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MEMORANDUM FOR Carolyn M. Pickering
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Subject: Nonresponse Bias Analysis for Wave 3 of the Survey of Income
and Program Participation 2014 Panel (ALYS-18)

This memorandum includes the documentation of the nonresponse bias analysis for Wave 3 of the 2014 Survey of Income and Program Participation (SIPP).

The U.S. Census Bureau reviewed this data product for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied to this release. CBDRB-FY20-POP001-0180.

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Nonresponse Bias Analysis for Wave 3 of the 2014 Survey of Income and Program Participation (SIPP)

**Version 1.0
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Executive Summary

The Office of Management and Budget (OMB) Standards and Guidelines for Statistical Surveys and The U.S. Census Bureau's Statistical Quality Standards require surveys to conduct a nonresponse bias analysis if unit response rates are below 80 percent (OMB, 2006; U.S. Census Bureau, 2013). This report documents the nonresponse bias analysis for Wave 3 of the 2014 Panel of the Survey of Income and Program Participation (SIPP), which covered the reference period from January to December 2015 and had a cumulative response rate of 42.2 percent. The methods implemented in this study include: comparing cross-sectional weighted unit response rates across several demographics of the SIPP sample; examining key estimates and characteristics of the full sample, responders, and nonresponders using data from Wave 1 of the 2014 Panel; and benchmarking SIPP 2014 Wave 3 estimates. Our findings are as follows:

- Weighted response rates for various subgroups differed from the overall Wave 3 cross-sectional unit response rate among households that were interviewed in Wave 1 and eligible for interview in Wave 3 (62.18 percent). Weighted response rates also differed significantly across subgroups of the same characteristic. The largest response rate differences occurred in the age of householder characteristic, where response rates increased with the age of the householder. The response rate in households whose householders were age 65 or older was 20.74 percentage points higher than that of households whose householders were age 24 or younger.
- Wave 1 demographics, frame characteristics and SIPP key estimates significantly differed between Wave 3 respondent and nonrespondent households suggesting a high potential for nonresponse bias in Wave 3. Nonresponding households were more likely to be located outside principal cities of Core Based Statistical Areas (CBSAs), less likely to participate in most government welfare programs, and more likely to reside in the Northeast and West regions compared to responding households.
- Relative differences between some full sample and respondent only statistics computed using data from Wave 1 of the SIPP were significantly reduced when respondent statistics were calculated using the Wave 3 noninterview adjusted weight, demonstrating the noninterview adjustment was effective in reducing nonresponse bias associated with some key estimates and demographic groups.
- Comparing SIPP 2014 Wave 3 estimates to benchmarks revealed SIPP median income in calendar year 2015 was 2.42 percent lower than the value published in the 2016 Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC) Current Population Reports. However, the estimated poverty rates were not significantly different between the two surveys. In addition, the SIPP may underestimate participation in Social Security, Medicaid, Supplemental Nutritional Assistance Program (SNAP), and Temporary Assistance for Needy Families (TANF), but overestimate participation in Medicare and Supplemental Security Income (SSI) programs in Wave 3.

1. Introduction

Unit nonresponse occurs when sample units – for example households in a household survey – do not respond to a survey. Nonresponse rates have been increasing in recent years among large government surveys, creating growing concerns over data quality and the loss of valuable information from the nonrespondents. Declining response rates can indicate *nonresponse bias*, differences in survey measure estimates from the actual population values due to inherent dissimilarities between respondents and nonrespondents in the sample. However, there is not always a direct link between response rates and nonresponse bias. Different statistics within a survey can experience different degrees of nonresponse bias depending on the correlation between each statistic and a unit’s likelihood of responding. Low response rates may result in significant nonresponse bias for some statistics but not others (Groves, 2006; Groves & Peytcheva, 2008). Similarly, high response rates will not lead to a reduction in nonresponse bias if there is no association between response propensities and the variables in question.

Therefore, the degree of nonresponse bias is a function of not only the response rate, but also how much the respondents and nonrespondents differ on the survey variables of interest. For a sample mean, an estimate of the bias of the sample respondent mean is given by:

$$B(\bar{y}_r) = \bar{y}_r - \bar{y}_t = \left(\frac{n_{nr}}{n}\right) (\bar{y}_r - \bar{y}_{nr})$$

Where:

- \bar{y}_t = the mean based on all sample cases;
- \bar{y}_r = the mean based only on respondent cases;
- \bar{y}_{nr} = the mean based only on the nonrespondent cases;
- n = the number of cases in the sample; and
- n_{nr} = the number of nonrespondent cases.

Policymakers use estimates from the surveys conducted by the U.S. Census Bureau and other agencies to determine the impact of government programs and evaluate national economic indicators; therefore, understanding and measuring nonresponse bias associated with these key estimates is necessary. The Office of Management and Budget (OMB) Standards, released in 2006, require survey programs to implement a nonresponse bias analysis if unit response rates fall below 80 percent (OMB, 2006). In addition to the OMB Standards, the Census Bureau’s Statistical Quality Standards state that serious data quality issues related to nonsampling error can occur when cumulative response rates for a longitudinal survey fall below 60 percent and/or when sample attrition from one wave to the next is greater than 5 percent (U.S. Census Bureau, 2013).

1.1 Data

The SIPP is a longitudinal survey designed to collect detailed information on income, employment, health insurance, and participation in government programs among the civilian noninstitutionalized population residing in the United States. The Census Bureau employed a two-stage sample design to select the 2014 SIPP sample. Housing units¹ in the Master Address File (MAF), which is created from the decennial censuses and frequently updated by the Census Bureau, were systematically selected from 820 Primary Sampling Units (PSUs). Selected housing units were partitioned into two strata with one containing a higher concentration of low income households than the other. Households located in the low income stratum were oversampled by 24 percent to increase the accuracy of the estimates of low income households.

Sampled households in the 2014 SIPP were interviewed annually over a period of four years and data was collected on the 12 months of the preceding calendar year. Each cycle of interviewing is called a *wave*. The SIPP 2014 Wave 1 interviews occurred from February through May of 2014 and obtained data on the reference period covering January 2013 through December 2013. Interviews for Waves 2 and 3 were conducted in years 2015 and 2016 respectively, providing data on the calendar year preceding the year of interview. During each interview, Field Representatives (FRs) identify an adult² reference person, also called the *householder*, in each household. The householder is often the owner or renter of the residence.

The designated sample in Wave 1 of the 2014 SIPP consisted of approximately 53,000³ housing units, of which 42,500 households were eligible for interview. Of the eligible households, 29,500 households were interviewed resulting in a weighted response rate of 69.8 percent. Adults in *original sample* households – households that were interviewed in Wave 1 – were followed in subsequent waves and interviews were attempted for all household members, including new household members who joined a previously interviewed household. Furthermore, when persons from original sample households join a new household that was not originally in the SIPP sample, the new household – referred to as a *spawned household* – also becomes part of the SIPP sample in subsequent waves.

Table A shows the counts of eligible, interviewed, and noninterviewed households, and response rates in Wave 1 through Wave 3 of the 2014 SIPP. In Wave 3, FRs obtained interviews from about 19,000 of the 31,000 eligible households, resulting in a weighted unit response rate of 61.30⁴ percent. Cross-sectional single wave response rates do not accurately reflect

¹ The SIPP selects housing units which may be occupied or vacant; households are occupied housing units.

² The SIPP defines adults as all household members age 15 or older.

³ Unweighted housing unit and household counts throughout this report are rounded to the nearest hundred or thousand and may not sum up to totals or match proportions that are computed from unrounded counts.

⁴ The response rate of 61.30 percent is the weighted response rate among all eligible households – i.e. original sample and spawned households – in Wave 3 while the response rate of 62.18 percent in the executive summary on page 1 and used throughout the report is the weighted response rate among original sample households who

nonresponse over the course of the SIPP because it is a longitudinal survey. The SIPP measures cumulative sample attrition at the end of each wave using a sample loss rate given in formula 1.

