High School and Beyond (HS&B) Longitudinal Study

Website: http://nces.ed.gov/surveys/hsb/

1. OVERVIEW

The High School and Beyond (HS&B) Longitudinal Study was the second study conducted as part of NCES' National Longitudinal Studies Program. This program was established to study the educational, vocational, and personal development of young people, beginning with their elementary or high school years and following them over time as they take on adult roles and responsibilities. The HS&B included two high school cohorts—a senior cohort (the graduating class of 1980) and a sophomore cohort (the sophomore class of 1980). Students, school administrators, teachers, parents, and administrative records provided data for the study. HS&B results can be compared with the results of three other longitudinal studies—the National Longitudinal Study of the High School Class of 1972 (NLS:72), the National Education Longitudinal Study of 1988 (NELS:88), and the Education Longitudinal Study of 2002 (ELS:2002). (See NLS:72, NELS:88, and ELS:2002 chapters, respectively, for descriptions of these studies.)

The HS&B covered more than 30,000 high school seniors and 28,000 high school sophomores. It consisted primarily of a base-year survey in 1980 and four follow-up surveys in 1982, 1984, 1986, and 1992. Record studies were also conducted to obtain key supplemental data on students. As part of the first follow-up, high school transcripts were requested for the sophomore cohort, providing information on the sophomores' course taking behavior through their 4 years of high school. Postsecondary transcripts were collected in 1984 for the senior cohort and in 1987 and 1993 for the sophomore cohort. In addition, student financial aid data were obtained from administrative records in 1984 for the senior cohort and in 1986 for the sophomore cohort. The HS&B project ended in 1993 after the completion of the fourth follow-up survey and a related transcripts study of the sophomore cohort.

LONGITUDINAL SAMPLE SURVEY OF THE HIGH SCHOOL SOPHOMORE AND SENIOR CLASSES OF 1980; BASE-YEAR SURVEY AND FOUR FOLLOW-UPS, ENDING IN 1992

HS&B collects data from:

- Students and dropouts
- School administrators
- Teachers
- Parents
- High school transcripts
- Postsecondary transcripts
- Postsecondary financial aid records

Purpose

To (1) study longitudinally the given cohorts' educational, vocational, and personal development, beginning with their high school years, and the personal, familial, social, institutional, and cultural factors that may affect that development; and (2) compare the results with data from the NLS:72, NELS:88, and ELS:2002 to facilitate cross-cohort studies of American youth's schooling and socialization.

Components

The HS&B compiled data from a sample of students, parents, teachers, and school administrators in a base-year and four follow-up surveys. It also collected high school and postsecondary transcripts and administrative financial aid records. The various components are described below.

Base-Year Survey. The base-year survey was conducted in spring 1980 and comprised the following:

Student Questionnaire. Students were asked to (1) fill out a booklet, which included several items on the use of non-English languages as well as confidential identifying information; (2) complete a questionnaire that focused on their individual and family background, high school experiences, work experiences, future educational plans, future occupational goals, and plans for and ability to finance postsecondary education; and (3) take timed cognitive tests that measured verbal and quantitative abilities. The sophomore test battery included achievement measures in science, writing, and civics, while seniors were asked to respond to tests measuring abstract and nonverbal abilities.

School Questionnaire. Completed by an official in the participating school, this questionnaire collected information about enrollment, staff, educational programs, facilities and services, dropout rates, and special programs for handicapped and disadvantaged students.

Teacher Comment Checklist. At each grade level, teachers had the opportunity to answer questions about the traits and behaviors of sampled students who had been in their classes. The typical student in the sample was rated on average by four different teachers.

Parent Questionnaire. A sample of parents provided information about family attitudes, family income, employment, occupation, salary, financial planning, and how these affect postsecondary education and goals. The results included responses from the parents of about 3,600 sophomores and 3,600 seniors.

First Follow-up Survey. The first follow-up survey was conducted in spring 1982. As in the base-year survey, information was collected from students, school administrators, and parents. For the 1980 senior cohort, high school and postsecondary experiences were the main focus of the survey; seniors were asked about their school and employment experiences, family status, and attitudes and plans. For the 1980 sophomore cohort, the survey gathered information on school, family, work experiences, educational and occupational aspirations, personal values, and test scores of sample participants. A high school transcript collection was also part of the first follow-up for sophomore cohort members. (See section on Record Studies for more detail.)

Sophomores were classified by high school status as of 1982 (i.e., dropout, same school, transfer, or early graduate). Dropouts completed a *Not Currently in High School Questionnaire*, which included some questions from the regular Student Questionnaire but focused on their reasons for dropping out and its impact on their educational and career development. In addition to the regular Student Questionnaire, a *Transfer Supplement* was completed by members of the sophomore cohort who had transferred out of their base-year sample high school to another high school. This supplement gathered information on the reasons for transferring and for selecting a particular school, the length of the interruption in schooling and why it occurred, and particulars about the school itself (type, location, entrance requirements, size of student body, grades). Sophomore cohort members who graduated from high school ahead of schedule completed an *Early Graduate Supplement* in addition to the regular questionnaire. The Early Graduate Supplement documented the reasons for and circumstances of early graduation, the adjustments required to finish early, and respondents' activities compared with those of other out-of-school survey members (i.e., dropouts, 1980 seniors).

