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ABSTRACT

This report presents an analysis blueprint for data provided by the National Education Longitudinal Study of 1988 (NELS:88), a survey system sponsored by the National Center for Education Statistics (NCES). The report will inform beginning NELS:88 data users of the many substantive issues that can be addressed by the data, and it should present experienced researchers with promising ideas that can be explored through NELS:88 data. Other audiences may find the report useful in gaining an overview of the richness of NCES data in addressing education policy issues. The report, primarily the outcome of an NCES-sponsored conference, incorporates the more than 70 research issues discussed at the conference, and categorizes them into these broad areas: (1) secondary education; (2) transition from school to work; (3) postsecondary education; (4) career attainment and life cycle transition after college; (5) motivation, aspiration, self- concept, and other psychosocial issues; and (6) methodological research. The report is organized into four major sections. Section 1 presents information on the background and purpose of the report, and section 2 provides an overview of the NELS:88 database. Section 3 discusses the types and levels of analysis that can be conducted with NELS:88 data. Section 4 presents a list of issues related to the core six areas. Appendixes A-D include technical notes (including a glossary), data analysis suggestions, a discussion of the availability of documents and advice, and a listing of other NCES projects. Contains one figure and one table.) (SLD)

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(NELS:88)
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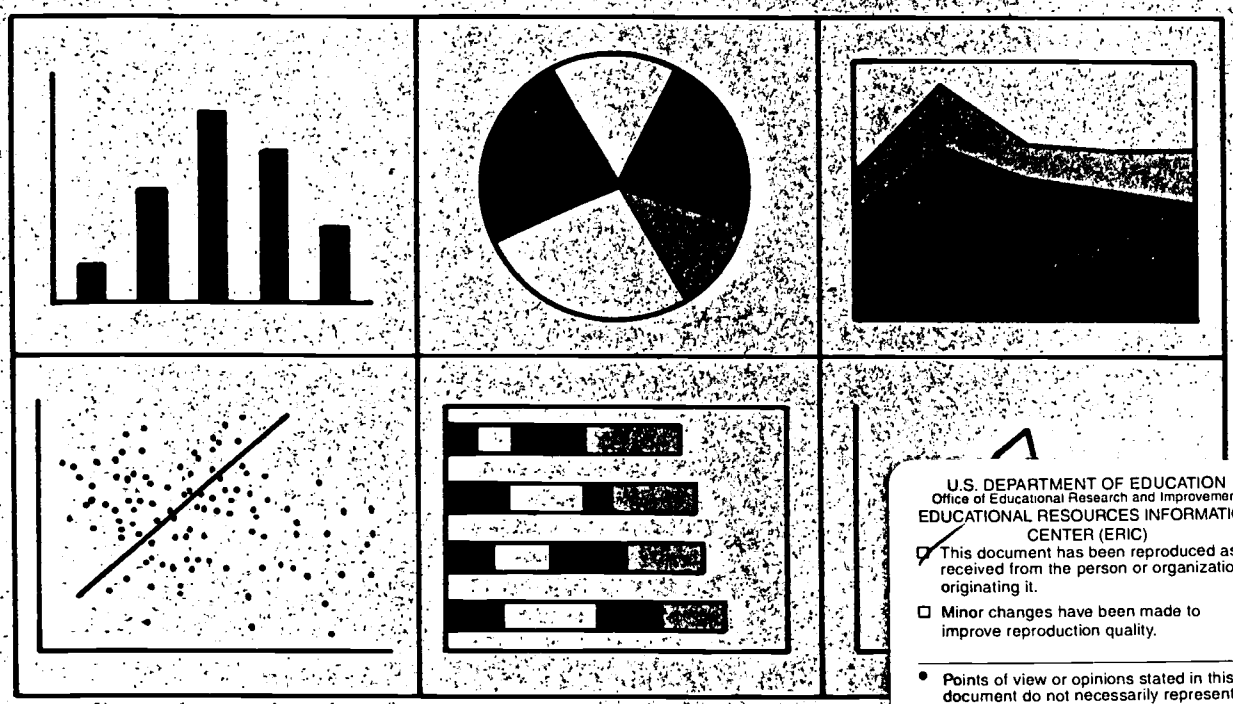

U.S. Department of Education
Office of Educational Research and Improvement

National Education Longitudinal Study of 1988 (NELS:88) Research Framework and Issues

Working Paper No. 96-03 February 1996

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February 1996

Foreword

Each year a large number of written documents are generated by NCES staff and individuals commissioned by NCES which provide preliminary analyses of survey results and address technical, methodological, and evaluation issues. Even though they are not formally published, these documents reflect a tremendous amount of unique expertise, knowledge, and experience.

The ***Working Paper Series*** was created in order to preserve the information contained in these documents and to promote the sharing of valuable work experience and knowledge. However, these documents were prepared under different formats and did not undergo vigorous NCES publication review and editing prior to their inclusion in the series. Consequently, we encourage users of the series to consult the individual authors for citations.

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February 1996

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I. BACKGROUND AND PURPOSE

The primary purpose of this report is to present an analysis blueprint for data provided by the National Education Longitudinal Study of 1988 (NELS:88), a survey system sponsored by the National Center for Education Statistics (NCES), U.S. Department of Education. It is part of a continuing effort by NCES to promote and facilitate the use of this valuable national education information resource for advancing the understanding of educational and vocational development processes.

This report is designed to serve several audiences. First, it will inform beginning NELS:88 data users of the many substantive issues that can be addressed by the data. Second, it will hopefully challenge experienced analysts by presenting them with promising but complicated research ideas that can be explored with NELS:88 data. Third, other audiences may find this report useful for gaining an overview of the richness of NELS:88 data in addressing education policy issues.

This report is primarily the outcome of an NCES-sponsored conference, held in Washington, DC, during the summer of 1995, to discuss a research agenda for the NCES Longitudinal Studies Program. Prior to the meeting, NCES staff prepared a general analysis framework which was shared with the 40 researchers from a variety of disciplines who were asked to participate in the meeting. Invitees were encouraged to review the analysis framework and then prepare a summary of research in which they were involved. These summaries were discussed at the meeting and served as the primary basis for writing this analysis blueprint.

Over 70 research issues were discussed at this meeting and incorporated into this report. For the convenience of presentation, these research issues have been categorized into six broad areas. These areas are: (1) secondary education; (2) transition from high school to work; (3) postsecondary education; (4) career attainment and life cycle transition after college; (5) motivation, aspiration, self-concept, and other psychosocial issues; and (6) methodological research. For each research issue summarized in this report, sections in the specific write-up include information on its significance to policy, suggestions for analyses, and cautions on potential methodological complications. It should be noted that no attempt was made to prioritize the importance of the issues and it is possible that we may have overlooked some issues. However, in spite of possible incompleteness, this analysis blueprint should prove to be helpful to users in framing their plans to explore the potential of NELS:88 in research and policy discussion.

This report is organized into four major sections. Section I presents information on the background and purpose of this report. Section II provides an overview of the NELS:88 database, including data file structure and availability of data files to users. Section III discusses the types and levels of analyses that can be conducted with NELS:88 and some cautions that users should consider in analyzing the data. Section IV presents a list of issues in six broad areas as mentioned earlier, including some citations of prior or on-going research. Related technical notes, including a NELS:88 glossary, suggestions for analyzing NELS:88 data, the availability of documents and technical advice, and a listing of other NCES projects, are presented in appendices A through D.

II. OVERVIEW OF NELS:88 DATABASE

Originally designed as a general purpose data set for the development and examination of education policy, NELS:88 can be used to inform decision makers, education practitioners, and parents about the changes in the operation of the educational system over time. It can also be used to study the relationships of various elements of the system with the educational and vocational development of the individuals who go through it. Specifically, NELS:88 focuses on a number of inter-related policy issues, including:

- identification of school attributes associated with achievement;
- transitions of different types of students from eighth grade to secondary school;
- transitions of secondary students to postsecondary education or the work force;
- influence of ability grouping and program type on future educational experiences and achievements;
- determinants of dropping out of the educational system; and
- changes in educational practices over time.

NELS:88 also collected information on the role of parents in education. The second followup parent survey (the parent survey was also conducted in 1988) can be used to examine the effect of parents' attitudes and behaviors on educational or career choices, financial preparation for postsecondary education, the correlates of active parental involvement in the school, and the parents' role in the educational success of their children.

NELS:88 is the successor of two prior studies sponsored by NCES: the National Longitudinal Study of the High School Class of 1972 (NLS-72) and High School and Beyond (HS&B). It expands the knowledge base developed by the previous studies by following students from an earlier age (8th grade) and by updating information throughout the 1990s. Its major features include:

- the integration of data from students, dropouts, parents, teachers, and schools;
- the inclusion of supplementary components to support analyses of geographically and demographically distinct subgroups;
- the design linkages to previous longitudinal studies and other current cross-sectional studies; and
- the use of proficiency tests that are "adaptive" to the ability level of the student.

NELS:88 began with a cohort of 25,000 eighth graders attending 1,000 public and private schools across the nation in 1988. Since then three followup surveys have been completed at two-year intervals—1990, 1992, and 1994. The next followup is tentatively scheduled for 1998 when most respondents will have finished postsecondary education and/or have entered the labor force.

For most survey components, data were collected through self-administered questionnaires/ tests in group sessions on campus, but there were several exceptions. 1) Parents were surveyed via mailed questionnaires, and 2) dropouts and students who had transferred schools and who missed in-school sessions were surveyed through off-campus group sessions. Finally, in the third followup, as most cohort members had graduated from high school, computer-assisted telephone interviews were conducted to collect data.

The following subsections summarize the design and content of each NELS:88 survey. For further details, readers should consult the Users' Manuals and other technical documents listed in appendix C.

A. Design and Content of NELS:88

1. Base-year survey

The base-year survey was comprised of four components: (a) survey and tests of students, (b) survey of parents, (c) survey of teachers, and (d) survey of school administrators. The student component provided data on the students' backgrounds and on such topics as school work, educational and occupational aspirations, and social relationships. The cognitive tests completed by students were curriculum sensitive, measuring achievement in reading, mathematics, science, and social studies. The parent survey, administered to one parent of each sampled student, collected data on parental aspirations for children, the education support at home, and family characteristics in general. Selected teachers in two of the four subject areas completed the teacher questionnaire, providing data on school and teacher characteristics, evaluations of the sampled students, course content, and classroom teaching practices. Finally, school principals of the sampled schools were surveyed, providing data about each school's teaching staff, school climate, characteristics of the student body, and school policies and program offerings.

A two-stage stratified probability design was used to select a nationally representative sample of 8th grade schools and students. Schools constituted the primary sampling unit. An initial pool of 1,032 schools was selected through stratified sampling with probability of selection proportional to eighth grade size and with over sampling of private schools. After replacing ineligible and nonparticipant schools, a total of 1,052 schools (815 public schools and 237 private schools) participated in the study and provided usable student data. The second stage of sampling—student sampling— produced a random selection of 26,432 eighth graders from participating schools, of which 24,599 participated in the study during the 1988 spring term. On average, each school was represented by 23 participating students. Students were randomly sampled from 8th grade school rosters.

2. First followup survey

The first followup of NELS:88 was comprised of surveys and tests of students, surveys of teachers and school administrators, and three new components—the dropout study, the base-year ineligible study, and the school effectiveness study. Students, augmented by a freshened sample, completed a questionnaire and a series of cognitive tests. The survey gathered information on students' school and home environment, coursework, extra-curricular activities, employment, education aspirations, and self-concept. The test was designed to measure tenth grade achievement and cognitive growth in the period in the same four subject areas as in the base year. The teacher and administrator surveys were administered in the same way as in the base year. A new student supplement was completed by first-time participants, including students who were added to the sample through the freshening process, students who were ineligible in the base year but became eligible now, and base-year nonrespondents who participated in the first followup. The dropout study surveyed and tested youths who had dropped out of school between the spring term of the 1987-88 school year and the spring term of the 1989-90 school year.

Students were selected in two stages. The first stage involved the selection of 21,474 students who were in the eighth grade sample in 1988. Since some tenth graders in 1990 were not in the eighth grade or not in the country in the 1988 spring term, a freshening process was used to add 1,043 tenth graders into the sample such that the resulting sample represented the 1990 national population of tenth graders. The base- year ineligible study was added to the first followup to ascertain the 1990 school enrollment status and the 1990 NELS:88 eligibility status of students who were excluded from the base-year survey due to language barrier or disabilities.

Because 90 percent of NELS:88 base year students changed schools between 8th and 10th grades, the first follow-up school sample was no longer nationally representative. To sustain analyses of high school issues with longitudinal data, it was necessary to conduct a school effectiveness study in conjunction with the first followup survey. This study involved a sizable and representative within-school student sample that consisted of 248 NELS:88 schools from 30 major metropolitan areas. As participants of the first followup, these schools cooperated in additional data collection for the school effectiveness study.

3. Second followup survey

The second followup repeated all components of the first followup, re-included the parent component, and initiated two new components—the transcript and course offerings components. The course offerings component was implemented as a part of the school effectiveness study. The transcript component was undertaken for sample members who were students attending sampled schools in the spring of 1992, all dropouts, dropouts in alternative programs, early graduates, and "triple ineligibles" (those 1988 eighth graders who were ineligible for the base year, first followup, and second followup due to language barriers or disabilities).

The student component again consisted of a questionnaire and a series of cognitive tests. The questionnaire focused on planning for postsecondary education and work, among other topics. The test measured twelfth grade achievement and cognitive growth in the same four subject areas. The student questionnaire contained a supplement for early graduates, which tapped the reasons for

and circumstances of early graduation. From first-time participants in NELS:88 (either via the freshening process or the ineligible study), another supplement questionnaire collected demographic background data. While teachers and administrators were surveyed again, only one teacher for each student—rather than two as in previous waves—was asked to participate.

Each student and dropout selected for the first followup was included in the second followup. From the schools attended by the sample members, 1,500 schools with 12th grade were included into the school sample. All components were completed in 1,374 schools, but only the student and parent questionnaires were administered in the remaining 126. The student sample was then freshened to provide a representative sample of students enrolled in the 12th grade during the spring term of the 1991-92 school year.

The second followup school effectiveness study included 247 participating schools. The sampling process involved freshening and additional selection of students. Data were enhanced by the course offerings component and the free response science and mathematics test items given to this sample.

4. Third followup survey

In 1994, the third followup interviewed students via telephone after they were out of high school. The student component covered information on high school completion and alternative ways of completion, post high school employment, schooling, and family life. The sample was selected based on the retained sample of the second followup, with subsampling based on relevant policy subgroups and verified eligibility. The sampling design involved stratification on a number of variables, including the original high school sector, race, SES quartile, and high school dropout status.

B. Alternative Student Transition Paths

To understand the complicated survey design and file organization, data users need to understand the transition paths that a student may have followed between the 1988 base-year and the 1992 second followup surveys. For example, the status of a student surveyed as an eighth grader could change several times between the base year and second followup (e.g., student in 1988, dropout in 1990, and student in 1992). By the time this student was surveyed in 1994, he/she might have completed high school, earned a GED, or still not have a high school diploma.

The above example is further elaborated in figure 1 which presents the statuses (and numbers) of NELS:88 sample students who followed selected paths as of the second followup. For example, out of 20,062 students (column 1) who were sampled in the base-year and retained in the first followup surveys, 18,270 (column 2) were classified as students in the first followup. Of these 18,270 students, 16,885 (column 3—69 + 16,339 + 11 + 466) were classified as students during the second followup. Researchers are advised to pay particular attention to the shifts between dropouts, students, out of scope, status unknown respondents from the first to the second followup surveys.

Figure 1.--NELS:88 eighth-grade spring defined cohort status distribution in first and second follow-ups

Base Year	First Follow-up Status	Second Follow-up Status		
Students N = 20,062	Dropouts N = 1,029	Dropout	N =	611
		Alt. Completer[a]	N =	222
		Student	N =	69
		Out of Scope	N =	9
		Status Unknown	N =	118
	Students N = 18,270	Dropout	N =	1,041
		Alt. Completer[a]	N =	542
		Student	N =	16,339
		Out of Scope	N =	82
		Status Unknown	N =	266
	Out of Scope N = 129	Dropout	N =	11
		Alt. Completer[a]	N =	6
		Student	N =	11
		Out of Scope	N =	83
		Status Unknown	N =	18
	Status Unknown N = 634	Dropout	N =	58
		Alt. Completer[a]	N =	20
		Student	N =	466
		Out of Scope	N =	6
		Status Unknown	N =	84

[a]Alt. Completer = Alternative Completer or Alternative Student

Note: In addition to the 20,062 sample members listed above, an additional 1,126 sample members were added due to sample freshening. Thus, 20,062 and 1,126 equals the 21,188 cases found on the data file.

C. Available Data Sets

Given the number and breadth of coverage of the individual NELS:88 base-year through the third followup surveys, researchers have much latitude in selecting sub-samples and variables for specific analyses. In fact, with the completion of the third followup, NELS:88 data can be categorized into the following data sets:

1. Four waves of student data (1988, 1990, 1992, and 1994)
2. Three waves of dropout data (1990, 1992, and 1994)
3. Three waves of middle/high school data (1988, 1990, and 1992)
4. Three waves of teacher data (1988, 1990, and 1992)
5. Two waves of parent data (1988 and 1992)
6. Three waves of cognitive test data (1988, 1990, and 1992)
7. Two waves of freshened student data (1990 and 1992)
8. Base-year ineligible students (added in 1990 and 1992)
9. Asian and Hispanic student supplement (augmented in 1988; followed in 1990 and 1992)
10. Math and science item supplements (1988, 1990, and 1992)--additional items sponsored by the National Science Foundation
11. School effects supplement (1990 and 1992)—restricted-use data*
12. School effects supplement math and science free response item file (1992)—restricted-use
13. School effects supplement school course file (1992)—restricted-use
14. High school transcripts (1992)—restricted-use
15. Cognitive test item response level file (1988, 1990, and 1992)—restricted-use
16. Base-year school organizations supplement (1988)—restricted-use--supplemental items asked in a re-survey of base year schools
17. Christian school supplement (1988 and 1992)—restricted-use
18. State augmentations for selected states (1988, 1990, 1992, and 1994)—restricted-use
19. Early graduate supplement (1992)
20. Census zip code data file (1992)—restricted-use
21. Common Core of Data merge IDs (1992)—restricted-use
22. Quality education data selected school variables (1992)—restricted-use

* NCES releases the NELS:88 data files on CD-ROMs in two different formats: public release and restricted-use release. Access to the restricted-use CD-ROM requires a special licensing agreement with NCES. These can be obtained by calling the Data Security Officer at (202) 219-1920.

