

# EVALUATION OF OVERSAMPLING THE LOW INCOME POPULATION IN THE 1996 SURVEY OF INCOME AND PROGRAM PARTICIPATION (SIPP)

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## I. INTRODUCTION

The goal of the Survey of Income and Program Participation (SIPP) is to provide policy makers with accurate and comprehensive information about the economic situation of persons and households in the noninstitutionalized U.S. population, particularly the low income population. Over the years, budget constraints fairly regularly dictated reductions in SIPP sample sizes which greatly hindered the ability to conduct meaningful analysis for subgroups such as the low income population and Blacks and Hispanics in poverty.

In response to analysts concerns about the diminished usefulness of the SIPP data to meet its goal, the Census Bureau decided that during the redesign of the SIPP for the 1996 through 2004 panels, an effort should be made to oversample the low income population. Screening interviews to obtain an oversample component is generally thought to be the most efficient oversampling technique. However it is also one of the most expensive. With a tight and uncertain budget for SIPP, the Bureau decided to make use of the 1990 decennial census information available on the sampling frame to assign the universe of addresses into two strata, one with a higher proportion of poverty than the other. We then selected sample disproportionately higher in the high poverty stratum.

Our primary concern with this approach was whether the stratification would be stable enough over time -- 6 years from the decennial data collection to fielding the 1996 SIPP -- to provide enough of an oversample to meet analytical needs.

The purpose of this paper is to examine the success of this oversampling approach and to make some inferences about whether an expensive screening operation would have been more efficient for the 1996 SIPP. In the text below, we first describe the oversampling methodology utilized in the SIPP redesign. We then present the data analysis for the 1996 panel and some results from the success of the National Health Interview Survey screening approach in obtaining an oversample of Blacks and Hispanics. We conclude with remarks about the expectations of success in oversampling the low income population for the 2000 and 2004 SIPP panels using the current methodology.

## II. OVERSAMPLING METHODOLOGY

The complete sampling frame for the SIPP consists of four major sub-frames, three of which originate from the development of address and special quarters listings for the 1990 Decennial Census of Population and Housing. The four sub-frames are:

- **Unit** -- List of housing units in census blocks that contained a high proportion of complete addresses and are covered by building permit offices.
- **Area** -- List of housing units and group quarters in census blocks that contained a high proportion of incomplete addresses in the 1990 census, or are not covered by building permit offices. These blocks are listed and sampled in the field prior to survey interviewing.
- **New Construction** -- New construction permits obtained from building permit offices across the U.S. This frame captures new construction after the decennial census.
- **Group Quarters** -- List of group quarters in census blocks that contained a sufficient proportion of complete addresses or were covered by building permit offices. Examples of group quarters are boarding houses, hotel rooms, and institutions.

Only the addresses in the unit and area frames were stratified and oversampled. These two frames contribute about 90% to the total SIPP sample. New construction and group quarter frames were not oversampled in the 1996-2004 redesigned SIPP panels. We have very little information on the new construction frame from which to stratify units into poverty and non-poverty strata and group quarters contributes such a small part to the total sample, the resources to stratify and select and oversample did not seem justified.

Each primary sampling unit (PSU) in the SIPP is comprised of one or more counties. Housing units within each PSU were split into the two strata -- high and low poverty strata. Then, using methodology developed by Joseph Waksberg [Waksberg, 1973], differential sampling rates were derived to optimize the reliability of the proportion of black persons in poverty subject to a fixed sample size and subject to a constraint on the

increase in variance for the proportion of people aged 55 and over.

In the **unit frame**, we had information available at the address level to simply assign addresses to one or the other stratum. For addresses that were part of the decennial census sample component, we used information about their poverty<sup>2</sup> status as of 1989. For addresses that were not part of the census sample, we used auxiliary variables with high correlations to poverty status. If the sample unit had any of the following six characteristics, the unit was assigned to the poverty stratum:

1. Female householder with children under 18 and no spouse present.
2. Living in a central city of a metropolitan statistical area (MSA) and renter with rent < \$300.
3. Black householder and living in a central city of an MSA.
4. Hispanic householder and living in a central city of an MSA.
5. Black householder and householder < age 18 or > age 64.
6. Hispanic householder and householder < age 18 or > age 64.