Cumulative sample loss incorporates nonresponse⁵ from the beginning of the panel in Wave 1 to the end of the current wave and accounts for the unobservable loss of nonrespondent spawned households using an estimated growth factor computed from interviewed households. The cumulative sample loss rate was 31.2 percent in Wave 1, 47.7 percent in Wave 2, and 57.8 percent in Wave 3.

$$\text{Sample Loss} = \frac{(A_1 \times GF_c) + A_c + D_c}{I_c + (A_1 \times GF_c) + A_c + D_c} \quad 1$$

where:

A_1 = weighted number of Type A noninterviewed households in Wave 1

A_c = weighted number of Type A noninterviewed households in the current wave

D_c = weighted number of Type D noninterviewed households in the current wave

I_c = weighted number of interviewed households in the current wave

GF_c = growth factor associated with the current wave

Table A. 2014 Panel Household Total Counts, Sample Loss and Weighted Unit Response Rates

Wave	Eligible Households ¹	Interviewed Households	Type A Households	Type D Households	Growth Factor	Weighted Cross-sectional Response Rate (percent)	Weighted Cumulative Response Rates (percent)	Weighted Cumulative Sample Loss (percent)
1	42,500	29,500	12,500	-	1.0	69.8	69.8	31.2
2	30,000	23,000	6,400	700	1.0	76.7	52.3	47.7
3	31,000	19,000	10,000	1,500	1.1	61.3	42.2	57.8

Source: U.S. Census Bureau, 2014 Survey of Income and Program Participation.

¹ Interviewed and noninterviewed households may not sum up to eligible households due to rounding.

were eligible for interview in Wave 3.

⁵ There are two types of unit nonresponse in the SIPP: Type A and Type D nonresponse. Type A nonrespondent households are eligible households where the interviewer obtains no interviews while Type D nonrespondents are previously interviewed households who move to an unknown address or moved more than 100 miles from a SIPP interviewer and no telephone interview could be conducted. As a result, Type D noninterviews only occur after Wave 1.

This report analyzes nonresponse bias in original sample households that were eligible for interview in Wave 3⁶ – hereafter referred to as original sample or full sample households throughout the report – which were categorized as respondents or nonrespondents depending on whether FRs interviewed them in the third wave. If an original sample household is associated with one or more spawned households in Wave 3, the address where the Wave 1 reference person resides – or whose householder is a Wave 1 interviewed adult if the Wave 1 reference person is not listed on any of the household rosters in Wave 3 – is used to determine the original household’s response status⁷. Approximately 29,000 of the 29,500 original sample households interviewed in Wave 1 were eligible for interview in Wave 3; 18,000 were classified as respondents and the remaining 11,000 household were considered nonrespondents.

1.2 Nonresponse Bias in Previous Waves of the 2014 Panel.

Previous efforts to examine nonresponse bias and determine its impact on SIPP estimates involved comparing frame variables and data available from previous interviews between respondent households and households who were nonrespondents in the first or later waves of the survey. SIPP estimates were also compared to benchmarks – official statistics computed from administrative records or surveys and available to the public – to assess the likelihood of nonresponse bias.

The SIPP 2014 Wave 1 nonresponse bias analysis results suggests the SIPP underestimated participation in government programs, consistent with nonresponse bias reports from previous panels. The study also found that response rates differed between various subgroups of the selected sample that were eligible for interview in Wave 1. FRs were most likely to interview households located in the Midwest compared to other census regions and households in the low income stratum were more likely to be respondents than those in the non-low income stratum. While the distribution of frame and demographic variables differed between all selected eligible households and Wave 1 respondents, bias associated with most of these estimates – measured using relative differences between estimates – was mitigated when nonresponse adjusted weights were used in computing these statistics (Treat, 2017a).

Analysis on Wave 2 of the 2014 SIPP also found that cross-sectional response rates in Wave 2 differed across various subgroups of the households interviewed in Wave 1. Households with older reference persons and households in the low income stratum were more likely to respond to the survey than households with younger householders and households in non-low income stratum respectively. Wave 1 key estimates including household income, net worth, and participation rates among various government programs also significantly differed between responding and nonresponding households. Nonetheless, some relative differences between

⁶ A previously interviewed SIPP household may become ineligible in later waves of the survey if (a) the household unit becomes vacant, demolished or otherwise unfit for residence or (b) all sample members of the household are no longer part of the SIPP sample universe, for example they become institutionalized, active military personnel or, move abroad.

⁷ All Wave 1 householders – including those that were not interviewed – were listed in Wave 3 household rosters.

full sample and respondent only statistics computed using data from Wave 1 of the SIPP were reduced when respondent statistics were calculated using the Wave 2 noninterview adjusted weight, demonstrating noninterview adjustment was effective in reducing nonresponse bias associated with some key estimates and demographic groups.

SIPP calendar year 2014 estimates of household income and poverty rates computed using data from all households interviewed in Wave 2 – including original and spawned households – were not significantly different from official statistics produced from the Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC) Current Population Reports. However, the SIPP underestimated counts of enrollees in Social Security, Medicaid, Medicare, Supplemental Nutritional Assistance Program (SNAP), and Temporary Assistance for Needy Families (TANF) programs (Tersine, 2020b).

2. Methodology

Four methods were used to investigate nonresponse bias in Wave 3 of the 2014 SIPP, all of which were used to assess nonresponse bias in earlier waves of the panel. The techniques analyze a combination of geographic frame variables, Wave 1 data available for both respondents and nonrespondents, Wave 3 data available for respondents only, and external benchmarks. They include:

1. Comparing cross-sectional response rates for subgroups of the sample to that of the original sample households eligible for interview in Wave 3.
2. Comparing Wave 1 household characteristics and SIPP key estimates between Wave 3 respondent and nonrespondent households.
3. Comparing Wave 1 household characteristics and SIPP key estimates between original sample households and the Wave 3 respondent sample.
4. Benchmark analysis comparing SIPP Wave 3 key estimates to corresponding administrative data statistics and estimates from other surveys.

2.1 Weighting Procedure

SIPP sample households – and therefore sample persons – are selected with unequal probabilities. Appropriate weights, estimates of the number of households (persons) each sample household (person) represents in the population, should be used when computing SIPP estimates to account for the survey's sample design.

All sampled households were assigned base weights (BW) equal to the inverse of their selection probabilities at the beginning of the panel. Base weights were adjusted for additional subsampling done in the field and nonresponse during Wave 1 interviews using Weighting Control Factors (WCF) and Wave 1 noninterview adjustment factors ($W1_{af}$) respectively, to create Wave 1 household noninterview adjusted weights ($W1_{NIwgt}$). The household noninterview weights were then assigned to each member of the household, and raked to

independent population controls for each month in the wave to determine monthly final person weights (*PFINWGT*) in Wave 1.

Each eligible household in subsequent waves, #, was assigned an initial weight ($W\#_{INITwgt}$) equal to its Wave 1 noninterview adjusted weight. Initial weights were multiplied by movers' adjustment factors ($W\#_{MF}$) to account for multiple chances of selection of movers⁸. The resulting movers' weights were multiplied by a noninterview adjustment factor $W\#_{af}$ to obtain household noninterview adjusted weights for the current wave. Finally, the household noninterview weights were assigned to all occupants of the household and raked to monthly population controls to determine the person weights for each month. Details of the SIPP cross-sectional weighting procedure are outlined in Treat (2017b) and Tersine (2020a).

