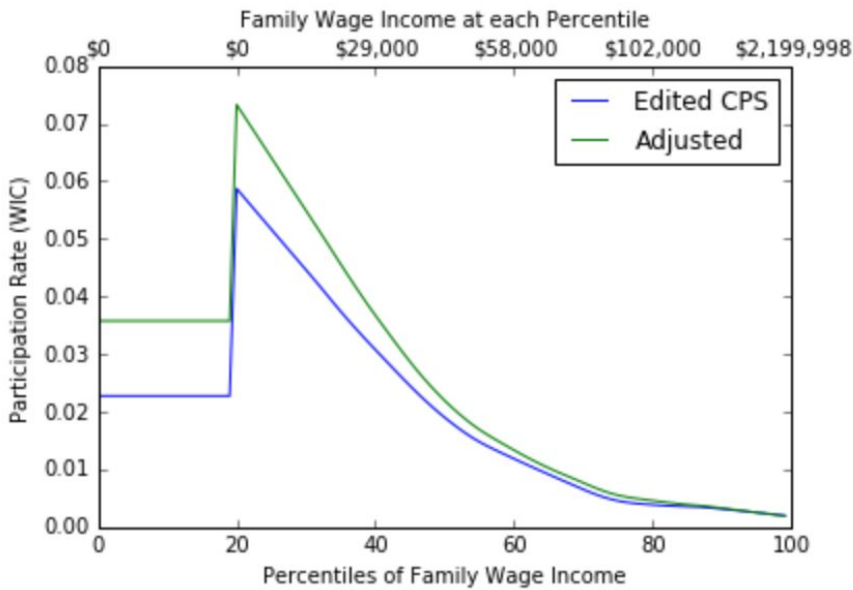
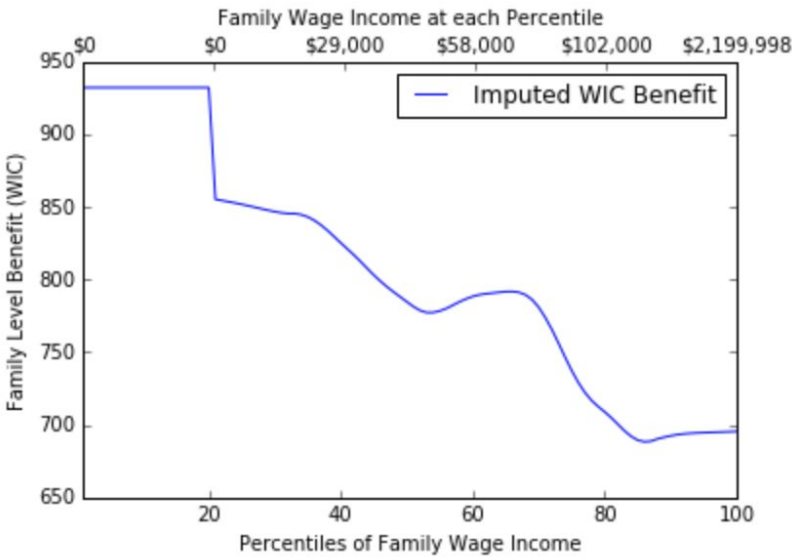


Figure 20. Imputed WIC Benefits, by Family Wage Income Decile



## Medicaid and Medicare

Medicaid is a joint federal-state program that provides health coverage to low-income families and people with disabilities.<sup>63</sup> Medicare is a federal health insurance program for people who are 65 or older, certain younger people with disabilities, and people with end-stage renal diseases.<sup>64</sup>

The CPS reports participation for both Medicaid and Medicare, but does not report benefits for either. Even though these two program are quite different in terms of coverage provided and beneficiary demographics, we include them in the same section because our goal is the same for these two health insurance programs—meet administrative participation targets for the noninstitutionalized population and impute average insurance values for participants.

We currently do not impute MTRs for either Medicare or Medicaid. For Medicare, income is not a factor in calculating enrollment or benefits. For Medicaid, there is an MTR spike at the upper bound of the income-eligible range. We currently ignore this cliff. Medicaid enrollees above and below the spike face no MTR from the program.

**Participation and Benefits Adjustment.** We estimate that the CPS underreports Medicaid participation by about 9.3 million and reports Medicare enrollment fairly accurately.<sup>65</sup> Medicaid enrollment was estimated at 64.8 million in 2014, according to the 2015 Medicaid Actuarial Report,<sup>66</sup> including around 1.4 million institutional enrollees.<sup>67</sup> The raw CPS reports total Medicaid enrollment of 54.1 million. Subtracting the CPS enrollment from the noninstitutional administrative total, we find a 9.3 million enrollee gap. For Medicare, the gap between CPS enrollment (48.9 million) and the noninstitutional

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<sup>63</sup> US Department of Health and Human Services, “Overview,” 2016, <https://www.medicaid.gov/medicaid/index.html>.

<sup>64</sup> US Department of Health and Human Services, “What’s Medicare?,” <https://www.medicare.gov/sign-up-change-plans/decide-how-to-get-medicare/whats-medicare/what-is-medicare.html>.

<sup>65</sup> CPS questions on Medicaid and Medicare ask if the participant is “covered” by either program, not if the participants have received medical care paid for by either program.

<sup>66</sup> US Department of Health and Human Services, Centers for Medicare and Medicaid Services, *2015 Actuarial Report on the Financial Outlook for Medicaid*, 2015, <https://www.medicaid.gov/medicaid/financing-and-reimbursement/downloads/medicaid-actuarial-report-2015.pdf>.

<sup>67</sup> US Department of Health and Human Services, *2015 CMS Statistics*, 2015, 4. Approximately four million persons received care in nursing facilities, including skilled nursing facilities (SNFs).

administrative total (53.8 million)<sup>68</sup> is relatively small, and we currently proceed without adjusting the CPS Medicare participation.

For both Medicaid and Medicare benefits, we aim to approximate the noninstitutional administrative totals, which exclude nursing homes and hospice services. We estimate noninstitutional Medicaid medical assistance spending is about \$397.4 billion, the difference between total medical spending of \$468.8 billion<sup>69</sup> and institutional long-term service spending of \$71.2 billion.<sup>70</sup> For Medicare, we estimate that noninstitutional benefit expenditures are \$575.7 billion, the difference between total benefit expenditures of \$604.5 billion<sup>71</sup> and \$28.8 billion benefits distributed to skilled nursing facilities.<sup>72</sup>

We impute medical care expenses for both Medicaid and Medicare from the Medical Expenditure Panel Survey (MEPS) for each enrollee. We choose MEPS because it provides the amount and source of payments information collected from hospitals and insurance companies. Although not all enrollees receive medical services in a given year, we take the additional step of reassigning all participants the average benefit value by income quintiles to capture the insurance value.<sup>73</sup>

*Stage 1: Participation Adjustment for Medicaid.* Starting in 2014, the Affordable Care Act expands eligibility to all adults under 65 who live in families with income below 138 percent of the poverty line.<sup>74</sup> We randomly draw individuals in similar families to fill the gap between CPS enrollee aggregate and administrative total. As a simplification, we rely on the CPS's poverty line variable (povll) rather than

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<sup>68</sup> The Boards of Trustees, Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, *2015 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds*, 2015, Table II.B1, <https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/reportstrustfunds/downloads/tr2015.pdf>.

<sup>69</sup> US Department of Health and Human Services, *2015 Actuarial Report on the Financial Outlook for Medicaid*, Table I. Medical assistance payments (\$468.8 billion) includes four major categories: acute care, long-term care benefits, capitation payments and premiums, and disproportionate share hospital payments. Among all four categories, we assume only long-term care benefits has major payments to public institutions, and we neglect potential institutional components in other categories.

<sup>70</sup> Steve Eiken et al., *Medicaid Expenditures for Long-Term Services and Supports (LTSS) in FY 2014: Manages LTSS Reached 15 Percent of LTSS Spending*, Truven Health Analytics, April 15, 2016, <https://www.medicaid.gov/medicaid/ltss/downloads/ltss-expenditures-2014.pdf>. This research defines institutional services as nursing homes, intermediate care facilities for individuals with intellectual disabilities, and mental health facilities.

<sup>71</sup> The Boards of Trustees, Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, *2015 Annual Report of the Boards of Trustees*, Table II. B1. To get this number, we subtract \$8.8 billion from total expenditures of \$613.3 billion.

<sup>72</sup> Total benefit expenditures consists of seven categories: hospital, SNF, home health care, physician fee schedule, private health plans, prescription drugs, and other. We assume most expenditures in SNFs are institutional. Although Medicare enrollees can use Part D for prescription drugs, we have not been able to approximate the institutional portion due to lack of data.

