

**NAEP 2008 ARTS SAMPLE
NONRESPONSE BIAS
ANALYSIS REPORT**

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1. NONRESPONSE BIAS ANALYSIS IN THE 2008 NAEP ARTS SAMPLE

NCES statistical standards calls for a nonresponse bias analysis to be conducted for a sample with a response rate below 85 percent. Weighted school response rates for the 2008 NAEP Arts sample indicate a need for a school nonresponse bias analysis for the private school sample. A student nonresponse bias analysis is not necessary for any of the student samples. Response rates for schools and students are shown in tables 1 and 2, respectively.

Table 1. Weighted school response rates, before substitution

	Public	Private
Grade 8	98.6	76.2

Table 2. Weighted student response rates

	Session	Public	Private
Grade 8	Music	93.1	97.0
	Visual Arts	92.3	93.6

2. SCHOOL NONRESPONSE BIAS ANALYSIS

The school analysis, required for private schools, for the 2008 NAEP Arts sample was conducted in three parts.

1. The distribution of the responding original school sample was compared with that of the entire eligible original school sample. In each case, schools were weighted by their school base weights and their enrollment, referred to as a size-adjusted weight. The original sample is the sample before substitution. Various characteristics of the schools were considered.
2. The distribution of the responding sample, including participating substitutes was compared to the full sample (but in this case, substitutes were included in place of those nonrespondents that they replaced). Again, the size-adjusted school base weights were used for both the full sample and the respondents.
3. The same sets of schools were compared as in the second analysis, but this time when analyzing the responding schools alone, school nonresponse adjustments were applied to the size adjusted weights.

The first part of the analysis indicates the potential for nonresponse bias that was introduced through school nonresponse. The second part of the analysis suggests the remaining potential for nonresponse bias after the mitigating effects of substitution have been accounted for. The third part of the analysis indicates the potential for bias after accounting for the mitigating effects of both substitution and nonresponse weight adjustments. Both the second and third analyses, however, may provide an overly optimistic scenario, since even though substitution and nonresponse adjustments may correct somewhat for deficiencies in the few characteristics examined here, there is no guarantee that they are equally as effective for other characteristics, and in particular for student achievement.

In each analysis, chi-square tests of association were conducted between school response status and each of the following five categorical variables:

- census region;
- private school subgroup;
- metro-centric locale;
- urban-centric locale; and
- estimated grade enrollment divided into three equally sized categories.

The chi-square tests were carried out using procedures that appropriately account for the complex sample design used in NAEP, and the weighting procedures. The Rao-Scott (RS2) chi-square test (Rao and Scott 1981) was computed using WesVar (Westat 2007).

In addition, mean values of enrollment for responding and nonresponding schools and race/ethnicity enrollment percentages were compared. Two measures of the mean size of enrollment in grade 8 were considered, one using the size adjusted school weight (mean size of school attended by an average student), and the other using the school weight without the size adjustment (mean estimated grade enrollment). Differences between the means for the respondents and full sample were tested using t-tests. These tests also took account of the complex sample design, as well as the fact that the respondents are a subset of the full sample (thus in that sense the first two sets of comparisons, using only school base weights, are equivalent to testing whether the mean for respondents is significantly different from the mean for nonrespondents).

The results of these analyses are presented in the tables in Appendix A, and summarized in Table 3 below.

Table 3. Arts Private School Sample, Characteristics with p-values less than 0.05

Analysis	Characteristics with p-values less than 0.05
Original sample	Private school subgroup, Race/ethnicity
Sample with substitutes	Private school subgroup, Race/ethnicity
Nonresponse adjusted	Private school subgroup, Race/ethnicity

Overall, nonresponse adjustment and substitution did not decrease the number of variables with significant differences. The significant race/ethnicity results after substitution are for the percent Hispanic estimates. The absolute biases are small – 2-3 percent on estimates of about 9 percent – but the relative biases are large. The significant race/ethnicity results after nonresponse adjustment also include the percent White estimates, though the relative bias is smaller than for Hispanics. Private school subgroup remains significant after substitution and nonresponse adjustment. The original sample estimates about 61 percent of the students attend Catholic schools, while after substitution and nonresponse adjustment, this estimate is 67 percent. Using the original sample respondents, the estimate is about 73 percent. Thus it seems that Catholic schools respond at a higher rate than non-Catholic schools, and this discrepancy is not entirely accounted for by substitution and nonresponse adjustment.

