

NONRESPONSE BIAS ANALYSIS FOR THE 1999–2000 SCHOOLS AND STAFFING SURVEYS (SASS)

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KEY WORDS: Hierarchical Nonresponse, Response Rates

Abstract

A nonresponse bias analysis was conducted for each of the components of the National Center for Education Statistics (NCES) 1999–2000 Schools and Staffing Survey (SASS). The analysis included steps to evaluate the extent of potential bias introduced by school district nonresponse, school principal nonresponse, school library nonresponse, school nonresponse, and teacher nonresponse. Two different approaches were used to examine the potential for bias. First, the unweighted and weighted response rates for each SASS component were examined to find large response rate differences by selected school characteristics among the frame variables. For the public school, public charter school, and BIA school surveys, the selected school characteristics were state, region, community type, school level, and student enrollment. For the private school survey, the selected school characteristics were affiliation, region, NCES typology, community type, school level, and student enrollment. Second, the distributions of respondent units and the distributions of all units in the sampling frame were compared for each SASS component, also for a selected set of school characteristics, because significant differences between the distribution of the respondent units and the frame distribution would suggest a potential bias due to nonresponse. The characteristics used in the different comparisons are as follows. For the school district component: number of schools, number of teachers, and student enrollment in the district. For the teacher component: state, region, community type, school instruction level, student enrollment, affiliation, and NCES typology. For the principal, library, and school components: percentage of minority students, number of teachers, and student enrollment in the school. The results of these analyses are reported in detail in the forthcoming *Nonresponse Bias Analysis for the 1999–2000 Schools and Staffing Survey (SASS)*. Results suggest that there is no evidence to point to a substantial bias due to nonresponse of school districts, principals, libraries, schools, or teachers, even when unit nonresponse is greater than 25 percent.

Introduction

The 1999–2000 Schools and Staffing Survey (SASS) is the fourth in a series of studies of public and private elementary and secondary schools by the National Center for Education Statistics (NCES). Data were also collected in 1987–88, 1990–91, and 1993–94. SASS collects information from several types of respondents—such as school district personnel, public school principals, private school heads, and public and private school teachers. The series provides data on school and teacher characteristics, school operations, programs and policies, teacher demand and supply, and the opinions and attitudes of teachers and school principals about policies and working conditions. The analytic power of the data is enhanced by the ability to link survey data for individual school districts, schools, principals, teachers, and librarians. The data are collected by mail with telephone follow up of nonrespondents. Computer-aided telephone interviewing (CATI) facilities are used extensively for the nonresponse follow up.

The current undertaking is part of a comprehensive effort by NCES to systematically review the quality of SASS data. As such, it is designed to enable users to understand the potential limitations of the 1999–2000 SASS data and to provide managers with information for planning future rounds of SASS. Similar reports on the 1987–88, 1990–91, and 1993–94 SASS include Jabine (1994), Scheuren et al. (1996), and Monaco et al. (1997).

SASS results are affected by two potential sources of error: sampling error and nonsampling error. Sampling errors result from basing survey estimates on a sample rather than all units in the population of interest; sampling errors are published for selected estimates in all reports based on SASS data. In addition, the Salvucci and Weng (1995) report on generalized variance functions provides approximations of sampling errors for all 1990–91 SASS estimates. Nonsampling error includes all errors that are not due to sampling.

This paper is concerned almost exclusively with the most pervasive and challenging source of nonsampling error in estimates from sample surveys; that is, the error associated with incomplete data. The three major sources of incomplete data are item nonresponse, unit nonresponse, and undercoverage.

Nonresponse can arise when a response is not obtained for a sampled unit (e.g., a school, school district, teacher, or principal in SASS) or when a response is missing for an item in an otherwise completed interview. Nonresponse reduces the sample size and thus increases the sampling variance. Nonrespondents may also differ significantly from respondents; thus, the estimate obtained from respondents can be biased and the magnitude of this bias may be unknown. Concerns about bias are generally greater as the rate of nonresponse increases. Undercoverage can arise when units that should be in the frames (e.g., the lists of public and private schools in the United States for SASS) from which a sample is selected are not in those frames, or units in the sample are mistakenly classified as ineligible or are omitted from the sample or from the units interviewed.

One of the reasons that it is so hard to get objective measures of nonresponse bias in the estimates from surveys is the lack of data from nonrespondents. As a result, the nonresponse analysis presented in this paper is limited to frame variables. Thus, this paper focuses on quantifying the extent of unit nonresponse in SASS as well as analyzing the differences in the characteristics of respondents and nonrespondents for different subgroups of the survey populations to provide some indication of the *potential* effects of nonresponse bias.