Wave 3 household initial weights ($W3_{INITwgt}$)⁹, household noninterview adjusted weights ($W3_{NIwgt}$), and final person weights ($W3PFINWGT$) are used for the analyses in this report and computed as follows:

$$\begin{aligned} W3_{INITwgt} &= W1_{NIwgt} = BW * WCF * W1_{af} \\ W3_{NIwgt} &= W3_{INITwgt} * W3_{MF} * W3_{af} \\ W3PFINWGT^{10} &= W3_{NIwgt} * W3SS_{af} \end{aligned}$$

$W3SS_{af}$ are second stage adjustment factors computed during the raking to population control step of the weighting procedure. All analyses were conducted using survey procedures in SAS[®] software and hypothesis testing was carried out at the 90 percent confidence level.

2.2 Analytic Variables

We evaluated nonresponse bias associated with SIPP key estimates including household earned income, total income, net worth, poverty rates, and participation in government programs. Estimates of nonresponse bias can only be produced for variables that are available for both respondents and nonrespondents. Due to the longitudinal structure of the SIPP, calendar year 2013 data obtained during Wave 1 interviews is available for Wave 3 respondents and nonrespondents, and used to assess the potential for nonresponse bias.

⁸ Movers – persons who move into SIPP sample households after Wave 1 interviews – have two chances to become SIPP sample persons: (a) selection into original SIPP sample households in Wave 1 or (b) selection by moving into a sample household after Wave 1.

⁹ A household's Wave 3 initial weight is equal to its Wave 1 noninterview adjusted weight. As a result, statistics that are computed with the Wave 3 initial weight have already been adjusted for Wave 1 nonresponse.

¹⁰ Previous SIPP Panels published person, family, and household level final weights with cross-sectional public use files. The SIPP 2014 Panel however, only published final person weights. Household weights can be created by either using the final weights of the householder or averaging the final weights of all persons in the households; we use the first method to compute all final weighted household level estimates in Section 4.4 of this report.

The SIPP key estimates¹¹ examined in this analysis include:

- *Median annual household earnings*
- *Median annual household total income*
- *Median household net worth*
- *Household annual poverty rates*
- *Percent of households where at least one household member was covered by Medicaid*
- *Percent of households where at least one household member was covered by Medicare*
- *Percent of households where at least one household member received Social Security income*
- *Percent of households where at least one household member received Supplemental Security Income (SSI)*
- *Percent of households where at least one household member received Supplemental Nutrition Assistance Program (SNAP) benefits*
- *Percent of households where at least one household member received Temporary Assistance for Needy Families (TANF) benefits*
- *Percent of households receiving welfare income i.e., households where at least one household member participated in or received income from one of the following sources: Medicaid, SNAP, SSI, General Assistance, TANF, or Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)*

Table 1 lists Wave 1 demographic variables and geographic sampling frame variables that are also available for both respondents and nonrespondents and are included in our analyses. Some of these variables were used in Wave 1 and/or Wave 3 household noninterview adjustment. Approximately 200 households had missing Core Based Statistical Area (CBSA) values and 250 households had missing Urban/Rural Status values. These households were excluded when computing estimates that utilized CBSA or Urban Rural Status, including unit response rates and proportions of households for each level of the variables.

Table 1. Characteristics and Geographic Frame Variables Used to Assess Nonresponse Bias

Variable/Characteristics	Level Definitions
<i>Age of Householder</i>	Under 25 years 25 to 34 years 35 to 44 years 45 to 54 years 55 to 64 years 65 years or older ^t

¹¹ The SIPP cross-sectional data files contain monthly and annual coverage indicator variables for most programs and topics collected during interview. We use the annual coverage indicators to determine programs' recipients in this report unless otherwise noted.

Variable/Characteristics	Level Definitions
<i>Assets</i> [^]	Bonds – at least one household member possessed one of the following assets: U.S. Government savings bonds or securities, money market deposit accounts, certificates of deposit, mutual funds, stocks, rental properties, municipal or corporate bonds, other investments. Minimal – No one in household possessed any of the above assets.
<i>Core Based Statistical Area (CBSA) status</i> [^]	In principal city of a Core Based Statistical Area (CBSA) In CBSA but not in principal city Outside a CBSA or principal city
<i>Census Region</i> [^]	Northeast Midwest South West
<i>Educational Attainment of Householder</i> [*]	Up to high school diploma Some college, no bachelor's degree Bachelor's degree or higher
<i>Hispanic Origin of Householder</i> [*]	Hispanic, Non-Hispanic
<i>Household Income to Poverty Ratio</i> [*]	Less than 1.75 1.75 to 4.5 Greater than 4.5
<i>Household Size</i> ^{^*}	1 person household 2 person household 3 person household 4 or more person household
<i>Household Type</i> [*]	Female householder with biological child and no spouse present. Householder age 65 years or older [†] Other
<i>Marital Status of Householder</i> [*]	Married, spouse present Married, spouse absent Widowed Divorced Separated Never married
<i>Race of Householder</i> ^{^*}	White only Black only Asian only Other
<i>Sex of Householder</i>	Male Female

Variable/Characteristics	Level Definitions
<i>Tenure</i> ^{^*}	Owner Renter, no government subsidy Renter, receives government subsidy
<i>Urban/Rural Status</i>	Household located in urban area Household located in rural area
<i>Within PSU Strata</i> [^]	Low income stratum Non-low income stratum

Source: U.S. Census Bureau, Survey of Income and Program Participation (SIPP), 2014 Panel. For more information on sampling and nonsampling error see the SIPP 2014 User's Guide.

[^] Variables were used in computing Wave 1 noninterview adjustment factors.

^{*} Variables were used in computing Wave 3 noninterview adjustment factors.

[‡] Estimates of the last category of the *Age of Householder* variable and the second category of the *Household Type* variable represent the same statistic: households whose householders were age 65 years or older.

The relationship between the demographic and sampling frame variables above and SIPP key estimates were examined using the Rao-Scott chi-square test of association. Most of the demographic and geographic variables were significantly associated with the key estimates.

2.3 Examining Weighted Unit Response Rates for Subgroups of the Original Sample Households Eligible for Interview in Wave 3

Weighted unit response rates were calculated using Wave 3 initial weights for different subgroups of the original sample households interviewed in Wave 1 and compared to the total weighted cross-sectional unit response rate of 62.18 percent for Wave 3 of the SIPP 2014 Panel. Pairwise comparisons of response rates across subgroups within the same demographic or geographic characteristic were also done and Bonferroni correction was used to adjust for the multiple comparisons. Response rates were calculated using formula 2 below.

$$Response\ Rate = \frac{\sum_{i \in S} w_i R_i D_i}{\sum_{i \in S} w_i D_i} \quad 2$$

where:

i = indicator for each original sample household

S = set of all original sample households

w_i = Wave 3 initial weight of the i^{th} household

R_i = response indicator

D_i = domain indicator

Dissimilar response rates among subgroups within the same characteristics indicate a potential for nonresponse bias. Subgroups with lower response rates compared to the other subgroups of the same variable may be underrepresented in the final sample and subgroups with high

response rates compared to the other subgroups of the same variable may be overrepresented in the survey. Fay's modified Balanced Repeated Replication (BRR) was used to estimate the standard error of the difference between weighted unit response rates for each subgroup and the total unit response rate (Fay, 1984).

2.4 Comparing Key Estimates, Demographic Characteristics, and Frame Variables Between Wave 3 Respondent and Nonrespondent Households

SIPP calendar year 2013 key estimates described in Section 2.2, including household earned income, total income, net worth, poverty rates, and program participation rates, were computed from Wave 1 data and compared between Wave 3 respondent and nonrespondent households. We also examined the distribution of demographic and geographic variables between the two respondent groups using Rao-Scott chi-squared test of association. All estimates and their standard errors were calculated using Wave 3 initial weights and replicate weights respectively. While differing response rates indicate which demographic variables may be associated with nonresponse bias, the difference between estimates computed from respondents and nonrespondents is a direct approximation of nonresponse bias which occurs when respondent and nonrespondent sample units within a survey differ with respect to survey variables (Groves, 2006).

