Evaluation of the Survey of Income and Program Participation's Cross-Sectional Noninterview Adjustment Method

Rita J. Petroni and Karen E. King**
U.S. Bureau of the Census

I. Introduction

This paper presents results of a study conducted to evaluate the effectiveness of the Survey of Income and Program Participation's (SIPP) cross-sectional household noninterview adjustment procedure in the context of the entire weighting scheme. As described in more detail in section V, the study uses 1984 panel data to approximate estimates that would be obtained if data were available for respondents missing at a later wave. These estimates are compared to the SIPP estimates obtained when these data are missing.

Before providing the details of the study, results, and future plans, the paper presents an overview of the design and content of the SIPP in section II, describes the weighting methodology in section III, and discusses compensation procedures for the SIPP's nonresponse in section IV.

II. Design and Content of the SIPP

The SIPP is a nationally representative survey program of the U.S. Bureau of the Census. It is designed to obtain comprehensive information about the financial situation of persons, families, and households in the noninstitutionalized population of the United States. The survey collects information on cash and noncash income, eligibility and participation in various government transfer programs, labor force status, assets and liabilities, and many other topics. (e.g. work history, marital history, educational attainment, etc.)

The SIPP is a continuing survey with new national probability samples of households (panels) introduced each year. Sample households are interviewed every four months for about 2½ years (8 interviews).

To facilitate field and processing operations, each panel is divided into four approximately equal subsamples (i.e. rotation groups). Only one rotation group is interviewed in a given month so that one cycle (i.e. wave) of interviewing, in general, requires four consecutive months.

Interviewing for the first panel (i.e. the 1984 panel) of the SIPP began in October 1983. At the first interview, the panel consisted of approximately 20,000 occupied and eligible households in 174 Primary Sampling Units (PSUs). Due to budget constraints 17.8% of the eligible sample was dropped in March 1985 (the middle of the fifth interview). The later panels have begun with fewer households.

All persons in a sample household at the time of the first interview remain in the sample even if they move to new addresses. At each interview, information is obtained for each person who is 15 or more years old. In addition, persons aged 15 and over who subsequently share living quarters with original sample persons (individuals who were living in an interviewed sample unit at the time of the first interview) are interviewed as long as they reside with an original sample person. Generally, no attempts are made to interview nonrespondents in subsequent waves. (For further details see Nelson, et.al. (1985).)

III. Cross-Sectional Weighting Overview

The SIPP data are weighted in several stages to account for sampling, nonresponse, and coverage errors, with the intent of reducing the mean square error of estimates. Weighting for Wave 1 and subsequent waves differ somewhat.

The final monthly weight for each sample person in Wave 1 is the product of four sets of factors. These factors are the base weight, the noninterview adjustment factor, the first stage factor, and the second-stage factor. For subsequent waves, the final weight for each sample person is also the product of four sets of factors. The first factor (i.e. the initial weight) is the product of the first three Wave 1 weighting factors. The other factors are the mover's adjustment (see Huang (1984)), the subsequent wave noninterview adjustment factor, and a second stage adjustment factor corresponding to the time period covered by the subsequent wave. Except for the 1984 panel, the second stage adjustment factor includes an Hispanic adjustment. (For details of the weighting factors see U.S. Department of Commerce (1988f, 1988g, 1988i).)

IV. Nonresponse in the SIPP

A. Compensation for Nonresponse

The SIPP noninterview adjustment factor accounts for household nonresponse. A noninterview occurs when no one is home, household members are temporarily absent (e.g. on vacation), household members refuse to participate, a household cannot be located, or when households refuse due to extenuating circumstances. Additionally, noninterviews occur when initial occupants of a unit move within the United State and cannot be located and/or contacted. (See Nelson, et al. (1987).)

Imputation procedures are used to compensate for nonresponding eligible persons in responding households (type Z nonresponse) and item nonresponse. (See U.S. Department of Commerce (1984) and Nelson, et al.(1985).) For the 1984 panel only, households containing type Z

noninterviews at Wave 1 were treated as household noninterviews because specifications for the imputation of this type of noninterview were not available at the time the data were processed.

