EFFECT OF OVERSAMPLING BY POVERTY STATUS IN AN RDD SURVEY

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1. Introduction

The National Survey of America's Families (NSAF) is part of a multi-year study to assess the New Federalism by tracking ongoing social policy reforms and relating policy changes of the status and well-being of children and adults. The major objective of the study is to assess the effects of the devolution of responsibility for major social programs such as Aid to Families with Dependent Children from the federal to the state level. The NSAF is collecting information on the economic, health, and social dimensions of well-being of children, non-aged adults, and their families in 14 sites that will be intensively studied as part of the project, and in the balance of the nation to permit national estimates. The 14 sites, which account for about 50 percent of the country's population, were selected to provide variation in terms of size and geographic location, the dominant political party, and key baseline indicators of well-being and fiscal capacity. Low-income families were oversampled because the policy changes of interest are anticipated to affect them most. The initial round of the NSAF took place in 1997 and a follow-up round is planned for 1999. There are two rounds of case studies in parallel with the survey to provide a detailed understanding of the policy changes occurring in each of the 14 sites. The entire study is being directed by The Urban Institute and Child Trends and is being funded by a consortium of foundations, led by the Annie E. Casey Foundation. Westat is responsible for sampling, data collection, processing, and related activities.

The NSAF is a dual frame survey. The main component is a random digit dialing (RDD) survey of households with telephones. The second component is a supplementary area sample, selected at a lower sampling rate, that was conducted in person for those households that do not have a telephone. This design permitted the use of low cost RDD interviewing for most of the survey while also insuring coverage of households without telephones. See Waksberg et al (1997) and Westat (1998, in press) for details.

The data collection for the RDD component required two contacts for many households. During the first contact (screening interview), high income households were subsampled and households with only persons 65 and over were deleted from the sample. If the household was retained in the sample, we conducted an extended interview either at that time or at a later point in time. During the extended interview, data about specific individuals were collected.

This paper analyzes the consistency of income classification (above or below 200 percent of the poverty level) between the initial screening interview and the extended interview. The main conclusion is that a high proportion of households with children, and of children and adults, are classified differently in the two interviews. The inconsistency was greater than what was expected, based on experience in an earlier survey. This resulted in smaller nominal and effective sample sizes for number of low income households with children than was planned in the RDD portion of the survey.

The next two sections of the paper discuss the target sample sizes for the survey and provide details on the subsampling procedure. Section 4 discusses why inconsistency should be expected, and compares NSAF procedures to those of an earlier survey that was used as a predictor. Section 5 presents the misclassification rates that were experienced. The final sections discuss the effect of the misclassification on sample sizes and summarize the paper.

2. Target Sample Sizes

For the NSAF, sample sizes and allocation decisions were largely based on desired effective sample sizes for specific populations. During the sample design, nominal and effective sample sizes were set for households with children and households with children below 200 percent of the poverty threshold by site for the area sample, the telephone sample, and for the combined area and telephone samples. (See Table 1). The magnitude of the sample size was determined in order to achieve reliable estimates and to obtain a specified minimal detectable difference. To determine the required sample sizes we used several assumptions. These assumptions included expected residential rates, screener and extended response rates, and eligibility rates. (See Westat, 1998, in press).

3. Subsampling of Nonpoor Households

Screener interviews were conducted to make a preliminary determination of poverty status. The screener obtained information on number of persons living in the household and presence of children and/or persons age 64 or younger. Based on this information, predetermined ranges of income were asked to determine whether the household was below the 200 percent poverty threshold. Households above this threshold were subsampled at a specified rate, since conducting extended interviews for all households would have been inefficient and costly. The rate of subsampling for high-income households was determined at the design stage in order to obtain the required effective sample sizes for poor children. It was also necessary in the actual implementation of the survey to subsample households for which the poverty level could not be determined. These households were subsampled at a higher rate than the high-income households were. The inclusion of this additional stratum (unknown poverty status) for subsampling was not considered during the design of the sample.

