SAMPLING FRAMES AT THE UNITED STATES NATIONAL CENTER FOR EDUCATION STATISTICS

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Introduction

Federal data collection of education statistics began in the 1869-70 school year when the Office of Education implemented a biennial voluntary education survey that included data on elementary and secondary school student attendance, teaching staff, and finance aggregated to the state level. It was 1954 before the Federal collection efforts moved to an annual collection. And National reporting of school district and school level data did not begin until 1975.

Throughout the 124 years of education data collection and reporting, considerable attention has focused on the coverage, quality, comparability, and timeliness of the data. A number of special studies and commissions have addressed these issues resulting in at least six reconfigurations of the data collection system and four bureaucratic relocations of the agency.

The current set of elementary-secondary data collections grew out of the 1985 Elementary-Secondary Redesign Project. The Redesign Project was charged with the task of reviewing the thrust and scope of the elementary and secondary data collection system. Ultimately a ten year plan was formulated as a result of a set of public meetings, a series of invited papers and comments, and a synthesis of the papers and comments.

The Hawkins-Stafford Education Improvement Amendments of 1988 strengthened the structure of the National Center for Education Statistics as a statistics-gathering agency and established a federal-state cooperative statistics system. The resulting changes provided the impetus for the implementation of the basic elements of the ten-year plan.

The combined outcome from the 1988 Education Improvement Amendments, the redesign project and related ten year plan is a data collection program that is considerably different and more comprehensive in scope than the one that had existed previously. One significant change has been an increased reliance on NCES data collections as sampling frames for sample surveys. This paper describes the major data systems currently used as sampling frames at the U.S. National Center for Education Statistics. As will be described below, the NCES sampling frames are of two types; universe data collection systems and sample survey data systems. While both types of systems are typically institution-based(school/school district/postsecondary institution), they are often used as the first stage sampling frame for multi-level longitudinal and cross-sectional surveys of students, teachers, or administrators.

First, we describe the three principal institution-based universe data collection systems of the NCES: 1) the Common Core of Data (CCD) and its five components is the NCES primary data base on elementary and secondary public education in the United States; 2) the Private School Survey (PSS) is the principal data base on elementary and secondary private schools in the United States. This data system is comparable to the CCD Universe Survey for public schools; and 3) the Integrated Postsecondary Education Data System (IPEDS) is the core postsecondary education data collection program, its multiple components(like CCD) encompass all identified institutions whose primary purpose is to provide postsecondary education. Second, we describe two sample survey data systems, the Schools and Staffing Survey (SASS) and the National Postsecondary Student Aid Study (NPSAS), and how these data systems are used as sampling frames for noninstitution-based studies.

Universe Data Collection Systems: Common Core of Data

The Common Core of Data (CCD) is the basic NCES database on elementary and secondary public education. The CCD is an annual national data set with statistical information for all public schools and school districts in the U.S. and its territories; data reported on the CCD are comparable across all states.

The Common Core of Data has two purposes: first, to provide basic information and descriptive statistics on public elementary and secondary

schools and schooling in general; second, to provide an official list of public elementary and secondary schools and districts in the nation, thus providing NCES the universe from which to select samples for NCES surveys.

CCD Design

The CCD survey collects data about all public elementary and secondary schools, all local education agencies (LEAs), and all state education agencies (SEAs) in the United States. CCD contains basic data on schools and school districts, students and staff, in addition to fiscal data. Basic data are name, address, phone number, and type of locale; students and staff data contain demographic characteristics; and the fiscal data cover revenues and current expenditures.

The CCD is made up of a set of five surveys sent to state education departments, including the Virgin Islands and outlying areas. Most data are obtained from administrative records maintained by the state education agencies (SEAs). The SEAs compile CCD requested data into prescribed formats and transmit the information to NCES.

Components of CCD

The CCD data system has five parts:

1. The Public School Universe contains data on public elementary and secondary schools in operation during a school year, school location and type, enrollment by grade and counts of students by race/ethnicity, counts of students eligible for free lunch, and the number of classroom teachers(FTE).

