Appendix C. **Source and Accuracy of Estimates**

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 are not eligible to be in the survey. United States citizens residing abroad are not eligible to be in the survey. Foreign visitors who work or attend school in this country and their families are eligible; all others are not eligible. With the exceptions noted above, field representatives interview eligible persons who are at least 15 years of age at the time of the interview.

The 1991 Panel SIPP sample is located in 230 Primary Sampling Units (PSU's) each consisting of a county or a group of contiguous counties. Within these PSU's, expected clusters of two living quarters (LQ's) were systematically selected from lists of addresses prepared for the 1980 decennial census to form the bulk of the sample. To account for LQ's built within each of the sample areas after the 1980 census, a sample containing clusters of four LQ's was selected from permits issued for construction of residential LQ's up until shortly before the beginning of the panel.

In jurisdictions that have incomplete addresses or do not issue building permits, small land areas were sampled, and expected clusters of four LQ's within those areas were listed, and then subsampled. In addition, a sample of LQ's was selected from a supplemental frame that included LQ's identified as missed in the 1980 census.

The first interview occurred during February, March, April, or May of 1991. Interviews for approximately one-fourth of the sample took place in each of these months. For the remainder of the panel, interviews for each person occurred every 4 months. At each interview, the reference period was the 4 months preceding the interview month.

Occupants of about 93 percent of all eligible living quarters participated in the first interview of the panel. For later interviews, field representatives interviewed only original sample persons (those in Wave 1 sample households and interviewed in Wave 1) and persons living with them. The Bureau automatically designated all first wave noninterviewed households as noninterviews for all subsequent interviews. Field representatives conducted personal interviews in the first, second, and sixth waves only. The remaining interviews were telephone interviews. For personal interviews, 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. If the original sample persons moved farther than 100 miles from a SIPP sample area, telephone interviews were attempted. When original sample persons moved to remote parts of the country and were unreachable by telephone, moved without leaving a forwarding address, or refused the interview, additional noninterviews resulted.

As a part of most waves, subjects that are important to meet SIPP goals and do not require repeated measurement during the panel are covered. The data on these subjects are of particular interest to data users and policy makers. These subjects are covered once during the panel or annually. By collecting data once for the panel or annually, respondent burden is reduced. A specific set of questions on a subject is called a topical module. For this report, the topical modules analyzed include questions on child care arrangements. They were implemented in Wave 3 of the 1991 Panel.

Noninterviews. Tabulations in this report were drawn from interviews conducted from October 1991 through January 1992. Table C-1 summarizes information on nonresponse for the interview months in which the data used to produce this report were collected.

Table C-1. **Household Sample Size by Month and Interview Status**

Month	Eligible	Interviewed	Noninterviewed	Nonresponse rate[1] (%)
October 1991	4,200	3,400	700	18
November 1991	4,000	3,400	600	15
December 1991	4,100	3,400	600	16
January 1992	4,000	3,400	600	15

[1]Due to rounding of all numbers to the nearest 100, there are some inconsistencies. The percentage was calculated using unrounded numbers.

Some respondents do not respond to some of the questions. Therefore, the overall nonresponse rate for some items such as income and money related items is higher than the nonresponse rates in table C-1. 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 User Services Division, of the U.S. Census Bureau (301-763-6100).

WEIGHTING PROCEDURE

SIPP person weights in each panel were derived from several stages of weight adjustments. In the first wave, each person was given a base weight equal to the inverse of his/her probability of selection. For each subsequent interview, the Bureau gave each person a base weight that accounted for following movers.

A 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 derived.

A noninterview adjustment factor was applied to the weight of every occupant of interviewed households to account for persons in noninterviewed occupied households eligible for the sample. (The Bureau treated individual nonresponse within partially interviewed households with imputation. No special adjustment was made for noninterviews in group quarters.)

The Bureau used complex techniques to adjust the weights for nonresponse. For a further explanation of the techniques used, see the *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. The success of these techniques in avoiding bias is unknown. An example of successfully avoiding bias is in "Current Nonresponse Research for the Survey of Income and Participation" (paper by Petroni, presented at the Second International Workshop on Household Survey Nonresponse, October 1991).

An additional stage of adjustment to persons' weights was performed to reduce the mean square errors 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 at the national level by demographic characteristics including age, sex, and race as of the specified date. The Bureau brought CPS estimates by age, sex, and race into agreement with adjusted estimates from the 1980 decennial census. Adjustments to the 1980 decennial census estimates reflect births, deaths, immigration, emigration, and changes in the Armed Forces since 1980. In addition, SIPP estimates were controlled to independent Hispanic controls and adjusted to assign equal weights to husbands and wives within the same household. All of the above adjustments were implemented for each reference month and the interview month.