2.5 Comparing Key Estimates and Characteristics of the Full Sample to the Respondent Sample

We examined calendar year 2013 SIPP key estimates, as well as the distribution of geographic and householder demographic variables among original sample households eligible for interview in Wave 3, and among the Wave 3 respondent sample. The estimates derived from the full sample were weighted using Wave 3 initial weights, which incorporates unit nonresponse from Wave 1 while the respondent sample estimates were computed using both Wave 3 initial and noninterview adjusted weights respectively. Fay's modified BRR was used to estimate the standard error of the differences between full sample and respondent estimates.

The difference between the respondent statistics obtained using the initial weights and the full sample statistic for each variable is an estimate of nonresponse bias. Whereas the difference between the respondent statistics obtained with nonresponse adjusted weights and the respondent statistics obtained with initial weights is reflective of the effects of nonresponse weighting adjustments on the bias.

2.6 Benchmarking

We computed person and household level monthly, average monthly, and calendar year estimates using Wave 3 data for all households that were interviewed in Wave 3 – including original sample households and all spawned households – and compared them to corresponding benchmark values. The methods and key estimates discussed in Sections 2.3 to

2.5 were calculated from original sample households and only included spawned households containing an original sample householder as described in Section 1.1. The benchmarking analysis includes data from all households interviewed in Wave 3 regardless of whether they were interviewed in previous waves. It also accounts for item level nonresponse in Wave 3 by incorporating post-interview item imputed responses for survey measures that interviewed persons did not provide¹².

SIPP estimates of monthly program participation counts in December 2015 were compared to monthly counts of programs' enrollees published by The Centers for Medicare and Medicaid Services (*Medicaid, Medicare*¹³), United States Department of Agriculture (*SNAP*), United States Department of Health and Human Services (*TANF*), and the Social Security Administration (*SSI, Social Security*). Average monthly Social Security and SSI income in December 2015 were computed from the SIPP and compared to those published in the 2016 Social Security Annual Statistical Supplement. Annual median income and poverty rates computed from all Wave 3 interviewed households were compared to 2015 annual median income and poverty rates from the 2016 Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC), the official source of poverty estimates for the United States.

The SIPP estimates were calculated using final weights that are adjusted for nonresponse and raked to population control totals. Standard errors of the estimates were calculated using Fay's method of BRR and t-tests were used to test for significant differences between SIPP estimates and benchmark statistics. Significant differences between the two values for any statistic may suggest that the SIPP underestimates or overestimates that statistic.

3. Assumptions and Limitations

Most of the methods in our analysis exclude spawned households without an original sample household reference person. As a result, the Wave 3 noninterview adjusted weights for these households and persons residing in them are not accounted for. We also do not account for changes in household composition between interview periods. The demographic variables used, including age, sex, Hispanic origin, educational level, householder type, race, and marital status belong to the household reference person in the first wave, but household compositions and reference persons may change between waves. As a result, the actual difference between full sample and respondent estimates may slightly differ from the values we computed. Our benchmark analysis attempts to compensate for this, as it includes all households interviewed in the current wave and also utilizes demographic variables and key estimates from the current wave.

¹² Chapter 6 of the SIPP Users' Guide provides more details on the imputation methods for item nonresponse in the SIPP.

¹³ Medicare SIPP estimate and benchmarks were average monthly enrollments over the course of calendar year 2015.

4. Results

4.1 Weighted Unit Response Rates for Subgroups of the Original Sample Households Eligible for Interview in Wave 3

Table 2 summarizes the results of comparing Wave 3 cross-sectional response rates across different subgroups of the sample. The second through fifth columns show the unweighted and weighted household counts in each subgroup, weighted response rates, and their corresponding standard errors respectively. The sixth column displays results of multiple pairwise comparisons across subgroups within the same characteristics; response rates from subgroups with the same letters are not significantly different from each other. The last column indicates whether a subgroup's response rate is significantly different from the overall response rate of 62.18 percent.

Response rates in all subgroups – except for those of reference person's Hispanic origin – differ from the overall response rate. The highest difference in response rate is 12.29 percentage points; the difference between overall response rate (62.18 percent) and response rate in households with reference persons age 24 or younger (49.89 percent). This suggests that households with householders in the lowest age group category are underrepresented in the respondent sample.

Households that: had reference persons age 54 or younger; were located in the Northeast or West census regions; consisted of three or more persons; or had female householders with biological children also had response rates lower than the Wave 3 cross-sectional response rate among original sample households. In contrast, households whose reference person were age 55 or older had higher response rates than that of the overall original sample, suggesting they may be overrepresented in Wave 3 of the SIPP. Households that: were located outside of CBSAs; consisted of only one person; owned their homes or rented their homes and received government subsidies; or belonged to the low income stratum also had response rates significantly higher than 62.18 percent and may also be overrepresented in the third wave of the 2014 SIPP.

Age of householder characteristic had the highest variation in subgroup response rates per Bonferroni corrected multiple pairwise comparison results; response rates generally increased with the householder's age, a trend observed in previous waves of the 2014 SIPP and also in older SIPP panels. Households with reference persons age 65 or older had response rates 20.74 percentage points higher than the lowest age category, households with reference persons age 24 or younger, and at least 5 percentage points higher than the other age groups. The response rates also differed between each pair of age groups – except for households with householders in the second and third age groups (significance grouping B) whose response rates were about 57 percent.

Response rates were not significantly different between households whose reference persons had at most a high school diploma and households whose reference person attained a Bachelor's or more advanced degree. Both subgroups had higher response rates than households whose reference person had some college degree or license below a Bachelor's degrees.

Table 2. SIPP 2014 Wave 3 Weighted Response Rates for Different Subgroups of the Original Sample Households

Characteristic	Unweighted ¹ Households	Weighted ¹ Households (in thousands)	Weighted Response Rate (percent)	Standard Error (percent)	Significance Grouping [‡]	
Total	29,000	109,300	62.18	0.33	-	
Age of Householder						
Under 25 years	1,500	5,081	49.89	1.49	A	*
25 to 34 years	4,200	15,640	57.02	0.82	B	*
35 to 44 years	4,800	18,190	56.52	0.78	B	*
45 to 54 years	5,600	21,410	60.06	0.74	C	*
55 to 64 years	5,700	21,770	65.02	0.76	D	*
65 years or older	7,000	27,180	70.63	0.57	E	*
Census Region						
Northeast	3,700	19,870	59.53	0.72	A	*
Midwest	6,400	24,610	63.99	0.58	B	*
South	13,000	40,380	64.38	0.49	B	*
West	5,900	24,400	58.87	0.80	A	*
Core Based Statistical Area (CBSA)						
Status						
Inside principal city of a CBSA	9,400	36,170	62.11	0.58	A	
In CBSA but not principal city	13,500	55,850	60.91	0.46	A	*
Not in a CBSA	5,800	16,490	66.70	0.86	B	*
Educational Attainment of Householder						
Up to high school diploma	12,000	41,890	62.91	0.52	A	*
Some college, no bachelor's degree	8,500	31,670	59.50	0.61	B	*
Bachelor's degree or higher	8,200	35,710	63.71	0.55	A	*
Sex of Householder						
Male	13,500	51,880	61.62	0.48	A	*
Female	15,500	57,390	62.69	0.43	B	*
Hispanic Origin of Householder						
Hispanic	3,600	13,460	61.12	0.84	A	
Non-Hispanic	25,000	95,800	62.33	0.32	A	
Household Size						
1 person household	8,200	29,720	67.98	0.58	A	*