2. The Local Education Agency Universe contains name, phone number, location and type of agency, current number of students, and number of high school graduates and completers in the previous year, counts of dropouts by sex for grades 7 through 12 for all LEAs in the nation.

3. The State Aggregate Non-Fiscal Report contains state level aggregates of students by grade level, full-time equivalent staff by major employment category, and high school graduates and completers in the previous year.

4. The State Aggregate Fiscal Report contains state level data on average daily attendance, school district revenues by source (local, state, federal), and expenditures by function (instruction, support services, and non-instruction).

5. The School District Fiscal Data contain data by school district, including enrollment, revenues by source and expenditures by function.

The Public School Universe Survey and the Local Education Universe Survey are the two key universe components of the CCD used for sampling schools and local education agencies, respectively. The addresses in the universe surveys provide the means for contacting a sampled school, while the basic data the surveys obtain provide information needed to design and stratify the sample.

Universe Data Collection Systems: Private School Survey

To obtain a complete picture of elementary/secondary education, activity comparable to the CCD public school universe survey is needed for the private elementary/ secondary education sector. At a 1988 meeting with private school associations, NCES introduced a proposal to develop such a private school data collection system. This data collection system, the Private School Survey (PSS), is designed to build an NCES universe of private schools in the U.S.

Private school universe data are obtained every two years by a mail-out/mail-back collection design. A lack of response by the school elicits a telephone followup. Data collected include: grade range, enrollment by grade, number of graduates(if a high school), number of teachers, student race/ethnicity distribution, and school's religious orientation.

Private School Frames

The primary sources for building the universe list of private schools are: a commercial list, state lists of private schools, and private school association lists. To identify schools overlooked in the list building component, an area frame component is included. The universe list and additional schools identified in the area search comprise schools included in the Private School Survey.

List Frames

NCES has used a dual frame approach in surveying private schools since 1983. A commercial list from Quality Education Data (QED) served as the base

list for the private school universe in 1987 and 1989. NCES checked all schools on the QED file to determine their eligibility for inclusion on the list per criteria defined by NCES. Many schools on the QED base list did not meet the criteria and were eliminated, leaving approximately 23,000 private schools on the base list.

To improve coverage NCES collected membership lists from 20 private school associations and denominations. Schools on private school membership lists were compared and added to the base list when appropriate. As a result of these efforts, 1,261 schools were added in 1987, and 866 schools were added in 1989 for a total of 24,727 schools on the NCES private school universe list. Despite these efforts, the list frame undercoverage of schools was estimated to be approximately 20%.

The 1991-92 PSS made a substantial effort to increase the number of schools on the master list of private schools by not only adding schools from the sources previously mentioned (commercial lists and private school association lists), but also by adding schools obtained from lists maintained state education agencies. A significant number of additional schools were added, resulting in a school undercoverage rate of about 12% and an enrollment undercoverage rate of about 3%. A project is underway at the Census Bureau to evaluate these efforts and the impact of these new sources.

Area Frame

Additional schools are identified through an area search of randomly selected primary sampling units (PSUs). The first NCES area search for private schools was conducted in 1983, and this method has been used to improve coverage in private school surveys since that time.

The 1989-90 PSS area frame sample consisted of 123 PSUs from two sets of sample PSUs. Within each of the 123 PSUs, the Census Bureau attempted to find all eligible private schools. An area canvas was not attempted; however, regional field staff created the frame by using such sources as yellow pages, local education agencies, chambers of commerce, and local government offices. The schools found were matched with the NCES private school universe list from the list frame. Schools that did not match the list were contacted to verify eligibility. Eligible schools located and identified in the area frame and not on the master list were assigned a sample weight and an estimate of the number of private schools represented by the area frame calculated. This estimate when combined with the number of private schools on the master list yields the national estimate of the number of private schools.

