Chapter 3
Sample Design, Weighting, Design Effects, and Data Quality

3.1 Introduction

This chapter describes the Education Longitudinal Study of 2002 (ELS:2002) base-year and first follow-up sample designs, weighting, standard errors and design effects, imputation, disclosure analysis and protections, and unit and item nonresponse bias analyses. This section provides an overview of each of these subjects, and the details are provided in later sections of the chapter.

3.1.1 Base-Year Sample Design

The ELS:2002 base-year sample design comprises two primary target populations—schools with 10th grades and sophomores in those schools—in the spring term of the 2001–02 school year. ELS:2002 used a two-stage sample selection process. First, schools were selected. These schools were then asked to provide sophomore enrollment lists. A full discussion of the sample design and response rates is presented in this chapter and in chapter 4.

Schools and students are the study's basic units of analysis. School-level data reflect a school administrator questionnaire, a library media center questionnaire, a facilities checklist, and the aggregation of student data to the school level. Student-level data consist of student questionnaire and assessment data and reports from students' teachers and parents. (School-level data, however, can also be reported at the student level and serve as contextual data for students.)

3.1.2 First Follow-up Sample Design

The basis for the sampling frame for the first follow-up was the sample of schools and students used in the ELS:2002 base-year sample. There are two slightly different target populations for the follow-up. One population consists of those students who were enrolled in the 10th grade in 2002. The other population consists of those students who were enrolled in the 12th grade in 2004. The former population includes students who dropped out of school between 10th and 12th grades, and such students are a major analytical subgroup. Note that in the first follow-up, a student is defined as a member of the student sample, that is, an ELS:2002 spring 2002 sophomore or a freshened first follow-up spring 2004 12th-grader.[20]

3.1.3 Weighting

The general purpose of the weighting scheme was to compensate for unequal probabilities of selection of students into the base-year sample and freshened students into the first follow-up sample and to adjust for the fact that not all students selected into the sample

[20] In spring term 2002, such students may have been out of the country, been enrolled in school in the United States in a grade other than 10th, had an extended illness or injury, been homeschooled, been institutionalized, or temporarily dropped out of school. These students comprised the first follow-up "freshening sample." Freshening ensures that a nationally representative sample of high school seniors was selected.

actually participated. Four sets of weights were computed subsequent to first follow-up data collection:

- A cross-sectional weight for the expanded sample that includes the students who completed a questionnaire in the first follow-up or were incapable of completing the questionnaire. (This weight is on the restricted-use file only.)
- A cross-sectional first follow-up weight for sample members who completed a questionnaire in the first follow-up.
- A first follow-up panel weight (longitudinal weight) for the expanded sample that includes sample members who completed a questionnaire in both the base year and first follow-up, including those with base-year imputed data, or who were questionnaire incapable. (This weight is on the restricted-use file only.)
- A first follow-up panel weight for sample members who completed a questionnaire in both the base year and first follow-up, including those with base-year imputed data.

Student weights were adjusted for nonresponse, and these adjustments were designed to significantly reduce or eliminate nonresponse bias for data elements known for most respondents and nonrespondents. In addition, student weights were poststratified to base-year weighted totals. Weighting is discussed in detail in section 3.4.

3.1.4 Standard Errors and Design Effects

The variance estimation procedure had to take into account the complex sample design, including stratification and clustering. One common procedure for estimating variances of survey statistics is the Taylor series linearization procedure. This procedure takes the first-order Taylor series approximation of the nonlinear statistic and then substitutes the linear representation into the appropriate variance formula based on the sample design. For stratified multistage surveys, the Taylor series procedure requires analysis strata and analysis primary sampling units (PSUs). Therefore, analysis strata and analysis PSUs were created in the base year and used again in the first follow-up. The impact of the departures of the ELS:2002 complex sample design from a simple random sample design on the precision of sample estimates can be measured by the design effect. Appendix I presents standard errors and design effects for 30 means and proportions based on the ELS:2002 student data for the sample (as a whole and for selected subgroups).

3.1.5 Imputation

The imputation procedures used for the first follow-up study include logical imputation, weighted sequential hot deck procedure, and a multiple imputation procedure. Eighteen variables were selected for imputation. Fourteen of the variables were key demographic and family background variables that were also chosen for imputation in the base year. These key variables were imputed (when not provided by respondents in the new participant supplement data) for first follow-up respondents who were one of the following: base-year nonrespondents, 12th-grade freshened sample members, or base-year questionnaire eligible students (who were part of the base-year expanded sample only but became first follow-up eligible respondents). Additionally, the 10th-grade student ability estimates for mathematics and reading were imputed

for the base-year nonrespondents who became first follow-up respondents since they were included in the spring 2002 sophomore cohort. These ability estimates had been imputed, if missing, in the base year for base-year respondents.

Two first follow-up variables were imputed, as applicable, when the data were missing. Student enrollment status as of spring 2004 was imputed for the first follow-up respondents if enrollment status was not provided by the sample school. The first follow-up mathematics ability estimate was imputed, if missing, for first follow-up respondents who were considered in-school students: students at the base-year school or at another (transfer) school as of spring 2004. (Sample members who dropped out, finished high school early, or were being homeschooled as of spring 2004 were not defined as in-school students, so no ability estimates were determined for them.) Only students at the base-year schools were tested—ability estimates were imputed for all transfer student respondents.

With the exception of the ability estimates, all variables chosen for imputation had less than 15 percent missing data. Imputation is discussed in detail in section 3.6.

3.1.6 Disclosure Risk Analysis and Protection

Because of the paramount importance of protecting the confidentiality of NCES data containing information about specific individuals, ELS:2002 first follow-up data were subject to various procedures to minimize disclosure. As a first step, all ELS:2002 data files (school and student) were reviewed to identify high-risk variables. As a second step, a technique called "data swapping" was carried out, both for school-level data and for student-level data. The swapping was conducted independently from the base-year swapping. As a final step, the ELS:2002 data underwent a disclosure risk analysis. In this analysis, school characteristics information available on the data files was compared with information on publicly available universe files of schools. Disclosure avoidance procedures are discussed in detail in section 3.7.

3.1.7 Data Quality: Student and Item Nonresponse Bias Analyses

The overall weighted student response rate was 88.7 percent, although the response rate for certain domains was below 85 percent. Student unit nonresponse bias analyses were performed. The bias due to nonresponse prior to computing weights and after computing weights was estimated based on the data collected from both respondents and nonrespondents, as well as frame data. An item nonresponse bias analysis was also performed for all questionnaire variables in which response fell below 85 percent. Details of the bias analyses are given in section 3.8.

3.2 Base-Year Sample Design

The sample design for ELS:2002 is similar in many respects to the designs used in the three prior studies of the National Education Longitudinal Studies Program: the National Longitudinal Study of the High School Class of 1972 (NLS-72), the High School and Beyond (HS&B) longitudinal study, and the National Education Longitudinal Study of 1988 (NELS:88). ELS:2002 is different from NELS:88 in that the ELS:2002 base-year sample students are 10th-graders rather than 8th-graders. As in NELS:88, Hispanics and Asians were oversampled in

ELS:2002. However, for ELS:2002, counts of Hispanics and Asians were obtained from the Common Core of Data (CCD) and the Private School Survey (PSS) to set the initial oversampling rates.

ELS:2002 used a two-stage sample selection process. First, schools were selected with probability proportional to size (PPS), and school contacting resulted in 1,221 eligible public, Catholic, and other private schools from a population of approximately 27,000 schools containing sophomores. Of the eligible schools, 752 participated in the study. These schools were then asked to provide sophomore enrollment lists. In the second stage of sample selection, approximately 26 students per school were selected from these lists. Additional information on the base-year sample design can be found in the base-year data file user's manual (Ingels et al. 2004), chapter 3 and appendix J.

The target population of schools for the ELS:2002 base year consisted of regular public schools, including state Department of Education schools and charter schools, and Catholic and other private schools that contained 10th grades and were in the United States (the 50 states and the District of Columbia).

The sampling frame of schools was constructed with the intent to match the target population. However, selected schools were determined to be ineligible if they did not meet the definition of the target population. Responding schools were those schools that had a survey day (i.e., data collection occurred for students in the school).[21] Of the 1,268 sampled schools, there were 1,221 eligible schools and 752 responding schools (67.8 percent weighted response rate).

A subset of most but not all responding schools also completed a school administrator questionnaire and a library or media center questionnaire (98.5 percent and 95.9 percent weighted response rates, respectively). Most nonresponding schools or their districts provided some basic information about school characteristics, so that the differences between responding and nonresponding schools could be better understood, analyzed, and adjusted. Additionally, the RTI field staff completed a facilities checklist for each responding school (100 percent response rate).

The target population of students for the full-scale ELS:2002 consisted of spring-term sophomores in 2002 (excluding foreign exchange students) enrolled in schools in the school target population. The sampling frames of students within schools were constructed with the intent to match the target population. However, selected students were determined to be ineligible if they did not meet the definition of the target population. Of the 19,218 sampled schools, there were 17,591 eligible students and 15,362 participants (87.3 percent weighted response rate).

The ELS:2002 survey instruments comprised two assessments (reading and mathematics) and a student questionnaire. Participation in ELS:2002 was defined by questionnaire completion. Although most students were asked to complete the assessment battery in addition to the questionnaire, there were some cases in which a student completed the questionnaire but

[21] One eligible school had no eligible students selected in the sample. This school was considered a responding school.

did not complete the assessments. Guidelines were provided to schools to assist them in determining whether students would be able to complete the ELS:2002 survey instruments.

Students who could not (by virtue of limited English proficiency or physical or mental disability) complete the ELS:2002 survey instruments (including the questionnaire and the tests) were part of the expanded sample of 2002 sophomores who will be followed in the study and whose eligibility status was reassessed 2 years hence. There were 163 such students. To obtain additional information about their home background and school experiences, contextual data were collected from the base-year parent, teacher, and school administrator surveys.

The student sample was selected, when possible, in the fall or early winter so that sample teachers could be identified and materials could be prepared well in advance of Survey Day. However, selecting the sample in advance meant that some students transferred into the sample schools and others left between the time of sample selection and Survey Day. To address this issue, sample updating was conducted closer to the time of data collection. Complete enrollment lists were collected at both the time of initial sampling and the time of the sample update.

One parent of the sample student and English and mathematics teachers of the sample student were also included in the base-year sample. A full discussion of the sample design and response rates is presented in the ELS:2002 base-year data file user's manual (Ingels et al. 2004).

3.3 First Follow-up Sample Design

As described in section 3.1.2, there are two target populations for the ELS:2002 first follow-up. Because of these two target populations and the major analytical subgroups, the sample included the following types of students:

- ELS:2002 base-year student respondents who were currently enrolled in either the 12th grade or some other grade in the school in which they were originally sampled. All such students were included in the follow-up sample.
- ELS:2002 base-year student respondents who finished high school early, including those who graduated from high school early, as well as those who did not graduate because they had alternative certification (e.g., exam-certified equivalency such as the General Educational Development [GED] credential). All such students were included in the follow-up sample.
- ELS:2002 base-year sample students who were deemed unable to participate during the base year owing to disability or insufficient command of the English language. All such students were included in the follow-up sample.
- ELS:2002 base-year student respondents who dropped out of school prior to data collection in the 12th grade. All such students were included in the follow-up sample.
- ELS:2002 base-year student respondents who transferred out of the school in which they were originally sampled. All such students were included in the follow-up sample.

- Nonrespondents (including those who did not have parental consent) of the ELS:2002 base-year full-scale sample who were at the base-year school, finished high school early, or transferred. Such students are discussed in section 3.3.2.
- Students at the base-year sample school who were currently enrolled in the 12th grade but who were not in 10th grade in the United States during the 2002 school year. During 2002 such students may have been out of the country, been enrolled in school in the United States in a grade other than 10th, had an extended illness or injury, been institutionalized, been homeschooled, or temporarily dropped out of school. Such students are discussed in section 3.3.3.

If a base-year school split into two or more schools, many of the ELS base-year sample members moved en masse to a new school, and they were followed to the destination school. These schools can be thought of as additional base-year schools in a new form. Specifically, a necessary condition of adding a new school in the first follow-up was that it arose from a situation such as the splitting of an original base-year school, thus resulting in a large transfer of base-year sample members (usually to one school, but potentially to more). Four base-year schools split, and five new schools were spawned from these four schools. At these new schools, as well as at the original base-year schools, students were tested and interviewed. Additionally, student freshening was done, and the administrator questionnaire was administered.

3.3.1 Eligibility

All spring-term 2002 sophomores in eligible schools, except for foreign exchange students, were eligible for the base-year study and were assumed eligible again in the first follow-up. Additionally, all spring-term 2004 seniors in eligible schools, except for foreign exchange students, were eligible for the first follow-up. Some base-year students were out of scope for this round, but they may be eligible again in future rounds. Reasons for being out of scope included being institutionalized or out of the country. Also, some base-year students died between the base year and the first follow-up.

Several categories of students who were ineligible for HS&B and NELS:88 were eligible for ELS:2002 (though it did not mean that such students were necessarily tested or that they completed questionnaires). In NELS:88, the following categories of students were deemed ineligible:

- students with disabilities (including students with physical or mental disabilities, or serious emotional disturbance, and who normally had an assigned Individual Education Program [IEP]) whose degree of disability was deemed by school officials to make it impractical or inadvisable to assess them; and
- students whose command of the English language was insufficient, in the judgment of school officials, for understanding the survey materials and who therefore could not validly be assessed in English.

In ELS:2002, the treatment of these categories of students was addressed as discussed below.

3.3.1.1 Schools Given Clear Criteria for Including/Excluding Students

Students were not excluded categorically (e.g., just because they received special education services, had IEPs, or received bilingual education or English as a second language services), but rather on a case-by-case (individual) basis. The guiding assumption was that many students with IEPs or limited English proficiency (LEP) would be able to participate, and schools were asked, if unsure, to include the student. Although both questionnaire and assessment data were sought, the minimum case of participation was completion of the student questionnaire. Hence, some students who could not be assessed could nevertheless participate (i.e., complete the questionnaire).

In addition, the ELS:2002 assessments were more accessible to many students who formerly (as in NELS:88) might have been excluded, because unlike NELS:88, ELS:2002 offered various testing accommodations. Schools and parents were urged to permit the study to survey and test students under these special conditions.

The suggested criterion for exclusion of students from survey instrument completion on language grounds followed the current practice for the National Assessment of Educational Progress (NAEP) students. Students were regarded as capable of taking part in the survey session (test and questionnaire administration) if they had received academic instruction primarily in English for at least 3 years or had received academic instruction in English for less than 3 years, but school staff judged or determined that they were capable of participating. In terms of exclusion from taking the instruments on disability grounds, it was suggested that only if the student's IEP specifically recommended against their participation in assessment programs should they be excluded, and then only from the tests if questionnaire-level participation were possible. Moreover, if their IEP stated that they could be assessed if accommodations were provided, then their participation became a question of whether the school could supply the particular accommodation. The specific accommodations offered by schools are explained below.

3.3.1.2 Accommodations Offered to Increase Participation

To the extent possible, given practical and monetary constraints, accommodations were offered to increase the number of participants. All tests taken under conditions of special accommodations were flagged on the data file (F1TXACC is the accommodation indicator), and the nature of the accommodation was noted.

In theory, many kinds of accommodations were possible. There were accommodations of test presentation, response, setting, and allotted testing time. In addition to accommodations for the assessments, special measures were employed to facilitate questionnaire completion (e.g., in some instances, ELS:2002 students were administered the student questionnaire by survey staff, if self-administration was not possible for them).

One type of accommodation offered is alternative test presentation (e.g., on mathematics tests, one might read problems aloud, have someone sign the directions using American Sign Language, use a taped version of the test, provide a braille or large-print edition of the test, or supply magnifying equipment). Although the study could not, for example, provide braille translations, when a school could assist in providing a presentational accommodation (as with

magnifying equipment or an aide who translated directions into American Sign Language), this alternative was deemed an acceptable accommodation.

A second type of accommodation sometimes offered is alternative means of test responses (e.g., responses made in braille or American Sign Language or produced using a keyboard or specially designed writing tool). However, ELS:2002 was not able to provide special accommodations for responding.

A third type of accommodation sometimes offered is providing an alternative setting. For example, an emotionally disturbed student might not be a good candidate for a group administration but might be able to be assessed alone. ELS:2002 made this type of accommodation available where possible or permissible by the school.

A fourth possible kind of accommodation is in timing or length of administration. There were two options for proceeding: (1) give extra time or (2) keep testing time constant in minutes tested but give more breaks. Table 10 lists the counts for students excluded from survey instrument completion and students accommodated.

Table 10. Number of students excluded and accommodated: 2004

Excluded or accommodated	Number
Number of students excluded	100
Mental or physical disability	90
Language barrier (LEP/NEP)[1]	10
Number of students accommodated	48

[1] LEP = limited English proficient; NEP = non-English proficient.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

3.3.1.3 Questionnaire Eligibility Status Changes in the First Follow-up

The questionnaire eligibility status for some students changed between the base year and first follow-up. As shown in table 11, there were 16 students eligible for the questionnaire in the base year who were questionnaire ineligible in the first follow-up. Of these 16 students, 14 were base-year respondents, and 2 were base-year nonrespondents. Also shown in table 11 is that, of the 163 base-year questionnaire ineligible students, 105 were questionnaire eligible in the first follow-up, 57 were still questionnaire ineligible in the first follow-up, and 1 was deceased.

Table 11. Change in questionnaire eligibility status between base year and first follow-up: 2004

Base-year eligibility status	First follow-up questionnaire eligibility	Count
Questionnaire eligible	Questionnaire ineligible	16
Respondent	Questionnaire ineligible	14
Nonrespondent	Questionnaire ineligible	2
Questionnaire ineligible	Questionnaire eligible	105
Questionnaire ineligible	Questionnaire ineligible	57
Questionnaire ineligible	Deceased	1

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

3.3.1.4 Records and Contextual Data Gathered for Students Unable to be Surveyed or Validly Assessed

High school transcripts have been collected for students unable to be surveyed or validly assessed. School-level data, such as school administrator survey responses in the base year and first follow-up, have been linked to these students. Contextual or expanded sample cross-sectional and panel weights—as contrasted to the student questionnaire completion weights—have been created and are included on the restricted-use data file. See section 3.4 for a description of these weights and their uses.

3.3.2 Subsampling

A base-year nonrespondent student was defined as a student that was selected in the base year and did not complete a student questionnaire or portion of the questionnaire. Many of these students were enrolled in the same school during the follow-up. For the first follow-up, a subsample of 1,000 nonrespondent students was selected from the 2,229 base-year nonrespondents. Initially, a subsample of 1,620 nonrespondents was selected. All nonresponding students were included with certainty (i.e., probability equal to one), except for White students in public schools who were randomly subsampled. Then, to help the response rate and to conserve resources, the subsample of 1,620 was randomly subsampled across all student types to 1,000 nonrespondents. See table 12 for a summary of the nonrespondent subsample.

Table 12. Base-year nonrespondent subsample, by school sector and student type: 2004

School sector and student type	Base-year nonrespondents	Initial subsample	Final subsample
Public	1,843	1,234	764
All other races[1]	1,006	397	246
Asian	289	289	179
Black or African American	286	286	177
Hispanic or Latino	262	262	162
Catholic	193	193	119
All other races[1]	169	169	105
Asian	5	5	3
Black or African American	4	4	2
Hispanic or Latino	15	15	9
Other private	193	193	117
All other races[1]	161	161	98
Asian	18	18	11
Black or African American	14	14	8
Hispanic or Latino	#	#	#

[#] Rounds to zero.

[1] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

3.3.3 Student Sample Freshening

Because part of the target population consists of those students who were enrolled in the 12th grade in the spring of 2004, the first follow-up included students at the base-year sample school who were enrolled in the 12th grade in the spring of 2004 but who were not in the 10th grade in the United States during the spring of 2002. During this time, such students may have been out of the country or may have been enrolled in school in the United States in a grade other than 10th (either at the sampled school or at some other school). In addition, some students may have reenrolled, although in spring 2002 they were temporarily out of school, owing to illness, injury, institutionalization, homeschooling, or school dropout.

Student freshening was limited to the base-year sample schools and the five new schools added due to school splits because all sample students were identified at these schools regardless of their status 2 years later, and they could be linked to potential freshened students. Freshened lists were not obtained from transfer schools. Therefore, a small number of freshening eligible students from "new" schools that were not on the 2002 school sampling frame did not have a chance of selection.

In October 2003, each sample school was asked to provide an electronic or hard copy listing of all their 12th-grade students enrolled in the 2003–04 school year. This requested listing was similar to the listing requested in the base year. The information requested for each eligible student included the following:

- student ID number;
- Social Security number;
- full name;
- sex; and
- race/ethnicity.

The race/ethnicity variable was used to stratify the students.

The sample school was given instructions for submitting the electronic and hardcopy lists. The electronic lists were requested to be a column formatted or comma delimited ASCII file or an Excel file. Schools were able to provide the electronic lists by sending them in an e-mail, providing a diskette or CD-ROM containing the file, or uploading the file to the ELS:2002 website. If the school could not provide an electronic list, then it was requested that the hardcopy lists were sorted in alphabetical order within race/ethnicity strata to facilitate stratified sampling. As shown in table 13, of the 615 enrollment lists received, 46.7 percent sent in electronic lists, 49.1 percent sent in hardcopy lists, and 4.2 percent sent in both types. The students from these 615 schools were selected such that the sample would be representative (i.e., linked to a representative sample of students in a representative sample of schools), as described in the following paragraphs. However, estimates based on respondents could potentially be biased due to nonresponse or excluding "new" schools. Nonresponse bias analysis was not conducted for the freshening nonresponse. However, nonresponse adjustment factors were computed to account for potential bias due to the school-level freshening nonresponse (see weighting section). Any bias due to excluding "new" schools is likely to be small due to the small number of freshening-eligible students. Approximately 130 schools did not send a

freshened list, either because they refused to provide the list or because they indicated they had no freshening eligible students. Also, about 20 schools either sent in lists too late or sent lists that were incomplete and could not be used.

Table 13. Number of 12th-grade student lists provided by schools, by type: 2004

Type of list received	Frequency[1]	Percent
Total	615	100.00
Both electronic and hardcopy	26	4.23
Electronic copy	287	46.67
Hardcopy	302	49.11

[1] The counts include all schools that sent in a 12th-grade student list, but three of these schools sent in a list that was not sufficient to use for freshening.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

Quality assurance (QA) checks were performed on all lists received. Any list that was unreadable immediately failed the QA checks. Additionally, any list that did not allow the students to be stratified failed the QA checks, unless the original sophomore list also did not contain race/ethnicity. To verify that the school provided a complete list of eligible students, the school's count of 12th-grade students from the most recent CCD (for public schools) and PSS (for private/Catholic schools) databases were compared with the counts (overall and within strata) of 12th-graders from the list provided. If any of the counts of 12th-graders for total students or by the race/ethnicity strata on the provided list were more than 25 percent lower or higher than the counts from the CCD data, then the list failed the QA checks, unless the provided count was greater than zero and the absolute difference was less than 50. However, if the provided count of Hispanics, Asians, or Blacks was zero and the original list count was less than five, the count did not fail the QA checks.

Table 14 shows that of the lists received, 512 passed all QA checks, 16 lists failed the QA check regarding student counts, 74 failed the QA check regarding identification of race stratum, 2 lists were unreadable, 4 lists had insufficient documentation, and 4 lists had multiple or other problems.

Table 14. Types of problems encountered with student lists: 2004

Type of problem	Frequency	Percent
Total	612	100.00
None	512	83.66
Unreadable file or list	2	0.33
Count out of bounds	16	2.61
Cannot identify strata	74	12.09
Insufficient documentation	4	0.65
Multiple problems	1	0.16
Other problems	3	0.49

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

Schools that failed the QA checks were contacted to resolve the discrepancy. When it was determined that the initial list provided by the school was not satisfactory, a replacement list was requested. If the school confirmed that the provided list was correct or if the school sent a replacement list, then the freshening process was initiated. If the school refused to send a replacement list, then the freshening process was initiated, when possible.

If both the original and new enrollment lists were electronic, they were sorted alphabetically within stratum (as the original list was sorted for sample selection) to facilitate the comparison of the original and new lists. If one of the lists was electronic and one was hard copy, then the electronic list was sorted alphabetically within stratum and printed for the freshening process. If both of the lists were hard copy, then the lists were used as is in the freshening process.

The freshening process began by identifying the base-year sample students on the new list. If the student immediately following each sampled base-year student within the race/ethnicity strata on the new list was not on the original list, then that student was selected as a potential addition to the sample. Whenever a potential new sample student was identified, the next student on the list was examined to determine whether that student was on the original list. If this next student was not on the original list, then that student was a potential addition to the sample. This process was continued until reaching a student who was on the original list. Then, this process was repeated with the next base-year sample student on the list.[22]

Next, the school was contacted to determine the eligibility of the freshened students. Any student identified as eligible by the school was selected into the sample.

Table 15 shows that 2,712 freshened students were included in the first follow-up sample. Of these 2,712 students, 238 (8.8 percent) were found to be eligible for inclusion in the study, and 2,474 students (91.2 percent) were found to be ineligible. Of the 238 eligible freshened students, 31 were questionnaire ineligible. Eligibility was determined for all freshened students. The high ineligibility rate was expected because the freshening procedure selected 12th-grade students who were not on the sophomore list without information on their status in the 10th grade. Many of these sampled students were sophomores at other regular U.S. schools in the spring of 2002 who transferred to a sample school, which contributed to the high ineligibility rate. The number of freshened students was approximately 0.39 students per school (238 students out of 612 schools that sent usable 12th-grade enrollment lists).

Table 15. Number of freshened sample members, by eligibility: 2004

Freshened eligibility status	Count	Percent
Total	2,712	100.00
Eligible	207	7.63
Questionnaire ineligible	31	1.14
Ineligible	2,474	91.22

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), “Base Year, 2002” and “First Follow-up, 2004.”

[22] This process is also known as the half-open interval rule.

3.4 Calculation of Weights and Results of Weighting

3.4.1 Analysis Populations

The sample design for ELS:2002 supports a number of analyses, which in turn permit accurate inferences to be made to three major groups or target populations. Within these populations are important analytical domains.

Population A: Spring 2002 sophomores

Domains:

- spring 2002 sophomores capable of completing the student questionnaire
- all spring 2002 sophomores including those capable and not capable of completing the questionnaire
- spring 2002 sophomores in base-year school in spring 2004
- spring 2002 sophomores in a different school in spring 2004 (transfers)
- spring 2002 sophomores who were dropouts in spring 2004
- spring 2002 sophomores who graduated or achieved equivalency early, that is, prior to March 15, 2004
- spring 2002 sophomores who were homeschooled in spring 2004[23]
- spring 2002 White sophomores
- spring 2002 Black sophomores
- spring 2002 Hispanic sophomores
- spring 2002 Asian sophomores
- spring 2002 public school sophomores
- spring 2002 private school sophomores

Population B: Spring 2004 12th-grade students

Domains:

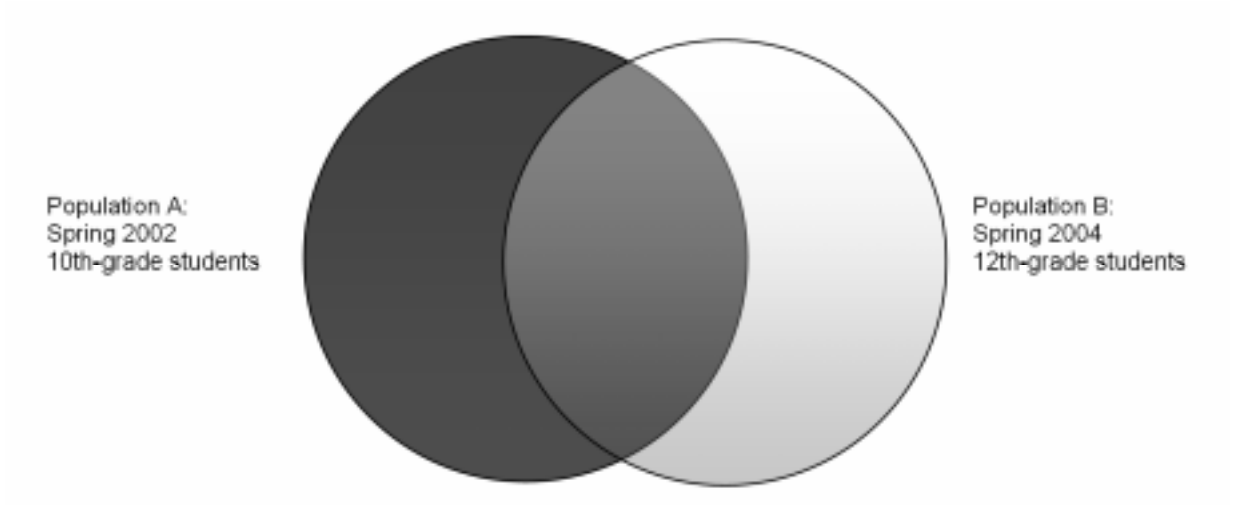
- spring 2004 12th-grade students capable of completing the student questionnaire
- all spring 2004 12th-grade students including those capable and not capable of completing the questionnaire
- spring 2004 12th-grade students who were graduating high school seniors in spring 2004

[23] Although conceptually spring 2002 sophomores who were homeschooled in 2004 may be thought of as an analysis population, they were not designed to be so and were therefore not subject to minimum sample size requirements. The group is of limited analytic utility owing both to the low sample size and to the narrowness of the population definition. The compelling practical reason for distinguishing this group was so that they could be administered only those items consonant with their unique situation as out-of-school students.

- spring 2004 White 12th-grade students
- spring 2004 Black 12th-grade students
- spring 2004 Hispanic 12th-grade students
- spring 2004 Asian 12th-grade students
- spring 2004 public school 12th-grade students
- spring 2004 private school 12th-grade students

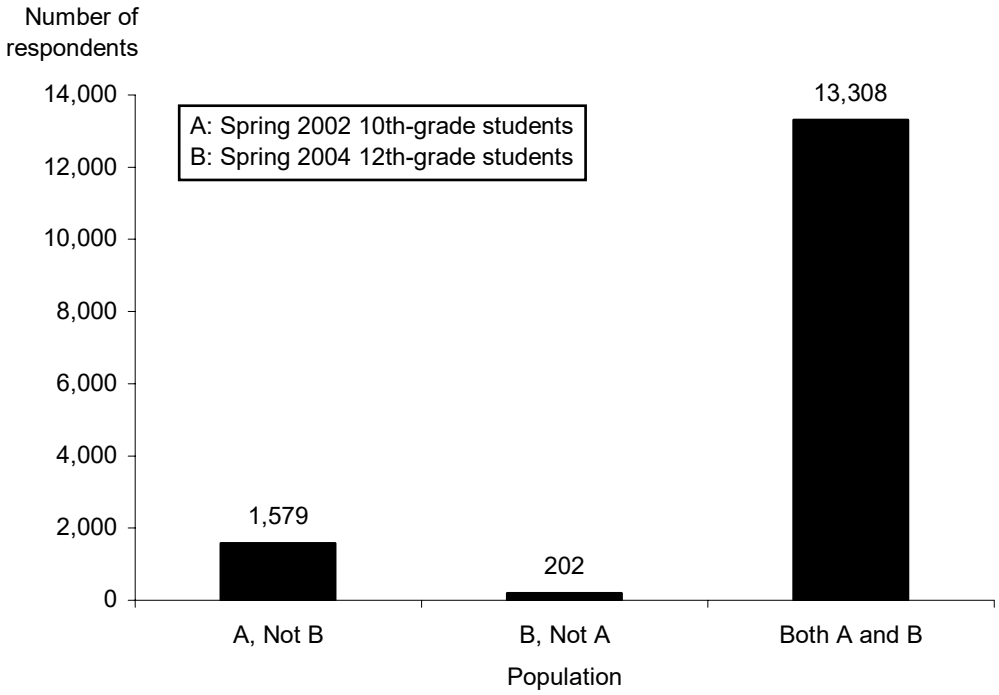
Figure 2 helps illustrate that, whereas some students are in only population A or population B, many students are in both populations—that is, both a spring 2002 sophomore and a spring 2004 12th-grade student. Figure 3 further illustrates the overlap between the two populations.

Figure 2. Student analysis populations, by year: 2004



SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

Figure 3. Student analysis population respondent counts, by year: 2004



SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

Population C: Spring 2002 10th-grade schools

Domains:

- control
- urbanicity
- region

Analytic uses of these three populations, and the weighting required to support the analyses, are discussed in sections 3.4.2 (student level) and 3.4.3 (school level).

3.4.2 Uses of Student-Level Data; Student Weights

3.4.2.1 Population A: Spring 2002 Sophomores

This population can be employed in both cross-sectional and longitudinal analyses. (Note to the user: The expanded weights [BYEXPWT and F1XPNLWT] are only available on the restricted-use file.) Weights for cross-sectional analyses were created in the base year. BYSTUWT can be used for cross-cohort comparisons of students capable of completing the questionnaire (on an intercohort time-lag basis employing the sophomore classes of 1980 and 1990). BYEXPWT generalizes to the entire population, including both students capable and incapable of completing the questionnaire.

The weight F1PNLWT was created for all persons who completed a questionnaire or a sufficient portion of a questionnaire, both in the base year and the first follow-up. Also, base-year data were imputed when not available from the new participant supplement (NPS) for first follow-up respondents, and these cases also have F1PNLWT. The panel weight can be used for both intracohort (across rounds of ELS:2002) and intercohort (longitudinal comparative analysis) purposes. An example of using a panel weight for intracohort analysis is to take a cohort of sophomores, look at their enrollment 2 years later, and determine what proportion have dropped out. An example of using a panel weight for intercohort analysis is to compute math gains between sophomore and senior years using the ELS:2002 panel weight and also for the NELS:88 panel weight and then comparing the gain between sophomore and senior year for the two cohorts. Missing test data were imputed, so a version of the panel weight adjusted for test nonresponse was unnecessary. The weight F1XPNLWT was created for the expanded sample of students capable and not capable of completing the questionnaire. See section 3.4.4 for more details.

Base-year nonrespondents who responded in the first follow-up are considered to be part of this population, but there is no base-year weight (BYSTUWT or BYEXPWT) for them. The NPS ensured that the standard classification variables collected in the base year were also available for this group. However, key variables were imputed for base-year nonrespondents who were first follow-up respondents (see section 3.6), so that these students could be analyzed as part of the sophomore panel using F1PNLWT and/or F1XPNLWT. BYSTUWT and BYEXPWT were not recomputed.

Transcripts will provide continuous data covering grades 9 through 12 for students who remained in school and were in the modal grade sequence (or a lesser range of data for students who dropped out or fell behind the modal progression). A cross-sectional 2004 transcript weight (F1TRSCWT) will be produced, encompassing cases that meet the following conditions, for sample members for whom a transcript has been obtained: (a) member of the 10th-grade or the 12th-grade cohort who was a student questionnaire completer in the base year, first follow-up, or both; or (b) member of the questionnaire-incapable expanded sample. This weight will generalize to the analysis population of spring 2002 sophomores by subsetting the sample through the use of a flag (G10COHRT). In addition, a transcript panel weight (F1TRPWT) will be produced for all individuals who have a transcript in 2004 and who are regular or expanded sample participants in both 2002 and 2004, including base-year nonrespondents with imputed data. See section 3.4.4 for more details.

3.4.2.2 Population B: Spring 2004 12th-Grade Students

This population can also be employed in both cross-sectional and longitudinal analyses. (Note to the user: The expanded weight [F1EXPWT] is only available on the restricted-use file.) The longitudinal analyses will be conducted after further rounds of the study. Weights for cross-sectional (including cross-cohort) analyses (F1QWT) were created for students capable of completing the questionnaire. This weight should be used in conjunction with a flag (G12COHRT) that identifies the sample member as part of the senior cohort. F1EXPWT will generalize to the entire population, including students capable and incapable of completing the questionnaire. See section 3.4.4 for more details.

Note that generalizations about the mathematics achievement of the 2004 senior class involve imputation for the transfer students and other seniors who were not tested (see section 3.6).

The cross-sectional transcript weight described above will also generalize to the analysis population of spring 2004 12th-graders by subsetting the sample through the use of a flag (G12COHRT). See section 3.4.4 for more details.

3.4.3 Uses of School-Level Data; School-Level Weights

This population of spring 2002 10th-grade schools can be employed in cross-sectional analyses and potentially in longitudinal analyses. Weights for cross-sectional analyses were created in the base year. BYSCHWT can be used for spring 2002 10th-grade schools.

The first follow-up school data can be analyzed using the student weight. That is, the school data can be analyzed in relation to student characteristics (i.e., the administrator data are linked to student data, with the student as the fundamental unit of analysis).

Although it is not possible to produce a cross-sectional 2004 school weight because the first follow-up school sample is not nationally representative of American high schools in 2004, the base-year school weight can be used for longitudinal analyses treating the base-year schools as a panel. Although there are multiple data points for analysis, the weight maintains generalizability only to schools in 2002.