D. NELS:88 Data File Structure

NELS:88 data, both public and restricted-use, are available on CD-ROMs. Each CD-ROM contains (1) data directories, (2) document directories, (3) readme files, and (4) electronic codebook directories containing software for viewing individual survey questions and frequencies. Both the public and restricted-use third followup CD-ROM contains two electronic codebooks

(ECB). The first ECB contains data for the base year through second followup (every case who has ever been in the sample) and the second ECB contains data for respondents who only participated in the third followup (base year through third followup data). Each of the electronic codebooks allows the user to:

1. Display unweighted frequencies and percents for each variable;
2. Display question text for each variable;
3. Select or tag variables for subsequent analyses;
4. Write SAS, SPSS/PC+, and SPSS for Windows program codes and command statements for constructing a raw data file or system file of the selected variables; and
5. Generate a printed codebook of the selected variables.

To operate the NELS:88 ECB, it is recommended that the user have access to a PC-DOS based computer (486 or higher) with a CD-ROM drive, a 100 megabyte hard drive and 4 megabytes of ROM (at a minimum), and SAS/PC or SPSS statistical software.

III. ANALYSIS PERSPECTIVES

A. Type of Analysis

The NELS:88 design enables researchers to conduct three types of analyses: cross-wave (longitudinal), cross-sectional at a single time point, and cross-cohort by comparing NELS:88 findings to those of HS&B and NLS-72.

1. Longitudinal analysis

The first of these three types of analysis serves the primary objective of longitudinal surveys. The NELS:88 sampling and data collection design gives priority to maintaining and surveying a substantial number of base-year sample members as well as to sustaining overlapping but analytically distinct cohorts of sophomores and seniors. Users of NELS:88 data will be able to study the effect of a wide variety of factors on students' educational and professional attainment. The longitudinal data gathered from students, and augmented through parent, teacher, school administrator, and school record of students' progression and development (for example, academic transcripts), will facilitate scrutiny of various facets of students' lives and permit examination of the relationships of these factors on social, behavioral, educational, and vocational development.

2. Cross-sectional analysis

The second analytic type within NELS:88 is cross-sectional. By beginning with a cross-section of 1988 eighth graders, following a substantial subsample of these students at two-year intervals, and freshening the 1990 and 1992 samples to obtain representative national cross-sections of tenth and twelfth graders, the study also provides a statistical profile of America's eighth graders, high school sophomores, and high school seniors.

3. Cross-cohort comparison

Finally, NELS:88 has been designed to provide researchers with data for drawing comparisons with previous NELS-sponsored longitudinal studies. To facilitate cross-cohort comparisons, many of the content areas and related questionnaire items contained in the NLS-72 and HS&B surveys were repeated in NELS:88 surveys. The comparability and consistency of items across these three data sets allow us to conduct, among others, the following trend analyses:

- NELS:88 1990 sophomores (with freshening) can be compared to HS&B 1980 sophomores;
- NELS:88 1990 (with freshening) sophomores two years later (that is, in 1992) can be compared to HS&B 1980 sophomores two years later (in 1982);
- NELS:88 1990 (with freshening) sophomore cohort dropouts (as of 1992) can be compared to HS&B 1980 sophomore cohort dropouts (as of 1982);
- NELS:88 1992 seniors (with freshening) can be compared to HS&B 1980 seniors and NLS-72 1972 seniors; and

- NELS:88 1992 collected high school transcripts can be compared to HS&B 1982 collected high school transcripts.

Comparisons are also possible using transcript data collected for 1987 and 1990 high school graduates in NAEP schools. Table 1 summarizes the types of trend comparisons possible.

Table 1.—Trend comparison points for students, dropouts, parents of seniors, or transcript comparisons

	National Education Longitudinal Studies Program			
Students	NLS-72	HS&B-So	HS&B-Sr	NELS:88
Grade				
G8				1988*
G10		**1980***		**1990***
G12	**1972***	**1982**	**1980***	**1992***
G12 + 1	1973			
G12 + 2	**1974**	**1984**	**1982**	**1994**
G12 + 4	**1976**	**1986**	**1984**	
G12 + 5				1998
G12 + 6			1986	
G12 + 7	1979			
G12 + 10		1992		
G12 + 14	1986			
Dropouts				
G10 - G12		**1982***		**1992***
followup		**1984** (1986, 1992)		**1994** (1998)
Early graduates	**1982**			**1992**
Parents of seniors			**1980**	**1992**
High School Transcript Studies	HS&B	NAEP'87	NAEP'90	NELS:88
Seniors in:	**1982**	**1987***[1]	**1990***	**1992***

Note: Comparison points are in **bold.**
Representative grade samples are * (asterisked).
So = Sophomore; Sr = Senior.

[1] Based on the populations of students in eleventh grade and/or age seventeen in 1985-86.

B. Level of Analysis

Both descriptive and relational analyses can be conducted with NELS:88 data. Descriptive analyses, often used to summarize education conditions, can be used to produce a snap shot of statistics for one year or statistics across years. For example, achievement test results can be generated for a given year or for cross years. They can also be presented in comparison to earlier cohorts at the same grade level; for example, achievement by tenth graders from the class of 1990 in NELS:88 first followup and tenth graders from the class of 1980 in HS&B. Such analyses may suggest trends of achievement growth across cohorts.

Relational analyses usually seek to identify the relationships between an outcome variable and the variables that theoretically influence the outcome. This can be done in either cross-sectional or longitudinal designs. Results from cross-sectional analyses can be generalized to the national population because the NELS:88 student sample was freshened in each wave to represent the national population at a given grade level. The longitudinal design, in which the main sample of the cohort was followed throughout the first four waves of the survey, allows researchers to ascertain relationships between antecedent variables (e.g., demographic background and coursework) and outcome variables (e.g., high school completion and college attendance). Furthermore, cross-cohort analyses make it possible to see how the relationships revealed by relational analyses based on either cross-sectional or longitudinal designs changed in the past decades. For instance, with data from NLS-72, HS&B, and NELS:88, we can examine how the relationship between high school course taking and college entrance changes among high school graduates of 1972, 1980, and 1992.

C. Unit of Analysis

By design, the basic unit of analysis for most NELS:88 analyses is the student. The school administrator, parent, and teacher data can be thought of as providing contextual data (e.g., background, school characteristics, opportunity to learn). The exception to this rule is the base-year school file. Because the base year of NELS:88 involved the random selection of 1,000 schools from across the nation, the eighth-grade school sample can also be considered to be a stand-alone file in that the basic unit of analysis can be the school. This is not true of the first and second followup school files, however. These schools were selected because they contained students who participated in NELS:88 during the base year. Using common IDs, the individual data files comprising NELS:88 can be merged with each other to form working data files containing student, parent, school, and teacher data.

D. Sampling Weights

Because students were not selected with equal probabilities, sampling weights need to be used in analyses in order to obtain unbiased estimates. Sampling weights are the inverse of selection probabilities adjusted for non-responses. Details about proper weights and correct use of these weights are presented in Appendix B.

E. Cautions and Limitations

There are some limitations. For example, the sample sizes for specific groups of respondents may be too small to get reliable estimates (e.g., the number of American Indian/Alaskan Native youth broken down by gender and socio-economic status). In other instances, NELS:88 may not have collected enough information to examine an issue in detail (e.g., drug use history or courses taken in elementary school). There are also some nuances in the data such as the high numbers of missing data for dropouts who did not take the cognitive tests or who took the abbreviated (adapted for phone) form of the dropout questionnaire. Data users are thus advised to study the user manuals closely and to conduct preliminary analyses (e.g., frequencies, missing value checks, bias analyses) so that the disadvantages and limitations of the data are known prior to the actual data analysis.

IV. SUMMARY OF RESEARCH ISSUES

The research issues that can be addressed with NELS:88 data are grouped into six broad substantive areas: (a) secondary education; (b) transition from high school to work; (c) postsecondary education; (d) career attainment and life cycle transition after college; (e) motivation, aspiration, self-concept, and other psychosocial issues; and (f) methodological research. Within each area, specific research issues as identified by NCES staff and the conference participants are listed. For each issue, a short summary is presented, providing information on 1) the significance of the issue to policy making, 2) addressability using NELS:88 data, and 3) possible cautions due to methodological complications.

The amount of detail provided in each summary varies. For some areas where much research has already been conducted, the summary statements tend to be longer and more detailed. In other areas, less research had been conducted and thus the summary may point to the need for future research. In these areas, ideas rather than results of past research are presented.

A listing of relevant literature is included for most research issues. The citations cover only research that used NELS:88 data and that were published into 1995. Note that NELS:88-based research regarding postsecondary education and later transition is scant in the literature. This is because NELS:88 data on postsecondary education, collected in the third followup, are being processed and are not yet publicly available. Readers should consult other sources of literature to develop theoretic and technical understanding of those research issues.

A. Secondary Education

NELS:88 was designed to study the transitions students experienced as they moved from eighth grade to high school. It offers great potential for research on secondary education because it collected information on academic achievement at three points in time from multiple sources (teachers, students, administrators, parents, and transcripts). Important research issues on secondary education can be addressed with NELS:88 data.

1. Linking Instructional Environment/Processes to Learning

Issue: Achievement growth (categorized by proficiency levels) as related to instruction/learning processes for specific student groups

One of the original purposes of NELS:88 is to trace achievement growth over the high school years. NELS:88 has improved its tests, particularly the mathematics test, by taking an adaptive test approach whereby both mainstream and disadvantaged students have opportunity to show their cognitive growth. Their test gains, however, tend to be in different areas: high ability students may gain in problem solving skills whereas disadvantaged students may gain in repertory skills. Because their gains may look similar on the aggregated scale, it is necessary to differentiate gains at different proficiency levels in performing analyses. To identify the process in which the achievement gains take place, one can use transcripts to examine the courses taken by students

who may be at different proficiency levels. The process variables can then be linked to the test gains at the corresponding proficiency level to assess the effectiveness of the process. Only after separating the proficiency levels in the test score gains, can we both detect the gains and understand the meaning of the gains. To tackle diverse learning processes and to check their results, using a differential adaptive approach is imperative.

Relevant literature

Epstein, J.L. & MacIver, D.J. (1992). Opportunities to learn. Effects on eighth graders of curriculum offerings and instructional approaches. Baltimore, MD: Center for Research on Effective Schooling for Disadvantaged Students

Horn, L. & Hafner, A. (1992). A Profile of American eighth-grade mathematics and science instruction. NELS:88. Statistical analysis report. NCES 92-486. Washington, DC: NCES.

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Rock, D., Owings, J. & Lee, R. (1994). Changes in math proficiency between 8th and tenth grades. Statistics in brief. NCES 93-455. Washington, DC: NCES.

Rock, D.A. & Pollack, J.M. (1991). Psychometric report for the NELS:88 Base Year Test Battery. Contractor report. Technical report. NCES 91-468. Washington, DC: NCES.

Rock, D.A., Pollack, J.M. & Hafner, A. (1991). The tested achievement of the National Education Longitudinal Study of 1988 eighth grade class. E.D. Tabs. NCES 91-460. Washington, DC: NCES.

Issue: The effectiveness of curriculum and pedagogy in improving student learning

With its multiple sources of data (students, teachers, parents, and schools) and longitudinal design, NELS:88 allows comprehensive research on instruction effectiveness and academic press in connection to student performance. Linking teacher reported curriculum data to transcripts seems to be a possible way to address the issues. Student reported classroom experience is another source to link to the outcomes.

Caution: The data on instruction in NELS:88 can be problematic. They reflect instruction during the short period of time when the survey was conducted; i.e., a year or maybe only a semester, rather than the whole two years between waves. It is questionable to relate the short-term

instruction features to test scores that reflect the outcome of two years. In addition, measurement of instruction tends to be overly simplistic. For instance, in science instruction, the more time spent in classroom discussion, the less time spent in hands-on experiments, but both are crucial for effective science learning. If we only look at one activity's correlation with the outcome, the complex process of instruction and learning can be misleadingly simplified. The instruction data are promising, but need to be handled cautiously in analysis.

Relevant literature

Bobbitt, S.A. (1993). Using opportunity to learn items in elementary and secondary national surveys. Paper presented at the meeting of the American Educational Research Association, Atlanta, GA, April 1993. Education Resource and Information Center Document No. ED 363667.

Braddock, J.H.II & Dawkins, M.P. (1993). Ability grouping, aspirations, and attainments: Evidence from the National Educational Longitudinal Study of 1988. Journal of Negro Education, 62(3), 324-36.

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Thomas, J. (1990). The Numbers game: What eighth graders study—and how much of it they do. Humanities, 11(6), 9-10.

Issue: Opportunity to learn (OTL) with alternative definitions to distribution of OTL across student groups

Alternative definitions for OTL may use a variety of variables including content of instruction, instructional strategies, resources and expenditures, availability of technology, staff quality, and compensation. These alternative definitions can be used to examine the differential distribution of OTL by student needs. A question that can be asked is how tangible resources (e.g., money and technology) lead to shaping a positive learning environment, which further leads to higher achievement. The results from such an examination can help policymakers and the administration monitor the condition of OTL.

NELS:88 contains a large number of data items to tap OTL. Common Core of Data (CCD) and other sources of data can be merged into NELS:88 data (with the common identification number) to expand the concept of OTL. Scale construction may be needed for developing alternative OTL definitions. Descriptive analysis of OTL by student groups (e.g., sex, race, SES, locale) can help identify inequality. Structural equation and HLM techniques may be used to link OTL to variables responsible for differential OTL.

Caution: Instruction data represent the processes in the short period of time when the survey was conducted and are thus inadequate to explain the outcomes of the two years of schooling between the followups.

Relevant literature

Bobbitt, S.A. (1993). Using opportunity to learn items in elementary and secondary national surveys. Paper presented at the meeting of the American Educational Research Association, Atlanta, April 1993. Education Resource and Information Center Document No. ED 363667.

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Catsambis, S. (1994). The path to math: Gender and racial-ethnic differences in mathematics participation from middle school to high school. Sociology of Education, 67(3), 199-215.

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Horn, L. & Hafner, A. (1992). A Profile of American eighth-grade mathematics and science instruction. NELS:88. Statistical analysis report. NCES 92-486. Washington, DC: NCES.

Stevenson, D.L., Schiller, K.S. & Schneider, B. (1994). Sequences of opportunities for learning. Sociology of Education, 67(3), 184-98.

Issue: Academic growth profiles to related background and curriculum factors

Study of academic growth conceptualized as group profiles can typify growth rates and the shape of the growth curve differentiated by important school and sociodemographic factors. More responsive instruction can be developed according to meaningful growth profiling. Particularly interesting will be growth profiling at high proficiency levels, as the results will reflect the learning of problem solving skills (one of the Goals 2000).

With NELS:88 test score gains, three growth profiles can be generated: (1) "early accelerated growth," which includes students who made their biggest gain between grades 8 and 10, (2) "later accelerated growth," which refers to those who gained more between grades 10 and 12, and (3) "constant growth," which covers those who made about the same gains across the four year

period. The three profiles can then be correlated to background (e.g., SES, sex, and locale) and schooling (course work, curriculum, and school policies). Data on level 4 in math and level 3 in science may generate high proficiency profiles for assessing the gap from the Goals 2000.

Relevant literature

Jaskir, J. (1994). The Application of proficiency scaling on the measurement of change. Unpublished doctoral dissertation. Rutgers University.

Catsambis, S. (1994). The path to math: Gender and racial-ethnic differences in mathematics participation from middle school to high school. Sociology of Education, 67(3), 199-215.

Issue: Teacher characteristics, teacher-student interaction, and school performance

Study is needed to focus on personal interaction and relationships between teachers and students in elementary and secondary schools. Instruction and learning can be studied by examining the teacher-student relationship. Teachers' evaluations and expectations regarding student efforts and performance on one hand, and students' perceptions about classroom instruction and teacher attitudes on the other, are jointly responsible for the outcomes. Research on the issue is important for pedagogy improvement.

A unique strength of NELS:88 data is the link between data about student learning collected from teachers and data about instruction collected from students. This feature allows researchers to delve into the processes in which teaching influences students' perception on instruction and learning, and such perceptions in turn affect performance.

Caution: Teachers' responses to pedagogical questions probably cover a period (usually a semester or one year) shorter than the two-year time span in which the followup took place. Thus, the information provided by the teacher may not fully reflect the pedagogical effects on the student outcomes in the two years.

Relevant literature

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Taylor, D.L. & Tashakkori, A. (1994). Predicting teachers' sense of efficacy and job satisfaction using school climate and participatory decision making. Paper presented at the meeting of the Southwest Educational Research Association, San Antonio, TX, January 1994.

2. Equity and Access

Issue: The performance of the current school system in reaching the goals of equity and access

Special populations in NELS:88 include limited English proficient (LEP) students, special education students, schools in disadvantaged locales (inner city or remote rural places), low SES, and racial/ethnic minorities. These groups have different needs and learning approaches, and face different school environments (school resources and climate) and variant opportunities to learn (e.g., course content, amount, and instruction strategies).

Two student populations in particular concern researchers. One is students in urban areas, surrounded by violence and poverty; the other is Hispanics with extremely low literacy. The two populations are growing rapidly and pose serious policy questions relating to their education.

NELS:88 offers information for studying the two groups, with oversampling of Hispanics. Many pressing issues related to the two groups can be addressed. For instance, to what extent do the two groups respond to program conditions? Are there interaction effects between at-risk factors and program conditions? In other words, does a specific program work with a given risk group more effectively than it does with another group?