The remainder of the paper is divided in four sections. Section 2 presents an overview of the SASS 1999–2000 design. Section 3 includes some results of a descriptive analysis of unweighted and base-weighted response rates for all SASS components. In the fourth section, we consider each component of SASS that fails to meet our response rate standard of 75%* and/or in which response rates are non-uniform across levels of the frame characteristics as a general indicator of the potential for nonresponse bias. Hence we compare the distributions of respondent units and of all the units in the sampling frame for each SASS component for a selected set of school characteristics. The Common Core of Data (CCD) serves as the frame for public schools, and the Private School Survey (PSS) as the frame for private schools. Significant differences between the distribution of the respondent units and the frame distribution would suggest a potential bias due to nonresponse. The final

* NCEES requires a minimum response rate of 70% for the analysis and release of survey data. As a result, any survey with unit nonresponse in excess of 30% must be evaluated for potential nonresponse bias before data are released. However, for the purpose of this paper only, we decided to use 75% as the minimum response rate instead of 70%.

section provides highlights of our findings and the conclusion.

Overview of the 1999–2000 SASS Design

The 1999–2000 SASS includes five components: the School District Survey, the School Survey, the School Principal Survey, the Teacher Survey, and the Library Survey. The sample sizes corresponding to each component and sector are presented in the table below.

Table 1: SASS 1999–2000 Component Sample Sizes

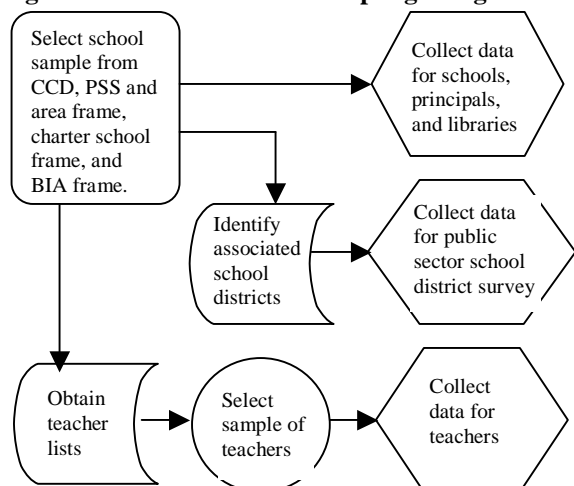
Sector	Component				
	School district	Principal /Head	School	Teacher	School library media center
Public school	5,465	9,893	9,893	56,354	9,893
Private school	N/A	3,558	3,558	10,760	3,558
BIA school	N/A	124	124	506	124
Charter school	N/A	1,122	1,122	4,438	N/A
SASS total	5,465	14,697	14,697	72,058	13,575

N/A = not applicable

A schematic diagram of the sample selection and data collection process is shown in Figure 1 below. The sample selection proceeded in stages:

- 1) Schools were selected first. Each selected school received a school questionnaire, a principal questionnaire, and a library questionnaire.
- 2) For public schools, the school district associated with the selected schools received a school district questionnaire.
- 3) Each selected school received a teacher listing form. A sample of teachers was selected from those forms, and each selected teacher received a teacher questionnaire.

Figure 1: SASS 1999–2000 Sampling Design



Descriptive Analysis

In this step, we analyzed response rates for the Teacher Listing Form and for all SASS components to identify any rates that fell below 75%. Components with rates of 75% or above were not included in the next step of our analysis, testing for potential nonresponse bias.

Response rates in SASS are “final” response rates: No distinction is made between mail and follow-up response. Also, no distinction is made between refusals and non-locatables. Unweighted response rates are defined as the number of in-scope responding questionnaires divided by the number of in-scope sample cases. There are two types of unweighted response rates: 1) the unweighted unit-level response rate and 2) the overall unweighted unit-level response rate. Weighted unit-level response rates are defined in a similar way to the unweighted rates, with the one difference that weighted instead of unweighted numbers are used. The overall weighted response rates are defined as the product of the weighted response rates and the rate at which the sampled schools cooperated.

We started by evaluating the school response rates for the Teacher Listing Form (TLF) file, which is also the frame for the teacher file. No public, Indian, or charter school response rates for the Teacher Listing Form are under 75%; however, private school response rates for the Teacher Listing Form showed three religious affiliations with response rates below 75%: Hebrew Day (70.25%), Other Jewish (71.00%) and American Association of Christian Schools (65.38%). Table 2 shows the unweighted and weighted response rates for the private school teacher component by the following school characteristics: affiliation, NCES typology, region, community type, school level, and student

enrollment. Table 2 also provides the unweighted and weighted number of respondents by the school characteristics listed above, as well as the total rates. Finally, it shows the weighted response rate at each sampling level and the overall response rate. It is clear from Table 2 that the Private School Questionnaires has low response rates for most of selected school characteristics.