<sup>73</sup> In a future version, we may use age and gender rather than income group to derive a risk-related insurance value following Timothy M. Smeeding et al., "Poverty, Inequality, and Family Living Standards Impacts Across Seven Nations: The Effect of Noncash Subsidies for Health, Education and Housing," *Review of Income and Wealth* 39, no. 3 (September 1993), <http://www.roiw.org/1993/229.pdf>.

<sup>74</sup> US Department of Health and Human Services, "2015 Actuarial Report on the Financial Outlook for Medicaid."

calculating the poverty level directly, and we only draw families below 125 percent of the poverty line. We end up with 63.0 million participating families.

Descriptive statistics for Medicare and Medicaid enrollment before and after the imputation are included in Table 18 and Figure 21.

Table 18. Enrollment and Enrollment Rate for Medicare and Medicaid, by Individual Earned Income Decile

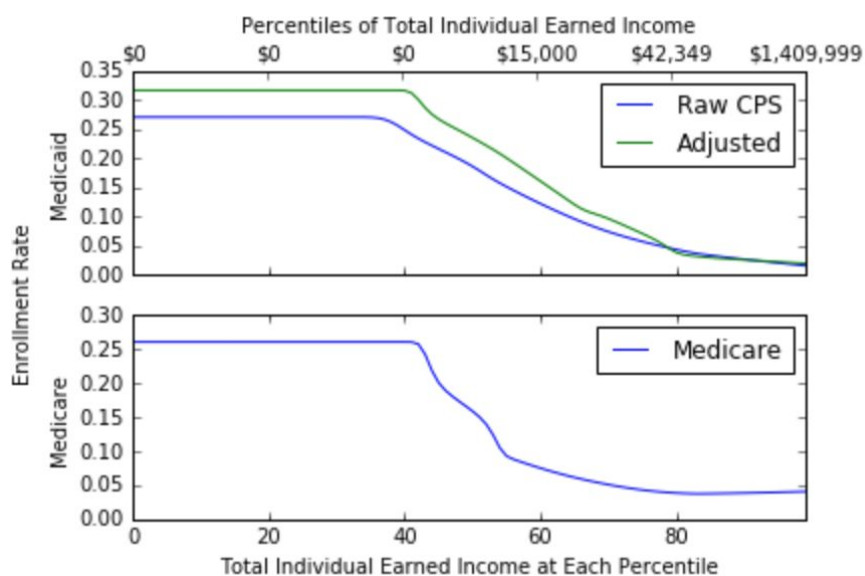
| Decile | Medicare       |                     | Medicaid       |                     |                     |                          |
|--------|----------------|---------------------|----------------|---------------------|---------------------|--------------------------|
|        | Raw Enrollment | Raw Enrollment Rate | Raw Enrollment | Raw Enrollment Rate | Adjusted Enrollment | Adjusted Enrollment Rate |
| 1      | 8,266,350      | 0.264               | 9,019,503      | 0.288               | 10,161,072          | 0.324                    |
| 2      | 8,090,447      | 0.258               | 8,961,542      | 0.286               | 10,062,145          | 0.321                    |
| 3      | 7,822,582      | 0.250               | 9,045,821      | 0.289               | 10,156,468          | 0.324                    |
| 4      | 8,228,200      | 0.263               | 8,150,500      | 0.260               | 9,369,583           | 0.299                    |
| 5      | 8,280,836      | 0.264               | 8,417,064      | 0.269               | 9,721,799           | 0.310                    |
| 6      | 3,143,898      | 0.100               | 4,608,393      | 0.147               | 6,644,051           | 0.212                    |
| 7      | 1,594,434      | 0.051               | 2,914,325      | 0.093               | 3,798,696           | 0.121                    |
| 8      | 1,215,641      | 0.039               | 1,488,009      | 0.047               | 1,591,839           | 0.051                    |
| 9      | 1,125,438      | 0.036               | 773,071        | 0.025               | 776,067             | 0.025                    |
| 10     | 1,188,749      | 0.038               | 702,268        | 0.022               | 702,268             | 0.022                    |
| Total  | 48,956,576     | 0.156               | 54,080,497     | 0.173               | 62,983,987          | 0.201                    |

Note:

Individuals younger than 65 who are temporarily laid off are eligible for Medicaid if their income is below 138 percent of federal poverty line.

This table includes enrollment and enrollment rate for Medicaid before and After Adjustment, but only raw data for Medicare since there's no adjustment.

Figure 21. CPS Medicaid and Medicare Enrollment Rate,  
by Individual Earned Income Percentile



Note: Medicaid enrollment has been imputed to match the noninstitutional total. Medicare enrollment is CPS raw data without any imputation. The curves have been smoothed using local linear estimates.

*Stage 2: Benefit Adjustment.* For both Medicare and Medicaid, we define the insurance value as the average benefit amount by total income quintile, and we augment the insurance value of each enrollee to match total spending for the noninstitutionalized population.



The first step is to match individual information from the MEPS to the CPS using age, gender, state of residence, and income.<sup>75</sup> Both original and imputed CPS enrollees receive an expenditure amount from an MEPS record with the same gender and age (within plus or minus two years), state of residence, and income (within plus or minus \$100).

The second step is to rank all participants by their total income (provided by the CPS), average the expenditures by income quintile, and assign average expenditures as the insurance value.

The third step is to adjust aggregates to match administrative totals. After imputing the average insurance value from the MEPS match, the program aggregates (Medicaid, \$168.8 billion; Medicare, \$398.0 billion) are still below total benefit amounts for both programs. This is likely because the MEPS aggregates do not include a portion of independent lab tests<sup>76</sup> and underreport high-cost cases.<sup>77</sup> We apply a uniform ratio to each program to match the total spending on benefits for noninstitutional beneficiaries. The ratios are 2.35 for Medicaid and 1.45 for Medicare.

Table 19. Average Insurance Value for Medicaid and Medicare, by Total Individual Income Quintile

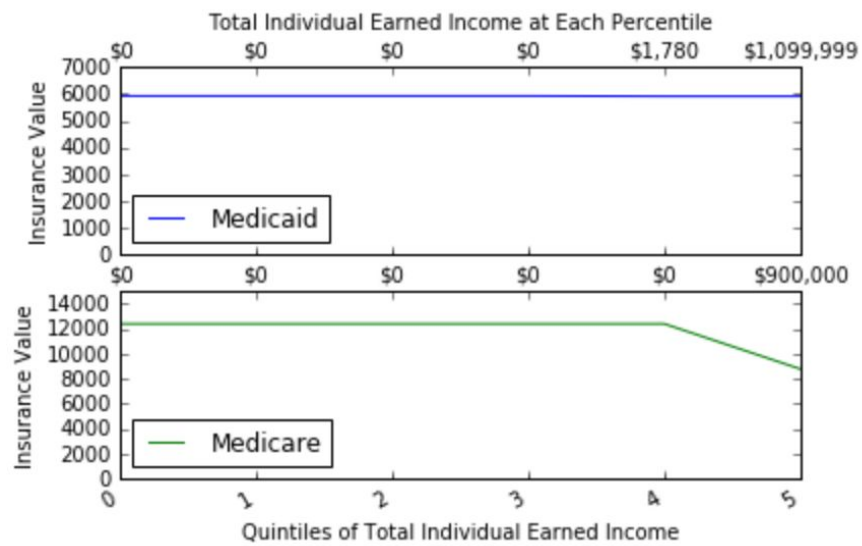
| Quintile | Medicaid           |                 | Medicare           |                 |
|----------|--------------------|-----------------|--------------------|-----------------|
|          | Income Upper Bound | Insurance Value | Income Upper Bound | Insurance Value |
| 1        | \$0                | \$5,927         | \$0                | \$12,404        |
| 2        | \$0                | \$5,927         | \$0                | \$12,404        |
| 3        | \$0                | \$5,927         | \$0                | \$12,404        |
| 4        | \$1,780            | \$5,911         | \$0                | \$12,404        |
| 5        | \$1,099,999        | \$5,911         | \$900,000          | \$8,776         |

<sup>75</sup> If no MEPS individual exists under all four requirements, we first release the income requirement and then state of residence, making sure at least age and gender matches between the MEPS and the CPS. Then if there is still no one who meets only the age and gender requirements, we leave the enrollee without any benefit in this step.

<sup>76</sup> The MEPS does not field a follow-up survey to independent labs and diagnostic and testing facilities.