Characteristic	Unweighted ¹ Households	Weighted ¹ Households (in thousands)	Weighted Response Rate (percent)	Standard Error (percent)	Significance Grouping [‡]	
2 person household	9,500	38,980	62.12	0.59	B	
3 person household	4,500	16,590	59.41	0.85	C	*
4 or more person household	6,600	23,970	57.01	0.65	C	*
Household Type						
Female householder with biological child and no spouse present	1,900	6,474	54.91	1.26	A	*
Householder 65 years or older	7,000	27,180	70.63	0.57	B	*
Other	20,000	75,610	59.77	0.41	C	*
Marital Status of Householder						
Married, spouse present	13,500	53,340	61.14	0.48	A	*
Married, spouse absent	500	1,906	61.42	2.34	A,B,D	
Widowed	2,800	10,070	72.89	0.89	C	*
Divorced	5,000	18,630	64.35	0.83	D	*
Separated	900	3,005	59.49	2.16	A,B,D	
Never married	6,100	22,310	58.45	0.66	B	*
Race of Householder						
White Only	22,500	88,410	62.71	0.35	A	*
Black Only	4,300	13,040	59.89	0.84	B	*
Asian Only	1,000	4,864	58.87	1.48	B	*
Other	850	2,949	61.98	1.99	A,B	
Tenure						
Owner	18,000	70,780	63.69	0.40	A	*
Renter, no government subsidy	9,100	33,530	57.98	0.56	B	*
Renter, receives government subsidy	1,500	4,959	69.04	1.34	C	*
Urban/Rural Status						
Urban	22,000	87,530	61.45	0.35	A	*
Rural	6,500	20,870	65.31	0.75	B	*
Within PSU Strata						
Low income	14,500	40,030	63.58	0.43	A	*
Non-low income	14,000	69,230	61.37	0.43	B	*

Source: U.S. Census Bureau, Survey of Income and Program Participation, 2014 Panel.

¹ Sums may not add up to total due to rounding.

[‡] Response rates of subgroups within the same characteristic with same letters are not significantly different from each other at the $\alpha=0.10$ level.

* Indicates subgroup response rate is significantly different from overall response rate at the $\alpha=0.10$ level.

4.2 Comparing Key Estimates and Characteristics Between Wave 3 Respondent and Nonrespondent Households

Table 3 shows results of comparing respondent and nonrespondent households' key estimates and the distribution of demographic and frame variables derived from SIPP 2014 Wave 1 data using Wave 3 initial weights. Median annual earned income and total income among nonresponding households in 2013 were \$10,100 and \$4,950 higher respectively, than those of responding households. However, household net worth among respondent households was \$10,040 higher than that of nonresponding households, suggesting that the SIPP may underestimate household earnings and income, but overestimate household net worth in Wave 3.

Household poverty rates did not significantly differ by response status but respondent households had lower income to poverty ratio and were more likely to receive income from or participate in most government programs during the 2013 calendar year. Approximately 35.27 percent of respondent households had at least one person receiving Social Security benefits compared to 25.22 percent Social Security receipt rate in nonrespondent households. Additionally, Medicare¹⁴ participation rate among responding households was 10 percentage points higher than that of nonresponding households, consistent with the significantly higher response rates among households with reference persons age 65 or older in Table 2.

The distribution of demographic and geographic variables also differed significantly between the two groups except for the householder's Hispanic origin. Householders in respondent households were more likely to own their homes, bonds, and other investments compared to those in nonresponding households. Respondent households were also more likely to be in the low income stratum compared to nonrespondent households, in line with their higher participation rates in government programs. Nonresponding households were more likely to reside in urban areas compared to responding households.

Table 3: Comparison of Estimates between Wave 3 Respondents and Nonrespondents

Characteristics and Key Estimates	Respondents		Nonrespondents		Chi-Square Statistic (df)	
	Percent/Median in Dollars	Standard Error	Percent/Median in Dollars	Standard Error		
Annual household earnings	31,610	595	41,710	791	-	*
Annual household income	50,130	428	55,080	913	-	*
Household net worth	91,500	1,844	81,460	2,778	-	*
Households in poverty	13.44	0.26	13.94	0.36	-	
Households receiving income from welfare programs	24.51	0.32	23.00	0.42	-	*

¹⁴ Medicare is a federal funded health insurance program for persons age 65 or older, persons younger than 65 with disabilities, and persons with end stage renal disease. In calendar year 2015, 45,630,186 of the 54,296,653 Medicare recipients – 84 percent – were age 65 or older (Centers for Medicare and Medicaid Services, 2018).

Characteristics and Key Estimates	Respondents		Nonrespondents		Chi-Square Statistic (df)	
	Percent/ Median in Dollars	Standard Error	Percent/ Median in Dollars	Standard Error		
Program Participation						
Medicaid	19.55	0.31	18.58	0.40	3.152(1)	*
Medicare	34.79	0.36	24.76	0.48	247.1(1)	*
Supplemental Nutritional Assistance Program (SNAP)	13.94	0.24	12.58	0.29	12.37(1)	*
Social Security	35.27	0.34	25.33	0.46	261.2(1)	*
Supplemental Security Income (SSI)	6.12	0.18	4.26	0.19	47.82(1)	*
Temporary Assistance for Needy Families (TANF)	0.86	0.08	1.09	0.10	3.432(1)	*
Asset Ownership						
Bonds	36.81	0.39	33.19	0.61	22.85(1)	*
Minimal	63.19	0.39	66.81	0.61		
Age of Householder						
Under 25 years	3.73	0.15	6.16	0.28	368.0(5)	*
25 to 34 years	13.12	0.23	16.26	0.43		
35 to 44 years	15.14	0.29	19.14	0.39		
45 to 54 years	18.93	0.30	20.69	0.42		
55 to 64 years	20.83	0.34	18.42	0.44		
65 years or older	28.25	0.33	19.32	0.43		
Census Region						
Northeast	17.41	0.22	19.46	0.32	64.12(3)	*
Midwest	23.18	0.22	21.45	0.36		
South	38.27	0.24	34.81	0.40		
West	21.14	0.25	24.29	0.42		
Core Based Statistical Area (CBSA) Status						
Inside principal city of a CBSA	33.29	0.39	33.41	0.51	33.84(2)	*
In CBSA but not principal city	50.41	0.49	53.20	0.58		
Not in a CBSA	16.30	0.46	13.39	0.47		
Educational Attainment of Householder						
Up to high school diploma	38.78	0.35	37.60	0.52	29.54(2)	*
Some college, no bachelor's degree	27.73	0.35	31.04	0.50		
Bachelor's degree or higher	33.48	0.32	31.36	0.56		
Hispanic Origin of Householder						
Hispanic	12.11	0.23	12.66	0.30	2.124(1)	
Non-Hispanic	87.89	0.23	87.34	0.30		
Household Income to Poverty Ratio						
Less than 1.75	27.07	0.31	25.98	0.47	8.381(2)	*
1.75 to 4.5	39.96	0.42	39.28	0.45		
Greater than 4.5	32.97	0.39	34.74	0.52		