For the **area frame**, we used block level information about the proportion of people in poverty in the block to assign the whole block to one or the other stratum in each PSU. We used the actual census poverty estimates from the census when available. Otherwise we used characteristics 1-6 above to estimate a poverty statistic for the block. The process of assigning blocks to strata was an iterative process. We first ranked the blocks by the proportion of persons in poverty. Then we iteratively added one block to the high poverty stratum -- stratum 1 and assigned the remaining blocks in the low poverty stratum -- stratum 2, calculating estimates and variances for 35 evaluative variables to examine how they would be affected by the oversampling. A stratification that appeared optimal was then selected for the PSU. This included evaluation of the decreases in variance for poverty and poverty related characteristics compared to increases in variance for other characteristics such as the aged 55 and over population. A variety of within-PSU stratifications were reviewed and the "optimal" stratification was selected on a PSU by PSU basis.

After reviewing the different sampling rates by strata for each PSU, we decided that we probably were not gaining much additional reliability with such a large number of different sampling rates (two for each PSU in sample) and decided to apply only one sampling rate across the board to select units from the high poverty stratum and only one sampling rate for units in the low poverty stratum.

The results of this application in the unit and area frame using census information to estimate poverty for all redesigned samples is as follows:

***Sample persons in stratum 1 (high poverty)***

*34.97%*

***Sample persons in stratum 2 (low poverty)***

*65.03%*

***Population below 150% poverty in stratum 1***

*54.22%*

***Population below 150% poverty in stratum 2***

*10.40%*

***Sample persons below 150% poverty in stratum 1***

*18.96%*

***Sample persons below 150% poverty in stratum 2***

*6.76%*

***Sample persons below 150% poverty***

*25.72%*

Using 1990 Decennial Census data, the national poverty rate at 150% of the poverty threshold was approximately 21%, which implies the initial oversampling produced a 18% increase in the number of cases in and near poverty -- a substantial increase. However, we realized that over time, the stratification based on decennial data would break down as poverty addresses became non-poverty and vice-versa. Using Annual Housing Survey data, we researched how the stratification might deteriorate over time to assess whether the approach would break down unacceptably over a 4-6 year period until the 1996 SIPP would be fielded. We found some deterioration, but the end gains in poverty sample for blacks (which was our primary oversampling goal) was expected to remain significant leading us to implement the oversampling approach. [Weller, 1992] Table 1 provides the expected difference in sample cases between a self-weighting and oversample design for selected characteristics over a 4 year period.

### **III. HOW SUCCESSFUL WAS THE OVER-SAMPLING APPROACH IN SIPP?**

Using data collected in the first interview of the 1996 panel, we tabulated the number of sample cases we obtained for important subgroups under an oversample design. We then simulated the number of sample cases we would have had under a self-weighting design by assuming a constant sampling rate across both within-PSU strata. Comparing these two sets of numbers informs us about the percent increase/decrease in the number of sample cases that resulted in SIPP from oversampling. Tables 2 and 3 provide these numbers for estimates at the household and person level, respectively. The increase in the total number of 150% of poverty sample cases for households and persons was about 8%, certainly a significant increase that is even higher than the 4% we

projected and show in table 1 for a shorter deterioration period.

The true gains are found in the subgroup estimates, such as Blacks and Hispanics in poverty where we see a gain in the number of sample cases as high as 24%. It is also pleasing to see the increase in AFDC and Food stamp households. The number of cases with income in the 35K to 49,999 range and the number of cases of persons 55+ were not seriously affected.

Overall, the gains are quite substantial, considering no costly screening operation was utilized and the fact that the data used for stratification was 7 years old by the time the sample was fielded. At the time of sample selection, about 26% of the sample cases were in poverty (<150%). 1996 Wave 1 results currently show 30% of the sample cases to be in poverty. But this is due in part to an observed increase in the poverty rate. Adjusting for this increase by fixing the poverty rate to the 1990 21%, approximately 23% of the sample cases are at or below poverty. Stratification over time for the total in poverty held up reasonably well, with the true gains found in the subgroup estimates as discussed above.