<sup>77</sup> The MEPS might miss some high-cost physician or hospital expenditures that occurred right before the patient died, according to Merrile Sing et al. "Reconciling Medical Expenditure Estimates from the MEPS and NHEA, 2002," *Health Care Financing Review* 28, no. 1 (Fall 2006): 25–40, <http://search.proquest.com/openview/0d2193b191b2e593fda30a764f769fc6/1?pq-origsite=gscholar&cbl=5416>.

Figure 22. Medicaid and Medicare Insurance Value, by Individual Earned Income Quintile (Participants Only)



Note: The curves have been smoothed using local linear estimates.

## Cumulative Program Summary

Figure 23. Benefits of Six Programs Stacked, by Household Wage Income Percentiles

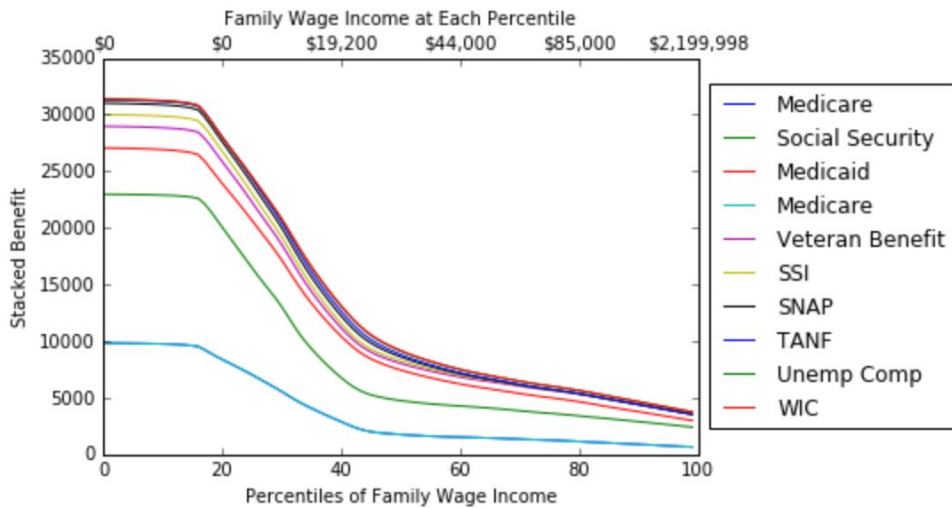
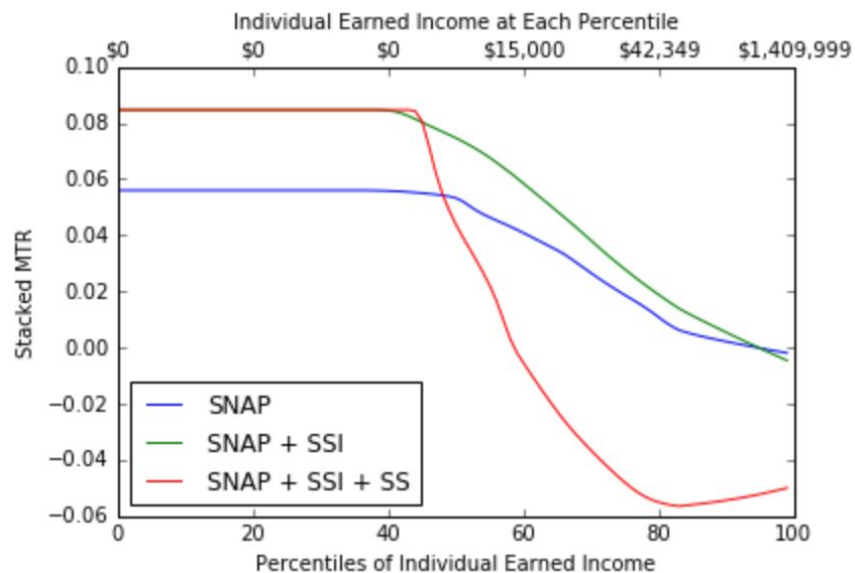
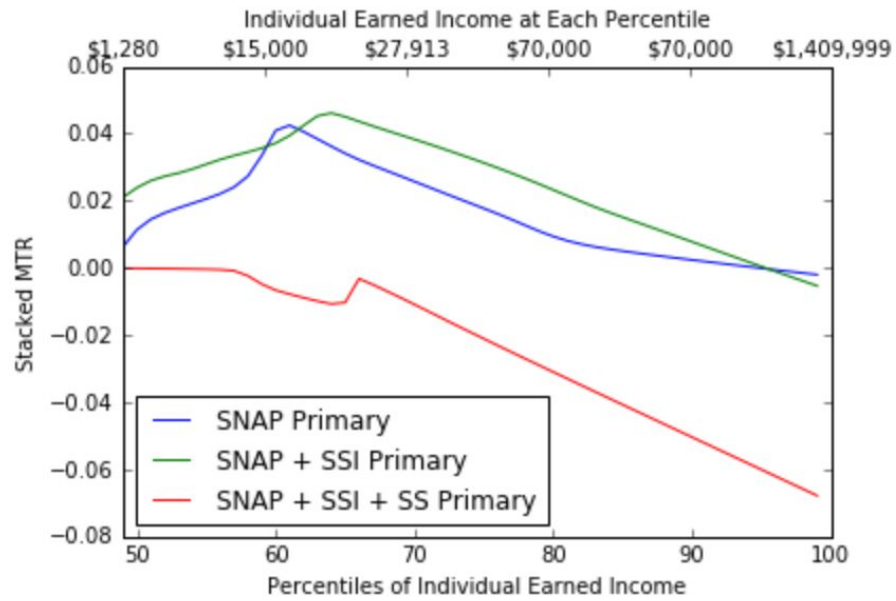


Figure 24. Stacked MTR for SSI, SNAP, and Social Security



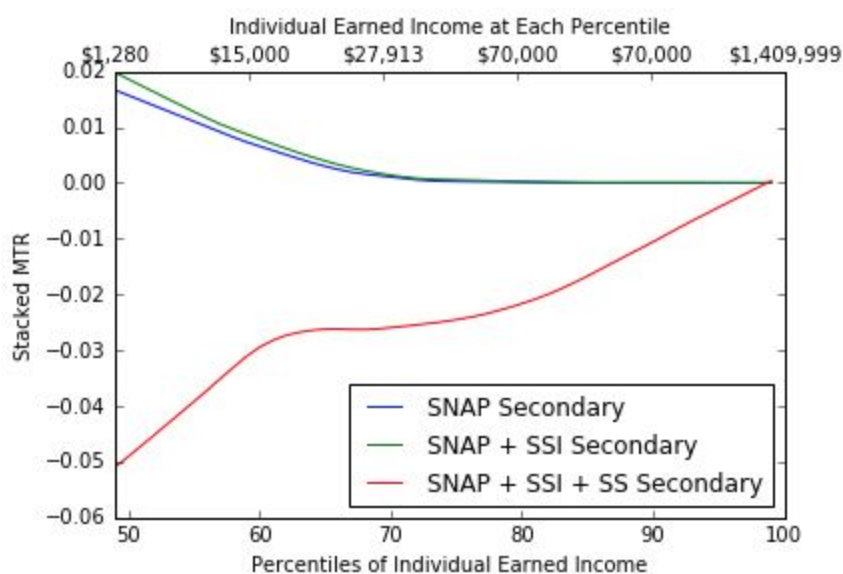
Note: The curves have been smoothed using local linear estimates.

Figure 25. Stacked Primary Earner's MTR, by Individual Wage Income



Note: The curves have been smoothed using local linear estimates.

Figure 26. Stacked Secondary Earner's MTR, by Individual Wage Income



Note: Secondary earners are sparser than primary earners in the low-income range, and they are more likely to get lower MTR rates than primary earners for SSI, 0.5 versus 1. Thus, when some secondary earners get large negative MTRs from Social Security, the averaged MTR curve goes downward. The curves have been smoothed using local linear estimates.

### Affordable Care Act: Premium Tax Credits

The premium tax credit (PTC) is a refundable tax credit for individuals who purchased health insurance in the Affordable Care Act marketplace and have a household income between 100 and 400 percent of the federal poverty line. IRS Commissioner John Koskinen reported that through October 2015, 3.0 million returns claimed \$10.3 billion in PTCs.<sup>78</sup> The IRS projects that 4.8 million taxpayers will file Form 8962 for PTC or advance payments of the PTC (APTC) reconciliation, bringing total PTC claims above their 2014 levels of \$15.5 billion.<sup>79</sup>

<sup>78</sup> On January 8, 2016, IRS Commissioner John Koskinen updated members of Congress on preliminary results from the 2015 filing season related to Affordable Care Act provisions as of October 2015. John Koskinen, letter to Congress, January 8, 2016, [https://www.irs.gov/pub/newsroom/irs\\_letter\\_aca\\_stats\\_010816.pdf](https://www.irs.gov/pub/newsroom/irs_letter_aca_stats_010816.pdf).