ACCURACY OF ESTIMATES

SIPP estimates are based on a sample. The sample estimates may differ somewhat from the values obtained from administering a complete census using the same questionnaire, instructions, and enumerators. The difference occurs because with an estimate based on a sample survey two types of errors are possible: nonsampling and sampling. Estimates of the magnitude of the SIPP sampling error can be provided, but this is not true of nonsampling error. The next few sections describe SIPP nonsampling error sources, 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, including:

- 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 collection (e.g., recording or coding the data),
- errors made in processing the data,
- errors made in estimating values for missing data,
- biases resulting from the differing recall periods caused by the interviewing pattern used,
- 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 are in the *SIPP Quality Profile*.

Undercoverage in SIPP resulted 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 Nonblacks. Ratio estimation to independent age-race-sex population controls partially corrects for the bias due to survey undercoverage. However, biases exist in the estimates when 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 for undercoverage in the Census were not adjusted.

A common measure of survey coverage is the coverage ratio, the estimated population before ratio adjustment divided by the independent population control. Table C-2 shows CPS coverage ratios for age-sex-race groups for 1992. The CPS coverage ratios can exhibit some variability from month to month; however, this table shows a typical set of coverage ratios. Other Census Bureau household surveys like the SIPP experience similar coverage.

A bias may also occur in estimates related to "latchkey kids." An example of such an estimate is total number of children in self-care. The following causes for bias are suggested.

1. The complexity of the questions and concepts used to identify "latchkey kids" may have led to confusion among respondents.
2. In some jurisdictions the parents of children found to be "latchkey kids" could be charged with the crime "child neglect."
3. Respondents may fear they are placing a child in jeopardy by disclosing that the child is alone.
4. It may be more socially desirable to report that a child is supervised than that the child cares for self.

The misreporting of any specific child care arrangement may affect the overall distribution of child care arrangements shown in this report. For example, an underestimate in the proportion of children caring for self would result in overestimates for one or more of the other child care arrangements.

Comparability with Other Estimates. Exercise caution when comparing data from this report with data from other SIPP publications or with data from other surveys. Comparability problems are from varying 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.

Some of the data in this report comes from previous yearly SIPP child care reports entitled, *Who's Minding the Kids? Child Care Arrangements:*[1] from the SIPP P-70 series. The parameters used in these reports are in table C-3. CPS parameters are in table C-4.

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 mostly measure the variations that occurred by chance because a sample was surveyed rather than the entire population.

[1]Winter 1984 to 1985, Fall 1986, Fall 1987, Fall 1988.

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 and surveyed, each of these 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 1.645 standard errors below the estimate to 1.645 standard errors above the estimate would include the average result of all possible samples.
3. Approximately 95 percent of the intervals from 1.960 standard errors below the estimate to 1.960 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 confidence interval includes the average estimate derived from all possible samples.

Hypothesis Testing. Standard errors may also be used for hypothesis testing. Hypothesis testing is a procedure for distinguishing between population characteristics using sample estimates. The most common type of hypothesis tested is: (1) the population characteristics are identical versus (2) they are different. One can perform tests 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.

Unless noted otherwise, all statements of comparison in the report 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 1.645 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 -1.645 times s_{DIFF} and +1.645 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 -1.645 times s_{DIFF} or larger than +1.645 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, interpret the significance of any single test 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. We show estimated numbers, however, even though the relative standard errors of these numbers are larger than those for the corresponding percentages. Smaller estimates are provided primarily to permit such combinations of the categories as serve each user's needs. Therefore, be careful 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 were sampled for the SIPP. To derive standard errors at a moderate cost and applicable to a wide variety of estimates, a number of approximations were made. Estimates with similar standard error behavior were grouped, 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. Use 1991 Panel base "a" and "b" parameters found in table C-3 for Wave 3 1991 Panel estimates.

For users who wish further simplification, general standard errors are provided in tables C-5 and C-6. Note that these standard errors need to be adjusted by a factor from table C-3. The standard errors resulting from this simplified approach are less accurate. Methods for using these parameters and tables for computation of standard errors follow.