Caution: Urban schools and other disadvantaged, "outlier" schools may be under-represented in NELS:88; the existing definition of urban schools is questioned by some researchers as too narrow.

Relevant literature

Anderson, J. et al. (1992). Poverty and achievement: Re-examining the relationship between school poverty and student achievement. Paper presented at the meeting of the American Education Research Association, San Francisco, April 1992. Education Resource and Information Center Document No. ED 346207.

Bradby, D. (1992). Language characteristics and academic achievement: A Look at Asian and Hispanic eighth graders in NELS:88. Statistical analysis report. NCES 92-479. Washington DC: NCES.

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Hernandez-Gantes, V.M. (1993). Direct and indirect influences of school learning variables on Hispanic American eighth-grade students' academic achievement. Unpublished doctoral dissertation. Virginia Polytechnic Institute and State University.

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Sebring, P.A. & Camburn, E.M. (1992). A Profile of eighth graders in Catholic schools, based on the National Education Longitudinal Study of 1988. Washington, DC: National Catholic Educational Association.

Issue: Comparisons across state and localities in education resources and outcomes

Since state and local governments take chief responsibility for educational policymaking, resource allocation, and program planning, it is particularly appropriate to examine equity of education input and outcomes at the state level.

Using the NELS:88 State Augmentation File that provides data with additional samples for five states, researchers can perform state-to-state or state-to-nation comparisons. While the National Assessment of Education Progress (NAEP) survey provides cross-sectional assessment data, the NELS:88 longitudinal design (following the same cohort of students) enables researchers performing state analysis to look at more specific policy factors that may explain the outcome differences within or across states. The results of such studies may go beyond the scope of an aggregated "report card" and pinpoint problems contributing to equity in specific states. Data available from state governments may be merged with NELS:88 data to expand the range of research issues.

Caution: Specific sampling weights may be needed for a given state; the augmentation file is restricted-use data and only available through a licensing procedure (contact the NCES Data Security Officer).

Relevant literature

Connecticut State Department of Education. (1989). Connecticut participation in the National Education Longitudinal Study (NELS). Connecticut State Department of Education Research Bulletin, no. 3.

New York State Education Department. (1991). Characteristics of New York State's eighth grade students from the National Education Longitudinal Study of 1988. Albany, NY: Author.

Issue: Schooling of students with disabilities or other special needs

Federal laws mandate a provision of equal access to education for children with special needs caused by mental/physical disabilities. Limited English proficiency (LEP) students also need special help to ensure their equal access to education. Much investment has been made to serve these special groups at different levels of administration. However, the actual quality of education received by these children and the effectiveness of the special programs has not been fully examined at the national level.

NELS:88 provides data to address the issues from different perspectives: students, parents, and school administration. A systematic examination of access to and quality of education for disabled children is feasible with NELS:88 data.

Caution: Exclusion of severely disabled students (especially those with learning disorders or retardation) or LEP students from the NELS:88 sample limits the coverage of special needs students.

Relevant literature

Bradby, D. (1992). Language characteristics and academic achievement: A look at Asian and Hispanic eighth graders in NELS:88. Statistical analysis report. NCES 92-479. Washington, DC: NCES.

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3. At-risk Students

Issue: The characteristics of students who are at risk of school failure

The most obvious at-risk students are high school dropouts. Hispanic dropouts are especially poorly understood in research. For example, what is the effect of Hispanic immigrant families' mobile lifestyle on school performance and dropout rates? Other at-risk groups include students

who are involved in violence, substance abuse, teen sex/parenthood, and gang activity. Multiple disadvantageous factors often affect the same demographic group (e.g., for urban black children, poverty, single-parent family, crime-ridden community, and youth violence frequently happen together).

Since NELS:88 oversampled Hispanic students, it can be used to closely examine this population. With student reported risk behavior and data on disadvantaged background, the relationships between student characteristics and risk behaviors can be specified.

Caution: It should be pointed out that 5 percent of the base year students were excluded from the study because of physical, mental, and language problems. Many of these students could be considered at-risk.

Relevant literature

Burbridge, L.C. (1991). The Interaction of race, gender, and socioeconomic status in education outcomes. Center for Research on Women Working Paper Series. No. 246. Paper presented at the annual meeting of the American Sociological Association, Cincinnati, August 1991. Education Resource and Information Center Document No. ED 360243.

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Jordan, W.J., Lara, J. & McPartland, J.M. (1994). Exploring the complexity of early dropout causal structures. Research report no. 48. Baltimore, MD: Center for Research on Effective Teaching for Disadvantaged Students.

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Ukaga, O.M. (1993). Structural determinants of at-risk students: relationship with eighth graders' expectations for completing high school. Unpublished doctoral dissertation. Pennsylvania State University.

Issue: The effectiveness of school programs in retaining teen mothers or attracting them back to school

Teenage motherhood is an established risk factor closely associated with high school dropouts. The combination of the two experiences often leads to a life-course failure. A relevant policy issue is to identify school programs that are effective in retaining teen mothers or attracting them back to school so that they can finish high school and eventually function as productive individuals. Program factors (alternative programs such as within a high school or with GED programs) together with family and individual efforts, contribute to teen mothers' school completion.

The issue may be tackled with NELS:88 data that cover both teen pregnancy and school dropout. With data collected in the third followup (conducted in 1994 and currently under processing), research can follow dropout teen mothers to figure out their whereabouts in relation to special services they received.

Caution: Information is not complete for all dropouts in followup surveys. For example, the NELS:88 Second Followup surveyed a portion of students who were identified as dropout and alternative students with student questionnaires rather than dropout questionnaires. Thus, in the resultant responses, information on the timing of dropping out or of returning to school is absent.

Relevant literature

Ingels, S.J. & Scott, L.A. (1991). National dropout statistics from a longitudinal cohort perspective: Estimating rates of school-leaving and school noncompletion. Paper presented at the meeting of the American Educational Research Association, Chicago, IL, April 1991. Education Resource and Information Center Document No. ED 334260.

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Issue: Student misbehaviors and school disciplining measures

Student misbehavior in relation to academic learning and achievement is an issue relevant to the research of at-risk students. Student behavior normally is highly stable (e.g., disciplining, engagement) and impacts academic outcomes. Student misbehaviors (including absence or truancy, violence, drug use, and crime) can be studied to identify community and school conditions which may be responsible for behavioral problems or that contribute to school order. It may be also interesting to examine the relationship between misbehavior and other psychosocial problems such as impaired self-concept and emotional disorder (see the issues in number 2. Self-Concept, Locus-of-Control, and Social Behavior under Motivation, Aspiration, Self-Concept, and Other Psychosocial Issues). For both practitioners and policymakers, knowledge on these issues will be valuable.

NELS:88 provides data on problem behavior and school discipline measures (reported by students) which can be linked to school performance; the school survey contains data on school policies and efforts for discipline which can be related to student reported misbehavior.

Relevant literature

Braddock, J.H.II & Slavin, R.E. (1992). Why ability grouping must end: Achieving excellence and equity in American education. Paper presented at the Common Destiny Conference, Johns Hopkins University, Baltimore, MD, September 1992. Education Resource and Information Center Document No. ED 355296.

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Spiegel, A.N. (1994). Student and school variables related to the academic engagement of at-risk students. Unpublished doctoral dissertation. University of Minnesota.

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Issue: The impact of retention on student performance

Controversial as it is, retention is a measure intended to, by repeating the grade, help students meet academic achievement requirements after they fail at the current grade level. Critics argue that this approach works against its intended goal: instead of helping retained students, it damages students' self-esteem and academic motivation, and makes these students fall further behind. Because retention happens more often to disadvantaged students, the joint effect of retention and other risk factors may push students to eventual school failure. Many issues in this connection, however, remain unclear. For example, is there a uniform negative effect of retention on later achievement? If not, what are the differential effects of retention on different student groups (e.g., gender, race, or students with specific disabilities)? Does the timing of retention (e.g., in middle school versus high school) make differences to the outcomes? What are alternative ways to help students who temporarily fail in school?

Two types of information on retention are available in NELS:88. Transcript data from eighth grade to high school senior reflect retention experiences in middle school and high school. Parent recollection of experience of retention at each grade level from kindergarten to seventh grade is another source for checking early retention. With data on student background and school outcomes, a variety of retention related issues can be addressed.

Caution: Retrospective data collected from students or parents on early experiences of retention should be handled with caution, and perhaps be checked against transcript data.

Relevant literature

Meisels, S. J. & Liaw, F.R. (1993). Failure in grade: Do retained students catch up? Journal of Educational Research, 87(2), 69-77.

Issue: Academic resilience and school experience among disadvantaged students

Not all disadvantaged children fail in school. Some of them are highly successful in secondary and college education and many manage to acquire basic literacy and to function in society. For practitioners and researchers alike, it is interesting to understand how academic resilience is developed against the odds of a disadvantageous environment. Children of racial or language minorities, families in poverty, and schools in inner cities or remote rural areas, for example, may be considered at education disadvantage. Studies are needed to learn about the process in which institutional, community, and family conditions work with personal characteristics to develop resilience and academic success. These conditions may interact with one another and jointly contribute to subsequent school performance and personal development.

With the NELS:88 oversampling of certain disadvantaged groups (Hispanic and Asian students), a reasonably large number of resilient students can be identified for analysis. Drawing data about school, family, and student personal experience, NELS:88 makes it feasible to examine the resilience issue. Attention should be focused on the interaction patterns in which school, family, and the student's personal effort affect outcomes.

Relevant literature

Finn, J.D. (1993). School engagement and students at risk. NCES 93-470. Washington, DC: NCES.

Hawkins, R., Royster, D.A. & Braddock, J.H. (1992). School sports and academic resilience among African American, Anglo and Latino males. Paper presented at the Meeting of the American Sociological Association, Pittsburgh, August 1992.

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Issue: The causes and the long-term effects of teen parenthood

Teen sex, pregnancy, and parenthood not only affect students' academic achievement but also affect their adult lives. In connection to the proposed welfare reform, research into the causality and the long-term effects of teen parenthood is highly significant. For example, what is the impact of teen pregnancy on high school completion and postsecondary educational attainment? How effective are programs of sex education and pregnancy prevention in reducing the problem? What is the effect of family/parental involvement in both preventing and coping with the eventuality? What kind of role do peers play in the process?

NELS:88 systematically collects data on dating, sexual behavior (e.g., first time sex, the number of partners, and use of contraception), knowledge about sex and pregnancy, pregnancy, and child bearing. Data on school programs dealing with teen sex and pregnancy are available as well. The longitudinal design makes it possible to examine the effectiveness of programs and the consequence of teen pregnancy.

4. Process of Education Reform

Issue: The impact of school restructuring on teaching and learning

School restructuring has been a continuing approach to improving education. Research has not, however, systematically assessed the consequences of school restructuring in connection to achievement outcomes. School restructuring calls for flexible school organization, decisionmaking participation by teachers and parents, heterogeneous grouping, and team teaching. With such changes, student engagement and academic achievement are expected to improve. While school restructuring is underway to foster a community of learning, it also poses new dilemmas to teachers.

NELS:88 contains some relevant data collected from teachers, administrators, and students, including departmentalization, classroom grouping, and teaching responsibility and organization, among others. Researchers need to carefully conceptualize school restructuring and build appropriate measures to tackle the complicated processes of changes and link the changes to school performance.

Relevant literature

Lee, V.E. & Smith, J.B. (1992). Effects of school restructuring on the achievement and engagement of middle-grade students. Sociology of Education, 66(3), 164-187.

Lee, V.E. & Smith, J.B. (1995). Effects of high school restructuring and size on early gains in achievement and engagement. Sociology of education, 68(4), 241-270.

Lee, V.E. & Smith, J.B. (1994). High school restructuring and student achievement. A new study finds strong links. Issues in restructuring schools, 7 (Fall). Madison, WI: Center on Organization and Restructuring of Schools.

Lee, V.E. & Smith, J.B. (1994). Effects of high school restructuring and size on gains in achievement and engagement for early secondary school students. Madison, WI: Center on Organization and Restructuring of Schools.

Office of Educational Research and Improvement. (1990). Restructuring schools for young adolescents. Issues in education. OERI-AS-90-002. Washington, DC: Author.

Taylor, D.L. & Tashakkori, A. (1994). Predicting teachers' sense of efficacy and job satisfaction using school climate and participatory decision making. Paper presented at the meeting of the Southwest Educational Research Association, San Antonio, TX, January 1994.

Issue: Academic achievement gains in the high school years: intercohort comparison between the HS&B and NELS:88 cohorts

Current education improvement can benefit from historic comparisons of academic performance resulting from education improvement efforts. For example, we may examine the academic achievement gaps across curriculum groups and student backgrounds. Significant fluctuations of such gaps related to policy changes will be informative to the present education reform.

NELS:88 and HS&B contain many comparable measures of academic achievement, student demographics, and grouping by program/curriculum. Such comparability enables intercohort analysis of achievement gap relating to SES background and curriculum grouping. The analysis can clarify whether or not the achievement gaps between curriculum groups and demographic groups have widened in the last decade when education reform has been on the national agenda.

Group differences in learning on specific subjects (e.g., math and science) for the same grade span (e.g., from sophomore to the senior year) of the two cohorts, measured with standard deviation units, can be compared. A partition analysis used by demographers can partition cohort differences into three components: difference due to demographic shifts, difference due to educational reform (e.g., policies and curriculum), and difference due to the interaction of the two.

Issue: Studying systemic reform of school with econometric modeling

Education reform calls for schools to produce high quality graduates with limited resources. To achieve school effectiveness, administrators and policymakers need to understand the process by which variables of involved parties (the district, school, teachers, and students) jointly determine the final outcomes (i.e., students of high achievement and responsible citizenry). An econometric modeling approach can be applied to scrutinize the factors operating in the reform.

NELS:88 with its comprehensive coverage of relevant data and longitudinal design makes econometric modeling possible. Such models address learning environment/ process (including both classroom conditions and broader institutional reform) and performance outcomes. This approach not only involves multilevel modeling (such as in HLM) but also allows simultaneous estimating to predict the outcomes with multilevel path analysis. Some ongoing studies are already attempting this: with teacher-student paired data and school-level data, by modeling science teaching and learning, and with simultaneous three-level path analysis to predict science education outcome. With "switches" in the model (i.e., variables that are important theoretically or closely related to policymaking and that can be manipulated in the analysis), one can use the model to see how these variables affect the outcome and use the models for decision-making.

Caution: A constraint to such analyses with NELS:88 data is that the sample did not have enough students in each class, nor enough classes in each school. It is only possible to model two levels, the student and the school. Aggregating classroom data into the school level may lessen or confuse the effects of instruction/curriculum variables.

Relevant literature

Akerhielm, K.B. (1994). The determinants of student achievement in the United States: A microeconometric study with endogenous educational inputs. Unpublished doctoral dissertation. Yale University.

Issue: The effectiveness of restructured social services in the school and community

Integrated services is a new strategy for dealing with multiple problems facing disadvantaged students and families. How has this approach worked so far? With what kind of problems or student groups has integrated services worked more effectively? Answers to these questions are helpful for improving practice and decisionmaking on program administration and planning.

With data from recent years, NELS:88 may be able to help address some of the questions.

Issue: The impact of national or state standards for academic achievement

The notion of national standards that hold high expectations for all children are controversial. Critics say that standardization simply adds bureaucratic procedures to the already ineffective system and forces students with diverse backgrounds to learn skills irrelevant to the needs of the local labor market and community. Empirical evidence is required to show whether high standards actually help schools raise their performance through accountability.

NELS:88 data allow such research. Outcome measures are available for students with different prior performance. Student and school background, resources, technical support, and incentives for achieving the standards also can be examined to isolate the effects of standardization. Study can compare the achievement outcomes of schools that have adapted state standards or some form of national standards and those that have not.

Caution: Data on state standards and on school adaptation of standards may be insufficient. Additional data are probably needed from state governments.

Relevant literature

Office of Education Research and Improvement. (1994). What do student grades mean? Differences across schools. Washington, DC: Author.

Thomas, J. (1990). The numbers game: What eighth graders study—and how much of it they do. Humanities, 11(6), 9-10.

5. Parent/Community Involvement

Issue: The functions of market mechanisms and parents' "choice" of school that increase school competition for student enrollment

Research is needed to find out how to empower parents so that they can exercise real influence in school policymaking and operation. Some market mechanisms have been introduced to increase the competition for students among schools in order to improve school efficiency. Parents' "choice" of school is a key element in the proposed change. Has this competition mechanism worked to strengthen parents' influence and to improve school accountability? Many are skeptical about this. Critics argue that such changes are hurting children of disadvantaged families and may

increase inequality in the system. Scientific studies are needed to inform the ongoing debate on this issue. NELS:88 provides most of the relevant data needed for such studies.

Caution: Data about specific market mechanisms may be inadequate. Other data sources may need to be incorporated.

Relevant literature

Coleman, J.S., Schiller, K.S. & Schneider, B. (1993). Parent choice and inequality. In B. Schneider & J.S. Coleman (Eds.). Parents, their children, and schools (pp.147-182). Boulder, CO: Westview Press.

Goldhaber, D.D. (1994). Public and private high schools: School choice and the consequences. Unpublished doctoral dissertation. Cornell University.

Sosniak, L.A. & Ethington, C.A. (1992). When public school "choice" is not academic: Findings from the National Education Longitudinal Study of 1988. Educational Evaluation and Policy Analysis, 14(1), 35-52.

Issue: Forms of parental involvement at home and with the school, the conditions under which different forms of involvement take place, and the effects of different forms of involvement on student performance

It is abundantly clear that parents play a crucial role in children's education. It is not clear, however, what kind of parental involvement works better for different student groups. For instance, expectations and emotional support in contrast to actual help to student learning in forms of discussion, mentoring, and examining results both seem necessary. But not all parents are making such efforts. Different parent roles in children's schooling, while often rooted in cultural traditions, are subject to changes under the influence of school efforts to engage parents. The extent to which different parental approaches succeed also depends on student characteristics. Knowledge about the effectiveness of parental support and how to advise parents to use appropriate approaches can help schools develop better strategies for involving parents.

