

## Analysis of School Nonresponse Bias in the 2005 NAEP – Grades 4 and 8

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Preliminary weighted school response rates for 2005 NAEP indicate that response rates for private schools fall below 85 percent at all three grades. Public school response rates, at all grades, prior to substitution, are well above 85 percent for the nation, all states, and the districts participating in the Trial Urban District Assessment. Although the response rates are not yet completely final, they are based on final school dispositions, and utilize appropriate school weights. Thus it seems clear that NCES statistical standards call for nonresponse bias analyses to be conducted for private schools at all three grades, but not for any other school types. This report provides nonresponse bias analysis results for grades 4 and 8.

The analysis of private school nonresponse bias for the grades 4 and operational assessments in reading and mathematics in the 2005 NAEP was conducted in three parts for each grade. First, 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. The original sample is the sample before substitution. Various characteristics of the schools were considered. Second, the distribution of the responding sample, including participating substitutes was compared to the full original sample. Again, school base weights were used for both the full sample and the respondents. Third, 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 weights. Thus the first analysis indicates the potential for nonresponse bias that was introduced through school nonresponse. The second analysis suggests the remaining potential for nonresponse bias after the mitigating effects of substitution have been accounted for. The third 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 make 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.

Each of these analyses compared schools on the distributions of schools by Census region, type of private school, type of location, and school size, where size was treated as three categories. The size category boundaries vary by grade, as they were set so as to place about one-third of the population for the grade in each category. For these analyses chi-square tests of the association between school response status and the particular variable under consideration were conducted. These tests were carried out using procedures that appropriately account for the complex sample design used in NAEP, and the weighting procedures. The p-values for these chi-square tests are presented in the tables. In addition we considered weighted mean values of race/ethnicity enrollment percentages for responding and nonresponding schools, as well as mean size of enrollment in the respective grades. 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 of course the respondents are a subset of the full sample (thus in that sense they are

equivalent to testing whether the mean for respondents is significantly different from the mean for nonrespondents). The p-values of these t-tests are reported in the tables.

The results of these analyses are presented and summarized by grade.

#### **Grade 4**

The results for all private schools are shown in Tables 1 through 6. Tables 1 and 2 give the results for the comparison of the full sample to the original responding sample, using base weights in each case. Tables 3 and 4 give the results for the comparison of the full sample with the entire responding sample, including substitutes, again using base weights. Tables 5 and 6 show the results comparing the full sample, using base weights, with the responding sample, including substitutes and using the nonresponse-adjusted weights. The significant findings from the Chi-square tests (i.e., with p-values less than 0.05) were as follows: Table 1 – Census region, reporting group, school size; Table 3 – Census region, reporting group. For table 5 there were no characteristics with significant results.

The significant findings from the t-tests (i.e., the differences with p-values less than 0.05), seen in Table 2 are as follows: Estimated grade enrolment, percent Hispanic. There were no statistically significant results for Tables 4 and 6.

Thus substitution and nonresponse adjustments appear to have been at least partially effective in reducing the nonresponse bias, as there are no significant results for Tables 5 and 6.

#### **Grade 8**

The results for all private schools are shown in Tables 7 through 12. Tables 7 and 8 give the results for the comparison of the full sample to the original responding sample, using base weights in each case. Tables 9 and 10 give the results for the comparison of the full sample with the entire responding sample, including substitutes, again using base weights. Tables 11 and 12 show the results comparing the full sample, using base weights, with the responding sample, including substitutes and using the nonresponse-adjusted weights. The significant findings from the Chi-square tests (i.e., with p-values less than 0.05) were as follows: Table 7 – Census region, reporting group, type of location; Table 9 – Census region, reporting group. For table 11 there were no characteristics with significant results.

The significant findings from the t-tests (i.e., the differences with p-values less than 0.05) are as follows: Table 8 – Estimated grade enrollment, percent Asian; Table 10 – Percent American Indian. There were no significant results in Table 12.