During the last administration of the PSS, the area frame component accounted for a smaller contribution to the overall national estimate of the number of private schools and the number of students in private schools in the U.S. The acquisition of new lists and improved unduplication procedures has improved the private school list. Unfortunately, the fact that the 1991-92 area frame still constitutes 12% of the student estimate and 3% of the student estimate indicate that the universe list is still missing a significant number of schools. Since they are small schools (i.e, 12% of schools, but only 3% students), this suggests their exclusion would yield biased estimates; thus, the elimination of the area frame component of the PSS is not yet warranted.

Universe Data Collection Systems: Integrated Postsecondary Education Data System

The Integrated Postsecondary Education Data System (IPEDS) is the core postsecondary education data collection program. It contains all institutions whose primary purpose is to provide postsecondary education. This includes academic, vocational, and continuing professional education programs, and excludes avocational and adult basic education programs.

The approximately 11,000 IPEDS institutions include: baccalaureate or higher degree granting institutions, 2-year award institutions, and less-than-2-year institutions(i.e., institutions whose awards usually result in terminal occupational awards or are creditable toward a formal 2-year or higher award). Compatible reporting formats have been developed for the different sectors(public, private nonprofit, private for-profit) of postsecondary education providers.

IPEDS Components

The IPEDS data system contains:

1. Institutional Characteristics Survey which includes annual data on the institution's address, telephone number, tuition, types of programs, levels of

degrees, and accreditation.

2. Fall Enrollment Survey which includes full-and part-time enrollment data by sex, and racial/ethnic categories.

3. Fall Enrollment in Occupationally Specific Programs Survey which provides fall enrollment in occupationally specific programs, by sex and race/ethnicity.

4. Completions Survey which provides numbers of associate, bachelor's, master's, doctor's and first professional degrees by discipline and sex, numbers of awards by racial/ethnic composition, program area, and sex.

5. Salaries, Tenure, and Fringe Benefits of Full-Time Instructional Faculty Survey which provides annual data on the number of full-time instructional faculty by rank, sex, tenure status, length of contract, and salaries and fringe benefits.

6. Financial Statistics Survey which annually provides current revenues by source, current expenditures by function (e.g.,instruction, research), assets and indebtedness, and endowment investments.

7. College and University Libraries Survey which provides staffing, collection, transaction, and operating expenditures data.

8. Fall Staff Survey which provides the number of staff by occupational activity, full-time and part-time status, sex, and race/ethnicity.

Since the Institutional Characteristics Survey identifies and characterizes institutions offering postsecondary programs, it is used as the basis for sampling postsecondary institutions. The data the survey obtains on the institution and its programs provide the background information necessary to stratify postsecondary institution samples; however, individual components of the IPEDS data system are also used together for sampling as the need arises; for example, to build the frame for the National Postsecondary Student Aid Study (discussed below) IPEDS institutions on the Institutional Characteristics and the Fall Enrollment files were used, whereas the IPEDS Completions File was used to develop data on race/ethnicity trends in degrees conferred.

Sample Survey Data Collection Systems: Schools and Staffing Survey

SASS Overview

The Schools and Staffing Survey(SASS) uses the two elementary/secondary universe data systems, CCD and the PSS, as frames for drawing a sample of elementary/secondary schools in the public and private sectors, respectively. In addition, the SASS sample of schools is then used to draw samples for other SASS components - - principals, teachers, local education agencies, and most recently, students and libraries.

SASS was initially implemented to meet the need for information on the characteristics and experience of teachers and administrators, to describe the essential features of the school as a place to work and a place to learn, and to provide data on aspects of teacher supply and demand and attrition. The SASS design permits state and national estimates for public schools and affiliation and national estimates for private schools. The SASS was first fielded in the 1987-88 school year, was repeated in the 1990-91 school year, and will be conducted every three years.

The SASS is an integrated system of surveys of public and private schools, school districts, school principals and administrators (public and private), and teachers (public and private). The data collection consists of seven mail-out/mail-back surveys implemented during one school year.