Characteristics and Key Estimates	Respondents		Nonrespondents		Chi-Square Statistic (df)	
	Percent/ Median in Dollars	Standard Error	Percent/ Median in Dollars	Standard Error		
Household Size						
1 person household	29.73	0.33	23.03	0.44	155.8(3)	*
2 person household	35.64	0.38	35.73	0.52		
3 person household	14.51	0.28	16.30	0.38		
4 or more person household	20.12	0.29	24.94	0.44		
Household Type						
Female householder with biological child and no spouse present	5.23	0.16	7.06	0.26	269.7(2)	*
Householder 65 years or older	28.25	0.33	19.32	0.43		
Other	66.51	0.34	73.62	0.48		
Marital Status of Householder						
Married, spouse present	48.00	0.41	50.16	0.52	148.1(5)	*
Married, spouse absent	1.72	0.09	1.78	0.14		
Widowed	10.80	0.22	6.60	0.27		
Divorced	17.65	0.30	16.07	0.48		
Separated	2.63	0.13	2.95	0.20		
Never married	19.19	0.32	22.44	0.41		
Race of Householder						
White Only	81.60	0.27	79.79	0.39	14.26(3)	*
Black Only	11.49	0.21	12.66	0.28		
Asian Only	4.21	0.15	4.84	0.23		
Other	2.69	0.14	2.71	0.18		
Sex of Householder						
Male	47.05	0.41	48.18	0.57	2.771(1)	*
Female	52.95	0.41	51.82	0.57		
Tenure						
Owner	66.35	0.31	62.19	0.44	100.6(2)	*
Renter, no government subsidy	28.61	0.33	34.10	0.43		
Renter, receives government subsidy	5.04	0.16	3.72	0.18		
Urban/Rural Status						
Urban	79.78	0.34	82.33	0.43	21.10(1)	*
Rural	20.22	0.34	17.67	0.43		
Within PSU Strata						
Low income	37.46	0.29	35.28	0.39	14.06(1)	*
Non-low income	62.54	0.29	64.72	0.39		

Source: U.S. Census Bureau, Survey of Income and Program Participation, 2014 Panel.

* Indicates respondent and nonrespondents estimates are significantly different at the $\alpha=0.10$ level.

4.3 Comparing Key Estimates and Characteristics between the Full Sample and the Respondent Sample

Relative differences between calendar year 2013 estimates computed from all original sample households interviewed Wave 1 and from original sample households that responded to the survey in Wave 3 are presented in Table 4. All estimates from the full sample were computed using Wave 3 initial weights while estimates for the respondent sample were weighted both using Wave 3 initial weights, as well as, nonresponse adjusted weights.

The relative difference for an estimate i , is calculated as $100 * (R_i - F_i)/F_i$ where F_i is the value of estimate obtained from the full sample and R_i is the value of the estimate obtained from the respondent sample. Relative differences between the initial weighted estimates from both samples – column six – are estimates of nonresponse bias. Comparing them with relative differences computed from Wave 3 noninterview weighted respondent estimates – the ninth column – gives insight on the effect of the adjustments on the bias.

In 2013, the median household income from the respondent sample using Wave 3 initial weights was \$1,620 or 3.13 percent lower than the median household income of the entire original sample households. This indicates a downward bias associated with earned income and suggests the SIPP may underestimate household income in Wave 3 due to nonresponse. The relative difference between these estimates is reduced to -1.7 percent when nonresponse adjusted weights are used to calculate median income in the respondent sample, thus demonstrating that nonresponse adjustment corrected some of the bias associated with the household income variable.

Nonresponse adjustment corrected the bias associated with receipt of welfare income, Medicaid and SNAP participation rates, reducing the relative differences between full sample and respondent participation rates from 2.38 percent to 0.38 percent, 1.93 percent to -0.21 percent, and 3.87 percent to 0.6 percent respectively. The SIPP 2014 Wave 3 nonresponse bias adjustments also corrected biases of estimates for subgroups of the household income to poverty ratio, householder race, and within PSU strata variables. There are some estimates–like household net worth for example – where noninterview adjustment had no significant effect on the relative differences.

In few estimates, nonresponse adjustment increases or introduces bias. Household poverty rate in the respondent sample computed using the initial weights is not significantly different from the full sample estimate. However, the nonresponse adjusted weights decrease the respondent sample estimate from 13.44 percent to 12.95 percent, thus increasing the relative difference between the two estimates from -1.39 to -4.99 percent. Furthermore, the estimated proportion of householders under age 25 years was 19.78 percent lower in the respondent sample compared to the full sample when computed using initial weights and further reduced to 25.59 percent lower in the respondent sample using the nonresponse adjusted weights.

Table 4. Comparison of Estimates between the Full Sample and the Wave 3 Respondent Sample

Characteristics and Key Estimates	All Sample Cases		Respondents					
	Initial Weight		Initial Weight			Nonresponse Adjusted Weight		
	Percent/ Median	Std Error	Percent/ Median	Std Error	Relative Difference	Percent/ Median	Std Error	Relative Difference
Annual household earnings	36,000	424	31,610	595	-12.19*	32,440	528	-9.89*^
Annual household income	51,750	361	50,130	428	-3.13*	50,870	409	-1.7*^
Household net worth	88,070	1,749	91,500	1,844	3.89*	93,140	1,959	5.76*
Households in poverty	13.63	0.23	13.44	0.26	-1.39	12.95	0.26	-4.99*
Households receiving income from welfare programs	23.94	0.25	24.51	0.32	2.38*	24.03	0.32	0.38^
Program Participation								
Medicaid	19.18	0.22	19.55	0.31	1.93*	19.14	0.30	-0.21^
Medicare	31.00	0.28	34.79	0.36	12.23*	34.62	0.37	11.68*
Supplemental Nutritional Assistance Program (SNAP)	13.42	0.18	13.94	0.24	3.87*	13.50	0.23	0.6^
Social Security	31.51	0.26	35.27	0.34	11.93*	35.20	0.35	11.71*
Supplemental Security Income (SSI)	5.42	0.13	6.12	0.18	12.92*	5.93	0.18	9.41*^
Temporary Assistance for Needy Families (TANF)	0.95	0.06	0.86	0.08	-9.47*	0.86	0.08	-9.47*
Age of Householder								
Under 25 years	4.65	0.15	3.73	0.15	-19.78*	3.46	0.14	-25.59*
25 to 34 years	14.31	0.23	13.12	0.23	-8.32*	13.22	0.24	-7.62*
35 to 44 years	16.65	0.23	15.14	0.29	-9.07*	15.32	0.29	-7.99*^
45 to 54 years	19.59	0.23	18.93	0.30	-3.37*	18.92	0.31	-3.42*
55 to 64 years	19.92	0.24	20.83	0.34	4.57*	20.88	0.35	4.82*
65 years or older	24.87	0.26	28.25	0.33	13.59*	28.21	0.34	13.43*
Asset Ownership								
Bonds	35.44	0.32	36.81	0.39	3.87*	36.85	0.36	3.98*
Minimal	64.56	0.32	63.19	0.39	-2.12*	63.15	0.36	-2.18*
Census Region								
Northeast	18.18	0.10	17.41	0.22	-4.24*	17.46	0.23	-3.96*
Midwest	22.52	0.11	23.18	0.22	2.93*	23.09	0.23	2.53*
South	36.96	0.14	38.27	0.24	3.54*	38.21	0.26	3.38*
West	22.33	0.11	21.14	0.25	-5.33*	21.24	0.26	-4.88*
Core Based Statistical Area (CBSA) Status								
Inside principal city of a CBSA	33.33	0.30	33.29	0.39	-0.12	33.33	0.38	0
In CBSA but not principal city	51.47	0.39	50.41	0.49	-2.06*	50.34	0.50	-2.2*
Not in a CBSA	15.20	0.38	16.30	0.46	7.24*	16.33	0.47	7.43*