Second Follow-up Survey. This survey was conducted in spring 1984. For both the sophomore and senior cohorts, the survey collected data on the students' work experience, postsecondary schooling, earnings, periods of unemployment, and so forth. For seniors, postsecondary transcripts and financial aid records were also collected. (See section on Record Studies for more detail.)

Third Follow-up Survey. This survey was administered in spring 1986, using the same questionnaire for both the sophomore and senior cohorts. To maintain comparability with prior waves, many questions from earlier follow-up surveys were repeated. Respondents were asked to update background information and to provide information about their work experience, unemployment history, education and other training, family information (including marriage patterns), income, and other experiences and opinions. Financial aid records and postsecondary transcripts were collected for sophomores. (See section on Record Studies for more detail.)

Fourth Follow-up Survey. This survey was administered in spring 1992 only to the sophomore cohort. The survey sought to obtain valuable information on issues of access to, and choice of, undergraduate and graduate education institutions; persistence in obtaining educational goals; progress through the curriculum; rates of degree attainment and other assessments of educational outcomes; and rates of return to the individual and society. Additionally, a collection of postsecondary transcripts for sophomore cohort members (i.e. members who had received their

baccalaureate degrees and then went on to pursue graduate, doctoral, and first-professional degrees) took place in 1993.

Record Studies. The following record studies were conducted during the course of the HS&B project.

High School Transcript Study. In fall 1982, as part of the first follow-up, nearly 16,000 high school transcripts were collected for sophomore cohort students who were seniors in 1982. This data collection allowed the study of the course taking behavior of the members of the sophomore cohort throughout their 4 years of high school. Data included a six-digit course number for each course taken; course credit, expressed in Carnegie units (a standard of measurement that represents one credit for the completion of a 1-year course); course grade; year that course was taken; grade point average; days absent; and standardized test scores. (For more information, see HSTS chapter, which covers the High School Transcript Studies.)

Postsecondary Education Transcript Study. This study gathered data on students' academic histories since leaving high school. As part of the second follow-up in 1984, postsecondary transcripts were collected for the senior cohort. Transcripts were requested from all postsecondary institutions reported by senior cohort members in the first and second follow-up surveys. Transcript data included dates of attendance; fields of study; degrees earned; and the titles, grades, and credits of every course attempted at each institution.

In 1987 and again in 1993, postsecondary transcripts were collected for the sophomore cohort. The latter collection allowed information to be obtained on sophomore cohort members who had received their baccalaureate degrees and then went on to pursue graduate, doctoral, and first-professional degrees.

Student Financial Aid Records. In 1984, HS&B collected institutional financial aid records and federal records on the Guaranteed Student Loan Program and the Pell Grant Program for seniors who had indicated postsecondary attendance. Federal financial aid records were obtained for the sophomore cohort in 1986.

Periodicity

The base-year survey was conducted in 1980, with four follow-ups in 1982, 1984, 1986, and 1992 (the 1992 follow-up included only the sophomore cohort). High school transcripts were collected for the sophomore cohort in 1982. Postsecondary transcripts were collected for the senior cohort in 1984 and for the sophomore cohort in 1987 and 1993. Student financial aid records were collected for the senior cohort in 1984 and for the sophomore cohort in 1986.

2. USES OF DATA

The HS&B provides information on the educational, vocational, and personal development of young people as they move from high school into postsecondary education or the workforce and then into adult life. The initial longitudinal study (NLS:72) laid the groundwork for comparison with HS&B, while successive studies (NELS:88 and ELS:2002) provide a basis for further comparisons. NLS:72 recorded the economic and social conditions surrounding high school seniors in 1972 and, within that context, their hopes and plans; subsequently, it measured outcomes while also observing the intervening processes. Data on 1980 seniors from the HS&B base-year survey are directly comparable to NLS:72 data on 1972 seniors. With the follow-up data, trend comparisons can be made for the period 1972 to 1984. HS&B permits researchers to further monitor change by, for example, measuring the economic returns of postsecondary education for minorities and delineating the need for financial aid.

By following adolescents at an earlier age (beginning in eighth grade) and into the 21st century, NELS:88 expands the base of knowledge established in the NLS:72 and HS&B studies. NELS:88 first follow-up data provide a comparison point to high school sophomores 10 years earlier, as studied in HS&B; the second follow-up data allow trend comparisons of the high school class of 1992 with the 1980 seniors studied in the HS&B. The third follow-up allows comparisons with HS&B related to postsecondary outcomes. (Please see NELS:88 chapter for detailed information on NELS:88.)

ELS:2002 further measures educational processes and outcomes, especially as such data pertain to student learning, predictors of dropping out, and high school effects on students' access to, and success in, postsecondary education and the workforce. Comparisons can be made between high school sophomores in 1980 and in 2002, and between high school seniors in 1980 and in 2004 (the first follow-up of ELS:2002) using the HS&B and ELS:2002 studies. (Please see ELS:2002 chapter for detailed information on ELS:2002.)

By comparing the results of the HS&B and its three related longitudinal studies, researchers can determine how plans and outcomes differ in response to changing conditions, or remain the same despite such changes.