In the year following SASS, a subsample of teachers in the SASS teacher sample are selected for the SASS Teacher Followup Survey. This mail survey, a survey of public and private school teachers, is designed to provide information on teacher attrition and retention in public and private schools. In the 1993-94 school year, SASS will also implement a sample of students (of a subsample of SASS teachers). Student data will be reported from administrative records the school maintains on the students.

SASS As A Sampling Frame

Schools are the primary sampling unit in SASS, the sample being drawn from the CCD for the public school sample and from the PSS for the private school sample. School administrators/principals are in sample if the school is in sample, and public

school districts are included in sample when one or more schools in the district are selected.

To develop a sampling frame of teachers for the SASS, all schools in the SASS sample are asked to provide a list of teachers in the school. The list includes name as well as limited information about the teacher, such as years teaching experience, race, and teaching specialty by level. Schools are asked to complete and mail back a form requesting this information, provide the list of teachers over the telephone, or if neither of these alternatives are acceptable to draw the sample themselves with instructions from the Census Bureau. On average, between four and eight teachers are selected in each sample school selected for the SASS.

In each round of SASS, a subsample of teachers responding in SASS serve as the sampling frame for the Teacher Followup Survey. A sample of teachers responding to SASS is drawn. The sample is stratified by whether or not the teachers are in the teaching profession one year after the SASS is conducted.

In school year 1993-94, a subsample of public and private schools in the SASS sample will be asked to to participate in a survey of library media centers (staffing collection, expenditures, technology, and equipment) and librarians/media specialists (qualifications and working conditions).

In school year 1993-94, the sample of teachers selected in the SASS sample constitutes the sampling frame for a new student records component of the SASS. For a subsample of the teachers selected in the teacher sample, class rosters for a specific day and class period will be requested from the school in order to provide a list of students eligible for sample selection; thus, the national probability sample of schools has served as the frame for a national probability sample of teachers, and finally a national probability sample of students distributed across elementary and secondary levels.

Finally, in school year 1993-94 public schools in the 1990-91 SASS sample will serve as a sampling frame for an NCES conducted national survey on curricular options in public high schools. The use of schools in the SASS sample permits analyses using the extensive school-based data collected in the SASS, such as the school's enrollment and racial composition, the size, structure, and experience of the faculty, along with the curricular options data obtained in the survey.

Sample Survey Data Collection Systems: National Postsecondary Student Aid Study

NPSAS Overview

The National Postsecondary Student Aid Study (NPSAS), conducted every three years, is a nationwide study of students enrolled in less-than-2-year institutions, community and junior colleges, 4-year colleges, and major universities located in the U.S. and Puerto Rico. NPSAS obtains data on student demographics, family income, education expenses, employment, education aspirations, parental demographic characteristics, parental support, and how students and their families meet the costs of postsecondary education. The first NPSAS was conducted during the 1986-87 school year and repeated in 1989-90. Data were gathered from students' institutional records, from the students themselves, and parents.

NPSAS Design

The sample design for NPSAS was a multi-stage probability sample of students enrolled in postsecondary institutions. The first stage sample consisted of geographic areas of the country; institutions within the selected geographic areas were selected in the second stage of sampling; the third stage of sampling was the selection of students in sampled institutions. The 1993 NPSAS sample includes about 78,000 students at 1,200 institutions and about 25,000 parents. NPSAS data come from multiple sources, including institutional records, and student and parent interviews. Detailed data concerning participation in student financial aid programs are extracted from institutional records. Beginning with the 1990 NPSAS, student and parent data were collected using a computer-assisted interview.

The 1987 NPSAS sampled students only enrolled in the fall of 1986. Beginning with the 1990 NPSAS, students enrolled at any time during the year were eligible for the study. This design change provides data necessary to estimate full-year financial aid awards.