3.4.4 Weights

Four sets of weights were computed:

- A cross-sectional weight for the expanded sample that includes sample numbers who completed all or a sufficient portion of the questionnaire in the first follow-up, the base-year students who were still incapable of completing the questionnaire 2 years later, base-year students who were newly incapable of completing the questionnaire, and freshened students who were incapable of completing the questionnaire (F1EXPWT). This weight is only available on the restricted-use file.
- A cross-sectional first follow-up weight for sample members who completed all or a sufficient portion of the questionnaire in the first follow-up (F1QWT).
- A first follow-up panel weight (longitudinal weight) for the expanded sample that includes students who fully or partially completed a questionnaire in both the base year and first follow-up, students who fully or partially completed a questionnaire in the first follow-up and had base-year data imputed if not on the NPS (see section 3.6), and students who were questionnaire incapable in the base year and/or the first follow-up (F1XPNLWT). This expanded sample panel weight is only available on the restricted-use file.
- A first follow-up panel weight for sample members who fully or partially completed a questionnaire in both the base year and first follow-up or who fully or partially

completed a questionnaire in the first follow-up and had base-year data imputed if not on the NPS (F1PNLWT).

Also, two weights (only available on the restricted-use file) will be computed and documented later:

- a cross-sectional transcript weight for sample members for whom transcript data have been collected and who either fully or partially completed a questionnaire in the first follow-up or were members of the expanded sample (F1TRSCWT); and
- a panel transcript weight for sample members for whom transcript data have been collected and who either fully or partially completed a questionnaire in both the base year and first follow-up, fully or partially completed a questionnaire in the first follow-up and had base-year data imputed if not on the NPS, or were members of the expanded sample (F1TRPWT).

Additionally, there are two flags that can be used in analyses to identify members of the sophomore and senior cohorts:

- a flag indicating a member of the sophomore cohort, that is, spring 2002 sophomore (G10COHRT); and
- a flag indicating a member of the senior cohort, that is, spring 2004 12th-grader (G12COHRT).

Table 16 illustrates the relationship among the first four weights listed above plus the base-year weights, universe flags, populations described in section 3.4.1, and respondents. Below, the weighting procedures are described for the first four of these weights. The procedures for calculating F1QWT differ somewhat for base-year sample students and first follow-up freshened sample students.

3.4.4.1 F1EXPWT for Base-Year Sample Students

The expanded sample cross-sectional weight was computed for the expanded sample that includes students who fully or partially completed the questionnaire and students incapable of completing the questionnaire.[24] In addition to the expanded sample students identified in the base year, such students could be those who were base-year nonrespondents, became disabled between the base year and first follow-up, or were misclassified in the base year.

With a few exceptions, base-year eligible sample students remained eligible for the first follow-up sample. Students who died were out of scope for the first follow-up. Students who left the country, were unavailable for the duration of the study (e.g., in military boot camp), or were institutionalized were temporarily out of scope for the first follow-up, although they may be eligible in future rounds.

[24] The expanded sample weights and the full expanded sample are available on the restricted-use file but not on the public-use file.

Table 16. Relationship among weights, populations, respondents, and universe flags: 2004

Weight[1]	Universe flag	Population	Respondent
BYSTUWT	G10COHRT	Spring 2002 sophomore	Fully or partially completed questionnaire in 2002
BYEXPWT	G10COHRT	Spring 2002 sophomore	Fully or partially completed questionnaire in 2002 or incapable of completing a questionnaire
F1PNLWT	G10COHRT	Spring 2002 sophomore	Fully or partially completed questionnaire in 2002 and 2004 (base-year data may be imputed)
F1XPNLWT	G10COHRT	Spring 2002 sophomore	Fully or partially completed questionnaire in 2002 and 2004 (base-year data may be imputed) or incapable of completing a questionnaire in 2002 or 2004
F1QWT	G10COHRT	Spring 2002 sophomore	Fully or partially completed questionnaire in 2004
	G12COHRT	Spring 2004 12th-grader	
F1EXPWT	G10COHRT	Spring 2002 sophomore	Fully or partially completed questionnaire in 2004 or incapable of completing a questionnaire in 2004
	G12COHRT	Spring 2004 12th-grader	

[1] The expanded sample weights and the full expanded sample are available on the restricted-use file but not on the public-use file.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

First, the student-level design weight (F1DWT) was calculated as equal to the base-year design weight multiplied by the reciprocal of the student's probability to be included in the first follow-up. All base-year eligible sample students have a base-year design weight (BYDWT) that accounts for the base-year school probability of selection (adjusted for nonresponse) and for the base-year student probability of selection within the sample school. This base-year design weight is not adjusted for base-year student nonresponse. The student's probability of selection in the first follow-up is 1.0 for base-year respondents and base-year questionnaire-incapable students and less than 1.0 for base-year nonrespondents. This weight is used because all base-year respondents are in the first follow-up sample, and 1,000 out of 2,229 base-year nonrespondents were subsampled to be included in the first follow-up sample. Different subsampling rates were used for the various school types and student types. Note that hostile refusals—those who requested to be removed from the study for all rounds—had a positive probability of selection but were always treated as first follow-up nonrespondents. The formula for F1DWT for student i is

$$F1DWT_i = BYDWT_i * (1 / P_{1i}),$$

where P_{1i} is the probability of selection for student i for the first follow-up sample.

In the base year, all nonresponding students were assumed to be eligible. Adjusting the weights of base-year nonrespondents to compensate for the small portion of students who were actually ineligible was considered. However, in CATI, only nine ineligible students were identified, so it was assumed that all of the nonrespondents were eligible. If the assumption was made that some nonrespondents were ineligible, the adjustment would be negligible. In the first

follow-up, some of these nonrespondents still had unknown eligibility, including some for whom the name was unknown. Again, they were assumed to be eligible, as they were in the base year.

Next, generalized exponential models (GEM) (Folsom and Singh 2000) were used. The GEM approach is a general version of weighting adjustments and was based on a generalization of Deville and Särndal's logit model (Deville and Särndal 1992). GEM is not a competing method to weighting classes or logistic regression; rather, it is a method employed to do weight adjustments with a choice of optional features to employ. It is a formalization of weighting procedures such as nonresponse adjustment, poststratification, and weight trimming. GEM controls at the margins as opposed to controlling at the cell level, as weighting class adjustments. This approach allows more variables to be considered. GEM is designed so that the sum of the unadjusted weights for all eligible units equals the sum of the adjusted weights for respondents. GEM also constrains the nonresponse adjustment factors to be greater than or equal to one.

The questionnaire-incapable students are generally included as part of the expanded set of cases, but a small number of hostile refusals were treated as nonrespondents. Therefore, a simple weighting class nonresponse adjustment was performed. The classes were formed by school type, given the small number of questionnaire-ineligible students. This nonresponse adjustment factor is WTADJ1, and these students have a second nonresponse adjustment factor (WTADJ2) equal to one (see below). For questionnaire-capable students, a first follow-up respondent is defined as a student who completed the questionnaire or a significant portion of the questionnaire. The variables used in the nonresponse weight adjustment were those available for most respondents and nonrespondents that are described in section 3.8.

The student nonresponse was performed in two stages—refusal and other nonresponse—because the predictors of response propensity were potentially different at each stage. The nonresponse models reduce the bias due to nonresponse for the model predictor variables and related variables. Therefore, using these two stages of nonresponse adjustment achieved greater reduction in nonresponse bias to the extent that different variables were significant predictors of response propensity at each stage.

For data known for most but not all students, data collected from responding students and weighted hot deck imputation were used so that data are available for all eligible sample students. These variables were main effects in the models. They were also used in Automatic Interaction Detection (AID) analyses (with response as the dependent variable) to determine important interactions for the nonresponse adjustment models. The outcomes of these first models were nonresponse adjustment factors (WTADJ1 and WTADJ2). The unequal weighting effects (UWEs) and maximum adjustment factors were monitored to ensure reasonable values.

Next, the GEM approach was used to poststratify the nonresponse adjusted weights—that is, F1DWT * WTADJ1 * WTADJ2—to meet overall and marginal totals of the base-year expanded sample weights (BYEXPWT). The full expanded sample was included in this adjustment, and the control totals were the base-year expanded weight sums, because students can potentially move in and out of being questionnaire incapable (i.e., being questionnaire capable or questionnaire incapable is not static). The variables used in poststratification were school type and student race/ethnicity. This adjustment ensures that the first follow-up weight

sums are equal to the base-year weight sums for these variables. GEM generated a poststratification adjustment factor (WTADJ3).

Extreme weights occur in the ELS:2002 data due to small probabilities of sample selection or due to weight adjustments. These extreme weights (either very small or very large) can significantly increase the variance of estimates. One way to account for this and decrease the variance is to trim and smooth extreme weights within prespecified domains. Note that trimming weights has the potential to increase bias. However, the increase in bias is often offset by the decrease in variance due to weight trimming. As a result, this reduces the mean square error (MSE) of an estimate, defined as variance plus bias squared.

The innovation introduced in GEM is the ability to incorporate specific lower and upper bounds. An important application of this feature is to identify at each adjustment step an initial set of cases with extreme weights and to use specific bounds to exercise control over the final adjusted weights. Thus, there is built-in control for extreme weights in GEM.

GEM uses the median +/– X * IQR, where X is any number, typically between 2 and 3, and IQR is the interquartile range. There are also different points in the weight adjustment process during which weight trimming can occur. GEM has options to make adjustments for extreme weights as part of the nonresponse and as part of the poststratification. GEM adjusted for ELS:2002 extreme weights during both nonresponse adjustments, as well as during the poststratification. For GEM, a variable or set of variables is identified to be used to identify extreme weights within each level of the variable(s), and the variables race and school type were chosen. Prior to running GEM, the unweighted and weighted percentage of extreme weights was examined for all four levels of race crossed with the three levels of school type using various values to multiply by the IQR (2.0, 2.1, 2.2,…4.0), and the value of 2.5 was chosen.

The final student weight for the expanded sample student i is the product of the first follow-up design weight, the nonresponse adjustment factors, and the poststratification factor, such that

$$F1EXPWT_i = F1DWT_i * WTADJ1_i * WTADJ2_i * WTADJ3_i.$$

3.4.4.2 F1EXPWT for First Follow-up Freshened Sample Students

The expanded sample cross-sectional weight was computed for eligible freshened sample students who fully or partially completed the questionnaire or who were incapable of completing the questionnaire. These sample students were not in the base-year population (i.e., not in 10th grade in the United States in spring 2002). During 2002, such students may have been out of the country, been enrolled in school in the United States in a grade other than 10th, had an extended illness or injury, been institutionalized, been homeschooled, or temporarily dropped out of school. A 12th-grade enrollment list was requested from each base-year school or from the new school if the base-year school was closed, split, or did not enroll 12th-graders. Students were identified who were on the 12th-grade enrollment list but not on the sophomore list. Each of these students was linked to a student on the sophomore enrollment list, and they were selected for the freshened sample if the linked sophomore had been selected for the base-year sample.

The first follow-up design weight (F1DWT) for each freshened sample student is therefore equal to the base-year design weight of the linked sophomore.

After the freshened sample students were selected, the schools were asked to identify those that were eligible for freshening (i.e., those that were not in the base-year population). Of 2,702 sampled freshened students, 425 (16 percent) were determined by the school to be eligible. Freshened eligibility was determined by the school for all freshened students. However, more than 150 of these freshened students determined by the school to be eligible were later determined during the student interview to be ineligible. There were no nonresponding freshened students with undetermined eligibility.

In the first follow-up, 612 schools sent a 12th-grade enrollment list that was sufficient for selecting freshened students. This number includes new schools that were added as a result of base-year schools that split. Another 13 schools did not send a 12th-grade enrollment list because they either did not have any 12th-graders that were new to the school since spring 2002 or they did not enroll 12th-graders. Therefore, 127 of the 752 base-year participating schools did not provide a freshened list.

The freshened student weights were adjusted upward to account for the school nonresponse to freshening. Weighting classes were formed from the variables school type and school metropolitan status. Each class had a minimum of 30 eligible freshened students. First, the average number of eligible freshened students per school that sent in a 12th-grade list was calculated. Next, this average was multiplied by the number of schools that did not send in a list. Then, this number was added to the eligible freshened students, and this sum was divided by the number of eligible freshened students. The result is the weight adjustment factor $WTADJ1_j$ for weighting class j:

$$WTADJ1_j = ((Avg_j * NR_j) + FE_j) / FE_j,$$

where:

Avg_j is the average number of eligible freshened students per school that sent in a 12th-grade list in weighting class j;

NR_j is the number of schools in weighting class j that did not respond to the request to send in a 12th-grade list; and

FE_j is the number of eligible freshened students in weighting class j.

The nonresponse adjustment for the freshened sample students was done together with the nonresponse adjustment for the base-year sample students because of the small number of eligible freshened students. A flag for freshened students was included in the nonresponse models. The outcomes of the nonresponse models were nonresponse adjustment factors (WTADJ2 and WTADJ3).

Table 17 presents the final predictor variables used in the first-stage student nonresponse adjustment model, which includes both base-year and freshened sample students. This table also includes the average weight adjustment factors resulting from these variables: 3.73 percent unweighted and 14.30 percent weighted of the students were identified as having extreme weights. The first stage of nonresponse adjustment factors met the following constraints:

- minimum: 0.10
- median: 1.08
- maximum: 2.12

Table 18 presents the final predictor variables used in the second-stage student nonresponse adjustment model, which includes both base-year and freshened sample students. This table includes the average weight adjustment factors resulting from these variables: 3.13 percent unweighted and 8.93 percent weighted of the students were identified as having extreme weights. The second stage of nonresponse adjustment factors met the following constraints:

- minimum: 0.09
- median: 1.05
- maximum: 2.35

Table 17. Average weight adjustment factors used to adjust cross-sectional weights for refusal, by selected characteristics: 2004

Model predictor variables[1]	Number of responding students and "other" nonresponding students[2]	Weighted response rate	Average weight adjustment factor
Total	15,608	94.97	1.11
School sector			
Public	12,262	95.07	1.11
Catholic	1,929	94.63	1.07
Other private	1,417	92.89	1.20
School urbanicity			
Urban	5,325	94.56	1.13
Suburban	7,449	94.79	1.10
Rural	2,834	96.05	1.09
10th-grade enrollment			
0–99	3,033	96.26	1.11
100–249	3,971	95.71	1.08
250–499	4,992	94.69	1.12
≥ 500	3,612	94.22	1.12

See notes at end of table.

Table 17. Average weight adjustment factors used to adjust cross-sectional weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding students and "other" nonresponding students[2]	Weighted response rate	Average weight adjustment factor
Type of grades within school			
K–12, PreK–10th, 1st–12th, PreK/1st–9th/12th and PreK–12 schools	1,021	95.97	1.21
Middle grades but no elementary	1,638	95.14	1.08
Only high school	12,949	94.90	1.10
Number of grades within the school			
4	11,906	95.03	1.10
> or < 4	3,702	94.73	1.13
Number of days in school year			
Less than 180 days	4,055	95.49	1.10
180 days	8,642	95.10	1.11
More than 180 days	2,911	93.88	1.13
Minutes per class period			
≤ 45	3,733	94.65	1.11
46–50	3,346	94.59	1.11
51–80	4,168	94.85	1.13
≥ 81	4,361	95.56	1.09
Class periods per day			
1–4	4,504	95.60	1.09
5–6	3,849	94.33	1.12
7	4,215	94.63	1.11
8–9	3,040	95.33	1.11
IEP[3] percentage			
≤ 5 percent	6,042	94.77	1.11
6–10 percent	4,023	94.88	1.10
11–15 percent	3,450	95.29	1.10
> 15 percent	2,093	94.93	1.14
LEP[4] percentage			
0 percent	6,722	95.73	1.10
1 percent	3,053	94.24	1.11
2–5 percent	2,631	94.44	1.11
≥ 6 percent	3,202	95.01	1.13

See notes at end of table.

Table 17. Average weight adjustment factors used to adjust cross-sectional weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding students and "other" nonresponding students[2]	Weighted response rate	Average weight adjustment factor
Free or reduced-price lunch			
0 percent	2,753	92.89	1.11
1–10 percent	3,484	93.72	1.12
11–30 percent	4,693	95.45	1.11
≥ 31 percent	4,678	95.95	1.09
Number of full-time teachers			
1–40	4,033	96.00	1.09
41–70	3,938	95.13	1.09
71–100	4,038	94.70	1.13
> 100	3,599	94.48	1.12
Number of part-time teachers			
0–1	4,545	95.17	1.10
2–3	4,467	95.48	1.11
4–6	3,768	94.11	1.12
≥ 7	2,828	94.85	1.11
Full-time teachers certified			
0–90 percent	4,016	95.63	1.11
91–99 percent	2,755	94.46	1.11
100 percent	8,837	94.97	1.11
School coeducational status			
Coeducational school	14,814	95.00	1.11
All-female school	366	91.82	1.08
All-male school	428	95.08	1.06
Total enrollment			
0–600 students	3,672	96.45	1.09
601–1,200 students	4,652	94.68	1.11
1,201–1,800 students	3,563	94.70	1.10
> 1,800 students	3,721	94.59	1.13

See notes at end of table.

Table 17. Average weight adjustment factors used to adjust cross-sectional weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding students and "other" nonresponding students[2]	Weighted response rate	Average weight adjustment factor
Census region			
Northeast	2,881	94.65	1.12
Midwest	3,903	95.04	1.10
South	5,629	95.79	1.08
West	3,195	93.94	1.16
All other races 10th-grade enrollment			
≤ 80 percent	7,821	95.09	1.11
> 80 percent	7,787	94.84	1.11
Asian 10th-grade enrollment			
≤ 2 percent	6,034	95.25	1.09
> 2 percent	9,574	94.80	1.12
Black or African American 10th-grade enrollment			
≤ 4 percent	5,279	94.50	1.11
> 4 percent	10,329	95.21	1.11
Hispanic or Latino 10th-grade enrollment			
≤ 3 percent	5,993	94.63	1.10
> 3 percent	9,615	95.17	1.11
CHAID[5] segments			
CHAID segment 1 = 1–40 full-time teachers; public school; ≤ 2 percent Asian 10th-grade enrollment	1,323	94.41	1.12
CHAID segment 2 = 1–40 full-time teachers; public school; > 2 percent Asian 10th-grade enrollment	405	87.90	1.15
CHAID segment 3 = 1–40 full-time teachers; Catholic and other private schools; race = Hispanic or other	751	96.00	1.09
CHAID segment 4 = 1–40 full-time teachers; Catholic and other private schools; race = Asian or Black	1,119	94.26	1.10
CHAID segment 5 = 41–70 full-time teachers; 0–6 part-time teachers; 1–6 class periods	599	90.59	1.16
CHAID segment 6 = 41–70 full-time teachers; 0–6 part-time teachers; 7–9 class periods	1,055	94.61	1.11
CHAID segment 7 = 41–70 full-time teachers; ≥ 7 part-time teachers; ≤ 180 school days	985	92.90	1.15
CHAID segment 8 = 41–70 full-time teachers; ≥ 7 part-time teachers; > 180 school days	1,052	98.62	1.07

See notes at end of table.

Table 17. Average weight adjustment factors used to adjust cross-sectional weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding students and "other" nonresponding students[2]	Weighted response rate	Average weight adjustment factor
CHAID[5] segments—Continued			
CHAID segment 9 = > 70 full-time teachers; 0–1 part-time teachers; ≤ 80 percent other 10th-grade enrollment	1,747	97.40	1.05
CHAID segment 10 = > 70 full-time teachers; 0–1 part-time teachers; > 80 percent other 10th-grade enrollment	2,546	96.47	1.10
CHAID segment 11 = > 70 full-time teachers; ≥ 2 part-time teachers; ≤ 45 minutes per class	1,966	95.18	1.11
CHAID segment 12 = > 70 full-time teachers; ≥ 2 part-time teachers; 46–80 minutes per class	197	98.37	1.15
CHAID segment 13 = > 70 full-time teachers; ≥ 2 part-time teachers; ≥ 81 minutes per class	645	91.04	1.16
CHAID segment 14 = 11+ percent free or reduced-price lunch; in-school out-of-grade enrollment status; 1,801+ total enrollment	526	95.86	1.14
CHAID segment 15 = 11+ percent free or reduced-price lunch; out-of-school enrollment status; race = Asian, White, or other	325	86.98	1.21
CHAID segment 16 = 11+ percent free or reduced-price lunch; out-of-school enrollment status; race = Black, Hispanic, Indian, or Pacific Islander	367	94.06	1.10
Sex			
Male	7,811	95.16	1.11
Female	7,797	94.77	1.10
Race/ethnicity[6]			
All other races	9,517	94.56	1.13
Asian	1,744	94.80	1.09
Black or African American	2,345	95.88	1.08
Hispanic or Latino	2,002	95.90	1.06
Freshened status			
Freshened	186	88.75	1.16
Enrollment status			
In school, in grade (in grade 12)	12,842	95.67	1.10
In school, out of grade (in grade 10 or 11, ungraded, or graduated early)	1,892	93.33	1.15
Out of school (dropout or homeschooled)	874	90.20	1.17

See notes at end of table.

Table 17. Average weight adjustment factors used to adjust cross-sectional weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding students and "other" nonresponding students[2]	Weighted response rate	Average weight adjustment factor
School sector and race/ethnicity			
Public schools, All other races	6,882	94.68	1.13
Public schools, Asian	1,589	94.59	1.10
Public schools, Black or African American	2,076	95.96	1.07
Public schools, Hispanic or Latino	1,715	95.89	1.07
Catholic schools, All other races	1,464	94.77	1.07
Catholic schools, Asian	77	98.06	1.02
Catholic schools, Black or African American	175	92.37	1.09
Catholic schools, Hispanic or Latino	213	93.85	1.02
Other private school, All other races	1,171	91.86	1.21
Other private schools, Asian	78	96.49	1.04
Other private schools, Black or African American	94	94.35	1.30
Other private schools, Hispanic or Latino	74	98.37	1.01

[1] Model predictor variables had a value of 0 or 1. Some of the listed model predictor variables were not actually in the model because they served as reference groups. For each group of variables, one of the categories (predictor variable) was used as a reference group.

[2] "Other" nonresponding students are students who were nonrespondents but did not explicitly refuse. Responding students are grouped with the "other" nonrespondents for the first nonresponse adjustment that adjusts for refusals.

[3] IEP = Individualized Education Program.

[4] LEP = limited English proficient.

[5] CHAID = chi-squared automatic interaction detection.

[6] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

Table 18. Average weight adjustment factors used to adjust cross-sectional weights for other nonresponse, by selected characteristics: 2004

Model predictor variables[1]	Number of responding students	Weighted response rate	Average weight adjustment factor
Total	14,884	94.83	1.06
School sector			
Public	11,604	94.63	1.07
Catholic	1,899	98.69	1.02
Other private	1,381	95.38	1.06
School urbanicity			
Urban	5,020	93.12	1.08
Suburban	7,140	95.42	1.06
Rural	2,724	95.98	1.05
10th-grade enrollment			
0–99	2,922	95.77	1.06
100–249	3,847	96.45	1.04
250–499	4,760	95.01	1.07
≥ 500	3,355	93.00	1.09
Type of grades within school			
K–12, PreK–10th, 1st–12th, PreK/1st–9th/12th and PreK–12 schools	995	96.05	1.06
Middle grades but no elementary	1,570	95.29	1.05
Only high school	12,319	94.72	1.07
Number of grades within the school			
4	11,330	94.72	1.07
> or < 4	3,554	95.28	1.06
Number of days in school year			
Less than 180 days	3,897	95.24	1.05
180 days	8,228	94.74	1.07
More than 180 days	2,759	94.58	1.07
Minutes per class period			
≤ 45	3,574	95.12	1.06
46–50	3,203	95.52	1.06
51–80	3,970	94.65	1.07
≥ 81	4,137	94.33	1.07

See notes at end of table.

Table 18. Average weight adjustment factors used to adjust cross-sectional weights for other nonresponse, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding students	Weighted response rate	Average weight adjustment factor
Class periods per day			
1–4	4,277	94.59	1.07
5–6	3,654	94.66	1.07
7	4,029	94.65	1.06
8–9	2,924	95.80	1.06
IEP[2] percentage			
≤ 5 percent	5,848	95.76	1.05
6–10 percent	3,811	94.64	1.07
11–15 percent	3,260	94.52	1.08
> 15 percent	1,965	94.12	1.09
LEP[3] percentage			
0 percent	6,501	96.08	1.05
1 percent	2,932	95.96	1.05
2–5 percent	2,476	93.57	1.08
≥ 6 percent	2,975	92.99	1.09
Free or reduced-price lunch			
0 percent	2,691	97.07	1.04
1–10 percent	3,372	96.46	1.05
11–30 percent	4,447	94.61	1.07
≥ 31 percent	4,374	93.27	1.09
Number of full-time teachers			
1–40	3,886	96.16	1.05
41–70	3,812	96.56	1.05
71–100	3,810	94.16	1.08
> 100	3,376	93.29	1.08
Number of part-time teachers			
0–1	4,273	93.69	1.07
2–3	4,287	95.35	1.06
4–6	3,608	95.22	1.06
≥ 7	2,716	95.54	1.06

See notes at end of table.

Table 18. Average weight adjustment factors used to adjust cross-sectional weights for other nonresponse, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding students	Weighted response rate	Average weight adjustment factor
Full-time teachers certified			
0–90 percent	3,846	94.32	1.06
91–99 percent	2,606	93.92	1.08
100 percent	8,432	95.26	1.06
School coeducational status			
Coeducational school	14,100	94.74	1.07
All-female school	362	98.80	1.01
All-male school	422	99.16	1.01
Total enrollment			
0–600 students	3,546	96.14	1.05
601–1,200 students	4,490	96.13	1.05
1,201–1,800 students	3,371	94.14	1.07
> 1,800 students	3,477	93.44	1.09
Census region			
Northeast	2,751	95.33	1.06
Midwest	3,723	95.03	1.06
South	5,375	94.62	1.06
West	3,035	94.56	1.08
All other races 10th-grade enrollment			
≤ 80 percent	7,349	93.41	1.08
> 80 percent	7,535	96.36	1.05
Asian 10th-grade enrollment			
≤ 2 percent	5,747	94.48	1.06
> 2 percent	9,137	95.05	1.06
Black or African American 10th-grade enrollment			
≤ 4 percent	5,100	96.09	1.05
> 4 percent	9,784	94.18	1.07
Hispanic or Latino 10th-grade enrollment			
≤ 3 percent	5,773	96.01	1.05
> 3 percent	9,111	94.13	1.07

See notes at end of table.

Table 18. Average weight adjustment factors used to adjust cross-sectional weights for other nonresponse, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding students	Weighted response rate	Average weight adjustment factor
CHAID[4] segments			
CHAID segment 1 = ≤ 80 percent Other 10th-grade enrollment; race = American Indian or Alaska Native, Hispanic, race specified, or White; in school, in grade	3,193	97.58	1.05
CHAID segment 2 = ≤ 80 percent Other 10th-grade enrollment; race = American Indian or Alaska Native, Hispanic, race specified, or White; in school, out of grade	512	91.90	1.13
CHAID segment 3 = ≤ 80 percent Other 10th-grade enrollment; race = American Indian or Alaska Native, Hispanic, race specified, or White; out of school	158	80.14	1.23
CHAID segment 4 = ≤ 80 percent Other 10th-grade enrollment; race = Asian, Black or African American, Hispanic, no race specified, Multiracial, or Native Hawaiian/Pacific Islander; in school, in grade	2,550	94.74	1.06
CHAID segment 5 = ≤ 80 percent Other 10th-grade enrollment; race = Asian, Black or African American, Hispanic, no race specified, Multiracial, or Native Hawaiian/Pacific Islander; in school, out of grade	641	85.99	1.17
CHAID segment 7 = > 80 percent Other 10th-grade enrollment; in school, in grade; ≤ 2 percent Asian 10th-grade enrollment	2,803	96.99	1.04
CHAID segment 10 = > 80 percent Other 10th-grade enrollment; in school, out of grade; 5 or more class periods per day	389	94.08	1.08
CHAID segment 11 = > 80 percent Other 10th-grade enrollment; out of school; 0 percent LEP students	135	78.16	1.29
CHAID segment 12 = > 80 percent Other 10th-grade enrollment; out of school; 1 percent LEP students	60	93.14	1.08
Sex			
Male	7,432	94.76	1.07
Female	7,452	94.91	1.06
Race/ethnicity[5]			
All other races	9,196	96.28	1.05
Asian	1,658	94.51	1.07
Black or African American	2,182	92.39	1.09
Hispanic or Latino	1,848	90.92	1.10
Freshened status			
Freshened	171	90.15	1.13

See notes at end of table.

Table 18. Average weight adjustment factors used to adjust cross-sectional weights for other nonresponse, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding students	Weighted response rate	Average weight adjustment factor
Enrollment status			
In school, in grade (in grade 12)	12,476	97.02	1.04
In school, out of grade (in grade 10 or 11, ungraded, or graduated early)	1,697	89.14	1.14
Out of school (dropout or homeschooled)	711	79.91	1.25
School sector and race/ethnicity			
Public schools, All other races	6,598	96.03	1.06
Public schools, Asian	1,510	94.43	1.07
Public schools, Black or African American	1,924	92.30	1.09
Public schools, Hispanic or Latino	1,572	91.12	1.10
Catholic schools, All other races	1,448	99.05	1.01
Catholic schools, Asian	73	96.00	1.04
Catholic schools, Black or African American	171	97.66	1.03
Catholic schools, Hispanic or Latino	207	97.07	1.03
Other private school, All other races	1,150	98.08	1.04
Other private schools, Asian	75	94.99	1.07
Other private schools, Black or African American	87	92.20	1.12
Other private schools, Hispanic or Latino	69	77.53	1.31

[1] Model predictor variables had a value of 0 or 1. Some of the listed model predictor variables were not actually in the model because they served as reference groups. For each group of variables, one of the categories (predictor variable) was used as a reference group.
[2] IEP = Individualized Education Program.
[3] LEP = limited English proficient.
[4] CHAID = chi-squared automatic interaction detection.
[5] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

The freshened students were not included with the base-year sample students in the poststratification because, as in the base year, there are no reliable external counts of 12th-graders to use for control totals. Table 19 presents the poststratification control totals and the average weight adjustment factors for base-year students needed to achieve these totals: 2.00 percent unweighted and 6.00 percent weighted of the students were identified as having extreme weights. The base-year student poststratification met the following constraints:

- minimum: 0.07
- median: 1.01
- maximum: 1.04

Table 19. Average weight adjustment factors for poststratifying cross-sectional weights to control totals, by selected characteristics: 2004

Model variable[1]	Control total[2]	Average weight adjustment factor
Total	3,474,053	1.00
Census region		
Northeast	641,468	1.00
Midwest	841,308	1.00
South	1,193,807	1.00
West	797,471	1.00
School sector		
Public	3,210,979	1.00
Catholic	146,214	1.00
Other private	116,860	1.01
Sex		
Male	1,760,242	1.01
Female	1,713,810	1.00
Race/ethnicity[3]		
All other races	2,311,679	1.00
Asian	134,793	1.00
Black or African American	557,835	1.00
Hispanic or Latino	469,746	1.00

[1] Model variables had a value of 0 or 1.
[2] The control totals were the base-year expanded weight sums (i.e., 10th-graders in spring 2002); 12th-grade freshened students were not included in the poststratification.
[3] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

The final student weight for freshened student i is the product of the first follow-up design weight, the school nonresponse to freshening factor, and the nonresponse adjustment factors, such that

$$F1EXPWT_i = F1DWT_i * WTADJ1_i * WTADJ2_i * WTADJ3_i.$$

Table 20 shows the statistical properties of F1EXPWT.

3.4.4.3 F1QWT

For sample students who fully or partially completed the first follow-up questionnaire, F1QWT = F1EXPWT. F1QWT is equal to F1EXPWT for sample students who fully or partially completed the questionnaire because such students are a subset of the expanded sample that

includes students who fully or partially completed the questionnaire and students incapable of completing the questionnaire. Table 20 also shows the statistical properties of F1QWT.

Table 20. Statistical properties of cross-sectional weights: 2004

Weight	F1QWT	F1EXPWT
Mean	232.29	232.36
Variance	26,283.59	26,249.80
Standard deviation	162.12	162.02
Coefficient of variation (x 100)	69.79	69.73
Minimum	1.77	1.77
Maximum	1,427.47	1,427.47
Skewness	1.21	1.21
Kurtosis	2.41	2.41
Sum	3,481,853.86	3,506,024.17
Number of cases	14,989	15,089

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

3.4.4.4 F1XPNLWT

The panel weight was computed for the expanded sample students who have base-year and first follow-up data. Such students include questionnaire-capable students who completed full or partial questionnaires in both the base year and first follow-up, questionnaire-capable students who completed full or partial questionnaires in the first follow-up and had base-year data imputed if not on the NPS (see section 3.6), and students who were questionnaire incapable in the base year and/or the first follow-up. The same procedures were used that were used in developing the first follow-up weight for base-year sample students. That is, GEM was used to perform nonresponse adjustment, extreme value adjustment, and poststratification. The same variables were input for GEM as for F1QWT, and the control totals from the base year for poststratification were the same as for F1QWT.

Table 21 presents the final predictor variables used in the first-stage student nonresponse adjustment model and the average weight adjustment factors resulting from these variables: 3.66 percent unweighted and 14.20 percent weighted of the students were identified as having extreme weights. The first stage of nonresponse adjustment factors met the following constraints:

- minimum: 0.10
- median: 1.08
- maximum: 2.12

Table 22 presents the final predictor variables used in the second-stage student nonresponse adjustment model and the average weight adjustment factors resulting from these variables: 2.99 percent unweighted and 8.54 percent weighted of the students were identified as having extreme weights. The second stage of nonresponse adjustment factors met the following constraints:

- minimum: 0.09
- median: 1.05
- maximum: 1.94

Table 21. Average weight adjustment factors used to adjust panel weights for refusal, by selected characteristics: 2004

Model predictor variables[1]	Number of responding sample members and "other" nonrespondents[2]	Weighted response rate	Average weight adjustment factor
Total	15,422	94.02	1.11
School sector			
Public	12,103	94.10	1.10
Catholic	1,928	93.67	1.07
Other private	1,391	92.21	1.20
School urbanicity			
Urban	5,246	93.94	1.13
Suburban	7,366	93.48	1.10
Rural	2,810	95.49	1.09
10th-grade enrollment			
0–99	2,999	96.19	1.11
100–249	3,944	95.09	1.08
250–499	4,933	93.28	1.12
≥ 500	3,546	93.22	1.12
Type of grades within school			
K–12, PreK–10th, 1st–12th, PreK/1st–9th/12th and PreK–12 schools	1,006	95.84	1.21
Middle grades but no elementary	1,621	94.58	1.08
Only high school	12,795	93.87	1.10
Number of grades within the school			
4	11,769	94.06	1.10
> or < 4	3,653	93.85	1.13
Number of days in school year			
Less than 180 days	4,010	94.53	1.10
180 days	8,539	94.19	1.11
More than 180 days	2,873	92.84	1.12

See notes at end of table.

Table 21. Average weight adjustment factors used to adjust panel weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding sample members and "other" nonrespondents[2]	Weighted response rate	Average weight adjustment factor
Minutes per class period			
≤ 45	3,696	93.07	1.11
46–50	3,303	93.82	1.11
51–80	4,118	93.84	1.12
≥ 81	4,305	94.93	1.09
Class periods per day			
1–4	4,444	95.05	1.09
5–6	3,804	93.19	1.12
7	4,163	93.63	1.11
8–9	3,011	94.03	1.11
IEP[3] percentage			
≤ 5 percent	5,995	93.53	1.11
6–10 percent	3,968	93.84	1.09
11–15 percent	3,398	94.64	1.10
> 15 percent	2,061	94.18	1.13
LEP[4] percentage			
0 percent	6,674	94.52	1.10
1 percent	3,017	93.30	1.11
2–5 percent	2,601	93.48	1.11
≥ 6 percent	3,130	94.42	1.13
Free or reduced-price lunch			
0 percent	2,729	91.90	1.12
1–10 percent	3,458	91.89	1.12
11–30 percent	4,623	94.88	1.11
≥ 31 percent	4,612	95.30	1.09
Number of full-time teachers			
1–40	4,004	95.62	1.09
41–70	3,902	94.45	1.09
71–100	3,981	93.62	1.13
> 100	3,535	93.09	1.12

See notes at end of table.

Table 21. Average weight adjustment factors used to adjust panel weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding sample members and "other" nonrespondents[2]	Weighted response rate	Average weight adjustment factor
Number of part-time teachers			
0–1	4,470	94.58	1.10
2–3	4,414	94.50	1.11
4–6	3,728	93.25	1.12
≥ 7	2,810	93.26	1.11
Full-time teachers certified			
0–90 percent	3,964	95.68	1.11
91–99 percent	2,721	93.20	1.11
100 percent	8,737	93.86	1.11
School coeducational status			
Coeducational school	14,636	94.04	1.11
All-female school	365	91.02	1.09
All-male school	421	94.23	1.06
Total enrollment			
0–600 students	3,637	96.23	1.09
601–1,200 students	4,614	93.68	1.11
1,201–1,800 students	3,508	93.31	1.10
> 1,800 students	3,663	93.65	1.13
Census region			
Northeast	2,841	92.88	1.12
Midwest	3,877	94.41	1.09
South	5,558	94.84	1.09
West	3,146	93.29	1.15
All other races 10th-grade enrollment			
≤ 80 percent	7,708	94.55	1.11
> 80 percent	7,714	93.46	1.11
Asian 10th-grade enrollment			
≤ 2 percent	5,962	94.46	1.09
> 2 percent	9,460	93.74	1.12

See notes at end of table.