B. Household Nonresponse Adjustment

The sample weighting procedure partitions interviewed and noninterviewed households into weighting classes by values of variables available for respondent and nonrespondent households. To reduce the bias in principal estimates, variables which define weighting classes were selected so that (a) there is high correlation between the principal survey estimates and the variables used to define the nonresponse weighting classes, (b) within each weighting class the means for sample respondents and nonrespondents are similar, (c) the means of any two weighting classes differ, and (d) the expected response rate of any two weighting classes differ.

Separate nonresponse adjustment factors are obtained for each weighting class by dividing the weighted count of interviewed and noninterviewed households by the weighted count of interviewed households. To control the amount of variability in weights, if the number of interviewed households in a class is small (less than 30 for the SIPP) or the noninterview adjustment factor is greater than 2, classes expected to have households with similar characteristics are collapsed. (The SIPP collapses classes with similar 1979 poverty rates.) More details are given in Singh and Petroni (1988).

At the time of the first SIPP interview little information is available about the noninterviewed households. Therefore, a limited number of variables can be used to form noninterview classes. For the first wave, noninterview classes are formed using the following variables: Race of reference person (black, non-black); Tenure (owner, renter); Residence (MSA, not MSA); Census region (Northeast, Midwest, South, West); and Household size (1, 2, 3, 4 or more). For noninterviewed households, race of reference persons, tenure, and household size are determined by asking knowledgeable proxies such as neighbors. (See U.S. Department of Commerce (1988f, 1988i).)

The subsequent waves' noninterview adjustments are in addition to the Wave 1 adjustment which becomes an integral part of subsequent waves weighting. In subsequent waves, additional information obtained on previous wave respondent households is available for forming weighting classes. The following household level variables are used to construct adjustment cells for subsequent waves to compensate for noninterviews: Tenure (owner, renter); Public housing or rent subsidized (resident of public housing or recipient of government rent subsidies, others); Type of income (welfare etc., others); Household type (female householder with own children under 16 years of age but no husband present, householder is 65 years of age or older, others); Assets (bonds etc., others); Education level of reference person (less than 8 years, 8-11 years, 12-15 years, 16 or more years); Race and Spanish origin of reference person (non-Spanish white, other); and Household size (1, 2, 3, 4 or more). The welfare etc. category includes income sources such as Federal Supplemental Security Income; State Supplemental Security Income; Aid to Families with Dependent Children; Women, Infants and Children Nutrition Program; food stamps; and Medicaid. The bonds etc. category includes households in which at least one member possesses at least one asset type other than regular/passbook savings accounts in a bank, savings and loan or credit union or NOW, Super NOW or other interest-earning checking accounts. (See U.S. Department of Commerce for more details (1988g, 1988i).)

C. Why Assess Noninterview Adjustment?

For Waves 1 and 2, the noninterview adjustment procedure is not being examined. First, the variables which currently define the weighting classes are believed to be highly correlated to variables which exploratory analysis of 1984 panel SIPP data suggested are related to household nonresponse (see U.S. Department of Commerce (1988c) and to income, program participation, and labor force estimates. Second, Wave 1 household nonresponse rates range from about 5% to 7% and increases in household nonresponse between Waves 1 and 2 range from about 4.1 to 6.1%. (See King et al. (1987).) Since other demographic surveys conducted by the U.S. Census Bureau use nonresponse adjustment methodology similar to the SIPP's and have household nonresponse rates of about 5% or less, the SIPP Wave 1 and 2 estimates should have levels of nonresponse bias similar to those accepted for the other demographic surveys. However, it is not known how well this noninterview procedure accounts for bias in estimates at later waves when the nonresponse rate is higher. (By the last wave the rate is over 20%.)

V. The Evaluation Project

To evaluate the noninterview adjustment for later waves, ideally data for the later wave's noninterviews would be available so estimates calculated with their actual data could be compared to the SIPP estimate in which their data are missing. Of course, this is impossible since these data are missing by definition. However, such a comparison can be approximated by identifying Wave 2 interviewed households which are missing at a later wave and computing a second Wave 2 estimate treating these cases as missing. By assuming that a household's Wave 2 characteristics are similar to its char-

acteristics at a later wave, the actual situation at the later wave is approximated.