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-3, and s is the standard error of the estimate obtained by interpolation from table C-5. Alternatively, approximate s_x using the formula,

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

from which the standard errors in table C-5 were calculated. Here x is the size of the estimate, and a and b are the parameters in table C-3 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 the SIPP estimate of the number of children under age 15 living in the United States with working mothers in the Fall of 1991 is 31,000,000. The appropriate "a" and "b" parameters and the "f" factor to use for calculating the standard error for the estimate are found in table C-3. They are

$$a = -0.0001340, b = 7{,}514, f = 0.52$$

From table C-5,

$$s = 859{,}000$$

Using formula (1), the approximate standard error is

$$s_x = 0.52(859{,}000)$$
$$\doteq 447{,}000$$

The 90-percent confidence interval is from 30,264,685 to 31,735,315. 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 (2), the approximate standard error is

$$= s_x\sqrt{(-0.0000848)\,(30{,}287{,}000)^2 + (4755)\,(30{,}287{,}000)}$$
$$\doteq 323{,}000$$

The 90-percent confidence interval is from 30,468,665 to 31,531,335.

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-3 indicated by the numerator.

Calculate the approximate standard error, $s_{(x,p)}$, of an estimated percentage p using 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 children in child care centers.

In this formula, f is the appropriate "f" factor from table C-3 and s is obtained by interpolation from table C-6.

Alternatively, approximate it by the formula:

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

from which the standard errors were calculated in table C-6 . 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-3 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, the SIPP estimate of the number of children under age 15 is 56,000,000. Of these, 50.0 percent had working mothers in Fall 1991. Using formula (3) and the "f" factor of 0.52 from table C-3 and s from table C-6, the approximate standard error is

$$s_{xp} = 0.52(1.10)$$
$$= 0.57\%$$

Consequently, the 90-percent confidence interval is from 49.1 percent to 50.9 percent.

Using formula (4) and the "b" parameter of 7,514 from table C-3, the approximate standard error is

$$s_{xp} = \sqrt{\frac{7{,}514}{56{,}000{,}000}(50)(50)}$$
$$= .58\ \%$$

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, we assume r is 0.

Illustration. Suppose that we are interested in the difference in the percentage of children living with unemployed mothers versus unemployed fathers. Of the 34,198,000 children living with their mothers, 4 percent had mothers who were unemployed. Of the 1,301,000 children living with their fathers, 7 percent had fathers who were unemployed.

Using the appropriate "b" parameter from table C-3 and formula (4), the standard errors for the children living with unemployed mothers and fathers are .29 and 1.94 percent, respectively.

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

$$s_{(x-y)} = \sqrt{(.29)^2 + (1.94)^2 - 2(0)(.29)(1.94)} = 1.96 \qquad (6)$$

Suppose 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 3 percent to the product 1.96 x 1.645 = 3.22 percent. Since the percent difference is not more than 1.645 times the standard error of the difference, the data does not support the hypothesis that the 2-percent estimates are significantly different at the 10 percent level.

Table C-2. **1992 CPS Coverage Ratios**

Age	Non-Black		Black		All persons		
	Males	Females	Males	Females	Males	Females	Total
0 to 14	0.963	0.965	0.927	0.926	0.957	0.959	0.958
15	0.962	0.949	0.899	0.919	0.952	0.944	0.948
16	0.969	0.936	0.923	0.907	0.962	0.932	0.947
17	0.981	0.975	0.945	0.862	0.975	0.957	0.966
18	0.939	0.926	0.883	0.846	0.930	0.913	0.922
19	0.860	0.872	0.754	0.801	0.844	0.861	0.853
20 to 24	0.913	0.927	0.734	0.832	0.889	0.913	0.901
25 to 26	0.927	0.940	0.688	0.877	0.897	0.931	0.914
27 to 29	0.910	0.954	0.707	0.864	0.885	0.941	0.914
30 to 34	0.893	0.948	0.691	0.883	0.870	0.939	0.905
35 to 39	0.910	0.949	0.763	0.899	0.895	0.942	0.919
40 to 44	0.929	0.951	0.824	0.906	0.919	0.946	0.933
45 to 49	0.956	0.966	0.903	0.956	0.951	0.965	0.958
50 to 54	0.940	0.961	0.807	0.877	0.927	0.951	0.940
55 to 59	0.944	0.941	0.826	0.825	0.932	0.928	0.930
60 to 62	0.965	0.956	0.792	0.850	0.948	0.944	0.946
63 to 64	0.905	0.907	0.669	0.872	0.884	0.903	0.894
65 to 67	0.935	0.979	0.783	0.875	0.921	0.969	0.947
68 to 69	0.925	0.942	0.789	0.831	0.913	0.931	0.923
70 to 74	0.926	0.993	0.856	1.014	0.920	0.995	0.962
75 to 99	0.977	0.989	0.764	0.912	0.961	0.983	0.975
15+	0.928	0.953	0.782	0.883	0.912	0.944	0.929
0+	0.936	0.955	0.827	0.895	0.923	0.947	0.935