Table 21. Average weight adjustment factors used to adjust panel weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding sample members and "other" nonrespondents[2]	Weighted response rate	Average weight adjustment factor
Black or African American 10th-grade enrollment			
≤ 4 percent	5,219	93.66	1.11
> 4 percent	10,203	94.20	1.11
Hispanic or Latino 10th-grade enrollment			
≤ 3 percent	5,933	93.18	1.10
> 3 percent	9,489	94.53	1.11
CHAID[5] segments			
CHAID segment 1 = 0–10 percent free or reduced-price lunch; 0–99 sophomores; 1–40 full-time teachers	1,306	93.99	1.11
CHAID segment 2 = 0–10 percent free or reduced-price lunch; 0–99 sophomores; > 40 full-time teachers	395	87.38	1.15
CHAID segment 3 = 0–10 percent free or reduced-price lunch; 100–249 sophomores; 4 grade levels within the school	1,416	95.02	1.08
CHAID segment 4 = 0–10 percent free or reduced-price lunch; 100–249 sophomores; > or < 4 grade levels within the school	451	91.25	1.16
CHAID segment 5 = 0–10 percent free or reduced-price lunch; > 249 sophomores; ≤ 10 percent IEP	1,654	89.94	1.13
CHAID segment 6 = 0–10 percent free or reduced-price lunch; > 249 sophomores; 11–15 percent IEP	712	93.90	1.11
CHAID segment 7 = 0–10 percent free or reduced-price lunch; > 249 sophomores; > 15 percent IEP	253	87.93	1.21
CHAID segment 8 = > 10 percent free or reduced-price lunch; in school, in grade (in grade 12); 0–99 sophomores	1,045	98.74	1.07
CHAID segment 9 = > 10 percent free or reduced-price lunch; in school, in grade (in grade 12); 100–249 sophomores	1,724	97.37	1.05
CHAID segment 10 = > 10 percent free or reduced-price lunch; in school, in grade (in grade 12); 250–499 sophomores	2,499	95.75	1.10
CHAID segment 11 = > 10 percent free or reduced-price lunch; in school, in grade (in grade 12); ≥ 500 sophomores	1,910	94.48	1.11
CHAID segment 12 = > 10 percent free or reduced-price lunch; in school, out of grade (in grade 10 or 11, ungraded, or graduated early); total enrollment 0–600 students	197	98.55	1.15
CHAID segment 13 = > 10 percent free or reduced-price lunch; in school, out of grade (in grade 10 or 11, ungraded, or graduated early); total enrollment 601–1,800 students	645	88.90	1.16
CHAID segment 14 = > 10 percent free or reduced-price lunch; in school, out of grade (in grade 10 or 11, ungraded, or graduated early); total enrollment > 1,800 students	526	95.61	1.13

See notes at end of table.

Table 21. Average weight adjustment factors used to adjust panel weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding sample members and "other" nonrespondents[2]	Weighted response rate	Average weight adjustment factor
CHAID segments—Continued			
CHAID segment 15 = > 10 percent free or reduced-price lunch; out of school (dropout or homeschooled); race = Asian, White, or Other	325	85.08	1.21
CHAID segment 16 = > 10 percent free or reduced-price lunch; out of school (dropout or homeschooled); race = Black, Hispanic, Indian, or Pacific Islander	364	94.55	1.10
Sex			
Male	7,703	94.00	1.11
Female	7,719	94.03	1.10
Race/ethnicity[6]			
All other races	9,436	93.47	1.13
Asian	1,704	94.69	1.10
Black or African American	2,329	95.01	1.08
Hispanic or Latino	1,953	95.36	1.06
Enrollment status			
In school, in grade (in grade 12)	12,659	94.71	1.10
In school, out of grade (in grade 10 or 11, ungraded, or graduated early)	1,892	92.49	1.15
Out of school (dropout or homeschooled)	871	89.37	1.17
School sector and race/ethnicity			
Public schools, All other races	6,817	93.56	1.12
Public schools, Asian	1,556	94.53	1.10
Public schools, Black or African American	2,062	95.09	1.07
Public schools, Hispanic or Latino	1,668	95.35	1.07
Catholic schools, All other races	1,464	93.71	1.07
Catholic schools, Asian	76	98.10	1.02
Catholic schools, Black or African American	175	91.67	1.09
Catholic schools, Hispanic or Latino	213	93.19	1.02
Other private school, All other races	1,155	91.15	1.21

See notes at end of table.

Table 21. Average weight adjustment factors used to adjust panel weights for refusal, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding sample members and "other" nonrespondents[2]	Weighted response rate	Average weight adjustment factor
School sector and race/ethnicity—Continued			
Other private schools, Asian	72	95.52	1.04
Other private schools, Black or African American	92	93.47	1.28
Other private schools, Hispanic or Latino	72	98.35	1.00

[1] Model predictor variables had a value of 0 or 1. Some of the listed model predictor variables were not actually in the model because they served as reference groups. For each group of variables, one of the categories (predictor variable) was used as a reference group.

[2] "Other" nonresponding students are students who were nonrespondents but did not explicitly refuse. Responding students are grouped with the "other" nonrespondents for the first nonresponse adjustment that adjusts for refusals.

[3] IEP = Individualized Education Program.

[4] LEP = limited English proficient.

[5] CHAID = chi-squared automatic interaction detection.

[6] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

Table 22. Average weight adjustment factors used to adjust panel weights for other nonresponse, by selected characteristics: 2004

Model predictor variables[1]	Number of responding sample members	Weighted response rate	Average weight adjustment factor
Total	14,713	94.53	1.06
School sector			
Public	11,460	94.25	1.07
Catholic	1,898	98.63	1.02
Other private	1,355	96.81	1.06
School urbanicity			
Urban	4,950	92.60	1.08
Suburban	7,063	95.15	1.06
Rural	2,700	95.89	1.05
10th-grade enrollment			
0–99	2,888	95.69	1.06
100–249	3,823	96.27	1.04
250–499	4,704	94.64	1.07
≥ 500	3,298	92.61	1.09
Type of grades within school			
K–12, PreK–10th, 1st–12th, PreK/1st–9th/12th and PreK–12 schools	980	96.74	1.06
Middle grades but no elementary	1,555	95.23	1.05
Only high school	12,178	94.34	1.07
Number of grades within the school			
4	11,206	94.42	1.06
> or < 4	3,507	94.92	1.06
Number of days in school year			
Less than 180 days	3,856	95.13	1.05
180 days	8,135	94.41	1.07
More than 180 days	2,722	94.11	1.07
Minutes per class period			
≤ 45	3,540	94.21	1.06
46–50	3,166	95.44	1.05
51–80	3,925	94.43	1.07
≥ 81	4,082	94.16	1.07

See notes at end of table.

Table 22. Average weight adjustment factors used to adjust panel weights for other nonresponse, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding sample members	Weighted response rate	Average weight adjustment factor
Class periods per day			
1–4	4,219	94.35	1.07
5–6	3,612	94.14	1.07
7	3,984	94.80	1.06
8–9	2,898	95.06	1.06
IEP[2] percentage			
≤ 5 percent	5,801	95.54	1.05
6–10 percent	3,760	94.39	1.07
11–15 percent	3,213	94.16	1.07
> 15 percent	1,939	93.64	1.09
LEP[3] percentage			
0 percent	6,457	95.74	1.05
1 percent	2,897	95.65	1.05
2–5 percent	2,447	93.09	1.08
≥ 6 percent	2,912	92.87	1.09
Free or reduced-price lunch			
0 percent	2,667	96.81	1.04
1–10 percent	3,347	96.11	1.05
11–30 percent	4,386	94.40	1.07
≥ 31 percent	4,313	92.79	1.09
Number of full-time teachers			
1–40	3,857	95.68	1.05
41–70	3,776	96.12	1.05
71–100	3,759	93.80	1.08
> 100	3,321	93.29	1.08
Number of part-time teachers			
0–1	4,205	93.17	1.07
2–3	4,241	95.58	1.06
4–6	3,569	94.63	1.06
≥ 7	2,698	95.03	1.06

See notes at end of table.

Table 22. Average weight adjustment factors used to adjust panel weights for other nonresponse, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding sample members	Weighted response rate	Average weight adjustment factor
Full-time teachers certified			
0–90 percent	3,797	93.90	1.06
91–99 percent	2,577	93.63	1.07
100 percent	8,339	94.97	1.06
School coeducational status			
Coeducational school	13,937	94.43	1.07
All-female school	361	98.76	1.01
All-male school	415	99.15	1.01
Total enrollment			
0–600 students	3,511	96.02	1.05
601–1,200 students	4,453	95.78	1.05
1,201–1,800 students	3,321	93.95	1.07
> 1,800 students	3,428	92.99	1.09
Census region			
Northeast	2,715	94.53	1.06
Midwest	3,699	94.71	1.06
South	5,311	94.56	1.06
West	2,988	94.27	1.08
All other races 10th-grade enrollment			
≤ 80 percent	7,245	92.99	1.08
> 80 percent	7,468	96.14	1.05
Asian 10th-grade enrollment			
≤ 2 percent	5,684	94.04	1.06
> 2 percent	9,029	94.83	1.06
Black or African American 10th-grade enrollment			
≤ 4 percent	5,043	95.75	1.05
> 4 percent	9,670	93.88	1.07
Hispanic or Latino 10th-grade enrollment			
≤ 3 percent	5,716	95.86	1.05
> 3 percent	8,997	93.71	1.07

See notes at end of table.

Table 22. Average weight adjustment factors used to adjust panel weights for other nonresponse, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding sample members	Weighted response rate	Average weight adjustment factor
CHAID[4] segments			
CHAID segment 1 = ≤ 80 percent Other 10th-grade enrollment; out of school (dropout or homeschooled)	453	79.85	1.25
CHAID segment 2 = ≤ 80 percent Other 10th-grade enrollment; in school, in grade (in grade 12); 0–499 sophomores	3,751	97.30	1.04
CHAID segment 3 = ≤ 80 percent Other 10th-grade enrollment; in school, in grade (in grade 12); ≥ 500 sophomores	1,888	94.13	1.08
CHAID segment 4 = ≤ 80 percent Other 10th-grade enrollment; in school, out of grade (in grade 10 or 11, ungraded, or graduated early); region = Northeast, Midwest, or South	884	85.79	1.17
CHAID segment 5 = ≤ 80 percent Other 10th-grade enrollment; in school, out of grade (in grade 10 or 11, ungraded, or graduated early); region = West	269	93.18	1.11
CHAID segment 6 = > 80 percent Other 10th-grade enrollment; in school, in grade (in grade 12); ≤ 2 percent Asian 10th-grade enrollment	2,773	96.92	1.04
CHAID segment 7 = > 80 percent Other 10th-grade enrollment; in school, in grade (in grade 12); > 2 percent Asian 10th-grade enrollment	3,893	98.31	1.03
CHAID segment 8 = > 80 percent Other 10th-grade enrollment; in school, out of grade (in grade 10 or 11, ungraded, or graduated early); ≤ 80 minutes per class period	397	93.12	1.08
CHAID segment 9 = > 80 percent Other 10th-grade enrollment; in school, out of grade (in grade 10 or 11, ungraded, or graduated early); ≥ 81 minutes per class period	147	84.31	1.19
CHAID segment 10 = > 80 percent Other 10th-grade enrollment; out of school (dropout or homeschooled); 1–70 full-time teachers	168	84.85	1.18
CHAID segment 11 = > 80 percent Other 10th-grade enrollment; out of school (dropout or homeschooled); > 71 full-time teachers	90	74.14	1.34
Sex			
Male	7,335	94.36	1.07
Female	7,378	94.69	1.06
Race/ethnicity[5]			
All other races	9,120	95.87	1.05
Asian	1,619	94.19	1.07
Black or African American	2,169	91.78	1.09
Hispanic or Latino	1,805	91.15	1.10

See notes at end of table.

Table 22. Average weight adjustment factors used to adjust panel weights for other nonresponse, by selected characteristics: 2004—Continued

Model predictor variables[1]	Number of responding sample members	Weighted response rate	Average weight adjustment factor
Enrollment status			
In school, in grade (in grade 12)	12,305	96.92	1.04
In school, out of grade (in grade 10 or 11, ungraded, or graduated early)	1,697	88.46	1.14
Out of school (dropout or homeschooled)	711	79.97	1.25
School sector and race/ethnicity			
Public schools, All other races	6,538	95.60	1.06
Public schools, Asian	1,478	94.14	1.07
Public schools, Black or African American	1,913	91.69	1.09
Public schools, Hispanic or Latino	1,531	91.01	1.09
Catholic schools, All other races	1,448	98.95	1.01
Catholic schools, Asian	72	96.10	1.04
Catholic schools, Black or African American	171	97.64	1.03
Catholic schools, Hispanic or Latino	207	97.12	1.03
Other private school, All other races	1,134	97.80	1.03
Other private schools, Asian	69	93.82	1.07
Other private schools, Black or African American	85	91.20	1.12
Other private schools, Hispanic or Latino	67	87.84	1.35

[1] Model predictor variables had a value of 0 or 1. Some of the listed model predictor variables were not actually in the model because they served as reference groups. For each group of variables, one of the categories (predictor variable) was used as a reference group.

[2] IEP = Individualized Education Program.

[3] LEP = limited English proficient.

[4] CHAID = chi-squared automatic interaction detection.

[5] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

Table 23 presents the poststratification control totals and the average weight adjustment factors needed to achieve these totals: 1.85 percent unweighted and 5.50 percent weighted of the students were identified as having extreme weights. The poststratification met the following constraints:

- minimum: 0.07
- median: 1.01
- maximum: 1.04

Table 23. Average weight adjustment factors for poststratifying panel weights to control totals, by selected characteristics: 2004

Model variable[1]	Control total[2]	Average weight adjustment factor
Total	3,474,053	1.00
Census region		
Northeast	641,468	1.00
Midwest	841,308	1.00
South	1,193,807	1.00
West	797,471	1.00
School sector		
Public	3,210,979	1.00
Catholic	146,214	1.00
Other private	116,860	1.01
Sex		
Male	1,760,242	1.01
Female	1,713,810	1.00
Race/ethnicity[3]		
All other races	2,311,679	1.00
Asian	134,793	1.00
Black or African American	557,835	1.00
Hispanic or Latino	469,746	1.00

[1] Model variables had a value of 0 or 1.
[2] The control totals were the base-year expanded weight sums (i.e., 10th-graders in spring 2002); 12th-grade freshened students were not included in the poststratification.
[3] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

Table 24 shows the statistical properties of F1XPNLWT.

3.4.4.5 F1PNLWT

For questionnaire-capable students who have base-year and first follow-up data, F1PNLWT = F1XPNLWT. F1QWT is equal to F1EXPWT for questionnaire-capable students who have base-year and first follow-up data because such students are a subset of the expanded sample that includes questionnaire-capable and questionnaire-incapable students. Table 24 also shows the statistical properties of F1PNLWT.

Table 24. Statistical properties of panel weights: 2004

Weight	F1PNLWT	F1XPNLWT
Mean	231.31	231.20
Variance	25,985.12	25,883.66
Standard deviation	161.20	160.88
Coefficient of variation (x 100)	69.69	69.59
Minimum	1.75	1.75
Maximum	1,445.49	1,445.49
Skewness	1.21	1.21
Kurtosis	2.48	2.49
Sum	3,403,321.11	3,441,475.79
Number of cases	14,713	14,885

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

3.4.4.6 Quality Control

Quality control was emphasized on all activities, including weighting. Because of the central importance of the analysis weights to population estimation, a senior statistician thoroughly checked each set of weights. The most fundamental type of check was the verification of totals that are algebraically equivalent (e.g., marginal totals of the weights of eligible students prior to nonresponse adjustment and of respondents after nonresponse adjustment). In addition, various analytic properties of the initial weights, the weight adjustment factors, and the final weights were examined, both overall and within sampling strata, including

- distribution of the weights;
- ratio of the maximum weight divided by the minimum weight; and
- unequal weighting design effect, or variance inflation effect ($1 + CV^2$).

Additionally, two-dimensional tables before and after weight adjustments were reviewed to ensure that the weight distribution was not distorted.

3.5 Standard Errors and Design Effects

3.5.1 Standard Errors

For probability-based sample surveys, most estimates are nonlinear statistics. For example, a mean or proportion, which is expressed as $\Sigma wy/\Sigma w$,[25] is nonlinear because the denominator is a survey estimate of the (unknown) population total. In this situation, the variances of the estimates cannot be expressed in closed form. One common procedure for estimating variances of survey statistics is the Taylor series linearization procedure. This procedure takes the first-order Taylor series approximation of the nonlinear statistic and then substitutes the linear representation into the appropriate variance formula based on the sample design. Woodruff presented the mathematical formulation of this procedure (Woodruff 1971).

[25] w is the estimated population, and y is a 0/1 variable indicating whether a certain characteristic is present for the sample member.

The variance estimation must also take into account stratification and clustering. There are other variance estimation procedures, such as jackknife and balanced repeated replication (BRR). However, Taylor series estimation was used for the base year and is sufficient again for the first follow-up. Therefore, replicate weights were not produced. However, ELS:2002/04 will be available at a later date as a Data Analysis System (DAS). For the DAS, BRR replicate weights will be used.

Variance estimation procedures assumed a with-replacement design at the first stage of sampling. Because school sampling rates were moderately low, this assumption yields estimates that are only slightly biased in the positive direction. For stratified multistage surveys and a with-replacement sample design, the Taylor series procedure requires the specification of analysis strata and analysis primary sampling units (PSUs). In the base year, 361 analysis strata were formed from the sampling strata used in the first stage of sampling, and the analysis PSUs were the individual schools. Given that the school sample was selected using probability with minimum replacement (pmr), for variance estimation in the base year, variance estimation strata were formed consisting of two PSUs per stratum (Chromy 1981). However, when there was an odd number of schools in a sampling stratum, one of the analysis strata formed had three PSUs. The same analysis strata and PSUs as in the base year were used in the first follow-up. Each PSU still has at least two responding students. Students from new schools created by school splits (see section 3.3) are in the same strata and PSUs as they were for the base-year school. Also, freshened students are in the same strata and PSUs as the base-year students to whom they are linked.

As described in section 3.2, the ELS:2002 base-year sampling design was a stratified two-stage design. A stratified sample of schools was selected with probabilities proportional to a composite measure of size at the first stage, and a stratified systematic sample of students was selected from sample schools at the second stage. At the first stage, the school sampling rates varied considerably by school sampling strata. At the second stage, Asian and Hispanic students were sampled at higher rates than other students. Because of this complex sampling design, statistical analyses should be conducted using software that properly accounts for the complex survey design.

Many commonly used statistical computing packages assume that the data were obtained from a simple random sample; that is, they assume that the observations are independent and identically distributed. When the data have been collected using a complex sampling design, the simple random sampling assumption usually leads to an underestimate of the sampling variance, which would lead to artificially small confidence intervals and liberal hypothesis test results (i.e., rejecting the null hypothesis when it is in fact true more often than indicated by the nominal Type I error level) (Carlson, Johnson, and Cohen 1993).

Statistical strategies that have been developed to address this issue include first-order Taylor series expansion of the variance equation, balanced repeated replication, and the jackknife approach (Wolter 1985). Special-purpose software packages that have been developed for analysis of complex sample survey data include SUDAAN, WesVar, and Stata. Evaluations of the relative performances of these packages are reported by Cohen (1997).

- SUDAAN is a commercial product developed by RTI; information regarding the features of this package and its lease terms is available from the website http://www.rti.org/sudaan.
- WesVar is a product of Westat, Inc.; information regarding the features of this package and its lease terms is available from the website http://www.westat.com/wesvar.
- Information regarding the features of Stata and its lease terms is available from the website http://www.stata.com.
- In addition to the variance estimation packages noted above, the American Institutes for Research (AIR) has developed the AM Statistical Software. AM software can be downloaded for free from the following website: http://am.air.org/.

Following is an example of generic SUDAAN code to produce estimates and standard errors using Taylor series. The symbols /* and */ in the code indicate the beginning and end of a comment. Note that the dataset must be sorted by analysis strata and analysis PSUs.

```
proc descript data=/* insert filename*/ design=wr;

nest analstr analpsu; /* these variables are the analysis strata and analysis PSUs,

respectively */

weight F1QWT;

var /*insert variables*/;

subpopn /* insert domain of interest if domain is a subset of students*/;

print nsum mean semean  / style=nchs;

run;
```

3.5.2 Design Effects

The impact of the departures of the ELS:2002 complex sample design from a simple random sample design on the precision of sample estimates can be measured by the design effect. The design effect is the ratio of the actual variance of the statistic to the variance that would have been obtained had the sample been a simple random sample. The design standard errors will be different from the standard errors that are based on the assumption that the data are from a simple random sample. The ELS:2002 sample departs from the assumption of simple random sampling in three major respects: student samples were stratified by student characteristics, students were selected with unequal probabilities of selection, and the sample of students was clustered by school. A simple random sample is, by contrast, unclustered and not stratified. Additionally, in a simple random sample, all members of the population have the same probability of selection. Generally, clustering and unequal probabilities of selection

increase the variance of sample estimates relative to a simple random sample, and stratification decreases the variance of estimates.

Standard errors and design effects were computed for all respondents and separately for only dropouts. Due to the lack of perfect overlap between questions on the student and dropout questionnaires and because dropouts were not administered tests, it was necessary to select two sets of 30 items. One set represents questions asked of all respondents, and the other set represents questions asked of all dropouts.

Standard errors and design effects were computed for 30 means and proportions overall for all respondents and dropouts and for subgroups of all respondents. They were not computed for subgroups of dropouts due to small cell sizes. The subgroups are similar to those used in NELS:88 and the ELS:2002 base year:

- sex (male and female);
- race/ethnicity (American Indian or Alaska Native, Asian or Pacific Islander, Black or African American, Hispanic or Latino, More than one race, White and all other races);[26]
- school sector (public, Catholic, and other private);
- socioeconomic status (SES) (lowest quarter, middle two quarters, and highest quarter); and
- urbanicity (urban, suburban, and rural).

Tables 3.3.1–9 and 3.3.1–15 from the NELS:88 second follow-up data file user's manual (Ingels et al. 1994) were used to guide the items picked. For all respondents, it was often difficult to find an ELS:2002 item that matched exactly with the NELS:88 item. For dropouts, it was a little easier to find matching variables. The items chosen are a good representation of the different items on the ELS:2002 questionnaires. Therefore, these items should provide a range of data that give a reasonable average, as well as a reading on design effects for subgroups. However, because item matching with NELS:88 was difficult, the ELS:2002 design effects may not be comparable with the NELS:88 repeated design effects. Ideally, one would like to compare exact items between survey systems. Appendix K design effect tables from the ELS:2002 base-year data file user's manual (Ingels et al. 2004) were not used to guide the items picked. Design effects were not expected to change much from the base year to the first follow-up, and it is more important to compare design effects across cohorts (e.g., ELS:2002 versus NELS:88) than to compare design effects from the base year with those from the first follow-up.

The student variables used were the versions after imputation, and all variables used were after disclosure avoidance (see sections 3.6 and 3.7). Also, the public versions of the variables were used when the public version differed from the restricted version. For all respondents and for dropouts, the standard errors and design effects were calculated using both the cross-sectional weight (F1QWT) and the panel weight (F1PNLWT). When using the panel weight, only panel respondents were included. The difference between the cross-sectional and panel respondents is

[26] "White and all other races" is predominantly White, with a very small number of individuals from other race categories. All race categories exclude individuals of Hispanic or Latino origin.

that base-year expanded sample students who responded in the first follow-up and freshened respondents are cross-sectional respondents but are not panel respondents. Expanded sample students were excluded from the analyses.

Appendix I contains tables of design effects for all respondents and dropouts. Each table includes the survey item (or composite variable), variable name and value, percent estimate, design standard error, simple random sample standard error, sample size (N), design effect (DEFF), and square root of the design effect (DEFT). Tables 25 and 26 summarize the average DEFFs and DEFTs for the full sample and panel sample, respectively, for all respondents, dropouts, and each subgroup. The reader should note that the mean DEFTs reported in tables 25, 26, and 27 were not calculated directly from the mean DEFF but, rather, are based on the summary statistics from the tables in appendix I.

Table 25. Mean design effects (DEFFs) and root design effects (DEFTs) for the first follow-up full sample, by selected characteristics: 2004

Characteristic	Mean DEFF	Mean DEFT
All respondents	2.26	1.47
Dropouts	1.31	1.14
Male	1.90	1.37
Female	1.94	1.37
American Indian or Alaska Native	1.51	1.22
Asian or Pacific Islander	2.14	1.44
Black or African American	1.49	1.21
Hispanic or Latino	1.59	1.25
More than one race	1.71	1.30
White and all other races[1]	1.84	1.35
Public schools	1.97	1.37
Catholic schools	2.25	1.46
Other private schools	3.02	1.66
Low socioeconomic status (SES)	1.66	1.27
Middle SES	1.68	1.29
High SES	1.91	1.38
Urban	2.85	1.64
Suburban	2.08	1.41
Rural	1.71	1.29

[1] "White and all other races" is predominantly White, with a very small number of individuals from other race categories. All race categories exclude individuals of Hispanic or Latino origin.

NOTE: The mean DEFT was not calculated directly from the mean DEFF but, rather, is the average DEFT over selected items. See appendix I of this document for more information.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 26. Mean design effects (DEFFs) and root design effects (DEFTs) for the first follow-up panel sample, by selected characteristics: 2004

Characteristic	Mean DEFF	Mean DEFT
All respondents	2.23	1.46
Dropouts	1.31	1.14
Male	1.88	1.37
Female	1.93	1.37
American Indian or Alaska Native	1.50	1.21
Asian or Pacific Islander	2.17	1.44
Black or African American	1.49	1.22
Hispanic or Latino	1.60	1.25
More than one race	1.70	1.30
White and all other races[1]	1.83	1.35
Public schools	1.94	1.37
Catholic schools	2.25	1.46
Other private schools	3.00	1.65
Low socioeconomic status (SES)	1.64	1.26
Middle SES	1.67	1.29
High SES	1.92	1.38
Urban	2.80	1.63
Suburban	2.08	1.42
Rural	1.71	1.30

[1] "White and all other races" is predominantly White, with a very small number of individuals from other race categories. All race categories exclude individuals of Hispanic or Latino origin.

NOTE: The mean DEFT was not calculated directly from the mean DEFF but, rather, is the average DEFT over selected items. See appendix I of this document for more information.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 27 shows the design effects from the BY for subgroups. The first follow-up design effects are lower for all respondents and for most of the subgroups than the base year design effects. For the full sample, the design effect for males is the same as in the base year, the design effects for American Indian or Alaska Native and for multiracial respondents are greater than in the base year, and the design effects for the other 14 subgroups are less than in the base year. For the panel sample, the design effects for American Indian or Alaska Native and for multiracial respondents are greater than in the base year, and the design effects for the other 15 subgroups are less than in the base year.

Table 27. Mean design effects (DEFFs) and root design effects (DEFTs) for base-year student questionnaire data, by selected characteristics: 2002

Group	Mean DEFF	Mean DEFT
All students	2.35	1.50
Male	1.90	1.37
Female	2.01	1.40
American Indian or Alaska Native	1.42	1.18
Asian or Pacific Islander	2.27	1.49
Black or African American	1.67	1.28
Hispanic or Latino	1.82	1.32
More than one race	1.63	1.27
White and all other races[1]	2.03	1.41
Public schools	2.07	1.41
Catholic schools	2.43	1.51
Other private schools	3.53	1.78
Low socioeconomic status (SES)	1.70	1.29
Middle SES	1.73	1.31
High SES	1.99	1.39
Urban	2.88	1.64
Suburban	2.15	1.44
Rural	1.94	1.37

[1] "White and all other races" is predominantly White, with a very small number of individuals from other race categories. All race categories exclude individuals of Hispanic or Latino origin.

NOTE: The mean DEFT was not calculated directly from the mean DEFF but, rather, is the average DEFT over selected items. See appendix I of this document for more information.

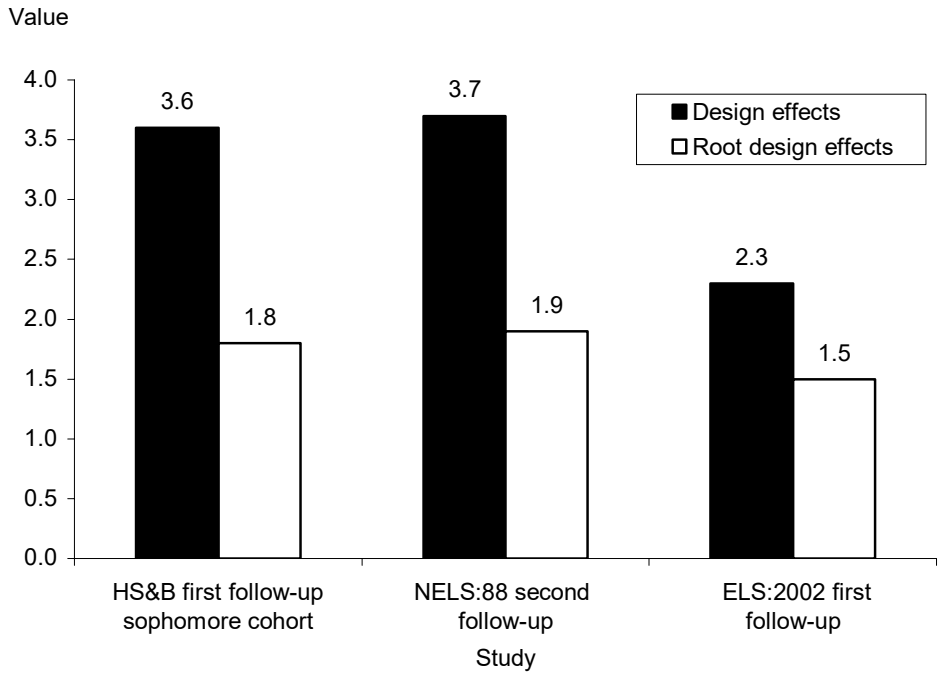
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002."

The smaller design effects in the first follow-up compared with those in the base year may be due to the general tendency in longitudinal studies for design effects to lessen over time, as dispersion reduces the original clustering. In the first follow-up, as some of the sample members left the base-year school, the clusters of students within schools dispersed to an extent. Social characteristics of the sample members potentially varied to a greater extent as the clusters dispersed. Also, the weight trimming was more aggressive in the first follow-up than in the base year (i.e., the weights were trimmed for a larger percentage of the sample members in the first follow-up than in the base year). As discussed in section 3.4, trimming weights reduces the variance, which, by definition, reduces the design effect. Additionally, the items used to compute the mean design effects were different in the first follow-up than in the base year, because the design effects were not expected to change much between the two rounds of the study. It is more important to compare design effects across cohorts, as described below, so the items were chosen to be as comparable to NELS:88 second follow-up items as possible.

The design effects indicate that the ELS:2002 first follow-up full sample was more efficient than the NELS:88 second follow-up full sample and the HS&B first follow-up sophomore cohort full sample. For means and proportions based on first follow-up questionnaire

data for all respondents, the average design effect in ELS:2002 was 2.26; the comparable figures were 3.71 for the NELS:88 second follow-up and 3.59 for the HS&B sophomore cohort first follow-up. Figure 4 shows the mean design effects and root design effects for the HS&B first follow-up sophomore cohort, NELS:88 second follow-up, and ELS:2002 first follow-up. The difference in design effects is also apparent for some subgroup estimates. Ingels et al. (1994) present design effects for 16 subgroups defined similarly to those in table 25 above. For all 16 subgroups, the ELS:2002 design effects are smaller on average than those for the NELS:88 second follow-up.

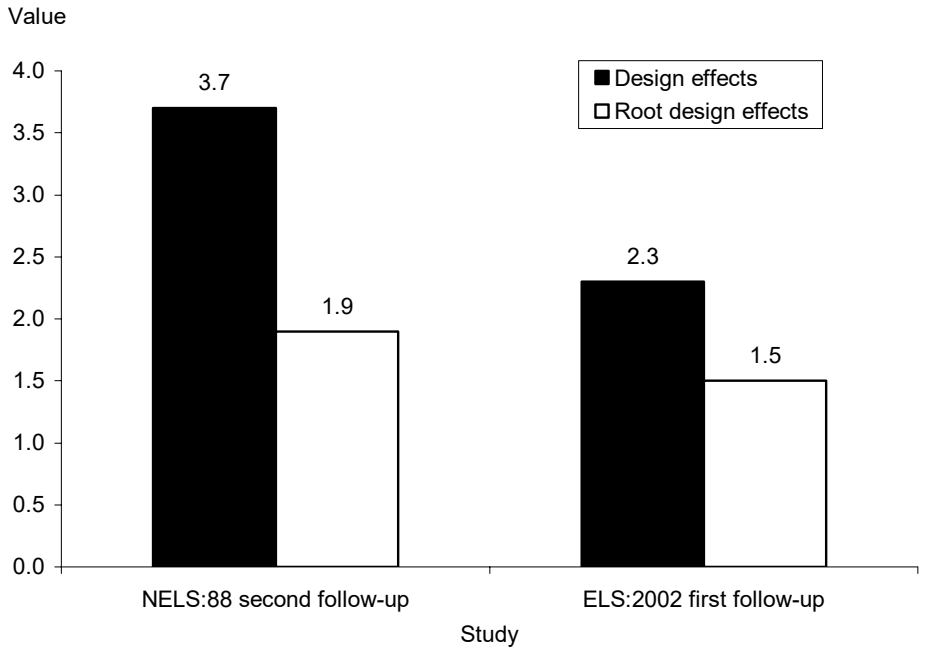
Figure 4. Full sample mean design effects and root design effects, by longitudinal study: Selected years, 1972–2004



SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B), "First Follow-up, 1980"; National Education Longitudinal Study of 1988 (NELS:88), "Second Follow-up, 1992"; and Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

The design effects indicate that the ELS:2002 panel sample (sophomore cohort) was more efficient than the NELS:88 F1F2 panel sample (sophomore cohort). For means and proportions based on first follow-up questionnaire data for all respondents, the average design effect in ELS:2002 was 2.23; the comparable figure was 3.73 for the NELS:88 sophomore cohort. Figure 5 shows the mean design effects and root design effects for the NELS:88 second follow-up and the ELS:2002 first follow-up sophomore cohort. The difference in design effects is also apparent for some subgroup estimates. Ingels et al. (1994) present design effects for 16 subgroups defined similarly to those in table 26 above. For all 16 subgroups, the ELS:2002 design effects are smaller on average than those for the NELS:88 sophomore cohort.

Figure 5. Mean design effects and root design effects, by NELS:88 and ELS:2002 panel sample (sophomore cohort): Selected years, 1988–2004



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88), "Second Follow-up, 1992"; and Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

The design effects indicate that the ELS:2002 full and panel samples were also more efficient than the NELS:88 sample for dropouts. For means and proportions based on first follow-up questionnaire data for dropouts, the average design effect in ELS:2002 was 1.31 for both the full and panel samples; the comparable figures were 2.9 and 2.8 for the NELS:88 second follow-up full and F1F2 panel samples, respectively.

The smaller design effects in ELS:2002 compared with those for NELS:88 and HS&B are probably due to subsampling. Nonrespondents were subsampled in the ELS:2002 first follow-up, but additional subsampling was done in the other studies. In NELS:88, no subsampling was done in the second follow-up, but several types of sample members, including nonrespondents, were subsampled. Additionally, disproportional strata representation was introduced by subsampling in the NELS:88 first follow-up. Dropouts were retained with certainty, whereas other students were subsampled at different rates. See Ingels et al. (1994) for more details. In HS&B, the sophomore cohort members who were no longer in the base-year school were subsampled. See Spencer et al. (1987) for more details. As mentioned above, the general tendency in longitudinal studies is for design effects to lessen over time, as dispersion reduces the original clustering. Subsampling increases design effects because it introduces additional variability into the weights with an attendant loss in sample efficiency.

The smaller design effects in ELS:2002 compared with those for the HS&B sophomore cohort also may reflect the somewhat smaller cluster size used in the later survey in the base year. Although the clusters were reduced somewhat in the first follow-up for both studies, a number of students remained in the base-year school. The HS&B base-year sample design

called for 36 sophomores selected from each school. The ELS:2002 sample design called for about 26 sophomores selected from each school. Clustering tends to increase the variance of survey estimates because the observations within a cluster are similar and therefore add less information than independently selected observations. The impact of clustering depends mainly on two factors: the number of observations within each cluster and the degree of within-cluster homogeneity. When cluster sizes vary, the impact of clustering (DEFFc) can be estimated by

$$\text{DEFFc} = 1 + \left(\bar{b} - 1\right) \text{rho},$$

where $\bar{b}$ refers to the average cluster size (the average number of students selected from each school) and rho refers to the intraclass correlation coefficient, a measure of the degree of within-cluster homogeneity. If the value of rho (which varies from one variable to the next) averaged about 0.05 in both studies, then the reduced cluster size in ELS:2002 would almost exactly account for the reduction in the design effects relative to HS&B.

If one must perform a quick analysis of ELS:2002 data without using one of the software packages for analysis of complex survey data, the design effects tables in appendix I can be used to make approximate adjustments to the standard errors of survey statistics computed using the standard software packages that assume simple random sampling designs. One cannot be confident regarding the actual design-based standard error without performing the analysis using one of the software packages specifically designed for analysis of data from complex sample surveys.