The HS&B allows both cross-sectional and longitudinal analyses of the students who were sophomores or seniors in 1980. The data are used to address issues of educational attainment, employment,

family formation, personal values, and community activities since 1980. For example, a major study on high school dropouts used HS&B data to demonstrate that a large number of dropouts return to school and earn a high school diploma or an equivalency certificate. Other examples of issues and questions that can be addressed are as follows:

- How, when, and why do students enroll in postsecondary education institutions?
- Do students who, while in high school, expect to complete the baccalaureate degree actually do so?
- How has the percentage of recent graduates from a given cohort who enter the workforce in their field changed over the past years?
- What are the long-term effects of not completing high school in the traditional way? How do employment and earnings event histories of traditional high school graduates differ from those of students who do not finish high school in the traditional manner?
- Do individuals who attend college earn more than those who do not attend college? What is the effect of student financial aid?
- What percentage of college graduates is eligible or qualified to enter a public service profession, such as teaching?
- How many college graduates enter the workforce full time in the area for which they are qualified?
- How, and in what ways, do public and private schools differ?

3. KEY CONCEPTS

Some of the key terms related to HS&B are defined below.

Cognitive Tests. Achievement tests administered to both cohorts in the base-year survey and only to the sophomore cohort in the first follow-up. For the sophomore cohort, the content in the base-year and first follow-up achievement tests was as follows: (1) vocabulary (21 items, 7 minutes), using a synonym format; (2) reading (20 items, 15 minutes), consisting of short passages (100–200 words) followed by comprehension questions and a few analysis and interpretation items; (3) mathematics (38 items, 21 minutes), in which students were asked to determine which of two quantities was greater, whether they were equal, or whether there were insufficient data to answer the question; (4) science (20 items, 10 minutes), based on science knowledge and scientific reasoning ability; (5) writing (17 items, 10 minutes), based on writing ability and knowledge of basic grammar; and (6) civics education (10 questions, 5 minutes), based on various principles of law, government, and social behavior. Seniors in the base-year survey were given a cognitive test with items in the following categories: vocabulary (27 items, 9 minutes), reading (20 items, 15 minutes), mathematics (33 items, 19 minutes), picture-number pairs (15 items, 5 minutes), mosaic comparisons (89 items, 6 minutes), visualization in three dimensions (16 items, 9 minutes), and questions about the test (5 minutes).

Course Offering and Course Taking. Course offering data were collected from the School Questionnaires filled out by school administrators; course offerings included regular and advanced placement curricula provided by the schools. Course taking data were collected in different ways for the sophomore and senior cohorts. For sophomores, official high school transcripts provided records of students' coursework. For the senior cohort, high school transcripts were not available; instead, coursework was self-reported by seniors in a series of items asking retrospectively about the courses and hours taken. Despite these differences in data collection, the listings of courses for the two cohorts were consistent, including major subjects in both regular and advanced placement curricula.

Socioeconomic Status (SES). The level of a student's SES was a composite variable, constructed from a set of variables from the base-year and first follow-up data, including father's occupation, father's education, mother's education, family income, and material possessions in the household.

4. SURVEY DESIGN

Target Population

High school students who were in the 10th or 12th grade in U.S. public and private schools in spring 1980.

Sample Design

HS&B was designed to provide nationally representative data on 10th- and 12th-grade students in the United States.

Base-Year Survey. In the base-year, students were selected using a two-stage, stratified probability sample design, with secondary schools as the first-stage units and students within schools as the second-stage units.

Sampling rates were set so as to select in each stratum the number of schools needed to satisfy study design criteria regarding minimum sample sizes for certain types of schools. The following types of schools were oversampled to make the study more useful for policy analyses: public schools with a high percentage of Hispanic students; Catholic schools with a high percentage of Black, Hispanic, and other race/ethnicity students; alternative public schools; and private schools with high-achieving students. Thus, some schools had a high probability of inclusion in the sample (in some cases, equal to 1.0), while others had a low probability. The total number of schools in the sample was 1,120, selected from a frame of 24,730 schools with grades 10 or 12 or both (there was only one school sample in the base-year for both cohorts). Within each stratum, schools were selected with probabilities proportional to the estimated enrollment in their 10th and 12th grades.

Within each school, 36 seniors and 36 sophomores were randomly selected. In schools with fewer than 36 seniors or 36 sophomores, all eligible students were drawn in the sample. Students in all but the special strata were selected with approximately equal probabilities. (The students in the special strata were selected with higher probabilities.) Special efforts were made to identify sampled students who were twins or triplets so that their co-twins or co-triplets could be invited to participate in the study.

Substitution was carried out for schools that refused to participate in the survey. There was no substitution for students who refused, for students whose parents refused, or for students who were absent on survey day and makeup days.

First Follow-up Survey. The first follow-up sophomore and senior cohort samples were based on the base-year samples, retaining the essential features of a stratified multistage design. (For details see *High School and Beyond First Follow-Up (1982) Sample Design Report* [Tourangeau et al. 1983].)

For the sophomore cohort, all schools selected for the base-year sample were included in the first follow-up (except 40 schools that had no 1980 sophomores, had closed, or had merged with other schools in the sample). The sample also included 17 schools that received two or more students from base-year schools; school-level data from these institutions were eventually added to students' records as contextual information. However, these schools were not added to the existing probability sample of schools.

Sophomores still enrolled in their original base-year schools were retained with certainty since the base-year clustered design made it relatively inexpensive to resurvey and retest them. Sophomores no longer attending their original base-year schools were subsampled (i.e., dropouts, early graduates, students who transferred as individuals to a new school). Certain groups were retained with higher probabilities in order to support statistical research on such policy issues as excellence of education throughout society, access to postsecondary education, and transition from school to the labor force.