<sup>79</sup> Treasury Inspector General of Tax Administration found errors in the IRS financial accounting and reporting errors in PTC-related fund outlays. Treasury Inspector General for Tax Administration, *Affordable Care Act: Controls over Financial Accounting for the Premium Tax Credit Should Be Improved*, March 2, 2016, <https://www.treasury.gov/tigta/auditreports/2016reports/201613021fr.pdf>.

We use a microsimulation model to determine eligibility and benefit amount, without matching the aggregates to administrative targets. We impute insurance area rating codes for a significant portion of returns that are missing that field. This results in 2.0 million PTC recipients receiving \$10.1 billion in benefits.

The average PTC per tax unit is higher on the adjusted file than the average indicated by the IRS commissioner, since every imputed participant receives benefits for the full year, whereas there are likely many actual participants who receive benefits for under a full year. We seek to improve the model in the near future.

**Participation, Benefit and MTR Calculation.** The OSPC PTC calculator<sup>80</sup> determines eligibility and calculates the PTC amount using IRS Form 8962. To replicate IRS Form 8962, this calculator requires tax-unit-level health insurance coverage information; insurance rating area code of residence; modified adjusted gross income (AGI); ages of the filer, spouse, and dependents; and regular tax variables such as filing status and total number of people in tax unit.

Currently the input data set is a tax-unit data set created by John O'Hare from the most recent three years of the CPS ASEC<sup>81</sup>, which includes the employer health insurance coverage<sup>82</sup> and age<sup>83</sup> of each member in tax unit. Modified AGI<sup>84</sup> is the sum of AGI, the nontaxable portion of OASDI benefits,<sup>85</sup> and tax-exempt interest income. One last input is insurance area rating code, which is mapped through the county<sup>86</sup> of residence information in the CPS tax-unit data set. However, this county field is not available

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<sup>80</sup> The OSPC-ACA calculator was developed by Martin Holmer and Nikolai Boboshko. Martin Holmer and Nikolai Boboshko, "OSPC-ACA," 2014, <http://chiselapp.com/user/mrh/repository/OSPC-ACA/doc/trunk/www/home.wiki>.

<sup>81</sup> Current version includes files from 2013, 2014, and 2015.

<sup>82</sup> When employer insurance coverage is not consistent with either the filing status or total number of tax-unit members, we adjust insurance coverage based using the best assumption. For example, if a single filer reports to have employer coverage for both filer and spouse, we change this record to cover for filer only.

<sup>83</sup> If a joint record is missing the spouse's age, we assign the spouse the same age as the filer.

<sup>84</sup> Our approximation does not include foreign earned income (Form 2555), since no data are available.

<sup>85</sup> We use the IRS Public Use File (PUF) data to impute taxable ratio of the benefit and then use the ratio to calculate the nontaxable portion of OASDI. As indicated by PUF variables (e01500 and e01700), most people's pension benefits are either fully taxable or fully nontaxable. Among all tax returns with positive pension benefits, 8 percent returns have no taxable pension benefits, 6 percent returns have less than 50 percent taxable benefit (average taxable ratio at 0.0596), 23 percent returns have more than 50 percent taxable benefit (average taxable ratio at 0.921), and 63 percent returns have fully taxable benefits. So we used a random number generator and assign taxable benefits according to the following specifications.

| <u>Random Number Range</u> | <u>Taxable Ratio</u> |
|----------------------------|----------------------|
| 0 <= x < 0.08              | 0                    |
| 0.08 <= x < 0.14           | 0.0596               |
| 0.14 <= x < 0.37           | 0.0921               |
| x >= 0.37                  | 1                    |

<sup>86</sup> This variable is missing for many records. We drop those records in this version and will impute them in the near future.

for every record, so we impute the area rating code based on county population table for 2014 with a random number generator.<sup>87</sup>

We feed the information above to the calculator and then get the PTC amount for each eligible tax unit. To obtain MTR, we add one dollar to the modified AGI, re-run the calculator, and get the different PTC amounts, which is MTR by definition.

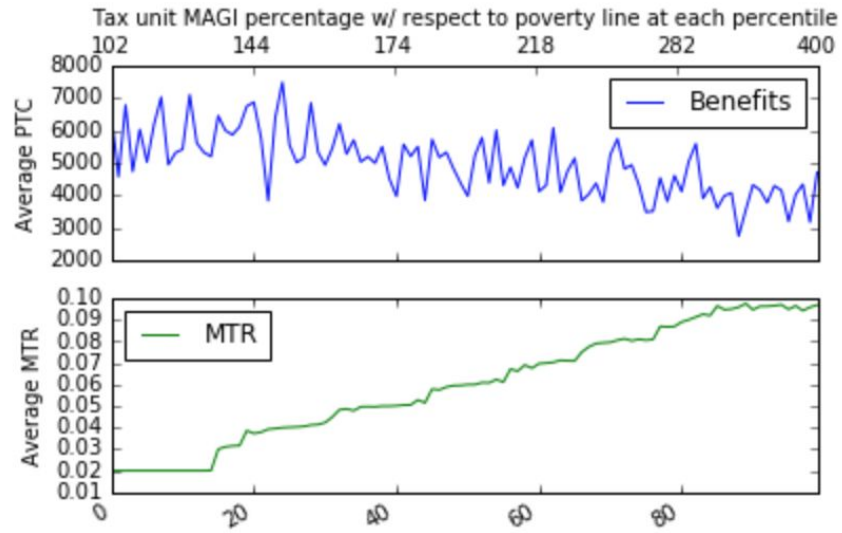
Descriptive statistics for benefits and MTRs are included in Table 20 and Figure 27.

Table 20. Average PTC Amounts and MTR, by Modified AGI Percentage to Federal Poverty Line Decile

| Decile | Modified AGI Upper Bound (Percentage to FPL) | Average Benefits | Average MTR |
|--------|--|------------------|-------------|
| 1      | 123  | \$5,718          | 0.020       |
| 2      | 142  | \$5,989          | 0.026       |
| 3      | 157  | \$5,831          | 0.040       |
| 4      | 174  | \$5,283          | 0.048       |
| 5      | 192  | \$4,953          | 0.055       |
| 6      | 214  | \$4,966          | 0.064       |
| 7      | 245  | \$4,453          | 0.073       |
| 8      | 276  | \$4,502          | 0.083       |
| 9      | 323  | \$4,085          | 0.094       |
| 10     | 400  | \$4,012          | 0.096       |

<sup>87</sup> Specifically, since multiple counties might share one insurance area rating code, we estimate the probability of residing in each area from current CPS county-level population and official county population. Then we use random numbers to assign tax units to different areas according to this probability.

Figure 27. Affordable Care Act: Premium Tax Credits





## Appendix

**Table A1. SSI Participation Regression Results**

| Logit Regression Results |                  |                   |         |       |                    |           |
|--------------------------|------------------|-------------------|---------|-------|--------------------|-----------|
| Dep. Variable:           | ssi_indicator    | No. Observations: | 139415  |       |                    |           |
| Model:                   | Logit            | Df Residuals:     | 139397  |       |                    |           |
| Method:                  | MLE              | Df Model:         | 17      |       |                    |           |
| Date:                    | Mon, 15 May 2017 | Pseudo R-squ.:    | 0.6772  |       |                    |           |
| Time:                    | 17:31:02         | Log-Likelihood:   | -4155.3 |       |                    |           |
| converged:               | True             | LL-Null:          | -12873. |       |                    |           |
|                          |                  | LLR p-value:      | 0.000   |       |                    |           |
|                          | coef             | std err           | z       | P> z  | [95.0% Conf. Int.] |           |
| intercept                | -9.1377          | 0.184             | -49.634 | 0.000 | -9.499             | -8.777    |
| countable_income         | -4.355e-05       | 7.8e-06           | -5.583  | 0.000 | -5.88e-05          | -2.83e-05 |
| combined_disability      | 5.3380           | 0.164             | 32.460  | 0.000 | 5.016              | 5.660     |
| uc_yn                    | -0.7786          | 0.244             | -3.193  | 0.001 | -1.257             | -0.301    |
| ss_yn                    | -1.6194          | 0.076             | -21.382 | 0.000 | -1.768             | -1.471    |
| wc_yn                    | -2.1539          | 0.489             | -4.408  | 0.000 | -3.111             | -1.196    |
| paw_yn                   | -0.4005          | 0.134             | -2.994  | 0.003 | -0.663             | -0.138    |
| vet_yn                   | -1.1384          | 0.275             | -4.132  | 0.000 | -1.678             | -0.598    |
| sur_yn                   | -0.7834          | 0.303             | -2.590  | 0.010 | -1.376             | -0.191    |
| hed_yn                   | -0.3711          | 0.127             | -2.932  | 0.003 | -0.619             | -0.123    |
| hcsp_yn                  | 0.0788           | 0.120             | 0.656   | 0.512 | -0.157             | 0.314     |
| hfdval                   | 0.3016           | 0.059             | 5.078   | 0.000 | 0.185              | 0.418     |
| mcare                    | 0.6082           | 0.085             | 7.179   | 0.000 | 0.442              | 0.774     |
| mcaid                    | 4.1083           | 0.094             | 43.480  | 0.000 | 3.923              | 4.293     |
| age_dummy18              | -1.2735          | 0.244             | -5.228  | 0.000 | -1.751             | -0.796    |
| age_dummy65              | 3.3369           | 0.212             | 15.708  | 0.000 | 2.921              | 3.753     |
| age18_X_disability       | 1.2371           | 0.275             | 4.493   | 0.000 | 0.697              | 1.777     |
| age65_X_disability       | -2.8653          | 0.216             | -13.267 | 0.000 | -3.289             | -2.442    |

Note: The universe to draw participants is truncated to the bottom 95 percent of SSI participants according to their annual family earned income, or \$57,000.