With NELS:88 data gathered from students, teachers, and parents, in-depth study into parental involvement is possible.

Relevant literature

Coleman, J.S., Schiller, K.S. & Schneider, B. (1993). Parent choice and inequality. In Schneider, B.& Coleman, J.S. (Eds.). Parents, their children, and schools (pp.147-182). Boulder, CO: Westview Press.

Keith, P.B. (1992). Effects of parental involvement on Mexican-American eighth-grade students' academic achievement: A structural equations analysis. Unpublished doctoral dissertation. Virginia Polytechnic Institute and State University.

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Kerbow, D. & Bernhardt, A. (1993). Parental intervention in the school: The context of minority involvement. In B. Schneider & J.S. Coleman (Eds.), Parents, their children, and schools (pp.115-146). Boulder, CO: Westview Press.

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———. (1993). Parental involvement and academic achievement: An analysis of family resources available to the child. In B. Schneider & J.S. Coleman (Eds.), Parents, their children, and schools (pp.77-113). Boulder, CO: Westview Press.

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Muller, C. et al. (1991). Defying statistics or "latch-key" children in the late '80s: Family composition, working mothers, and after school supervision. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL, April 1991.

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Peng, S.S. & Wright, D. (1994). Explanation of academic achievement of Asian American students. Journal of Educational Research, 87(6), 346-352.

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West, J., Rasinski, K.A. & Camburn, E. (1990). Parental involvement in education: Findings from the NELS:88 base-year parent survey. Paper presented at the meeting of the American Education Research Association, Boston, MA, March 1990.

Issue: Home environment and family support for learning in relation to student motivation, learning approach, and education outcomes

The dilemma facing public schools in teaching values and behavior leaves family a major role to play in guiding and supporting students to learn. Available research suggests that the family helps form children's values, aspirations, and expectations that are essential for achieving academic excellence. These influences, as cultural ingredients, are exerted in the home setting by senior members of the family. Understanding how home environment and school factors jointly affect student learning and behavior can contribute to policymaking and program development for parental involvement.

NELS:88 contains a wealth of data for scrutinizing home environment; for example, family composition and family members (parents, siblings, and other relatives), home language, family rules regarding children's behavior and activities, parents' expectations for children, interaction between parents and children, family activities conducive to learning and achievement (e.g.,

lessons or programs outside of school, visiting libraries and other cultural facilities), and family resources for learning (e.g., place for study, computer, reading materials). Indicators of home environment can be constructed to identify subgroup differences in home environment.

Caution: Data provided by the student may differ from that by the parents. Validation and integration of data from different files is advisable.

Relevant literature

Cagampang, F.H.H. (1992). What parents know about preparing for college and how it affects their children's academic performance: Parents' information in the college choice decision. Unpublished doctoral dissertation. University of California at Berkeley.

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Lee, V.E., Burkam, D.T., Zimiles, H. & Ladewski, B. (1994). Family structure and its effect on behavioral and emotional problems in young adolescents. Journal of Research on Adolescence, 4(3), 405-437.

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Peng, S.S. & Lee, R.M. (1992) Home variables, parent-child activities, and academic achievement: A study of 1988 eighth graders. Paper presented at the meeting of the American Educational Research Association, San Francisco, April 1992.

Zhang, M. (1993). Family as a dynamic of educational attainment: Asian students in America. Unpublished doctoral dissertation. University of South Carolina.

Issue: The influence of community participation in school decisionmaking on school performance

The role of a caring community is believed to be a key factor affecting education improvement. How does community participation in school decisionmaking help improve school performance? Do children have a sense of attachment to the community? The community or students' immediate neighborhood may influence students' behavior, aspirations, and educational performance to a great extent. And such community influences are particularly intense in disadvantaged urban neighborhoods and isolated rural places. However, the community-school relationship and its impact on school outcomes is probably one of the weakest areas in education research.

Merging NELS:88 data with Census and CCD data offers opportunities for dealing with these issues. The research can be oriented to developing both policy and theory.

Caution: The relatively thin data on neighborhood in NELS:88 may require additional efforts to incorporate appropriate Census data or locally collected information.

6. Student Mobility

Issue: Student transition: continuing versus dropping out of school, transferring across schools or school sectors, and other issues related to student mobility

Over the years of secondary schooling, especially between middle school and high school, a substantial portion of students experience transitions that often cause stress and influence students' later education: early dropping out can happen during the transition, some students change from public to private schools or vice versa, and most students change their schools as they upgrade from middle school or junior high into high school. Some families move and students are relocated into different schools. Administration imposed transition may take place in such forms as school consolidation and district rezoning. Learning about the complicated patterns of student transition and subsequent school experience is helpful for improving administration and planning to reduce difficulties facing mobile students.

NELS:88 tracks students' transitions; the resulting high sample attrition rates provide data for such studies.

Relevant literature

Owings, J. & Peng, S. (1992). Transitions experienced by 1988 eighth graders. Statistics in brief. NCES 92-023. Washington, DC: NCES.

Scott, L.A. & Ingels, S.J. (1992). Transitions to high school; instruction and achievement: Findings from the NELS:88 first followup (1990) student survey. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA, April 1992.

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7. School Organization and Climate

Issue: School organization, administration, and leadership in connection to education outcomes

The school is a social organization with diverse administrative structures, varying sizes of staff and enrollment, changing policies, and distinct institutional cultures. It is a challenge to education research to understand how school works to achieve equity and excellence. Systematic studies focusing on school as an institution are framed in different intellectual perspectives (e.g., in economic models, school is an input/output production process; in sociological theories, school is a structured arrangement wherein groups and individuals interact). Relevant to policy analysis, school sector (public versus private), size, socioeconomic conditions of the community, administrative approach, policies and climate are all important concepts.

NELS:88 offers school data including school demographics (e.g., enrollment, student/staff racial/ethnic composition, sector, and locale), school facilities, school regulations and rules, program offerings, and school climate as perceived by teachers and students. Data were collected from administrators, teachers, parents and students. Linking data about school resources and climate with data on student performance, economic models can be applied. Linking different sources of data about school culture (e.g., students' perception about school climate and student-teacher relationships, teachers' perception about student behavior and school administration), social psychological concerns can be addressed.

While NELS:88 has not maintained its school sample as nationally representative after the base year, a School Effectiveness Study was added to the first followup to provide a nationally representative sample of 10th and twelfth grade schools. This supplementary project sustains longitudinal school-level analysis.

Caution: In followups, schools are no longer a focus of sampling design because of complicated student transitions after middle school. Therefore, school weighting needs to be developed (see the first issue of number 2, Research on Sampling Problems, in Methodological Research) if school is the unit of analysis. School weights were developed for the School Effectiveness

Supplement data. This data can only be obtained, though, through a licensing procedure. (Contact the NCES Data Security Officer.)

Relevant literature

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Collins, M.A. (1992). School social context, self-esteem, and locus-of-control among white, black, and Hispanic youth. Unpublished doctoral dissertation. University of Maryland at College Park.

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Crone, L.J. & Tashakkori, A. (1992). Variance of student achievement in effective and ineffective schools: Inconsistencies across SES categories. Paper presented at the meetings of the American Educational Research Association, San Francisco, CA, April 1992. Education Resource and Information Center Document No. ED 346613.

Eccles, J.S. et al. (1991). What are we doing to early adolescents: The impact of educational contexts on early adolescents. American Journal of Education, 99(4), 521-542.

Finn, J.D. & Voelkl, K.E. (1993). School characteristics related to student engagement. Journal of Negro Education, 62(3), 249-68.

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Lee, V.E. & Smith, J.B. (1992). Effects of school restructuring on the achievement and engagement of middle-grade students. Sociology of Education, 66(3), 164-187.

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Schneider, B. & Shouse, R. (1992). Children of color in independent schools: An analysis of the eighth-grade cohort from the National Education Longitudinal Study of 1988. Journal of Negro Education, 61(2), 223-234.

Spiegel, A.N. (1994). Student and school variables related to the academic engagement of at-risk students. Unpublished doctoral dissertation. University of Minnesota.

Taylor, D.L. & Tashakkori, A. (1994). Predicting teachers' sense of efficacy and job satisfaction using school climate and participatory decision making. Paper presented at the meeting of the Southwest Educational Research Association, San Antonio, TX, January 1994.

Wu, Shi Chang. (1992). Education and learning in schools with high dropout rates. Evaluative report. Washington, DC: NCES.

B. Transition from High School to Work

Transition from high school to work occurs for most students, including a substantial proportion of college goers who do not immediately enter college after high school. The transition may involve a series of events, such as high school completion, dropping out, or acquisition of alternative credentials such as the GED; labor force participation, employment, and occupational advance; and participation in adult education or other on-the-job training. Understanding the transition process entails studies on such themes as education/career aspirations, information access and planning, labor market adjustment, and career decision making.

Transition data were collected in the NELS:88 third followup in 1994 and are currently being processed. While comparable to NLS-72 and HS&B, NELS:88 will allow broader coverage of issues relevant to postsecondary issues because other data sources can be integrated into NELS:88. For example, occupational attainment studies require data on local economic conditions and the labor market context, which are available by merging NELS:88 files with CCD and Census data with the common ID numbers. The school level or household level data will also be available on CD-ROM. Thus, opportunity for research on postsecondary issues is enhanced substantially with NELS:88 data.

1. High School Completion, GED, and Dropout

Issue: High school completion/dropout and related individual, school, and community factors

High school completion is a basic requirement for an individual to function in today's labor market. Without a high school credential, one would face significantly higher risk of low-pay employment, unemployment, and dependency on public assistance. High school dropping out, in some research, is related to not only individuals' failure in the labor market, but also to institutional consequences such as a loss of local or state tax revenue and an increase of public service costs. Comparative study of high school completion/dropout rates across demographic groups and regions are thus an important undertaking for policymaking purposes.

NELS:88 has improved the data quality on dropping out of school. All known dropouts were sampled with certainty in followups. Data were collected by administering questionnaires in the presence of project staff or via telephone interview. With data on school and community, it is possible to do comparative analysis of school completion/dropout rates and to link the differences to an array of individual, school, and community variables.

Caution: To clarify the understanding of the complicated paths to eventual school completion requires careful conceptualization and data scrutiny; for example, within-round dropout-returnees (also called "stopout," referring to those who dropped out and then returned to school between two waves of the survey) might be undetected in the survey data (see section 2 for the discussion). Attrition of dropouts among NELS:88 respondents makes it uncertain whether or not the remaining dropouts in the sample represent the national population. Lack of information on exact timing of events is another barrier to longitudinal analysis.

Relevant literature

Kaufman, P. & Bradby, D. (1992). Characteristics of at-risk students in NELS:88. NCES 92-042. Washington, DC: NCES.

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Issue: The dropout career and postsecondary outcomes

Tracing the dropout career may help researchers understand the school dropout as an evolving life history within the contexts of school, family, and community. Such an understanding can shed light for both policymaking and educational practice aimed at preventing and developing remedies for dropouts.

Using NELS:88 data, we may examine specific personal or family events/factors (e.g., child bearing) related to dropping out. After dropping out, different paths are possible. Some former students may return and complete school, or drop out again; some may receive a Graduate Equivalency Diploma (GED) later on; some may enroll in adult education or vocational education, join the military, or even go to college; others may fail, (e.g., commit a crime and go to jail). One can also look at dropouts' attitudes and behavior in regard to civic and social responsibilities (voting, community involvement) and see how they relate to postsecondary

outcomes. A systematic followup of dropouts with NELS:88 data probably can provide some answers.

Caution: Again, issues in defining dropouts, sample attrition, and the exact timing of dropout processes should be considered.

Relevant literature

Braddock, J.H.II & Slavin, R.E. (1992). Why ability grouping must end: Achieving excellence and equity in American education. Paper presented at the Common Destiny Conference, Johns Hopkins University, Baltimore, MD, September 1992. Education Resource and Information Center Document No. ED 355296.

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Jordan, W.J., Lara, J. & McPartland, J.M. (1994). Exploring the complexity of early dropout causal structures. Research report no. 48. Baltimore, MD: Center for Research on Effective Teaching for Disadvantaged Students.

National Center for Education Statistics. (1995). Dropouts and late completers. NCES 95-720. Washington, DC: NCES.

Ukaga, O.M. (1993). Structural determinants of at-risk students: Relationship with eighth graders' expectations for completing high school. Unpublished doctoral dissertation. Pennsylvania State University.

2. Effects of High School Experience on Later Life Outcomes

Issue: Compatibility between the knowledge content of school and the knowledge content of work

To what extent in the existing system does the knowledge content of school match the knowledge content of work? What are the conditions under which the knowledge content of school and the knowledge content of work match better? "Conditions" can be taken to include curriculum, course taking, program provision, and school types (public versus private). Specifically, the effects of program provision and course taking should be examined in connection to occupational attainment.

Using NELS:88 and HS&B transcripts, course clusters (i.e., the pattern of course taking for different student groups) can be examined to see how such clustering influences high school outcomes and career success. The concept of student networks in joint course taking is another development that can be explored.

Issue: Relative preparedness of high school seniors for entering the labor market or postsecondary education

The concept and the measures of proficiency levels can be used to study high school seniors' relative preparedness for employment or college. Such a study can tackle the question of knowledge content and help us to understand the relevance of schooling to labor market performance. For example, by examining the percentage of students who were at a specific proficiency level on specific subjects and who entered specific sectors of the labor market, one can assess the relationship between high school preparedness and occupational outcomes.

NELS:88 data collected in the third followup can be used for such studies.

Relevant literature

Ingels, S.J. et al. (1994). A profile of the American high school sophomore in 1990. National Education Longitudinal Study of 1988. NCES 95-086. Chicago, IL: National Opinion Research Center.

Owings, J.A. et al. (1995). Making the cut: Who meets highly selective college entrance criteria? Statistics in brief. NCES 95-732. Washington, DC: NCES.

Rock, D., Owings, J. & Lee, R. (1994). Changes in math proficiency between eighth and tenth grades. Statistics in brief. NCES 93-455. Washington, DC: NCES.

Issue: Long-term effects of racially integrated schooling (desegregated education) on minority students' college attendance, occupational attainment, and earnings

Study on the short-term effects of desegregated education (e.g., test results and self-esteem) has accumulated a sizable literature, but study on the long-term effects has fallen short. Study on long-term effects is essential for assessing the fulfillment of the ultimate goal of school desegregation (i.e., overall socioeconomic equity for minorities).

NELS:88 and prior longitudinal surveys all contain information about school racial composition and individual students' peer racial backgrounds, plus the information on postsecondary outcomes collected in the third followup.

Caution: The definition of a desegregated school requires considering specific conditions such as school racial composition, court order, and busing policy. The "self-selection" effect—black students who choose to go to desegregated schools may differ in background and behavior from other black students—needs to be scrutinized.

Issue: Problem behaviors in high school and later life conditions

Problem behaviors such as teen parenthood, substance use, and gang participation may have prolonged influence on students' later life. Educational attainment, employment, and earnings are probably subject to the impact of problem behavior in high school. Involvement in adolescent

deviant behavior may also contribute to forming social attitudes and value systems in older age. There are, however, unsettled issues in this regard. For example, some recent research emphasizes that certain risk behaviors (e.g., vandalism and drunk driving) among teenagers are of a recreational nature and often diminish in the process of social and psychological maturation. On the other hand, it is compelling to assume that problem behaviors are likely to continue if socioeconomic or psychoemotional adversities exist in the student's life. Longitudinal research is in order to assess early problem behaviors' impact on later life conditions.

NELS:88 contains student reported involvement in problem behavior and later life conditions. It is possible to examine problem behaviors such as adolescent violence, drug abuse, teen sex, and gang participation to see their relationship with postsecondary education and occupational attainment.

3. Employment and Occupational Attainment

Issue: Entry into labor force: the rates, timing, and conditions

A large portion of high school graduates (and nongraduates) enter the labor force without further formal schooling after high school. The rates of labor force participation among this population, however, differ across geographic areas and student groups. The timing of entry also varies: some students start part-time work while still in school, others begin after graduation or after further delay. A substantial number of youth do not participate in the labor force after school due to child bearing or other difficulties. Finally, the nature of labor force participation differs (e.g., temporary job versus permanent career, part-time versus full-time; working while going to school versus working without plans for college). Initial wages and working conditions differ as well. The differential processes of labor force entrance have important implications for examining and crafting education and labor policies.

NELS:88 contains data on student employment before high school (in the base year to the second followup). Data on employment after high school are covered in the third followup. All together, there is information about labor force entry, timing, weekly hours, wages, job changes and changes in labor force participation status.

Issue: Employment, occupational performance, and participation in public assistance programs

Policymaking can be informed by studies of the employment experiences of high school graduates (and nongraduates) after they enter the labor force. These experiences include occupational performance and career advance during employment, changes in income, experience of unemployment, and receiving public assistance. Analyses focusing on differences across demographic groups or geographic areas will be particularly valuable for advising the current reform of the employment and welfare services and other social services programs. Studies intended to link employment issues to prior school experience (course work, program

participation, and achievement) and school or community factors can also help explain young people's success or failure in the labor market.

Pertinent data on these issues will be available in NELS:88 third and subsequent followups.

Issue: Student aspirations and enlistment to military service

The changing role of the U.S. armed forces (from military confrontations to more humanitarian activities) and related downsizing pose problems to military recruitment and enlistment. The Department of Defense is trying to understand why and how the recruitment market is shrinking and to generate programs to work with the declining market.

HS&B and NELS:88 both contain items on aspirations to military service, background influences on career decision making, and participation in and results of military application tests. A combination of background data about family, school, and community with NELS:88 and HS&B data is promising for study of this issue.

Issue: The effect of high school curricula on rural-to-urban migration

The rural-to-urban migration of educated youth is an important issue in rural communities. Some critics contend that the establishment of public schools is actually leading educated rural youth to move out of the community and hence contributes to the decline of rural America, because the established curriculum is oriented only to the urban labor market. It is not clear what kind of high school curriculum can help foster community attachment and construct the meanings of rural life as well as teach skills to meet the local needs. The issue is significant not only for rural education but also for community development.