Students who transferred as a class to a different school were considered to be still enrolled if their original school had been a junior high school, had closed, or had merged with another school. Students who had graduated early or had transferred as individuals to other schools were treated as school leavers for the purposes of sampling. The 1980 sophomore cohort school leavers were selected with certainty or according to predesignated rates designed to produce approximately the number of completed cases needed for each of several different sample categories. School leavers who did not participate in the base-year were given a selection probability of 0.1.

For the 1980 senior cohort, students selected for the base-year sample had a known, nonzero chance of being selected for the first and all subsequent follow-up surveys. The first follow-up sample consisted of 11,995 selections from the base-year probability sample (including 11,500 of the 28,240 base-year participants and 495 of the 6,740 base-year nonparticipants). In addition, 204 nonsampled co-twins or co-triplets (who were not part of the probability sample) were included in the first follow-up sample, resulting in a total of 12,200 selections.

High School Transcript Study (1980 Sophomore Cohort). Subsequent to the first follow-up survey, high school transcripts were sought for a probability subsample of nearly 18,500 members of the 1980 sophomore cohort. The subsampling plan for the transcript study emphasized the retention of members of subgroups of special relevance for education policy analysis. Compared to the base-year and first follow-up surveys, the transcript study sample design further increased the overrepresentation of certain race/ethnicity groups, students who attended private high schools, school dropouts, transfers, early graduates, and students whose parents completed the base-year Parent Questionnaire on financing postsecondary education. Transcripts were collected and processed for nearly 16,000 members of the sophomore cohort.

Second and Third Follow-up Surveys. The sample for the second follow-up survey of the 1980 sophomore

cohort was based upon the design of the High School Transcript Study. A total of 14,830 cases were selected from the nearly 18,500 sample members retained for the transcript study. The second follow-up sample included disproportionate numbers of sample members from policy-relevant subpopulations. The sample for the senior cohort in the second follow-up consisted exactly of those sample members selected into the first follow-up sample. The senior and sophomore cohort samples for the third follow-up survey were the same as those used for the second follow-up. The third follow-up was the last survey conducted for the senior cohort. Postsecondary school transcripts were collected for all members of the senior cohort who reported attending any form of postsecondary schooling in either of the follow-up surveys. Over 7,000 individuals reported more than 11,000 instances of postsecondary school attendance.

Fourth Follow-up Survey. The fourth follow-up was composed solely of members of the sophomore cohort, and consisted exactly of those students selected into the second and third follow-up sample. For any student who had ever enrolled in postsecondary education, complete transcript information was requested from the institutions indicated by the student.

Data Collection and Processing

HS&B compiled data from six primary sources: students, school administrators, teachers, parents of selected students, high school administrative records (transcripts), and postsecondary administrative records (transcripts and financial aid). Data collection began in fall 1979 (when information from school administrators and teachers was first gathered) and ended in 1993 (when postsecondary transcripts of sophomore cohort members were collected). The National Opinion Research Center (NORC) at the University of Chicago was the contractor for the HS&B project.

Reference dates. In the base-year survey, most questions referred to the students' experience up to the time of the survey administration in spring 1980 (i.e., all 4 high school years for the senior cohort and the first 2 high school years for the sophomore cohort). In the follow-ups, most questions referred to experiences that occurred between the previous survey and the current survey. For example, the second follow-up largely covered the period between 1982 (when the first follow-up was conducted) and 1984 (when the second follow-up was conducted).

Data collection. In both the base-year and first follow-up surveys, it was necessary to secure a commitment to participate in the study from the administrator of each sampled school. For public schools, the process began by contacting the chief state school officer. Once approval was gained at the state level, contact was made with district superintendents and then with school principals. Wherever private schools were organized into an administrative hierarchy (e.g., catholic school dioceses), approval was obtained at the superior level before approaching the school principal or headmaster. The principal of each cooperating school designated a school coordinator to serve as a liaison between the NORC staff, school administrator, and selected students. The school coordinator (most often a senior guidance counselor) handled all requests for data and materials, as well as all logistical arrangements for student-level data collection on the school premises.

In the 1980 base-year survey, a single data collection method—on-campus administration—was used for both the sophomore and senior cohorts. In the first follow-up, most members of the sophomore cohort (nearly all of whom were then in the 12th grade) were resurveyed using methods similar to those of the base-year survey. However, since some of the 1980 sophomores had left school by 1982, the first follow-up survey involved on-campus administration for in-school respondents as well as off-campus group administration for school leavers (transfers, dropouts, early graduates). On-campus surveys generally were similar to those used in the base-year. Off-campus survey sessions were held afterward for school leavers in the sophomore cohort. Personal or telephone interviews were conducted with individuals who did not attend the sessions. Members of the 1980 senior cohort were surveyed primarily by mail. Nonrespondents to the mail survey (approximately 25 percent) were interviewed either in person or by telephone.

By the time of the second follow-up, the sophomore cohort was out of school. Thus, in the second (1984) and third (1986) follow-ups, data for both the sophomore and senior cohorts were collected through mailed questionnaires. Telephone and personal interviews were conducted with sample members who did not respond to the mailed survey within 2 to 3 months. Only the sophomore cohort was surveyed in the fourth follow-up (1992). Computer-assisted telephone interviewing (CATI) was used to collect these data. The CATI program included two instruments; the first was used to locate and verify the identity of the respondent, while the second contained all of the survey questions. The average administration time for an interview was 30.6 minutes. Intensive telephone locating and field intervention procedures were used to locate respondents and conduct interviews.