Standard errors for a proportion can be estimated from the standard error computed using the formula for the standard error of a proportion based on a simple random sample and the appropriate DEFT:

$$\text{SE} = \text{DEFT} * (p(1-p)/n)^{1/2}.$$

Similarly, the standard error of a mean can be estimated from the weighted variance of the individual scores and the appropriate mean DEFT:

$$\text{SE} = \text{DEFT} * (\text{Var}/n)^{1/2}.$$

Tables 25, 26, and 27 make it clear that the DEFFs and DEFTs vary considerably by subgroup. It is therefore important to use the mean DEFT for the relevant subgroup in calculating approximate standard errors for subgroup statistics.

Standard error estimates may be needed for subgroups that are not shown in the appendix. One rule of thumb may be useful in such situations. The general rule states that design effects will generally be smaller for groups that are formed by subdividing the subgroups listed in the tables. (Smaller subgroups will be affected less by clustering than larger subgroups; in terms of the equation for DEFFc, $\bar{b}$ will be reduced.) Estimates for Hispanic males, for example, will generally have smaller design effects than the corresponding estimates for all Hispanics or all males. For this reason, it will usually be conservative to use the subgroup mean DEFT to approximate standard errors for estimates concerning a portion of the subgroup. This rule only applies when the variable used to subdivide a subgroup crosscuts schools. Sex is one

such variable because most schools include students of both sexes. It will not reduce the average cluster size to form groups that are based on subsets of schools.

Standard errors may also be needed for other types of estimates than the simple means and proportions that are the basis for the results presented in the above tables. A second method can be used to estimate approximate standard errors for comparisons between subgroups. If the subgroups crosscut schools, then the design effect for the difference between the subgroup means will be somewhat smaller than the design effect for the individual means; consequently, the variance of the difference estimate will be less than the sum of the variances of the two subgroup means from which it is derived:

$$Var(b-a) = Var(b) + Var(a)$$

where Var(b-a) refers to the variance of the estimated difference between the subgroup means, and Var(a) and Var(b) refer to the variances of the two subgroup means. This equation assumes that the covariance of the subgroup means is negligible. It follows from this equation that Var(a) + Var(b) can be used in place of Var(b-a) with conservative results.

A final principle is that more complex estimators show smaller design effects than simple estimators (Kish and Frankel 1974). Thus, correlation and regression coefficients tend to have smaller design effects than subgroup comparisons, and subgroup comparisons have smaller design effects than means. This principle implies that it will be conservative to use the DEFTs in the above tables in calculating approximate standard errors for complex statistics, such as multiple regression coefficients. The procedure for calculating such approximate standard errors is the same as with simpler estimates: first, a standard error is calculated using the formula for data from a simple random sample; then the standard error is multiplied by the appropriate DEFT.

One analytic strategy for accommodating complex survey designs is to use the mean design effect to adjust for the effective sample size resulting from the design. For example, one could create a weight that is the multiplicative inverse of the design effect and use that weight (in conjunction with sampling weights) to deflate the obtained sample size to take into account the inefficiencies due to a sample design that is a departure from a simple random sample. Using this procedure, statistics calculated by a statistical program such as SAS or SPSS will reflect the reduction in sample size in the calculation of standard errors and degrees of freedom. Such techniques capture the effect of the sample design on sample statistics only approximately. However, while not providing a full accounting of the sample design, this procedure provides some adjustment for the sample design and is probably better than conducting analysis that assumes the data were collected from a simple random sample. The analyst applying this correction procedure should carefully examine the statistical software being used and assess whether or not the program treats weights in such a way as to produce the effect described above.

3.6 Imputation

3.6.1 Imputation Variables

Eighteen key analysis variables were selected for imputation for the ELS:2002 first follow-up study. These variables included the same variables that were chosen for imputation in the base-year study and two new variables from the first follow-up study. Table 28 lists the selected variables. The two new variables selected for imputation include the spring 2004 student ability estimate for mathematics and the spring 2004 student enrollment status (e.g., in school in grade 12, in school in other grade or ungraded or early graduate, out of school because of dropout or homeschooled, or out of scope/ineligible). These variables were chosen because they are standard classification variables used in most data reporting.

Table 28. First follow-up imputation variables, by number and weighted proportion imputed: 2004

Variable	Number of cases imputed	Weighted percent imputed[1]
Student sex	1	0.01
Student race/ethnicity	6	0.04
Student language minority status	33	0.20
Student Hispanic subgroup[2]	14	0.09
Student Asian subgroup[2]	12	0.07
School program type	651	4.01
Student postsecondary educational expectations	91	0.56
Parental aspirations for student postsecondary achievement	687	4.23
Family composition	65	0.40
Mother's educational attainment[3]	111	0.68
Mother's occupation[3]	166	1.02
Father's educational attainment[3]	183	1.13
Father's occupation[3]	237	1.46
Family income (2001)[3]	868	5.34
Enrollment status (in school vs. out)	86	0.53
Spring 2004 student ability estimate (theta) for mathematics[4]	2,707	16.66
10th-grade student ability estimate (theta) for mathematics[4]	651	4.01
10th-grade student ability estimate (theta) for reading[4]	651	4.01

[1] The denominator used in calculating the weighted percent missing varies by variable due to restrictions on eligibility for imputation.
[2] All race categories exclude individuals of Hispanic or Latino origin.
[3] Used to construct socioeconomic status (SES).
[4] Used to construct scale, quartile, and proficiency scores.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

3.6.2 Imputation Methodologies

The ELS:2002 base-year and first follow-up data files were imputed using three imputation methods including logical imputation, weighted sequential hot deck imputation, and

multiple imputation. This section gives a brief summary of each of these methods and outlines how each one was used in the imputation plan.

All possible logical imputations were performed before any other imputation method was applied to the data files. For instance, student sex was imputed by assigning a value based on student name. This assignment mapping was developed using the distribution of the known student names and sex values. Student sex and student race were the only two variables that were logically imputed.

After all logical imputations were completed, weighted sequential hot deck imputation (Cox 1980) was used to impute 13 categorical variables. Sequential hot deck imputation is a common procedure used for item nonresponse. This method uses the respondent survey data (donors) to provide imputed values for records with missing values. The basic principle of sequential hot deck imputation involves defining imputation classes, which generally consist of a cross-classification of covariates, and then replacing missing values sequentially from a single pass through the survey data within the imputation classes. When sequential hot deck imputation is performed using the sampling weights of the item respondents and nonrespondents, the procedure is called weighted sequential hot deck imputation. This procedure takes into account the unequal probabilities of selection in the original sample by using the sampling weight to specify the expected number of times a particular respondent's answer was used to replace a missing item. These expected selection frequencies are specified so that, over repeated applications of the algorithm, the expected value of the weighted distribution of the imputed values will equal in expectation within imputation class the weighted distribution of the reported answers. Weighted sequential hot deck imputation was chosen for most of the variables because this procedure works well for categorical data.

The last imputation procedure used was multiple imputation (MI). The MI procedure was chosen for three continuous variables: the 10th-grade student ability estimate (theta) for mathematics, the 10th-grade student ability estimate (theta) for reading, and the spring 2004 student ability estimate (theta) for mathematics. MI is a technique that requires imputing missing values several times and creating *m* complete datasets. These are created such that regular complete-case analyses can be performed. The parameters of interest, then, can be calculated by averaging the parameter estimators from each augmented dataset. The SAS PROC MI procedure was used to impute these three variables. The Markov Chain Monte Carlo (MCMC) model option, which assumes the data are from a multivariate normal distribution, was used to estimate the entire joint posterior probability distribution of the unknown quantities. Random draws from this distribution were taken to fill in the missing values.

The SAS PROC MI procedure was selected for these three variables because it provides an imputation variance based on MI theory and does not require any additional computation. The "theta" value (which is only a restricted-use variable) is used in the construction of various ELS:2002 test variables, and this construction process requires an imputation variance.

It should be noted that MI was not chosen for imputation of all variables, because the MI procedure is currently restricted to imputation of continuous variables and most of the variables selected for imputation are categorical. Therefore, the weighted sequential hot deck was the preferred method for these variables.

3.6.3 Definition of Eligibility for Imputation

Table C-1 in appendix C shows the set of respondents for which each variable was imputed. The appendix lists the different respondent types, including the questionnaire-ineligible (expanded sample) students. As shown in the appendix, all variables were imputed for base-year nonrespondents who became first follow-up respondents (651 students) and for base-year respondents who were also first follow-up respondents (14,062). For base-year questionnaire-incapable students whose status had changed 2 years later and who were successfully surveyed in the first follow-up (n = 105), all variables were imputed except school program type and the 10th-grade ability estimates. For freshened respondents (171), all variables were imputed except school program type, the 10th-grade ability estimates, and parental aspirations. For the first follow-up questionnaire-incapable students (100), all variables were imputed except school program type, student postsecondary educational expectations, and the student ability estimates.

The 16 variables that were imputed in the base-year study were not imputed again for base-year nonrespondents because their data were either reported or imputed in the base year. These variables were only imputed in the first follow-up when not provided by respondents in the new participant supplement by first follow-up respondents who were base-year nonrespondents, 12th-grade freshened sample members, or base-year questionnaire-ineligible students who became first follow-up respondents. The base-year nonrespondents who became first follow-up respondents included students still at the base-year school, transfer students, dropouts, early graduates, and homeschooled students.

The spring 2004 student ability estimate for mathematics was imputed for students who were considered in school (i.e., students still attending the sample school as of spring 2004 and transfer students as of spring 2004). The estimate was not imputed for out-of-school respondents (i.e., dropouts, early graduates, and homeschooled students). For the 651 students who became first follow-up respondents and were base-year nonrespondents, the 10th-grade student ability estimates for mathematics and reading were imputed.

Finally, spring 2004 enrollment status for all first follow-up sample members (respondents and nonrespondents) on the restricted-use file (16,374) was imputed. Most information was imputed using data available from school records, and any remaining missing data were imputed using the weighted sequential hot deck procedure. This variable was imputed because it is an analysis variable that will be used frequently, and it provides a better picture of the cohort dropout rate.

3.6.4 Imputation Results

Of the 15 categorical variables, 2 variables (sex and race/ethnicity) were imputed using logical imputation, and 13 were imputed using a weighted sequential hot deck procedure. The remaining 3 continuous variables were imputed using MI.

Table 28 lists the variables in the order in which they were imputed and shows the number of cases that were imputed. The order in which the variables were imputed depended on whether the response of one variable was dependent upon the response of another variable. For instance, Hispanic and Asian subgroup could only be imputed after the race/ethnicity variable

was determined. Similarly, family income was dependent on parent education and occupation; therefore, parent education and occupation were imputed prior to family income. Within these dependencies, the variables were imputed in the same order that they were imputed in the base-year study, generally starting with the variable containing the lowest percentage missing up to the variable with the highest percentage missing.

The basic MI model used for imputing the student ability estimates included the following predictor variables: sex, race/ethnicity, student language, student postsecondary aspirations, parental aspirations for student, family composition, mother's and father's occupation and education level, household income, school type, urbanicity, and census region. The model used for predicting the spring 2004 student ability estimate in mathematics also contained the 10th-grade ability estimate for both mathematics and reading. Similarly, the model used for predicting the 10th-grade ability estimate for both mathematics and reading contained the spring 2004 student ability estimate in mathematics.

Table C-2 presents the imputation classes and sorting variables used for all of the variables imputed by the weighted sequential hot deck approach, and table C-3 presents the variables used in the MI models. Table C-4 presents the before- and after-imputation distributions.

3.6.5 Imputation Evaluation

The key measure for determining whether the imputation methods produce acceptable results is that the before- and after-imputation weighted distributions are similar. For evaluation of the imputation results, distributions were considered to be similar when absolute differences are less than 5 percent where the absolute difference is calculated by subtracting the before-imputation weighted percent from the after-imputation weighted percent. If absolute differences are greater than 5 percent, then the unweighted distributions were examined to see if the large differences are due to small sample sizes. Any large differences were evaluated and corrected when possible (perhaps by using different imputation classes) and documented when no resolution is possible.

MI inference assumes that the analyst's model is the same as the imputer's model. However, the two models may not be the same. Therefore, a general practice is to include as many variables as possible when doing MI. The precision that is lost when unimportant predictors are included is usually relatively small compared with the general validity of analyses of the resultant multiply imputed dataset. The PROC MI procedure provides the between-imputation, within-imputation, and total variances for the model. Additionally, it provides the degrees of freedom for the total variance, the relative increase in variance due to missing values, and the fraction of missing information for each parameter estimate. These statistics were used in the evaluation of the MI.

3.7 Disclosure Risk Analysis and Protections

Because of the paramount importance of protecting the confidentiality of NCES data that contain information about specific individuals, ELS:2002 first follow-up data were subject to various procedures to minimize disclosure risk.

As a first step, all ELS:2002 data files (school and student) were reviewed to identify high-risk variables. Some variables were identified as unsuitable for the public-use file in any form; these variables appear only on the restricted-use files. Public-use variables that might point to specific individuals or schools (e.g., some fine-grained variables, particularly those in continuous form, and variables with extreme outliers) were altered through data coarsening techniques, such as top coding, bottom coding, or recasting into categorical form.

As a second step, a technique called "data swapping" was carried out, both for school-level data and for student-level data. Schools and respondents were randomly selected for swapping to achieve a specific, but undisclosed, swapping rate. In data swapping, some variables for a sample case that has been paired with another case will be exchanged. By so doing, even if a tentative identification of an individual is made, because every case in the file has some undisclosed probability of having been swapped, uncertainty remains about the accuracy and interpretation of the match. The swapping was done independently of the swapping conducted in the base year.

As a final step, the ELS:2002 data underwent a disclosure risk analysis. In this analysis, school characteristics information available on the data files was compared to information on publicly available universe files of schools. A distance measure was used to compute risk of deductive disclosure, and techniques to minimize disclosure risk were applied until school identities were appropriately masked. Specific techniques employed included both perturbation (perturbation directly alters individual respondent data for some variables) and coarsening of the data (coarsening reduces the level of detail, for example, by making a continuous variable categorical).[27]

In the case of the coarsening applied to certain variables on the public-use file, more fine-grained detail for these variables may be found on the restricted-use files. In the case of perturbation of the data (including swapping), all changes imposed on the public-use files were also implemented in the restricted-use files. Although perturbation techniques such as swapping do result in changes in estimates generated from the data, before-and-after weighted distributions and correlations for swapped variables show that, after applying the disclosure limitation techniques, the analytic utility of the data files has not been compromised in any way.

3.8 Student Nonresponse Bias Analysis

Unit nonresponse causes bias in survey estimates when the outcomes of respondents and nonrespondents are different. For ELS:2002, student response is defined as the sample member completing at least a specified portion of the questionnaire. The response rate was above 85 percent overall and for most domains (see section 3.4 for a description of the domains). However, the response rate was below 85 percent for four domains (spring 2002 sophomores who were dropouts, transfer students, homeschooled, or early graduates), so a student-level nonresponse bias analysis was conducted for these domains. The final overall student weighted response rate was 88.7 percent. Although the overall response rate was above 85 percent and a

[27] The NCES Statistical Standards (Seastrom 2003) (http://nces.ed.gov/statprog/2002/std4_2.asp), specifically NCES Standard 4-2, provide information both about the legislative background and legal requirements of maintaining confidentiality, and definitions of key terms (perturbation, coarsening, disclosure risk analysis, data swapping, and so forth).

nonresponse bias analysis is not required by NCES standards, a bias analysis for base-year sophomores was conducted for the purposes of quality and completeness using both the cross-sectional and panel weights.

The nonresponse bias was estimated for variables known for both respondents and nonrespondents. In the base year, information was not collected for nonresponding students other than what was received on the student enrollment lists. On these lists, data were obtained on IEP status, race/ethnicity, and sex. These data were not provided by all schools (in particular, information on IEP status was often missing, and IEP information was typically relevant only for public schools). In consequence, only the school-supplied race/ethnicity and sex data were used. For most of the first follow-up freshened students, race/ethnicity and sex data were available. The student's spring 2004 enrollment status was also used and defined as follows:

- in school, in grade (in grade 12);
- in school, out of grade (in grade 10 or 11, ungraded, or graduated early); and
- out of school (dropout or homeschooled).

There were also extensive data available for schools from the base-year school administrator questionnaire, so these data were used to help reduce potential nonresponse bias. Students were linked to the base-year school from which they were sampled. The first follow-up administrator data were not used when available because it is possible that student nonresponse is correlated with school nonresponse. It was safer to use the base-year administrator data for all students. The school sampling frame constructed from the CCD and PSS also contains data for all base-year schools. School data used included the following:

- school sector;
- urbanicity;
- region;
- sophomore enrollment;
- total enrollment;
- number of minutes per class;
- number of class periods;
- number of school days;
- number of students receiving free or reduced-price lunch;
- number of full-time teachers;
- percentage of full-time teachers certified;
- number of part-time teachers;
- number of different grades taught at the school;
- school level;
- coeducational status;

- percentage of students with an IEP;
- percentage of students with LEP;
- percentage Hispanic or Latino sophomores;
- percentage Asian sophomores;
- percentage Black or African American sophomores; and
- percentage All other race sophomores (includes White).

The procedures used for the nonresponse bias analysis were similar to those used in the base year. First, for the school and student data known for most respondents and nonrespondents, the nonresponse bias was estimated and tested to determine if the bias was significant at the 5 percent level. Second, nonresponse adjustments were computed, and variables known for most respondents and nonrespondents were included in the nonresponse models. The nonresponse adjustments described in section 3.4 were designed to significantly reduce or eliminate nonresponse bias for variables included in the models. Variables not known for most respondents and nonrespondents could not be included in the nonresponse adjustments, and therefore nonresponse bias could not explicitly be reduced for these variables. However, many of the variables in the nonresponse models are correlated with many of the other variables.

Third, after the school and student weights were computed, remaining bias for data known for most respondents and nonrespondents was estimated and statistically tested to check if there was any remaining significant nonresponse bias. Fourth, the remaining bias after student weight adjustments was divided by the standard error, that is, bias/standard error.

The bias in an estimated mean based on respondents, $\overline{y}_R$, is the difference between this mean and the target parameter, π (i.e., the mean that would be estimated if a complete census of the target population was conducted). This bias can be expressed as follows:

$$B\left(\overline{y}_R\right) = \overline{y}_r - \pi$$

The estimated mean based on nonrespondents, $\overline{y}_{NR}$, can be computed if data for the particular variable for most of the nonrespondents are available. The estimation of π is as follows:

$$\hat{\pi} = \left(1-\eta\right)\overline{y}_R + \eta\overline{y}_{NR}$$

where η is the weighted unit nonresponse rate. For the variables that are from the frame rather than from the sample, π can be estimated without sampling error. Therefore, the bias can be estimated as follows:

$$\hat{B}\left(\overline{y}_R\right) = \overline{y}_R - \hat{\pi}$$

or equivalently

$$\hat{B}(\bar{y}_R) = \eta(\bar{y}_R - \bar{y}_{NR})$$

This formula shows that the estimate of the nonresponse bias is the difference between the mean for respondents and nonrespondents multiplied by the weighted nonresponse rate. The variance of the bias was computed using Taylor series estimation in RTI's software package SUDAAN.

Tables 29 and 30 show the nonresponse bias before and after weight adjustments for selected variables for base-year sophomores. The first set of columns in each table shows the estimated bias before nonresponse adjustment for the variables available for most responding and nonresponding students. The results are identical for these two tables. Statistical tests (*t* tests) were used to test each level of the variables for significance of the bias at the 0.05/(c-1) significance level, where c is the number of categories (levels) within the primary variable. Below is a summary of the before-adjustment significant bias for tables 29 and 30:

- At least one level of 9 of the 25 variables was biased in each table.
- Sixteen levels of variables were found to be significantly biased in both tables 29 and 30.
- Significant biases were usually small.

The second set of columns in tables 29 and 30 shows the estimated bias after weight adjustments (using F1QWT for table 29 and F1PNLWT for table 30) for the variables available for most responding and nonresponding students. The bias after weight adjustments was computed as the difference between the estimate using nonresponse-adjusted (final) weights and the estimate using the design (base) weights prior to nonresponse adjustment. This latter estimate is an estimate of π because it is the estimate of the target population using the design weights. Similar to the testing of before-adjustment bias, *t* tests were performed to test the significance of the bias for each level of the variables. In both tables 29 and 30, the estimated bias usually decreased after weight adjustments. Therefore, the number of significantly biased levels of variables decreased from 16 *before* adjustment to zero *after* adjustment in both tables.

Tables 31, 32, 33, and 34 show the nonresponse bias before and after weight adjustments for selected variables in domains where the response rate was less than 85 percent. Table 31 refers to the domain of transfer students, table 32 refers to the domain of dropouts, table 33 refers to the domain of early graduates, and table 34 refers to the domain of homeschooled students. As in tables 29 and 30, the first set of columns in each table shows the estimated bias before nonresponse adjustment for the variables available for most responding and nonresponding students. Statistical tests (*t* tests) were again used to test the significance of the bias at the 0.05/(c-1) significance level. Below is a summary of the before-adjustment significant bias for tables 31, 32, 33, and 34:

- At least one level of three variables and a total of four levels were found to be significantly biased in table 31.
- One level of two variables was found to be significantly biased in table 32.
- One level of five variables was found to be significantly biased in table 33.

- At least one level of four variables and a total of five levels were found to be significantly biased in table 34.
- Significant biases were usually small.

As in tables 29 and 30, the second set of columns in tables 31, 32, 33, and 34 shows the estimated bias after weight adjustments (using F1QWT) for the variables available for most responding and nonresponding students. The bias after weight adjustments was computed the same way as described above for tables 29 and 30. Statistical tests (*t* tests) were performed to test the significance of the bias for each level of the variables. In all four tables, the estimated bias sometimes decreased after weight adjustments and sometimes increased after weight adjustments. In tables 31 and 32, the amount of significant bias actually increased to seven levels of four variables and five levels of three variables, respectively. In tables 33 and 34, the amount of significant bias decreased to one and zero variables, respectively. Note that sample members are assigned to these domains based on data known for respondents and nonrespondents, and sample members may actually be in different domains. Therefore, these bias estimates are approximate. Also, the weight adjustments accounted for enrollment status, as described in section 3.4, but enrollment status combined the categories of transfer student, dropout, early graduate, or homeschooled student. Enrollment status was used because it was considered the more important analysis variable and to be consistent with NELS:88.

The student nonresponse bias analyses in conjunction with the weighting adjustments described below do not eliminate all bias. They reduce bias for some of the variables known for most respondents and nonrespondents, which are considered to be some of the analytically important variables and are correlated with many of the other variables. Significant bias after weight adjustments is minimal for the variables analyzed. Some of these variables are used to help create composite (or derived) variables. There may be bias remaining in other variables.

Figures 6 through 11 compare the estimated relative bias before nonresponse adjustment with the estimated relative bias after nonresponse adjustment for base-year sophomores using F1QWT, base-year sophomores using F1PNLWT, transfer students using F1QWT, dropouts using F1QWT, early graduates using F1QWT, and homeschooled students using F1QWT, respectively. Relative bias is the bias of the estimate divided by the estimate. It provides an indication of the order of magnitude of the bias with respect to the estimate. Figures 6 and 7 indicate that when the relative bias was large before nonresponse adjustment, it was almost always reduced after nonresponse adjustment. When the relative bias was small before nonresponse adjustment, it stayed small after nonresponse adjustment with occasional small increases. These two figures clearly show that the nonresponse adjustment reduced bias for base-year sophomores. Figures 8 through 11 show somewhat of a random pattern. Sometimes relative bias decreased after nonresponse adjustment, sometimes relative bias increased after nonresponse adjustment, and sometimes, relative bias did not change much after nonresponse adjustment. As shown in tables 32 through 34, the bias is frequently not significant after nonresponse adjustment. Also, as mentioned above, sample members are assigned to these domains based on data known for respondents and nonrespondents, and sample members may actually be in different domains.

Nonresponse bias can have an effect on significance testing. Tables 29 through 34 include an estimate of the bias ratio (student bias divided by the standard error). If this ratio is larger than 2 percent, then the probability of a Type I error is greater than 0.05. Figures 12 through 17 show the student bias ratio by the Type I error rate for base-year sophomores using F1QWT, base-year sophomores using F1PNLWT, transfer students, dropouts, early graduates, and homeschooled students, respectively. Figures 12 and 13 show that for many of the student variables included in the nonresponse bias analysis, the Type I error rate is at or close to 0.05, and outliers were not graphed. These results are similar to the base-year results for spring 2002 sophomores. Figures 14 through 17 show that although some variables have a Type I error rate at or near 0.05, there are more variables that have a higher Type I error rate. These figures do not take the school bias ratio into account. The school bias ratio varies by school variable, as shown in the ELS:2002 base-year data file user's manual (Ingels et al. 2004). If it is assumed that the school bias ratio is zero, then there is no effect on the student bias ratio. However, if the school bias ratio is large, then the Type I error rates are larger. Although the tables above show that nonresponse bias is minimal, the data user should exercise caution when conducting statistical tests.

Table 29. Nonresponse bias before and after nonresponse adjustment for base-year sophomores using the cross-sectional weight, by selected categorical variables: 2004

	Before nonresponse adjustment							After nonresponse adjustment					
Description	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Asian 10th-grade enrollment percent													
≤ 2 percent	5,684	547	38.298	39.784	-0.167	-0.004	N	38.465	38.686	-0.221	-0.461	-0.006	N
> 2 percent	9,029	943	61.702	60.216	0.167	0.003	N	61.535	61.314	0.221	0.461	0.004	N
Black or African American 10th-grade enrollment percent													
≤ 4 percent	5,043	459	34.669	32.029	0.296	0.009	N	34.373	34.296	0.076	0.150	0.002	N
> 4 percent	9,670	1031	65.331	67.971	-0.296	-0.005	N	65.627	65.704	-0.076	-0.150	-0.001	N
Minutes per class period													
≤ 45	3,540	368	18.887	21.081	-0.246	-0.013	N	19.133	19.144	-0.011	-0.031	-0.001	N
46–50	3,166	312	21.924	20.110	0.203	0.009	N	21.720	21.662	0.059	0.110	0.003	N
51–80	3,925	394	28.983	29.746	-0.086	-0.003	N	29.068	29.036	0.033	0.066	0.001	N
81+	4,082	416	30.206	29.063	0.128	0.004	N	30.078	30.159	-0.081	-0.180	-0.003	N
Class periods per day													
1–4	4,219	421	31.191	28.889	0.258	0.008	N	30.933	31.021	-0.088	-0.195	-0.003	N
5–6	3,612	403	26.901	29.533	-0.295	-0.011	N	27.196	27.129	0.067	0.144	0.002	N
7	3,984	400	24.649	25.304	-0.073	-0.003	N	24.722	24.742	-0.019	-0.047	-0.001	N
8–9	2,898	266	17.259	16.274	0.111	0.006	N	17.149	17.109	0.040	0.087	0.002	N
Is the school coeducational?													
Yes	13,937	1,425	97.909	98.506	-0.067	-0.001	N	97.976	97.970	0.006	0.150	#	N
No, all-female school	361	35	1.004	0.890	0.013	0.013	N	0.992	0.991	#	0.014	#	N
No, all-male school	415	30	1.087	0.604	0.054	0.052	N	1.032	1.039	-0.007	-0.283	-0.007	N
Student race/ethnicity[4]													
All other races	9,120	830	67.450	62.158	0.594	0.009	Y	66.857	66.818	0.039	0.089	0.001	N
Asian	1,619	173	3.891	3.623	0.030	0.008	N	3.861	3.853	0.008	0.071	0.002	N
Black or African American	2,169	261	15.708	18.383	-0.300	-0.019	N	16.008	15.985	0.022	0.075	0.001	N
Hispanic or Latino	1,805	226	12.951	15.836	-0.324	-0.024	N	13.275	13.344	-0.069	-0.247	-0.005	N
10th-grade enrollment													
0–99	2,888	255	12.689	9.164	0.395	0.032	Y	12.294	12.337	-0.043	-0.092	-0.004	N
100–249	3,823	293	22.457	16.644	0.652	0.030	Y	21.805	21.947	-0.142	-0.412	-0.007	N
250–499	4,704	485	36.049	38.916	-0.322	-0.009	N	36.371	36.355	0.016	0.031	#	N
500+	3,298	457	28.805	35.276	-0.726	-0.025	Y	29.530	29.361	0.170	0.325	0.006	N

See notes at end of table.

Table 29. Nonresponse bias before and after nonresponse adjustment for base-year sophomores using the cross-sectional weight, by selected categorical variables: 2004—Continued

	Before nonresponse adjustment							After nonresponse adjustment					
Description	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Total enrollment													
≤ 600	3,511	278	17.875	12.259	0.630	0.037	Y	17.245	17.327	-0.082	-0.171	-0.005	N
601–1,200	4,453	406	27.547	25.559	0.223	0.008	N	27.324	27.438	-0.114	-0.290	-0.004	N
1,201–1,800	3,321	364	25.828	29.082	-0.365	-0.014	N	26.193	26.117	0.076	0.195	0.003	N
> 1,800	3,428	442	28.750	33.099	-0.488	-0.017	N	29.238	29.117	0.121	0.227	0.004	N
Enrollment status													
In school, in grade (grade 12)	12,305	888	81.268	58.075	2.602	0.033	Y	78.666	78.622	0.044	0.102	0.001	N
In school, out of grade	1,697	350	13.235	23.153	-1.112	-0.078	Y	14.348	14.339	0.009	0.023	0.001	N
Out of school	711	252	5.497	18.772	-1.489	-0.213	Y	6.986	7.039	-0.053	-0.226	-0.008	N
Free or reduced-price lunch													
0	2,667	258	8.150	7.875	0.031	0.004	N	8.119	8.065	0.055	0.201	0.007	N
1–10	3,347	306	25.022	26.694	-0.188	-0.007	N	25.210	25.211	-0.001	-0.003	#	N
11–30	4,386	450	35.984	32.895	0.347	0.010	N	35.638	35.574	0.064	0.122	0.002	N
> 30	4,313	476	30.843	32.536	-0.190	-0.006	N	31.033	31.150	-0.117	-0.237	-0.004	N
Number of full-time teachers													
1–40	3,857	319	18.359	13.996	0.489	0.027	Y	17.870	17.963	-0.093	-0.211	-0.005	N
41–70	3,776	314	23.521	19.526	0.448	0.019	N	23.073	23.168	-0.095	-0.262	-0.004	N
71–100	3,759	436	30.240	32.764	-0.283	-0.009	N	30.523	30.421	0.102	0.202	0.003	N
101+	3,321	421	27.880	33.714	-0.654	-0.023	Y	28.535	28.448	0.087	0.181	0.003	N
Number of grades within the school													
4	11,206	1,131	79.654	79.374	0.031	#	N	79.623	79.660	-0.037	-0.081	#	N
> or < 4	3,507	359	20.346	20.626	-0.031	-0.002	N	20.377	20.340	0.037	0.081	0.002	N
Types of grades within the school													
K–12, PreK–10th, 1st–12th, PreK/1st–9th/12th and PreK–12 schools	980	91	5.024	3.745	0.143	0.029	N	4.881	4.829	0.051	0.115	0.011	N
Middle grades but no elementary	1,555	153	7.595	6.502	0.123	0.016	N	7.473	7.575	-0.102	-0.564	-0.014	N
Only high school	12,178	1,246	87.380	89.753	-0.266	-0.003	N	87.647	87.596	0.051	0.112	0.001	N
Hispanic 10th-grade enrollment percent													
≤ 3 percent	5,716	533	37.928	37.304	0.070	0.002	N	37.858	38.088	-0.230	-0.482	-0.006	N
> 3 percent	8,997	957	62.072	62.696	-0.070	-0.001	N	62.142	61.912	0.230	0.482	0.004	N

See notes at end of table.

Table 29. Nonresponse bias before and after nonresponse adjustment for base-year sophomores using the cross-sectional weight, by selected categorical variables: 2004—Continued

	Before nonresponse adjustment							After nonresponse adjustment					
Description	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
IEP[5] percentage													
≤ 5 percent	5,801	537	26.532	25.632	0.101	0.004	N	26.431	26.541	-0.110	-0.256	-0.004	N
6–10 percent	3,760	389	32.843	34.502	-0.186	-0.006	N	33.029	32.884	0.145	0.290	0.004	N
11–5 percent	3,213	352	26.441	25.356	0.122	0.005	N	26.319	26.294	0.025	0.058	0.001	N
> 15 percent	1,939	212	14.184	14.510	-0.037	-0.003	N	14.221	14.281	-0.060	-0.122	-0.004	N
LEP[6] percentage													
0 percent	6,457	532	34.559	28.762	0.650	0.019	Y	33.909	33.896	0.013	0.026	#	N
1 percent	2,897	289	23.189	22.184	0.113	0.005	N	23.076	23.079	-0.003	-0.007	#	N
2–5 percent	2,447	282	18.577	23.160	-0.514	-0.027	N	19.091	19.101	-0.009	-0.025	#	N
> 6 percent	2,912	387	23.675	25.894	-0.249	-0.010	N	23.924	23.924	0.000	-0.001	#	N
Urbanicity													
Urban	4,950	588	29.567	35.077	-0.618	-0.020	Y	30.185	30.078	0.107	0.212	0.004	N
Suburban	7,063	674	50.183	49.843	0.038	0.001	N	50.145	50.183	-0.038	-0.073	-0.001	N
Rural	2,700	228	20.250	15.080	0.580	0.029	Y	19.670	19.739	-0.069	-0.141	-0.004	N
All other races[6] 10th-grade enrollment percent													
≤ 80 percent	7,245	845	50.735	55.048	-0.484	-0.009	Y	51.219	51.153	0.066	0.120	0.001	N
> 80 percent	7,468	645	49.265	44.952	0.484	0.010	Y	48.781	48.847	-0.066	-0.120	-0.001	N
Number of part-time teachers													
0–1	4,205	479	30.682	32.753	-0.232	-0.008	N	30.914	30.956	-0.042	-0.086	-0.001	N
2–3	4,241	379	28.906	24.858	0.454	0.016	N	28.452	28.465	-0.013	-0.025	0.000	N
4–6	3,569	370	21.502	22.411	-0.102	-0.005	N	21.604	21.658	-0.053	-0.120	-0.002	N
7+	2,698	262	18.910	19.978	-0.120	-0.006	N	19.030	18.922	0.108	0.270	0.006	N
Full-time teacher certified													
0–90 percent	3,797	360	16.138	14.344	0.201	0.013	N	15.937	15.980	-0.044	-0.121	-0.003	N
91–99 percent	2,577	313	20.008	22.786	-0.312	-0.015	N	20.320	20.211	0.108	0.235	0.005	N
100 percent	8,339	817	63.854	62.871	0.110	0.002	N	63.744	63.808	-0.065	-0.124	-0.001	N
Geocode													
Census division (public schools)													
Public-New England/Middle Atlantic[5]	1,991	222	16.407	18.446	-0.229	-0.014	N	16.636	16.671	-0.034	-0.089	-0.002	N
Public-East North Central	1,782	213	14.241	16.450	-0.248	-0.017	N	14.489	14.359	0.130	0.441	0.009	N

See notes at end of table.

Table 29. Nonresponse bias before and after nonresponse adjustment for base-year sophomores using the cross-sectional weight, by selected categorical variables: 2004—Continued

	Before nonresponse adjustment							After nonresponse adjustment					
Description	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Geocode—Continued													
Public-West North Central	953	70	8.056	5.497	0.287	0.037	N	7.769	8.020	-0.251	-1.338	-0.032	N
Public-South Atlantic	2,112	223	16.390	16.654	-0.030	-0.002	N	16.420	16.440	-0.020	-0.067	-0.001	N
Public-East South Central	850	53	6.216	3.967	0.252	0.042	N	5.964	5.936	0.027	0.136	0.005	N
Public-West South Central	1,318	141	9.459	9.451	0.001	0.000	N	9.458	9.407	0.052	0.219	0.005	N
Public-Mountain	601	94	6.747	9.777	-0.340	-0.048	N	7.087	7.202	-0.115	-0.270	-0.016	N
Public-Pacific	1,853	202	14.705	13.160	0.173	0.012	N	14.531	14.313	0.219	0.446	0.015	N
Census region (private schools)													
Private-Northwest	724	59	1.916	1.248	0.075	0.041	N	1.841	1.817	0.025	0.240	0.013	N
Private-Midwest	964	78	1.990	1.910	0.009	0.005	N	1.981	1.910	0.071	1.090	0.036	N
Private-South	1,031	79	2.374	1.637	0.083	0.036	N	2.291	2.440	-0.149	-2.306	-0.065	N
Private-West	534	56	1.499	1.803	-0.034	-0.022	N	1.533	1.486	0.046	0.198	0.030	N
Number of days in school year													
Less than 180 days	3,856	357	24.501	21.603	0.325	0.013	N	24.176	24.277	-0.101	-0.284	-0.004	N
180 days	8,135	841	56.940	56.859	0.009	#	N	56.931	56.815	0.116	0.234	0.002	N
More than 180 days	2,722	292	18.558	21.538	-0.334	-0.018	N	18.893	18.908	-0.016	-0.039	-0.001	N
School sector													
Public	11,460	1,218	92.221	93.402	-0.132	-0.001	N	92.353	92.346	0.007	0.028	#	N
Catholic	1,898	129	4.438	2.902	0.172	0.040	Y	4.266	4.268	-0.003	-0.037	-0.001	N
Other private	1,355	143	3.341	3.696	-0.040	-0.012	N	3.381	3.385	-0.005	-0.018	-0.001	N
Student sex													
Male	7,335	744	50.198	50.193	0.001	#	N	50.198	50.433	-0.236	-0.609	-0.005	N
Female	7,378	746	49.802	49.807	-0.001	#	N	49.802	49.567	0.236	0.609	0.005	N

[#] Rounds to zero.