4. Switching of Poverty Status

During the sample design, it was recognized that a simple screening process would not always provide the correct classification of the households as poor or nonpoor. A portion of households screened as poor was expected to "switch" to nonpoor status during the extended interview, and some households screened as nonpoor were expected to "switch" to poor status, for the following reasons:

1. More detailed questions about income were asked in the extended interview than in the screener interview.
2. The definition for misclassification (switching) we used during the sample design does not reflect accurately the actual mechanism used to determine the poverty level in the survey. In the NSAF, during the screener interview we determined the poverty level at the household level. In contrast, during the extended interview, the poverty level was assessed for the <u>family</u>. The definition of misclassification as described above is valid for single family households where the poverty assessment is the same for the family and the household. However, the definition of misclassification does not have meaning for multiple family households, especially in cases where families within the households are classified at a different poverty level from the one

assessed for the household during the screener interview. Note also that the determination of the income level of the family is dependent on the family definition. During the sample design, we assumed that there were not multiple family households.

3. Extended interviews were conducted as much as three or four months after the screener interviews. In that period, family and household composition could have changed, as well as the income for individual persons.

Cantor and Wang (1998) discuss characteristics correlated with high switching rates and reasons for switching in more detail.

Since misclassification is a major factor in determining the actual sample size necessary to achieve the desired effective sample size, the design included an assumed rate of misclassification. We used a simplified rate of misclassification (or switching) derived from the Continuing Survey of Food Intake Interview (CSFII), conducted by Westat for the Department of Agriculture in 1994 and 1995.

The CSFII definition of low income used a threshold of 130 percent of poverty rather than the 200 percent threshold used in the NSAF. CSFII differed in a number of other ways from NSAF, such as: The extended interview was always conducted immediately after the screening interview, poverty was determined at the household and not the family level in the extended interview, and CSFII used different imputation methods for missing income. Even so, we assumed that NSAF would achieve misclassification rates similar to those in CSFII. Thus, we assumed that 15 percent of the poor would be screened as nonpoor and 3 percent of the nonpoor households would be screened as poor. We also assumed that these rates were constant across sites.

5. Analysis of Observed Results

Switching rates are presented for both households with children and for persons (children and adults, separately).

A household weight was determined for households with children in which at least one extended interview was completed. This weight was post-stratified to the total number of households in the site. Using this weight, we can estimate the expected number of households in each of the subsampling strata (sampled as poor, sampled as nonpoor and sampled as unknown).

In some households, which contain more than one family, one family may be low income and one family not low income according to the extended

470

interview. Thus, there is some ambiguity as to whether the household as a whole is categorized the same or different than in the screening interview. These few cases are treated as having switched poverty status between the screening and extended interviews. In addition, The Urban Institute imputed the poverty status for a number of families for which the status could not be assessed at the extended interview.

The observed rates of misclassification for households with children are presented in Table 2. Estimates are based on weighted estimates. The last row of the table provides the rates for CSFII, which were assumed in planning.

As an example of what the first set of columns means, consider the second last set of rows (providing national average data for NSAF). It shows that of all households with children in the country, which are classified as poor in a screening interview, an estimated 24 percent are classified as nonpoor in a detailed extended interview. The second set of columns for the same set of rows show that an estimated 19 percent of all households with children that are classified as poor in the extended interview are classified as nonpoor in the screening interview. The rate of misclassification for both low-income and high income, shown in the second last set of rows of the table, is much higher than anticipated, as shown in the last set of rows for CSFII. Although misclassification rates vary across the sites, they are always greater than for CSFII.

Table 3 shows switching rates at the person level, separately for children and adults. Only selected states are shown due to space limitations. Child level rates are fairly similar to rates for households with children. Adult level rates differ considerably from child level rates, with the worst misclassification rate (31 percent) for those screened as poor but determined to be nonpoor in the extended interview.