Processing. Although procedures varied across survey waves, all Student Questionnaires in all waves were checked for missing critical items. Approximately 40 items in each of the main survey instruments were designated as critical or "key" items. Cases failed this edit, if a codable response was missing for any of the key items. Such cases were flagged and then routed to the data retrieval station, where staff called respondents to obtain missing information or otherwise resolve the edit failure.

The base-year procedures for data control and preparation differed significantly from those in the follow-up surveys. Since the base-year student instruments were less complex than later instruments, the completed documents were sent directly from the schools to NORC's optical scanning subcontractor for conversion to machine-readable form. The scanning computer was programmed to perform the critical item edit on Student Questionnaires and to generate listings of cases missing critical data, which were then sent to NORC for data retrieval. School and Parent Questionnaires were converted to machine-readable form by the conventional key-to-disk method at NORC.

All follow-up questionnaires were sent to NORC for receipt control and data preparation prior to being shipped to the scanning subcontractor. The second follow-up survey contained optically scannable grids for the answers to numeric questions; staff examined numeric responses for correct entry (e.g., right justification, omission of decimal points). In the third follow-up, a portion of the instrument was designed for computer-assisted data entry (CADE), while the rest was prepared for optical scanning. All major skip items and all critical items were entered by CADE. With this system, operators were able to combine data entry with the traditional editing procedures. The CADE system stepped question by question through critical and numeric items, skipping over questions that were slated for scanning and questions that were legitimately skipped because of a response to a filter question. Ranges were set for each question, preventing the accidental entry of illegitimate responses. CADE operators were also responsible for the critical item edit; those critical items that did not pass the edit were flagged for retrieval, both manually and by the CADE system. After the retrieved data were keyed, questionnaires were shipped to the scanning firm.

For the fourth follow-up, a CATI program captured the data at the time of the interview. The CATI program examined the responses to completed questions and used that information to route the interviewer to the next appropriate question. It also applied the customary edits, described below under "Editing." At the conclusion of an interview, the completed case was deposited in the database ready for analysis. There was minimal post-data entry cleaning because the interviewing module itself conducted the majority of necessary edit checking and conversion functions. A CADE system was designed to enter and code transcript data.

The first through fourth follow-ups required coding of open-ended responses on occupation and industry; postsecondary schools; major field of study for each postsecondary school; licenses, certificates, and other diplomas received; and military specialized schools, specialty, and pay grade. Coding was compatible with the coding done in NLS:72, using the same sources from NCES and the U.S. Bureau of the Census. (See NLS:72 chapter) In the first follow-up, staff also coded open-ended questions in the Early Graduate and Transfer supplements, and transformed numeric responses to darkened ovals to facilitate optical scanning. In the third follow-up, all codes were loaded into a computer program for more efficient access. Coders typed in a given response, and the program displayed the corresponding numeric code.

In the fourth follow-up, interviewers received additional coding capabilities by temporarily exiting the CATI program and executing separate programs that assisted them in coding the open-ended responses. Data from the coding programs were automatically sent to the CATI program for inclusion in the dataset. In addition to the online coding tasks, interviewers recorded verbatim descriptions of industry and occupation. The coding scheme for industry in the fourth follow-up was a simplified version of the scheme used in previous rounds of HS&B (verbatim responses are available for more detailed coding). The coding scheme for occupation was adapted from verbatim responses received in the third follow-up. Postsecondary institutions were coded with Federal Interagency Committee on Education (FICE) codes.

Editing. In addition to the critical item edit described above, a series of edits checked the data for out-of-range values and inconsistencies between related items. In the base-year, machine editing was limited to examining responses for out-of-range values. No interim consistency checks were performed since there was only one skip pattern.

In the first and second follow-ups, several sections of the questionnaire required respondents to follow skip instructions. Computer edits were performed to resolve inconsistencies between filter and dependent questions, detect illegal codes, and generate reports on the

incidence of correctly and incorrectly answered questions. After improperly answered questions were converted to blanks, the student data were passed to another program for conversion to appropriate missing-data codes (e.g., "legitimate skip," "refused"). Detection of out-of-range codes was completed during scanning for all questions except those permitting an open-ended response. Hand-coded data for open-ended questions (occupation, industry, institution, field of study) were matched by computer against lists of valid codes.

In the third follow-up, CADE carried out many of the steps that normally occur during machine editing. The system enforced skip patterns, range checking, and appropriate use of reserved codes—allowing operators to deal with problems or inconsistencies while they had the document in hand. For scanned items, the same machine-editing steps as those used in prior follow-ups were implemented. Since most of the filter questions were CADE-designated items, there were few filter-dependent inconsistencies to be handled in machine editing.

In the fourth follow-up, machine editing was replaced by the interactive edit capabilities of the CATI program, which tested responses for valid ranges, data field size, data type (numeric or text), and consistency with other answers or data from previous rounds. If the system detected an inconsistency due to a keying error by the interviewer, or if the respondent simply realized that he or she had made a reporting error earlier in the interview, the interviewer could go back and change the earlier response. As the new response was entered, all of the edit checks performed at the first response were again performed. The system then worked its way forward through the questionnaire using the new value in all skip instructions, consistency checks, and the like until it reached the first unanswered question, and control was then returned to the interviewer. When problems were encountered, the system could suggest prompts for the interviewer to use in eliciting a better or more complete answer.