#### **IV. HOW DOES THE SIPP APPROACH COMPARE TO THE HIS SCREENING IN TERMS OF EFFICIENCY AND COST?**

The National Health Interview Survey (NHIS) sponsored by the National Center for Health Statistics (NCHS) and conducted by the U.S. Census Bureau also implemented oversampling in the 1990 sample redesign of the survey which began fielding in 1995. The new NHIS sample was designed to oversample Blacks and Hispanics. It combined oversampling at the time of sample selection and screening by field representatives prior to interview. Variable cluster sizes were used for the initial sample selection so that field representatives would have efficient workloads after screening. NHIS assigned every block to one of 20 strata based on Black and Hispanic population density from the 1990 decennial census. Sampling rates, cluster sizes, and nonminority retention rates varied by stratum.

The goal of the oversampling design was to continue the oversampling of Black people at the same rate as in the 1980 NHIS oversample design (an effect of a 41% increase in the sample of blacks) and for a new oversampling of Hispanics at a rate high enough so that the precision for Hispanic estimates would be comparable to that for Black estimates.

To increase the numbers of Blacks and Hispanics in the sample, the initial sample is larger than the 1980 design sample. The new design is intended to cost the same as the 1980 design, so to pay for the increased numbers of Blacks and Hispanics, some housing units containing no Blacks or Hispanics receive only a brief

screening interview and are then dropped from sample.

How much more did NHIS cost due to the screening component? The total cost was fixed.

In determining how much the initial sample could be increased and how many housing units containing no Blacks or Hispanics could be retained, a key assumption was made three screening interviews could be done for the cost of one complete interview. Normally, 62,000 cases per sample designation would be sent out to obtain 50,000 interviews. With screening 71,000 cases were sent out from expected 42,000 completed interviews. In terms of reliability, the NHIS lost 29% of the nonminority (Non-Black, Non-Hispanic) sample. This is a substantial loss in reliability which would be unacceptable to the multiple purposes of the SIPP. However, it meets the minority reliability goals in the NHIS.

Based on the first and second quarter data from the 1995 NHIS, results show that the NHIS is getting 13% fewer Black sample units than desired, but getting 6% more Hispanics than expected. Compared to a self weighting design, the sample has 11% more blacks and 63% more Hispanics.

SIPP is getting 17% more Blacks 16+ which is comparable to the NHIS results and 11% more Hispanics with the oversampling approach used to optimize sample for subgroups in poverty. The increases for Hispanics in SIPP are certainly not as high as the NHIS target, but they are substantial.

#### **V. OVERSAMPLING FOR FUTURE SIPP PANELS**

Oversampling in the 1996 SIPP appears to be a success in that we obtained a substantial oversample of low income households, particularly in the minority subgroups which was our primary goal. Also, we did not seriously affect the variance of other non-poverty characteristics, which is important to the multi-purpose nature of the SIPP program.

Samples for the SIPP 2000 and 2004 panels were also selected during 1990 sample redesign to include an oversample of low income households similar to the 1996 sample. It basically costs nothing at this point to implement the oversample, so it is not likely to be eliminated.

In the next five years, as welfare reform mandates and government policies change, we may find the need to boost the poverty sample even more. If so, what are our options?

A. First of all, we can learn from the SIPP and NHIS experiences about the deterioration of stratification over time at the housing unit, block, and cluster level. There are some modifications to sample already designated that can take advantage of this which would involve

reassignment of already designated sample rather than selecting all new sample which is so costly.

B. Screening is certainly an option. To designate sample for screening would require selecting additional sample either from the original sampling frame or existing reserve sample or using a field procedure. This would require a budget increase for the SIPP to cover the additional screening interviews, or a general sample cut that would then allow for more oversampling of important groups.

C. We can also combine the two -- taking advantage of stratification information and applying a screening operation similar to the NHIS approach. We will have more information about stratification over time from the NHIS and the SIPP over the next few years to help decide the best approach if we feel we need to boost the poverty sample even more in the 2000 and 2004 SIPP panels.