To accomplish this, first quarter 1984 estimates of selected socioeconomic characteristics were formed using current weighting procedures and households in sample at Wave 2 of the 1984 panel which were not later dropped from sample. Since the goal of the research is to evaluate the effectiveness of the noninterview adjustment in reducing bias due to noninterviews, the weights used for this study were the final SIPP weights (i.e. initial weight x mover adjustment factor x noninterview adjustment factor x second stage adjustment factor). The estimates were calculated twice. One estimate (W2/W2) was based on the actual Wave 2 household interview status. The other estimate (W2/W6) treated Wave 2 noninterviewed households and households which were interviewed at Wave 2 but not interviewed at Wave 6 as noninterviews. The two sets of estimates were then compared using t-tests.

Determination of an interviewed Wave 2 household's Wave 6 interview status was accomplished in two phases. First, individuals whose Wave 6 household interview status at Wave 6 was interviewed or who were interviewed up until they died or left the universe in Waves 3 through 6 were marked as belonging to an interviewed household at Wave 6. Otherwise, they were marked as being in a Wave 6 noninterviewed household. Second, an interviewed Wave 2 household was marked as interviewed at Wave 6 if at least one person in the Wave 2 household was marked as belonging to a Wave 6 interviewed household. All other Wave 2 households were marked as noninterviewed at Wave 6. (See U.S. Department of Commerce (1988h).)

Variances were calculated using SIPP generalized variance parameters (GVP). GVPs for W2/W2 estimates were obtained by adjusting the SIPP 1984 panel Wave 2 GVPs to account for the sample cut. GVPs for W2/W6 estimates were obtained by adjusting the W2/W2 GVPs to account for the additional sample loss associated with W2/W6 estimates. Correlation between the households in common was estimated to be $\sqrt{10,600/11,900}$ where, for the three rotations of Wave 2, 10,600 and 11,900 are respectively the number of Wave 2 households classified as interviewed at Wave 6 and the number interviewed at Wave 2. (A total of 12,500 households was eligible for interview.)

VI. Evaluation of Findings

A. Household Level Estimates

Tables 1 and 2 provide household level estimates of numbers receiving unemployment compensation, cash benefits, or food stamps, numbers with low monthly cash income, numbers with cash income, and mean and median monthly cash income for the two weightings.

Table 1 shows that most of the W2/W6 estimates of numbers of households with low monthly cash income, including the national level estimates, are significantly lower than the W2/W2 estimates. These results indicate that the "type of income" noninterview categories in conjunction with the other noninterview categories do not fully account for attrition of low monthly income households and suggest the use of "monthly cash income amounts" categories if it is operationally feasible.

Additionally, most of the W2/W6 estimates of numbers of households in large (1,000,000+) metropolitan areas are significantly lower than the W2/W2 estimates. These results suggest the use of "metropolitan/nonmetropolitan" categories to account for differential attrition in the various metropolitan and nonmetropolitan areas.

Table 1 also shows that all W2/W6 estimates associated with numbers of Spanish origin households are lower (half are statistically lower). This suggests that such households are attriting at a higher rate than is accounted for by the noninterview adjustment procedure. Thus, partitioning the current "race/Spanish origin" categories further may improve the estimates.

Lastly from table 1, note that, at the national level, the three sets of W2/W2 and W2/W6 benefits estimates are not statistically different. Also, note that none of the four sets of W2/W2 and W2/W6 estimates for female householder with no spouse present and with own children under 18 are statistically different. Because female householder with no spouse present and with own children under 16 is a classificatory variable in addition to the "income type" categories, the four sets of estimates are not expected to be different.