**Table A2. SSI Benefit Adjustment Ratios Applied at State Level**

| State                | Imputed (Millions) | Admin (Millions) | Adjust Ratio |
|----------------------|--------------------|------------------|--------------|
| Alabama              | \$1,213.67         | \$1,096.08       | 0.90         |
| Alaska               | \$90.01            | \$133.73         | 1.49         |
| Arizona              | \$949.83           | \$779.02         | 0.82         |
| Arkansas             | \$810.35           | \$710.06         | 0.88         |
| California           | \$10,672.57        | \$12,336.77      | 1.16         |
| Colorado             | \$477.35           | \$498.73         | 1.04         |
| Connecticut          | \$504.56           | \$464.08         | 0.92         |
| Delaware             | \$138.96           | \$110.75         | 0.80         |
| District of Columbia | \$219.66           | \$195.72         | 0.89         |
| Florida              | \$4,209.13         | \$3,589.73       | 0.85         |
| Georgia              | \$1,870.74         | \$1,667.66       | 0.89         |
| Hawaii               | \$172.53           | \$189.02         | 1.10         |
| Idaho                | \$269.04           | \$200.86         | 0.75         |
| Illinois             | \$2,413.19         | \$1,863.42       | 0.77         |
| Indiana              | \$1,151.85         | \$859.60         | 0.75         |
| Iowa                 | \$383.90           | \$323.75         | 0.84         |
| Kansas               | \$426.27           | \$312.33         | 0.73         |
| Kentucky             | \$1,575.39         | \$1,203.03       | 0.76         |
| Louisiana            | \$1,422.88         | \$1,155.53       | 0.81         |
| Maine                | \$366.28           | \$236.15         | 0.64         |
| Maryland             | \$958.95           | \$819.20         | 0.85         |
| Massachusetts        | \$1,419.84         | \$1,399.90       | 0.99         |
| Michigan             | \$2,075.35         | \$1,902.76       | 0.92         |
| Minnesota            | \$651.53           | \$699.76         | 1.07         |
| Mississippi          | \$988.59           | \$782.72         | 0.79         |

|                |            |            |      |
|----------------|------------|------------|------|
| Missouri       | \$1,352.99 | \$918.77   | 0.68 |
| Montana        | \$154.13   | \$112.19   | 0.73 |
| Nebraska       | \$228.17   | \$179.84   | 0.79 |
| Nevada         | \$428.02   | \$344.69   | 0.81 |
| New Hampshire  | \$195.32   | \$121.42   | 0.62 |
| New Jersey     | \$1,585.01 | \$1,281.12 | 0.81 |
| New Mexico     | \$383.80   | \$397.25   | 1.04 |
| New York       | \$5,651.82 | \$4,894.69 | 0.87 |
| North Carolina | \$1,956.27 | \$1,575.42 | 0.81 |
| North Dakota   | \$58.92    | \$47.35    | 0.80 |
| Ohio           | \$2,732.18 | \$2,118.75 | 0.78 |
| Oklahoma       | \$902.48   | \$664.30   | 0.74 |
| Oregon         | \$719.85   | \$569.73   | 0.79 |
| Pennsylvania   | \$3,270.49 | \$2,641.85 | 0.81 |
| Rhode Island   | \$283.20   | \$229.84   | 0.81 |
| South Carolina | \$873.10   | \$771.51   | 0.88 |
| South Dakota   | \$86.79    | \$91.35    | 1.05 |
| Tennessee      | \$1,365.24 | \$1,180.37 | 0.86 |
| Texas          | \$4,806.41 | \$4,060.68 | 0.84 |
| Utah           | \$235.46   | \$202.54   | 0.86 |
| Vermont        | \$109.68   | \$110.19   | 1.00 |
| Virginia       | \$1,029.88 | \$1,031.30 | 1.00 |
| Washington     | \$1,341.37 | \$1,055.27 | 0.79 |
| West Virginia  | \$591.24   | \$501.24   | 0.85 |
| Wisconsin      | \$984.63   | \$911.76   | 0.93 |
| Wyoming        | \$51.43    | \$41.19    | 0.80 |

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**Table A3. SNAP Participation Regression Results**

| Logit Regression Results |                  |                   |         |       |                    |           |
|--------------------------|------------------|-------------------|---------|-------|--------------------|-----------|
| Dep. Variable:           | indicator        | No. Observations: | 37780   |       |                    |           |
| Model:                   | Logit            | Df Residuals:     | 37765   |       |                    |           |
| Method:                  | MLE              | Df Model:         | 14      |       |                    |           |
| Date:                    | Mon, 15 May 2017 | Pseudo R-squ.:    | 0.3597  |       |                    |           |
| Time:                    | 18:51:18         | Log-Likelihood:   | -10768. |       |                    |           |
| converged:               | True             | LL-Null:          | -16817. |       |                    |           |
|                          |                  | LLR p-value:      | 0.000   |       |                    |           |
|                          | coef             | std err           | z       | P> z  | [95.0% Conf. Int.] |           |
| hh_net                   | -7.362e-05       | 1.52e-06          | -48.444 | 0.000 | -7.66e-05          | -7.06e-05 |
| hh_size                  | 0.1457           | 0.024             | 6.069   | 0.000 | 0.099              | 0.193     |
| disability               | 0.3142           | 0.034             | 9.141   | 0.000 | 0.247              | 0.382     |
| child_yn                 | 0.2667           | 0.030             | 8.777   | 0.000 | 0.207              | 0.326     |
| ABAWD                    | 0.2421           | 0.054             | 4.457   | 0.000 | 0.136              | 0.349     |
| ssi_yn                   | 0.2928           | 0.060             | 4.875   | 0.000 | 0.175              | 0.411     |
| intercept                | -2.0794          | 0.050             | -41.370 | 0.000 | -2.178             | -1.981    |
| uc_yn                    | 0.8390           | 0.068             | 12.270  | 0.000 | 0.705              | 0.973     |
| paw_yn                   | 1.3801           | 0.102             | 13.536  | 0.000 | 1.180              | 1.580     |
| vet_yn                   | -0.6743          | 0.130             | -5.183  | 0.000 | -0.929             | -0.419    |
| sur_yn                   | -0.7888          | 0.142             | -5.567  | 0.000 | -1.067             | -0.511    |
| mcare                    | -0.1265          | 0.061             | -2.068  | 0.039 | -0.246             | -0.007    |
| mcaid                    | 1.7742           | 0.042             | 42.515  | 0.000 | 1.692              | 1.856     |
| ss_yn                    | 0.5076           | 0.061             | 8.347   | 0.000 | 0.388              | 0.627     |
| wc_yn                    | -0.0916          | 0.169             | -0.544  | 0.587 | -0.422             | 0.239     |

