Appendix C. Source and Accuracy Statement

SOURCE OF DATA

The SIPP universe is the noninstitutionalized resident population living in the United States. This population includes persons living in group quarters, such as dormitories, rooming houses, and religious group dwellings. Crew members of merchant vessels, Armed Forces personnel living in military barracks, and institutionalized persons, such as correctional facility inmates and nursing home residents, were not eligible to be in the survey. Also, United States citizens residing abroad were not eligible to be in the survey. Foreign visitors who work or attend school in this country and their families were eligible; all others were not eligible. With the exceptions noted above, persons who were at least 15 years of age at the time of the interview were eligible to be interviewed in the survey.

The 1987 panel SIPP sample is located in 230 Primary Sampling Units (PSUs) each consisting of a county or a group of contiguous counties. Within these PSUs, expected clusters of two living quarters (LQs) were systematically selected from lists of addresses prepared for the 1980 decennial census to form the bulk of the sample. To account for LQs built within each of the sample areas after the 1980 census, a sample containing clusters of four LQs was drawn from permits issued for construction of residential LQs up until shortly before the beginning of the panel.

In jurisdictions that don't issue building permits or have incomplete addresses, small land areas were sampled and expected clusters of four LQs within were listed by field personnel and then subsampled. In addition, sample LQs were selected from a supplemental frame that included LQs identified as missed in the 1980 census.

The first interview was conducted during February, March, April, and May of 1987. Approximately one-fourth of the sample was interviewed in each of these months. Each sample person was visited every four months thereafter. At each interview the reference period was the four months preceding the interview month.

Occupants of about 93 percent of all eligible living quarters participated in the first interview of the panel. For subsequent interviews, only original sample persons (those in Wave 1 sample households and interviewed in Wave 1) and persons living with them were eligible to be interviewed. Original sample persons were followed if they moved to a new address, unless the new address was more than 100 miles from a SIPP sample area. Then, telephone interviews were attempted. All first wave noninterviewed households were automatically designated as noninterviews for all subsequent interviews. When original sample persons moved to remote parts of the country and couldn't be reached by telephoning, moved without leaving a forwarding address; or refused to be interviewed, additional noninterviews resulted.

A person was classified as interviewed or noninterviewed for the entire panel based on the following definitions. Interviewed sample persons were defined to be 1) those for whom self or proxy responses were obtained for each reference month of all seven interviews or 2) those for whom self or proxy responses were obtained for the first reference month of the panel and for each subsequent reference month until they were known to have died or moved to an ineligible address (foreign living quarters, institutions, or military barracks). Noninterviewed persons were defined to be those for whom neither self nor proxy responses were obtained for one or more reference months of the seven interviews (but not because they were deceased or moved to an ineligible address). Details on classification are found in "Weighting of Persons for SIPP Longitudinal Tabulations" (paper by Judkins, Hubble, Dorsch, McMillen, and Ernst in the *1984 Proceedings of the Survey Research Methods Section, American Statistical Association*). Details on patterns of nonresponse can be found in "Weighting Adjustment for Partial Nonresponse in the 1984 SIPP Panel" (paper by Lepkowski, Kalton, and Kasprzyk in the *1989 Proceedings of the Survey Research Methods Section, American Statistical Association*).

Table C-1. **Person Statistics for Longitudinal Panel**

Panel	Initially eligible	Classified as interviewed	Person nonresponse rate (percent)
87	33,100	24,400	26

Some respondents did not respond to some of the questions; therefore, the overall nonresponse rate for some items, especially sensitive income and money related items, is higher than the person nonresponse rate. For more discussion of nonresponse see the *Quality Profile for the Survey of Income and Program Participation*, May 1990, by T. Jabine, K. King, and R. Petroni, available from Customer Services, Data Users Services Division (301-763-6100).

ESTIMATION

Several stages of weight adjustments were involved in the estimation procedure used to derive the SIPP longitudinal person weights. Each person received a base weight equal to the inverse of his/her probability of selection. Two noninterview adjustment factors were applied. One adjusted the weights of interviewed persons in interviewed households to account for households which were eligible for the sample but could not be interviewed at the first interview. The second was applied to compensate for person noninterviews occurring in subsequent interviews. The Bureau has used complex techniques to adjust the weights for nonresponse, but the success of these techniques in avoiding bias is unknown. For more detail on oninterview adjustment for longitudinal estimates see *Nonresponse Adjustment Methods for Demographic Surveys at the U.S. Bureau of the Census*, November 1988, Working paper 8823, by R. Singh and R. Petroni. Another factor was applied to each interviewed person's weight to account for the SIPP sample areas not having the same population distribution as the strata from which they were selected.