Thus substitution and nonresponse adjustments appear to have been at least partially effective in reducing the nonresponse bias, as there are no significant results for Tables 11 and 12.

Table 1. 2005 NAEP Grade 4 original sample - Percentages and counts of responding and nonresponding schools by various subgroups - All Private Schools (sample size = 867)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi- square p-value
<b>Census Region</b>					<b>0.001</b>
Northeast	24.29	20.67	-3.62	-0.149	
Midwest	27.36	32.00	4.64	0.170	
South	29.93	28.89	-1.04	-0.035	
West	18.42	18.44	0.02	0.001	
<b>Private School Reporting Subgroup</b>					<b>0.000</b>
Conservative Christian	16.24	13.68	-2.56	-0.158	
Roman Catholic	49.86	58.04	8.18	0.164	
Lutheran	5.16	6.86	1.70	0.329	
Other Private	28.74	21.42	-7.32	-0.255	
<b>Type of Location</b>					0.572
Central City	41.73	42.99	1.26	0.030	
Urban Fringe/Large City	43.11	41.92	-1.19	-0.028	
Small Town/Rural	15.16	15.09	-0.07	-0.005	
<b>Estimated Grade Enrollment</b>					0.509
Large (>30)	55.98	56.04	0.06	0.001	
Medium (18-29)	26.31	27.17	0.86	0.033	
Small (<29)	17.71	16.79	-0.92	-0.052	

Table 2. 2005 NAEP Grade 4 original sample - Weighted mean values of various characteristics for responding and nonresponding schools - All Private Schools

	Full Sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Estimated Grade Enrollment	42.60	38.21	-4.39	-0.103	0.054
<b>Race/Ethnicity</b>					
Percentage American Indian	0.70	0.90	0.20	0.286	0.053
Percentage Asian	5.09	5.11	0.02	0.004	0.966
Percentage Black	7.96	8.23	0.27	0.034	0.540
Percentage Hispanic	9.19	10.08	0.89	0.097	0.059
Percentage White	77.07	75.68	-1.39	-0.018	0.098

Table 3. 2005 NAEP Grade 4 sample with substitutes - Percentages and counts of responding and nonresponding schools by various subgroups - All Private Schools (sample size = 861)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi- square p-value
<b>Census Region</b>					<b>0.000</b>
Northeast	24.25	20.86	-3.39	-0.140	
Midwest	27.44	31.07	3.63	0.132	
South	29.76	30.21	0.45	0.015	
West	18.56	17.86	-0.70	-0.038	
<b>Private School Reporting Subgroup</b>					<b>0.000</b>
Conservative Christian	15.92	14.17	-1.75	-0.110	
Roman Catholic	50.01	56.83	6.82	0.136	
Lutheran	5.21	6.18	0.97	0.186	
Other Private	28.87	22.82	-6.05	-0.210	
<b>Type of Location</b>					0.692
Central City	41.04	41.76	0.72	0.018	
Urban Fringe/Large City	43.27	42.85	-0.42	-0.010	
Small Town/Rural	15.69	15.39	-0.30	-0.019	
<b>Estimated Grade Enrollment</b>					0.120
Large (>30)	55.69	57.12	1.43	0.026	
Medium (18-29)	26.37	25.81	-0.56	-0.021	
Small (<29)	17.93	17.08	-0.85	-0.047	

Table 4. 2005 NAEP Grade 4 sample with substitutes - Weighted mean values of various characteristics for responding and nonresponding schools - All Private Schools

	Full sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Estimated Grade Enrollment	40.57	38.77	-1.80	-0.044	0.216
<b>Race/Ethnicity</b>					
Percentage American Indian	0.74	0.83	0.09	0.122	0.053
Percentage Asian	5.26	5.17	-0.09	-0.017	0.777
Percentage Black	7.85	7.75	-0.10	-0.013	0.687
Percentage Hispanic	8.98	9.18	0.20	0.022	0.557
Percentage White	77.17	77.07	-0.10	-0.001	0.838