**Table A4. SNAP Adjustment Ratios Applied at State Level**

| State                | Imputed         | Admin           | adjust ratio |
|----------------------|-----------------|-----------------|--------------|
| Alabama              | \$1,412,897,199 | \$1,318,133,562 | 0.93         |
| Alaska               | \$160,813,538   | \$174,241,813   | 1.08         |
| Arizona              | \$1,474,283,062 | \$1,476,761,898 | 1.00         |
| Arkansas             | \$630,076,990   | \$663,719,268   | 1.05         |
| California           | \$7,414,921,629 | \$7,411,483,685 | 1.00         |
| Colorado             | \$802,730,106   | \$765,737,085   | 0.95         |
| Connecticut          | \$774,412,320   | \$697,435,672   | 0.90         |
| Delaware             | \$242,208,372   | \$220,352,805   | 0.91         |
| District of Columbia | \$227,031,653   | \$222,604,041   | 0.98         |
| Florida              | \$5,708,244,944 | \$5,472,834,001 | 0.96         |
| Georgia              | \$2,772,734,034 | \$2,827,853,876 | 1.02         |
| Hawaii               | \$515,570,596   | \$525,397,960   | 1.02         |
| Idaho                | \$278,188,370   | \$295,662,973   | 1.06         |
| Illinois             | \$3,303,419,363 | \$3,202,509,863 | 0.97         |
| Indiana              | \$1,343,839,281 | \$1,311,468,403 | 0.98         |
| Iowa                 | \$543,055,027   | \$532,085,213   | 0.98         |
| Kansas               | \$384,008,771   | \$395,209,994   | 1.03         |
| Kentucky             | \$1,258,524,324 | \$1,170,989,948 | 0.93         |
| Louisiana            | \$1,262,291,318 | \$1,288,316,273 | 1.02         |
| Maine                | \$332,436,357   | \$321,550,513   | 0.97         |
| Maryland             | \$1,152,670,706 | \$1,133,135,874 | 0.98         |
| Massachusetts        | \$1,345,198,559 | \$1,272,977,488 | 0.95         |
| Michigan             | \$2,758,254,723 | \$2,576,165,148 | 0.93         |
| Minnesota            | \$653,506,951   | \$670,202,668   | 1.03         |

|                |                 |                 |      |
|----------------|-----------------|-----------------|------|
| Mississippi    | \$929,568,154   | \$912,985,504   | 0.98 |
| Missouri       | \$1,027,519,024 | \$1,236,444,630 | 1.20 |
| Montana        | \$172,921,946   | \$176,169,543   | 1.02 |
| Nebraska       | \$223,950,216   | \$238,904,358   | 1.07 |
| Nevada         | \$494,440,677   | \$536,711,313   | 1.09 |
| New Hampshire  | \$139,737,163   | \$140,718,624   | 1.01 |
| New Jersey     | \$1,300,061,580 | \$1,290,688,313 | 0.99 |
| New Mexico     | \$677,021,625   | \$629,160,453   | 0.93 |
| New York       | \$5,186,574,065 | \$5,200,758,093 | 1.00 |
| North Carolina | \$2,371,673,803 | \$2,383,571,501 | 1.01 |
| North Dakota   | \$78,125,787    | \$75,765,024    | 0.97 |
| Ohio           | \$2,284,023,155 | \$2,582,757,967 | 1.13 |
| Oklahoma       | \$891,596,869   | \$865,049,765   | 0.97 |
| Oregon         | \$1,239,172,153 | \$1,161,871,005 | 0.94 |
| Pennsylvania   | \$2,634,231,034 | \$2,573,657,445 | 0.98 |
| Rhode Island   | \$276,801,467   | \$279,843,287   | 1.01 |
| South Carolina | \$1,116,731,250 | \$1,235,696,260 | 1.11 |
| South Dakota   | \$139,931,149   | \$148,938,276   | 1.06 |
| Tennessee      | \$2,026,161,279 | \$1,951,918,832 | 0.96 |
| Texas          | \$5,511,301,661 | \$5,330,650,619 | 0.97 |
| Utah           | \$301,902,740   | \$316,671,764   | 1.05 |
| Vermont        | \$141,840,421   | \$130,324,476   | 0.92 |
| Virginia       | \$1,275,896,961 | \$1,303,281,631 | 1.02 |
| Washington     | \$1,646,737,360 | \$1,547,545,882 | 0.94 |
| West Virginia  | \$501,184,635   | \$476,134,200   | 0.95 |
| Wisconsin      | \$1,168,086,090 | \$1,112,980,884 | 0.95 |
| Wyoming        | \$51,942,873    | \$49,272,569    | 0.95 |

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**Table A5. VB Participation Regression 1 Results**

| Logit Regression Results |                  |                   |         |       |                    |          |
|--------------------------|------------------|-------------------|---------|-------|--------------------|----------|
| =====                    |                  |                   |         |       |                    |          |
| Dep. Variable:           | indicator        | No. Observations: | 139415  |       |                    |          |
| Model:                   | Logit            | Df Residuals:     | 139394  |       |                    |          |
| Method:                  | MLE              | Df Model:         | 20      |       |                    |          |
| Date:                    | Mon, 15 May 2017 | Pseudo R-squ.:    | 0.3441  |       |                    |          |
| Time:                    | 16:55:02         | Log-Likelihood:   | -5228.6 |       |                    |          |
| converged:               | True             | LL-Null:          | -7971.7 |       |                    |          |
|                          |                  | LLR p-value:      | 0.000   |       |                    |          |
| =====                    |                  |                   |         |       |                    |          |
|                          | coef             | std err           | z       | P> z  | [95.0% Conf. Int.] |          |
| -----                    |                  |                   |         |       |                    |          |
| a_age                    | 0.0076           | 0.002             | 3.288   | 0.001 | 0.003              | 0.012    |
| sex                      | -0.1342          | 0.086             | -1.565  | 0.118 | -0.302             | 0.034    |
| income                   | -6.324e-07       | 6.68e-07          | -0.946  | 0.344 | -1.94e-06          | 6.78e-07 |
| d1                       | -0.0197          | 0.170             | -0.116  | 0.908 | -0.354             | 0.314    |
| d2                       | 0.3553           | 0.097             | 3.678   | 0.000 | 0.166              | 0.545    |
| d3                       | -0.0995          | 0.170             | -0.585  | 0.558 | -0.433             | 0.234    |
| d4                       | -0.0693          | 0.146             | -0.475  | 0.635 | -0.355             | 0.216    |
| d5                       | 0.6409           | 0.095             | 6.726   | 0.000 | 0.454              | 0.828    |
| d6                       | 0.3919           | 0.124             | 3.168   | 0.002 | 0.149              | 0.634    |
| active                   | 3.8395           | 0.084             | 45.710  | 0.000 | 3.675              | 4.004    |
| paw_yn                   | 0.2986           | 0.532             | 0.561   | 0.575 | -0.745             | 1.342    |
| wc_yn                    | 0.9227           | 0.269             | 3.432   | 0.001 | 0.396              | 1.450    |
| ss_yn                    | 0.6313           | 0.115             | 5.484   | 0.000 | 0.406              | 0.857    |
| uc_yn                    | 0.0617           | 0.181             | 0.341   | 0.733 | -0.293             | 0.416    |
| sur_yn                   | 0.7058           | 0.201             | 3.513   | 0.000 | 0.312              | 1.100    |
| hed_yn                   | 0.6809           | 0.105             | 6.463   | 0.000 | 0.474              | 0.887    |
| hcsp_yn                  | -0.1412          | 0.173             | -0.815  | 0.415 | -0.481             | 0.198    |
| hfdval                   | -0.2444          | 0.124             | -1.972  | 0.049 | -0.487             | -0.001   |
| mcaid                    | -0.4446          | 0.135             | -3.301  | 0.001 | -0.709             | -0.181   |
| mcare                    | -0.4567          | 0.121             | -3.789  | 0.000 | -0.693             | -0.220   |
| intercept                | -6.3380          | 0.117             | -54.186 | 0.000 | -6.567             | -6.109   |
| =====                    |                  |                   |         |       |                    |          |