An additional stage of adjustment to longitudinal person weights was performed to reduce the mean square error of the survey estimates. This was accomplished by ratio adjusting the sample estimates to agree with monthly Current Population Survey (CPS) type estimates of the civilian (and some military) noninstitutional population of the United States by demographic characteristics including age, sex, and race, as of the specified control date. For the Panel, the control date is March 1987. The CPS estimates by age, race, and sex were themselves brought into agreement with estimates from the 1980 decennial census which have been adjusted to reflect births, deaths, immigration, emigration, and changes in the Armed Forces since 1980. Also, SIPP estimates were controlled to independent Hispanic controls.

ACCURACY OF ESTIMATES

SIPP estimates are based on a sample; they may differ somewhat from the figures that would have been obtained if a complete census had been taken using the same questionnaire, instructions, and enumerators. There are two types of errors possible in an estimate based on a sample survey: nonsampling and sampling. We are able to provide estimates of the magnitude of SIPP sampling error, but this is not true of nonsampling error. Found in the next sections are descriptions of sources of SIPP nonsampling error, followed by a discussion of sampling error, its estimation, and its use in data analysis.

Nonsampling variability. Nonsampling errors can be attributed to many sources, e.g., inability to obtain information about all cases in the sample; definitional difficulties; differences in the interpretation of questions; inability or unwillingness on the part of the respondents to provide correct information; inability to recall information, errors made in the following: collection such as in recording or coding the data, processing the data, estimating values for missing data; biases resulting from the differing recall periods caused by the interviewing pattern used; and undercoverage. Quality control and edit procedures were used to reduce errors made by respondents, coders and interviewers. More detailed discussions of the existence and control of nonsampling errors in the SIPP can be found in the *SIPP Quality Profile*.

Undercoverage in SIPP results from missed living quarters and missed persons within sample households. It is known that undercoverage varies with age, race, and sex. Generally, undercoverage is larger for males than for females and larger for Blacks than for Non-Blacks. Ratio estimation to independent age-race-sex population controls partially corrects for the bias due to survey undercoverage. However, biases exist in the estimates to the extent that persons in missed households or missed persons in interviewed households have characteristics different from those of interviewed persons in the same age-race-sex group. Further, the independent population controls used have not been adjusted for undercoverage in the Census.

Comparability with other estimates. Caution should be exercised when comparing data from this report with data from other SIPP publications or with data from other surveys. The comparability problems are caused by such sources as the seasonal patterns for many characteristics, different nonsampling errors, and different concepts and procedures. Refer to the *SIPP Quality Profile* for known differences with data from other sources and further discussion.

Sampling variability. Standard errors indicate the magnitude of the sampling error. They also partially measure the effect of some nonsampling errors in response and enumeration, but do not measure any systematic biases in the data. The standard errors for the most part measure the variations that occurred by chance because a sample rather than the entire population was surveyed.

USES AND COMPUTATION OF STANDARD ERRORS

Confidence intervals. The sample estimate and its standard error enable one to construct confidence intervals, ranges that would include the average result of all possible samples with a known probability. For example, if all possible samples were selected, each of these being surveyed under essentially the same conditions and using the same sample design, and if an estimate and its standard error were calculated from each sample, then:

1. Approximately 68 percent of the intervals from one standard error below the estimate to one standard error above the estimate would include the average result of all possible samples.

2. Approximately 90 percent of the intervals from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate would include the average result of all possible samples.

3. Approximately 95 percent of the intervals from two standard errors below the estimate to two standard errors above the estimate would include the average result of all possible samples.

The average estimate derived from all possible samples is or is not contained in any particular computed interval. However, for a particular sample, one can say with a specified confidence that the average estimate derived from all possible samples is included in the confidence interval.