Estimation Methods

Weighting is used to adjust for sampling and unit nonresponse.

Weighting. The weights are based on the inverse of the selection probabilities at each stage of the sample selection process and on nonresponse adjustment factors computed within weighting cells. While each wave provided weights for statistical estimation, the fourth follow-up weights can illustrate the concept of weighting. The fourth follow-up generated survey data and postsecondary transcript data. Weights were computed to account for nonresponse in both of these data collections.

First, a raw weight, unadjusted for nonresponse in any of the surveys, was calculated and included in the data file. The raw weight provided the basis for analysts to construct additional weights adjusted for the presence of any combination of data elements. However, *caution should be used if the combination of data elements results in a sample with a high proportion of missing cases.* For the survey data, two weights were computed. The first weight was computed for all fourth follow-up respondents. The second weight was computed for all fourth follow-up respondents who also participated in the base-year survey and in the first, second, and third follow-up surveys.

Two additional weights were computed to facilitate the use of the postsecondary transcript data. The collection of transcripts was based upon sophomore cohort reports of postsecondary attendance during either the third or fourth follow-up. A student may have reported attendance at more than one school. The first transcript weight was computed for students for whom at least one transcript was obtained. It is therefore possible for a student who was not a respondent in the fourth follow-up (but who was a respondent in the third follow-up) to have a nonzero value for the first transcript weight. The second transcript weight is more restrictive. It was designed to assign weights only to cases that were deemed to have complete data. Only students who responded during the fourth follow-up (and hence students for whom a complete report of postsecondary education attendance was available and for whom all requested transcripts were received) were assigned a nonzero value for the second transcript weight. For students who did not complete the fourth follow-up interview, complete transcripts may have been obtained in the 1987 transcript study, but since it was not certain that these transcripts were complete, they were given a weight of zero.

Imputation. No imputation was performed in HS&B.

5. DATA QUALITY AND COMPARABILITY

Sampling Error

Because the sample design for the HS&B cohorts involved stratification, disproportionate sampling of certain strata, and clustered probability sampling, the calculation of exact standard errors (an indication of sampling error) for survey estimates can be difficult and expensive.

Sampling error estimates for the first and second HS&B follow-ups were calculated by the method of Balanced Repeated Replication (BRR) using *BRRVAR*, a Department of Education statistical subroutine. (The BRR programs WesVar and SUREG are now available commercially.) For the base year and the third and fourth follow-ups, Taylor Series approximations were employed. More detailed discussions of the BRR and Taylor Series procedures can be found in the *High School and Beyond Third Follow-Up Sample Design Report* (Spencer et al. 1987). The Data Analysis System (DAS), included as part of the public-release file, automatically reports design-corrected Taylor Series standard errors for the tables it generates. Therefore, users of the DAS do not need to make adjustments to these estimates.

While design effects cannot be calculated for every estimate of interest to users, design effects will be similar from item to item within the same subgroup or population. Users can calculate approximate standard error estimates for items by multiplying the standard error under the simple random sample assumption by the square root of the average design effect for the population being studied.

Nonsampling Error

Nonsampling errors include coverage, nonresponse, and measurement errors.

Coverage error. Bias caused by explicit exclusion of certain groups of schools and students (e.g., special types of schools or students with disabilities or language barriers) is not addressed in HS&B technical reports. Potential coverage error in HS&B may relate to the exclusion of schools that refused to cooperate in the base-year survey. Students who refused to participate in the base-year survey were not excluded in the follow-ups. Since students were randomly selected from the sampled schools, the HS&B sample design did not entail exclusion of specified groups. (See "Sample Design," in section 4.)

Nonresponse error.
Unit nonresponse. HS&B base-year student-level estimates include two components of unit nonresponse bias: bias introduced by nonresponse at the school level, and bias introduced by nonresponse on the part of students attending cooperating schools. At the school level, some schools refused to participate in the base-year survey. Substitution was carried out for refusal schools within a stratum when there were two or more schools within the stratum. The bias introduced by base-year school-level refusals is of particular concern since it carried over into successive rounds of the survey. Students attending refusal schools were not sampled during the base-year and had no chance for selection into subsequent rounds of observation. To the extent that these students differed from students from cooperating schools in later waves of the study, the bias introduced by base-year school nonresponse would persist. Student nonresponse did not carry over in this way since student nonrespondents remained eligible for sampling in later waves of the study.

In general, the lack of survey data for nonrespondents prevents the estimation of unit nonresponse bias. However, during the first follow-up, School Questionnaire data were obtained from most of the base-year refusal schools, and student data were obtained from most of the base-year student nonrespondents selected for the first follow-up sample. These data provide a basis for assessing the magnitude of unit nonresponse bias in base-year estimates.

Overall, 1,120 schools were selected in the original sample, and 811 of those schools (72 percent) participated in the survey. An additional 204 schools were drawn in a replacement sample. Student refusals and absences resulted in a weighted student completion rate of 88 percent in the base-year survey. Participation was higher in most follow-up surveys. Completion rates in the first follow-up were as follows: 94 percent for seniors; 96 percent for sophomores eligible for on-campus survey administration; and 89 percent for sophomores who had left school between the base-year and first follow-up surveys (dropouts, transfer students, and early graduates). In the second follow-up, 91 percent of senior cohort members and 92 percent of sophomore cohort members completed the survey. In the third follow-up, completion rates were 88 percent for seniors and 91 percent for sophomores. Only the sophomore cohort was surveyed in the fourth follow-up; 86 percent of the sample members participated.