Next we focused our attention on the public school district file. Four states have response rates below 75%: Maryland (74.63%), New Hampshire (73.83%), Rhode Island (73.26%), and Vermont (68.89%).

Third, we analyzed the school principal files. The data shows that the Indian school principals and public charter school principals have no response rates below the 75% guideline. For the public school principals, only Maryland (72.54%) has a response rate lower than 75%. For the private school principals, two religious affiliations have lower response rates—Other Jewish (73.74%) and American Association of Christian Schools (71.30%)—and one NCES typology—nonsectarian regular (74.32%).

Fourth, we evaluated the school files. Indian schools and public charter schools have no response rates under 75%. For the public schools, again only Maryland (67.99%) has a response rate lower than 75%. (Figure 2 below provides the weighted overall response rates for the SASS 1999–2000 public school component by state.) Among private schools, a number of lower rates appeared. There are four religious affiliations with lower response rates—Friends (74.67%), Hebrew Day (70.69%), other Jewish (73.42%), and American Association of Christian Schools (66.57%). There is also one NCES typology—nonsectarian regular (74.32%)—one School Instruction level—combined (72.63%)—and one student enrollment category—less than 50 students (74.99%)—with lower rates.

Fifth, we looked at the teacher files, and here we focused on overall rates. Once again, no Indian school teacher overall response rates are under 75%. Among public school teachers, the northeast region has an overall response rate of 69.82%, the central city community type has an overall response rate of 71.58%, the student enrollment category of 1,000 or more students has an overall response rate of 73.85%, and 13 states have overall response rate lower than 75%: California (71.11%), Connecticut (74.35%), the District of Columbia (67.44%), Delaware (71.35%), Massachusetts (74.68%), Maryland (63.70%), Michigan (73.42%), New Jersey (67.72%), Nevada (71.49%), New York (65.39%), Pennsylvania (68.47%), Rhode Island (71.15%), and South Carolina (73.88%). Most of the overall response rates

for the private school teacher component are lower than 75%, as shown in Table 2. Only three religious affiliations and two NCES typology categories have overall response rates higher than 75%. For the public charter school teachers' file, the total overall response rate is 71.86%. Three of the four regions have overall response rates less than 75%: the Northeast (72.55%), South (69.72%), and West (70.69%). Two of the three community types have lower overall response rates: central city (68.40%) and urban fringe/large town (74.97%). All three school levels have lower overall response rates: elementary (73.91%), secondary (70.71%), and combined (70.54%). Three of the five student enrollment categories have overall response rates less than 75%: 100–149 students (71.09%), 150–499 students (70.03%) and 500 or more students (72.52%). Also, three of the six major states (i.e., states with 100 or more respondent teachers) have lower overall response rates: Arizona (69.68%), California (70.35%), and Texas (65.30%).

Finally, we reviewed the response rates across key characteristics for the school library files. The results indicate that the public school libraries and Indian school libraries have no response rate lower than 75% across key characteristics. For the private school libraries, two religious affiliations have lower response rates: Hebrew Day (73.40%) and Other Jewish (74.65%).

Testing for Potential Nonresponse Bias

In this step, we considered each SASS component that failed to meet the 75% guideline and/or in which response rates are non-uniform across levels of the frame characteristics as a general indicator of the potential for nonresponse bias. For that we focused exclusively on the categories of selected variables mentioned above that, for some components, failed to meet the 75% guideline.

The exploratory nature of the analysis began with construction of a 95% confidence interval around the percentage distributions to identify whether or not the distribution of the sample for some given key variables differed significantly from the distribution of the frame for those same key variables. We used the Balanced Repeated Replicate (BRR) method in WesVarPC[®], with replicate weights provided by the Bureau of Census to adjust for the design effect. Thus, the percentage estimates for the samples were compared to the percentage estimates of the frame for a selected set of school characteristics. The frame for public schools is the Common Core of Data (CCD) and the frame for private schools is the Private School Survey (PSS).

The school district component comparison used number of schools, number of teachers, and student enrollment in the district.

The public and charter school principal, school library, and school component comparisons used community type, percentage of minority students, number of teachers, and student enrollment in the school.

The private school principal, library, and school component comparisons used school religious affiliation, NCES typology, region, community type, school instruction level, and student enrollment in the school.