By examining NELS:88 data on curriculum and post-high school migration, the issue can be addressed within the context of regional and community economical conditions.

Caution: Information on local economic conditions is not available readily from NELS:88 files. One can, however, merge historical and current data from CCD on community economic background into NELS:88 data with common identification numbers.

Issue: Special groups in the postsecondary transition

Special groups can be conceived of in many ways: Latinos, women, performing arts students, high school athletes, LEP students, the gifted and talented, and disabled students, among others. How do these groups do in the postsecondary transition? What are their postsecondary educational attainments? What kind of jobs do they get after college?

Using NELS:88 (third followup and later), BPS, and B&B data, research can cover issues from the accessibility of higher education, college persistence and attainment, to postgraduate education and job market outcomes.

Caution: For some special groups, data may lack depth to cover these groups' unique conditions and needs; also, the subsample size may be small.

Relevant Literature

Owings, J.A. et al. (1995). Making the cut: Who meets highly selective college entrance criteria? Statistics in brief. NCES 95-732. Washington, DC: NCES.

Issue: The long-term effects of bilingual education and bilingualism

In the past decades, bilingual education has developed into a large but still controversial enterprise. The research has focused mostly on the cognitive/academic aspects of bilingual education. The long term social aspects of bilingual education's impact have been largely ignored. With resources invested by school and time spent by bilingual children, what benefit can bilingual students accrue in postsecondary education and employment? An assessment of such long-term effects in a longitudinal approach is in order.

NELS:88 measures of family immigration history, home language environment, school bilingual programs, oral versus literate bilingual abilities (student reported or transcripts or both) make it possible to examine the impact of bilingual education on post high school life. A study may be considered with the data on the base-year students excluded due to language barrier. A portion of these students were surveyed in followups as their English improved. As these students were initially disadvantaged due to different home languages, a study that looks at their postsecondary status in relation to their bilingual experience may tell a lot about what works and what does not work.

Relevant literature

Huang, G.G. (1992). Self-reported biliteracy and self-esteem: A study of Mexican American eighth graders. Charleston, WV: Appalachia Educational Laboratory. Education Resource and Information Center Document No. ED 356937.

Kennedy, E. & Park, H.S. (1994). Home language as a predictor of academic achievement: A comparative study of Mexican- and Asian-American youth. Journal of Research and Development of Education, 27(3), 188-94.

Waggoner, D. (Ed.). (1991). Numbers and needs: Ethnic and linguistic minorities in the United States. The Number News, 1-2. Education Resource and Information Center Document No. ED 359285.

C. Postsecondary Education

Postsecondary education can be considered in a broad sense as including higher education, vocational/technical education, community college, and continuing learning. As such, societal changes and institutional factors can affect postsecondary education.

NELS:88 data from the base year and the second followup has yet to generate much research in postsecondary education simply because the majority of cohort members had not entered postsecondary cycle before the third followup. The NELS:88 data on postsecondary education collected in the third followup of 1994 are being processed. The results, with census data that can be merged with NELS:88, promise great opportunities for research in these areas.

1. Higher Education Access and Choice

Issue: The college application process: institution selectivity and student qualifications in relation to eventual determination of differential access to higher education

The unequal distribution of access to higher education is largely determined by two factors: institutions' admission procedures and individuals' efforts to gain access. Admission procedures are regulated by a social structure wherein institutions differentially provide education to different student groups. Individuals efforts may be further restrained by their socioeconomic backgrounds and social networks. Understanding the interplay of the two factors in affecting college attendance may be helpful in improving equity in higher education.

With NELS:88 third followup data*, we can describe group (e.g., race, sex, and poverty status) differences in step-by-step approaches to college entrance (including information gathering, application for financial aid, preparation for entrance exams, knowledge of local and federal assistance for college education). These descriptions should be linked to analysis of institutional processes such as loans and grants provisions, school guidance services, and disadvantaged high schools ("outliers").

Caution: NELS data on institutional procedures may be less than complete. For additional data, analysts may want to consider extracting data from the NCES Integrated Postsecondary Education Data System (IPEDS). IPEDS is a single, comprehensive data source that includes all identified institutions whose primary purpose is to provide postsecondary education.

Relevant literature

Cagampang, F.H.H. (1992). What parents know about preparing for college and how it affects their children's academic performance: Parents' information in the college choice decision. Unpublished doctoral dissertation. University of California at Berkeley.

Owings, J.A. et al. (1995). Making the cut: Who meets highly selective college entrance criteria? Statistics in brief. NCES 95-732. Washington, DC: NCES.

* The data elements are not currently available but are likely to be available in the next followup.

Steelman, L.C. & Powell, B. (1993). Doing the right thing: Race and parental locus of responsibility for funding college. Sociology of Education, 66(4), 233-244.

Issue: College entry rates: differences across student groups and institution types

To inform policymaking, statistics on college entry rates are needed. Policymakers need to know the differences of entry rates across student demographic groups, higher education institution types, and geographic areas, as well as changes in the rates over time. Comparative analysis of the entry rates may help decisionmaking on resource allocation and procedural improvement related to higher education.

The upcoming NELS:88 data will provide college entry rates for such analysis, and the data will be comparable with HS&B and NLS-72 data.

2. Progression, Persistence, and Completion

Issue: College education experience: academic work and school activities

To learn about the processes of higher education, research should examine college students' experience in both intellectual and social development. The academic experience includes major field of studies and possible changes, financial support, courses taken and credits earned by field, and academic achievement. Social experience includes extra-curricular activities, work experience, religion or community involvement, and housing arrangements. Student background and institutional characteristics can be related to different college experiences.

The upcoming NELS:88 followup will provide data on college academic work (with transcripts data) and participation in campus activities.*

Issue: Completion or withdrawal at the postsecondary level

The issue of completion or dropping out at the postsecondary level can be linked to aspirations and high school experiences. Factors such as high school academic achievement (with high school transcripts), foreign language course taking, and advanced curriculum may contribute to college attendance, choice of college major, college completion, and post-college career development. While study on college completion awaits data from the fourth followup (in 1998 after cohort members supposedly complete college), other postsecondary education issues can be addressed with the third followup data.

Caution: The validity of student reported high school experiences (engagement, course taking, aspirations) need to be checked against transcripts or the teacher file.

* The data elements are not currently available but are likely to be available in the next followup.

Issue: Nontraditional (especially female) students in postsecondary education

Many women go back to college after a career or family; retirees or mid-career employees pursue college or graduate education. They are different from traditional college students in background and experience. Many factors may cause the non-traditional cycle in higher education and in the labor force: for example, part-time versus full-time work (or college attendance), multiple campus attendance (within a state or cross-states); and changing social status and roles in relation to such nontraditional education. What are the motivations, supports, and outcomes of nontraditional college education? What are the institutional factors facilitating nontraditional college attendance? Does counseling help people to make decisions on such matters as going back to college, changing majors, and switching careers? The NELS:88 sample with the high school cohort is not designed to cover the nontraditional student population; however, BPS does provide information on these issues (e.g., college attendance, academic major, program taking, and working status). Other sources, such as B&B, the Recent College Graduates survey (RCG), and the Bureau of the Census household survey should be considered for such a study.

3. Institutional Studies

Issue: Financial aid provisions, enrollment, withdrawal and transfer, and program length: higher education institutions

From the institutional perspective, higher education processes can be examined based on statistics aggregated from student surveys. Financial aid provided, student enrollment, withdrawal and transfer rates, selection and changes of academic fields, and the number of years taken to complete programs, are examples of key statistics for institutional research. Comparisons of such data across sectors, regions, academic disciplines/programs, and types of higher education institutions can help us learn about the operation of the higher education enterprise. Such studies may also offer implications for understanding changes in labor supply and demand.

The NELS:88 fourth followup will gather information about respondents' college experience that can be used for institutional studies.* Additional data about higher education institutions are available from IPEDS.

Issue: Community colleges' growing and changing role in education

Community colleges are growing into an important and increasingly diverse component in the nation's postsecondary education system. It is necessary for policymaking purposes to know the multiple roles played by community colleges, including academic/vocational/technical training, adult and continuing education, service to underrepresented groups and disadvantaged areas, and local cultural and developmental activities. Institutional characteristics should be examined to see how they are associated with high rates of student retention or transference to four-year programs and high enrollment of disadvantaged groups.

* The data elements are not currently available but are likely to be available in the next followup.

NELS:88 and the NCES higher education surveys (IPEDS, B&B, RCG, and BPS) contain institutional data. Statistics can be generalized to the national population from the representative institutional samples (except that from NELS:88, which did not sample institutions after the base year).

4. Attainment of Professional and Graduate Education

Issue: Choice of and entry into professional and graduate education programs

Recent years have witnessed a significant increase of women and minority enrollment in professional and graduate education programs. The distribution of women and minority students across major academic fields (e.g., science/engineering, social sciences/humanities, medicine, law, and business administration), however, is not even. It is interesting to study gender- or race-differentiated enrollment of graduate programs by relating advanced program attendance to secondary and undergraduate college experience. A host of important questions can be asked: What motivates students to go into advanced programs? What is the impact of high school coursework on the choice of specific professional/graduate programs? When and how did the gender/race differences in academic field selection emerge? Why do some students change their fields between undergraduate and graduate programs? What are the financial sources for advanced studies and how does financial support influence program choice and completion?

NELS:88 will collect data relevant to these questions in its fourth followup in 1998. The advantage of NELS:88 data (relative to the NCES higher education surveys) is its long range of data collection from middle school up to postgraduate education. In-depth studies can be formed to address issues related to professional and graduate education.

Issue: Aspiration, choice, and completion of advanced programs in science and engineering

It has been documented that, in the past decades, students' aspiration for and performance in science/engineering learning is declining. To maintain the nation's strong foothold in the global technological and economic competition, graduate education in science and engineering has a vital role to play. Studying the experience of students who are motivated to and succeed in advanced science/engineering training may shed light on policymaking and program planning aimed to improve high level training in these fields. Relevant to the issue of equity, study of graduate experience in science and technology training among traditionally disadvantaged groups is also needed. It can inform decisionmaking regarding resources and incentives for encouraging science/engineering studies among disadvantaged groups.

Again, with its rich data on student background, family and community, earlier stages of schooling, and college education, plus the to-be-collected data on graduate training, NELS:88 will be a promising source for research on graduate education and the career paths of scientists and engineers.

D. Motivation, Aspiration, Self-Concept, and Other Psychosocial Issues

Social psychological study of student motivation, aspiration, self-concept, attitudes, and perceptions has accumulated a large literature. These issues face researchers at both secondary and postsecondary levels.

1. Educational and Occupational Aspiration

Issue: Minority students' aspirations and the reality of their educational and occupational opportunities

Student aspirations are an important determinant of postsecondary educational attainment and occupational success for under-represented groups. Among minority students, aspirations can be examined against the reality (their academic performance and lifestyle, access to information about opportunities for higher education, and their parents' expectations and planning). How do students' "realistic" aspirations affect postsecondary outcomes? Some incongruency is often found among African American students. They aim high but have little access to information and opportunities and are poorly prepared in academic work.

Relevant literature

Braddock, J.H.II et al. (1991). Bouncing back: Sports and academic resilience among African-American males. Education and Urban Society, 24(1), 113-31.

Catsambis, S., Mulkey, L., Crain, R. & Ascevedo, M. (1994). Gender and middle-school tracking effects on student attitudes, engagement, aspirations and locus of control. Paper presented at the meeting of the American Sociological Association, Los Angeles, CA, August 1994.

Conway, K.P. (1994). Parent involvement, gender and race/ethnicity: The relationship of student and self-concept. Unpublished doctoral dissertation. Hofstra University.

Green, P., Baldridge, J.G., Zahs, D. & Ingels, S.J. (1993). High school seniors look to the future, 1972 and 1992. Statistics in brief. NCES 93-473. Washington, DC: NCES.

Green, P.J., Dugoni, B.L., Ingels, S.J. & Camburn, E. (1992). A Profile of the American high school senior in 1992. NCES 94-384. Washington, DC: NCES.

Ingels, S.J., Plank, S.B., Schneider, B. & Scott, L.A. (1994). A Profile of the American high school sophomore in 1990. Washington, DC: NCES.

Smith-Maddox, R.P. (1994) African American eighth graders: Factors affecting their educational and occupational aspirations. Unpublished doctoral dissertation. Brandeis University.

Solorzano, D.G. (1992). An Exploratory analysis of the effects of race, class, and gender on student and parent mobility aspirations. Journal of Negro Education, 61(1), 30-44.

Issue: Science/math learning aspiration and achievement under peer influence in different school/community contexts

This issue considers how children with the same interests influence each other in science and math learning and how school and family environments foster positive peer influences on science and math learning. Specifically, what is the impact of peer influence relative to the impact of school

programs and classroom instruction? How does this kind of peer influence differ across gender and race/ethnicity groups? How does the peer influence interact with school programs and school climate in affecting math/science learning? What are the effective approaches by which school and teachers can mediate the effect of peer culture? What is the role of family and community in encouraging students to study math and science? Some integrated theoretical models (e.g., educational productivity model) are available to guide systematic research on both the cognitive and psychosocial effects of learning.

NELS:88 provides relevant data for such studies, including peer values regarding academic learning in general and specific subjects; communication with peers, teachers, parents, and other significant others; and frequency and time spent with friends. Relating these data with data on students' likings, aspirations, and learning processes on math and science, as well as the influences of parents, teachers, and school programs, it is feasible to operationalize research on peer influence.

Relevant literature

Catsambis, S. (1994) The path to math: Gender and racial-ethnic differences in mathematics participation from middle school to high school. Sociology of Education, 67(3), 199-215.

Horn, L. & Hafner, A. (1992). A Profile of American eighth-grade mathematics and science instruction. NELS:88. Statistical analysis report. NCES 92-486. Washington, DC: NCES.

Peng, S.S. & Hill, S.T. (1994). Characteristics and educational experiences of high-achieving minority secondary students in science and mathematics. Journal of Women and Minorities in Science and Engineering, 1, 89-104.

Peng, S.S., Wright, D. & Hill, S.T. (1995). Understanding racial-ethnic differences in secondary school science and mathematics achievement. Research and development report. NCES 95-710. Washington, DC: NCES.

Pittman, S.G. (1992). The Effect of educational productivity factors on eighth-grade interest and achievement in science. Unpublished doctoral dissertation. University of Illinois at Chicago.

Snow, R.E. & Ennis, M.M. (1994). Correlates of high mathematical ability in a national sample of eighth graders. In C.P. Benbow & D. Lubinski (Eds.), From Psychometrics to giftedness. Baltimore, MD: Johns Hopkins University Press.

2. Self-Concept, Locus-of-Control, and Social Behavior

Issue: Student self-concept, self-esteem, and locus-of-control

Theoretically, self-esteem and related social psychological concepts are useful in explaining academic achievement and educational attainment. Many questions, however, remain unanswered regarding how self-concept evolves and how the changes affect learning and behavior. The process in which children modify their conception of self over the years of schooling is not clear. Research needs to pinpoint important factors that contribute to development of positive self-concept. Racial/ethnic identity, school environment, peer recognition, and teachers' assessment are conventional predictors of self-esteem. Academic performance and self-esteem, on the other hand, may be related to one another in complicated ways. Black children, for example, were found to have high self-esteem that is relatively independent of academic achievement.

NELS:88 data cover major psychosocial constructs relevant to self (e.g., self-esteem, self-direction, self-concept, self-confidence, fatalism, locus-of-control) with consistent measures of these concepts in base-year and each followup. With data on student background and school experience, NELS:88 makes it possible to study complicated relationships between self-concept and education experience and outcomes.

Relevant literature

Collins, M.A. (1992). School social context, self-esteem, and locus-of-control among white, black, and Hispanic youth. Unpublished doctoral dissertation. University of Maryland.

Conway, K.P. (1994). Parent involvement, gender and race/ethnicity: The relationship of student and self-concept. Unpublished doctoral dissertation. Hofstra University.

Driesler, K.J. (1993). Self-concept, locus-of-control and the home environment as predictors of reading comprehension in eighth-grade students. Unpublished doctoral dissertation. University of Tennessee.

Huang, G.G. (1992). Self-reported biliteracy and self-esteem: A study of Mexican American eighth graders. Charleston, WV: Appalachia Educational Laboratory. Education Resource and Information Center Document No. ED 356937.

Marsh, H.W. (1994). Using the National Longitudinal Study of 1988 to evaluate theoretical models of self-concept: The self-description questionnaire. Journal of Educational Psychology, 86(3), 439-56.

Issue: Substance use among high school and college students

Recent research indicates that substance use among the younger population, particularly marijuana use among high school and college students has been increasing since 1990, after a decline in the 1980s. The possible new rising trend of drug abuse among adolescent and young adults is alerting policymakers and practitioners to come up with new solutions. Understanding the causes of drug use, thus, is critical for policymaking and program planning.

NELS:88 provides standardized measures of major classes of substance use with lifetime, annual, and monthly incidence data. The data set may be helpful for explaining, rather than describing, the behavior of substance use. Because of the large time span of its longitudinal design and dense information about school, family, and peer groups, NELS:88 is good for tracing the drug use career (initiation, gatewaying, changing pattern of use, and cessation); evaluating the impact of family, community, and school experience on the behavior; and examining the long-term consequences of drug use.

Relevant literature

Dewalt, M.W. (1992). The Relationship between youth group participation and use of tobacco and drugs. Paper presented at the meeting of the American Educational Research Association, San Francisco, CA, April 1992. Education Resource and Information Center Document No. ED 350375.

———. (1993). Using youth group participation variables and smoking to predict drug use in a national sample. Paper presented at the meeting of the American Educational Research

Association, Atlanta, April 1993. Education Resource and Information Center Document No. ED 363558.

Issue: Students' psychoemotional problems and well-being

It has been widely accepted that adolescence is a development stage difficult to the individual because of rapid physical and psychosocial growth, which is often complicated by changes in family, school, and the society. High school students experience various adjustment problems taking place both in themselves and the environment. Research should monitor the psychoemotional well-being of youth and inform practitioners and policymakers so they can come up with responsive services.