As results from the fourth follow-up illustrate, student nonresponse varied by demographic and educational characteristics. Males had a slightly higher nonresponse rate than females (a difference of slightly over 3 percent). Blacks and Hispanics showed similarly high rates of nonresponse (around 20 percent), whereas nonresponse among White students was about 10 percent. Nonresponse increased as socioeconomic status decreased. Students who were in general or vocational programs during the base-year were more likely to be nonrespondents than students in academic programs. Dropouts had higher nonresponse rates than other students. Students with lower grades and lower test scores showed higher nonresponse than students with higher grades and test scores. Students who were frequently absent from school showed higher

nonresponse than students absent infrequently. Students with no postsecondary education by the time of the second follow-up had higher nonresponse than students with some postsecondary education. By selected school characteristics, the highest nonresponse rates were among students from alternative public schools, schools with large enrollments, schools in urban areas, and schools in the Northeast and West.

The patterns were similar in earlier rounds of HS&B. Nonresponse analyses conducted by NORC support the following general conclusions:

(1) The school-level bias component in HS&B estimates is small, averaging less than 2 percent for base-year and first follow-up estimates. It is probably of a similar magnitude for fourth follow-up estimates.

(2) The student-level bias component in base-year estimates is also small, averaging about 0.5 percent for percentage estimates.

(3) The student-level bias component in first, second, and third follow-up estimates is limited by the nonresponse rates, which were about three-fourths of the base-year rates.

(4) The student-level bias component in the fourth follow-up estimates is limited by the nonresponse rate, which was slightly higher than the base-year rate.

The first and second conclusions together suggest that nonresponse bias is not a major contributor to error in base-year estimates. The first and third conclusions suggest that nonresponse bias is not a major contributor to error in the first, second, and third follow-up estimates either. The first and fourth conclusions suggest that the fourth follow-up nonresponse bias might be a little greater than for the previous follow-ups, but probably not by much. Each of these conclusions must be given some qualifications. The analysis of school-level nonresponse is based on data concerning the schools, not the students attending them. The analyses of student nonresponse are based on survey data and are themselves subject to nonresponse bias. Despite these limitations, the results consistently indicate that nonresponse had a small impact on base-year and follow-up estimates.

Item nonresponse. Among students who participated in the survey, some did not complete the questionnaire or gave invalid responses to certain questions. The amount of item nonresponse varied considerably by item. For example, in the second follow-up, a very low nonresponse rate (0.1 percent) was observed for a question asking whether the respondent had attended a postsecondary institution. A much higher nonresponse rate (12.2 percent) was obtained for a question asking if the respondent had used a micro- or minicomputer in high school. Typical item nonresponse rates ranged from 3 to 4 percent.

Imputation was not used to compensate for item nonresponse in HS&B. However, an attempt was made in the fourth follow-up to reduce item nonresponse. In previous rounds, interviews were conducted by self-administered questionnaires (SAQs). Unfortunately, respondents often skipped questions incorrectly or gave unrecognizable answers. Thus, more data were missing than would have occurred through personal interviewing. In the fourth follow-up, interviewing was conducted using a CATI program. Unlike SAQs, CATI interviewing virtually eliminated missing data attributable to improperly skipped questions.

To evaluate the effectiveness of CATI interviewing, 25 items from both the third and fourth follow-up data were selected for comparison. Refusal and "don't know" responses were considered to be missing, but legitimate skips were not. For these 25 items, the overall percentage of missing items dropped from 4.36 percent in the third follow-up to 1.88 percent in the fourth follow-up.

CATI also eliminated all multiple responses and resulted in uncodable verbatim responses for only the two income variables. In addition, more was known about the missing data in the fourth follow-up. In the third follow-up, only 7.2 percent of the missing data were classified as refusals or "don't know" responses. In the fourth follow-up, 50.9 percent of the missing data were classified as refusals or "don't know" responses. The fact that most of the 25 comparisons showed a "very significant" decline in missing data supports the contention that missing data were reduced in the fourth follow-up.

Measurement error. An examination of consistency between responses to the third and fourth follow-ups provides an indication of the reliability of HS&B data.

Race/ethnicity. Race/ethnicity is one characteristic of the respondents that should not change between surveys. Overall, of the 12,310 respondents who reported their race/ethnicity on both questionnaires, 93.8 percent gave the same response in both years. However, certain race/ethnicity categories (e.g., Native American) had substantially less agreement. Only 53.4 percent of the respondents who classified themselves as Native Americans during the third follow-up classified themselves as Native Americans again during the fourth follow-up.

One explanation for these discrepancies may be the change in the method of survey administration. Unlike the third follow-up, which involved self-administered questionnaires, the fourth follow-up was conducted by telephone. The questionnaires mailed during the third follow-up had the five race/ethnicity categories listed for the respondent to see. In the fourth follow-up, respondents were simply asked over the telephone, "What is your race/ethnicity?" The interviewer coded the response. It is possible that Native Americans, Hispanics, and Asian/Pacific Islanders classified themselves as Black or White (not knowing that there was a more specific category for them to chose from), hence resulting in more Blacks and Whites in the fourth follow-up results.