The school characteristics used for the public and charter school teacher comparisons were state, region, community type, school instruction level, and student enrollment.

The school characteristics used for the private school teacher comparison were affiliation, NCES typology, region, community type, school instruction level, and student enrollment.

Our analysis showed a difference between sample and frame for two religious affiliations—Hebrew Day and Other Jewish—in the private school Teacher Listing Form, but that the difference was mainly due to a larger percentage of out-of-scope units in the sample.

For school districts, the sample distribution did not match the frame distribution for the school enrollment variable in Rhode Island, but that was due to small cell sizes. The difference between sample and frame for the public school and public school principals components in Maryland was also due to small cell sizes.

For the private school principals, the difference between sample and frame was due to large numbers and uneven distribution of the out-of-scope units across the categories of variables of interest.

For the private schools, the difference between the sample and the frame can be justified by either small cell sizes or some uneven distribution of the out-of-scope units.

The analysis of the public school teacher file revealed that only Delaware had a different sample distribution than frame distribution, but a closer look at the data showed that of the 18 teachers sampled in schools with less than 50 enrolled students, 16 were out-of-scope, which justifies the difference originally seen.

For the private school teacher file, our analysis showed that a significant difference between sample and frame only occurred in the school level distribution of “others” religious affiliation, in the affiliation distribution of the northeast region, and in the affiliation/region/community type distribution of the student enrollment category of “50 or less

students.” Further analysis of those groups showed that the differences were due to large numbers and uneven distribution of the out-of-scope units across categories of variables of interest instead of nonresponse bias. Our analysis found no significant difference in the charter school teacher file.

For the private school library file, we found a significant difference between sample and frame only in the community type and student enrollment of the “Hebrew Day” religious affiliation, and the region and student enrollment of the “Other Jewish” religious affiliation. Further analysis of those groups showed that the differences were due to small cell sizes in the sample, and not to nonresponse bias.

Summary

In summary, we found that the difference between the sample and frame distributions that were initially identified in the SASS components can be justified by a combination of three effects: small cell sizes, a large number of out-of-scope units, or some uneven distribution of the out-of-scope units across the categories of variables of that we considered. We found no evidence of substantial bias due to nonresponse of school districts, school principals, school libraries, schools, or teachers, even when unit nonresponse is greater than 25%.

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Figure 2. Public School Response Rate by State

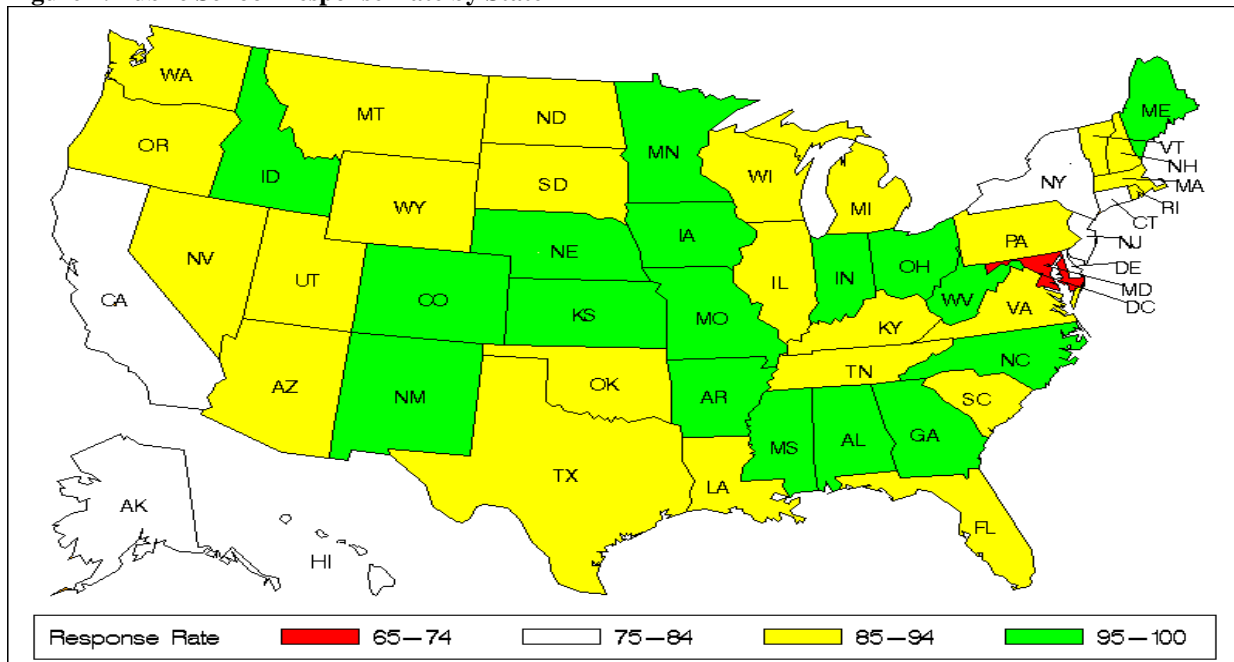


Table 2. SASS Private School Teacher Questionnaire Response Rates, by Affiliation, Typology, and Selected Characteristics