The NELS:88 longitudinal data on psychosocial and emotional development and relevant services received offer an opportunity for such research.

Relevant literature

Lee, V.E., Burkam, D.T., Zimiles, H. & Ladewski, B. (1994). Family structure and its effect on behavioral and emotional problems in young adolescents. Journal of Research on Adolescence, 4(3), 405-437.

Mulkeen, P. (1992). Adolescent activities in school and the community: Patterns of participation. Unpublished doctoral dissertation. Pennsylvania State University.

Sayler, M.F. & Brookshire, W.K. (1993). Social, emotional, and behavioral adjustment of accelerated students, students in gifted classes, and regular students in eighth grade. Gifted Child Quarterly, 37(4), 150-154.

Weishew, N.L. & Peng, S.S. (1993). Variables predicting students' problem behaviors. Journal of Educational Research, 87(1), 5-17.

E. Methodological Research

Methodological/technical matters are always intertwined with substantive issues. We limit the methodological presentation to issues that are primarily methodological concerns and that can be addressed with the currently available data. Methodological problems that concern program improvement that cannot be attempted with the available data will be presented elsewhere.

1. Data Quality and Measurement

Issue: Data validating

Data validating is a pressing issue for improving NCES data quality. Research has found problems in data validity, problems which were caused by irregular responses or inappropriate instrument design. African American male students tend to provide irregular responses to surveys to a much greater extent than other students. Social desirability can undermine data validity. Different or conflicting views on school issues are held by students, teachers, and parents; the perceptions of low ability students and high ability students differ. The meanings of such responses should be

sorted out. Such efforts can help improve survey design within relevant theoretical or policymaking frameworks.

With its comprehensive data contents and multiple data sources (students, teachers, parents, and administrator), NELS:88 should be subject to data validation. For example, 99 percent of the teachers in the survey answered that they stressed critical thinking skills, but we know that is not the case. Checking against student responses to questions on classroom process may help figure out the instructional reality. A "convergent" approach, in which the same information is collected from different informants (the student, his/her teacher and parents, and the school administrator), would enable researchers to examine data validity. Such a data validating process can also generate information to determine the best possible sources and best possible questionnaire items on specific issues for future survey design.

Relevant literature

Dowd, K.L. et al. (1991). The NELS:88 second followup field test report. Chicago, IL: National Opinion Research Center.

Greene, H. et al. (1989). National Education Longitudinal Study of 1988 (NELS:88) first followup field test report. Chicago, IL: National Opinion Research Center.

Hamilton, L.S., Nussbaum, M., Kupermintz, H., Kerkhoven, J.I.M. & Snow, R.E. (1994). Enhancing the validity and usefulness of large-scale educational assessments II: NELS:88 science achievement. Stanford, CA: Center for Research on the Context of Secondary Teaching, Stanford University.

Ingels, S.J. et al. (1987). National Education Longitudinal Study of 1988. Field test report. Chicago, IL: National Opinion Research Center.

Kaufman, P. & Rasinski, K.A. (1991). Quality of the responses of eighth-grade students in NELS:88-National Education Longitudinal Study of 1988. Technical report. NCES 91-487. Washington, DC: NCES.

Kupermintz, H., Ennis, M.M., Hamilton, L.S., Talbert, J.E. & Snow, R.E. (1994). Enhancing the validity and usefulness of large-scale educational assessment I: NELS:88 mathematics achievement. Stanford, CA: Center for Research on the Context of Secondary Teaching, Stanford University.

McGrew, K.S. et al. (1994). Matching information in national data collection programs to a model of school completion outcomes and indicators. Technical Report 7. Minnesota University, Minneapolis Coll. of Education: National Association of State Directors of Special Education. Alexandria, VA. National Center on Educational Outcomes. Minneapolis, MN: Saint Cloud State University, MN.

Pollack, J.M. (1990). Some issues in free response testing. Princeton, NJ: Educational Testing Service.

Rasinski, K.A. (1991). How seriously should we take children's reports about the seriousness of problems in their schools? A psychological analysis of the validity of children's survey responses. Paper presented at the meeting of the American Association for Public Opinion Research, St. Petersburg, FL, May 1989.

Issue: Test indicator scales with the multilevel structural equation technique

The indicator systems can be studied with multilevel structural equation modeling (with packages such as LISREL or PRE LIS). This approach, combining the strength of multilevel regression and path analysis techniques, promises to model student achievement by taking into account the fact that differences in policies and practices occur at the school and classroom levels. The model can be used to validate the indicators and to study the effects of changes in policy-related variables on achievement. Ongoing research has explored science achievement modeling and the related indicator system.

These studies examine the existing items in NELS:88 achievement scales to see how they differentially reflect the underlying concepts and how they are related to policy-relevant variables. Such studies can help refine the indicator systems by making them more sensitive to policy variation while increasing survey efficiency. Besides cognitive tests, other indicator systems, such as those for school climate, student self-esteem, parental involvement, and academic motivation can be considered. NELS:88, HS&B, NLS-72 contain such multi-item scales.

PRE LIS or other sophisticated software is needed to examine both construct validity and reliability. PRE LIS does confirmative factoring based on some theoretical constructs. Examining the factor correlation matrix resulting from LISREL can help eliminate some trivial items that load little on the conceptual construct. The approach is a solid way to test a hypothesis since some theoretic presupposition was imposed upon the data.

Caution: The small number of students nested in each classroom (which in turn is nested in each school) in the NELS:88 sampling design makes it impossible to deal with between-classroom differences. Another problem is related to the theoretical basis of such modeling. We assume a common factor structure across all schools in considering school policies and school climate. But, in reality, the structure can vary across schools. There may be different underlying factors for the notion of school climate (not just differences in the magnitude of factor loadings of items) depending on different school types (e.g., private versus public, disadvantaged versus advantaged). To allow the school level variables to vary and to investigate the implications of such school-level variance, we may want to do separate multilevel factor analysis with different types (groups) of schools. This way we can see different climate factor structures in different types of schools. Future research should consider this important issue.

Issue: School climate measures and other multiple-item indicator scales

The existing school climate measures have little predictive validity (i.e., they do not predict outcomes well). It is not that the idea of school climate is unimportant; rather, it is that measuring school climate is a problem. The composite score is not useful because different people perceive the question differently. What is the difference really meant by respondents when they say "disagree" in contrast to "agree"? A study shows that school climate variance occurs mostly within school; i.e., different views are held by teachers within the same school, not across schools. It is important to have both accurate measurement and an appropriate analytic approach at the school and individual levels.

In addition to school climate measures, NELS:88 also contains other indicator scales with multiple items, such as that of self-concept and opportunity to learn, which also need study. These scales can be examined with NELS:88 data. The results can be compared with that from other data sets that provide indicators for the same constructs (e.g., NAEP, SASS).

Relevant literature

Bobbitt, S.A. (1993). Using opportunity to learn items in elementary and secondary national surveys. Paper presented at the meeting of the American Educational Research Association, Atlanta, April 1993. Education Resource and Information Center Document No. ED 363667.

Marsh, H.W. (1994). Using the National Longitudinal Study of 1988 to evaluate theoretical models of self-concept: The self-description questionnaire. Journal of Educational Psychology, 86(3), 439-456.

Issue: Missing data, nonresponse analysis, and imputation procedures

Missing data caused by nonresponse are a thorny problem facing survey researchers. Nonresponse bias, conceived as a function of the nonresponse rates and the difference between respondents and nonrespondents, can cause misleading estimates if not handled appropriately. Unit nonresponse and item nonresponse, with different causes and impact on the survey results, are not consistently defined nor adequately examined in NCES projects. Nonresponse analysis and imputation procedures can help improve analysis of the existing data. Further, information about nonrespondents and the pattern wherein nonresponses happen can shed light on survey program improvement.

NELS:88's weighting procedures include adjustment for unit nonresponse. Item nonresponse, however, has not been compensated (with some exceptions). Studies are needed to systematically examine the nonresponse patterns and the bias to data analysis.

To examine unit nonresponses, one can use descriptive analysis of the available information about nonrespondents and respondents, linking the differences to key variables of respondent background if possible. For item nonresponse research, descriptive analysis of items can be done to see how item nonresponse relates to respondent characteristics, the content of the item (e.g., sensitivity and difficulty), and the questionnaire structure (e.g., sequencing of items, skip patterns, and the number of items in the questionnaire). Descriptive analysis of item nonresponse concerning specific substantive issues can be done with a similar approach.

Relevant literature

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Issue: Psychometric study of achievement gains in NELS:88 and HS&B

Psychometric research on comparability of achievement measures of different surveys is needed to set the ground for cross-cohort studies. Meaningful intercohort comparison is possible only when the measures for different cohorts are comparable. Analysis of data on sophomore to senior year gains with NELS:88 and HS&B data will contribute to this research.

NELS:88 includes a number of mathematics test items identical to those in HS&B. These items are sufficient for a common item equating study that may develop the same scale for the HS&B math test as that in NELS:88. Researchers could fix the common items from the two tests at the NELS:88 item parameter values and then put the remaining HS&B items on that scale. A multiple group Bayesian estimation procedure may be used for such a study.

Relevant Literature

Hamilton, L.S. et al. (1994). Enhancing the validity and usefulness of large-scale educational assessments: II. NELS:88 Science Achievement. Paper presented at the Annual Meeting of American Educational Research Association, New Orleans, LA, April 1994. Center for Research on the Context of Secondary School Teaching.

Kupermintz, H. et al. (1994). Enhancing the validity and usefulness of large-scale educational assessments: NELS:88 mathematics achievement. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA, April 1994. Center for Research on the Context of Secondary School Teaching.

2. Research on Sampling Problems

Issue: Development of school sample weights

The NELS:88 school sample is not nationally representative (except for the base year). For example, urban schools and disadvantaged schools with special groups (e.g., Hispanic students) were probably undersampled. This presents difficulties for studying school factors, which are essential in institutional and policy research. Investigation is needed to develop school weights to make NELS:88 school data representative of the nationwide high school population. Students' transition from middle school to high school may complicate the sample. Some schools in the sample have very few students after the base year. Study is needed to tackle the difficulties

arising from the small size of within-school student samples. Post-stratification adjustment seems to be an option for such a study.

Relevant literature

Spencer, B.D. & Foran, W. (1991). Sampling probabilities for aggregations, with application to NELS:88 and other educational longitudinal surveys. Journal of Educational Statistics, 16(1), 21-33.

Issue: Excluded students from NELS:88 sample and related problems

Some students were excluded from the NELS:88 sample because their disabilities or because language barriers made it infeasible to survey them with questionnaires and cognitive tests. Such exclusion has implications for sample representativeness, national estimation, and interpretation in policy analysis. The excluded students represent groups that face high risk of school failure and that need special services. It is necessary to assess the impact of the exclusion on the survey results in order to draw valid conclusions on pertinent policy issues (e.g., special education, LEP programs, and dropout). For example, on variables relevant to policy issues, descriptive analysis can be used to compare excluded students (the base-year ineligible students and the two waves of freshened students) and sampled students. Interpretative analysis with state or local data sources in examining the results from NELS:88 may help verify the bias resulting from the exclusion.

Relevant literature

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3. Analytic Techniques

Issue: Level of methodological sophistication necessary for valid results

What level of analytic sophistication is necessary for generating good data? What is the essential way to analyze data? This issue concerns the cost-efficiency of data analysis and has implications for increasing data utilization.

NELS:88 affords a laboratory to test the essence of sophistication of analytic techniques. Comparing results from analyses with different levels of sophistication but which cover the same data may help address the issues. For example, contrasting the results from LISREL with the SAS maximum likelihood estimate procedure (MLE) may be helpful for determining more efficient procedures in data analysis. Or, one can compare results from hierarchical regression on student data nested in schools with that from conventional multiple regression (with sampling bias correction procedures) to identify what kind of differences occur in the results. Factors (e.g., data measurement, scaling, range) that alter sensitivity of the outcomes to analytic techniques can be considered.

Issue: Using sampling weights in multilevel analysis and structural equation modeling

Questions arise as to how to apply sampling weights to complicated analysis with multilevel regression analysis. In addition, the problem of normality assumption with multistage sampling makes the LISREL model questionable. Estimates of variance with a multistage sampling design require sampling bias adjustment. NELS:88 data can be used for such exploration, for example, using PRE LIS to test the difference in results from procedures with sampling error correction versus procedures without such correction.

Issue: Application of Hierarchical Linear Modeling (HLM)

HLM is increasingly frequently used in research with NELS:88 data. Problems or complications involved in using the procedure (e.g., centered score versus raw score for predictor variables; instability of the nesting of students in schools) should be studied and the results documented. Further, the ways to present HLM results in the literature are not consistent, and some do not make sense. Efforts are needed to develop better ways to present HLM results (e.g., fixed effects and random effects at two or more levels) to make the results more informative. For example, it is sensible to present more "predictions"—not just goodness of fit—and to interpret diagnostics in order to attain validation of the model. Confidence interval estimates should be presented in addition to effect size (coefficients). Again, the NELS:88 design and data make it interesting to conduct such studies.

Relevant literature

Burton, B. (1993). Some observations on the effect of centering on the results obtained from hierarchical linear modeling. Paper presented at the meeting of the American Educational Research Association, Atlanta, April 1993. Education Resource and Information Center Document No. ED 363656.

Raudenbush, S. W. (1993). A Cross random effects model for unbalanced data with applications in cross-sectional and longitudinal research. Journal of Educational Statistics, 18(4), 321-349.

Issue: Design effects and their applications

The use of estimated design effects is still an option for handling sampling bias in multistage sample data. It supplements the multilevel regression technique (if the nested subsample size is too small) and the formal sampling bias correction (e.g., if software packages such as SUDAAN are not available). However, study is needed to clarify the conditions under which using design effects for computing variance estimates and hypothesis testing can produce reasonably good results, as compared with other approaches to correcting multistage sampling bias.

Issue: Prediction models of academic performance

Prediction models of performance may be helpful for both advancing analytic techniques and learning about education policies. If we have test scores for the same student at the different grade levels (e.g., grades 8-12), we can predict 12th grade scores based on the initial scores and a growth projectory within the time frame, and then identify the difference between the predicted 12th grade score and the actual 12th grade score. Though the predicted model may be a flat growth curve (which is not desirable), one can manipulate ("switch" on or off) certain variables either at school level (probably more policy-relevant) or individual level to see how the flat curve can be changed into a slope. Latent variables in the model are useful for such manipulation. The results can identify factors that are important in improving academic achievement growth. Such studies are underway [by the National Opinion Research Center (NORC) and some doctoral dissertations work with the growth curve technique] and the results probably will be available soon.

This approach is consistent with a generic way of looking at the data and policy issues: if a correlation is found, then researchers can go further to check at the experimental level to see how it works to improve outcomes.

Issue: Methods for intercohort analysis

Comparative analysis with longitudinal survey data collected from different cohorts across decades is highly valuable for policy studies. Major historical changes in education legislation and policies can be examined in connection to learning, behavior, and academic performance among

students of different cohorts. The approach can be used for different comparisons. For example, at the student level, time-lag, fixed time, and longitudinal comparative analysis can be performed. The analysis involves technical difficulties such as combining data sets, handling different attrition rates, developing analytic strategies that appropriately compare statistics resulting from different surveys; establishing comparability of measurements used in different surveys, and interpreting subtle inconsistency of seemingly similar items across data sets.

Methodological research and technical support is needed to develop sound strategies for intercohort analysis. NELS:88, HS&B, and NLS-72, with data that cover three decades of education changes in the U.S., offer abundant opportunities for exploring the issue. Further, one can compare statistical results from intercohort analysis to other information sources about historical changes in American education, including interpretive analysis—as in contrast to statistical analysis—of cross generation changes in broader literature of social sciences.

Relevant literature

Ingels, S.J. et al. (1994). Second followup student user's manual. (Appendices D and E). Washington, DC: NCES.

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McMillen, M.M., Hausken, E.G., Kaufman, P., Ingels, S.J., Dowd, K.L., Frankel, M.R. & Qian, J. (1993). Dropping out of school: 1982 and 1992. Issue brief. NCES 93-901. Washington, DC: NCES.

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Appendix A NELS:88 Glossary*

Base-year ineligible students - The NELS:88 Base-year Survey excluded students who were in the sample but could not complete the questionnaire due to language or physical/mental disabilities. Among this group, those who became eligible at the time of the first followup were located and surveyed by the NELS:88 Base-year Ineligible Study.

Ceiling effect - The result of a cognitive test having insufficient numbers of the more difficult items. In a longitudinal study, ceiling effects in the followup testings can cause change scores to be artificially constrained for high ability examinees. To reduce such bias, we can match test item difficulty to a person's ability level; this increases reliability at the extremes of the score distribution where it is most needed for studies of longitudinal change. The NELS:88 first and second followups used what was called "proficiency level tests" to minimize ceiling effects and floor effects (see also Floor effect). The multilevel tests are "adaptive" to the ability level of the students as they are assigned based on prior test performance. The results not only reduce the bias of the estimated score gains, but also allow more meaningful comparisons by linking score gains to learning and instruction.

Centered score - A data transformation procedure used in hierarchical data analysis (e.g., with student- and school-level data); it typically involves subtracting the mean (either grand mean or school means) from the raw value of a student-level predictor variable. The procedure may make estimates more stable and intercepts more meaningful in interpretation.

Cohort - A group of individuals who have a statistical characteristic in common, for example year of birth or grade in school or year of high school graduation. NELS:88 includes three overlapping but distinct nationally-representative grade cohorts: 1987-88 eighth graders, 1989-90 high school sophomores, and 1991-92 high school seniors.

Composite - A derived variable that is created as a function of one or more variables for which data was directly collected (e.g., socioeconomic status is developed from five parent variables in NELS:88).

Cross-sectional analysis - An analysis that focuses on events and statuses at a single point in time. For example, a cross-sectional analysis examines educational attainment of students at a particular stage of schooling (e.g., eighth grade, tenth grade, or twelfth grade). NELS:88 is a longitudinal survey but with its sample freshening, three representative cross-sections are available for cross-sectional analysis (see also Freshening and Longitudinal analysis).