Since estimates associated with low income households are important to meeting the goals of the SIPP, results for table 1 suggest that consideration be given to the use of cash income amounts variables in forming noninterview adjustment cells. Furthermore, the results indicate that if it is important to obtain metropolitan/nonmetropolitan or Spanish origin level estimates of program participation and low monthly household income, consideration should be given to the use of metropolitan/nonmetropolitan variables in forming the adjustment cells and to breaking the current race and Spanish origin cells into more categories.

Similar conclusions are reached from analysis of table 2 results, although many of the differences noted for this table are of marginal analytical importance. This table shows that most W2/W6 estimates of median income are higher (about half, including the national level estimate, are statistically higher).

Second, the table shows that all W2/W6 metropolitan/nonmetropolitan estimates of number of households with cash income are significantly different and that the W2/W6 large metropolitan area estimate of median monthly cash income is statistically higher. Third, some significant differences in mean and median amounts were observed for all races, white, black, and Hispanic populations.

The suggestions to consider household monthly income and metropolitan/nonmetropolitan status as classificatory variables for noninterview adjustment are consistent with results reported by the Nonresponse Workgroup in U.S. Department of Commerce (1988c).

B. Person Level Estimates

Tables 3 through 5 provide person level estimates of numbers receiving monthly earnings; numbers by labor force activity status; mean monthly earnings; mean and median monthly income; proportions receiving unemployment compensation, means tested programs, cash benefits, noncash benefits, or food stamps; and proportions in households with low monthly income.

These tables show that under the current noninterview adjustment procedures, person level estimates are affected by household nonresponse. The significant differences shown are consistent with findings by McArthur in U.S. Department of Commerce (1988b) that attrition differs by the reported first interview age, race, sex, ethnicity, person monthly income, size of residential area, and employment status. Without further investigation it is not clear what affects changes in the household adjustment cells would have on these estimates. However, these results suggest that the potential changes to the noninterview cells identified above may at least marginally improve person level estimates.

VII. Conclusion

Results of the evaluation project described above suggest that research be conducted to determine whether inclusion of monthly household cash income categories , metropolitan/nonmetropolitan status categories, and a further breakdown of the current race and Spanish origin categories should be considered for noninterview adjustment.

Additionally, work by other SIPP staff members suggests that mover and nonmover status of households be considered in defining noninterview cells. (See Short and McArthur (1986) and U.S. Department of Commerce (1988a, 1988e).) However, research is needed to learn more about their characteristics. (See U.S. Department of Commerce (1988d) for details.) Additionally, it is desirable that research similar to that described in section V be done using 1985 panel data since weighting for the 1985+ panels, unlike weighting for the 1984 panel, includes an Hispanic adjustment as part of the second stage weighting procedure. (See U.S. Department of Commerce (1986).) Since this weighting change may affect estimates such as income, as well as race and Spanish origin estimates, research using the 1985 panel may result in different conclusions. For example, it may not indicate that further breakdown of the race/Spanish origin categories or inclusion of income categories be considered.

The research should then desirably include an examination of correlations between categories currently used in noninterview adjustment, any newly identified categories which the research indicates are appropriate, and important survey variables in order to select a set(s) of categories to use for noninterview adjustment. The effectiveness of the resulting set(s) of noninterview cells in accounting for household nonresponse should then be evaluated and compared to the effectiveness of the current noninterview cells.

For the following tables '+' indicates that W2/W2 and W2/W6 are significantly different at the 5 percent significance level. '*' indicates that they are significantly different at the 10 percent level.

Table 1. Number of Households (In Thousands) Receiving Benefits or with Low Monthly Income, First Quarter 1984

