

**NAEP 2012 ECONOMICS
SAMPLE NONRESPONSE
BIAS ANALYSIS REPORT**

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1. NONRESPONSE BIAS ANALYSIS IN THE 2012 NAEP ECONOMICS SAMPLE

NCES statistical standards call for a nonresponse bias analysis to be conducted for a sample with a response rate below 85 percent. Weighted school response rates for 2012 NAEP indicate a need for school nonresponse bias analyses for the grade 12 Economics private school sample. Even though the weighted school response rate for public schools is above 85 percent, an analysis was conducted due to the state of Texas refusing to participate. Based on the weighted student response rates, a student nonresponse bias analysis is not required.

Response rates for schools and students are shown in tables 1 and 2, respectively.

Table 1. Weighted school response rates, before substitution

	Domain	Response Rate
Grade 12	Private	74.0
	Public	88.2

Table 2. Weighted student response rates

	Domain	Response Rate
Grade 12	Private	86.5
	Public	85.2

The analyses conducted in this report consider only certain characteristics of schools and students. They do not directly consider the effects of the nonresponse on student achievement; the primary focus of NAEP. Thus, these analyses cannot be conclusive of either the existence or absence of nonresponse bias for student achievement (see Peytcheva and Groves, 2009).

2. SCHOOL NONRESPONSE BIAS ANALYSIS

The school analysis, required for private and public school samples in grade 12, 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. 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.
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 indicates the potential for bias after accounting for the mitigating effects of both substitution and nonresponse weight adjustments. Both the second and third parts, 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 four categorical variables:

- Census region;
- Reporting subgroup for private schools (Catholic/ Non-Catholic);
- 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 chi-square test (Rao and Scott, 1984) was computed using WesVar (Westat 2002), where this test is referred to as 'RS3'.

In addition, mean values of race/ethnicity percentages and enrollment for responding and nonresponding schools were compared. Two measures of the mean size of enrollment in the respective grades 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 for private and public schools are presented in the tables in appendix A, and summarized in tables 3 and 4 respectively.

Table 3. Characteristics with p-values less than 0.05, private schools

Analysis	Characteristics with p-values less than 0.05
Original sample	Private school subgroup, Race/Ethnicity
Sample with substitutes	None
Nonresponse adjusted	None

Table 4. Characteristics with p-values less than 0.05, public schools

Analysis	Characteristics with p-values less than 0.05
Original sample	Census region, School size, Size of school attended by average student, Race/Ethnicity
Sample with substitutes	Census region, Size of school attended by average student, Race/Ethnicity
Nonresponse adjusted	None

Overall, nonresponse adjustments decreased the number of variables with significant differences. For private schools, the results showed no significant bias for any characteristic after substitution and nonresponse adjustments. For public schools, the large bias in the south Census region in the original sample was mainly due to the state of Texas refusing to participate. Substitution had no effect on the bias as no substitute schools in Texas participated. However, no variables remain significant after the nonresponse adjustment for public schools.

REFERENCES

- Peytcheva, E., and Groves, R.M. (2009). Using Variation in Response Rates of Demographic Subgroups as Evidence of Nonresponse Bias in Survey Estimates. *Journal of Official Statistics*, **25**, 193-201.
- Rao, J.N.K., and Scott, A.J. (1984). On Chi-Squared Tests for Multiway Contingency Tables with Cell Proportions Estimated from Survey Data. *Annals of Statistics*, **12**, 46-60.
- Westat (2002). WesVar 4.2 User's Guide. Rockville, MD: Westat, Inc.

Appendix A

School Tables

Table A-1. 2012 NAEP Economics original sample - weighted percentages of full sample and responding schools by various subgroups - all private schools (sample size = 74)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi-square p-value
Census region					0.835
Northeast	30.95	30.83	-0.12	-0.004	
Midwest	22.86	20.84	-2.02	-0.088	
South	25.51	28.01	2.50	0.098	
West	20.68	20.31	-0.37	-0.018	
Private school reporting subgroup					0.031
Roman Catholic	48.26	56.08	7.82	0.162	
Non-Catholic Private	51.74	43.92	-7.82	-0.151	
Urban-centric locale					0.565
City	38.93	35.94	-2.99	-0.077	
Suburban	46.16	50.46	4.30	0.093	
Town	5.47	3.92	-1.55	-0.283	
Rural	9.44	9.68	0.24	0.025	
Size					0.293
Large (≥ 82)	57.05	62.59	5.54	0.097	
Medium (15-81)	36.57	31.29	-5.28	-0.144	
Small (≤ 14)	6.38	6.12	-0.26	-0.041	

NOTE: Size-adjusted school weights were used.