Hypothesis testing. Standard errors may also be used for hypothesis testing, a procedure for distinguishing between population characteristics using sample estimates. The most common types of hypotheses tested are 1) the population characteristics are identical versus 2) they are different. Tests may be performed at various levels of significance, where a level of significance is the probability of concluding that the characteristics are different when, in fact, they are identical.

All statements of comparison in the report have passed a hypothesis test at the 0.10 level of significance or better. This means that, for differences cited in the report, the estimated absolute difference between parameters is greater than 1.6 times the standard error of the difference.

To perform the most common test, compute the difference X_A - X_B, where X_A and X_B are sample estimates of the characteristics of interest. A later section explains how to derive an estimate of the standard error of the difference X_A - X_B. Let that standard error be s_{DIFF}. If X_A - X_B is between -1.6 times s_{DIFF} and +1.6 times s_{DIFF}, no conclusion about the characteristics is justified at the 10 percent significance level. If, on the other hand, X_A - X_B is smaller than -1.6 times s_{DIFF} or larger than +1.6 times s_{DIFF}, the observed difference is significant at the 10 percent level. In this event, it is commonly accepted practice to say that the characteristics are different. Of course, sometimes this conclusion will be wrong. When the characteristics are, in fact, the same, there is a 10 percent chance of concluding that they are different.

Note that as more tests are performed, more erroneous significant differences will occur. For example, at the 10 percent significance level, if 100 independent hypothesis tests are performed in which there are no real differences, it is likely that about 10 erroneous differences will occur. Therefore, the significance of any single test should be interpreted cautiously.

Note concerning small estimates and small differences. Summary measures are shown in the report only when the base is 200,000 or greater. Because of the large standard errors involved, there is little chance that estimates will reveal useful information when computed on a base smaller than 200,000. Also, nonsampling error in one or more of the small number of cases providing the estimate can cause large relative error in that particular estimate. Estimated numbers are shown, however, even though the relative standard errors of these numbers are larger than those for the corresponding percentages. These smaller estimates are provided primarily to permit such combinations of the categories as serve each user's needs. Therefore, care must be taken in the interpretation of small differences since even a small amount of nonsampling error can cause a borderline difference to appear significant or not, thus distorting a seemingly valid hypothesis test.

Standard error parameters and tables and their use. Most SIPP estimates have greater standard errors than those obtained through a simple random sample because clusters of living quarters are sampled for the SIPP. To derive standard errors that would be applicable to a wide variety of estimates and could be prepared at a moderate cost, a number of approximations were required. Estimates with similar standard error behavior were grouped together and two parameters (denoted "a" and "b") were developed to approximate the standard error behavior of each group of estimates. Because the actual standard error behavior was not identical for all estimates within a group, the standard errors computed from these parameters provide an indication of the order of magnitude of the standard error for any specific estimate. These "a" and "b" parameters vary by characteristic and by demographic subgroup to which the estimate applies. Table C-2 provides base "a" and "b" parameters to be used for 1987 longitudinal panel estimates.

Table C-2. **SIPP Generalized Variance Parameters for Estimates Using Panel Weights: 1987 Longitudinal Panel File**

Characteristics[1]	a	b	f
Persons			
TOTAL OR WHITE			
16+ Program Participation and Benefits, Poverty (3)			
Both Sexes	-0.0001807	30,767	.90
Male	-0.0003801	30,767	.90
Female	-0.0003441	30,767	.90
16+ Income and Labor Force (4)			
Both Sexes	-0.0000615	10,490	.52
Male	-0.0001297	10,490	.52
Female	-0.0001172	10,490	.52
All Others[2] (5)			
Both Sexes	-0.0001654	38,147	1.00
Male	-0.0003421	38,147	1.00
Female	-0.0003203	38,147	1.00
BLACK			
Poverty (1)			
Both Sexes	-0.0009445	26,244	.83
Male	-0.0020159	26,244	.83
Female	-0.0017767	26,244	.83
All Others (2)			
Both Sexes	-0.0005115	14,113	.61
Male	-0.0010991	14,113	.61
Female	-0.0009565	14,113	.61

[1]For cross-tabulations, use the parameters of the characteristic with the smaller number within the parentheses.

[2]Use the "All Others" parameters for retirement tabulations, 0+ program participation, 0+ benefits, 0+ income, and 0+ labor force tabulations, in addition to any other types of tabulations not specifically covered by another characteristic in this table.