	Unemployment Compensation		Cash Benefits		Food Stamps		Low Monthly HH Income[1]	
	W2/W2	W2/W6	W2/W2	W2/W6	W2/W2	W2/W6	W2/W2	W2/W6
Race/Spanish Origin								
All Races	2707	2712	7246	7350	6582	6582	11819	11504+
White	2231	2217	4879	4986*	4238	4244	8659	8374+
Black	385	399	2155	2142	2133	2119	2890	2832*
Hispanic[2]	208	186*	779	767	728	682*	1132	1096
Metro/Non-Metro								
Metro	1861	1852	5355	5360	4671	4556*	8194	7790+
1,000,000+	917	897	2844	2752*	2444	2370*	4278	3978+
<1,000,000	944	955	2510	2608+	2227	2186	3916	3812*
Non-metro	846	860	1892	1989+	1911	2026+	3625	3714
Family HHs	2270	2284	5348	5401	5001	4982	7363	7127+
MC HHs[3]	1814	1799	2366	2463+	1859	1877	3838	3677+
Other Fam.	310	331	932	887	795	742+	884	834*
FHHerNSPW/C[3]	147	153	2051	2052	2347	2363	2640	2616
Nonfamily HHs								
Male HHer	272	271	582	590	466	463	1536	1471*
Female HHer	165	158	1316	1359	1115	1138	2921	2907

[1] Households with low monthly income are households below the poverty threshold for that month.

[2] Persons of Spanish Origin are also included in White or Black.

[3] MC = Married couple and FHHerNSPW/C = Female Householder, No Spouse present, with own children under 18 years of age.

Table 2. Monthly Cash Income for Households, First Quarter 1984

Race/Spanish Origin	Number of HHs (In Thousands) W2/W2	W2/W6	Mean Income W2/W2	W2/W6	Median Income W2/W2	W2/W6
All Races	83845	83871	2210	2203	1707	1717*
White	72681	72718	2299	2295	1791	1803*
Black	9314	9347*	1454	1427+	1165	1165
Hispanic [1]	4118	4091	1661	1702*	1391	1434*
Metro/Nonmetro						
Metro.	63763	63206+	2301	2291	1797	1813+
1,000,000+	34348	33489+	2448	2463	1893	1924+
<1,000,000	29415	29717+	2129	2097+	1697	1704
Non-Metro.	20083	20665+	1920	1933	1485	1491
Age Groups						
<25	5633	5654	1459	1476	1278	1289
25-34	19618	19557	2104	2120	1812	1845+
35-44	16420	16360	2660	2654	2244	2255
45-54	12127	12197	2934	2959	2386	2419
55-64	12635	12656	2489	2406+	1787	1767
65+	17412	17447	1439	1432	1000	986*
Married Couple HHs						
All Races	48847	48857	2772	2762	2257	2265
White	44229	44229	2816	2812	2298	2312
Black	3454	3483	2096	2014+	1807	1807
Hispanic[1]	2483	2490	2034	2096+	1723	1775*

[1] Hispanic persons are also included in Black or White.

Table 4. Labor Force Activity Status, Mean and Median Monthly Income for Persons 16+, First Quarter 1984

	Number of Persons (In Thousands) W2/W6	W2/W2	Mean Income W2/W6	W2/W2	Median Income W2/W2	W2/W6
Total						
Job Entire Month	99333	99812+	2918	2911	2484	2488
Full Time[1]	77230	77654+	3011	3003	2553	2557
Part Time[1]	18838	18956	2671	2658	2239	2228
Missed Some Weeks	3265	3202	2158	2183	1737	1722
Job Part of Month	3433	3472	2192	2196	1599	1589
No Job During Month	9498	9360*	1442	1472*	1096	1119
White						
Job Entire Month	86993	87483+	3001	2996	2553	2558
Full Time[1]	67487	67883+	3088	3082	2617	2625
Part Time[1]	16635	16769	2779	2763	2343	2328
Missed Some Weeks	2872	2831	2244	2300	1799	1828
Job Part of Month	2958	2964	2300	2315	1688	1684
No Job During Month	7105	7020	1506	1533	1157	1189*
Black						
Job Entire Month	9646	9739	2121	2079+	1855	1845
Full Time[1]	7600	7716	2253	2210+	2000	2003
Part Time[1]	1720	1701	1678	1659	1412	1407
Missed Some Weeks	327	323	1377	1161+	1080	917*
Job Part of Month	398	432*	1324	1319	1244	1255
No Job During Month	2066	1998*	1179	1210	933	934
Spanish Origin						
Job Entire Month	5112	5111	2440	2500*	2126	2202+
Full Time[1]	3997	3945	2516	2592+	2205	2319+
Part Time[1]	876	918*	2295	2302	2006	2006
Missed Some Weeks	240	247	1694	1759	1361	1461
Job Part of Month	222	216	1724	1789	1529	1623*
No Job During Month	821	782+	1119	1200+	760	825*

[1] Includes persons who worked all weeks.