REFERENCES

- Rao, J.N.K., and Scott, A.J. (1981). The Analysis of Categorical Data from Complex Sample Surveys: Chi-Squared Tests for Goodness of Fit and Independence in Two-Way Tables. *Journal of the American Statistical Association*, 76, 221-230.
- Westat (2007). *WesVar® 4.3 User's Guide*. Rockville, MD: Westat, Inc.

Appendix A

Table 1. 2008 NAEP Arts original sample - weighted percentages of full sample and responding schools by various subgroups weighted by school base weight - All Private Schools (sample size = 51)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi-square p-value
Census region					
Northeast	23.59	20.43	-3.2	-0.130	0.211
Midwest	30.66	38.93	8.3	0.270	
South	24.95	23.23	-1.7	-0.070	
West	20.79	17.41	-3.4	-0.160	
Private school subgroup					
Roman Catholic	60.70	72.65	12.0	0.200	0.005
Non-Catholic private	39.30	27.35	-12.0	-0.300	
Metro-centric locale					
Central city	45.85	38.06	-7.8	-0.170	0.095
Urban fringe/large city	44.68	51.29	6.6	0.150	
Small town/rural	9.47	10.65	1.2	0.120	
Urban-centric locale					
City	49.28	42.56	-6.7	-0.140	0.080
Suburban	36.23	45.36	9.1	0.250	
Town	7.21	3.84	-3.4	-0.470	
Rural	7.28	8.24	1.0	0.130	
Size					
Large (≥ 47)	43.93	40.36	-3.6	-0.080	0.120
Medium (21-46)	36.31	44.48	8.2	0.220	
Small (≤ 20)	19.76	15.16	-4.6	-0.230	

NOTE: Size-adjusted school weights were used.

Table 2. 2008 NAEP Arts original sample - weighted mean values of various characteristics for full sample and responding schools - All Private Schools

	Full sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Size of school attended by average student	48.25	48.93	0.7	0.010	0.835
Estimated grade enrollment	24.88	29.31	4.4	0.180	0.221
Race/ethnicity					
Percentage White, not Hispanic	80.65	78.80	-1.9	-0.020	0.167
Percentage Black, not Hispanic	7.20	7.00	-0.2	-0.030	0.849
Percentage Hispanic heritage	8.90	10.87	2.0	0.220	0.007
Percentage Asian/Pacific Islander	2.93	3.00	0.1	0.020	0.838
Percentage American Indian/Alaskan Native	0.31	0.32	0.0*	0.060	0.700

*Estimate rounds to zero.

NOTE: For the mean of school size attended by average student and the race/ethnicity percents, size-adjusted school based weights were used. For the mean of enrollment, school weights were used.

Table 3. 2008 NAEP Arts sample with substitutes - weighted percentages of full sample and responding schools by various subgroups weighted by school baseweight - All Private schools (sample size = 51)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi-square p-value
Census region					
Northeast	23.59	20.89	-2.7	-0.110	0.256
Midwest	30.66	36.97	6.3	0.210	
South	24.95	23.79	-1.2	-0.050	
West	20.79	18.35	-2.4	-0.120	
Private school subgroup					
Roman Catholic	60.70	70.81	10.1	0.170	0.005
Non-Catholic private	39.30	29.19	-10.1	-0.260	
Metro-centric locale					
Central city	45.85	37.96	-7.9	-0.170	0.094
Urban fringe/large city	44.68	48.70	4.0	0.090	
Small town/rural	9.47	13.34	3.9	0.410	
Urban-Centric Locale					
City	49.28	42.23	-7.1	-0.140	0.080
Suburban	36.23	43.07	6.8	0.190	
Town	7.21	3.65	-3.6	-0.490	
Rural	7.28	11.05	3.8	0.520	
Size					
Large (≥ 47)	43.93	38.32	-5.6	-0.130	0.142
Medium (21-46)	36.31	44.06	7.8	0.210	
Small (≤ 20)	19.76	17.62	-2.1	-0.110	

NOTE: Size-adjusted school weights were used.