Design effects - A measure of the efficiency of a sample. The design effect is the sampling variance of an estimate divided by the sampling variance of the estimate that would have

* This glossary covers technical terms used in this publication. Information was largely drawn from the Glossary in the *Second Followup: Student Component Data File User's Manual* (Ingels et al. 1994). Additional definitions of statistic terms were collected from other sources.

occurred if a sample of the same size of ultimate units had been selected using simple random sampling.

ECB (electronic codebook) - A menu-driven system that allows users to perform functions such as the following: search a list of database variables by key words or variable names/labels; display percentages for each variable in the database; display question text for each variable in the database; select variables for analysis; generate SAS or SPSS program code/command statements for constructing a system file; and generate a codebook of the selected variables. An ECB with NELS:88 data is available on CD-ROM.

Excluded students - See Base-year ineligible students.

Factor analysis - A branch of multivariate analysis with applications chiefly in the social sciences. It resolves a set of variables (say p) linearly in terms of (usually) a much smaller number (m) of categories or "factors." This resolution is accomplished by the analysis of pairwise correlations among the variables. A satisfactory solution yields factors which contain all the essential information of the original set of variables and thus attains scientific parsimony or economy of description. One such model is mathematically expressed by

$$\xi = \sum_{j=1}^{m} \grave{A}ijfj + bisi + ciei(i=1,...p)$$

where x_i is the observed variate, f_j is the jth factor, s_i a factor specific to the ith variate, and e_i is an error variate, and a, b, and c's are structural constants of the model.

Flag - A distinctive special outcome of a variable (e.g., dropout in student status).

Floor effect - The result of a cognitive test being too difficult for a large number of the examinees, causing the low ability examinees to receive chance scores on the first testing, and on subsequent testings if the test remains too difficult. Floor effects make the test unable to discriminate among low ability students or to detect their score gains over time. NELS:88 used proficiency tests to reduce floor effects (see also Proficiency test).

Freshening - A NELS:88 sampling procedure by which high school sophomores who were not in the eighth grade in the U.S. in 1988 were added in the first followup. This process was repeated in the second followup, adding high school seniors who were not in the eighth grade in the U.S. four years before, and not in the tenth grade in the U.S. two years before. This freshening ensured that the student sample would be representative of the 1992 senior class by allowing 1992 seniors who did not have a chance for selection into the base year (or the first followup) sample to have some probability of 1992 selection.

Hierarchical Linear Model (HLM) - In the social sciences where data structures are often hierarchical in nature in the sense that variables describe individuals while individuals are grouped into larger units. And there are other variables describing these higher order units. Hierarchical linear models have been developed for analyzing such data using regression methods. This class of models takes the hierarchical structure into account and make it

possible to incorporate variables from all levels in the regression analysis. In an education system, students are members of classes, and classes are grouped within schools. HLM can be used to analyze such relationships such that, among other advantages, coefficients in a linear model of a process occurring at one level of a hierarchical system can be viewed as variables of interest that are functions of characteristics of units at another level.

Imputation - A procedure whereby missing values in a questionnaire (due to item nonresponse) are filled in by a substitute value like the mean or obtained from a similar unit in the same survey (hot deck) or a previous survey (cold deck) or estimated from other variables (regression methods).

Ineligible students - see Base-year ineligible students.

Intercohort analysis - Analysis involving more than one cohort. For example, comparisons made between NELS:88, HS&B, and NLS-72. Different strategies can be used: (a) time-lag comparison, for example, comparing NELS:88 data as the third in a series of repeated cross-sections of twelfth graders, or comparing changes of the NELS:88 cohort in a time span of specified years with changes of HS&B and NLS-72 cohorts between the same time span; (b) fixed-time comparison, in which groups from different studies are compared to each other at different ages but at the same point in time (e.g., comparing the 1986 data of senior cohorts of NLS-72 and HS&B, at age of 32 and 24 respectively); and (c) longitudinal comparison by modeling the history of the age/grade cohorts.

Longitudinal analysis - Also called panel design, in which similar measurements—of the same sample of individuals, institutions, or other unit of analysis—are taken at multiple time points. NELS:88 employs a longitudinal design that follows the same student over time, thus permitting longitudinal analysis of student-level change (see also Cross-sectional analysis).

Multilevel analysis - see HLM (hierarchical linear model).

Multilevel factor analysis - Use of factor analysis at different levels in a hierarchical situation (see factor analysis).

Multilevel path analysis - Use of path analysis at different levels in a hierarchical situation (see path analysis).

Multilevel structural equation - Use of structural equation models at different levels in a hierarchical situation (see structural equation models)

Nonresponse bias - Error in estimation caused by (a) the proportion of surveyed persons who did not provide response to the questionnaire or an item and (b) the difference between respondents and nonrespondents in the population.

Path analysis - Study and analysis of causal relations in sociological and statistical research whose purpose is to examine and test alternative hypotheses or alternative independent variables and to help establish causal connection and inference. In multiple regression, each

predictor variable has a direct effect on the response variable. Sometimes the predictor variable affects the response variable not only directly but also indirectly through one or more intervening variables. Path analysis is a technique for analyzing this kind causal analysis and builds on ordinary multiple regression. H. Blalock first examined path analysis in detail in his book *Causal Inference in Nonexperimental Research* (North Carolina: North Carolina Press, 1961).

Post-stratification adjustment - A weight adjustment that forces survey estimates to match independent population totals within selected poststrata (adjustment cells).

Proficiency test - A multilevel test with differential difficulty levels matching examinees' ability level determined by prior test performance. The results of such tests reduce ceiling and floor effects bias on score gains (see also Ceiling effect and Floor effect).

Stratified sampling design - A sampling design which stratifies the population of interest into a number of mutually exclusive strata or subpopulations (usually homogeneous) and then draws simple random samples from each of the strata formed.

Structural equation model - An expression which is usually employed to denote a mathematical relation among variables entering into the specification of a model and hence expressing its structure. In statistics and economics the variables are frequently stochastic in character, and the term has been used to differentiate between such relations and those of a functional kind in the ordinary mathematical sense. A distinction is sometimes made between forecast models and structural models. The former does not aim at describing the underlying phenomenon being studied but rather try to predict outcomes while the latter is more focused on describing the process that produces the phenomenon. In path analysis, a model without feedback loops and with uncorrelated errors (between equations and within equations) is called a recursive model. Structural equation model is a larger class that includes all recursive models as well as some nonrecursive models.

Weights - A variable that is used to weight sample responses to population totals (e.g., the 24,599 base-year students represent 3,000,000 eighth graders nation-wide).

Appendix B Suggestions for Analyzing NELS:88 Data

Working with Composite Variables

All NELS:88 student data files, Base-Year (BY), First Followup (F1), Second Followup (F2), and Third Followup (F3), include both basic demographic composites, such as gender, race/ethnicity, SES, and school level composites, such as school enrollment and school sector type (i.e., public, Catholic, nonsectarian private, and other religious schools). An understanding of which version of a composite variable to select and use is essential to constructing a good working data file (the first time around) and performing sound analyses. For example, should the race/ethnicity composite from the BY student data file or the F1 student data file or the F2 student data file be selected?

When constructing a working data file with composites, the researcher should follow two rules for selecting composites. First, **with one exception, the most appropriate student file from which to select composites is the student file from the most recent round (and recent file) of NELS:88 in which such composites appear**. While some variables, such as race/ethnicity and gender, should in theory remain constant for individuals over time, in practice they may change if new information which improves upon the old is collected. Thus, select composites once and select them from the student data file from the most recent round (and recent file) of NELS:88.

There is one exception to the above rule. When the analysis population is the eighth grade cross-sectional cohort, SAMPLE SIZE=24,599, select composites from the BY student data file. In this situation the composites that appear on the BY student data file should be selected because they cover the full BY cross-sectional sample of 24,599, whereas, owing to student subsampling in the F1, the composites that appear on the F1 and the F2 student data files cover only BY sample members retained in the study, and not all 24,599 originally surveyed eighth graders.

REFERENCES

Second Followup Student's User's Manual (section IV; appendix H) and *Base-year Student Component Data File User's Manual* (section 4.4)

Subgroup Analyses

In addition to supporting multiple levels of analyses, NELS:88 is designed to support examination of specific policy-relevant subgroups. One such subgroup is dropouts. For the NELS:88 Base-year to First Followup longitudinal cohort, nearly 6.1 percent (does not include base-year ineligibles) had dropped out of school by the spring of 1990; and, for the First Followup sophomore longitudinal cohort, a similar 6.2 percent dropped out of school between the spring of 1990 and the spring of 1992. NELS:88 is also designed to produce estimates for specific racial-ethnic subgroups. Private school students, Hispanics and Asians were selected at a higher than normal rate in the base year and have been disproportionately retained in the study.

REFERENCES

Second Followup Student Component Data File User's Manual: Section 3.4.1—Bias Caused by Undercoverage of Special Populations, Appendix H—NELS:88 Student Data Weights, Flags, and Composite Variables (F2), and Appendix D—Conducting Trend Analyses of HS&B and NELS:88 Dropouts

Use of Design Weights

Sample Design. The NELS:88 survey used a two-stage stratified, clustered sample design. NELS:88 students were selected in the base year using a two-stage probability sample with schools as the first-stage units and students within schools as the second-stage units. Certain groups (for example, Asian and Hispanic students, private school students) were disproportionately selected, to ensure a large enough analysis sample for these subgroups. A subsample of base year (1988) eighth graders was re-surveyed in 1990 and 1992. (In the subsampling process, dropouts were retained with certainty, while Hispanics, Asians, and American Indians were disproportionately retained.) The sample was "freshened" at both of these times. That is, some individuals were added to the sample who were 1990 sophomores or 1992 seniors but who were not eighth graders in the spring term of 1988 and thus had no chance of selection into the base year. Because of sample freshening, NELS:88 constitutes a nationally representative sample of spring term *1990 sophomores* and spring term *1992 seniors*, as well as 1988 eighth graders.

Weighting. Weighting is used in sample surveys to accomplish a number of objectives:

- expand counts from sample data to full population levels;
- adjust for differential selection probabilities; and
- adjust for differential response rates.

Because many populations of interest can be analyzed with NELS:88 data (base-year schools, 1988 eighth graders two and four years later, 1990 sophomores, 1992 seniors, parents of students and dropouts in 1992, and so on), 12 separate "final" (or nonresponse-adjusted) weights have been produced. These weights appear on the data set—two for the base year, four for the first followup, and six for the second followup. Guidance on using the weights is provided below.

Weights. Unweighted frequencies (and percents) reflect the NELS:88 sample; weighted frequencies (and percents) reflect the national or regional population estimate that is derived from the sample. For example, there are 1,032 schools represented in the NELS:88 base-year school file. This sample of schools represents 38,774 schools with eighth grades in the 1987-88 school year. The number of schools in the population that are represented by a given NELS:88 participating sample school is variable—specifically, it varies from a minimum of 1.5 schools to a maximum of 387.3, with a mean of 37.5. Because of this variability in the weights, weighted and unweighted percentages will differ; true population estimates can only be produced through use of the appropriate weights. For example, if you want to examine the

proportion of American schools with eighth grades in 1988 that offered an academic honor society available to eighth graders, you will find that unweighted and weighted proportions would differ in the following way:

BYSC46A	Academic Honor Society Available to Eighth Grader		
	Unweighted Frequency	Unweighted Percent	Weighted Percent
Yes	579	55.9	43.0
No	456	44.1	57.0

In other words, 56 percent of the NELS:88 school sample, but 43 percent of the population of 38,774 schools with eighth grades, have academic honor societies available to eighth graders.

Weighted estimates from NELS:88 should approximate estimates from other national sources, within the combined sampling error of the two sources. (We say "approximate" because sampling variance is not the only possible source of measurement error; estimates can be biased by nonresponse, or by errors in reporting, data collection, or data processing). Use of external sources (and the NELS:88 codebook as well) as a benchmark may thus provide a check on whether the analyst is using data correctly.

For several reasons, weighted estimates for rare populations may lack precision. For example, NELS:88 data permits the analyst to examine the educational situation of Japanese-Americans attending suburban schools in the southern region. Because of small sample sizes, sampling error will be comparatively large. Moreover, while nonresponse adjustments in the weights compensate for broad categories of nonrespondents, including nonresponding Asians, it is not possible to adjust the weights for all factors that may be associated with nonresponse. Differential response between Asian subgroups, between urban and suburban Asians, or between Asians in different regions, is not taken into account in the generation of final weights, and may bias estimates for certain subgroups. **Hence rare populations in NELS:88 are not guaranteed to produce precise population estimates**.

Standard Errors. Standard errors are a measure of sampling variability in survey results; the standard error is an estimate of the expected difference between a statistic from a particular sample and the corresponding population value. The standard error of measurement is critical to determining the statistical significance of statistical inferences and interpretations. Because the NELS:88 sample design involved stratification, disproportionate sampling of certain strata, and clustered (i.e., multi-stage) probability sampling, the resulting statistics are more variable than they would have been had they been based on data from a simple random sample of the same size.

Popular statistical analysis packages such as SPSS or SAS do not calculate standard errors that take into account complex sample designs. Standard errors that do take into account a complex design such as that of NELS:88 will generally be higher than standard errors calculated under the assumptions of simple random sampling. Several procedures are available

for estimating the variance or sampling errors for complex samples. Procedures such as Taylor series approximations, Balanced Repeated Replication (BRR), and Jackknife Repeated Replication (JRR) produce similar results. Given the structure of the NELS:88 database, users are likely to find the Taylor series procedure the most convenient means to calculate standard errors. Software available for producing Taylor Series standard errors include C-Tab (available from NCES), SUDAAN, and SUPER CARP, among other variance estimation programs.

Alternatively, the design effect can be used to quantify the impact of departures from simple random sampling on the precision of sample estimates, and can serve as an adjustment factor for variances or standard errors calculated in accordance with the assumption of a simple random sample. For any statistical estimator (for example, a mean or a proportion), the design effect (DEFF) is the ratio of the estimate of the variance of a statistic derived from consideration of the sample design to that obtained from the formula for simple random samples. Because in many cases it is more useful to work with standard errors than with variances, the square root of the design effect (also called the root design effect, and designated as DEFT) is also useful. The root design effect expresses the relation between the actual standard error of an estimate and the standard error of the corresponding estimate from a simple random sample. A detailed account of design effects is provided in the NELS:88 user manuals and the sample design and final technical reports.

Selecting the Correct Weight. Owing to the complexity of the NELS:88 sample design, weighted data must be used to ensure accurate estimation and inference. In many cases, weights must be used with a particular flag (together with weight) in order to analyze the sample for a particular target population. The following nonresponse-adjusted weights appear on the data files:

Base Year

BYQWT. Use this weight for cross-sectional analysis of 1988 eighth graders when student is the unit of analysis.

BYADMWT. Use this weight for cross-sectional analysis of 1988 schools attended by eighth graders when school is the unit of analysis.

First Followup

F1QWT. Use this weight for cross-sectional analysis of NELS:88 sample members in 1990 when interested in making inferences about the population of tenth graders.

F1PNLWT. Use this weight to analyze 1988 and 1990 data in the examination of 1988 eighth graders two years later.

F1DQAJWT. Use this weight when analyzing dropout questionnaire items that were not included in the abbreviated version of the dropout questionnaire. (See the 1990 dropout user manual for details on use of F1DQAJWT and F1DPAJWT).

F1DPAJWT. This is the 1988-90 panel version of F1DQAJWT, suitable for use when both base-year and first followup data will be used in analysis.

Second Followup

F2QWT. Use this weight for cross-sectional analysis of NELS:88 sample members in 1992 when interested in making inferences about the population of twelfth graders.

F2F1PNWT. Use this weight for producing weighted student panel statistics when both first followup and second followup data are employed in analysis (for example, to measure changes in the 1990 sophomore cohort two years later).

F2PNLWT. Use for producing weighted student panel statistics when all three waves (survey base-year through second followup) are included in the analysis.

F2CXTWT. Use this weight for analyzing 1992 teacher and school administrator data. This cross-sectional weight applies to students who attended the schools selected for inclusion in the teacher and school administrator components and who completed a second followup questionnaire. The population was restricted to early graduates and students who were in the schools during spring data collection. This weight allows analysts to generate national statistics at student level using the teacher and school administrator data despite the bias against small cluster sizes in sample selection.

F2TRP1WT. This panel weight applies to sample members who were participants in 1988, 1990, and 1992 (all three rounds of NELS:88) and for whom transcript data are available. F2TRP1WT allows analysts to perform panel analyses using transcript data in conjunction with 1988, 1990, and 1992 test and questionnaire data.

F2TRP2WT. This panel weight applies to sample members who were participants in 1990 and 1992 (the first and second followups) and for whom transcript data are available. F2TRP2WT allows analysts to perform panel analyses using transcript data in conjunction with 1990-1992 test and questionnaire data.

F2TRSCWT. Use this weight for analysis involving high school transcript data. This cross-sectional weight applies to all early graduates, dropouts, students in sampled schools during spring data collection, and all sample members who were both ineligible for all three rounds of NELS:88 and were in the twelfth grade during the 1991-92 school year for whom a high school transcript was received.

F2PAQWT. Use this weight when analyzing 1992 parent data. This cross-sectional weight applies to all students (student level weight) for whom a parent questionnaire was collected during the second followup.

Using Weights. Table 7.1.1-1 of the first followup and second followup user's manual codebooks defines analysis samples and populations, with appropriate weights and flags. For example, for the first followup student data, four populations of interest are identified, the

number of sample members for each is specified, and weights and flags indicated, the first of which is the 1988-1990 panel—1988 eighth graders two years later. To analyze this population, the table indicates that the flag F1PANFLG should be selected, and the weight F1PNLWT employed.

Weights have not been constructed for all possible analytic purposes. In instances where there is a population of interest for which no specific weight has been produced, some existing weights may provide reasonable approximations. It was for this reason that no separate parent weight was produced in the NELS:88 base-year, and that student weights adjusted for cognitive test nonresponse have not been generated. Base-year parent—and test completion—response rates were so high relative to student questionnaire completion, that the student weight can be used for these cases with only minimal bias.