Affiliation, NCES typology, and selected characteristics	Unweighted number of teachers	Unweighted teacher response rate	Weighted number of teachers	Weighted teacher response rate	Weighted TLF school response rate	Weighted overall teacher response rate
Total	7,134	78.87	233,005	77.29	87.02	67.26
Affiliation						
Catholic	2,554	80.75	103,901	79.95	92.55	73.99
Episcopal	249	83.28	6,553	81.05	92.29	74.80
Friends	164	78.85	1,379	77.76	85.33	66.35
Seventh-Day Adventist	202	81.45	3,456	79.79	98.96	78.96
Hebrew Day	107	64.85	1,910	59.84	70.25	42.04
Solomon Schechter	119	74.84	1,056	72.00	89.29	64.29
Other Jewish	104	58.76	3,033	55.89	71.00	39.68
Lutheran, Missouri Synod	339	88.05	8,652	87.13	99.19	86.42
Lutheran, Wisconsin Synod	312	86.43	1,944	85.31	96.89	82.66
Evangelical Lutheran	223	80.51	903	77.48	95.83	74.25
Other Lutheran	127	78.40	240	77.09	87.93	67.79
Christian Schools International	276	87.07	4,360	86.39	88.34	76.32
American Assoc. of Christian Schools	110	73.83	4,243	69.79	65.38	45.63
Assoc. of Christian Schools Internatl.	445	75.68	22,106	75.51	83.47	63.03
Montessori	148	69.81	2,622	68.41	87.20	59.65
Natl. Assoc. of Priv. Sch./Except. Child.	165	84.62	2,484	83.81	88.87	74.48
Independent Schools	516	83.23	23,226	81.86	86.89	71.13
Natl. Indep. Private School Assoc.	131	73.60	1,147	75.40	80.20	60.47
Others	753	72.40	37,771	71.07	82.09	58.34
NCES typology						
Catholic	2,517	80.85	102,296	79.98	93.29	74.61
Parochial	1,101	81.43	49,195	80.32	93.39	75.01
Diocesan	897	80.23	35,608	79.80	93.95	74.97
Private	519	80.72	17,493	79.40	90.37	71.75
Other religious	3,094	78.47	75,394	75.00	89.12	66.84
Conservative Christian	652	74.68	26,691	72.77	83.88	61.04
Affiliated	1,566	80.47	28,602	77.82	92.64	72.09
Unaffiliated	876	77.94	20,101	74.19	91.35	67.77
Nonsectarian	1,294	78.76	47,186	78.12	87.03	67.99
Regular	788	81.32	30,892	80.66	82.48	66.53
Special emphasis	252	68.29	7,542	66.26	88.31	58.51
Special education	254	83.28	8,752	81.64	94.04	76.77
Region						
Northeast	1,759	75.75	61,143	75.03	84.20	63.18
Midwest	2,135	85.06	64,596	83.75	90.63	75.90
South	1,912	76.66	69,720	75.12	84.86	63.75
West	1,328	77.25	37,546	75.03	88.63	66.50
Community type						
Central city	3,214	77.48	107,596	75.69	86.45	65.43
Urban fringe/large town	3,060	79.77	98,165	78.92	85.61	67.56
Rural/small town	860	81.06	27,244	77.98	91.36	71.24
School level						
Elementary	3,767	80.13	120,546	79.27	90.84	72.01
Secondary	1,684	80.65	40,507	78.83	88.78	69.99
Combined	1,683	74.60	71,952	73.40	79.71	58.51
Student enrollment						
Less than 50	480	68.57	12,086	60.47	87.33	52.81
50-149	1,537	79.35	44,487	78.04	87.16	68.02
150-499	3,529	80.42	119,911	78.97	88.06	69.54
500-999	1,210	79.34	43,916	77.79	82.53	64.20
1,000 or more	371	76.49	12,435	77.78	81.90	63.70

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey (SASS), 1999–2000, “Private School Teacher Questionnaire” and “Teacher Listing File for Private Schools.”