Table 4. 2008 NAEP Arts sample with substitutes - weighted mean values of various characteristics for full sample and responding schools - All Private Schools

	Full sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Size of school attended by average student	48.25	47.36	-0.9	-0.020	0.775
Estimated grade enrollment	24.88	28.00	3.1	0.130	0.345
Race/ethnicity					
Percentage White, not Hispanic	80.65	78.70	-2.0	-0.020	0.121
Percentage Black, not Hispanic	7.20	7.23	0.0*	0.000	0.977
Percentage Hispanic heritage	8.90	10.69	1.8	0.200	0.005
Percentage Asian/Pacific Islander	2.93	3.07	0.1	0.050	0.627
Percentage American Indian/Alaskan Native	0.31	0.31	0.0*	0.010	0.965

*Estimate rounds to zero.

NOTE: For the mean of school size attended by average student and the race/ethnicity percents, size-adjusted school based weights were used. For the mean of enrollment, school weights were used.

Table 5. 2008 NAEP Arts nonresponse adjusted sample - weighted percentages of full sample and responding schools with substitutes by various subgroups - All Private schools (sample size = 51)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi-square p-value
Census region					
Northeast	23.59	23.89	0.3	0.010	1.000*
Midwest	30.66	29.81	-0.9	-0.030	
South	24.95	25.32	0.4	0.010	
West	20.79	20.98	0.2	0.010	
Private school reporting subgroup					
Roman Catholic	60.70	67.36	6.7	0.110	0.028
Non-Catholic private	39.30	32.64	-6.7	-0.170	
Metro-centric locale					
Central city	45.85	35.88	-10.0	-0.220	0.071
Urban fringe/large city	44.68	50.91	6.2	0.140	
Small town/rural	9.47	13.21	3.7	0.390	
Urban-centric locale					
City	49.28	43.53	-5.8	-0.120	0.116
Suburban	36.23	43.03	6.8	0.190	
Town	7.21	2.85	-4.4	-0.610	
Rural	7.28	10.59	3.3	0.450	
Size					
Large (≥ 47)	43.93	37.53	-6.4	-0.150	0.318
Medium (21-46)	36.31	41.99	5.7	0.160	
Small (≤ 20)	19.76	20.48	0.7	0.040	

* For Census Region, the Pearson chi-square p-value is shown since the RS2 approach was untestable due to a design effect close to zero.

NOTE: Size-adjusted school weights were used.

Table 6. 2008 NAEP Arts nonresponse adjusted sample - weighted mean values of various characteristics for full sample and responding schools with substitutes - All Private Schools

	Full sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Size of school attended by average student	48.25	47.18	-1.1	-0.020	0.756
Estimated grade enrollment	24.88	26.49	1.6	0.060	0.629
Race/ethnicity					
Percentage White, not Hispanic	80.65	76.35	-4.3	-0.050	0.032
Percentage Black, not Hispanic	7.20	8.34	1.1	0.160	0.378
Percentage Hispanic heritage	8.90	11.62	2.7	0.310	0.013
Percentage Asian/Pacific Islander	2.93	3.35	0.4	0.140	0.217
Percentage American Indian/Alaskan Native	0.31	0.33	0.0*	0.090	0.583

*Estimate rounds to zero.

NOTE: For the mean of school size attended by average student and the race/ethnicity percents, size-adjusted school based weights were used. For the mean of enrollment, school weights were used.