6. Effect on Sample Sizes

Table 1 shows how both nominal and effective sample sizes for the RDD sample were affected by the higher than expected switching rates. The columns labeled "With actual switching rates" account only for the effect of the observed switching rates. They are not the true achieved sample sizes, which were affected by differences in response rates and in number of telephone residential households as well as by switching rates. The table shows that the high switching rates had substantial effects on poor households for nearly every site, but the effect on total households was small.

7. Summary

NSAF utilized a screening procedure to classify households into a low income or a high income stratum, with all low income households retained for detailed interviews and only a subsample of the high income households retained. Previous experience with similar screening for CSFII turned out to be a poor predictor of the consistency of classification between screener and detailed interviews in NSAF. Switching between income classifications in NSAF was quite high. For example, of those children screened as being in families below 200 percent of the poverty level, about 21 percent were classified as being in families above 200 percent of the poverty level in the detailed interviews.

Subsampling rates of between ¼ and 2/5, depending on site, were used for NSAF. These were empirically determined, based on the CSFII switching rates. For Cycle II of NSAF, subsampling rates over ½ will be used, based on the high switching rates experienced. With better cost information now available, a standard optimization formula (Hansen et al, 1953) is being applied. The definition of the cost variables in this formula is tricky. Judkins (1998) gives the following formula for the optimal subsampling fraction f_2:

$$f_2 = \sqrt{\frac{\varphi}{1-\varphi} \frac{p'}{(1-\varphi)(1-p')}\left(1 + \frac{c_s}{c_i p'}\right)}.$$

φ is the false negative rate in the screening;

p' is the proportion of households determined to have low income in the screener interview;

c_s is the cost of all screener interviews required to find one cooperative household containing children; and

c_i is the marginal cost of an extended interview with one household after screening is complete.

The NSAF experience indicates that it can be difficult to achieve high consistency in income classification between a brief screening interview and a more detailed interview done possibly at a later time. For other surveys in which similar procedures are to be used, the NSAF experience serves as a warning against using small subsampling rates for the high income stratum. One should expect substantial losses in effective sample sizes from such a methodology, as illustrated in Table 1. If a planned survey is more

471

similar in execution to CSFII than to NSAF, then the lower switching rates of CSFII may apply.

8. References

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Table 1.   Sample size requirements for the RDD component of the NSAF

Site	Nominal sample size					
	Low income households with children			Households with children		
	With expected switching rates	With actual switching rates	Shortage or surplus	With expected switching rates	With actual switching rates	Shortage or surplus
Alabama	930	833	-97	1,600	1,637	37
California	936	921	-16	1,600	1,679	79
Colorado	988	713	-275	1,800	1,737	-63
Florida	1,003	869	-133	1,700	1,696	-4
Massachusetts	1,014	814	-200	2,100	2,090	-10
Michigan	984	713	-271	1,800	1,755	-45
Minnesota	1,006	716	-291	1,900	1,874	-26
Mississippi	992	919	-73	1,500	1,831	331
New Jersey	1,068	806	-262	2,300	2,258	-42
New York	969	965	-4	1,800	1,901	101
Texas	1,106	981	-124	1,800	1,813	13
Washington	985	772	-213	1,800	1,775	-25
Milwaukee	1,000	645	-354	1,800	1,724	-76
Bal. Wisconsin	1,008	818	-191	1,800	1,515	-285
Bal. US	1,411	1,157	-255	2,500	2,479	-21
Sum of all sites	15,399	12,640	-2,759	27,800	27,765	-35
Percentage			-17.92%			-0.13%
	Effective sample size					
Alabama	834	738	-96	1,328	1,364	36
California	800	770	-30	1,239	1,303	63
Colorado	857	694	-163	1,315	1,331	16
Florida	826	608	-219	1,596	1,614	18
Massachusetts	841	575	-266	1,410	1,404	-6
Michigan	820	542	-278	1,415	1,417	2
Minnesota	830	567	-263	1,687	1,703	16
Mississippi	828	803	-25	1,414	1,488	74
New Jersey	945	821	-124	1,383	1,411	28
New York	842	629	-213	1,410	1,413	3
Texas	890	686	-204	1,231	1,357	127
Washington	814	487	-327	1,326	1,305	-22
Milwaukee	821	734	-87	1,324	1,254	-70
Bal. Wisconsin	845	578	-267	1,409	1,391	-18
Bal. US	1,206	950	-256	1,948	1,954	6
Sum of all sites	12,999	10,182	-2,818	21,435	21,709	273
Percentage			-21.67%			1.27%