Characteristics and Key Estimates	All Sample Cases		Respondents					
	Initial Weight		Initial Weight			Nonresponse Adjusted Weight		
	Percent/ Median	Std Error	Percent/ Median	Std Error	Relative Difference	Percent/ Median	Std Error	Relative Difference
Educational Attainment of Householder								
Up to high school diploma	38.34	0.28	38.78	0.35	1.15*	38.77	0.32	1.12*
Some college, no bachelor's degree	28.98	0.29	27.73	0.35	-4.31*	27.85	0.31	-3.9*
Bachelor's degree or higher	32.68	0.29	33.48	0.32	2.45*	33.38	0.28	2.14*
Hispanic Origin of Householder								
Hispanic	12.32	0.18	12.11	0.23	-1.7	12.28	0.25	-0.32
Non-Hispanic	87.68	0.18	87.89	0.23	0.24	87.72	0.25	0.05
Household Income to Poverty Ratio								
Less than 1.75	26.65	0.26	27.07	0.31	1.58*	26.50	0.31	-0.56^
1.75 to 4.5	39.70	0.30	39.96	0.42	0.65	40.42	0.45	1.81*
Greater than 4.5	33.64	0.31	32.97	0.39	-1.99*	33.09	0.38	-1.63*
Household Size								
1 person household	27.20	0.30	29.73	0.39	9.3*	28.88	0.40	6.18*^
2 person household	35.67	0.32	35.64	0.40	-0.08	35.78	0.41	0.31
3 person household	15.19	0.22	14.51	0.29	-4.48*	14.63	0.30	-3.69*
4 or more person household	21.94	0.28	20.12	0.36	-8.3*	20.72	0.38	-5.56*^
Household Type								
Female householder with biological child and no spouse present	5.93	0.13	5.23	0.16	-11.8*	5.17	0.16	-12.82*
Householder 65 years or older	24.87	0.26	28.25	0.33	13.59*	28.21	0.34	13.43*
Other	69.20	0.28	66.51	0.34	-3.89*	66.62	0.36	-3.73*
Marital Status of Householder								
Married, spouse present	48.82	0.28	48.00	0.41	-1.68*	49.12	0.41	0.61^
Married, spouse absent	1.74	0.07	1.72	0.09	-1.15	1.56	0.09	-10.34*
Widowed	9.21	0.18	10.80	0.22	17.26*	10.75	0.24	16.72*
Divorced	17.05	0.27	17.65	0.30	3.52*	17.29	0.30	1.41^
Separated	2.75	0.10	2.63	0.13	-4.36	2.55	0.13	-7.27*
Never married	20.42	0.27	19.19	0.32	-6.02*	18.74	0.33	-8.23*
Race of Householder								
White Only	80.92	0.20	81.60	0.27	0.84*	80.91	0.26	-0.01^
Black Only	11.93	0.14	11.49	0.21	-3.69*	11.81	0.21	-1.01^
Asian Only	4.45	0.14	4.21	0.15	-5.39*	4.51	0.17	1.35^

Characteristics and Key Estimates	All Sample Cases		Respondents					
	Initial Weight		Initial Weight			Nonresponse Adjusted Weight		
	Percent/ Median	Std Error	Percent/ Median	Std Error	Relative Difference	Percent/ Median	Std Error	Relative Difference
Other	2.70	0.11	2.69	0.14	-0.37	2.76	0.15	2.22
Sex of Householder								
Male	47.48	0.34	47.05	0.41	-0.91*	46.99	0.41	-1.03*
Female	52.52	0.34	52.95	0.41	0.82*	53.01	0.41	0.93*
Tenure								
Owner	64.78	0.22	66.35	0.31	2.42*	65.90	0.27	1.73*^
Renter, no government subsidy	30.68	0.24	28.61	0.33	-6.75*	29.38	0.30	-4.24*^
Renter, receives government subsidy	4.54	0.11	5.04	0.16	11.01*	4.72	0.14	3.96*^
Urban/Rural Status								
Urban	80.75	0.27	79.78	0.34	-1.2*	79.79	0.34	-1.19*
Rural	19.25	0.27	20.22	0.34	5.04*	20.21	0.34	4.99*
Within PSU Strata								
Low income	36.64	0.18	37.46	0.29	2.24*	37.14	0.30	1.36*^
Non-low income	63.36	0.18	62.54	0.29	-1.29*	62.86	0.30	-0.79*^

Source: U.S. Census Bureau, Survey of Income and Program Participation, 2014 Panel.

* Indicates full sample and respondent estimates are significantly different at the $\alpha=0.10$ level.

^ Indicates nonresponse adjustments helped to reduce the bias. The relative difference for the nonresponse adjusted estimate is either no longer significant (relative difference was significant for the initial weighted estimate) or the difference is smaller than the relative difference using only the initial weight at the 90 percent confidence level.

4.4 Comparing Estimates to Benchmarks

Findings from comparing various SIPP person and household level final weighted estimates – computed from all original and spawned households that were interviewed in Wave 3 – to corresponding administrative data sources and estimates from the Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC) are summarized in Table 5. The statistics examined include: annual median household income by race and Hispanic origin of the householder; percent of persons in poverty by race and Hispanic origin, sex, and age; number of persons enrolled in Medicaid, Medicare, SNAP, Social Security, SSI, and TANF; and average monthly Social Security and SSI income among respective program recipients. The table displays benchmarks and their margins of error when available, SIPP estimates and their standard errors, and relative differences between the benchmark and SIPP estimates.

The reference period – duration for which an estimate is computed – depends on the benchmarks available. Median household income and poverty rates are annual estimates for

the entire 2015 calendar year. Medicaid, SNAP, Social Security and SSI statistics are monthly counts of persons who received benefits from these programs in December 2015. The Medicare statistic is the average monthly number of persons that participated in the program during the 2015 calendar year.

SIPP estimated 2015 annual median household income was 2.42 percent lower than the CPS ASEC annual income of \$56,516. The estimated median household income from both surveys also did not differ by race and Hispanic origin except among households that had White, non-Hispanic householders where the SIPP estimate was 4.69 percent lower than the CPS ASEC benchmark. The SIPP estimated percentage of persons in poverty during 2015, 13.2 percent, was also not significantly different from the CPS ASEC estimate of 13.5 percent but the SIPP estimated poverty rates significantly differed from those of the CPS ASEC among non-Hispanic persons and persons age 65 years or older.

The SIPP underestimated overall participation in Medicaid, SNAP, Social Security, and TANF but overestimated participation in Medicare and SSI, compared to the program data. The SIPP estimated counts of Medicaid, SNAP, Social Security, and TANF recipients were 8.64 percent, 18.92 percent, 5.19 percent, and 33.39 percent lower than benchmarks respectively. The SIPP estimated Medicare recipients were 1.22 percent higher than those published by the Centers for Medicare and Medicaid Services, and SSI enrollees were 16.89 percent higher than the value produced by the Social Security Administration.

The number of Social Security beneficiaries in December 2015 computed from the SIPP also differed from benchmarks published in the 2016 Social Security statistical supplement by sex and among persons age 62 years¹⁵ or older. SIPP estimates were 3.44 percent, 6.61 percent, and 5.41 percent lower than benchmarks among males, females, and persons age 62 or older respectively. The SIPP estimated average monthly Social Security income in the same month was 18.08 percent higher than the benchmark among all recipients, 17.85 percent higher among males, and 18.11 percent higher among females.

While the SIPP overestimated the number of SSI enrollees by 16.89 percent, participant counts by age groups was only higher among recipients age 18 to 64 years old. The SIPP estimated overall average monthly SSI income was 2.59 percent lower than the Social Security Administration published value, 8.71 percent lower among persons under 18 years, and 3.20 percent lower among recipients age 18 to 64 years old.

The SIPP sample universe and population enrolled in the various government programs are not equivalent. The SIPP sample universe is restricted to civilian noninstitutionalized persons residing United States. While program participation benchmark counts for Medicaid and Medicare in Table 5 are also restricted to persons residing in the US,¹⁶ they include

¹⁵ The earliest age persons can begin receiving social security retirement benefits is age 62.

¹⁶ The Centers for Medicare and Medicaid also produces counts of [Medicare](#) and [Medicaid](#) participants that include recipients residing in U.S territories.

institutionalized persons. Social Security and SSI participation benchmark counts and average monthly benefits include all persons in the United States and in eligible U.S. territories, as well as institutionalized persons.