The second followup contextual (school) and parent weights exist only in a cross-sectional version. This poses a difficulty (in selecting a weight) if in longitudinal analyses, for example, you wanted to look at parent-reported changes in the home education support system between 1988 and 1992. One might employ the 1992 cross-sectional parent weights in conjunction with prior round data. However, since these weights were not produced for this purpose, **population estimates produced from them would contain biases**.

Extreme caution must be exercised when a researcher wishes to conduct a weighted analysis for which a specific weight has not been provided. In particular, the analyst must weigh how much bias will be introduced by substitution of another weight. Two checks that should be made are (1) examination of the sum of the weights to compare that sum to true population totals; (2) analysis of nonresponse bias, that is of what groups are disproportionately excluded by the weighting strategy. *The specific purpose and required degree of precision of the analysis must be taken into account.* If subgroup estimates are central to the analytic plan, it is necessary to take into account bias at the subgroup level. In instances where more than one possible weight is available, the decision as to which is best to use should be guided by a comparison of the bias inherent in each alternative. Whatever weighting strategy is used, if the amount of bias is non-trivial, adjustments may be incorporated in models that accommodate measurement error, and potential biases reported with the results.

REFERENCES

Base-year sample design report; chapter 3 of the base-year, the first followup, and the second followup student component user manuals; the forthcoming second followup sample design report.

Working with Missing Data

In working with the NELS:88 data, it is important to understand the sources of missing data. The two main types of missing data in NELS:88 are "unit" and "item" nonresponse (i.e., "unit" signifies nonresponse to the entire survey instrument; "item" signifies nonresponse to specific items on the survey instrument). For example, 1,446 sampled students and/or dropouts did not complete first followup survey instruments (unit nonresponse). For item F1S78B

(number of times respondent drank alcohol during last 12 months), an additional 2,425 students left the item blank (item nonresponse).

In the NELS:88 first followup student codebook, four codes are used to signify values that the researcher may want to declare missing for specific analyses. These are:

1. Nonrespondents & Dropouts (blank) - the respondent is either a nonrespondent or a dropout (for item F1S78B on student questionnaire, the number of nonrespondents and dropouts equaled 2,485).

2. Missing (8, 98, 998) - the respondent did not respond to a particular item or group of items (for item F1S93E, the number of missing equaled 1,495).

3. Refused (7, 97, 997) - the respondent refused to respond to a particular item or group of items (for item F1S93E, the number of refused equaled 36).

4. Legitimate skip (9, 99, 999) - a respondent's response to a previous filter question allows that respondent to skip a particular item or group of items (for item F1S78B, the number of legitimate skips equaled 366).

It is important for the analyst to realize that missing data has the potential to BIAS analyses. Nonrespondents may have different characteristics than respondents (e.g., a higher proportion of nonrespondents may be classified as low SES). It is important to compare the characteristics of the respondents in the working data file with the characteristics of both the total population and the nonrespondents who will be deleted from the analysis because of missing data.

REFERENCES

Second Followup Student User's Manual (section III-3.4; section VII-7.3)

Choosing between Cross-sectional and Longitudinal Analyses

NELS:88 data can be used descriptively, or inferentially, in multivariate models, and both cross-sectional and longitudinal analyses can be performed on the data.

NELS:88 data can be used in two distinct ways. One use is descriptive and aims at estimation—specifically, the estimation of descriptive and relational population and subgroup statistics. Such descriptive data are usually expressed as means (for example, mean gain in reading scores for various racial/ethnic groups between 1988 and 1990) or percentages (for example, the percentages of male and female 1988 eighth graders who report studying more in high school than in eighth grade) and answer questions about the size and distribution of educational phenomena or about the characteristics of students and the educational system. For example, descriptive data tell us how many students have dropped out of school, and who they are—that is, whether they are more likely to be male or female, or how much more likely high achieving students are to stay in school. But descriptive accounts, while they answer the question "how many", cannot conclusively answer the question "why". A second

way of using the data, however, can address such questions. "Why" questions involve using the data inferentially, aiming at explanatory accounts of educational processes. Inferential uses can assume either a research or an applied policy focus. Research investigations into educational processes and outcomes test hypotheses about the underlying causes of educational phenomena (i.e., What school related factors are associated with school failure?).

In a longitudinal design, a probability sample of a population is drawn at one time (for NELS:88, 1988 eighth graders) and the same individuals are measured at later times (for NELS:88, in 1990, 1992, 1994, and 1998). However, in a cross-sectional survey a different probability sample is drawn of the population at each point of time when the survey is conducted. The base year of a longitudinal survey is also, by definition, a cross-sectional survey. NELS:88 base-year data can be analyzed cross-sectionally— researchers can look at the situation of a nationally representative sample of eighth graders in 1987-88. Or NELS:88 base-year data can be analyzed longitudinally—one can look at what happens to the eighth grade cohort over time (for example, one can measure the gain in their mathematics achievement between 1988 and 1992, or who drops out of school between 1988 and 1990).

NELS:88 has a special sample freshening feature which effectively supplies two additional nationally representative cross-sections: the nation's spring 1990 sophomores and spring 1992 seniors. Hence the first and second followup data can also be analyzed either cross-sectionally or longitudinally.

Cross-sectional analysis provides a snapshot at a single point in time. Repeated cross-sectional analysis, and longitudinal analysis, permit the measurement of change over time. In terms of the sample design, change (and stability over time) can be measured in one of two ways in NELS:88:

1. At the group level, change can be measured across the successive cross-sections—eighth graders in 1988, sophomores in 1990, and seniors in 1992. In addition, NELS:88 and comparable studies (e.g., NLS-72 and HS&B) can be analyzed as repeated cross-sections (e.g. of seniors in 1972, 1980/82, and 1992) to measure trends.

2. Change can also be analyzed in individuals over time. The latter possibility—true longitudinal measurement—represents, for most purposes, the unique strength of the NELS:88 design. Following individual educational histories generally provides the best basis for drawing causal inferences about educational processes and their effects.

To analyze followup data cross-sectionally, one must carefully define the analysis sample. For example, *the eighth grade cohort in 1990* includes tenth grade students, students not in tenth grade, and dropouts, but does not include freshened tenth graders. On the other hand the *sophomore cohort in 1990* includes freshened students and all members of the eighth grade cohort who were enrolled in the tenth grade in the spring of 1990. With release of data from the second followup, three cohorts can be analyzed with the help of appropriate weights and flags: two cross-sectionally or longitudinally (eighth grade and sophomore) and one cross-sectionally only (1992 seniors).

Special Procedures for Regression and Other Multivariate Techniques

NCES longitudinal surveys are based on complex samples that use stratified cluster designs. This has an impact on the estimates of variances (i.e., standard errors) for the statistical analyses carried out on surveys such as NELS:88. Standard statistical packages such as SAS and SPSS treat data as if they were collected under a simple random sample design. There are two important aspects of the NELS:88 survey which make it different from a simple random sample design: (1) the unequal probabilities of selection (e.g., NELS:88 oversampled minorities, giving minorities a higher probability of selection than nonminorities) and (2) the clustered nature of NELS:88 designs (e.g., NELS:88 sampled schools (clusters) and then students rather than simply taking a sample of students directly). **The impact of not having a simple random sample is that the observations are not independent and the variance of an estimate is not calculated using the standard textbook formula for s^2.** A sound approach to the analysis will account for these two characteristics of the NELS:88 sample.

Recommended Statistical Procedures. The following are recommended procedures for carrying out regression and other multivariate techniques on data from complex sample surveys such as NELS:88.

1. **Preferred Procedure: Use a program designed specifically for analyzing data from complex surveys.**

SUDAAN, a program which uses a Taylor series approach and is available for the mainframe or the PC is the most widely used. Others to be considered are PCCARP (Taylor series approach, PC), and CPLX (Bob Faye's (Census Bureau) program for contingency table analysis) or VPLX (currently able to compute variances for means and proportions and being expanded by Faye to do regression and other analyses). An NCES contractor has successfully used PCCARP and SUDAAN in recent NCES reports for regression and logistic regression analysis.

2. **Alternative for Ease of Implementation: Use SAS or SPSS or other statistical package using relative weights as described in 3 below, with or without design effect adjustment (as described in 3 below) for exploratory work. When down to a few plausible models, run SUDAAN or another package designed for survey data (as in 1 above).**

This approach saves time by doing preliminary runs with a faster, easier to use package, but checks out final results building in the survey design.

3. **Third in Preference but Acceptable Procedure: Use SAS or SPSS or other statistical package with relative weights and a design effect correction to the standard error.**

This approach gives an approximate and probably conservative adjustment; i.e., there may be real differences which are not picked up. It is implemented as follows:

(a) Run the analysis using a standard statistical package which allows the use of weights. The weight to be used in the analysis is the relative weight: the final survey weight divided by the average weight for the group being analyzed:

relwti = wti/avg wt.

Using the survey weight in the analysis accounts for the oversampling of certain populations and redistributes the observations to represent the distribution in the population. Dividing by the average weight keeps the correct distribution but makes the weights add to n, the sample size for your analysis. Failure to do this would lead to huge numbers of observations, which would inflate the degrees of freedom and the significance of the test statistic.

(b) Adjust the standard error to account for the complex nature of the design. To do this, multiply the standard error by the square root of the design effect for the dependent variable for the total group being analyzed. For example, if we are regressing test score on race/ethnicity represented by four dummy variables, this procedure would multiply the simple random sample standard error by the square root of the design effect for test score calculated for the total group being analyzed. Such design effects are usually found in the datafile user's manual. If the design effect for your dependent variable is not available, you might use the DEFT for a similar variable or the average design effect averaged over a set of variables if that is all that is available.

It is also possible to use the average design effect of the dependent variable, averaged over subgroups represented by the independent variables in the model. In the above example, four design effects would be calculated: the design effect of the mean test score, calculated for each of the four race/ethnicity subgroups. The square root of the average of these four design effects would be used to adjust the standard error. Equivalently, rather than multiplying the standard error by the square root of the design effect, one could divide the t statistic by the square root of the design effect or divide the F statistic by the design effect.

(c) The correct degrees of freedom for the error term in these analyses is the same as that given by SAS; i.e., the simple random sample degrees of freedom: sample size - number of terms in model.

Appendix C Available Documents and Technical Advice

Must Read Publications

Before a researcher attempts to use the NELS:88 data files, it is strongly suggested that time be spent reading the NELS:88 user's manuals and design documents. The following list of documents will provide researchers with the essential information that they need to understand the complexities of the NELS:88 data files.

Base-year Sample Design Report - This report documents the design and conduct of data collection activities for the NELS:88 base-year survey of eighth graders. Much of the information contained in this report is also contained in the base-year user's manuals. An updated Sample Design report will be produced for the second followup.

Base-year User's Manuals - Four user's manuals cover the student, school, teacher, and parent components of the base-year surveys administered in 1988.

First Followup User's Manuals - Four user's manuals cover the student, dropout, school, and teacher components of the first followup surveys administered in 1990.

Second Followup Public Use User's Manuals - Five user's manuals cover the student, dropout, school, teacher, and parent components of the second followup surveys administered in 1992.

Second Followup Privileged Use User's Manuals - The Transcript User's Manual describes the activities involved in collecting high school transcript data from NELS:88 cohort members. A user's manual will also be produced for the 1990-92 School Effectiveness Study.

Psychometric documentation is available in the **Base-year Psychometric Report** and the (forthcoming) **Second Followup Psychometric Report**.

Owings, J. et al. (1994) **A Guide to using NELS:88 data** gives user-friendly technical guide to using NELS:88 data.

NCES and Contractor Staff of Technical Expertise

Staff at NCES, NORC, ETS, and MPR Associates have been closely associated with important components of the NELS:88 design, instrumentation, sampling, data collection, data processing, and analyses that have occurred over the life of this project. These individuals, their specific expertise, and their phone numbers are included in the following list.

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Appendix D Other NCES Data Projects

Baccalaureate and Beyond Study (B&B) - A national longitudinal survey that provides information on education and work experiences after completing the bachelor's degree.

Beginning Postsecondary Student Longitudinal Study (BPS) - A national survey on participation, persistence, and attainment in postsecondary education, representing the national population of postsecondary students (including "nontraditional" college goers as well as traditional high school graduates).

Common Core of Data (CCD) - The NCES comprehensive data source on the nation's elementary and secondary schools, containing information on school identification, administrative and financing data.

Early Childhood Longitudinal Study (ECLS) - An upcoming NCES project that will survey children of preschool age with followups through their young adulthood.

High School and Beyond (HS&B) - The second in the series of longitudinal education studies sponsored by NCES. The HS&B Base Year study surveyed sophomore and senior students in 1980, with four followups through 1992.

Integrated Postsecondary Education Data System (IPEDS) - The NCES single, comprehensive data system including all identified postsecondary education institutions.

National Assessment of Educational Progress (NAEP) - A congressionally mandated project to monitor continuously the knowledge, skills, and performance of the nation's children and youth. It provides data about student performance at national, regional, and, on a trial basis, state levels.

National Household Education Survey (NHES) - This is the first NCES survey to collect education data through a household-based survey. Each collection covers two topical components.

National Longitudinal Study of the High School Class of 1972 (NLS-72) - This project was the first in the series of longitudinal education studies sponsored by NCES. It surveyed a cohort of 1972 senior students with four followups through 1986.

National Postsecondary Student Aid Study (NPSAS) - A nationwide study of students enrolled in less-than-2-year institutions, community and junior colleges, 4-year colleges and major universities in the U.S. and Puerto Rico. Students who receive financial aid, as well as those who do not receive aid, participate in the survey.

National Survey of Postsecondary Faculty (NSOPF) - A national survey that provides data about faculty to postsecondary education researchers, planners, and policymakers. NSOPF is

the most comprehensive study of faculty in postsecondary educational institutions ever undertaken.

Recent College Graduates Study (RCG) - A survey of college graduates conducted periodically from 1976 to 1991, providing information about post-degree employment and education experiences among this population, with estimates on potential teacher supply. Since 1993, the Baccalaureate and Beyond Study (B&B) has replaced RCG.

Schools and Staffing Survey (SASS) - A national survey of schools, local education agencies, school administrators, and teachers; one component is the Teacher Followup Survey (TFS).

Teacher Followup Survey (TFS) - See Schools and Staffing Survey.

Listing of NCES Working Papers to Date

Number	Title	Contact
94-01	Schools and Staffing Survey (SASS) Papers Presented at Meetings of the American Statistical Association	Dan Kasprzyk
94-02	Generalized Variance Estimate for Schools and Staffing Survey (SASS)	Dan Kasprzyk
94-03	1991 Schools and Staffing Survey (SASS) Reinterview Response Variance Report	Dan Kasprzyk
94-04	The Accuracy of Teachers' Self-reports on their Postsecondary Education: Teacher Transcript Study, Schools and Staffing Survey	Dan Kasprzyk
94-05	Cost-of-Education Differentials Across the States	William Fowler
94-06	Six Papers on Teachers from the 1990-91 SASS and Other Related Surveys	Dan Kasprzyk
94-07	Data Comparability and Public Policy: New Interest in Public Library Data Papers Presented at Meetings of the American Statistical Association	Carrol Kindel
95-01	Schools and Staffing Survey: 1994 papers presented at the 1994 Meeting of the American Statistical Association	Dan Kasprzyk
95-02	QED Estimates of the 1990-91 Schools and Staffing Survey: Deriving and Comparing QED School Estimates with CCD Estimates	Dan Kasprzyk
95-03	Schools and Staffing Survey: 1990-91 SASS Cross-Questionnaire Analysis	Dan Kasprzyk

Listing of NCES Working Papers to Date (Continued)

Number	Title	Contact
95-04	National Education Longitudinal Study of 1988: Second Follow-up Questionnaire Content Areas and Research Issues	Jeffrey Owings
95-05	National Education Longitudinal Study of 1988: Conducting Trend Analyses of NLS-72, HS&B, and NELS:88 Seniors	Jeffrey Owings
95-06	National Education Longitudinal Study of 1988: Conducting Cross-Cohort Comparisons Using HS&B, NAEP, and NELS:88 Academic Transcript Data	Jeffrey Owings
95-07	National Education Longitudinal Study of 1988: Conducting Trend Analyses HS&B and NELS:88 Sophomore Cohort Dropouts	Jeffrey Owings
95-08	CCD Adjustments to the 1990-91 SASS: A Comparison of Estimates	Dan Kasprzyk
95-09	The Results of the 1993 Teacher List Validation Study (TLVS)	Dan Kasprzyk
95-10	The Results of the 1991-92 Teacher Follow-up Survey (TFS) Reinterview and Extensive Reconciliation	Dan Kasprzyk
95-11	Measuring Instruction, Curriculum Content, and Instructional Resources: The Status of Recent Work	Sharon Bobbitt & John Ralph
95-12	Rural Education Data User's Guide	Samuel Peng

Listing of NCES Working Papers to Date (Continued)

Number	Title	Contact
95-13	Assessing Students with Disabilities and Limited English Proficiency	James Houser
95-14	Empirical Evaluation of Social, Psychological, & Educational Construct Variables Used in NCES Surveys	Samuel Peng
95-15	Classroom Instructional Processes: A Review of Existing Measurement Approaches and Their Applicability for the Teacher Follow-up Survey	Sharon Bobbitt
95-16	Intersurvey Consistency in NCES Private School Surveys	Steven Kaufman
95-17	Estimates of Expenditures for Private K-12 Schools	Steve Broughman
95-18	An Agenda for Research on Teachers and Schools: Revisiting NCES' Schools and Staffing Survey	Dan Kasprzyk
96-01	Methodological Issues in the Study of Teachers' Careers: Critical Features of a Truly Longitudinal Study	Dan Kasprzyk
96-02	Schools and Staffing Survey (SASS): 1995 Selected papers presented at the 1995 Meeting of the American Statistical Association	Dan Kasprzyk
96-03	National Education Longitudinal Study of 1988 (NELS:88) Research Framework and Issues	Jeffrey Owings

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