Table 3. Mean Monthly Earnings for Persons 16+, First Quarter 1984

Race/Spanish Origin	Number of Persons (In Thousands) W2/W2	W2/W6	Mean Monthly Earnings W2/W2	W2/W6
Total	98906	99689+	1455	1440+
White	86474	87227+	1493	1478+
Black	9780	9897	1101	1076+
Hispanic[1]	5168	5163	1138	1165+
Males				
Total	55242	55436	1834	1820
White	48911	49167	1888	1875
Black	4745	4767	1266	1221+
Hispanic[1]	3041	3094	1352	1392+
Females				
Total	43664	44253+	975	964+
White	37564	38060+	978	966+
Black	5035	5130	946	942
Hispanic[1]	2127	2069	831	826
Region				
Northeast	22404	22587	1538	1500*
Midwest	24580	25603+	1386	1381
South	32845	32388+	1366	1359
West	19076	19111	1597	1587
Metro/Nonmetro				
In Metro	76751	76685	1508	1492+
1000000+	42130	41562+	1591	1587
<1000000	34621	35122+	1406	1380+
Non-Metro	22155	23004+	1270	1266

[1] Hispanic persons are also included in either Black or White.

Table 5. Percent of Persons 16+ Receiving Benefits and Living in HHs with Low Monthly Income, First Quarter 1984.

	Unemployment Compensation W2/W2	W2/W6	Cash Benefits W2/W2	W2/W6	Food Stamps W2/W2	W2/W6	Low Monthly Income HHs[1] W2/W2	W2/W6
Age Groups								
Total	1.7	1.7	9.1	9.2	7.2	7.2	11.8	11.5+
16-19	0.6	0.6	12.6	12.7	11.1	11.1	16.3	16.2
20-64	2.2	2.2	8.2	8.3	6.4	6.8	11.4	10.9+
20-24	2.4	2.6	10.5	10.4	8.9	8.6	13.5	13.1
25-34	2.4	2.4	7.4	7.2	7.9	7.8	12.5	12.1*
35-44	2.4	2.3	6.3	6.6	5.3	5.3	10.2	9.2+
45-54	1.9	1.8	9.3	9.3	6.1	6.0	10.8	10.5
55-64	1.6	1.6	9.0	9.6+	6.0	6.2	9.6	9.5
65+	0.1	0.1	11.4	11.9*	6.5	6.8	11.3	11.5
65-69	0.2	0.1	9.8	10.2	5.8	6.1	9.0	9.0
70-74	0.3	0.2	9.8	10.0	5.5	5.6	11.2	11.4
75+	0.0	0.0	14.0	14.7	7.8	8.2	13.4	13.8
Race/Spanish Origin								
White	1.7	1.7	6.9	7.1+	5.2	5.2	9.6	9.3+
Black	2.2	2.2	25.4	25.3	21.1	20.8	27.7	26.8+
Hispanic	2.5	2.3	19.1	18.7	16.4	15.3	23.2	22.7
Household Relationship[2]								
Spouse	1.7	1.6*	4.8	5.0*	3.8	3.8	7.9	7.5+
FaHHerNSP	2.3	2.3	25.3	24.9	26.7	26.3	29.9	29.2
OthFaMem	1.7	1.9*	15.1	15.4	9.4	9.3	12.0	11.8
NotFaMem	1.8	1.8	9.5	9.6	8.1	8.1	17.4	17.1

[1] Households with low monthly income are households below the poverty threshold for that month. These include only households with cash benefits and earnings.
[2] Spouse = spouse in a married couple household; FaHHerNSP = Family Householder, no spouse present; OthFaMem = Another type of Family Member; NotFaMem = Not a Family Member.

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