Marital status. In the third follow-up, respondents were asked about their marital status in the first week of February 1986. In the fourth follow-up, respondents were asked about their marital status during and since February 1986. Although both questions asked about marital status during February 1986, respondents who had a change in marital status during the last 3 weeks of February could have given a different answer in the fourth follow-up than in the third follow-up. Overall, of the 11,850 respondents who gave their marital status in both questionnaires, 95.4 percent had answers that agreed.

Unlike the race/ethnicity question, memory and timing play an important role in matching answers for marital status. In this case, the recall period for third follow-up respondents was years shorter than the recall period for respondents in the fourth follow-up. Respondents in the third follow-up, which took place in spring 1986, were asked about a recent event. Respondents in the fourth follow-up, which was conducted in spring 1992, were asked to recall their status back in February 1986. As with the race/ethnicity question, the method of administering the question differed between rounds—namely, the question formatting had changed and the fourth follow-up used preloaded data to verify marital status.

Data Comparability

A goal of the National Longitudinal Studies Program is to allow comparative analysis of data generated in several waves of the same study as well as to enable cross-cohort comparisons with the other longitudinal studies. While the HS&B and NLS:72 studies are largely compatible, a number of variations in sample design, questionnaires, and data collection methods should be noted as a caution to data users.

Comparability within HS&B. While many data items were highly compatible across waves, the focus of the questionnaires necessarily shifted over the years in response to the changes in the cohorts' life cycle and the concerns of education policymakers. For seniors in the base-year survey and for sophomores in both the base-year and first follow-up surveys, the emphasis was on secondary schooling. In subsequent follow-ups, increasingly more items were collected dealing with postsecondary education and employment. Also, a major change in the data collection method occurred in the fourth follow-up, when CATI was introduced as the primary approach. Earlier waves used mailed questionnaires supplemented by telephone and personal interviews.

Comparability with NLS:72. The HS&B was designed to build on NLS:72 in three ways. First, the HS&B base-year survey included a 1980 cohort of high school seniors that was directly comparable to the NLS:72 cohort (1972 seniors). Replication of selected 1972 Student Questionnaire items and test items made it possible to analyze changes subsequent to 1972 and their relationship to federal education policies and programs in that period. Second, the introduction of the sophomore cohort in HS&B provided data on the many critical educational and vocational choices made between the sophomore and senior years in high school, thus permitting a fuller understanding of the secondary school experience and how it affects students. Third, HS&B expanded the NLS:72 focus by collecting data on a range of life cycle factors, such as family formation, labor force behavior, intellectual development, and social participation.

The sample design was largely similar for both HS&B and NLS:72, except that HS&B included a sophomore sample in addition to a senior sample. The questionnaires for the two studies contained a large number of identical (or similar) items dealing with secondary education and postsecondary work experience and education. The academic tests were also highly comparable. Of the 194 test items administered to the HS&B senior cohort in the base-year, 86 percent were identical to items that had been given to NLS:72 base-year respondents. Item response theory (IRT) was used in both studies to put math, vocabulary, and reading test scores on the same scale for 1972, 1980, and 1982 seniors. With the exception of the use of CATI in the HS&B fourth follow-up, both NLS:72 and HS&B used group administration of questionnaires and tests in the earliest surveys and mailed questionnaires in the follow-ups. HS&B, however, involved more extensive efforts to supplement the mailings by telephone and personal interviews.

Comparability with NELS:88. The sample design of HS&B was also similar to that of NELS:88. In each base-year, students were selected through a two-stage stratified probability sample, with schools as the first-stage units and students within schools as the second-stage units. Because NELS:88 base-year sample members were eighth-graders in 1988, its follow-ups encompass students (both in the modal grade progression sequence and out of sequence) and dropouts. Despite similarities, however, the sample designs of the two studies differ in three major ways: (1) the NELS:88 first and second follow-ups had relatively variable, small, and unrepresentative within-school student samples, compared to the relatively uniform, large, and representative within-school student samples in the HS&B; (2) unlike the earlier study, NELS:88 did not provide a nationally representative school sample in its follow-ups; and (3) there were differences in school and subgroup sampling and oversampling strategies in the two studies. These sample differences imply differences in the respondent populations covered. (For details, please refer to NELS:88 chapter).

Comparability with ELS:2002. The ELS:2002 base-year and first follow-up surveys contain many data elements that are comparable to items from the HS&B. Differences in sampling rates, sample sizes, and design effects across the studies, however, affect the precision of estimation and comparability. Asian students, for example, were oversampled in ELS:2002, but not in HS&B, where their numbers were quite small. The base-year (1980) participating sample in HS&B numbered 30,030 sophomores; in contrast, 15,362 sophomores participated in the base-year of ELS:2002. Cluster sizes within schools were much larger for HS&B (on average, 30 sophomores per school) than for ELS:2002 (just over 20 sophomores per school); larger cluster sizes are better for school effects research, but carry a penalty in greater sample inefficiency. Mean design effect (a measure of sample efficiency) is also quite variable across the studies. For example, for 10th grade, the design effect was 2.9 for HS&B, while a more favorable design effect of 2.4 was achieved for the ELS:2002 base-year. (For details, please refer to ELS:2002 chapter).

6. CONTACT INFORMATION

For content information on HS&B, contact:

Aurora M. D'Amico
Phone: (202) 502-7334
E-mail: aurora.damico@ed.gov

Mailing Address:

National Center for Education Statistics
Institute of Education Sciences
U.S. Department of Education
1990 K Street NW
Washington, DC 20006-5651

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