[1] Design weight is used before nonresponse adjustment. This is the distribution to each response category.

[2] "Y" denotes statistical significance at $p < .05$. "N" denotes no statistical significance.

[3] Weight after nonresponse adjustment.

[4] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.

[5] IEP = Individualized Education Program.

[6] LEP = limited English proficient.

[7] Collapsed category comprising two Census divisions.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 30. Nonresponse bias before and after nonresponse adjustment for base-year sophomores using the panel weight, by selected categorical variables: 2004

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Asian 10th-grade enrollment percent													
≤ 2 percent	5,684	547	38.298	39.784	-0.167	-0.004	N	38.465	38.700	-0.235	-0.491	-0.006	N
> 2 percent	9,029	943	61.702	60.216	0.167	0.003	N	61.535	61.300	0.235	0.491	0.004	N
Black or African American 10th-grade enrollment percent													
≤ 4 percent	5,043	459	34.669	32.029	0.296	0.009	N	34.373	34.346	0.026	0.051	0.001	N
> 4 percent	9,670	1031	65.331	67.971	-0.296	-0.005	N	65.627	65.654	-0.026	-0.051	#	N
Minutes per class period													
≤ 45	3,540	368	18.887	21.081	-0.246	-0.013	N	19.133	19.153	-0.019	-0.056	-0.001	N
46–50	3,166	312	21.924	20.110	0.203	0.009	N	21.720	21.650	0.070	0.132	0.003	N
51–80	3,925	394	28.983	29.746	-0.086	-0.003	N	29.068	29.028	0.040	0.080	0.001	N
81+	4,082	416	30.206	29.063	0.128	0.004	N	30.078	30.169	-0.091	-0.201	-0.003	N
Class periods per day													
1–4	4,219	421	31.191	28.889	0.258	0.008	N	30.933	31.005	-0.073	-0.160	-0.002	N
5–6	3,612	403	26.901	29.533	-0.295	-0.011	N	27.196	27.110	0.086	0.183	0.003	N
7	3,984	400	24.649	25.304	-0.073	-0.003	N	24.722	24.743	-0.021	-0.051	-0.001	N
8–9	2,898	266	17.259	16.274	0.111	0.006	N	17.149	17.141	0.008	0.018	#	N
Is the school coeducational?													
Yes	13,937	1,425	97.909	98.506	-0.067	-0.001	N	97.976	97.965	0.011	0.263	#	N
No, all-female school	361	35	1.004	0.890	0.013	0.013	N	0.992	0.993	-0.002	-0.053	-0.002	N
No, all-male school	415	30	1.087	0.604	0.054	0.052	N	1.032	1.042	-0.009	-0.396	-0.009	N
Student race/ethnicity[4]													
All other races	9,120	830	67.450	62.158	0.594	0.009	Y	66.857	66.817	0.040	0.090	0.001	N
Asian	1,619	173	3.891	3.623	0.030	0.008	N	3.861	3.853	0.008	0.067	0.002	N
Black or African American	2,169	261	15.708	18.383	-0.300	-0.019	N	16.008	15.985	0.023	0.077	0.001	N
Hispanic or Latino	1,805	226	12.951	15.836	-0.324	-0.024	N	13.275	13.345	-0.070	-0.248	-0.005	N
10th-grade enrollment													
0–99	2,888	255	12.689	9.164	0.395	0.032	Y	12.294	12.345	-0.051	-0.109	-0.004	N
100–249	3,823	293	22.457	16.644	0.652	0.030	Y	21.805	21.952	-0.147	-0.426	-0.007	N
250–499	4,704	485	36.049	38.916	-0.322	-0.009	N	36.371	36.384	-0.013	-0.025	#	N
500+	3,298	457	28.805	35.276	-0.726	-0.025	Y	29.530	29.320	0.211	0.404	0.007	N

See notes at end of table.

Table 30. Nonresponse bias before and after nonresponse adjustment for base-year sophomores using the panel weight, by selected categorical variables: 2004—Continued

	Before nonresponse adjustment							After nonresponse adjustment					
Description	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Total enrollment													
≤ 600	3,511	278	17.875	12.259	0.630	0.037	Y	17.245	17.341	-0.096	-0.199	-0.006	N
601–1,200	4,453	406	27.547	25.559	0.223	0.008	N	27.324	27.416	-0.092	-0.233	-0.003	N
1,201–1,800	3,321	364	25.828	29.082	-0.365	-0.014	N	26.193	26.225	-0.033	-0.084	-0.001	N
> 1,800	3,428	442	28.750	33.099	-0.488	-0.017	N	29.238	29.018	0.220	0.412	0.008	N
Enrollment status													
In school, in grade (grade 12)	12,305	888	81.268	58.075	2.602	0.033	Y	78.666	78.715	-0.049	-0.113	-0.001	N
In school, out of grade	1,697	350	13.235	23.153	-1.112	-0.078	Y	14.348	14.289	0.059	0.144	0.004	N
Out of school	711	252	5.497	18.772	-1.489	-0.213	Y	6.986	6.996	-0.010	-0.044	-0.001	N
Free or reduced-price lunch													
0	2,667	258	8.150	7.875	0.031	0.004	N	8.119	8.067	0.052	0.196	0.006	N
1–10	3,347	306	25.022	26.694	-0.188	-0.007	N	25.210	25.211	-0.001	-0.002	#	N
11–30	4,386	450	35.984	32.895	0.347	0.010	N	35.638	35.603	0.035	0.068	0.001	N
> 30	4,313	476	30.843	32.536	-0.190	-0.006	N	31.033	31.120	-0.087	-0.177	-0.003	N
Number of full-time teachers													
1–40	3,857	319	18.359	13.996	0.489	0.027	Y	17.870	17.976	-0.106	-0.240	-0.006	N
41–70	3,776	314	23.521	19.526	0.448	0.019	N	23.073	23.120	-0.047	-0.130	-0.002	N
71–100	3,759	436	30.240	32.764	-0.283	-0.009	N	30.523	30.451	0.072	0.142	0.002	N
101+	3,321	421	27.880	33.714	-0.654	-0.023	Y	28.535	28.453	0.081	0.171	0.003	N
Number of grades within the school													
4	11,206	1,131	79.654	79.374	0.031	#	N	79.623	79.619	0.004	0.009	#	N
> or < 4	3,507	359	20.346	20.626	-0.031	-0.002	N	20.377	20.381	-0.004	-0.009	#	N
Types of grades within the school													
K–12, PreK–10th, 1st–12th, PreK/1st-9th/12th and PreK–12 schools	980	91	5.024	3.745	0.143	0.029	N	4.881	4.829	0.052	0.116	0.011	N
Middle grades but no elementary	1,555	153	7.595	6.502	0.123	0.016	N	7.473	7.556	-0.083	-0.478	-0.011	N
Only high school	12,178	1,246	87.380	89.753	-0.266	-0.003	N	87.647	87.615	0.031	0.070	#	N
Hispanic 10th-grade enrollment percent													
≤ 3 percent	5,716	533	37.928	37.304	0.070	0.002	N	37.858	38.059	-0.200	-0.422	-0.005	N
> 3 percent	8,997	957	62.072	62.696	-0.070	-0.001	N	62.142	61.941	0.200	0.422	0.003	N

See notes at end of table.

Table 30. Nonresponse bias before and after nonresponse adjustment for base-year sophomores using the panel weight, by selected categorical variables: 2004—Continued

	Before nonresponse adjustment							After nonresponse adjustment					
Description	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
IEP[5] percentage													
≤ 5 percent	5,801	537	26.532	25.632	0.101	0.004	N	26.431	26.567	-0.136	-0.319	-0.005	N
6–10 percent	3,760	389	32.843	34.502	-0.186	-0.006	N	33.029	32.877	0.152	0.305	0.005	N
11–15 percent	3,213	352	26.441	25.356	0.122	0.005	N	26.319	26.356	-0.037	-0.084	-0.001	N
> 15 percent	1,939	212	14.184	14.510	-0.037	-0.003	N	14.221	14.200	0.021	0.043	0.001	N
LEP[6] percentage													
0 percent	6,457	532	34.559	28.762	0.650	0.019	Y	33.909	33.927	-0.018	-0.037	-0.001	N
1 percent	2,897	289	23.189	22.184	0.113	0.005	N	23.076	23.136	-0.060	-0.151	-0.003	N
2–5 percent	2,447	282	18.577	23.160	-0.514	-0.027	N	19.091	19.051	0.040	0.104	0.002	N
> 6 percent	2,912	387	23.675	25.894	-0.249	-0.010	N	23.924	23.886	0.038	0.071	0.002	N
Urbanicity													
Urban	4,950	588	29.567	35.077	-0.618	-0.020	Y	30.185	30.020	0.165	0.327	0.005	N
Suburban	7,063	674	50.183	49.843	0.038	0.001	N	50.145	50.252	-0.107	-0.206	-0.002	N
Rural	2,700	228	20.250	15.080	0.580	0.029	Y	19.670	19.728	-0.058	-0.118	-0.003	N
All other races 10th-grade enrollment percent													
≤ 80 percent	7,245	845	50.735	55.048	-0.484	-0.009	Y	51.219	51.104	0.115	0.210	0.002	N
> 80 percent	7,468	645	49.265	44.952	0.484	0.010	Y	48.781	48.896	-0.115	-0.210	-0.002	N
Number of part-time teachers													
0–1	4,205	479	30.682	32.753	-0.232	-0.008	N	30.914	30.925	-0.011	-0.023	#	N
2–3	4,241	379	28.906	24.858	0.454	0.016	N	28.452	28.440	0.012	0.024	#	N
4–6	3,569	370	21.502	22.411	-0.102	-0.005	N	21.604	21.704	-0.100	-0.224	-0.005	N
7+	2,698	262	18.910	19.978	-0.120	-0.006	N	19.030	18.931	0.099	0.250	0.005	N
Full-time teacher certified													
0–90 percent	3,797	360	16.138	14.344	0.201	0.013	N	15.937	15.903	0.033	0.091	0.002	N
91–99 percent	2,577	313	20.008	22.786	-0.312	-0.015	N	20.320	20.210	0.110	0.239	0.005	N
100 percent	8,339	817	63.854	62.871	0.110	0.002	N	63.744	63.887	-0.143	-0.274	-0.002	N

See notes at end of table.

Table 30. Nonresponse bias before and after nonresponse adjustment for base-year sophomores using the panel weight, by selected categorical variables: 2004—Continued

	Before nonresponse adjustment							After nonresponse adjustment					
Description	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Geocode													
Census division (public schools)													
Public-New England/Middle Atlantic[7]	1,991	222	16.407	18.446	-0.229	-0.014	N	16.636	16.686	-0.050	-0.131	-0.003	N
Public-East North Central	1,782	213	14.241	16.450	-0.248	-0.017	N	14.489	14.357	0.132	0.445	0.009	N
Public-West North Central	953	70	8.056	5.497	0.287	0.037	N	7.769	8.019	-0.250	-1.318	-0.032	N
Public-South Atlantic	2,112	223	16.390	16.654	-0.030	-0.002	N	16.420	16.407	0.013	0.041	0.001	N
Public-East South Central	850	53	6.216	3.967	0.252	0.042	N	5.964	5.934	0.030	0.148	0.005	N
Public-West South Central	1,318	141	9.459	9.451	0.001	#	N	9.458	9.429	0.030	0.124	0.003	N
Public-Mountain	601	94	6.747	9.777	-0.340	-0.048	N	7.087	7.217	-0.130	-0.308	-0.018	N
Public-Pacific	1,853	202	14.705	13.160	0.173	0.012	N	14.531	14.297	0.234	0.476	0.016	N
Census region (private schools)													
Private-Northwest	724	59	1.916	1.248	0.075	0.041	N	1.841	1.802	0.039	0.381	0.021	N
Private-Midwest	964	78	1.990	1.910	0.009	0.005	N	1.981	1.911	0.070	1.093	0.035	N
Private-South	1,031	79	2.374	1.637	0.083	0.036	N	2.291	2.455	-0.164	-2.335	-0.072	N
Private-West	534	56	1.499	1.803	-0.034	-0.022	N	1.533	1.485	0.048	0.203	0.031	N
Number of days in school year													
Less than 180 days	3,856	357	24.501	21.603	0.325	0.013	N	24.176	24.313	-0.137	-0.389	-0.006	N
180 days	8,135	841	56.940	56.859	0.009	#	N	56.931	56.839	0.092	0.186	0.002	N
More than 180 days	2,722	292	18.558	21.538	-0.334	-0.018	N	18.893	18.848	0.045	0.115	0.002	N
School sector													
Public	11,460	1,218	92.221	93.402	-0.132	-0.001	N	92.353	92.346	0.007	0.028	#	N
Catholic	1,898	129	4.438	2.902	0.172	0.040	Y	4.266	4.268	-0.002	-0.037	-0.001	N
Other private	1,355	143	3.341	3.696	-0.040	-0.012	N	3.381	3.386	-0.005	-0.019	-0.001	N
Student sex													
Male	7,335	744	50.198	50.193	0.001	#	N	50.198	50.435	-0.237	-0.611	-0.005	N
Female	7,378	746	49.802	49.807	-0.001	#	N	49.802	49.565	0.237	0.611	0.005	N

[#] Rounds to zero.

[1] Design weight is used before nonresponse adjustment. This is the distribution to each response category.

[2] "Y" denotes statistical significance at $p < .05$. "N" denotes no statistical significance.

[3] Weight after nonresponse adjustment.

[4] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.

[5] IEP = Individualized Education Program.

[6] LEP = limited English proficient.

[7] Collapsed category comprising two Census divisions.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 31. Nonresponse bias before and after nonresponse adjustment for transfer students, by selected categorical variables: 2004

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Asian 10th-grade enrollment percent													
≤ 2 percent	499	207	38.940	43.595	-1.484	-0.037	N	40.425	39.200	1.225	0.975	0.030	N
> 2 percent	764	316	61.060	56.405	1.484	0.025	N	59.575	60.800	-1.225	-0.975	-0.021	N
Black or African American 10th-grade enrollment percent													
≤ 4 percent	388	157	31.132	30.075	0.337	0.011	N	30.795	31.231	-0.436	-0.369	-0.014	N
> 4 percent	875	366	68.868	69.925	-0.337	-0.005	N	69.205	68.769	0.436	0.369	0.006	N
Minutes per class period													
≤ 45	292	118	16.627	17.673	-0.334	-0.020	N	16.961	16.365	0.596	0.520	0.035	N
46–50	256	94	18.943	19.014	-0.023	-0.001	N	18.966	18.806	0.160	0.153	0.008	N
51–80	382	160	34.360	31.884	0.790	0.024	N	33.570	35.087	-1.517	-1.217	-0.045	N
81+	333	151	30.070	31.428	-0.433	-0.014	N	30.503	29.742	0.761	0.630	0.025	N
Class periods per day													
1–4	338	139	31.118	28.703	0.770	0.025	N	30.347	30.483	-0.136	-0.117	-0.004	N
5–6	369	160	32.535	35.291	-0.879	-0.026	N	33.414	33.882	-0.469	-0.344	-0.014	N
7	343	139	22.398	23.522	-0.359	-0.016	N	22.757	22.052	0.704	0.604	0.031	N
8–9	213	85	13.949	12.484	0.467	0.035	N	13.482	13.582	-0.100	-0.105	-0.007	N
Is the school coeducational?													
Yes	1,205	508	98.063	98.997	-0.298	-0.003	N	98.361	98.121	0.240	1.738	0.002	N
No, all-female school	23	8	0.798	0.566	0.074	0.102	N	0.724	0.785	-0.061	-0.702	-0.085	N
No, all-male school	35	7	1.139	0.436	0.224	0.245	N	0.915	1.094	-0.179	-1.739	-0.195	N
Student race/ethnicity[4]													
All other races	632	251	53.508	55.613	-0.672	-0.012	N	54.179	53.159	1.020	0.762	0.019	N
Asian	131	61	3.716	3.731	-0.005	-0.001	N	3.721	3.723	-0.002	-0.010	-0.001	N
Black or African American	292	115	24.884	22.887	0.637	0.026	N	24.247	24.881	-0.634	-0.606	-0.026	N
Hispanic or Latino	208	96	17.892	17.769	0.039	0.002	N	17.853	18.237	-0.384	-0.457	-0.022	N
10th-grade enrollment													
0–99	267	105	12.298	10.865	0.457	0.039	N	11.841	12.647	-0.807	-1.247	-0.068	N
100–249	283	95	17.840	15.690	0.686	0.040	N	17.155	18.089	-0.934	-1.103	-0.054	N
250–499	395	166	35.178	37.831	-0.846	-0.023	N	36.024	34.762	1.261	0.926	0.035	N
500+	318	157	34.684	35.615	-0.297	-0.008	N	34.981	34.501	0.480	0.361	0.014	N

See notes at end of table.

Table 31. Nonresponse bias before and after nonresponse adjustment for transfer students, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Total enrollment													
≤ 600	301	107	15.675	12.404	1.043	0.071	N	14.632	15.917	-1.286	-1.710	-0.088	N
601–1,200	346	140	23.330	27.929	-1.467	-0.059	N	24.797	24.139	0.658	0.520	0.027	N
1,201–1,800	287	120	27.049	26.741	0.098	0.004	N	26.951	26.619	0.332	0.287	0.012	N
> 1,800	329	156	33.945	32.926	0.325	0.010	N	33.620	33.325	0.295	0.228	0.009	N
Enrollment status													
In school, in grade (grade 12)	1,069	410	83.088	77.862	1.667	0.020	N	81.421	80.386	1.035	1.105	0.013	N
In school, out of grade	193	85	16.829	16.362	0.149	0.009	N	16.680	19.496	-2.816	-3.053	-0.169	Y
Out of school	‡	28	0.083	5.776	-1.816	-0.956	Y	1.899	0.118	1.781	4.122	0.938	Y
Free or reduced-price lunch													
0	251	84	9.756	7.616	0.683	0.075	N	9.074	9.721	-0.647	-0.987	-0.071	N
1–10	246	94	20.829	23.433	-0.831	-0.038	N	21.660	20.808	0.851	0.656	0.039	N
11–30	353	157	35.491	31.627	1.233	0.036	N	34.259	34.415	-0.157	-0.117	-0.005	N
> 30	413	188	33.923	37.324	-1.085	-0.031	N	35.008	35.055	-0.047	-0.038	-0.001	N
Number of full-time teachers													
1–40	362	125	18.597	15.696	0.925	0.052	N	17.672	18.950	-1.279	-1.532	-0.072	N
41–70	320	107	21.113	17.826	1.048	0.052	N	20.065	21.556	-1.491	-1.613	-0.074	N
71–100	298	153	30.407	33.530	-0.996	-0.032	N	31.403	30.339	1.064	0.800	0.034	N
101+	283	138	29.883	32.948	-0.978	-0.032	N	30.861	29.154	1.707	1.334	0.055	N
Number of grades within the school													
4	968	382	80.539	76.561	1.269	0.016	N	79.270	80.289	-1.019	-0.951	-0.013	N
> or < 4	295	141	19.461	23.439	-1.269	-0.061	N	20.730	19.711	1.019	0.951	0.049	N
Types of grades within the school													
K–12, PreK–10th, 1st–12th, PreK/1st–9th/12th and PreK–12 schools	101	36	5.501	3.928	0.502	0.100	N	5.000	5.861	-0.861	-1.791	-0.172	N
Middle grades but no elementary	123	63	6.554	7.838	-0.410	-0.059	N	6.963	6.566	0.398	0.896	0.057	N
Only high school	1,039	424	87.945	88.233	-0.092	-0.001	N	88.037	87.574	0.463	0.705	0.005	N
Hispanic 10th-grade enrollment percent													
≤ 3 percent	411	163	31.872	32.595	-0.231	-0.007	N	32.102	31.158	0.945	0.684	0.029	N
> 3 percent	852	360	68.128	67.405	0.231	0.003	N	67.898	68.842	-0.945	-0.684	-0.014	N

See notes at end of table.

Table 31. Nonresponse bias before and after nonresponse adjustment for transfer students, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
IEP[5] percentage													
≤ 5 percent	527	178	28.194	24.358	1.224	0.045	N	26.971	28.403	-1.432	-1.279	-0.053	N
6–10 percent	307	148	33.959	33.567	0.125	0.004	N	33.834	31.945	1.889	1.411	0.056	N
11–15 percent	257	118	24.193	26.080	-0.602	-0.024	N	24.795	25.161	-0.366	-0.325	-0.015	N
> 15 percent	172	79	13.653	15.995	-0.747	-0.052	N	14.400	14.492	-0.092	-0.090	-0.006	N
LEP[6] percentage													
0 percent	526	185	30.619	28.095	0.805	0.027	N	29.814	31.079	-1.266	-1.163	-0.042	N
1 percent	230	110	22.575	27.127	-1.452	-0.060	N	24.027	21.628	2.399	1.810	0.100	N
2–5 percent	194	85	17.641	18.103	-0.147	-0.008	N	17.788	18.090	-0.301	-0.313	-0.017	N
> 6 percent	313	143	29.165	26.676	0.794	0.028	N	28.371	29.203	-0.832	-0.679	-0.029	N
Urbanicity													
Urban	516	224	37.376	38.433	-0.337	-0.009	N	37.713	37.955	-0.242	-0.186	-0.006	N
Suburban	551	221	46.516	44.836	0.536	0.012	N	45.980	45.783	0.197	0.149	0.004	N
Rural	196	78	16.109	16.730	-0.198	-0.012	N	16.307	16.262	0.045	0.052	0.003	N
All other races 10th-grade enrollment percent													
≤ 80 percent	714	321	59.812	58.717	0.349	0.006	N	59.463	59.696	-0.233	-0.176	-0.004	N
> 80 percent	549	202	40.188	41.283	-0.349	-0.009	N	40.537	40.304	0.233	0.176	0.006	N
Number of part-time teachers													
0–1	404	191	34.307	38.381	-1.299	-0.036	N	35.607	35.162	0.445	0.339	0.012	N
2–3	312	121	23.970	20.679	1.050	0.046	N	22.920	23.503	-0.583	-0.498	-0.025	N
4–6	319	130	23.523	22.978	0.174	0.007	N	23.349	23.159	0.191	0.174	0.008	N
7+	228	81	18.200	17.962	0.076	0.004	N	18.124	18.176	-0.053	-0.045	-0.003	N
Full-time teacher certified													
0–90 percent	389	135	20.484	15.960	1.443	0.076	N	19.041	21.254	-2.214	-2.352	-0.116	Y
91–99 percent	221	81	19.054	16.203	0.909	0.050	N	18.144	19.208	-1.064	-1.255	-0.059	N
100 percent	653	307	60.463	67.838	-2.352	-0.037	Y	62.815	59.537	3.278	2.762	0.052	Y

See notes at end of table.

Table 31. Nonresponse bias before and after nonresponse adjustment for transfer students, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Geocode													
Census division (public schools)													
Public-New England/Middle Atlantic[7]	112	51	10.274	13.368	-0.987	-0.088	N	11.261	10.045	1.216	1.085	0.108	N
Public-East North Central	142	93	12.613	18.875	-1.997	-0.137	N	14.610	13.065	1.545	1.452	0.106	N
Public-West North Central	76	25	7.650	5.417	0.712	0.103	N	6.938	7.451	-0.514	-0.849	-0.074	N
Public-South Atlantic	185	74	17.128	15.128	0.638	0.039	N	16.490	17.128	-0.638	-0.666	-0.039	N
Public-East South Central	49	19	4.375	5.068	-0.221	-0.048	N	4.596	4.392	0.204	0.519	0.044	N
Public-West South Central	124	45	11.451	8.235	1.026	0.098	N	10.425	10.703	-0.278	-0.453	-0.027	N
Public-Mountain	47	28	6.326	9.953	-1.157	-0.155	N	7.483	7.085	0.398	0.582	0.053	N
Public-Pacific	216	91	20.574	17.834	0.874	0.044	N	19.700	20.407	-0.707	-0.671	-0.036	N
Census region (private schools)													
Private-Northwest	57	19	1.766	0.985	0.249	0.164	N	1.517	1.710	-0.194	-1.617	-0.128	N
Private-Midwest	95	30	2.386	2.155	0.074	0.032	N	2.313	2.464	-0.151	-0.812	-0.065	N
Private-South	94	35	2.665	1.978	0.219	0.090	N	2.446	2.524	-0.078	-0.365	-0.032	N
Private-West	66	13	2.791	1.005	0.570	0.256	N	2.221	3.024	-0.803	-1.972	-0.361	N
Number of days in school year													
Less than 180 days	308	117	23.265	21.733	0.489	0.021	N	22.776	23.502	-0.725	-0.816	-0.032	N
180 days	729	303	57.790	59.478	-0.538	-0.009	N	58.329	59.391	-1.062	-0.864	-0.018	N
More than 180 days	226	103	18.945	18.789	0.050	0.003	N	18.895	17.108	1.787	1.503	0.095	N
School sector													
Public	951	426	90.392	93.877	-1.112	-0.012	Y	91.504	90.277	1.226	2.369	0.013	Y
Catholic	157	42	4.376	2.388	0.634	0.169	Y	3.742	4.169	-0.427	-2.063	-0.114	N
Other private	155	55	5.232	3.734	0.478	0.100	N	4.754	5.554	-0.800	-1.704	-0.168	N
Student sex													
Male	635	252	51.073	45.767	1.692	0.034	N	49.380	53.053	-3.672	-2.874	-0.074	Y
Female	628	271	48.927	54.233	-1.692	-0.033	N	50.620	46.947	3.672	2.874	0.073	Y

[#] Rounds to zero.
‡ Reporting standards not met.
[1] Design weight is used before nonresponse adjustment. This is the distribution to each response category.
[2] "Y" denotes statistical significance at $p < .05$. "N" denotes no statistical significance.
[3] Weight after nonresponse adjustment.
[4] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.
[5] IEP = Individualized Education Program.
[6] LEP = limited English proficient.
[7] Collapsed category comprising two Census divisions.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 32. Nonresponse bias before and after nonresponse adjustment for dropouts, by selected categorical variables: 2004

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Asian 10th-grade enrollment percent													
≤ 2 percent	275	78	40.915	45.749	-1.318	-0.031	N	42.233	39.881	2.352	1.294	0.056	N
> 2 percent	395	112	59.085	54.251	1.318	0.023	N	57.767	60.119	-2.352	-1.294	-0.041	N
Black or African American 10th-grade enrollment percent													
≤ 4 percent	129	57	22.543	31.284	-2.383	-0.096	N	24.926	23.577	1.349	0.908	0.054	N
> 4 percent	541	133	77.457	68.716	2.383	0.032	N	75.074	76.423	-1.349	-0.908	-0.018	N
Minutes per class period													
≤ 45	131	34	18.673	19.662	-0.270	-0.014	N	18.943	19.312	-0.369	-0.273	-0.019	N
46–50	129	27	19.172	10.406	2.390	0.142	Y	16.783	19.727	-2.945	-2.670	-0.175	Y
51–80	189	58	30.253	34.481	-1.153	-0.037	N	31.405	31.572	-0.167	-0.087	-0.005	N
81+	221	71	31.902	35.451	-0.968	-0.029	N	32.869	29.388	3.481	2.023	0.106	N
Class periods per day													
1–4	224	77	32.916	38.421	-1.501	-0.044	N	34.417	30.577	3.840	2.222	0.112	N
5–6	182	49	28.673	28.892	-0.060	-0.002	N	28.733	30.829	-2.097	-1.174	-0.073	N
7	167	38	24.750	20.837	1.067	0.045	N	23.683	24.023	-0.340	-0.205	-0.014	N
8–9	97	26	13.661	11.850	0.494	0.037	N	13.167	14.571	-1.404	-1.300	-0.107	N
Is the school coeducational?													
Yes	667	189	99.665	99.888	-0.061	-0.001	N	99.726	99.669	0.058	0.741	0.001	N
No, all-female school	‡	‡	0.231	0.112	0.033	0.164	N	0.199	0.237	-0.038	-0.512	-0.193	N
No, all-male school	‡	‡	0.104	#	#	#	N	0.075	0.094	-0.019	-0.988	-0.254	N
Student race/ethnicity[4]													
All other races	298	112	49.471	60.197	-2.924	-0.056	N	52.395	51.548	0.847	0.488	0.016	N
Asian	52	15	2.688	1.908	0.213	0.086	N	2.475	2.451	0.024	0.090	0.010	N
Black or African American	167	31	24.174	18.869	1.446	0.064	N	22.728	23.645	-0.918	-0.708	-0.040	N
Hispanic or Latino	153	32	23.667	19.026	1.265	0.056	N	22.402	22.355	0.046	0.034	0.002	N
10th-grade enrollment													
0–99	103	23	9.173	9.058	0.031	0.003	N	9.142	9.475	-0.334	-0.277	-0.036	N
100–249	131	40	20.203	19.590	0.167	0.008	N	20.036	18.413	1.622	1.072	0.081	N
250–499	232	69	34.173	42.579	-2.292	-0.063	N	36.465	34.561	1.904	1.045	0.052	N
500+	204	58	36.451	28.773	2.093	0.061	N	34.358	37.550	-3.192	-1.847	-0.093	N

See notes at end of table.

Table 32. Nonresponse bias before and after nonresponse adjustment for dropouts, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Total enrollment													
≤ 600	130	33	14.925	13.395	0.417	0.029	N	14.508	14.201	0.307	0.209	0.021	N
601–1,200	149	48	21.800	26.169	-1.191	-0.052	N	22.991	21.263	1.728	1.095	0.075	N
1,201–1,800	189	56	29.132	29.408	-0.075	-0.003	N	29.207	27.968	1.239	0.780	0.042	N
> 1,800	202	53	34.143	31.027	0.849	0.026	N	0.023	0.028	-0.006	-0.993	-0.258	N
Enrollment status													
Out of school	669	190	99.969	100.000	-0.008	#	N	99.977	99.972	0.006	—	#	N
Free or reduced-price lunch													
0	27	6	2.288	1.554	0.200	0.096	N	2.088	2.848	-0.760	-1.022	-0.364	N
1–10	106	37	18.462	21.421	-0.807	-0.042	N	19.268	18.439	0.829	0.489	0.043	N
11–30	220	65	34.551	33.426	0.307	0.009	N	34.244	35.744	-1.499	-0.920	-0.044	N
> 30	317	82	44.699	43.599	0.300	0.007	N	44.400	42.969	1.430	0.762	0.032	N
Number of full-time teachers													
1–40	140	35	15.869	10.743	1.398	0.097	N	14.472	15.023	-0.551	-0.465	-0.038	N
41–70	129	46	18.489	25.637	-1.949	-0.095	N	20.438	17.780	2.657	1.773	0.130	N
71–100	194	57	30.095	32.966	-0.783	-0.025	N	30.877	31.115	-0.237	-0.137	-0.008	N
101+	207	52	35.547	30.654	1.334	0.039	N	34.213	36.082	-1.869	-1.114	-0.055	N
Number of grades within the school													
4	533	152	81.030	78.088	0.802	0.010	N	80.228	82.281	-2.053	-1.226	-0.026	N
> or < 4	137	38	18.970	21.912	-0.802	-0.041	N	19.772	17.719	2.053	1.226	0.104	N
Types of grades within the school													
K–12, PreK–10th, 1st–12th, PreK/1st–9th/12th and PreK–12 schools	18	4	2.146	5.069	-0.797	-0.271	N	2.943	2.666	0.277	0.235	0.094	N
Middle grades but no elementary	60	13	8.457	4.499	1.079	0.146	N	7.378	6.427	0.952	0.927	0.129	N
Only high school	592	173	89.396	90.432	-0.282	-0.003	N	89.679	90.907	-1.228	-0.821	-0.014	N
Hispanic 10th-grade enrollment percent													
≤ 3 percent	248	67	34.371	37.298	-0.798	-0.023	N	35.169	31.527	3.642	2.019	0.104	Y
> 3 percent	422	123	65.629	62.702	0.798	0.012	N	64.831	68.473	-3.642	-2.019	-0.056	Y

See notes at end of table.

Table 32. Nonresponse bias before and after nonresponse adjustment for dropouts, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
IEP[5] percentage													
≤ 5 percent	158	51	19.525	26.546	-1.914	-0.089	N	21.439	19.635	1.804	1.115	0.084	N
6–10 percent	186	54	34.592	32.195	0.653	0.019	N	33.938	32.693	1.245	0.707	0.037	N
11–15 percent	203	57	30.611	27.038	0.974	0.033	N	29.637	31.111	-1.474	-0.904	-0.050	N
> 15 percent	123	28	15.272	14.221	0.287	0.019	N	14.986	16.561	-1.575	-1.147	-0.105	N
LEP[6] percentage													
0 percent	201	70	24.965	34.034	-2.472	-0.090	N	27.437	26.449	0.989	0.654	0.036	N
1 percent	154	29	24.395	12.640	3.205	0.151	Y	21.190	22.109	-0.919	-0.645	-0.043	N
2–5 percent	118	36	19.251	23.948	-1.280	-0.062	N	20.531	18.538	1.994	1.250	0.097	N
> 6 percent	197	55	31.389	29.378	0.548	0.018	N	30.841	32.905	-2.064	-1.156	-0.067	N
Urbanicity													
Urban	263	64	37.056	36.739	0.086	0.002	N	36.970	40.296	-3.326	-1.925	-0.090	N
Suburban	276	92	43.284	47.660	-1.193	-0.027	N	44.477	41.161	3.316	1.863	0.075	N
Rural	131	34	19.659	15.601	1.106	0.060	N	18.553	18.544	0.009	0.007	0.001	N
All other races 10th-grade enrollment percent													
≤ 80 percent	434	109	65.990	59.564	1.752	0.027	N	64.238	64.267	-0.029	-0.017	#	N
> 80 percent	236	81	34.010	40.436	-1.752	-0.049	N	35.762	35.733	0.029	0.017	0.001	N
Number of part-time teachers													
0–1	272	82	42.411	45.376	-0.808	-0.019	N	43.219	42.483	0.736	0.414	0.017	N
2–3	167	39	24.305	20.452	1.050	0.045	N	23.254	24.895	-1.641	-1.054	-0.071	N
4–6	156	49	22.251	23.508	-0.343	-0.015	N	22.594	21.402	1.192	0.895	0.053	N
7+	75	20	11.033	10.664	0.101	0.009	N	10.933	11.220	-0.288	-0.245	-0.026	N
Full-time teacher certified													
0–90 percent	135	49	16.745	21.346	-1.254	-0.070	N	18.000	16.025	1.975	1.414	0.110	N
91–99 percent	134	34	23.639	22.456	0.323	0.014	N	23.317	23.962	-0.645	-0.388	-0.028	N
100 percent	401	107	59.615	56.197	0.932	0.016	N	58.683	60.013	-1.330	-0.698	-0.023	N

See notes at end of table.