Table A-2. 2012 NAEP Economics 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	135.93	145.02	9.09	0.067	0.296
Estimated grade enrollment	44.87	48.55	3.67	0.082	0.490
Race/ethnicity					
Percentage White, not Hispanic	72.83	71.30	-1.53	-0.021	0.416
Percentage Black, not Hispanic	8.39	8.05	-0.34	-0.041	0.692
Percentage Hispanic heritage	8.22	9.88	1.66	0.202	0.045
Percentage Asian	5.76	5.84	0.07	0.013	0.894
Percentage Hawaiian/Pacific Islander	1.44	1.43	-0.01	-0.008	0.976
Percentage American Indian/Alaskan Native	0.45	0.48	0.04	0.086	0.410

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

Table A-3. 2012 NAEP Economics sample with substitutes - weighted percentages of full sample and responding schools by various subgroups - all private schools (sample size = 74)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi-square p-value
Census region					0.499
Northeast	30.95	32.06	1.11	0.036	
Midwest	22.86	19.52	-3.34	-0.146	
South	25.51	28.96	3.45	0.135	
West	20.68	19.46	-1.22	-0.059	
Private school reporting subgroup					0.204
Roman Catholic	48.26	52.53	4.27	0.088	
Non-Catholic Private	51.74	47.47	-4.27	-0.083	
Urban-centric locale					0.537
City	38.93	37.27	-1.66	-0.043	
Suburban	46.16	49.99	3.83	0.083	
Town	5.47	3.67	-1.80	-0.329	
Rural	9.44	9.07	-0.37	-0.039	
Size					0.236
Large (≥ 82)	57.05	62.52	5.47	0.096	
Medium (15-81)	36.57	31.75	-4.82	-0.132	
Small (≤ 14)	6.38	5.73	-0.65	-0.102	

NOTE: Size-adjusted school weights were used.

Table A-4. 2012 NAEP Economics 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	135.93	141.30	5.37	0.040	0.489
Estimated grade enrollment	44.87	48.82	3.95	0.088	0.428
Race/ethnicity					
Percentage White, not Hispanic	72.83	72.11	-0.73	-0.010	0.690
Percentage Black, not Hispanic	8.39	7.74	-0.65	-0.077	0.458
Percentage Hispanic heritage	8.22	9.37	1.15	0.140	0.081
Percentage Asian	5.76	5.88	0.12	0.021	0.798
Percentage Hawaiian/Pacific Islander	1.44	1.34	-0.10	-0.066	0.799
Percentage American Indian/Alaskan Native	0.45	0.46	0.02	0.041	0.679

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

Table A-5. 2012 NAEP Economics nonresponse-adjusted sample - weighted percentages of full sample and responding schools by various subgroups - all private schools (sample size = 74)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi-square p-value
Census region					0.410
Northeast	30.95	30.95	0.00	0.000	
Midwest	22.86	22.86	0.00	0.000	
South	25.51	26.66	1.15	0.045	
West	20.68	19.53	-1.15	-0.056	
Private school reporting subgroup					0.968
Roman Catholic	48.26	48.26	0.00	0.000	
Non-Catholic Private	51.74	51.74	0.00	0.000	
Urban-centric locale					0.673
City	38.93	37.15	-1.78	-0.046	
Suburban	46.16	48.84	2.68	0.058	
Town	5.47	3.84	-1.63	-0.298	
Rural	9.44	10.17	0.73	0.077	
Size					0.571
Large (≥ 82)	57.05	61.06	4.01	0.070	
Medium (15-81)	36.57	32.27	-4.30	-0.118	
Small (≤ 14)	6.38	6.67	0.29	0.045	

NOTE: Size-adjusted school weights were used.

Table A-6. 2012 NAEP Economics nonresponse-adjusted 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	135.93	135.73	-0.20	-0.001	0.983
Estimated grade enrollment	44.41	45.39	0.99	0.022	0.865
Race/ethnicity					
Percentage White, not Hispanic	72.83	72.32	-0.51	-0.007	0.757
Percentage Black, not Hispanic	8.39	7.53	-0.86	-0.102	0.363
Percentage Hispanic heritage	8.22	8.99	0.77	0.094	0.321
Percentage Asian	5.76	5.99	0.23	0.039	0.573
Percentage Hawaiian/Pacific Islander	1.44	1.38	-0.05	-0.038	0.893
Percentage American Indian/Alaskan Native	0.45	0.44	0.00	-0.003	0.993

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

Table A-7. 2012 NAEP Economics original sample - weighted percentages of full sample and responding schools by various subgroups - all public schools (sample size = 486)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi-square p-value
Census region					0.001
Northeast	16.49	18.35	1.86	0.113	
Midwest	24.29	26.74	2.45	0.101	
South	33.96	28.16	-5.80	-0.171	
West	25.26	26.74	1.48	0.059	
Urban-centric locale					0.068
City	26.38	26.42	0.04	0.002	
Suburban	34.22	32.62	-1.60	-0.047	
Town	14.44	15.86	1.42	0.098	
Rural	24.96	25.10	0.14	0.006	
Size					0.031
Large (≥ 436)	32.66	30.51	-2.15	-0.066	
Medium (233-435)	34.40	35.05	0.65	0.019	
Small (≤ 232)	32.94	34.44	1.50	0.046	

NOTE: Size-adjusted school weights were used.