Table 2.   Observed switching rates for households with children

Site	Detailed interview	Sampled as (% columns)			Sampled as (% rows)			
		Poor	Nonpoor	Unknown	Poor	Nonpoor	Unknown	TOTAL
Alabama	Poor	78.52	9.72	47.55	77.31	15.87	6.82	100.00
	Nonpoor	21.48	90.28	52.45	12.01	83.71	4.27	100.00
	TOTAL	100.00	100.00	100.00				
California	Poor	79.39	9.96	63.26	73.25	15.57	11.18	100.00
	Nonpoor	20.61	90.04	36.74	11.44	84.66	3.9	100.00
	TOTAL	100.00	100.00	100.00				
Colorado	Poor	70.98	7.95	43.14	70.5	21.54	7.95	100.00
	Nonpoor	29.02	92.05	56.86	9.98	86.39	3.63	100.00
	TOTAL	100.00	100.00	100.00				
Florida	Poor	76.29	14.17	52.54	65.76	24.89	9.34	100.00
	Nonpoor	23.71	85.83	47.46	11.38	83.92	4.7	100.00
	TOTAL	100.00	100.00	100.00				
Massachusetts	Poor	68.53	7.84	45.05	63.77	24.9	11.33	100.00
	Nonpoor	31.47	92.16	54.95	8.72	87.17	4.12	100.00
	TOTAL	100.00	100.00	100.00				
Michigan	Poor	69.88	8.49	31.38	70.33	22.51	7.16	100.00
	Nonpoor	30.12	91.51	68.62	10.5	84.07	5.43	100.00
	TOTAL	100.00	100.00	100.00				
Minnesota	Poor	65.49	6.93	28.50	72.33	22.81	4.86	100.00
	Nonpoor	34.51	93.07	71.50	10.68	85.9	3.42	100.00
	TOTAL	100.00	100.00	100.00				
Mississippi	Poor	76.03	9.52	64.21	77.87	12.55	9.57	100.00
	Nonpoor	23.97	90.48	35.79	16.46	79.97	3.58	100.00
	TOTAL	100.00	100.00	100.00				
New Jersey	Poor	65.78	6.22	41.60	60.97	24.25	14.78	100.00
	Nonpoor	34.22	93.78	58.40	7.58	87.46	4.96	100.00
	TOTAL	100.00	100.00	100.00				
New York	Poor	77.36	8.93	58.46	72.32	16.39	11.29	100.00
	Nonpoor	22.64	91.07	41.54	10.77	85.14	4.08	100.00
	TOTAL	100.00	100.00	100.00				
Texas	Poor	80.74	9.48	53.62	74.7	15.68	9.62	100.00
	Nonpoor	19.26	90.52	46.38	10.13	85.14	4.73	100.00
	TOTAL	100.00	100.00	100.00				
Washington	Poor	73.51	8.33	37.45	72.15	20.55	7.3	100.00
	Nonpoor	26.49	91.67	62.55	9.83	85.55	4.61	100.00
	TOTAL	100.00	100.00	100.00				
Milwaukee	Poor	77.05	11.80	43.19	67.62	24.85	7.53	100.00
	Nonpoor	22.95	88.20	56.81	9.34	86.07	4.59	100.00
	TOTAL	100.00	100.00	100.00				
Balance of Wisconsin	Poor	64.64	7.05	19.12	72.64	23.49	3.87	100.00
	Nonpoor	35.36	92.95	80.88	10.86	84.67	4.47	100.00
	TOTAL	100.00	100.00	100.00				
Balance of US	Poor	75.37	8.89	37.49	73.64	19.21	7.15	100.00
	Nonpoor	24.63	91.11	62.51	10.33	84.55	5.12	100.00
	TOTAL	100.00	100.00	100.00				