Table 32. Nonresponse bias before and after nonresponse adjustment for dropouts, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Geocode													
Census division (public schools)													
Public-New England/Middle Atlantic[7]	115	38	17.689	22.811	-1.396	-0.073	N	19.085	19.386	-0.301	-0.217	-0.016	N
Public-East North Central	98	27	14.843	15.744	-0.246	-0.016	N	15.089	14.436	0.652	0.439	0.043	N
Public-West North Central	40	11	5.665	5.934	-0.073	-0.013	N	5.739	5.874	-0.136	-0.183	-0.024	N
Public-South Atlantic	132	38	20.966	19.734	0.336	0.016	N	20.630	18.943	1.687	1.239	0.082	N
Public-East South Central	64	10	8.380	6.045	0.637	0.082	N	7.744	7.531	0.213	0.243	0.027	N
Public-West South Central	66	18	10.038	5.776	1.162	0.131	N	8.876	8.817	0.059	0.099	0.007	N
Public-Mountain	31	18	6.531	10.065	-0.963	-0.129	N	7.494	8.102	-0.608	-0.586	-0.081	N
Public-Pacific	87	22	14.159	8.955	1.419	0.111	N	12.741	15.109	-2.368	-2.163	-0.186	N
Census region (private schools)													
Private-Northwest	‡	‡	0.177	0.112	0.018	0.112	N	0.159	0.214	-0.055	-0.729	-0.344	N
Private-Midwest	12	3	0.576	0.243	0.091	0.187	N	0.485	0.643	-0.158	-1.214	-0.325	N
Private-South	18	3	0.544	0.361	0.050	0.101	N	0.494	0.629	-0.135	-1.069	-0.273	N
Private-West	5	‡	0.432	4.220	-1.033	-0.705	N	1.464	0.315	1.149	1.005	0.785	N
Number of days in school year													
Less than 180 days	167	41	23.478	18.139	1.455	0.066	N	22.023	22.108	-0.085	-0.073	-0.004	N
180 days	379	115	55.810	66.759	-2.985	-0.051	N	58.795	57.642	1.153	0.644	0.020	N
More than 180 days	124	34	20.712	15.101	1.530	0.080	N	19.183	20.250	-1.068	-0.677	-0.056	N
School sector													
Public	633	182	98.272	95.064	0.874	0.009	N	97.397	98.199	-0.802	-0.698	-0.008	N
Catholic	9	‡	0.469	0.112	0.098	0.262	N	0.372	0.419	-0.047	-1.133	-0.126	N
Other private	28	7	1.259	4.824	-0.972	-0.436	N	2.231	1.382	0.848	0.737	0.380	N
Student sex													
Male	375	107	53.769	49.503	1.163	0.022	N	52.606	56.236	-3.629	-2.015	-0.069	Y
Female	295	83	46.231	50.497	-1.163	-0.025	N	47.394	43.764	3.629	2.015	0.077	Y

— Not available.
Rounds to zero.
‡ Reporting standards not met.
[1] Design weight is used before nonresponse adjustment. This is the distribution to each response category.
[2] "Y" denotes statistical significance at $p < .05$. "N" denotes no statistical significance.
[3] Weight after nonresponse adjustment.
[4] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.
[5] IEP = Individualized Education Program.
[6] LEP = limited English proficient.
[7] Collapsed category comprising two Census divisions.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 33. Nonresponse bias before and after nonresponse adjustment for early graduates, by selected categorical variables: 2004

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Asian 10th-grade enrollment percent													
≤ 2 percent	266	62	44.452	56.500	-2.339	-0.050	N	46.791	46.602	0.189	0.086	0.004	N
> 2 percent	291	65	55.548	43.500	2.339	0.044	N	53.209	53.398	-0.189	-0.086	-0.004	N
Black or African American 10th-grade enrollment percent													
≤ 4 percent	124	26	26.134	28.875	-0.532	-0.020	N	26.667	24.581	2.086	0.851	0.078	N
> 4 percent	433	101	73.866	71.125	0.532	0.007	N	73.333	75.419	-2.086	-0.851	-0.028	N
Minutes per class period													
≤ 45	59	16	9.856	13.018	-0.614	-0.059	N	10.470	10.196	0.274	0.227	0.026	N
46–50	96	29	19.762	21.386	-0.315	-0.016	N	20.078	17.716	2.361	0.884	0.118	N
51–80	148	21	28.707	16.765	2.318	0.088	N	26.389	28.081	-1.692	-0.896	-0.064	N
81+	254	61	41.674	48.831	-1.389	-0.032	N	43.063	44.007	-0.944	-0.431	-0.022	N
Class periods per day													
1–4	248	63	41.117	50.504	-1.822	-0.042	N	42.939	42.784	0.155	0.070	0.004	N
5–6	142	26	28.331	15.394	2.511	0.097	N	25.820	27.243	-1.424	-0.586	-0.055	N
7	115	29	21.095	25.131	-0.783	-0.036	N	21.878	19.087	2.792	1.501	0.128	N
8–9	52	9	9.457	8.972	0.094	0.010	N	9.363	10.886	-1.523	-1.337	-0.163	N
Is the school coeducational?													
Yes	551	127	99.503	100.000	-0.096	-0.001	N	99.599	99.452	0.147	1.371	0.001	N
No, all-female school	4	#	0.388	#	#	#	N	0.313	0.444	-0.131	-1.237	-0.419	N
No, all-male school	‡	#	0.109	#	#	#	N	0.088	0.104	-0.016	-1.311	-0.183	N
Student race/ethnicity[4]													
All other races	300	65	59.404	52.710	1.299	0.022	N	58.105	59.572	-1.468	-0.678	-0.025	N
Asian	52	8	3.048	1.989	0.206	0.072	N	2.843	2.745	0.098	0.319	0.035	N
Black or African American	114	29	19.738	22.655	-0.566	-0.028	N	20.304	21.077	-0.773	-0.576	-0.038	N
Hispanic or Latino	91	25	17.810	22.646	-0.939	-0.050	N	18.748	16.606	2.142	1.226	0.114	N
10th-grade enrollment													
0–99	86	11	11.487	3.285	1.592	0.161	Y	9.895	9.847	0.048	0.030	0.005	N
100–249	121	25	20.199	18.169	0.394	0.020	N	19.805	20.090	-0.286	-0.185	-0.014	N
250–499	198	54	34.678	47.137	-2.418	-0.065	N	37.097	37.600	-0.504	-0.250	-0.014	N
500+	152	37	33.636	31.409	0.432	0.013	N	33.204	32.462	0.742	0.293	0.022	N

See notes at end of table.

Table 33. Nonresponse bias before and after nonresponse adjustment for early graduates, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Total enrollment													
≤ 600	103	13	15.111	6.145	1.741	0.130	Y	13.370	13.700	-0.329	-0.204	-0.025	N
601–1,200	151	35	25.051	30.838	-1.124	-0.043	N	26.174	25.852	0.322	0.173	0.012	N
1,201–1,800	148	41	26.563	32.032	-1.062	-0.038	N	27.625	28.634	-1.009	-0.606	-0.037	N
> 1,800	155	38	33.275	30.985	0.445	0.014	N	32.831	31.814	1.017	0.405	0.031	N
Enrollment status													
In school, out of grade	556	127	99.675	100.000	-0.063	-0.001	N	99.738	99.698	0.040	0.952	#	N
Free or reduced-price lunch													
0	41	7	5.414	2.513	0.563	0.116	N	4.851	4.757	0.094	0.068	0.019	N
1–10	95	22	17.009	19.831	-0.548	-0.031	N	17.557	17.057	0.500	0.396	0.028	N
11–30	187	38	35.179	33.020	0.419	0.012	N	34.760	37.276	-2.516	-1.223	-0.072	N
> 30	234	60	42.398	44.636	-0.434	-0.010	N	42.832	40.910	1.922	0.796	0.045	N
Number of full-time teachers													
1–40	120	14	16.257	5.781	2.034	0.143	Y	14.224	16.944	-2.720	-2.548	-0.191	Y
41–70	128	24	19.676	22.688	-0.585	-0.029	N	20.261	20.663	-0.402	-0.233	-0.020	N
71–100	146	46	31.117	37.338	-1.208	-0.037	N	32.325	28.015	4.309	1.713	0.133	N
101+	163	43	32.949	34.193	-0.241	-0.007	N	33.191	34.378	-1.187	-0.573	-0.036	N
Number of grades within the school													
4	446	104	81.820	86.231	-0.856	-0.010	N	82.676	82.047	0.629	0.366	0.008	N
> or < 4	111	23	18.180	13.769	0.856	0.049	N	17.324	17.953	-0.629	-0.366	-0.036	N
Types of grades within the school													
K–12, PreK–10th, 1st–12th, PreK/1st–9th/12th and PreK–12 schools	28	‡	5.560	0.941	0.897	0.192	N	4.663	3.843	0.820	0.528	0.176	N
Middle grades but no elementary	37	10	4.392	5.150	-0.147	-0.032	N	4.539	4.514	0.025	0.046	0.005	N
Only high school	492	115	90.048	93.908	-0.749	-0.008	N	90.798	91.642	-0.844	-0.529	-0.009	N
Hispanic 10th-grade enrollment percent													
≤ 3 percent	217	55	35.238	38.850	-0.701	-0.020	N	35.939	37.863	-1.924	-1.005	-0.054	N
> 3 percent	340	72	64.762	61.150	0.701	0.011	N	64.061	62.137	1.924	1.005	0.030	N

See notes at end of table.

Table 33. Nonresponse bias before and after nonresponse adjustment for early graduates, by selected categorical variables: 2004—Continued

	Before nonresponse adjustment							After nonresponse adjustment					
Description	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
IEP[5] percentage													
≤ 5 percent	157	30	27.199	18.845	1.622	0.063	N	25.577	24.098	1.479	0.662	0.058	N
6–10 percent	150	34	28.786	37.260	-1.645	-0.054	N	30.431	31.620	-1.189	-0.640	-0.039	N
11–15 percent	168	39	31.728	28.597	0.608	0.020	N	31.120	29.794	1.326	0.590	0.043	N
> 15 percent	82	24	12.288	15.297	-0.584	-0.045	N	12.872	14.488	-1.616	-1.286	-0.126	N
LEP[6] percentage													
0 percent	188	31	27.250	21.913	1.036	0.040	N	26.214	28.934	-2.721	-1.656	-0.104	N
1 percent	126	29	22.890	19.536	0.651	0.029	N	22.239	23.025	-0.786	-0.478	-0.035	N
2–5 percent	95	39	16.827	37.069	-3.929	-0.189	Y	20.757	17.924	2.832	1.680	0.136	N
> 6 percent	148	28	33.033	21.482	2.242	0.073	N	30.791	30.116	0.675	0.260	0.022	N
Urbanicity													
Urban	210	56	41.696	40.710	0.191	0.005	N	41.504	38.237	3.267	1.253	0.079	N
Suburban	256	53	43.490	45.431	-0.377	-0.009	N	43.867	47.048	-3.181	-1.451	-0.073	N
Rural	91	18	14.814	13.859	0.186	0.013	N	14.629	14.715	-0.086	-0.068	-0.006	N
All other races 10th-grade enrollment percent													
≤ 80 percent	345	79	64.455	56.894	1.468	0.023	N	62.987	61.991	0.996	0.490	0.016	N
> 80 percent	212	48	35.545	43.106	-1.468	-0.040	N	37.013	38.009	-0.996	-0.490	-0.027	N
Number of part-time teachers													
0–1	188	45	37.980	34.827	0.612	0.016	N	37.368	37.224	0.144	0.061	0.004	N
2–3	181	31	31.809	26.096	1.109	0.036	N	30.700	30.708	-0.008	-0.004	#	N
4–6	125	33	17.981	22.667	-0.910	-0.048	N	18.890	20.229	-1.338	-0.931	-0.071	N
7+	63	18	12.230	16.410	-0.812	-0.062	N	13.041	11.839	1.202	0.751	0.092	N
Full-time teacher certified													
0–90 percent	117	21	21.369	10.265	2.156	0.112	Y	19.214	17.568	1.646	0.640	0.086	N
91–99 percent	108	37	19.441	32.139	-2.465	-0.113	N	21.906	18.970	2.936	1.573	0.134	N
100 percent	332	69	59.190	57.596	0.309	0.005	N	58.880	63.462	-4.581	-1.859	-0.078	N

See notes at end of table.

Table 33. Nonresponse bias before and after nonresponse adjustment for early graduates, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Geocode													
Census division (public schools)													
Public-New England/Middle Atlantic[7]	56	13	10.900	7.828	0.596	0.058	N	10.304	10.698	-0.394	-0.292	-0.038	N
Public-East North Central	80	17	14.068	17.413	-0.649	-0.044	N	14.717	15.377	-0.660	-0.456	-0.045	N
Public-West North Central	33	10	5.546	6.753	-0.234	-0.041	N	5.780	6.403	-0.623	-0.895	-0.108	N
Public-South Atlantic	113	31	20.509	22.393	-0.366	-0.018	N	20.875	20.364	0.511	0.371	0.024	N
Public-East South Central	43	10	6.434	8.027	-0.309	-0.046	N	6.743	7.004	-0.261	-0.306	-0.039	N
Public-West South Central	89	26	14.695	23.286	-1.668	-0.102	N	16.363	13.900	2.463	1.526	0.151	N
Public-Mountain	34	6	8.080	7.974	0.021	0.003	N	8.060	10.474	-2.414	-1.935	-0.300	N
Public-Pacific	66	6	15.517	4.786	2.083	0.155	N	13.434	13.072	0.362	0.145	0.027	N
Census region (private schools)													
Private-Northwest	4	‡	0.418	0.272	0.028	0.073	N	0.390	0.389	0.001	0.012	0.002	N
Private-Midwest	12	5	0.597	0.922	-0.063	-0.096	N	0.660	0.685	-0.025	-0.242	-0.038	N
Private-South	18	‡	0.899	0.346	0.107	0.136	N	0.791	0.993	-0.201	-1.385	-0.254	N
Private-West	9	#	2.336	#	#	#	N	1.883	0.642	1.240	0.843	0.659	N
Number of days in school year													
Less than 180 days	131	39	22.161	34.883	-2.470	-0.100	N	24.631	23.966	0.665	0.430	0.027	N
180 days	330	71	60.394	51.556	1.716	0.029	N	58.678	59.943	-1.264	-0.577	-0.022	N
More than 180 days	96	17	17.445	13.561	0.754	0.045	N	16.691	16.092	0.599	0.327	0.036	N
School sector													
Public	514	119	95.750	98.460	-0.526	-0.005	N	96.276	97.291	-1.015	-0.695	-0.011	N
Catholic	8	‡	0.413	0.402	0.002	0.005	N	0.411	0.418	-0.007	-0.112	-0.018	N
Other private	35	6	3.837	1.138	0.524	0.158	N	3.313	2.291	1.022	0.699	0.309	N

See notes at end of table.

Table 33. Nonresponse bias before and after nonresponse adjustment for early graduates, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Student sex													
Male	275	60	50.330	50.115	0.042	0.001	N	50.288	51.578	-1.289	-0.574	-0.026	N
Female	282	67	49.670	49.885	-0.042	-0.001	N	49.712	48.422	1.289	0.574	0.026	N

Rounds to zero.

‡ Reporting standards not met.

[1] Design weight is used before nonresponse adjustment. This is the distribution to each response category.

[2] "Y" denotes statistical significance at $p < .05$. "N" denotes no statistical significance.

[3] Weight after nonresponse adjustment.

[4] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.

[5] IEP = Individualized Education Program.

[6] LEP = limited English proficient.

[7] Collapsed category comprising two Census divisions.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 34. Nonresponse bias before and after nonresponse adjustment for homeschooled students, by selected categorical variables: 2004

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Asian 10th-grade enrollment percent													
≤ 2 percent	14	9	36.443	42.093	-1.802	-0.047	N	38.245	38.227	0.017	0.003	#	N
> 2 percent	26	11	63.557	57.907	1.802	0.029	N	61.755	61.773	-0.017	-0.003	#	N
Black or African American 10th-grade enrollment percent													
≤ 4 percent	20	‡	55.692	13.165	13.564	0.322	Y	42.128	52.812	-10.684	-1.776	-0.254	N
> 4 percent	20	18	44.308	86.835	-13.564	-0.234	Y	57.872	47.188	10.684	1.776	0.185	N
Minutes per class period													
≤ 45	13	5	25.215	19.633	1.781	0.076	N	23.435	29.804	-6.370	-1.384	-0.272	N
46–50	11	‡	24.487	7.603	5.385	0.282	N	19.102	26.071	-6.969	-1.766	-0.365	N
51–80	9	3	31.145	26.231	1.567	0.053	N	29.578	23.887	5.690	0.911	0.192	N
81+	7	10	19.152	46.534	-8.733	-0.313	N	27.886	20.237	7.648	1.472	0.274	N
Class periods per day													
1–4	8	10	27.383	46.534	-6.108	-0.182	N	33.491	20.526	12.965	2.110	0.387	N
5–6	11	3	32.682	26.231	2.058	0.067	N	30.624	33.051	-2.427	-0.453	-0.079	N
7	11	4	22.604	12.312	3.283	0.170	N	19.321	25.490	-6.169	-1.507	-0.319	N
8–9	10	3	17.331	14.924	0.768	0.046	N	16.564	20.933	-4.370	-1.068	-0.264	N
Is the school coeducational?													
Yes	37	20	97.424	100.000	-0.822	-0.008	N	98.246	97.834	0.411	1.141	0.004	N
No, all-female school	‡	#	1.651	#	#	#	N	1.125	1.335	-0.210	-0.932	-0.187	N
No, all-male school	‡	#	0.925	#	#	#	N	0.630	0.831	-0.201	-0.902	-0.320	N
Student race/ethnicity[4]													
All other races	29	15	66.631	72.847	-1.982	-0.029	N	68.614	67.280	1.334	0.252	0.019	N
Asian	‡	‡	0.395	2.952	-0.815	-0.673	N	1.211	0.323	0.887	0.959	0.733	N
Black or African American	4	3	12.742	17.877	-1.638	-0.114	N	14.379	12.116	2.263	0.590	0.157	N
Hispanic or Latino	6	‡	20.232	6.325	4.436	0.281	N	15.796	20.281	-4.485	-1.233	-0.284	N
10th-grade enrollment													
0–99	17	3	28.730	10.048	5.959	0.262	N	22.772	23.878	-1.106	-0.201	-0.049	N
100–249	6	5	14.005	23.254	-2.950	-0.174	N	16.955	14.172	2.783	0.707	0.164	N
250–499	9	9	30.745	40.466	-3.101	-0.092	N	33.845	33.079	0.766	0.142	0.023	N
500+	8	3	26.521	26.231	0.092	0.003	N	26.428	28.871	-2.443	-0.451	-0.092	N

See notes at end of table.

Table 34. Nonresponse bias before and after nonresponse adjustment for homeschooled students, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Total enrollment													
≤ 600	16	‡	31.545	5.108	8.432	0.365	Y	23.113	26.242	-3.129	-0.579	-0.135	N
601–1,200	11	9	25.027	40.729	-5.008	-0.167	N	30.035	27.181	2.854	0.548	0.095	N
1,201–1,800	5	6	17.913	27.932	-3.196	-0.151	N	21.109	19.222	1.887	0.418	0.089	N
> 1,800	8	3	25.515	26.231	-0.228	-0.009	N	25.743	27.355	-1.612	-0.299	-0.063	N
Enrollment status													
Out of school	40	20	100.000	100.000	#	#	Y	100.000	100.000	#	—	#	N
Free or reduced-price lunch													
0	12	3	16.342	8.028	2.652	0.194	N	13.690	10.209	3.481	0.673	0.254	N
1–10	4	‡	11.845	16.425	-1.461	-0.110	N	13.306	12.785	0.521	0.126	0.039	N
11–30	14	7	48.928	41.624	2.330	0.050	N	46.599	53.474	-6.875	-1.192	-0.148	N
> 30	10	8	22.884	33.923	-3.521	-0.133	N	26.405	23.532	2.873	0.612	0.109	N
Number of full-time teachers													
1–40	20	6	40.155	26.043	4.501	0.126	N	35.654	36.874	-1.220	-0.203	-0.034	N
41–70	6	5	12.676	24.320	-3.714	-0.227	N	16.390	12.970	3.420	0.833	0.209	N
71–100	8	4	24.545	18.941	1.787	0.079	N	22.758	26.851	-4.093	-0.885	-0.180	N
101+	6	5	22.623	30.696	-2.575	-0.102	N	25.198	23.305	1.893	0.379	0.075	N
Number of grades within the school													
4	24	15	72.682	75.849	-1.010	-0.014	N	73.692	76.647	-2.955	-0.489	-0.040	N
> or < 4	16	5	27.318	24.151	1.010	0.038	N	26.308	23.353	2.955	0.489	0.112	N
Types of grades within the school													
K–12, PreK–10th, 1st–12th, PreK/1st–9th/12th and PreK–12 schools	10	‡	16.196	7.694	2.712	0.201	N	13.484	10.936	2.549	0.469	0.189	N
Middle grades but no elementary	5	#	8.692	#	#	#	N	5.920	8.908	-2.988	-1.626	-0.505	N
Only high school	25	18	75.112	92.306	-5.484	-0.068	N	80.596	80.157	0.439	0.080	0.005	N
Hispanic 10th-grade enrollment percent													
≤ 3 percent	12	8	25.884	35.141	-2.953	-0.102	N	28.837	25.398	3.439	0.730	0.119	N
> 3 percent	28	12	74.116	64.859	2.953	0.041	N	71.163	74.602	-3.439	-0.730	-0.048	N

See notes at end of table.

Table 34. Nonresponse bias before and after nonresponse adjustment for homeschooled students, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
IEP[5] percentage													
≤ 5 percent	19	6	34.812	19.899	4.757	0.158	N	30.056	27.945	2.111	0.383	0.070	N
6–10 percent	9	6	30.592	34.188	-1.147	-0.036	N	31.739	32.697	-0.958	-0.175	-0.030	N
11–15 percent	7	3	21.799	23.138	-0.427	-0.019	N	22.226	23.538	-1.312	-0.265	-0.059	N
> 15 percent	5	5	12.797	22.776	-3.183	-0.199	N	15.979	15.820	0.159	0.038	0.010	N
LEP[6] percentage													
0 percent	22	12	43.965	50.930	-2.222	-0.048	N	46.187	41.181	5.005	0.840	0.108	N
1 percent	5	3	12.355	21.332	-2.863	-0.188	N	15.218	11.807	3.411	0.818	0.224	N
2–5 percent	7	4	23.244	21.025	0.708	0.031	N	22.536	26.781	-4.245	-0.855	-0.188	N
> 6 percent	6	‡	20.436	6.713	4.377	0.273	N	16.059	20.231	-4.172	-1.171	-0.260	N
Urbanicity													
Urban	10	3	17.742	8.028	3.098	0.212	N	14.644	20.807	-6.163	-1.679	-0.421	N
Suburban	19	10	57.755	57.268	0.155	0.003	N	57.599	52.817	4.783	0.836	0.083	N
Rural	11	7	24.503	34.705	-3.254	-0.117	N	27.757	26.376	1.380	0.280	0.050	N
All other races 10th-grade enrollment percent													
≤ 80 percent	17	12	49.219	55.986	-2.158	-0.042	N	51.377	52.461	-1.084	-0.183	-0.021	N
> 80 percent	23	8	50.781	44.014	2.158	0.044	N	48.623	47.539	1.084	0.183	0.022	N
Number of part-time teachers													
0–1	14	9	40.492	43.889	-1.083	-0.026	N	41.575	44.061	-2.485	-0.438	-0.060	N
2–3	9	5	26.332	21.688	1.481	0.060	N	24.851	18.514	6.337	1.148	0.255	N
4–6	9	4	19.750	20.768	-0.325	-0.016	N	20.075	22.015	-1.941	-0.417	-0.097	N
7+	8	‡	13.426	13.655	-0.073	-0.005	N	13.499	15.410	-1.911	-0.483	-0.142	N
Full-time teacher certified													
0–90 percent	17	3	36.817	8.028	9.182	0.332	Y	27.635	31.377	-3.743	-0.673	-0.135	N
91–99 percent	‡	3	9.238	17.397	-2.602	-0.220	N	11.841	9.107	2.734	0.741	0.231	N
100 percent	21	14	53.945	74.576	-6.580	-0.109	N	60.525	59.516	1.009	0.172	0.017	N

See notes at end of table.

Table 34. Nonresponse bias before and after nonresponse adjustment for homeschooled students, by selected categorical variables: 2004—Continued

	Before nonresponse adjustment							After nonresponse adjustment					
Description	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Geocode													
Census division (public schools)													
Public-New England/Middle Atlantic[7]	‡	4	7.581	21.468	-4.429	-0.369	N	12.010	10.267	1.743	0.408	0.145	N
Public-East North Central	8	‡	25.700	5.612	6.407	0.332	N	19.293	25.966	-6.673	-1.763	-0.346	N
Public-West North Central	‡	#	4.704	#	#	#	N	3.204	4.541	-1.337	-1.286	-0.417	N
Public-South Atlantic	4	4	12.578	25.748	-4.201	-0.250	N	16.778	12.706	4.072	0.923	0.243	N
Public-East South Central	‡	4	6.223	16.928	-3.414	-0.354	N	9.637	6.385	3.252	1.050	0.337	N
Public-West South Central	4	‡	11.439	2.727	2.779	0.321	N	8.660	12.417	-3.757	-1.279	-0.434	N
Public-Mountain	‡	#	5.854	#	#	#	N	3.987	6.805	-2.818	-1.252	-0.707	N
Public-Pacific	3	‡	9.184	17.136	-2.536	-0.216	N	11.720	10.379	1.341	0.298	0.114	N
Census region (private schools)													
Private-Northwest	‡	#	0.887	#	#	#	N	0.604	0.960	-0.356	-0.957	-0.589	N
Private-Midwest	‡	2	0.395	4.709	-1.376	-0.777	N	1.771	0.323	1.448	1.306	0.817	N
Private-South	6	2	11.413	5.673	1.831	0.191	N	9.582	4.064	5.518	1.059	0.576	N
Private-West	5	#	4.042	#	#	#	N	2.753	5.185	-2.432	-1.970	-0.883	N
Number of days in school year													
Less than 180 days	14	3	30.146	8.273	6.976	0.301	Y	23.170	32.305	-9.136	-2.116	-0.394	N
180 days	23	13	60.270	68.624	-2.664	-0.042	N	62.935	58.376	4.559	0.837	0.072	N
More than 180 days	3	4	9.584	23.103	-4.312	-0.310	N	13.895	9.319	4.577	1.103	0.329	N
School sector													
Public	27	16	83.262	89.618	-2.027	-0.024	N	85.290	89.467	-4.178	-0.806	-0.049	N
Catholic	‡	‡	2.181	2.920	-0.236	-0.098	N	2.416	1.842	0.574	0.589	0.238	N
Other private	11	3	14.557	7.462	2.263	0.184	N	12.294	8.690	3.604	0.692	0.293	N

See notes at end of table.

Table 34. Nonresponse bias before and after nonresponse adjustment for homeschooled students, by selected categorical variables: 2004—Continued

Description	Before nonresponse adjustment							After nonresponse adjustment					
	Unweighted respondents	Unweighted non-respondents	Respondent mean weighted[1]	Non-respondent mean weighted[1]	Esti-mated bias	Relative bias	SIG[2]	Overall mean, before adjust-ments[1]	Overall mean, after adjust-ments[3]	Esti-mated bias	Bias per standard error	Relative bias	SIG[2]
Student sex													
Male	20	8	56.978	44.752	3.899	0.073	N	53.079	56.685	-3.607	-0.631	-0.068	N
Female	20	12	43.022	55.248	-3.899	-0.083	N	46.921	43.315	3.607	0.631	0.077	N

— Not available.

[#] Rounds to zero.

‡ Reporting standards not met.

[1] Design weight is used before nonresponse adjustment. This is the distribution to each response category.

[2] "Y" denotes statistical significance at $p < .05$. "N" denotes no statistical significance.

[3] Weight after nonresponse adjustment.

[4] "All other races" includes White, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, and Multiracial. All race categories exclude individuals of Hispanic or Latino origin.

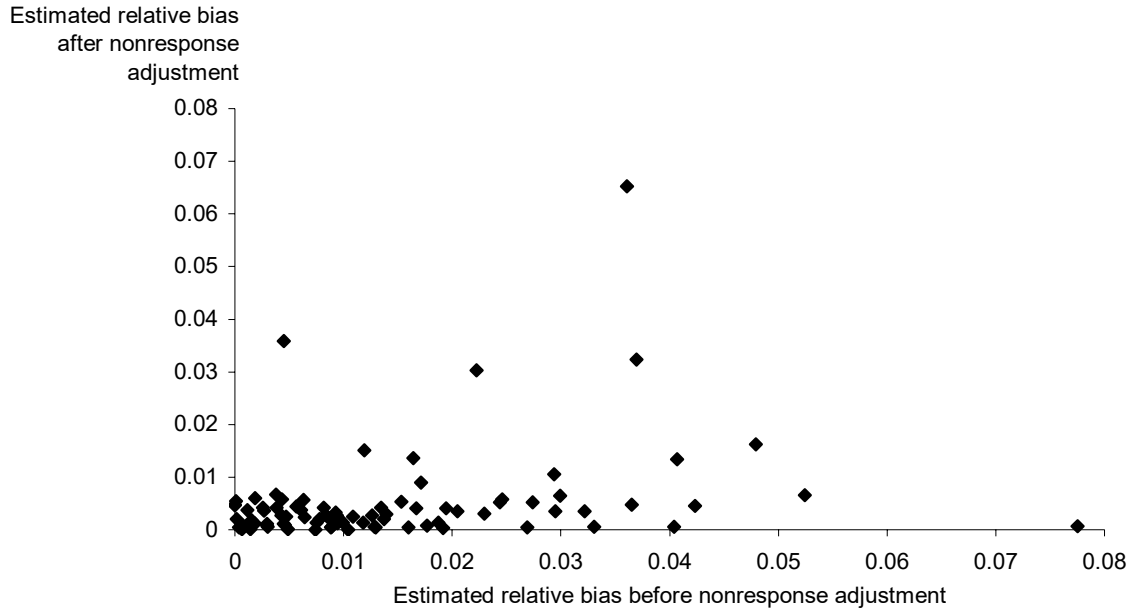
[5] IEP = Individualized Education Program.

[6] LEP = limited English proficient.

[7] Collapsed category comprising two Census divisions.

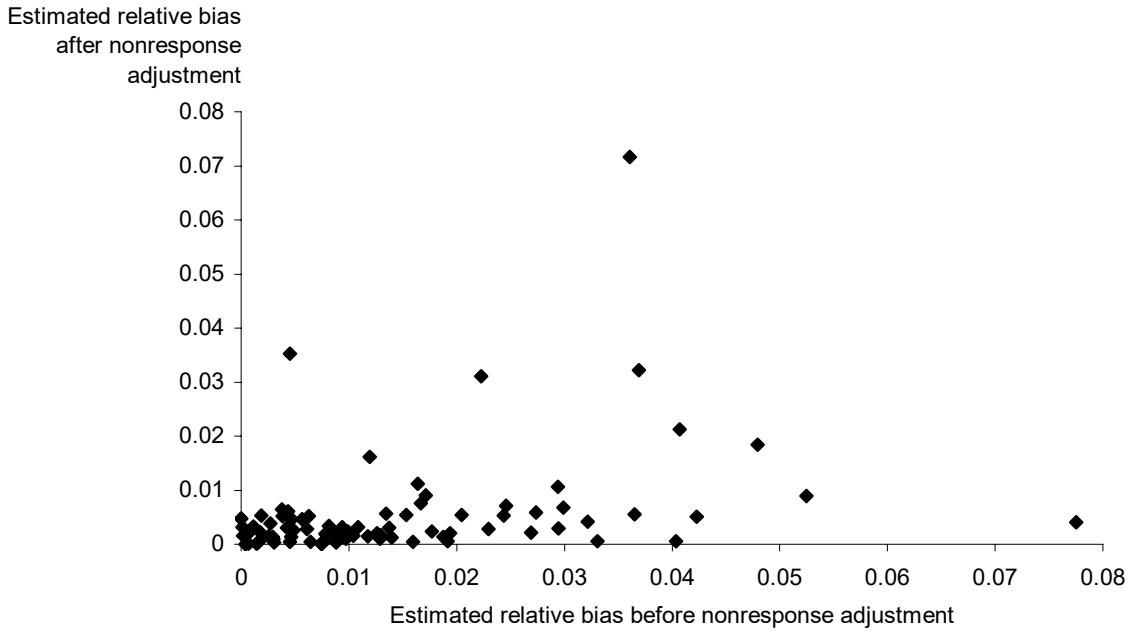
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 6. Before versus after nonresponse adjustment estimates for relative bias for base-year sophomores using the cross-sectional weight: 2004



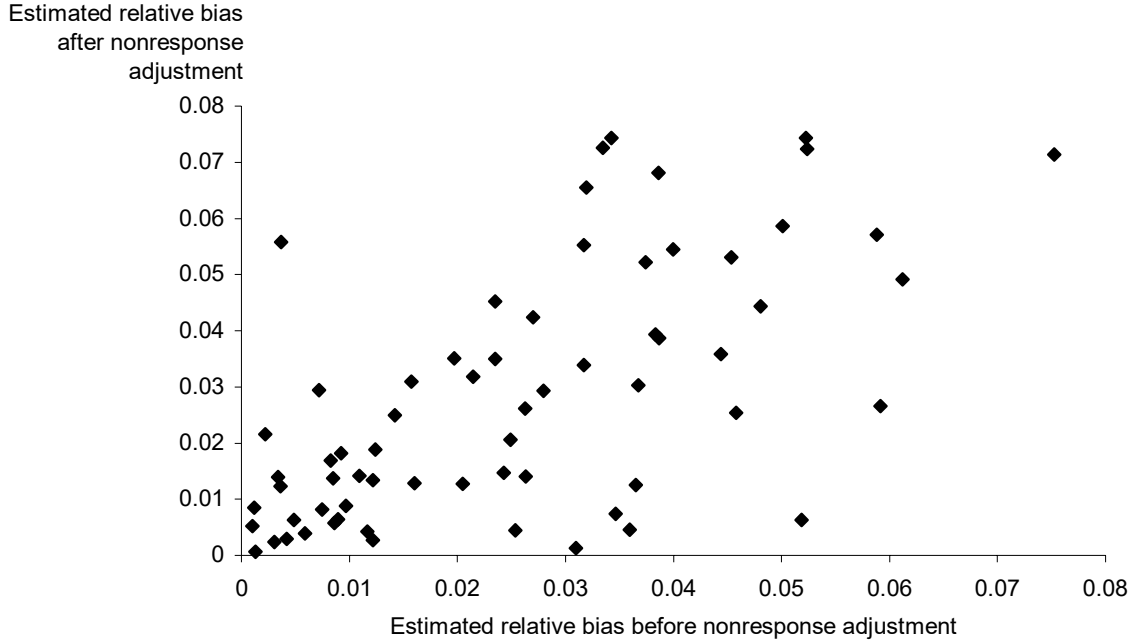
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 7. Before versus after nonresponse adjustment estimates for relative bias for base-year sophomores using the panel weight: 2004



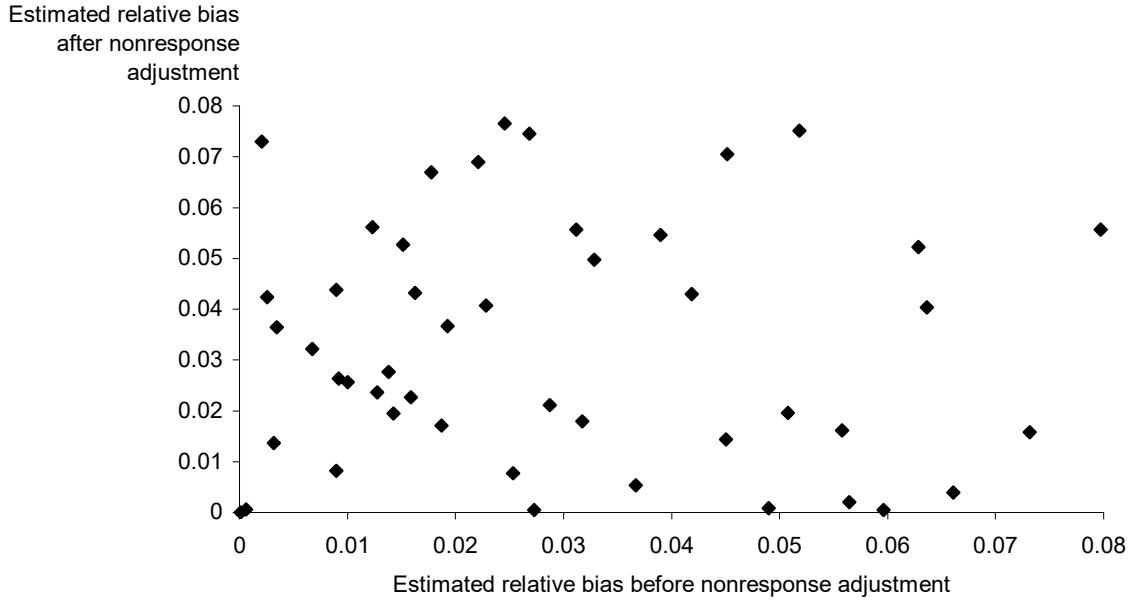
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 8. Before versus after nonresponse adjustment estimates for relative bias for transfer students using the cross-sectional weight: 2004



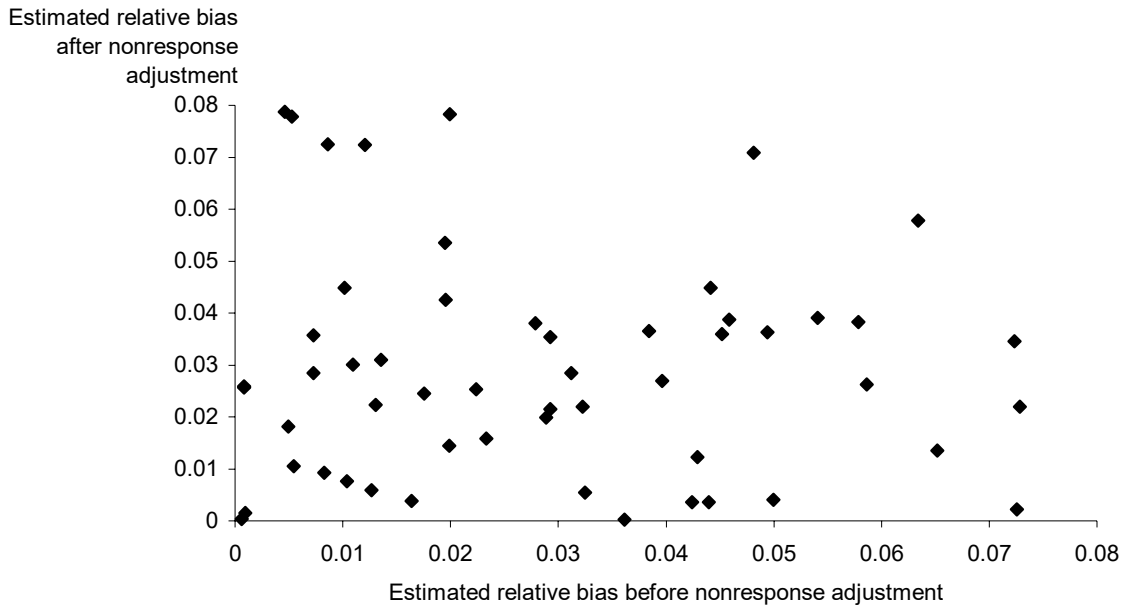
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 9. Before versus after nonresponse adjustment estimates for relative bias for dropouts using the cross-sectional weight: 2004