Table C-3. **SIPP Generalized Variance Parameters for 1991, 1990, 1988, 1987, 1986, and 1985 Panels**

Characteristics	a	b	f
1991 Panel			
0 to 14 child care	-0.0001340	7,514	0.52
Family child support[1]	-0.0000883	9,286	0.58
Female, 16+ income and labor force	-0.0000778	7,514	0.52
1990 Panel			
0 to 14 child care	-0.0000867	4,890	0.42
Family child support[1]	-0.0000612	6,043	0.47
Female, 16+ income and labor force	-0.0000547	4,890	0.42
1988 Panel			
0 to 14 child care	-0.0000848	4,755	0.42
Family child support[1]	-0.0000468	4,522	0.41
Female, 16+ income and labor force	-0.0000468	4,522	0.41
1987 Panel			
0 to 14 child care	-0.0001110	5,772	0.46
Family child support[1]	-0.0000645	5,773	0.46
Female, 16+ income and labor force	-0.0000645	5,773	0.46
1986 Panel			
0 to 14 child care	-0.0001173	6,077	0.47
Family child support[1]	-0.0000679	6,075	0.47
Female, 16+ income and labor force	-0.0000679	6,075	0.47
1985 Panel			
0 to 14 child care	-0.0001155	5,980	0.47
Family child support[1]	-0.0000669	5,980	0.47
Female, 16+ income and labor force	-0.0000669	5,980	0.47

[1]This parameter includes Family Child Care Expenses.

Table C-4. **CPS Variance Parameters for 1977 and 1991**

Characteristics	a	b
June 1977		
0 to 14 child care	-0.000202	3,082
March 1991		
Children 0 to 14	-0.000026	4,785

Table C-5. **Standard Errors of Estimated Numbers of Persons**

[Numbers in thousands]

Size of estimate	Standard error	Size of estimate	Standard error
200	74	12,000	558
300	91	14,000	600
500	117	16,000	639
600	128	18,000	675
800	148	20,000	708
1,000	165	25,000	783
2,000	233	30,000	847
3,000	285	31,000	859
5,000	366	34,000	893
6,000	400	35,000	904
8,000	460	56,000	1,084
10,000	512	57,000	1,091

Table C-6. **Standard Errors of Estimated Percentages of Persons Estimates**

Base of estimated percentage (thousands)	Estimated percentages					
	$\leq$ 1 or $\leq$ 99	2 or 98	5 or 95	10 or 90	25 or 75	50
200	3.68	5.17	8.06	11.09	16.01	18.48
300	3.00	4.23	6.58	9.05	13.07	15.09
500	2.33	3.27	5.10	7.01	10.12	11.69
600	2.12	2.99	4.65	6.40	9.24	10.67
800	1.84	2.59	4.03	5.54	8.00	9.24
1,000	1.64	2.31	3.60	4.96	7.16	8.27
2,000	1.16	1.64	2.55	3.51	5.06	5.84
3,000	0.95	1.34	2.08	2.86	4.13	4.77
5,000	0.74	1.03	1.61	2.22	3.20	3.70
6,000	0.67	0.94	1.47	2.02	2.92	3.37
8,000	0.58	0.82	1.27	1.75	2.53	2.92
10,000	0.52	0.73	1.14	1.57	2.26	2.61
12,000	0.47	0.67	1.04	1.43	2.07	2.39
14,000	0.44	0.62	0.96	1.33	1.91	2.21
16,000	0.41	0.58	0.90	1.24	1.79	2.07
18,000	0.39	0.55	0.85	1.17	1.69	1.95
20,000	0.37	0.52	0.81	1.11	1.60	1.85
25,000	0.33	0.46	0.72	0.99	1.43	1.65
30,000	0.30	0.42	0.66	0.91	1.31	1.51
31,000	0.30	0.42	0.65	0.89	1.29	1.48
34,000	0.28	0.40	0.62	0.85	1.23	1.42
35,000	0.28	0.39	0.61	0.84	1.21	1.40
56,000	0.22	0.31	0.48	0.66	0.96	1.10
57,000	0.22	0.31	0.48	0.66	0.96	1.10
80,000	0.18	0.26	0.40	0.55	0.80	0.92
100,000	0.16	0.23	0.36	0.50	0.72	0.83
150,000	0.13	0.19	0.29	0.40	0.58	0.67
200,000	0.12	0.16	0.25	0.35	0.51	0.58