Table 5. Comparing SIPP 2015 Key Estimates to Benchmarks from Administrative Data and Estimates from the 2016 Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC)

Characteristic and Subgroups	Benchmark	Benchmark Margin of Error	SIPP Estimate	SIPP Standard Errors	Relative Difference (percent)
Annual Median Income (in Dollars)					
All households	56,516	528	55,150	482	-2.42*
Race and Hispanic Origin					
White Only	62,950	892	60,000	548	-4.69*
Black Only	36,898	845	36,810	1,156	-0.24
Asian Only	77,166	2,791	75,940	3,648	-1.59
Hispanic of any race	45,148	1,012	46,840	1,256	3.75
Poverty Rates (Percentages)					
All persons	13.50	0.30	13.20	0.34	-2.22
Age					
Under 18 years	19.70	0.60	19.86	0.82	0.81
18 to 64 years	12.40	0.30	12.64	0.30	1.94
65 years or older	8.80	0.40	6.29	0.32	-28.52*
Race and Hispanic Origin					
White Only	9.10	0.30	9.85	0.33	8.24*
Black Only	24.10	1.00	20.57	0.98	-14.65*
Asian Only	11.40	1.00	8.05	1.31	-29.39*
Hispanic of any race	21.40	0.80	20.46	1.05	-4.39
Sex					
Male	12.20	0.30	11.86	0.34	-2.79
Female	14.80	0.30	14.48	0.40	-2.16
Social Security Participation					
All Recipients	59,963,425	.	56,850,000	446,400	-5.19*
Age ¹					
Under 62 years	11,580,454	.	11,150,000	391,400	-3.72
62 years or older	48,314,095	.	45,700,000	264,700	-5.41*
Sex					
Male	27,175,237	.	26,240,000	271,100	-3.44*
Female	32,788,188	.	30,620,000	287,600	-6.61*
Average Monthly Social Security Income (in Dollars)					
All Recipients	1,228	.	1,450	7.80	18.08*

Sex					
Male	1,384	.	1,631	11.46	17.85*
Female	1,099	.	1,298	9.36	18.11*
Supplemental Security Income (SSI) Participation					
All Recipients	8,309,564	.	9,713,000	320,200	16.89*
Age					
Under 18 years	1,267,160	.	1,369,000	127,600	8.04
18 to 64 years	4,888,555	.	6,123,000	242,300	25.25*
65 years or older	2,153,849	.	2,221,000	136,500	3.12
Average Monthly Supplemental Security Income (in Dollars)					
All Recipients	541	.	527	8.42	-2.59*
Age					
Under 18 years	643	.	587	19.19	-8.71*
18 to 64 years	562	.	544	10.41	-3.20*
65 years or older	435	.	443	14.69	1.84
Participation in Other Programs					
Medicaid	72,701,268	.	66,420,000	1,054,000	-8.64*
Medicare	54,296,653	.	54,960,000	353,900	1.22*
Supplemental Nutrition Assistance Program (SNAP)	45,188,751	.	36,640,000	824,800	-18.92*
Temporary Assistance for Needy Families (TANF)	2,910,873	.	1,939,000	183,500	-33.39*

Sources: U.S. Census Bureau, Survey of Income and Program Participation, 2014 Panel.

U.S. Census Bureau Current Population Survey 2016 Annual Social and Economic Supplements.

The Centers for Medicaid & Medicare Services (CMS) Program Statistics, 2015 Medicare Enrollment Section.

The Center for Medicaid and Children's Health Insurance Program (CHIP) Services, Monthly Medicaid & CHIP Application, Eligibility Determination and Enrollment Reports & Data, Monthly Enrollment, January 2016.

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¹ Social Security participation by age benchmarks obtained from Tables 5A.1 to 5A.11 of the 2016 Social Security Annual Statistical Supplements exclude disabled persons age 60 to 64 years.

* Indicates SIPP estimates are significantly different from benchmarks at the $\alpha=0.10$ level.

Note regarding benchmark analysis in Wave 1 of the SIPP 2014 Panel: *The SIPP re-released Wave 1 files in September 2017 which included changes to beginning and ending months of SNAP and TANF receipt spells. However, all estimates in the Wave 1 nonresponse bias analysis were computed using the original SIPP Wave 1 data published in March 2017 and hence contain incorrect estimates of SNAP and TANF participation. The correct estimates for the number of persons who receive SNAP and TANF in December 2013 are 36,540,000 and 2,543,000 respectively. Both numbers are still significantly lower than the benchmarks and hence do not alter the conclusions of the report.*

The Wave 1 SIPP Medicaid estimates and benchmarks represent different statistics than those computed in the nonresponse bias analysis report for subsequent waves of the 2014 SIPP. The Wave 1 statistics corresponds to the unduplicated number of persons who were enrolled in Medicaid in the 2013 fiscal year and the benchmark was obtained from the 2014 edition of the Center of Medicaid and Medicare Statistics Reference Booklet which was discontinued in 2016 and replaced with the Center of Medicaid and Medicare Program Statistics. The Wave 2 and later wave Medicaid statistic is the number of persons enrolled in Medicaid at any point in December of the specified year and the benchmark was obtained from Center for Medicaid and CHIP Services.

5. Discussion and Conclusions

This analysis employed different techniques to investigate the potential for nonresponse bias in Wave 3 of the 2014 SIPP including: comparing weighted response rates across subgroups of the sample; examining key estimates, frame and demographic characteristics among full sample, respondents, and nonrespondents; and benchmarking. Some of the methods identified variables correlated with nonresponse while others provided estimates of nonresponse bias for specific estimates and the effect of noninterview adjustment on these statistics.

Weighted subgroup response rates were significantly different from the Wave 3 cross-sectional unit response rate among original sample households and response rates differed across subgroups of the same characteristics, implying there is potential bias due to nonresponse for statistics associated with these characteristics. These findings were supported by comparisons between nonrespondent and respondent household estimates in Section 4.2 and also in line with results from nonresponse bias analysis in previous SIPP panels and in earlier waves of the 2014 SIPP.

Comparing relative differences between initial weighted full sample estimates and respondent estimates computed using noninterview adjusted weights demonstrates that the noninterview

adjustment is effective in reducing nonresponse bias associated with some, but not all of the estimates. Fortunately, many of those estimates not improved by the nonresponse adjustment are strongly correlated with variables¹⁷ used in the second stage adjustment portion of SIPP weighting adjustments described in Section 2.1. As a result, the bias associated with these estimates may be further reduced following the second stage adjustment. Furthermore, only 6¹⁸ of the estimates had relative biases greater than 10 percent after incorporating noninterview adjusted weights. Combining the different methods from Sections 4.1 to 4.3, we see that there is potential for nonresponse bias in Wave 3 of the SIPP and noninterview adjustment mitigates nonresponse bias in some but not all estimates. However, the remaining biased estimates may not have practical significance if the magnitude of the relative biases are small.

Although benchmarking in Section 4.4 utilizes data from all – both original and spawned – households interviewed in Wave 3, and reveals that some of the SIPP estimates may be biased, we cannot infer that nonresponse is solely responsible for these differences. The differences in estimates may be due to differences in measurement procedures, survey design, or interpretation of the survey questions. They may also result from differences in the target populations¹⁹ as the benchmarks for program participation include institutionalized persons and/or persons residing in U.S territories.

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¹⁷ Second stage adjustment uses *race, Hispanic origin, sex, state, and age* to adjust subgroups of the sample to population controls.

¹⁸ The magnitude of noninterview weighted relative difference associated with the estimated percentage of households whose householders were married with spouse absent (-10.34 percent) was not significantly different from 10 percent.

¹⁹ The SIPP and CPS ASEC survey have the same sample universe – civilian noninstitutionalized population residing in the United States.

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