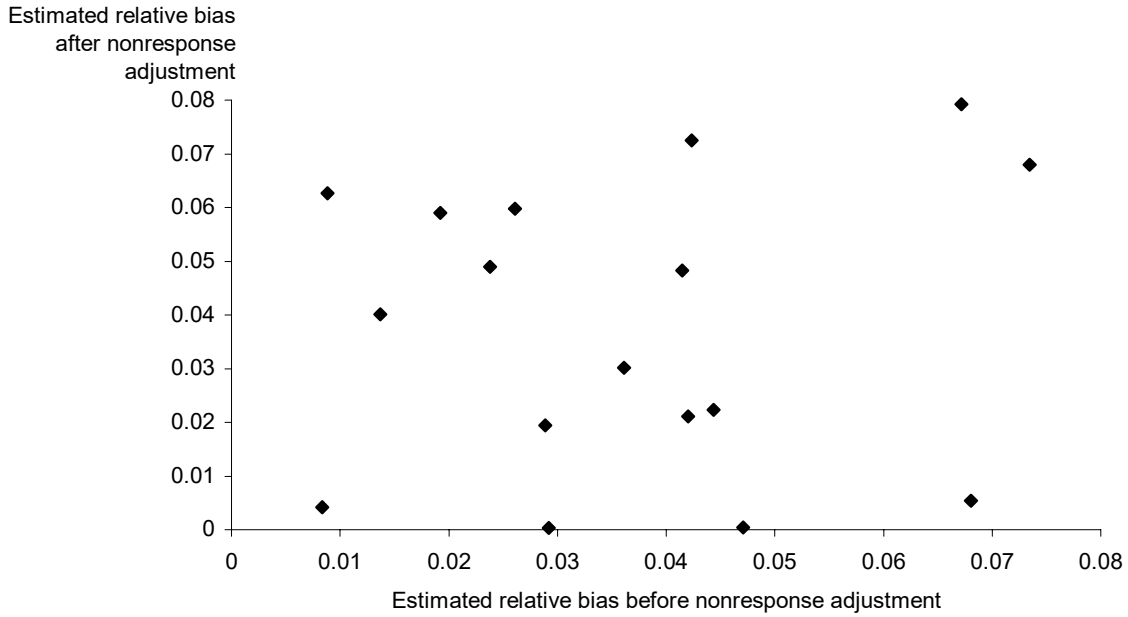
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 10. Before versus after nonresponse-adjustment estimates for relative bias for early graduates using the cross-sectional weight: 2004



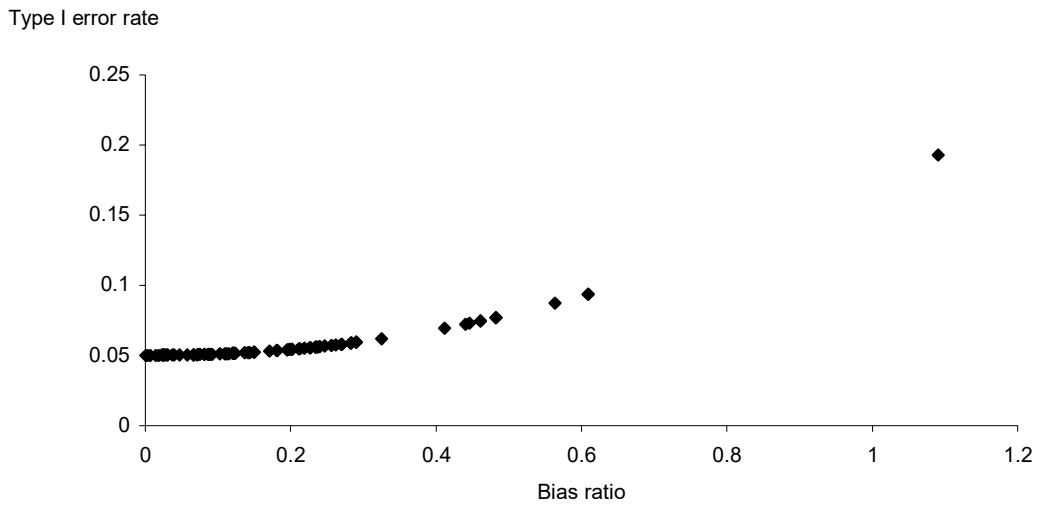
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 11. Before versus after nonresponse adjustment estimates for relative bias for homeschooled students using the cross-sectional weight: 2004



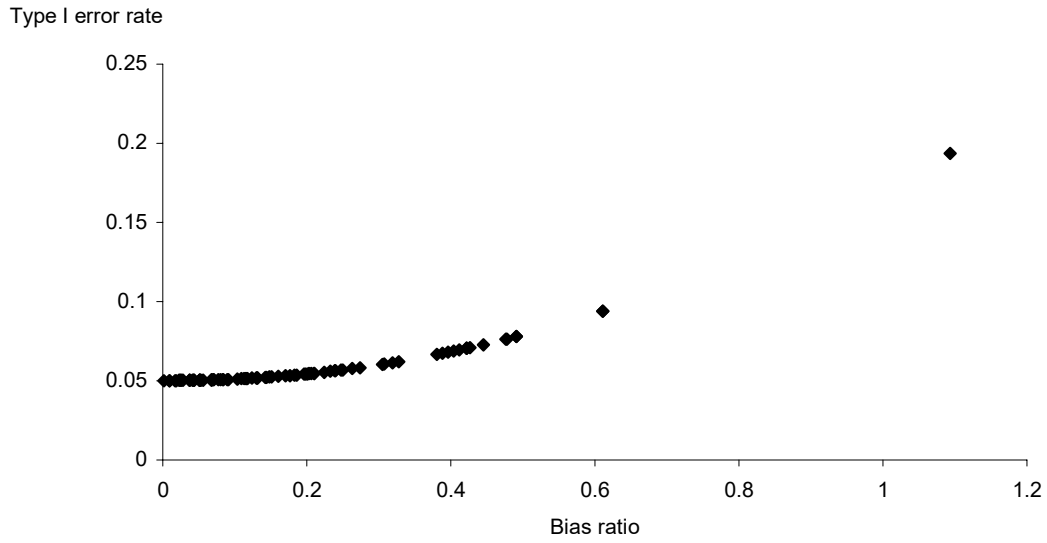
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 12. Minimum bias ratio by Type I error rate for base-year sophomores using the cross-sectional weight: 2004



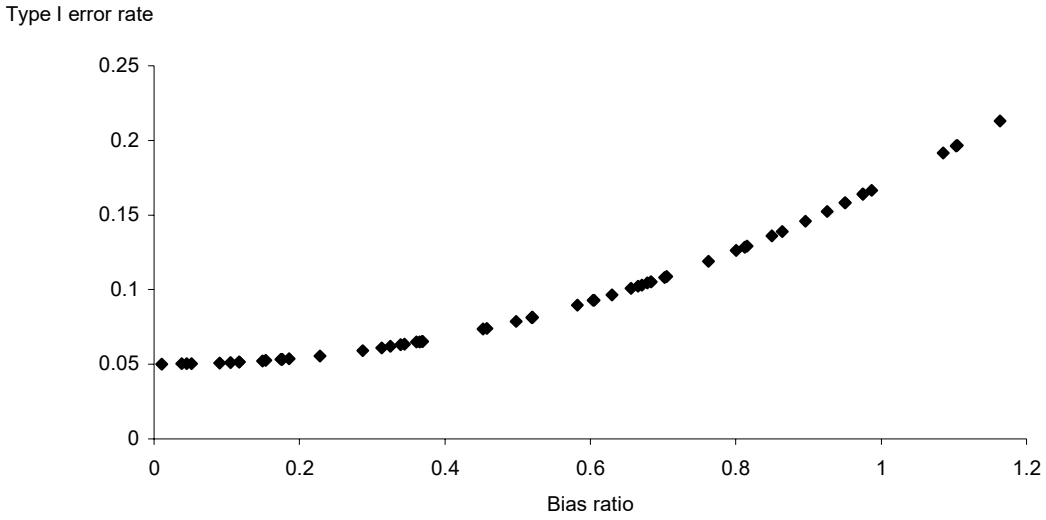
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 13. Minimum bias ratio by Type I error rate for base-year sophomores using the panel weight: 2004



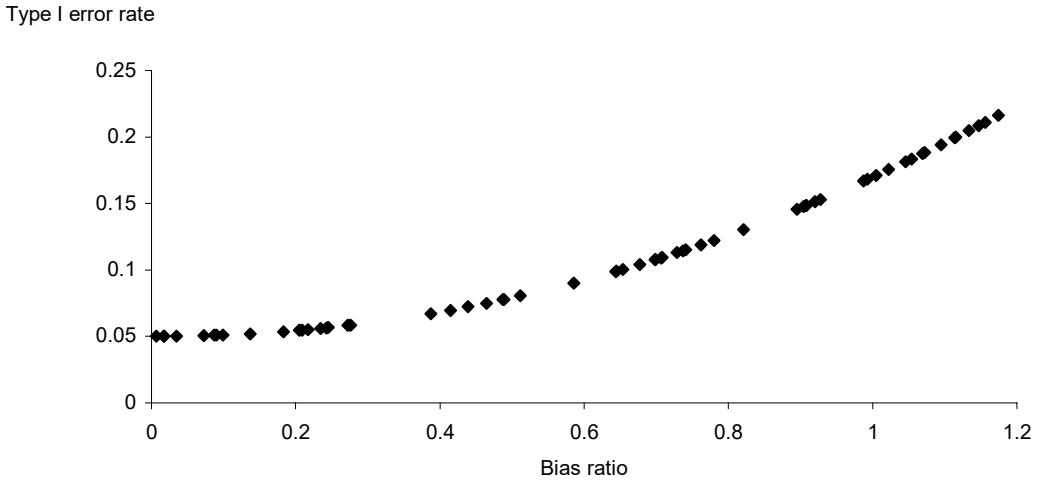
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 14. Minimum bias ratio by Type I error rate for transfer students using the cross-sectional weight: 2004



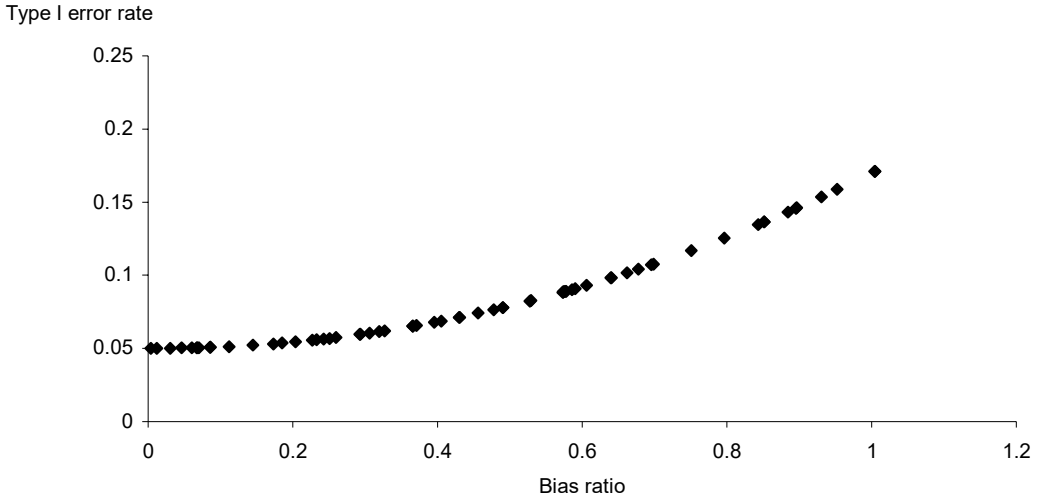
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 15. Minimum bias ratio by Type I error rate for dropouts using the cross-sectional weight: 2004



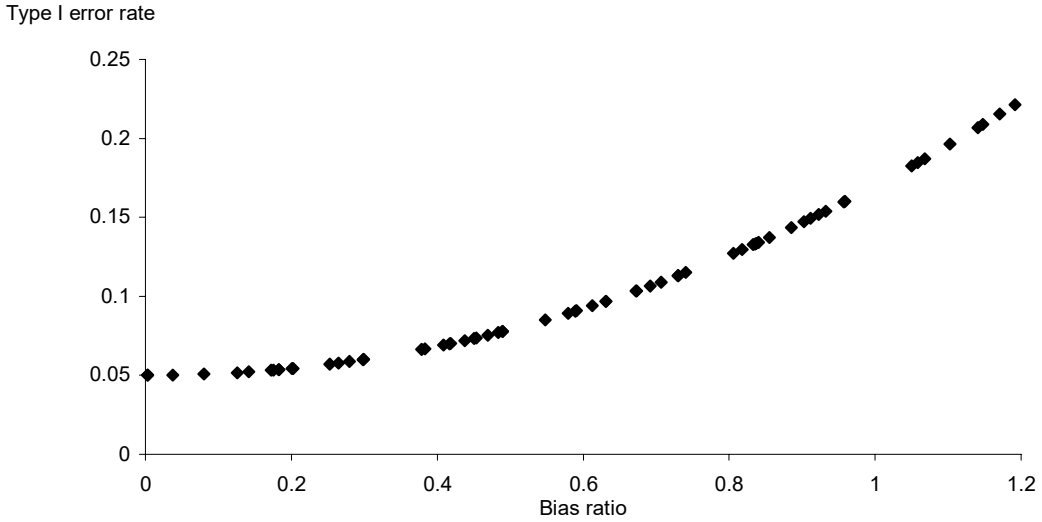
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 16. Minimum bias ratio by Type I error rate for early graduates using the cross-sectional weight: 2004



SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Figure 17. Minimum bias ratio by Type I error rate for homeschooled students using the cross-sectional weight: 2004



SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Chapter 4
Data Collection Methodology and Results

4.1 Data Collection Overview

This chapter briefly describes data collection for the Education Longitudinal Study of 2002 (ELS:2002) base-year survey and, more expansively, data collection for the first follow-up. The discussion of first follow-up data collection includes both in-school student data collection and out-of-school follow-up for those no longer in school or unable to take part in the school setting.

The base-year survey collected data from students, parents, teachers, librarians, and school administrators. Pre-data-collection activities included securing endorsements from educational organizations and gaining cooperation from state education agencies, school districts, and individual schools. Self-administered questionnaires and cognitive tests were the principal mode of data collection. Data collection primarily took place during in-school survey sessions conducted by an RTI field interviewer or team.

Base-year data were collected in spring term 2002. A total of 752 high schools participated, resulting in a weighted school response rate of 67.8 percent. A total of 15,362 students participated, primarily in in-school sessions, for an 87.3 percent weighted response rate.[28] Each sampled student's mathematics teacher and English teacher were given a questionnaire to complete. Weighted student-level coverage rates for teacher data were 91.6 percent (indicating receipt of a report from either the math teacher, the English teacher, or both). School administrators and library media coordinators also completed a questionnaire (weighted response rates were 98.5 percent and 95.9 percent, respectively). Mail questionnaires were sent to parents with a telephone follow-up for nonresponders. Student coverage for parent questionnaires was 87.5 percent (weighted). Survey administrators (SAs) completed a facilities checklist at each school. Full details about the base-year study may be found in the *Education Longitudinal Study of 2002: Base Year Data File User's Manual* (NCES 2004–405) (Ingels et al. 2004), available on the NCES website. The number of completed instruments and both weighted and unweighted completion rates are summarized in table 35.

[28] In a two stage-sample, a final response rate should be viewed as the product of both levels of participation. For example, with a school response rate of 67.8 percent and a student response rate of 87.3 percent, the final response rate taking both stages of the design into account is 67.8 * 87.3 = 59.2 percent. A school nonresponse analysis was conducted in the base year to establish that nonresponse bias at the school level was minimal and to provide a fuller basis for nonresponse adjustments in the final weighting. Similar analysis and adjustment were undertaken at the student level. For details see Ingels et al. (2004), *Education Longitudinal Study of 2002: Base Year Data File User's Manual* (NCES 2004–405), chapter 3, section 3.2.6.

Table 35. Summary of ELS:2002 base-year completion and coverage rates, by instrument: 2002

Instrument	Selected	Participated	Weighted percent	Unweighted percent
Student questionnaire	17,591	15,362	87.28	87.33
Student assessment[1]	15,362	14,543	95.08	94.67
Parent questionnaire[2]	15,362	13,488	87.45	87.80
Teacher ratings of students[3]	15,362	14,081	91.64	91.66
School administrator questionnaire	752	743	98.53	98.80
Library media center questionnaire	752	718	95.93	95.48
Facilities checklist	752	752	100.00	100.00

[1] Percentage of cases for which a student questionnaire and cognitive test were obtained. When a test was not obtained, test results were imputed.

[2] Indicates a coverage rate: the proportion of participating students with a parent report. More parents participated; completed case numbers reflect the records in the public-use data file, where parent (and teacher) data were excluded for students who did not complete a base-year student questionnaire.

[3] Indicates a coverage rate: ratings obtained from at least one teacher.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002."

First follow-up in-school data collection occurred between January and June 2004. Out-of-school data collection took place between February and August 2004 and included telephone and in-person interviews. Results are summarized in table 36.

Table 36. Summary of ELS:2002 first follow-up completion and coverage rates, by instrument: 2004

Instrument	Selected	Participated	Weighted percent	Unweighted percent
Total sample for public-use file	16,515	14,989	88.70	90.76
Student questionnaire	13,092	12,427	93.39	94.92
Student assessment[1]	12,427	10,995	87.40	88.48
School administrator questionnaire[2]	12,427	11,856	95.90	95.41
Transfer questionnaire	1,799	1,275	68.36	70.87
Dropout questionnaire	876	686	73.20	78.31
Early graduate questionnaire	687	560	80.64	81.51
Homeschool questionnaire	61	41	61.46	67.21

[1] Indicates a coverage rate: percentage of cases for which a student questionnaire and cognitive test were obtained. When a test was not obtained, test results were imputed.

[2] Indicates a coverage rate: percentage of students affiliated with base-year (2002) schools in 2004 (student questionnaire completers) for whom a school administrator report was obtained.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "Base Year, 2002" and "First Follow-up, 2004."

Tables 37 and 38 give further information about response rates for each of the first follow-up questionnaires. Table 37 shows that overall about 89 percent (weighted; or 91 percent unweighted) of the total ELS:2002 sample (comprising both 2002 sophomores 2 years later and 2004 freshened seniors) were successfully surveyed—whether through completion of a student, transfer student, dropout, homeschool, or early graduate questionnaire.

Table 37. Summary of ELS:2002 first follow-up completion and coverage rates, overall results by student questionnaire, math assessment, and school questionnaire, by selected characteristics: 2004

Characteristic	Total[1]		Student questionnaire		Coverage: math assessment[2]		Coverage: school questionnaire[3]	
	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted
Total	88.70	90.76	93.39	94.92	87.40	88.48	95.19	95.41
Participated		14,989		12,427		10,995		11,856
Sampled		16,515		13,092		12,427		12,427
Base-year school sector								
Public	88.57	90.33	93.38	94.94	86.92	87.23	94.92	94.82
Catholic	92.36	93.64	93.85	95.40	92.92	92.46	98.81	98.14
Other private	87.97	90.57	92.90	94.05	92.73	92.89	97.40	96.18
Base-year school urbanicity								
Urban	86.74	89.25	92.18	93.93	85.91	88.73	94.86	96.09
Suburban	88.89	91.31	93.18	95.18	88.10	88.92	95.57	95.25
Rural	91.30	92.17	95.60	96.00	87.73	86.87	94.68	94.63
Base-year school region								
Northeast	88.07	90.56	92.02	93.75	84.88	86.70	92.34	93.62
Midwest	88.75	90.96	93.78	95.51	89.58	89.68	96.79	97.08
South	89.55	91.47	94.45	95.98	89.53	90.27	95.64	96.00
West	87.91	89.45	92.61	93.48	83.98	85.49	95.24	93.96
Race/ethnicity[4]								
American Indian or Alaska Native	89.83	90.44	95.98	94.90	87.85	84.95	98.91	97.85
Asian or Pacific Islander	89.39	90.54		94.08	85.39	87.42	96.31	95.23
Black or African American	87.78	89.36		95.38	86.25	87.11	91.67	92.09
Hispanic or Latino	88.25	89.91		95.10		86.19	96.51	95.88
More than one race	81.26	83.64	93.35	88.85		88.32	93.86	95.02
White	89.63	92.04	94.55	93.50	95.46	88.23	89.51	95.55	95.99
			94.16		85.22			
			86.69		88.06			

[1] A student, transfer, early graduate, dropout, or homeschool questionnaire was obtained.
[2] Percentage of participating student cohort members in base-year schools who completed the math test.
[3] Percentage of participating (i.e., questionnaire completers) student cohort members in base-year schools for whom administrator data were obtained.
[4] All race categories exclude individuals of Hispanic or Latino origin.
NOTE: Coverage rates are based on questionnaire completers associated with base-year (2002) schools in 2004 (i.e., sophomore cohort members who remained in base-year schools or freshened seniors at the same schools).
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 38. Summary of ELS:2002 first follow-up completion and coverage rates, overall results by transfer, dropout, early graduate, and homeschool questionnaire, by selected characteristics: 2004

Characteristic	Transfer questionnaire		Dropout questionnaire		Early graduate questionnaire		Homeschool questionnaire	
	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted
Total	68.36	70.87	73.20	78.31	80.64	81.51	68.65	67.21
Participated		1,275		686		560		41
Sampled		1,799		876		687		61
Base-year school sector								
Public	67.57	69.28	73.85	78.10	80.19	81.26	67.16	63.64
Catholic	79.64	78.89	91.89	90.00	81.03	80.00	61.46	66.67
Other private	74.94	73.81	40.92	80.00	93.43	85.71	80.60	78.57
Base-year school urbanicity								
Urban	67.67	69.93	73.26	80.72	81.17	79.18	84.40	78.57
Suburban	69.13	71.43	71.50	75.60	79.80	82.85	68.29	65.52
Rural	67.75	71.84	77.20	79.64	81.60	83.49	60.07	61.11
Base-year school region								
Northeast	64.15	70.71	67.88	75.32	85.30	81.08	45.73	42.86
Midwest	64.81	67.89	72.22	78.87	76.77	79.62	86.44	78.57
South	71.79	72.63	77.62	80.78	76.77	79.34	64.89	60.71
West	69.07	71.55	71.01	75.15	89.42	90.16	70.34	83.33
Race/ethnicity[1]								
American Indian or Alaska Native	78.18	80.00	50.25	60.00	100.00	100.00	#	#
Asian or Pacific Islander	67.01	70.06	82.28	75.00	76.84	81.48	100.00	100.00
Black or African American	70.08	72.16	77.15	81.42	78.45	79.39	72.15	71.43
Hispanic or Latino	69.04	70.36		84.58		80.29	87.22	85.71
More than one race	62.39	61.95		75.93		75.00	32.40	25.00
White	67.82	71.72	68.80	74.37	83.03	83.18	63.55	65.85

78.96 78.18
68.26 69.82

Rounds to zero.

[1] All race categories exclude individuals of Hispanic or Latino origin.

NOTE: Coverage rates are based on questionnaire completers associated with base-year (2002) schools in 2004 (i.e., sophomore cohort members who remained in base-year schools or freshened seniors at the same schools).

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Student questionnaire completers comprise those participating first follow-up sample members then currently (spring term 2004) associated with a base-year (2002) school. In other words, the student questionnaire sample was drawn from base-year sophomore cohort members who remained at their base-year school or seniors brought in through the freshening process at those same schools. There were 13,092 individuals in the sample eligible to complete a student questionnaire, and 12,427 did so. The overall response rate for this group was 93.4 percent, weighted (94.9 percent unweighted).

The mathematics assessment was administered to about 87 percent (weighted) of the student questionnaire sample (again, the individuals who remained in, or were freshened in, the base-year schools). For this same sample (students associated with a base-year school 2 years later), school administrator data are available 95 percent (weighted) of the time.

Of course, not all sophomore cohort members remained in their base-year schools. Many transferred to a new school. These students completed a transfer student questionnaire. (Although they did not complete the mathematics assessment, a mathematics score was imputed for them.) Table 38 shows that for transfer students, a 68.4 percent weighted (70.9 percent unweighted) questionnaire completion rate was achieved.

Dropouts were defined in ELS:2002 as sample members who were absent from school for 4 consecutive weeks or more at the time of the survey, and not absent due to accident or illness. Table 38 also shows that the sophomore cohort dropout participation rate was about 73 percent (though over 78 percent unweighted). Early graduates were defined as sample members who had graduated from high school or obtained certification of high school equivalency (e.g., obtained the General Educational Development [GED] credential) on or before March 15, 2004. Table 38 also provides information about early graduates (80.6 percent weighted response rate) and the small number (61) of 2002 sophomores who were in a homeschool situation 2 years later.

Although it is of interest to examine response rates in terms of the various first follow-up questionnaires, it is also of interest to examine questionnaire response in terms of such analytic populations as high school seniors. This examination requires that response rates for two different questionnaires, the student questionnaire and the transfer student questionnaire, be combined. The senior cohort comprises sophomore cohort members 2 years later who were spring-term seniors in 2004, regardless of whether they remained at the base-year school or transferred to a new school. It also includes a freshening sample of seniors who were not eligible for selection into the sophomore cohort (either because they were not in 10th grade in 2002 or were not in the country). Table 39 shows that over 94 percent of 2004 seniors completed a questionnaire. The table also reports separately on student questionnaire completers (the "stayers" who remained in the base-year schools and were seniors, and the freshened seniors in the same schools) and transfer questionnaire completers (the "movers" who went to another school and were also seniors in 2004).

Table 39. Questionnaire completion rate for ELS:2002 senior cohort, by selected characteristics: 2004

Characteristic	Completed student questionnaire		Completed transfer questionnaire		Overall completion rate	
	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted
Total (2004 seniors)	96.84	96.78	74.32	73.79	94.42	94.25
Participated		12,269		1,157		13,426
Sampled		12,677		1,568		14,245
Base-year school sector						
Public	96.77	96.57	73.63	72.07	94.30	93.89
Catholic	97.69	97.61	83.91	80.77	96.45	96.04
Other private	97.66	97.29	79.47	77.89	94.86	94.59
Base-year school urbanicity						
Urban	96.87	96.78	74.23	73.27	93.78	93.63
Suburban	96.58	96.72	75.03	74.52	94.44	94.52
Rural	97.46	96.94	72.55	73.09	95.25	94.66
Base-year school region						
Northeast	96.11	96.14	80.92	77.60	95.17	94.80
Midwest	97.54	97.53	69.40	70.36	94.44	94.41
South	97.14	97.14	75.61	74.60	94.71	94.63
West	96.28	95.84	74.62	74.38	93.37	92.92
Race/ethnicity[1]						
American Indian or Alaska Native	96.86	95.79	83.78	83.33	93.79	93.81
Asian or Pacific Islander	97.10	96.86	72.86	74.03	94.40	94.51
Black or African American	97.13	96.90	77.37	76.47	93.72	93.40
Hispanic or Latino	96.94	96.86	74.22	73.08	93.77	93.36
More than one race	96.60	95.19	67.61	63.74	93.19	91.07
White	96.77	96.87	73.48	73.91	94.82	94.87

[1] All race categories exclude individuals of Hispanic or Latino origin.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

4.2 First Follow-up Pre-Data-Collection Activities

Although the results of data collection have been described above, section 4.2 describes pre-data-collection activities, and sections 4.3 through 4.5 discuss in-school student and administrator and out-of-school data collection procedures. Prior to beginning first follow-up data collection, it was necessary to recruit schools and have the school coordinator (the point of contact for ELS:2002 at the school) fill out enrollment status update information (in anticipation of tracing and sampling activities). Additionally, SAs had to be hired and trained.

4.2.1 School Recruitment

States and districts had been informed in the base year that there would be a first follow-up 2 years later. For that reason, the states were not recontacted. For most districts, a courtesy letter was mailed reminding them about ELS:2002 and stating that their schools would be contacted to gain permission to collect follow-up data. A few districts required that a research application be resubmitted to return to the schools in their jurisdiction.

After receiving district approval (or 1 week after sending the district courtesy letter for those districts that did not require applications), each school was sent an information package by Federal Express. The package was addressed to the principal. It contained a letter from the project officer and a list of the students who had been sampled from the base year. The letter contained a request that the school update this student list with current student status and return it to RTI. The package also contained an endorsement letter from the district, if the district had provided a letter, and a district-level approval to conduct research if applicable.

Several days after the package was sent, schools were contacted by telephone. After determining the appropriate person with whom to speak, the recruiter discussed details of the study and answered any questions. If the school agreed to participate again, a school coordinator was identified. This person served as a point of contact at the school and was responsible for handling the logistical arrangements. Dates for Survey Day and two Makeup Days were scheduled. Also, the name of the staff member who should receive the school administrator questionnaire was obtained. The type of parental consent that the school required was determined, and approval was obtained for a student incentive.

Some 752 schools participated in the base-year study. When base-year schools were recontacted for the first follow-up, it was learned that five of the schools no longer had ELS:2002 sample members (enrolled in any grade at the school) or high school seniors (hence no freshening sample). These schools, therefore, were no longer eligible for the study. Of the eligible schools, 698 (93.4 percent) allowed RTI to return to collect data in the schools. In 44 cases, the school refused to allow RTI to return to the school to collect data. Three districts (representing a total of five schools) also refused to allow RTI to return to their schools to collect data. Data from students enrolled at these schools/districts were collected outside of the school setting. Students at the base-year schools completed student questionnaires and a math test at the in-school administration. School administrator questionnaires were collected.

A handful of base-year schools split into multiple schools between 2002 and 2004. Thus, in addition to schools that participated in the base year, five schools that received pools of students from base-year schools were included as new schools in survey activities but were not added to the probability sample. All five of these schools agreed to participate in the first follow-up. The students who had moved to these new schools in en masse transfers from a base-year school were asked to complete both the student questionnaires and the mathematics assessment. An in-school administration was held, with the full complement of makeup days. School administrator questionnaires were also collected to provide student contextual data; no school weight has been generated for the five new schools.

As expected, there were numerous instances in which students had transferred from the base-year school to another school. If five or more students had transferred to the same school,

an attempt was made to conduct a Survey Day at the destination school. These schools were called "convenience" schools. Ten schools were identified as convenience schools and agreed to participate. Students at convenience schools completed transfer student questionnaires at the in-school administration but did not complete the math test. School administrator questionnaires were not collected at convenience schools.

At the time schools were recruited, recruiters ascertained the type of consent required by the school. A total of 91.2 percent of the schools allowed passive consent. Private, non-Catholic schools (other private) had the lowest rate of passive consent (88.6 percent allowing passive consent compared with 91.3 percent and 92.3 percent, respectively, for public and Catholic schools).

4.2.2 Presurvey Contacts With Schools

In the spring and again in the autumn of 2003, each base-year school was provided a list of ELS:2002 base-year sample members from their school. The school was asked to indicate whether each sample member was still enrolled at the school. For any sample member who was no longer enrolled, the school was asked to indicate the reason and date the student left. If the student had transferred to another school, the base-year school was asked to indicate the name and location of the transfer school. This information was gathered again in the spring of 2004, prior to the school's scheduled Survey Day.

In the fall of 2003, each base-year school was also asked to provide a list of the 12th-graders enrolled at that school, so this information could be used as part of the freshening process.

4.2.3 Tracing the Student Sample

As noted in the prior section, schools were asked to identify sample members who no longer attended the base-year school. At the time, contact information for those individuals was collected.

A postcard update was mailed to all ELS:2002 sample members in the early fall of 2003. Sample members were asked to update contact information and return the postcard to RTI. A total of 3,830 postcards were returned by sample members. In addition, 280 mailings were returned from the post office with forwarding address information, and 1,028 were returned with no forwarding information.

Prior to the start of first follow-up data collection, location information for the sample members was processed through locating databases (including the U.S. Postal Service National Change of Address [NCOA] file). In addition, the following types of cases were sent through Telematch (a national database that provides telephone number):

- any case that had a new address from NCOA;
- any base-year nonrespondent or questionnaire-ineligible case;
- any base-year respondent that was a candidate for out-of-school data collection (because the base-year school identified the respondent as having left the school); and

- any base-year respondent or freshened eligible 12th-grader with an address but no phone number.

During the course of data collection, cases were sent to the tracing unit for intensive tracing if the telephone unit was unsuccessful in locating the sample member. Information crucial to tracing was collected at the time of the base-year data collection and was made available to the tracing staff. The students were asked to provide the following information when they completed the in-school questionnaire in the base year:

- student's full name, address, and current telephone number;
- student's Social Security number;
- full name, address, telephone number (both home and work), and e-mail address of mother/father or female/male guardian;
- full name, address, and telephone number of a close relative or friend not currently living with the student who is likely to know how to locate the student should the student relocate; and
- student's nickname, if any.

The questionnaire the parents completed contained a similar set of questions:

- student's Social Security number;
- parent's Social Security number;
- full name, address, and telephone number (home and work) of mother/father or female/male guardian; and
- full name, address, and telephone number of a close relative or friend not currently living with the family who is likely to know how to locate the student or the parent should the student or family relocate.

The tracing unit updated addresses and telephone numbers produced by these tracing activities directly into the ELS:2002 locator database. The database maintained the most current location information for the students (i.e., name, address, telephone number, and Social Security number) as well as historical data generated from various tracing activities.

Tracing sources included Fastdata (for name, address, and change of address searches), Experian (for address or Social Security number searches), LexisNexis (for Social Security number, address, and reverse phone searches), and Trans Union (to develop Social Security numbers from other information). In addition, the Department of Education's Central Processing System (CPS) was checked to see if sample members had applied for postsecondary financial aid using the Free Application for Federal Student Aid (FAFSA). Some 1,666 cases were sent for matching, with information located for 271 cases.

The in-house tracing unit was able to locate 1,137 sample members. Of the 1,611 cases that went through tracing, interviews were completed with 964 of them.

Cases that could not be located via telephone or database search were sent to the field for tracing. Field staff used sources such as apartment complex management, Department of Motor Vehicles' databases, real estate agents, voter registration rolls, and neighbors to try to locate sample members or their families. Field staff also often returned to the base-year school to see if any additional locating information could be provided.

Peer locating was also attempted. The locator inquired whether the sample member knew the whereabouts of other sample members from the same (base-year) school.

4.2.4 Training

4.2.4.1 Field Staff Recruitment and Training

In the first follow-up, 10 field supervisors (FS) and 85 survey administrators (SA) were hired and trained. Staff were identified from RTI's National Interviewer File, a database that contains information about available field staff across the country. Five of the FSs had worked on the base-year ELS:2002 study. A number of the SAs had worked on previous rounds of ELS:2002 (either as SAs or as SA assistants). The others had experience on a variety of other research studies.

Prior to training, each SA was mailed a copy of the SA manual and a home study exercise. The SAs were instructed to read the manual and complete the home study exercise before the first day of training. Project staff conducted training in Durham, North Carolina, on January 9–11, 2004. Table 40 presents the SA training agenda.

Each SA signed a confidentiality agreement and an affidavit of nondisclosure at the beginning of training. During training, contacts that had already been made with the schools were discussed, as well as contacts that each SA would need to make with the school coordinator prior to Survey Day. Survey Day logistics were covered as well as administration instructions for the student questionnaire and cognitive tests. Criteria for scheduling Makeup Days were also covered as well as how to schedule the Makeup Days with the coordinator. The field supervisor discussed the recruitment, hiring, and training procedures for SA assistants (SAs were responsible for hiring their own assistant). While explaining active and passive consent procedures, there was a discussion about contacting parents for gaining active permission and converting refusals.

Before the beginning of out-of-school field data collection, the field supervisors and regional supervisors identified SAs and other field personnel who would be suited to conduct in-person interviews with sample members. These staff received additional training by telephone. Training focused extensively on field tracing techniques and on administering a screener to sample members to determine the correct questionnaire to use for the interview. A total of 92 staff were trained to collect data in the field.

Table 40. Survey administration training agenda: 2004

Friday, January 9, 2004

- Introductions
- Confidentiality
- Prior NCES studies/overview of ELS:2002
- Prior contacts with schools
- Consent types
- Types of schools (base year, new, convenience)
- CAC and CAC exercise
- Roster
- Working with the school coordinator
- Role play—going over roster
  - Recognizing and dealing with reluctant coordinators
- Types of students
- Survey Day logistics
- Student and new participant student questionnaires (NPSQs)
- Math test
- Editing and edit exercise

Saturday, January 10, 2004

- Questions about previous day
- Unusual situations
- Coordinator honorarium
- Other end of Survey Day activities—collect school administrator, catalogs, nonresponding student form
- Transmittal form and transmittal form exercise
- Packing list
- Shipping materials
- Phone report to field supervisors
- Survey Day from start to finish
- Makeup Days
- Contacting parents (with role play)
- Hiring and training survey administrator (SA) assistants

Sunday, January 11, 2004

- Questions from previous days
- Student nonresponse follow-up
- Dealing with paperwork
- Dealing with disruptive students/other problems at schools
- Institutional Review Board (IRB) training
- Headway procedures
- Certification
- Distribution of assignments

4.2.4.2 Telephone Interviewer Training

Telephone interviewers were trained beginning on February 7, 2004. Several training classes were held in conjunction with the graduated release of sample to the telephone interviewers. Table 41 presents the telephone interviewer training agenda.