NPSAS As A Sampling Frame

NPSAS is a nationally representative sample of

institutions, students, and parents. It, thus, provides an efficient way of identifying a nationally representative sample of beginning students in postsecondary education as well as an efficient way to identify a nationally representative sample of baccalaureate degree completers in postsecondary education. Thus, NPSAS serves as a sampling frame for the Beginning Postsecondary Study (BPS) a longitudinal study of students from the beginning of their postsecondary education and the Baccalaureate and Beyond (B&B) study, a longitudinal study of students from graduation on. Using NPSAS as a sampling frame for these two studies has the obvious benefit of having available data from all components of NPSAS as base year data for the samples.

BPS follows NPSAS beginning students at 2-year intervals for at least six years beginning with the 1990 administration of NPSAS. This should allow adequate time to complete postsecondary education and transit between undergraduate and graduate education and between postsecondary education and work.

B&B will follow NPSAS baccalaureate degree completers at 1,3,6,9, and 12 years after completion of their undergraduate, beginning with the 1993 NPSAS. In addition to student data, B&B will collect postsecondary transcripts and financial aid records covering the undergraduate period, providing complete information on progress and persistence at both the undergraduate and graduate levels.

Future Considerations For NCES Sampling Frames

The work of NCES programs has been highly decentralized in the past. In particular, the development and maintenance of universe data collection systems has involved both NCES staff and a variety of contractors. In recent years, the Census Bureau has become the NCES data collection agent for these universe data systems. The expected benefits of such an arrangement include a stronger approach to maintaining consistent definitions and concepts over time and where feasible across data collections, the development over the long term staff knowledgeable of NCES concepts and issues, a closer and more efficient working relationship between staff involved in universe data collection systems and survey data systems, and improvements in the use of the universe data systems for sampling.

We also expect to see over the next several years a project develop that will design and implement an integrated sampling frame, useful over an extended period of time (with updates) for all major NCES surveys. The elementary/secondary school universe will extend to cover schools with pre-kindergarten programs, thus providing a frame for sampling such programs in order to allow for the possibility of extending the scope of NCES institutional data collections. At the present time, our knowledge of early childhood education programs is limited primarily to parent reports. The addition of pre-kindergarten programs to the universe frame will allow NCES to extend the scope of NCES surveys of programs, staffs and students. Samples will be designed to minimize overlap among the various programs and take advantage of the similarities in the operations of some programs.

An integrated approach will also involve the centralized management of list frame operations and, perhaps, more importantly area frames. For example, at the present time, only private school estimates at the elementary/secondary level incorporate an area frame component for estimation. To the extent that undercoverage may exist in some sections of the postsecondary and prekindergarten universe, each collection could benefit from the shared effort of a list frame operation that spans prekindergarten and postsecondary education. For example, universe collections using an area frame for coverage improvement can share the effort of listing eligible schools.

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MONITORING DATA QUALITY IN EDUCATION SURVEYS

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Achieving high quality in education surveys is a major goal of the National Center for Education Statistics, U.S. Department of Education. Various features have been routinely built into the design of surveys and operational procedures to ensure that, for example the sample is selected according to specifications, the response rate is high and nonresponse bias is minimized, and the data are valid, accurate, and reliable. To assess the achievement of these procedures and to identify areas for improvement, NCES has developed a set of statistical standards against which project staff can determine the strengths and weaknesses of each survey system. NCES has also initiated a series of studies to develop and examine the quality profiles of survey systems, such as the Schools and Staffing Survey and the Common Core of Data, and to evaluate specific quality issues, such as the potential nonresponse biases of State NAEP (National Assessment of Educational Progress) trial assessments and the undercoverage of certain kinds of institutions in the Integrated Postsecondary Education Data System. The quality profiles are to include consideration of both sampling and nonsampling errors. This presentation describes these activities and shares our recent experience and findings.