For those users who wish further simplification, we have also provided general standard errors in tables C-3 and C-4. Note that these standard errors must be adjusted by a factor from table C-2. The standard errors resulting from this simplified approach are less accurate. Methods for using these parameters and tables for computation of standard errors are given in the following sections.

Standard errors of estimated numbers. There are two ways to compute the approximate standard error, s_x, of an estimated number shown in this report. The first uses the formula

$$s_x = fs \qquad (1)$$

where f is a factor from table C-2, and s is the standard error of the estimate obtained by interpolation from table C-3. Alternatively, s_x may be approximated by the formula,

$$s_x = \sqrt{ax^2 + bx} \qquad (2)$$

from which the standard errors in table C-3 were calculated. Here x is the size of the estimate and a and b are the parameters in table C-2 associated with the particular type of characteristic. Use of formula 2 will provide more accurate results than the use of formula 1. When calculating standard errors for numbers from cross-tabulations involving different characteristics, use the factor or set of parameters for the characteristic which will give the largest standard error.

Illustration. Suppose that we have a SIPP estimate of 960,000 adults 18 years or over who were poor in 1987 yet exited poverty in 1988 and increased their weeks or hours worked. The appropriate "a" and "b" parameters to use in calculating a standard error for the estimate are obtained from table C-2. They are a= -.0001807 and b= 30,767, respectively. Using formula (2), the approximate standard error is

$$\sqrt{(-.001807)\,(960{,}000)^2 + (30{,}767)\,(960{,}000)}$$
$$= 171{,}000$$

The 90 percent confidence interval is from 686,000 to 1,234,000. Therefore, a conclusion that the average estimate derived from all possible samples lies within a range computed in this way would be correct for roughly 90 percent of all samples.

Using formula (1), the appropriate "f" factor (f = .90) from table C-2, and the appropriate standard error of the estimate from table C-3, the approximate standard error is:

$$s_x = .90(190{,}600) = 172{,}000$$

Table C-3. **Standard Errors of Estimated Numbers of Persons for 1987 Longitudinal Panel File (Numbers in Thousands)**

Size of Estimate	Standard Error	Size of Estimate	Standard Error
200	87	50,000	1222
300	107	80,000	1412
600	151	100,000	1470
1,000	195	130,000	1471
2,000	275	135,000	1461
5,000	432	150,000	1414
8,000	543	200,000	1007
11,000	632	220,000	622
13,000	684	230,000	155
15,000	731		
17,000	775		
22,000	871		
26,000	938		
30,000	998		

Standard errors of estimated percentages. The reliability of an estimated percentage, computed using sample data for both numerator and denominator, depends on the size of the percentage and its base. When the numerator and denominator of the percentage have different parameters, use the parameter (or appropriate factor) from table C-2 indicated by the numerator.

The approximate standard error, $s_{(x,p)}$, of an estimated percentage p can be obtained by use of the formula

$$s_{(x,p)} = fs \qquad (3)$$

where p is the percentage of persons/families/households with a particular characteristic such as the percent of persons owning their own homes.

In this formula, f is the appropriate "f" factor from table C-2, and s is the standard error of the estimate obtained by interpolation from table C-4. Alternatively, it may be approximated by the formula:

$$s_{(x,p)} = \sqrt{\frac{b}{x}\,(p)\,(100-p)} \qquad (4)$$

from which the standard errors in table C-4 were calculated. Here x is the total number of persons, families, households, or unrelated individuals in the base of the percentage, p is the percentage ($0 \leq p \leq 100$), and b is the "b" parameter in table C-2 associated with the characteristic in the numerator of the percentage. Use of this formula will give more accurate results than use of formula (3) above.