The SIPP program does not have one goal, it has many conflicting goals. Boosting the poverty sample too much hurts other characteristics and has not been the primary focus in past sample designs. Thus the NHIS approach would not currently be acceptable to the SIPP program. The changing policy and political environments, and our experiences with analyzing the 1996 data as it becomes available will certainly drive the oversampling decisions for the 2000 and 2004 panels.

#### NOTES

1. The views expressed are attributable to the authors and do not necessarily reflect those of the U.S. Bureau of the Census.
2. Poverty in this paper refers to those people in families that have income less than 150% of the poverty threshold unless otherwise noted.

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**TABLE 1. EXPECTED DIFFERENCES IN SAMPLE SIZE BETWEEN SELF-WEIGHTING AND OVERSAMPLE DESIGNS--4 YEAR DETERIORATION PERIOD**

Subgroup	AFDC Hhs	Food Stamp Hhs	Social Security Hhs	SSI Hhs	Persons <150% of Poverty	Black Persons <150% of Poverty	Hispanic Persons <150% of Poverty	Persons 55 +
<b>Expected Difference</b>	6.5%	7.1%	3.2%	8.8%	4.3%	17.5%	18.7%	0.0%

**TABLE 2. SAMPLE SIZES FOR SELF-WEIGHTING AND OVERSAMPLE DESIGNS IN THE 1996 SIPP PANEL - HOUSEHOLDS**

	Self-Weighting Design	Oversample Design	Percent Difference
<b>Total Households (Hhs)</b>	36,730	36,730	
Hhs<150% of Poverty	9,451	10,239	<b>8.34%</b>
Black Headed Hhs <150% of Poverty	1,819	2,229	<b>22.54%</b>
Hispanic Headed Hhs <150% of Poverty	1,263	1,474	<b>16.71%</b>
Female Headed Hhs< 150% of Poverty	5,659	6,221	<b>9.93%</b>
Hhs <100% of Poverty	5,737	6,317	<b>10.11%</b>
Black Headed Hhs < 100% of Poverty	1,250	1,549	<b>23.92%</b>
Hispanic Headed Hhs < 100% of Poverty	843	1,001	<b>18.74%</b>
Female Headed Hhs< 100% of Poverty	3,535	3,976	<b>12.48%</b>
AFDC Hhs	1,287	1,511	<b>17.40%</b>
Food Stamp Hhs	3,128	3,609	<b>15.38%</b>
Social Security Hhs	10,476	10,488	<b>0.11%</b>
SSI Hhs	1,730	1,967	<b>13.70%</b>
Black Headed Hhs	4,175	4,907	<b>17.5%</b>
Female Headed Hhs	16,465	16,874	<b>2.5%</b>
Hispanic Headed Hhs	2,794	3,114	<b>11.4%</b>
Female Headed Hhs, no Spouse Present Living with Relatives	274	293	<b>6.9%</b>
Hhs with Income 35K to 49,999K	5,828	5,694	<b>-2.3%</b>
Hhs with Income 50K to 74,999K	5,873	5,586	<b>-4.89</b>
Hhs with Income 75K+	4,863	4,516	<b>-7.2%</b>

**TABLE 3. SAMPLE SIZES FOR SELF-WEIGHTING AND OVERSAMPLE DESIGNS IN THE 1996 SIPP PANEL - PERSONS**

	<b>Self-Weighting Design</b>	<b>Oversample Design</b>	<b>Percent Difference</b>
<b>Total Persons</b>	95,402	95,402	
Persons <150% of Poverty	26,266	28,482	<b>8.4%</b>
Black Persons <150% of Poverty	5,496	6,680	<b>21.5%</b>
Hispanic Persons <150% of Poverty	4,948	5,674	<b>14.7%</b>
Persons < 100% of Poverty	15,026	16,663	<b>10.89%</b>
Black Persons < 100% of Poverty	3,569	4,410	<b>23.56%</b>
Hispanic Persons <100% of Poverty	3,173	3,695	<b>16.45%</b>
Persons 55+	19,711	19,340	<b>-1.88%</b>
Persons 65+	12,105	11,881	<b>-1.85%</b>
Black 16+	7,951	9,283	<b>16.75%</b>
Hispanic 16+	6,608	7,312	<b>10.65%</b>