Table 5. 2005 NAEP Grade 4 sample Nonresponse adjusted - Percentages and counts of responding and nonresponding schools by various subgroups - All Private Schools (sample size = 861)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi- square p-value
<b>Census Region</b>					0.299
Northeast	24.25	23.81	-0.44	-0.018	
Midwest	27.44	27.41	-0.03	-0.001	
South	29.76	30.24	0.48	0.016	
West	18.56	18.54	-0.02	-0.001	
<b>Private School Reporting Subgroup</b>					0.065
Conservative Christian	15.92	15.82	-0.10	-0.006	
Roman Catholic	50.01	50.71	0.70	0.014	
Lutheran	5.21	5.28	0.07	0.013	
Other Private	28.87	28.19	-0.68	-0.024	
<b>Type of Location</b>					0.123
Central City	41.04	42.68	1.64	0.040	
Urban Fringe/Large City	43.27	41.89	-1.38	-0.032	
Small Town/Rural	15.69	15.43	-0.26	-0.017	
<b>Estimated Grade Enrollment</b>					0.948
Large (>30)	55.69	55.73	0.04	0.001	
Medium (18-29)	26.37	26.14	-0.23	-0.009	
Small (<29)	17.93	18.12	0.19	0.011	

Table 6. 2005 NAEP Grade 4 sample Nonresponse adjusted - Weighted mean values of various characteristics for responding and nonresponding schools - All Private Schools

	Full sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Estimated Grade Enrollment	40.57	38.03	-2.54	-0.063	0.110
<b>Race/Ethnicity</b>					
Percentage American Indian	0.74	0.87	0.13	0.176	0.252
Percentage Asian	5.26	5.34	0.08	0.015	0.825
Percentage Black	7.85	8.39	0.54	0.069	0.177
Percentage Hispanic	8.98	8.88	-0.10	-0.011	0.776
Percentage White	77.17	76.53	-0.64	-0.008	0.217

Table 7. 2005 NAEP Grade 8 original sample - Percentages and counts of responding and nonresponding schools by various subgroups - All Private Schools (sample size = 858)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi- square p-value
<b>Census Region</b>					<b>0.004</b>
Northeast	24.40	21.73	-2.67	-0.109	
Midwest	25.71	29.88	4.17	0.162	
South	30.63	30.09	-0.54	-0.018	
West	19.26	18.30	-0.96	-0.050	
<b>Private School Reporting Subgroup</b>					<b>0.000</b>
Conservative Christian	14.90	13.99	-0.91	-0.061	
Roman Catholic	50.53	58.05	7.52	0.149	
Lutheran	4.61	6.12	1.51	0.328	
Other Private	29.96	21.83	-8.13	-0.271	
<b>Type of Location</b>					0.763
Central City	45.07	46.05	0.98	0.022	
Urban Fringe/Large City	40.70	39.98	-0.72	-0.018	
Small Town/Rural	14.23	13.97	-0.26	-0.018	
<b>Estimated Grade Enrollment</b>					0.731
Large (>31)	58.69	57.71	-0.98	-0.017	
Medium (18-31)	25.10	25.60	0.50	0.020	
Small (<18)	16.21	16.69	0.48	0.030	

Table 8. 2005 NAEP Grade 8 original sample - Weighted mean values of various characteristics for responding and nonresponding schools - All Private Schools

	Full Sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Estimated Grade Enrollment	49.89	45.37	-4.52	-0.091	<b>0.023</b>
<b>Race/Ethnicity</b>					
Percentage American Indian	0.54	0.65	0.11	0.204	0.174
Percentage Asian	5.35	4.61	-0.74	-0.138	<b>0.048</b>
Percentage Black	8.85	9.06	0.21	0.024	0.653
Percentage Hispanic	9.24	9.86	0.62	0.067	0.130
Percentage White	76.01	75.82	-0.19	-0.002	0.804