Table A-8. 2012 NAEP Economics original sample - weighted mean values of various characteristics for full sample and responding schools - all public schools

	Full sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Size of school attended by average student	347.49	336.80	-10.69	-0.031	0.009
Estimated grade enrollment	181.11	178.87	-2.24	-0.012	0.570
Race/ethnicity					
Percentage White, not Hispanic	61.01	63.52	2.51	0.041	0.028
Percentage Black, not Hispanic	16.08	15.91	-0.17	-0.011	0.661
Percentage Hispanic heritage	16.69	14.42	-2.27	-0.136	0.096
Percentage Asian	4.79	4.64	-0.16	-0.032	0.397
Percentage Hawaiian/Pacific Islander	0.10	0.11	0.01	0.076	0.101
Percentage American Indian/Alaskan Native	0.85	0.90	0.06	0.065	0.090

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

Table A-9. 2012 NAEP Economics sample with substitutes - weighted percentages of full sample and responding schools by various subgroups - all public schools (sample size = 486)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi-square p-value
Census region					0.000
Northeast	16.49	18.27	1.78	0.108	
Midwest	24.29	26.74	2.45	0.101	
South	33.96	27.52	-6.44	-0.190	
West	25.26	27.47	2.21	0.087	
Urban-centric locale					0.205
City	26.38	26.15	-0.23	-0.009	
Suburban	34.22	33.22	-1.00	-0.029	
Town	14.44	15.83	1.39	0.096	
Rural	24.96	24.80	-0.16	-0.006	
Size					0.085
Large (≥ 436)	32.66	30.65	-2.01	-0.062	
Medium (233-435)	34.40	35.09	0.69	0.020	
Small (≤ 232)	32.94	34.26	1.32	0.040	

NOTE: Size-adjusted school weights were used.

Table A-10. 2012 NAEP Economics sample with substitutes - weighted mean values of various characteristics for full sample and responding schools - all public schools

	Full Sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Size of school attended by average student	347.49	337.19	-10.29	-0.030	0.007
Estimated grade enrollment	181.11	177.26	-3.85	-0.021	0.176
Race/ethnicity					
Percentage White, not Hispanic	61.01	63.60	2.59	0.042	0.021
Percentage Black, not Hispanic	16.08	15.61	-0.47	-0.029	0.180
Percentage Hispanic heritage	16.69	14.50	-2.19	-0.131	0.107
Percentage Asian	4.79	4.78	-0.02	-0.004	0.920
Percentage Hawaiian/Pacific Islander	0.10	0.11	0.01	0.107	0.045
Percentage American Indian/Alaskan Native	0.85	0.90	0.05	0.059	0.078

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

Table A-11. 2012 NAEP Economics nonresponse-adjusted sample - weighted percentages of full sample and responding schools by various subgroups - all public schools (sample size = 486)

	Full sample weighted percentage	Respondent weighted percentage	Bias	Relative bias	Chi-square p-value
Census region					0.992
Northeast	16.49	16.49	0.00	0.000	
Midwest	24.29	24.29	0.00	0.000	
South	33.96	33.96	0.00	0.000	
West	25.26	25.26	0.00	0.000	
Urban-centric locale					0.317
City	26.38	26.38	0.00	0.000	
Suburban	34.22	34.22	0.00	0.000	
Town	14.44	14.75	0.31	0.021	
Rural	24.96	24.66	-0.30	-0.012	
Size					0.695
Large (≥ 436)	32.66	31.99	-0.67	-0.021	
Medium (233-435)	34.40	34.90	0.50	0.015	
Small (≤ 232)	32.94	33.11	0.17	0.005	

NOTE: Size-adjusted school weights were used.

Table A-12. 2012 NAEP Economics nonresponse-adjusted sample - weighted mean values of various characteristics for full sample and responding schools - all public schools

	Full sample mean	Respondent mean	Bias	Relative bias	T-test p-value
Size of school attended by average student	347.49	341.76	-5.73	-0.016	0.199
Estimated grade enrollment	181.11	181.01	-0.10	-0.001	0.982
Race/ethnicity					
Percentage White, not Hispanic	61.01	62.49	1.47	0.024	0.195
Percentage Black, not Hispanic	16.08	16.88	0.81	0.050	0.091
Percentage Hispanic heritage	16.69	14.53	-2.16	-0.129	0.139
Percentage Asian	4.79	4.70	-0.09	-0.020	0.530
Percentage Hawaiian/Pacific Islander	0.10	0.10	0.00	0.008	0.818
Percentage American Indian/Alaskan Native	0.85	0.85	0.00	-0.003	0.817

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