Telephone interviewer training included an overview of the study, frequently asked questions, practice with the various questionnaires, and practice with the computer-assisted telephone interview (CATI) Case Management System (how to get into the computer system, coding various call outcomes, etc.). Interviewers also had extensive practice on refusal avoidance and refusal conversion. Questionnaire practice took the form of "round robins" (where the entire group took turns asking various questions from the questionnaire and keying responses) and paired mocks (where two interviewers were paired together—one acted as the respondent and the other acted as the interviewer). Prior to beginning calling, interviewers had to pass a certification process to prove that they had mastered the training material. Certification included answering frequently asked questions as well as demonstrating proficiency in two practice interviews and refusal avoidance.

4.3 Data Collection Procedures—In-School

After training, each SA recruited, hired, and trained an SA assistant to help in the school. In some cases, the SA was able to use the same assistant for all of the assigned schools. However, in a few cases, the schools were far enough away from where the SA lived that it involved an overnight stay. In that case, the SA hired an SA assistant who lived close to the school.

The SAs received case assignment cards for each of their assigned schools. The case assignment cards contained information about the school, including the name and phone number of the school coordinator and the designated Survey Day and Makeup Days. Prior to the designated Survey Day, the SA contacted the coordinator to make sure that the Survey Day supplies had arrived and the arrangements were in place. The SA also asked for an update of sample members' status (e.g., if anyone had transferred/dropped out or if any of the students who had left the school had returned since the fall update) and determined the eligibility of students on the freshened 12th-grader list. At the same time, the SA determined if the coordinator had received any parental refusals. If so, the SA began refusal conversion efforts if the school coordinator was willing to provide a telephone number for the parent. In active consent schools, the SA also determined from the coordinator which parents had not yet returned permission forms. If the school was willing to provide telephone numbers and/or if contact information was available from base-year data collection, the SA began calling those parents to prompt them to return the forms.

Table 41. Telephone interviewer training agenda: 2004

Saturday, February 7, 2004

- Welcome/introduction of staff
- Introduction to ELS:2002/overview
- Demo interview (student interview)
- Group questions
  - Divide into groups; scripted questions asked by project staff; group discussion about reactions to questionnaire, project, etc.
- Frequently asked questions (FAQs)
  - Cover key FAQs in detail, present certification questions
- Confidentiality forms
- Screener—eligibility
  - Presentation about screener
- Round robin mock: Homeschool
- Incentives
- Round robin mock: Transfer
- Front-end practice
  - Intro to the front-end and computer-assisted telephone interview (CATI) Case Management System (CMS). Discuss what happens when no one answers the phone. Review how to code a refusal, intro to roster lines, etc.
- Round robin mock: Early graduate
- Quality control (QC)
  - QC meetings, monitoring, etc.

Sunday, February 8, 2004

- Questions from previous day
- Refusal avoidance presentation
  - Generic refusal avoidance presentation, tone of voice, listening skills, etc.; some project-specific material
- Round robin mock: Dropout
- Front-end practice
  - Brief review of previous day; in depth about roster lines, adding roster lines, informed consent, etc.
- Refusal avoidance practice (mocks)
  - Divide into groups or pairs; telephone interviewers (TIs) have scripted sheets and FAQs to use; mock phone calls with respondents; how to address concerns (some project-specific concerns based on field test)
- Round robin: New participant student
- Refusal avoidance practice (mocks)
  - Continuation from above; focus on project-specific concerns
- Scripted paired mocks
  - Divide into pairs—one TI is interviewer, the other is respondent
- Certification

On Survey Day at each school, the SA checked in with the school coordinator and collected any parental permission forms that had been received. In active consent schools, the SA checked the student roster to make sure that only students who had returned signed permission forms were allowed to participate. In both active and passive consent schools, the SA made sure that no one for whom the school received a parental refusal was allowed to participate unless the parent had rescinded that decision in writing. As students entered the testing room, they were checked off on the student roster. After the majority of the sampled students arrived, the school coordinator was asked to try to locate the students who were not present.

Survey Day at each school was staffed with one SA and one SA assistant. The SA labeled questionnaires and tests with each student's identification number. Prior to beginning data collection, the students were read a script describing the study, giving the elements of informed consent and instructions for completing the questionnaires/tests. Students who were base-year respondents received student questionnaires. Students who had not participated in the base year received new participant student questionnaires (NPSQs).

Each student was given a questionnaire to complete during a 45-minute group administration. After the questionnaires were collected, the SA handed out math tests. There were four different math test forms. Base-year mathematics test results determined which test form each base-year respondent received in the first follow-up (high, medium, or low difficulty). Students who did not participate in the base year were given a math test that encompassed a range of questions from high to low math ability. Students were given 26 minutes to complete the math test. While the students were taking the tests, the SA and SA assistant checked the student questionnaires for critical items. After the tests had been completed, the SA asked students who missed critical items to complete them before returning to class.

At the conclusion of the group administration, the SA gave each participating student an incentive if preapproved by the school. Nearly three-fourths of the schools (72.9 percent) approved a $20 cash incentive for each participating student. Approximately 20 percent of the schools did not approve cash but allowed a $20 gift certificate to be presented to each participating student. Approximately 4 percent of the schools did not allow either incentive but had alternative arrangements (such as a cash equivalent donation to the student council, school library, etc.). Fewer than 3 percent of the schools would not permit an incentive of any type.

After distributing the incentive and sending the students back to class, the SA determined whether a Makeup Day was necessary. A Makeup Day was automatically scheduled if three or more students who had permission to participate were not present for Survey Day. If fewer students missed the session, a decision was made on a case-by-case basis. If a Makeup Day was deemed necessary, the SA informed the school coordinator. Makeup Days had been scheduled during the recruitment phase of the study. During the first follow-up, 190 schools had only a Survey Day administration. A Survey Day and one Makeup Day were held at 320 schools. A total of 203 schools required a Survey Day and at least two Makeup Days. Because of the smaller number of students in makeup sessions, only one person covered Makeup Days. Generally, the SA conducted Makeup Days unless the SA assistant lived substantially closer to the school.

As expected, the first day of data collection at a school was the most productive. Of those who participated in in-school survey sessions, 87.5 percent (9,737) were interviewed on Survey Day, and the remaining 12.5 percent on a Makeup Day. Some 10.1 percent (1,126) participated on the first Makeup Day, and 2.4 percent (262) on a subsequent Makeup Day.

School coordinators were given a base honorarium of $50. However, as a graduated-results-based incentive, additional honorarium amounts of up to $50 were given for schools with high student response rates.

Table 42 shows the proportion of student questionnaire cases completed in in-school sessions versus those that had to be completed outside school. Table 43 reports on the completion rates for sample members who were classified as currently enrolled students at schools that allowed in-school survey administration for the first follow-up. Of the 12,161 students sampled from schools that allowed in-school survey administration, 89.0 percent who participated took part during the in-school administration. Even though these schools allowed at least one in-school Survey Day (and often one or more Makeup Days), it was nevertheless necessary to pursue some students outside school. An additional 5.8 percent were surveyed outside the school setting, to achieve an overall weighted participation rate of 94.8 percent.

Although questionnaire completion defines participation in ELS:2002, student questionnaire completers were also asked to complete a mathematics assessment. There is little difference in the ultimate questionnaire-defined response rates according to whether the school allowed a survey session (94.8 percent) or did not (93.4 percent), but a greater difference exists for test completion. Math test completion rates are shown in tables 44 and 45. Table 44 shows test completion rates of all sample members classified as currently (spring 2004) enrolled students in base-year schools regardless of whether the school allowed in-school data collection for the first follow-up. Math tests were collected for 93.1 percent (weighted) of all sample members classified as currently enrolled. Table 45 reports on test completion rates of currently enrolled student respondents at high schools where in-school Survey Days were held. As expected, the rate of test completion among questionnaire completers who attended schools that permitted in-school survey administration was quite high—99.1 percent.

Table 42. Proportion of student questionnaire cases completed in-school versus out-of-school, by selected characteristics: 2004

Characteristic	Total		In-school		Out of school		Nonrespondent	
	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted
Total	93.39	94.92	82.83	84.72	10.56	10.20	6.61	5.08
Participated		12,427		11,092		1,335		665
Sampled		13,092		13,092		13,092		13,092
Base-year school sector								
Public	93.38	94.94	82.39	83.62	10.99	11.32	6.62	5.06
Catholic	93.85	95.40	88.34	89.04	5.52	6.37	6.15	4.60
Other private	92.90	94.05	87.25	87.44	5.66	6.61	7.10	5.95
Base-year school urbanicity								
Urban	92.18	93.93	81.79	84.30	10.39	9.63	7.82	6.07
Suburban	93.18	95.18	82.20	85.12	10.98	10.06	6.82	4.82
Rural	95.60	96.00	85.89	84.44	9.72	11.57	4.40	4.00
Base-year school region								
Northeast	92.02	93.75	78.46	81.59	13.55	12.16	7.98	6.25
Midwest	93.78	95.51	84.74	86.68	9.04	8.83	6.22	4.49
South	94.45	95.98	86.43	87.69	8.02	8.29	5.55	4.02
West	92.61	93.48	79.27	80.19	13.34	13.30	7.39	6.52
Race/ethnicity[1]								
American Indian or Alaska Native	95.98	94.90	85.33	80.61	10.65	14.29	4.02	5.10
Asian or Pacific Islander	93.35	94.08	80.16	82.68	13.19	11.40	6.65	5.92
Black or African American	94.55	95.38	83.38	84.06	11.17	11.32	5.45	4.62
Hispanic or Latino	94.16	95.10	81.87	82.78	12.29	12.33	5.84	4.90
More than one race	86.69	88.85	74.80	79.24	11.89	9.62	13.31	11.15
White	93.50	95.46	83.73	86.19	9.78	9.27	6.50	4.54

[1] All race categories exclude individuals of Hispanic or Latino origin.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 43. Student questionnaire completion rates at base-year schools that allowed in-school data collection in the first follow-up, by selected characteristics: 2004

Characteristic	In-school		Out-of-school	
	Weighted	Unweighted	Weighted	Unweighted
Total	88.97	91.21	5.78	4.98
Participated		11,093		606
Sampled		12,161		12,161
Base-year school sector				
Public	88.73	90.64	6.06	5.70
Catholic	91.88	93.38	2.84	2.85
Other private	91.24	92.57	2.46	2.42
Base-year school urbanicity				
Urban	85.66	88.95	7.25	5.97
Suburban	89.20	91.71	5.74	4.79
Rural	93.16	94.11	3.74	3.66
Base-year school region				
Northeast	85.49	88.38	8.01	7.11
Midwest	90.21	92.49	4.71	4.14
South	92.42	93.86	3.48	3.22
West	85.46	87.66	8.44	7.08
Race/ethnicity[1]				
American Indian or Alaska Native	91.69	88.76	6.87	8.99
Asian or Pacific Islander	86.72	88.62	8.24	6.88
Black or African American	89.53	91.50	6.07	5.24
Hispanic or Latino	87.42	88.92	8.26	7.49
More than one race	84.25	85.36	5.33	5.43
White	89.67	92.68	5.03	3.93

[1] All race categories exclude individuals of Hispanic or Latino origin.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 44. Math test completion—all eligible students (students still associated with a base-year school at time of data collection, regardless of whether the school permitted an in-school survey session), by selected characteristics: 2004

Characteristic	Tests completed	
	Weighted	Unweighted
Total	93.06	93.99
Participated		10,995
Sampled		11,698
Base-year school sector		
Public	92.75	93.18
Catholic	95.96	96.14
Other private	97.32	97.36
Base-year school urbanicity		
Urban	91.01	92.65
Suburban	93.41	94.50
Rural	95.06	95.07
Base-year school region		
Northeast	91.03	92.20
Midwest	93.90	94.57
South	95.13	95.52
West	90.73	92.22
Race/ethnicity[1]		
American Indian or Alaska Native	93.03	90.80
Asian or Pacific Islander	90.82	92.32
Black or African American	92.65	93.48
Hispanic or Latino	90.26	91.34
More than one race	92.16	93.12
White	93.97	95.11

[1] All race categories exclude individuals of Hispanic or Latino origin.

NOTE: Students were eligible to take the mathematics test only if they were enrolled in their base-year (2002) school 2 years later (2004) or were a 2004 freshened senior in a base-year school that participated in the first follow-up.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 45. Math test completion—only base-year schools allowing survey days in the first follow-up, as a percentage of questionnaire completers, by selected characteristics: 2004

Characteristic	Tests completed	
	Weighted	Unweighted
Total	99.10	99.12
Participated		10,995
Sampled		11,093
Base-year school sector		
Public	99.08	99.04
Catholic	98.86	99.01
Other private	99.95	99.91
Base-year school urbanicity		
Urban	98.71	98.87
Suburban	99.41	99.41
Rural	98.87	98.77
Base-year school region		
Northeast	99.56	99.62
Midwest	98.79	98.78
South	98.72	98.81
West	99.69	99.67
Race/ethnicity[1]		
American Indian or Alaska Native	100.00	100.00
Asian or Pacific Islander	99.45	99.48
Black or African American	98.93	98.84
Hispanic or Latino	98.80	99.03
More than one race	97.99	99.04
White	99.25	99.12

[1] All race categories exclude individuals of Hispanic or Latino origin.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

4.4 Data Collection Procedures—School Administrator Survey

When schools were recruited for the first follow-up, school coordinators were asked to name an individual who would be responsible for completing the school administrator survey. Because the bulk of the questions were of a general nature about the school and its policies, any knowledgeable staff member was permitted to complete the majority of the questionnaire. It was required that the final section be filled out by the principal of the school. Because this section only took about 5 minutes to complete, it reduced the burden on the principal by allowing someone else in the school to complete the greater part of the questionnaire.

School administrator questionnaires were mailed to the designated survey recipients in February 2004. These questionnaires were sent to the base-year participating schools, including those schools that did not permit in-school data collection for the first follow-up (with the exception of 13 that refused both in-school administration and the school administrator questionnaire). Prompting for school administrator questionnaires was done during SA contacts with the schools. After the last Survey Day in the school, institutional recruiters prompted for questionnaires. In an attempt to boost participation, a small subset of the schools was offered the option of completing an abbreviated questionnaire designed to gather key data points. Schools were also offered the option of e-mailing or faxing the completed questionnaire instead of sending it by mail. A total of 712 questionnaires (94.7 percent) were received. Completed school administrator questionnaires were received from 98.9 percent of all of the schools that allowed first follow-up data collection in the schools and 47.8 percent of the schools that refused in-school data collection.

4.5 Data Collection Procedures—Out-of-School

During the school recruitment process, base-year schools were asked to provide enrollment status updates for sample members at three points in time: spring term of 2003, fall term of 2003, and several weeks prior to the scheduled Survey Day in spring term of 2004. For those who left their base-year school, the school was asked to provide contact information to allow for out-of-school data collection during the first follow-up survey period.

Telephone data collection began in February 2004. Sample members who were identified for initial contact by the telephone unit included those no longer enrolled at the base-year school and those who attended base-year schools that did not grant permission to conduct an in-school survey session. Other cases were identified for telephone follow-up after the Survey Day and all Makeup Days had taken place at the school the sample members attended.

For sample members under the age of 18, parental permission was obtained by telephone prior to initiating contact with the sample member. Once parental permission was obtained (and for those sample members aged 18 or older), a screener was administered to the sample member to determine eligibility and which type of questionnaire to administer (student, transfer, dropout, early graduate, or homeschool). Sample members who did not participate in the base year were also administered a new participant supplement (NPS).

Some nonresponding sample members were assigned to SAs for field follow-up. The determination of which cases were sent to the field was based on the distance of the sample member from the SA, the SA's availability, and whether telephone leads on the sample member had been exhausted. In March 2004, SAs were identified to work cases in the field that had proved difficult to reach by telephone. A total of 1,803 cases were assigned to field staff. The SAs were sent tracing information on each sample member. As with the telephone interviewing, SAs obtained parental permission for sample members under the age of 18. SAs also screened sample members prior to interviewing them to determine eligibility and which questionnaire to administer. A total of 797 sample members were interviewed in the field. An additional 80 field cases were completed either by mailed questionnaire or telephone interview and were withdrawn from the field assignment. (Questionnaires were mailed to sample members at their request, but there was no mass mailing.)

4.6 First Follow-up Yield

Tables 46 and 47 summarize additional data collection results for the ELS:2002 first follow-up that are of methodological interest. (Because they are not concerned with population estimates but have a methodological focus, the tables present only unweighted percentages.)

Overall yield by method of data collection is shown in table 46. The majority of those who responded did so during the in-school Survey or Makeup Day. Approximately 20 percent participated as a result of the telephone interview follow-up. Just over 5 percent were interviewed by a field interviewer.

Table 46. Overall yield, by method of data collection (unweighted percents): 2004

Method	Number of responses	Percent of total response
Total responses	14,989	100.00
In school	11,125	74.21
Mail	43	0.29
Telephone	3024	20.17
Field	797	5.33

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Table 47 summarizes response rates by the sample members' base-year status. As expected, response rates were higher for sample members who had been base-year respondents than for those who had not participated in 2002. Nevertheless, about two-thirds of the sample of base-year nonparticipants took part in the first follow-up, a high percentage given the past response propensities of this group. More specifically, the first follow-up response rate for base-year respondents was 92.4 percent, compared with 66.7 percent for base-year nonrespondents. Freshened sample members were enrolled in the 12th grade in the spring term of 2004 but had not been eligible to participate in the base year because they were either out of the country or were not high school sophomores at that time. Some 82.6 percent of freshened seniors completed a first follow-up student questionnaire. Finally, some sophomores sampled in the base year were unable, for reasons of their language status (insufficient command of English) or owing to a severe disability, to participate through questionnaire completion at the time (nonetheless, contextual data were collected for these individuals, who appear only on the base-year restricted-use file). A subset of these individuals was reclassified in the spring of 2004 as able to complete a questionnaire and took part in the study. These 105 individuals are included in the total row only; they are included on the public-use file ECB.

Table 47. Overall unweighted response rates, by base-year status: 2004

Base-year status	Eligible sample	Respondents	Response rate (unweighted percent)
Total	16,515[1]	14,989[1]	90.76
Base-year nonrespondent	976	651	66.70
Base-year respondent	15,227	14,062	92.35
Freshened 12th-grader	207	171	82.61

[1] Includes (shown only in totals) 105 sophomore cohort members who were classified as incapable of completing a questionnaire in 2002 but were reevaluated in 2004, found to be capable, and responded to the first follow-up survey.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, 2004."

Chapter 5
Data Preparation and Processing

This chapter describes the automated systems used to control survey processes for the Education Longitudinal Study of 2002 (ELS:2002), including procedures used to maintain receipt control; aspects of data preparation (such as coding); and the various procedures for data capture, cleaning, and editing. The chapter is organized into seven sections: (1) overview of systems design, development, and testing; (2) data receipt; (3) coding for hardcopy instruments; (4) data capture for optically scanned instruments; (5) data cleaning and editing; (6) data capture and editing for computer-assisted telephone interviewing (CATI); and (7) data processing and file preparation.

5.1 Overview of Systems Design, Development, and Testing

Most systems were developed in the base year, then redesigned if necessary during the first follow-up field test with concern for the processes needed for the first follow-up main study. The effort was to test systems in a smaller environment to reveal points in which improvements could be implemented on a larger scale. After the field test, improvements were implemented and checked in a test environment.

The following systems were developed in the base year and refined and tested in the first follow-up field test:

- a recruiting system;
- a Survey Control System (SCS);
- a Survey Day materials generation program;
- a questionnaire receipt application;
- a web-based Integrated Management System (IMS);
- production reports;
- TELEform (application used for scanning questionnaires);
- a mail return application;
- an incentive tracking application;
- a field reporting system to help field supervisors track the status of in-school data collection and field interviewing;
- a Structured Query Language (SQL) server database to store scanned data responses;
- a scanned image database; and
- a student CATI instrument.

A full development process, including design, programming, testing, and implementation, was used in the creation of these systems. Specifications were developed in word processing

documents and flowchart applications, and progress was tracked using Microsoft Project and Microsoft Excel. Specifications for questionnaires were designed in word processing documents and were updated to reflect what changed between the field test questionnaires and the full-scale questionnaires.

Between the field test and full-scale studies, systems and procedures were evaluated, and the following functionality was added to the full-scale operations:

- a field assignment system;
- a field materials generation system;
- mail generation invoked by requests in CATI;
- a computer-assisted data entry (CADE) program for the field screener;
- TELEform versions of out-of-school hardcopy questionnaires (i.e., transfer, dropout, early graduate);
- quality control steps implemented during scanning, rather than later during data delivery processes;
- data cleaning and editing programs;
- a scanned image archive server that allowed instant access to scanned questionnaires during the data cleaning and review process;
- a cleaning and editing application that allowed editors to review and correct questionnaire data as appropriate, working in conjunction with actual scanned images in cases in which inconsistent data occurred;
- a data review system that allowed reviewers to randomly review questionnaires with data to detect data deficiencies (e.g., scanning problems); and
- an occupation coding application.

5.2 Data Receipt

The data preparation facility received all materials returned to RTI after a school's survey was complete or school officials sent in completed questionnaires. Procedures were established to systematically receive and record all required forms; this process included the scanning of bar-coded labels. Receipt events were available for the full-scale study to identify questionnaires that were not completed fully or accurately and to allow project staff to follow up promptly. Different versions of questionnaires (e.g., student, transfer, early graduate, etc.) were easily distinguishable within the receipt process and were automatically batched separately based on the questionnaire type.

After questionnaires were received and added to the receipt system, a batch number was assigned to the questionnaire. To assist the project team in cases that required referring to a questionnaire, the system was able to access dynamically the status of an individual questionnaire and provide its batch number. If the questionnaire had moved beyond the scanning stage, the scanned image could be accessed as well. Questionnaires were occasionally identified

for data removal (e.g., when parental consent was lacking). Rather than deal with the removal process manually, a spreadsheet was developed to document these cases, and case removal was integrated into the data delivery process. This approach was useful because it did not disrupt the questionnaire processes and provided the ability to add cases back to final data files when appropriate (e.g., when parental permission was obtained).

5.3 Coding for Hardcopy Instruments

The following text items were obtained in the questionnaires:

- mother/female guardian occupation (from student's new participant supplement);
- father/male guardian occupation (from student's new participant supplement);
- expected occupation after high school (from student questionnaire); and
- expected occupation at age 30 (from student questionnaire).

Occupation text was loaded into a coding application in which a coding specialist could select the correct code from the 16 occupation categories. The resulting codes were merged back into the data files.

5.4 Data Capture for Optically Scanned Instruments

The following questionnaires were developed for optical scanning:

- a student questionnaire;
- a new participant student questionnaire (new participant supplement joined with an abbreviated student questionnaire);
- four math tests;
- a school administrator questionnaire;
- an abbreviated student questionnaire;
- a new participant supplement;
- a transfer questionnaire;
- a not currently in school (dropout) questionnaire;
- an early graduate questionnaire; and
- a homeschool questionnaire.

After questionnaires were received and batched, they were ready for TELEform scanning. A TELEform questionnaire contained text fields that could be recognized by scanning machines and interpreted forms text to data through optical character recognition. Verifiers reviewed data that were not interpreted accurately by the scanning machines or were not consistent with expected ranges. Once verification was complete, the data were converted to an American Standard Code for Information Interchange (ASCII) file, and the questionnaire image

was written to the server. This process provided immediate access to raw questionnaire data and a repository of images accessible by ELS:2002 staff.

TELEform development began with the field test TELEform document and specifications in Microsoft Word that indicated changes made between the field test and the full-scale study. Modifications were easily made, and variable names were updated appropriately. Any new TELEform documents were first developed in Microsoft Word as a specification. As changes in the TELEform document were required, the corresponding Microsoft Word document was updated using the "Track Changes" tool. Reviewers would compare the specifications to the printed version of the TELEform document to ensure that all questionnaires were the latest version. When a TELEform document was confirmed as final, internal testing of the scanning and data-writing processes occurred. About 10 forms were printed and filled out for testing purposes. The test forms were scanned so that the resulting data could be compared to the original questionnaire; this comparison would detect problems with the printed questionnaire, the scanning program, or the SQL server database.

Scanning procedures were evaluated after the field test in an effort to streamline the scanning process for the full-scale study. Different stages of the scanning process were timed, and averages across each stage (i.e., cutting, scanning, evaluation, verification, data/image commit) for each questionnaire were used to analyze system and staffing needs. The need for efficient archiving procedures arose from the large amount of space taken by scanned images on the server and the need for access to the image for review. An application was developed to control the archiving process across the tens of thousands of scanned images. Archive procedures were modified from those used during the field test, and an SQL database was created to track what had been archived (and to which CD volume) for easy image retrieval.

Questionnaire data were committed to ASCII data files and loaded with a scheduled process into an SQL server database each night. Raw SQL server data were compared to the original questionnaires to ensure that scanning procedures were accurately storing data to the SQL server. The SCS tracked each form that was scanned by indicating a scanned event whenever the SQL server database was updated for a questionnaire. If a record was not transmitted successfully before or during the commit (i.e., nightly loading process) to the SQL server, a scanned event would be lacking for the questionnaire and could be easily identified later for rescanning. This approach ultimately ensured that all questionnaires had a corresponding data record and could not be dropped without detection.

5.5 Data Cleaning and Editing

An application was developed in which case/item-specific issues were reviewed and new values were recorded for subsequent data cleaning and editing. Records were selected for review based on one of the following criteria: random selection, suspicious values during frequency reviews, values out of expected ranges, and values not adhering to a particular skip pattern. The review application provided the case/item-level information, reasons for review, and a link to the scanned image of the questionnaire. Reviewers determined scanning corrections, recommended changes (if respondents had misinterpreted the question), and reviewed items randomly to spot potential problems that would require more widespread review.

The application was built on an SQL server database that contained all records for review and stored the recommended data changes. Editing programs built in SAS read the SQL server database to obtain the edits and applied the edits to the questionnaire data. Questionnaire data were stored at multiple stages across cleaning and editing programs, so comparison across each stage of data cleaning could be easily confirmed with the documentation on recommended edits. Raw data were never directly updated, so changes were always stored cumulatively and applied each time a cleaned dataset was produced. This process provided the ability to document all changes and easily fix errors or reverse decisions upon further review.

Editing programs also contained procedures that output inconsistent items across logical patterns within the questionnaire. For example, instructions to skip items could be based on previously answered questions; however, the respondent may not have followed the proper pattern based on the previous answers. These items were reviewed, and rules were written to either correct previously answered (or unanswered) questions to match the dependent items or blank out subsequent items to stay consistent with previously answered items.

5.6 Data Capture and Editing for CATI

For the out-of-school data collection effort, the following CATI instruments were developed to administer to sample members: student (developed from the TELEform abbreviated version), transfer, not currently in school (dropout), early graduate, and homeschool. A screener at the beginning of the CATI survey was responsible for determining which questionnaire module a respondent was to be administered.

CATI logic was designed such that the TELEform and CATI records could be concatenated into one data file. CATI instruments were developed with logic based on the skip patterns in the questionnaires. Questions were automatically skipped during administration. The questionnaire development program (Blaise) stored data for each item answered, but respondents were allowed to go back to previously answered items. In rare cases, a previously answered item could be changed in such a way that the questionnaire logic was inconsistent with data already answered from a different logical path. Blaise automatically corrected the previously administered responses so that the skip logic was consistent.

5.7 Data Processing and File Preparation

All TELEform questionnaire scans were stored in an SQL server database. CATI data were exported nightly to ASCII files. Cleaning programs were designed to concatenate CATI and TELEform SQL server data into SAS datasets, adjusting and cleaning variables when formats were not consistent. Special attention was focused on this concatenation to verify that results stayed consistent and to rule out possible format problems.

Once questionnaire data were concatenated and cleaned across modes and versions, the following cleaning and editing steps were implemented:

- anomalous data cleaning based on review of data with original questionnaire image (e.g., scanning errors);

- rule-based cleaning (changes that were made based on patterns in data, rather than review of images);
- hard-coded edits based on changes recommended by a reviewer if respondents misunderstood the questionnaire (e.g., respondent was instructed to enter a percentage, but there was strong evidence that the respondent entered a count rather than the percentage); and
- edits based on logical patterns in questionnaire (e.g., skip pattern relationships between gate and dependent questions).

All respondent records in the final dataset were verified with the SCS to spot inconsistencies. For example, it was possible that data were collected for a respondent who later was set to an ineligible status. It would not be appropriate to include that data, and the SCS served as a safeguard to ensure data integrity. Furthermore, the data files served as a check against the SCS to ensure that all respondent information was included in production reports.

Item documentation procedures were developed to capture variable and value labels for each item. Item wording for each question was also provided as part of the documentation. This information was loaded into a documentation database that could export final data file layouts and format statements used to produce formatted frequencies for review. The documentation database also had tools to produce final electronic codebook input files.

Chapter 6
Data File Contents

This chapter provides a concise account of the Education Longitudinal Study of 2002 (ELS:2002/04) base-year to first follow-up longitudinal data file contents. It addresses the following six topics: (1) structure of the electronic codebook (ECB) system, (2) analysis populations, (3) weights and flags, (4) composite and classification variables, (5) variable naming conventions, and (6) the hardcopy student component codebook.

6.1 Data Structure

ELS:2002/04 first follow-up data have been made available in public- and (for licensed users) restricted-use versions[29] in an ECB format on CD-ROM. The ECB is designed to be run in a Windows environment. The ECB (NCES 2006–346) is available at no cost from the National Center for Education Statistics (NCES). Appendix A supplies a brief introduction to the ECB, including its installation.

The ECB system serves as an electronic version of a fully documented survey codebook. It allows the data user to browse through all ELS:2002/04 variables contained on the data files, search variable and value names for key words related to particular research questions, review the wording of these items along with notes and other pertinent information related to them, examine the definitions and programs used to develop composite and classification variables, and "output" the data for statistical analysis. The ECB also provides an electronic display of the distribution of counts and percentages for each variable in the dataset. Analysts can use the ECB to select or "tag" variables of interest, print hardcopy codebooks that display the distributions of the tagged variables, and generate SAS and SPSS program code (including variable and value labels) that can be used with the analyst's own statistical software.

The ECB comprises two megafiles, one at the student level (with other data sources supplying contextual data for analysis of the student) and one at the school level. The megafile at the student level encompasses base-year student (student questionnaire and test, parent, and teacher questionnaires) and school (administrator, library, facilities) data in conjunction with first follow-up student (student, transfer, dropout, early graduate, and homeschool questionnaires, and student tests) and school administrator data.

The second megafile, at the school level, encompasses base-year data (facilities checklist, the school administrator questionnaire, and the library media center questionnaire) and first follow-up school administrator questionnaire data. Analysts should be aware that the base-year school data may be used as a stand-alone, nationally representative sample of 2001–02 schools with 10th grades, but that the school data for the 2003–04 school year are *not* generalizable to the nation's high schools with 12th grades.

[29] A license is required to access the restricted-use ECB (http://nces.ed.gov/statprog/confid6.asp).

6.2 First Follow-up Analysis Populations

There are several first follow-up populations of analytic interest. One may be interested in longitudinal analyses of the sophomore cohort 2 years later or in analyses of selected subsets of the cohort (e.g., dropouts, students who remained in the base-year schools and for whom school effects can be measured). One may also be interested in cross-sectional analysis of the senior class of 2004. In turn, cross-sectional cross-cohort analyses may be undertaken, comparing the ELS:2002 senior cohort (2004) with that of the National Longitudinal Study of the High School Class of 1972 (NLS-72) (1972), the High School and Beyond Longitudinal Study of 1980 (HS&B) (1980), and the National Education Longitudinal Study of 1988 (NELS:88) (1992), and longitudinal cross-cohort analyses, comparing panels of the HS&B sophomore cohort (1980–82), the NELS:88 sophomore cohort (1990–92), and the ELS:2002 sophomore cohort (2002–04).

6.3 First Follow-up Weights and Flags

In addition to the base-year school and student weights (further described in chapter 3), two weights have been created for the public-use file in the ELS:2002 first follow-up: a cross-sectional first follow-up weight for sample members who completed a questionnaire in the first follow-up (F1QWT), and a first follow-up panel weight for sample members who completed a questionnaire in both the base year and first follow-up or who completed a questionnaire in the first follow-up and completed selected base-year items in the first follow-up (the standard classification variables) and had base-year assessment results imputed (F1PNLWT). It should be noted that F1QWT generalizes to no meaningful population. It encompasses both 2002 sophomores 2 years later and 2004 seniors, including freshened seniors (who were not part of the sophomore cohort).

Participation flags (which are always dichotomous) and status variables (which have more than two values), as well as weights, may be used for subsetting—in other words, they can be used to select the subset of respondents that the analyst intends to examine. For example, if one wishes to select only those students for whom there are math assessment data, the status variable F1TSTAT would be invoked (a “1” means a math test was completed; a “2” or “3” reflects imputed test data).

6.4 Composite and Classification Variables

Composite variables—also called constructed, derived, or created variables—are usually generated using responses from two or more questionnaire items or from recoding of a variable (typically for disclosure avoidance reasons). Some are copied from another source (e.g., a variable supplied in sampling or imported from an external database). Examples of composite variables include school variables (school sector, urbanicity, region of the country), math assessment scores (achievement quartile in math), and demographic variables (sex, race, Hispanic ethnicity, and month and year of birth).

Most of the composite variables can be used as classification variables or independent variables in data analysis. For better estimation in cross-sectional analysis, many of the

composites have undergone imputation procedures for missing data (all imputed versions of variables have been flagged).

6.5 Naming Conventions

Data users should find naming conventions for variables, flags, and weights intuitive and quite similar to those employed in NELS:88. Most variables begin with an indicator of the wave (e.g., base-year variables begin with BY). Weights follow the same wave-naming convention and also contain the suffix WT (e.g., BYSTUWT is the name for the final student weight for base-year questionnaire completion, F1QWT is the equivalent first follow-up questionnaire completion weight, and BYSCHWT is the name for the base-year final school weight). Just as first follow-up variables begin with the prefix F1, second follow-up (2006) variables will begin with F2, and so on.

Variable names also distinguish (in their third character) among components and questionnaire types. F1S, for example, indicates a first follow-up student questionnaire variable, whereas F1A stands for administrator questionnaire items. Likewise, F1T is used for the transfer questionnaire, F1D for the dropout questionnaire, F1E for the early graduate questionnaire, F1H for the homeschool questionnaire, and F1N for new participant supplement items. Variables that reflect specific items in the questionnaire carry the question number in the variable name, immediately after the component indicator. Hence, F1S58 would be item 58 from the first follow-up student questionnaire, and F1D19 would be item 19 in the dropout instrument.

The round-specific constructed variables are typically not anchored in a single questionnaire item and may sometimes reflect nonquestionnaire sources of information, such as the assessments. First follow-up test scores carry the prefix F1TX. F1TXMQU, for example, indicates the quartile score for the first follow-up mathematics test. Flags are indicated by the suffix FLG or FG. Variable names also distinguish between the public (P) and restricted (R) use forms, where variables differ between them.

6.6 Guide to the Hardcopy Codebooks

Although for most purposes the flexibility of the ECB will best meet users' needs, in some situations it may be helpful to have access to a specialized hardcopy codebook of the student data. The hardcopy codebooks appear as PDF files for the web-published version of this manual (see http://nces.ed.gov/surveys/els2002) and correspond to appendix G of this document. The codebook supplies a comprehensive description of the student data file. For each variable on the student component data file, the codebook provides a summary of the related information, including the question number and wording, the variable name, and the responses to the item, along with their unweighted frequency and percent and weighted percent. It also provides missing data frequencies sorted by the following reserve codes:[30]

[30] The reserve codes are used throughout the ECB. The description is added to the first variable of each section to help users understand the meaning of each code.

- -1: “Don’t know” represents respondents who indicated that they did not know the answer to the question.
- -2: “Refused” represents respondents who indicated that they refused to answer the question.
- -3: “Item legitimate skip/NA” is filled for questions that are not answered because prior answers route the respondent elsewhere.
- -4: “Nonrespondent” is filled for all variables across the entire questionnaire when a sample member did not respond to the questionnaire.
- -5: “Out of range” represents hardcopy questionnaire respondents who reported values that are out of range.
- -6: “Multiple response” represents hardcopy questionnaire respondents who clearly reported more than one response for an item that requires only one response.
- -7: “Partial interview-breakoff” is filled for questions that are not answered because the respondent does not wish to continue the interview or they have run out of time. This also includes particular items that are not included on an abbreviated version questionnaire.
- -8: “Survey component legitimate skip/NA” is filled for all items within a survey component for sample members who were not administered that component by design for one of the following reasons: (1) the component was not administered based on their status (e.g., transfer students did not receive certain items on the in-school survey), (2) the sample member was not yet included in the study at the time of administration (e.g., first follow-up freshened sample members did not participate in the base-year survey), or (3) the sample member was not capable of completing the survey component (e.g., students who were ineligible due to a language barrier or disability at the time of the survey were not administered a questionnaire).
- -9: “Missing” is filled for questions that are not answered within the hardcopy questionnaire when the routing suggests that they should have filled a response.

Information on obtaining the ELS:2002/04 Base-Year to First Follow-up ECB (and other NCES ECBs) can be found by reviewing the data products for the study at http://nces.ed.gov/pubsearch. Information on applying for a restricted-use license also appears on the NCES website at http://nces.ed.gov/pubsearch/licenses.asp.

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