Illustration. Suppose that 28 percent of the 3,682,000 adults who exited poverty in 1988 did not work in either 1987 or 1988. Using formula (4) and the "b" parameter of 30,767 from table C-2, the approximate standard error is:

$$\sqrt{\frac{30{,}767}{3{,}682{,}00}\,(28)\,(100-28)} = 4.1 \text{ percent}$$

Table C-4. **Standard Errors of Estimated Percentages of Persons for 1987 Longitudinal Panel File**

Base of estimated percentage (Thousands)	Estimated percentages					
	≤1 or ≥99	2 or 98	5 or 95	10 or 90	25 or 75	50
200	4.3	6.1	9.5	13.1	18.9	21.8
300	3.5	5.0	7.8	10.7	15.4	17.8
600	2.5	3.5	5.5	7.6	10.9	12.6
1,000	1.9	2.7	4.3	5.9	8.5	9.8
2,000	1.4	1.9	3.0	4.1	6.0	6.9
5,000	0.9	1.2	1.9	2.6	3.8	4.4
8,000	0.7	1.0	1.5	2.1	3.0	3.5
11,000	0.6	0.8	1.3	1.8	2.5	2.9
13,000	0.5	0.8	1.2	1.6	2.3	2.7
17,000	0.5	0.7	1.0	1.4	2.1	2.4
22,000	0.4	0.6	0.9	1.3	1.8	2.1
26,000	0.4	0.5	0.8	1.1	1.7	1.9
30,000	0.3	0.5	0.8	1.1	1.5	1.8
50,000	0.3	0.4	0.6	0.8	1.2	1.4
80,000	0.2	0.3	0.5	0.7	0.9	1.1
100,000	0.2	0.3	0.4	0.6	0.9	1.0
130,000	0.2	0.2	0.4	0.5	0.7	0.9
180,000	0.1	0.2	0.3	0.4	0.6	0.7
200,000	0.1	0.2	0.3	0.4	0.6	0.7
220,000	0.1	0.2	0.3	0.4	0.6	0.7
230,000	0.1	0.2	0.3	0.4	0.6	0.6

Consequently, the 90 percent confidence interval is from 21.4 to 34.6 percent.

Standard error of a difference. The standard error of a difference between two sample estimates, x and y, is approximately equal to

$$s_{(x-y)} = \sqrt{s_x^2 + s_y^2 - 2rs_xs_y} \qquad (5)$$

where s_x and s_y are the standard errors of the estimates x and y and r is the correlation coefficient between the characteristics estimated by x and y. The estimates can be numbers, averages, percents, ratios, etc. Underestimates or overestimates of standard error of differences result if the estimated correlation coefficient is overestimated or underestimated, respectively. In this report, r is assumed to be zero.

Illustration. Suppose that, 23.9 percent of the adults who exited poverty in 1988 increased their weeks or hours worked, whereas, 28 percent of such adults did not work in either 1987 or 1988. Using the appropriate b parameter from table C-2 and formula (4), the standard errors of these percentages are approximately 3.9 percent and 4.1 percent, respectively.

The standard error of the difference is computed using formula (5):

$$\sqrt{(3.9)^2 + (4.1)^2} = 5.7 \text{ percent}$$

Suppose that it is desired to test at the 10 percent significance level whether the above two percentages differ significantly. To perform the test, compare the difference of 4.1 percent to the product of 1.6 x 5.7 = 9.1 percent. Since the percent difference is smaller than 1.6 times the standard error of the difference, the data do not support the hypothesis that the two percent estimates are significantly different at the 10 percent level.

Standard errors of ratios of means and medians. The standard error for a ratio of means or medians is approximated by:

$$S_{x/y} = \sqrt{\left(\frac{x}{y}\right)^2\left[\left(\frac{s_y}{y}\right)^2 + \left(\frac{s_x}{x}\right)^2\right]} \qquad (6)$$

where x and y are means or medians, and s_x and s_y are their associated standard errors. Formula (6) assumes that the means or medians are not correlated. If the correlation between the population means or medians estimated by x and y are actually positive (negative), then this procedure will tend to produce overestimates (underestimates) of the true standard error for the ratio of means or medians.

Illustration. Suppose the SIPP estimate of Black-to-White median family income per person in 1988 is .62. Also, suppose that the median family income per person and its corresponding standard error are $17,822 and $669, respectively for the Blacks; and $28,962 and $474 respectively for the Whites.

Using formula (6), the standard error for this ratio is approximated by:

$$S_{x/y} = \sqrt{\left(\frac{17{,}822}{28{,}962}\right)^2\left[\left(\frac{669}{17{,}822}\right)^2 + \left(\frac{474}{28{,}962}\right)^2\right]}$$

$$= .025$$