1. Overview of NCES Data Quality Concerns

1.1 General Responsibility for Education Statistics

The National Center for Education Statistics (NCES), which is a part of the U.S. Department of Education, has major responsibilities assigned to it by the U.S. Congress for collecting, analyzing, and disseminating statistics and other data related to education in the United States and in other nations. The General Education Provisions Act and the Hawkins-Stafford Amendments of 1988 assign specific responsibilities to NCES for maintaining and improving the quality of education data and for assisting state and local educational agencies, including postsecondary education agencies, in improving and automating their statistical and data collection activities. NCES is directed to collect and report, on a state-by-state basis where feasible, full and complete statistics on the condition of education in the United States.

Recent legislation as well as recommendations from various advisory panels and organizations have led NCES to put renewed emphasis on the development of written standards for the conduct of its work. The first comprehensive written standards were adopted in 1987 and a major effort to revise and update the standards began in 1989 and was completed and adopted by NCES in January 1992. The current version of the *NCES Statistical Standards* (see Flemming, 1992) includes twenty "standards" (procedures that must be followed) and two "guidances" (procedures that are desirable but not mandatory). Many of the standards are directed toward the attainment of high quality data, both from sample surveys and from universe surveys, and other standards are directed toward documenting and evaluating survey designs and the resultant data quality.

1.2 Current Examples of Monitoring and Evaluating Data Quality

There is an ongoing program within NCES directed toward monitoring data quality in education surveys. As part of that program a number of special studies have been recently initiated and are in the process of being completed. Among these are the development of a "quality profile" for the Schools and Staffing Survey (SASS), the design and development of an ongoing assessment of the Common Core of Data (CCD), an examination of potential nonresponse biases in the state trial assessments of the National Assessment of Educational Progress (NAEP), and an investigation of the effects of undercoverage of certain types of postsecondary institutions on the estimates produced by the Integrated Postsecondary Education Data System (IPEDS).

Each of these periodic data collections are in fact "survey systems" rather than individual surveys.

- SASS is a sample survey system which has distinct components for public and private schools (elementary and secondary schools), for teachers and principals/headmasters in those schools as well as for administrators in local school districts.

- CCD is a universe survey which gathers fiscal and nonfiscal data from administrative records at the local public school and local education agency level as reported through state education agencies. Although sampling error is not involved, the components of nonsampling error are sometimes difficult to identify and to evaluate, including difficult questions which arise from the use of different (non-NCES standard) definitions in various states for some of the key data elements in the CCD.

- The NAEP state assessments of educational progress involve testing of individual students at designated grade levels and complex rules for substitution of schools when the designated schools fail to participate.

- The IPEDS Fall Enrollment Survey, conducted annually as part of a postsecondary education data system, provides an example of coverage and response problems when certain categories of institutions (particularly proprietary two-year postsecondary institutions) may come into existence or close their doors rather frequently and may often not be inclined to offer full cooperation to a government data collection. Imputation procedures for missing data present some subtle problems in this survey system.

For some of these survey systems, data collection and processing are conducted by the U.S. Bureau of the Census on behalf of NCES and for some components private contractors are involved. NCES's approach to data quality issues recognizes that in the case of public education there are distinct state and Federal roles and responsibilities and that private institutions at all levels present a special challenge of voluntary cooperation. NCES also recognizes its responsibility for balancing the tradeoffs between accuracy and timeliness and for balancing survey accuracy and survey costs (see Groves, 1989). There are also important sets of interaction effects between universe surveys (such as CCD) and sample surveys (such as SASS). Currently, CCD provides the frame information on public elementary and secondary schools for SASS.

In addition to the SASS quality profile development covered in this presentation, there is a broader SASS research program and other efforts aimed at improving SASS data, including special studies of nonresponse in SASS, a SASS reinterview program, a study of mode of data collection for SASS, intercomparisons of SASS and CCD data, an upcoming study of optimal periodicity for SASS, and development of a SASS users' manual.