**Table A6 . Social Security Participation Regression Results**

| Logit Regression Results |                  |                   |          |       |                    |        |
|--------------------------|------------------|-------------------|----------|-------|--------------------|--------|
| Dep. Variable:           | ss_indicator     | No. Observations: | 199024   |       |                    |        |
| Model:                   | Logit            | Df Residuals:     | 199009   |       |                    |        |
| Method:                  | MLE              | Df Model:         | 14       |       |                    |        |
| Date:                    | Fri, 29 Sep 2017 | Pseudo R-squ.:    | 0.6401   |       |                    |        |
| Time:                    | 11:26:56         | Log-Likelihood:   | -28704.  |       |                    |        |
| converged:               | True             | LL-Null:          | -79744.  |       |                    |        |
|                          |                  | LLR p-value:      | 0.000    |       |                    |        |
|                          | coef             | std err           | z        | P> z  | [95.0% Conf. Int.] |        |
| Aged_yn                  | 1.1048           | 0.043             | 25.541   | 0.000 | 1.020              | 1.190  |
| Disabled_yn              | 1.8414           | 0.037             | 49.905   | 0.000 | 1.769              | 1.914  |
| Widowed_yn               | 0.8190           | 0.048             | 17.175   | 0.000 | 0.725              | 0.912  |
| ssi_yn                   | -2.1609          | 0.065             | -33.255  | 0.000 | -2.288             | -2.034 |
| sur_yn                   | 0.8324           | 0.117             | 7.138    | 0.000 | 0.604              | 1.061  |
| vet_yn                   | 1.0322           | 0.086             | 12.025   | 0.000 | 0.864              | 1.200  |
| paw_yn                   | 0.0117           | 0.130             | 0.090    | 0.928 | -0.243             | 0.266  |
| hed_yn                   | -0.5422          | 0.061             | -8.921   | 0.000 | -0.661             | -0.423 |
| hcsp_yn                  | -0.1266          | 0.063             | -1.996   | 0.046 | -0.251             | -0.002 |
| hfdval                   | 0.0269           | 0.037             | 0.721    | 0.471 | -0.046             | 0.100  |
| mcare                    | 4.4305           | 0.042             | 106.219  | 0.000 | 4.349              | 4.512  |
| mcaid                    | 0.2956           | 0.036             | 8.304    | 0.000 | 0.226              | 0.365  |
| uc_yn                    | -0.1472          | 0.109             | -1.347   | 0.178 | -0.361             | 0.067  |
| wc_yn                    | -0.7886          | 0.191             | -4.139   | 0.000 | -1.162             | -0.415 |
| intercept                | -3.9596          | 0.020             | -197.227 | 0.000 | -3.999             | -3.920 |



**Table A7 . Public Housing Participation Regression Results**

| Logit Regression Results |                  |                   |         |       |                    |           |
|--------------------------|------------------|-------------------|---------|-------|--------------------|-----------|
| Dep. Variable:           | indicator        | No. Observations: | 60078   |       |                    |           |
| Model:                   | Logit            | Df Residuals:     | 60068   |       |                    |           |
| Method:                  | MLE              | Df Model:         | 9       |       |                    |           |
| Date:                    | Tue, 15 Aug 2017 | Pseudo R-squ.:    | 0.2638  |       |                    |           |
| Time:                    | 16:11:19         | Log-Likelihood:   | -8256.9 |       |                    |           |
| converged:               | True             | LL-Null:          | -11216. |       |                    |           |
|                          |                  | LLR p-value:      | 0.000   |       |                    |           |
|                          | coef             | std err           | z       | P> z  | [95.0% Conf. Int.] |           |
| intercept                | -3.0305          | 0.104             | -29.230 | 0.000 | -3.234             | -2.827    |
| family_size              | -0.1719          | 0.017             | -10.106 | 0.000 | -0.205             | -0.139    |
| F_MV                     | 1.4312           | 0.048             | 29.953  | 0.000 | 1.338              | 1.525     |
| under_30_inc             | 0.7948           | 0.097             | 8.219   | 0.000 | 0.605              | 0.984     |
| under_50_inc             | 0.3546           | 0.085             | 4.171   | 0.000 | 0.188              | 0.521     |
| family_net               | -2.623e-05       | 2.1e-06           | -12.491 | 0.000 | -3.03e-05          | -2.21e-05 |
| f_disability             | 0.3027           | 0.041             | 7.424   | 0.000 | 0.223              | 0.383     |
| f_elderly                | 0.0274           | 0.040             | 0.688   | 0.492 | -0.051             | 0.105     |
| citizenship              | -0.2665          | 0.072             | -3.686  | 0.000 | -0.408             | -0.125    |
| medicaid                 | 1.0232           | 0.049             | 21.039  | 0.000 | 0.928              | 1.119     |

**Table A8 . Unemployment Compensation Participation Regression Results**

| Logit Regression Results |                  |                   |         |       |                    |        |
|--------------------------|------------------|-------------------|---------|-------|--------------------|--------|
| =====                    |                  |                   |         |       |                    |        |
| Dep. Variable:           | indicator        | No. Observations: | 199024  |       |                    |        |
| Model:                   | Logit            | Df Residuals:     | 199015  |       |                    |        |
| Method:                  | MLE              | Df Model:         | 8       |       |                    |        |
| Date:                    | Thu, 17 Aug 2017 | Pseudo R-squ.:    | 0.3010  |       |                    |        |
| Time:                    | 12:15:45         | Log-Likelihood:   | -10345. |       |                    |        |
| converged:               | True             | LL-Null:          | -14800. |       |                    |        |
|                          |                  | LLR p-value:      | 0.000   |       |                    |        |
| =====                    |                  |                   |         |       |                    |        |
|                          | coef             | std err           | z       | P> z  | [95.0% Conf. Int.] |        |
| -----                    |                  |                   |         |       |                    |        |
| intercept                | -7.6445          | 0.099             | -77.077 | 0.000 | -7.839             | -7.450 |
| wuemp                    | 1.2214           | 0.068             | 18.002  | 0.000 | 1.088              | 1.354  |
| ptotval                  | 2.7799           | 0.094             | 29.534  | 0.000 | 2.595              | 2.964  |
| pruntype                 | 1.0651           | 0.109             | 9.770   | 0.000 | 0.851              | 1.279  |
| a_explf                  | 0.4154           | 0.091             | 4.572   | 0.000 | 0.237              | 0.593  |
| lkweeks                  | 1.9166           | 0.091             | 20.984  | 0.000 | 1.738              | 2.096  |
| lkstrch                  | 0.3859           | 0.076             | 5.050   | 0.000 | 0.236              | 0.536  |
| F_MV                     | 0.3130           | 0.057             | 5.525   | 0.000 | 0.202              | 0.424  |
| disability               | -0.0610          | 0.076             | -0.798  | 0.425 | -0.211             | 0.089  |
| =====                    |                  |                   |         |       |                    |        |