Table 9. 2005 NAEP Grade 8 sample with substitutes - Percentages and counts of responding and nonresponding schools by various subgroups - All Private Schools (sample size = 853)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi- square p-value
<b>Census Region</b>					<b>0.000</b>
Northeast	24.51	20.31	-4.20	-0.171	
Midwest	25.78	29.62	3.84	0.149	
South	30.75	31.30	0.55	0.018	
West	18.96	18.76	-0.20	-0.011	
<b>Private School Reporting Subgroup</b>					<b>0.000</b>
Conservative Christian	14.94	13.93	-1.01	-0.068	
Roman Catholic	50.52	57.34	6.82	0.135	
Lutheran	4.65	5.52	0.87	0.187	
Other Private	29.89	23.22	-6.67	-0.223	
<b>Type of Location</b>					0.579
Central City	44.24	45.32	1.08	0.024	
Urban Fringe/Large City	41.82	41.15	-0.67	-0.016	
Small Town/Rural	13.95	13.53	-0.42	-0.030	
<b>Estimated Grade Enrollment</b>					0.268
Large (>31)	57.06	57.72	0.66	0.012	
Medium (18-31)	26.58	26.93	0.35	0.013	
Small (<18)	16.36	15.35	-1.01	-0.062	

Table 10. 2005 NAEP Grade 8 sample with substitutes - Weighted mean values of various characteristics for responding and nonresponding schools - All Private Schools

	Full sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Estimated Grade Enrollment	47.99	46.08	-1.91	-0.040	0.215
<b>Race/Ethnicity</b>					
Percentage American Indian	0.69	0.79	0.10	0.145	<b>0.044</b>
Percentage Asian	5.13	4.95	-0.18	-0.035	0.620
Percentage Black	8.83	8.89	0.06	0.007	0.850
Percentage Hispanic	9.23	9.57	0.34	0.037	0.262
Percentage White	76.13	75.80	-0.33	-0.004	0.554

Table 11. 2005 NAEP Grade 8 sample Nonresponse adjusted - Percentages and counts of responding and nonresponding schools by various subgroups - All Private Schools (sample size = 853)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi- square p-value
<b>Census Region</b>					0.998
Northeast	24.51	24.12	-0.39	-0.016	
Midwest	25.78	26.04	0.26	0.010	
South	30.75	30.74	-0.01	0.000	
West	18.96	19.09	0.13	0.007	
<b>Private School Reporting Subgroup</b>					0.226
Conservative Christian	14.94	14.49	-0.45	-0.030	
Roman Catholic	50.52	50.92	0.40	0.008	
Lutheran	4.65	4.69	0.04	0.009	
Other Private	29.89	29.89	0.00	0.000	
<b>Type of Location</b>					0.922
Central City	44.24	43.88	-0.36	-0.008	
Urban Fringe/Large City	41.82	42.21	0.39	0.009	
Small Town/Rural	13.95	13.92	-0.03	-0.002	
<b>Estimated Grade Enrollment</b>					0.990
Large (>31)	58.36	58.52	0.16	0.003	
Medium (18-31)	25.28	25.18	-0.10	-0.004	
Small (<18)	16.36	16.30	-0.06	-0.004	

Table 12. 2005 NAEP Grade 8 sample Nonresponse adjusted - Weighted mean values of various characteristics for responding and nonresponding schools - All Private Schools

	Full sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Estimated Grade Enrollment	47.99	45.77	-2.22	-0.046	0.202
<b>Race/Ethnicity</b>					
Percentage American Indian	0.69	0.88	0.19	0.275	0.120
Percentage Asian	5.13	5.14	0.01	0.002	0.976
Percentage Black	8.83	9.54	0.71	0.080	0.077
Percentage Hispanic	9.23	9.19	-0.04	-0.004	0.899
Percentage White	76.13	75.24	-0.89	-0.012	0.077