Table 2. Observed switching rates for households with children (continued)

Site	Detailed interview	Sampled as (%) columns			Sampled as (%) rows			
		Poor	Nonpoor	Unknown	Poor	Nonpoor	Unknown	TOTAL
National	Poor	75.82	9.10	44.82	72.67	18.8	8.54	100.00
	Nonpoor	24.18	90.90	55.18	10.47	84.79	4.75	100.00
	TOTAL	100.00	100.00	100.00				
CSFII	Poor	89.00	4.00	0.00	85.00	15.00	0.00	100.00
	Nonpoor	11.00	96.00	0.00	3.00	97.00	0.00	100.00
	TOTAL	100.00	100.00					

Table 3. Observed switching rates at the person level

Site	Detailed interview	Sampled as (%) columns			Sampled as (%) rows			
		Poor	Nonpoor	Unknown	Poor	Nonpoor	Unknown	TOTAL
Children								
California	Poor	84.14	11.08	68.50	76.51	12.42	11.06	100.00
	Nonpoor	15.86	88.92	31.50	12.09	83.64	4.27	100.00
	TOTAL	100.00	100.00	100.00				
New York	Poor	80.55	9.88	64.69	76.73	13.09	10.18	100.00
	Nonpoor	19.45	90.12	35.31	12.91	83.22	3.87	100.00
	TOTAL	100.00	100.00	100.00				
Texas	Poor	83.52	9.70	67.33	77.84	11.72	10.45	100.00
	Nonpoor	16.48	90.30	32.67	11.86	84.23	3.91	100.00
	TOTAL	100.00	100.00	100.00				
Balance of US	Poor	78.61	10.67	41.87	76.65	16.83	6.52	100.00
	Nonpoor	21.39	89.33	58.13	12.21	82.50	5.30	100.00
	TOTAL	100.00	100.00	100.00				
National	Poor	79.33	10.37	50.78	76.22	15.67	8.12	100.00
	Nonpoor	20.67	89.63	49.22	12.18	83	4.82	100.00
	TOTAL	100.00	100.00	100.00				
Adults								
California	Poor	73.20	10.36	55.66	63.38	22.50	14.11	100.00
	Nonpoor	26.80	89.64	44.34	10.13	84.97	4.90	100.00
	TOTAL	100.00	100.00	100.00				
New York	Poor	71.05	7.94	45.48	66.70	18.88	14.41	100.00
	Nonpoor	28.95	92.06	54.52	10.32	83.12	6.56	100.00
	TOTAL	100.00	100.00	100.00				
Texas	Poor	72.90	8.94	50.16	68.92	18.33	12.75	100.00
	Nonpoor	27.10	91.06	49.84	11.38	82.99	5.63	100.00
	TOTAL	100.00	100.00	100.00				
Balance of US	Poor	67.82	8.20	37.12	66.54	23.60	9.86	100.00
	Nonpoor	32.18	91.80	62.88	10.10	84.55	5.34	100.00
	TOTAL	100.00	100.00	100.00				
National	Poor	68.95	8.65	40.92	65.41	23.47	11.12	100.00
	Nonpoor	31.05	91.35	59.08	10.05	84.47	5.48	100.00
	TOTAL	100.00	100.00	100.00				