# Logit Regression Results

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=====
Dep. Variable:          ss_indicator    No. Observations:      139415
Model:                  Logit           Df Residuals:          139400
Method:                 MLE            Df Model:              14
Date:                   Mon, 15 May 2017 Pseudo R-squ.:         0.6545
Time:                   17:07:41        Log-Likelihood:        -18732.
converged:              True            LL-Null:               -54217.
                                LLR p-value:           0.000
=====

```

|             | coef    | std err | z        | P> z  | [95.0% Conf. Int.] |        |
|-------------|---------|---------|----------|-------|--------------------|--------|
| Aged_yn     | 1.0964  | 0.055   | 19.984   | 0.000 | 0.989              | 1.204  |
| Disabled_yn | 2.0205  | 0.045   | 44.695   | 0.000 | 1.932              | 2.109  |
| Widowed_yn  | 1.0136  | 0.061   | 16.690   | 0.000 | 0.895              | 1.133  |
| ssi_yn      | -2.6727 | 0.084   | -31.734  | 0.000 | -2.838             | -2.508 |
| sur_yn      | 0.4184  | 0.133   | 3.146    | 0.002 | 0.158              | 0.679  |
| vet_yn      | 0.7229  | 0.112   | 6.467    | 0.000 | 0.504              | 0.942  |
| paw_yn      | 0.1355  | 0.157   | 0.863    | 0.388 | -0.172             | 0.443  |
| hed_yn      | -0.5271 | 0.073   | -7.254   | 0.000 | -0.670             | -0.385 |
| hcsp_yn     | -0.3478 | 0.080   | -4.347   | 0.000 | -0.505             | -0.191 |
| hfdval      | -0.0067 | 0.047   | -0.143   | 0.887 | -0.099             | 0.086  |
| mcare       | 4.4867  | 0.053   | 84.927   | 0.000 | 4.383              | 4.590  |
| mcaid       | 0.3733  | 0.045   | 8.307    | 0.000 | 0.285              | 0.461  |
| uc_yn       | -0.5829 | 0.126   | -4.622   | 0.000 | -0.830             | -0.336 |
| wc_yn       | -0.8230 | 0.227   | -3.623   | 0.000 | -1.268             | -0.378 |
| intercept   | -4.0082 | 0.024   | -163.933 | 0.000 | -4.056             | -3.960 |

# Logit Regression Results

|                |                  |                   |         |       |                    |           |
|----------------|------------------|-------------------|---------|-------|--------------------|-----------|
| Dep. Variable: | indicator        | No. Observations: | 60078   |       |                    |           |
| Model:         | Logit            | Df Residuals:     | 60068   |       |                    |           |
| Method:        | MLE              | Df Model:         | 9       |       |                    |           |
| Date:          | Tue, 15 Aug 2017 | Pseudo R-squ.:    | 0.2638  |       |                    |           |
| Time:          | 16:11:19         | Log-Likelihood:   | -8256.9 |       |                    |           |
| converged:     | True             | LL-Null:          | -11216. |       |                    |           |
|                |                  | LLR p-value:      | 0.000   |       |                    |           |
| =====          |                  |                   |         |       |                    |           |
|                | coef             | std err           | z       | P> z  | [95.0% Conf. Int.] |           |
| -----          |                  |                   |         |       |                    |           |
| intercept      | -3.0305          | 0.104             | -29.230 | 0.000 | -3.234             | -2.827    |
| family_size    | -0.1719          | 0.017             | -10.106 | 0.000 | -0.205             | -0.139    |
| F_MV           | 1.4312           | 0.048             | 29.953  | 0.000 | 1.338              | 1.525     |
| under_30_inc   | 0.7948           | 0.097             | 8.219   | 0.000 | 0.605              | 0.984     |
| under_50_inc   | 0.3546           | 0.085             | 4.171   | 0.000 | 0.188              | 0.521     |
| family_net     | -2.623e-05       | 2.1e-06           | -12.491 | 0.000 | -3.03e-05          | -2.21e-05 |
| f_disability   | 0.3027           | 0.041             | 7.424   | 0.000 | 0.223              | 0.383     |
| f_elderly      | 0.0274           | 0.040             | 0.688   | 0.492 | -0.051             | 0.105     |
| citizenship    | -0.2665          | 0.072             | -3.686  | 0.000 | -0.408             | -0.125    |
| medicaid       | 1.0232           | 0.049             | 21.039  | 0.000 | 0.928              | 1.119     |

**Table A9 . WIC Participation Regression Results**

**Infants**

| Logit Regression Results |                  |                   |            |       |                    |           |
|--------------------------|------------------|-------------------|------------|-------|--------------------|-----------|
| Dep. Variable:           | indicator        | No. Observations: | 2202       |       |                    |           |
| Model:                   | Logit            | Df Residuals:     | 2197       |       |                    |           |
| Method:                  | MLE              | Df Model:         | 4          |       |                    |           |
| Date:                    | Fri, 01 Sep 2017 | Pseudo R-squ.:    | 0.2680     |       |                    |           |
| Time:                    | 12:06:40         | Log-Likelihood:   | -977.39    |       |                    |           |
| converged:               | True             | LL-Null:          | -1335.1    |       |                    |           |
|                          |                  | LLR p-value:      | 1.527e-153 |       |                    |           |
|                          | coef             | std err           | z          | P> z  | [95.0% Conf. Int.] |           |
| intercept                | -1.1061          | 0.148             | -7.463     | 0.000 | -1.397             | -0.816    |
| hfdval                   | 0.9266           | 0.130             | 7.127      | 0.000 | 0.672              | 1.181     |
| cov_hi                   | -0.5517          | 0.135             | -4.088     | 0.000 | -0.816             | -0.287    |
| ch_mc                    | 1.2712           | 0.132             | 9.614      | 0.000 | 1.012              | 1.530     |
| fwsval                   | -1.129e-05       | 1.74e-06          | -6.478     | 0.000 | -1.47e-05          | -7.88e-06 |

**Children**

| Logit Regression Results |                  |                   |         |       |                    |           |
|--------------------------|------------------|-------------------|---------|-------|--------------------|-----------|
| Dep. Variable:           | indicator        | No. Observations: | 199024  |       |                    |           |
| Model:                   | Logit            | Df Residuals:     | 199019  |       |                    |           |
| Method:                  | MLE              | Df Model:         | 4       |       |                    |           |
| Date:                    | Fri, 01 Sep 2017 | Pseudo R-squ.:    | 0.2782  |       |                    |           |
| Time:                    | 12:06:42         | Log-Likelihood:   | -8832.9 |       |                    |           |
| converged:               | True             | LL-Null:          | -12238. |       |                    |           |
|                          |                  | LLR p-value:      | 0.000   |       |                    |           |
|                          | coef             | std err           | z       | P> z  | [95.0% Conf. Int.] |           |
| intercept                | -5.9317          | 0.066             | -89.690 | 0.000 | -6.061             | -5.802    |
| hfdval                   | 0.7553           | 0.051             | 14.745  | 0.000 | 0.655              | 0.856     |
| cov_hi                   | 0.1332           | 0.058             | 2.278   | 0.023 | 0.019              | 0.248     |
| ch_mc                    | 3.3967           | 0.060             | 56.911  | 0.000 | 3.280              | 3.514     |
| fwsval                   | -4.103e-06       | 6.46e-07          | -6.349  | 0.000 | -5.37e-06          | -2.84e-06 |



## Women

### Logit Regression Results

|                    |                  |                   |         |       |                    |           |
|--------------------|------------------|-------------------|---------|-------|--------------------|-----------|
| =====              |                  |                   |         |       |                    |           |
| Dep. Variable:     | indicator        | No. Observations: | 40825   |       |                    |           |
| Model:             | Logit            | Df Residuals:     | 40817   |       |                    |           |
| Method:            | MLE              | Df Model:         | 7       |       |                    |           |
| Date:              | Fri, 01 Sep 2017 | Pseudo R-squ.:    | 0.1703  |       |                    |           |
| Time:              | 12:06:45         | Log-Likelihood:   | -4072.8 |       |                    |           |
| converged:         | True             | LL-Null:          | -4909.0 |       |                    |           |
|                    |                  | LLR p-value:      | 0.000   |       |                    |           |
| =====              |                  |                   |         |       |                    |           |
|                    | coef             | std err           | z       | P> z  | [95.0% Conf. Int.] |           |
| -----              |                  |                   |         |       |                    |           |
| intercept          | -4.4495          | 0.153             | -29.065 | 0.000 | -4.750             | -4.149    |
| rsnnotw            | 0.5575           | 0.073             | 7.640   | 0.000 | 0.414              | 0.701     |
| has_child          | 1.0734           | 0.068             | 15.787  | 0.000 | 0.940              | 1.207     |
| hfdval             | 0.5887           | 0.077             | 7.681   | 0.000 | 0.438              | 0.739     |
| caid               | 1.0121           | 0.075             | 13.529  | 0.000 | 0.865              | 1.159     |
| income_eligibility | 0.2498           | 0.144             | 1.740   | 0.082 | -0.032             | 0.531     |
| fwsval             | -1.319e-05       | 1.21e-06          | -10.935 | 0.000 | -1.56e-05          | -1.08e-05 |
| paw_typ            | 0.0406           | 0.143             | 0.284   | 0.777 | -0.240             | 0.321     |
| =====              |                  |                   |         |       |                    |           |

**Table A10 . TANF Participation Regression Results**

| Logit Regression Results |                  |                   |         |       |                    |           |
|--------------------------|------------------|-------------------|---------|-------|--------------------|-----------|
| Dep. Variable:           | indicator        | No. Observations: | 199099  |       |                    |           |
| Model:                   | Logit            | Df Residuals:     | 199088  |       |                    |           |
| Method:                  | MLE              | Df Model:         | 10      |       |                    |           |
| Date:                    | Fri, 08 Sep 2017 | Pseudo R-squ.:    | 0.2488  |       |                    |           |
| Time:                    | 15:15:05         | Log-Likelihood:   | -6291.1 |       |                    |           |
| converged:               | True             | LL-Null:          | -8374.9 |       |                    |           |
|                          |                  | LLR p-value:      | 0.000   |       |                    |           |
|                          | coef             | std err           | z       | P> z  | [95.0% Conf. Int.] |           |
| intercept                | -6.6683          | 0.102             | -65.229 | 0.000 | -6.869             | -6.468    |
| a_age                    | 0.0013           | 0.002             | 0.702   | 0.483 | -0.002             | 0.005     |
| sex                      | 0.5925           | 0.060             | 9.902   | 0.000 | 0.475              | 0.710     |
| childunder6              | 0.0064           | 0.036             | 0.177   | 0.860 | -0.065             | 0.078     |
| child6to18               | 0.0692           | 0.022             | 3.148   | 0.002 | 0.026              | 0.112     |
| earned                   | -3.814e-05       | 3.63e-06          | -10.517 | 0.000 | -4.52e-05          | -3.1e-05  |
| unearned                 | -7.009e-05       | 1.02e-05          | -6.884  | 0.000 | -9e-05             | -5.01e-05 |
| unemploy_indicator       | 0.9930           | 0.168             | 5.907   | 0.000 | 0.663              | 1.322     |
| ssi_indicator            | -0.2299          | 0.122             | -1.891  | 0.059 | -0.468             | 0.008     |
| snap_indicator           | 3.2705           | 0.079             | 41.350  | 0.000 | 3.115              | 3.425     |
| marriage                 | 0.6802           | 0.130             | 5.215   | 0.000 | 0.425              | 0.936     |