2. A Quality Profile for the Schools and Staffing Survey

2.1 Background, Purposes, Scope, and Current Status

A quality profile is a document that summarizes, in convenient form, what is known about the quality of data in a particular survey. It describes the nature and sources of errors in the survey data and the findings from methodological experiments conducted to test alternative design components. A description of the survey design and procedures is included as background. A survey quality profile has two main audiences: data users, to inform them of the strengths and limitations of the data, and those responsible for the design and operation of the survey, for whom it can be an important tool for total quality management.

An early version of the quality profile was a 1978 "error profile" by Brooks and Bailar which provided this kind of information for estimates of employment from the Current Population Survey. The Census Bureau's Survey of Income and Program Participation, which began operation in 1983, was the subject of the first major quality profile for an entire survey (King, Petroni and Singh, 1987). An expanded version of that quality profile was released 3 years later (Jabine, 1990).

Work on a quality profile for the Survey of Schools and Staffing (SASS) began in 1992 and is nearing completion. Although its name suggests a single survey, SASS is actually a periodic, integrated *system of surveys* of schools, school districts (generally called local education agencies, or LEAs), school administrators, and teachers, conducted by the NCES. Users of the survey data include educators, researchers, policymakers and others interested in educational issues. The survey data are collected by mail, with telephone followups to nonrespondents. Survey data collection operations began in 1987 and two complete rounds of surveys have been conducted, with a third scheduled to start in 1993.

Development of a quality profile for a system of surveys, rather than a single survey, posed a new question about how to organize the materials. Should each chapter present information for a single major source of error, such as response error, for all five surveys or should the material be organized by survey? The question was further complicated by the sequential nature of the SASS sample selection process, which begins with the selection of samples of public and private schools, followed by selection of samples of

teachers and public school districts associated with the sample schools. The decision was to organize the information by survey, starting with the School Survey, and to avoid undue repetition of design and procedural information by referring back to earlier chapters as needed. Each of the chapters covering the individual surveys has sections covering: frame development and sampling; data collection procedures and associated errors; data processing and estimation; and evaluation of estimates.

The draft of the *SASS Quality Profile* is in the final stages of review. The remainder of this section summarizes the findings that will be included with respect to major sources of error and identifies several ongoing research, development and evaluation activities that were underway but not completed in sufficient time for inclusion in the first *SASS Quality Profile*.

2.2. Principal sources of error in SASS

Coverage error There are no direct estimates of gross or net coverage errors available for any of the SASS surveys. However, there are several indications, some of them quantitative, of potential coverage error. These include:

- The use, for both the public and private school surveys, of list frames constructed two years prior to the reference school year for the survey.

- The need to use an area sample to supplement the list frame for private schools. The area sample accounted for about 22 percent of the estimated number of private schools in Round 1 and about 21 percent in Round 2, indicating no significant improvement of coverage by the list frame in Round 2.

- In Round 2, it was discovered that some multi-site special education programs of the State of California were listed on the sampling frame as single schools. Adjustments were required to eliminate duplication for those sites located at existing schools and to select a sample of the other sites.

- Discovery in both rounds, subsequent to sample selection, of some duplicate listings in the private school list frame.

- In Round 1, exclusion from the public school frame of 275 small Nebraska LEAs with about 2,800 students.

- For the teacher surveys, use of teacher listing forms that ask only for teachers working at the sample schools at the time the forms were being completed. Teachers who begin working later in the reference year have no chance of inclusion.

- In Round 1, counts of teachers on teacher listing forms were, in the average state, about 5 percent below the counts reported for the same schools on their School Survey questionnaires.

Sample estimates of the number of schools were also affected in both rounds by school survey respondents who provided data for a unit other than the one intended on the basis of the sample selection. Some respondents, especially in Round 2, reported combined data for two different schools at the same location, and some, especially in small LEAs, reported combined data for all schools in the LEA. Conversely, in the Teacher Demand and Shortage Survey, a few LEAs reported data for a single school rather than the entire LEA. Many of these erroneous reports were identified and corrected prior to data release, but some may have escaped detection.

Nonresponse error Response rates for public schools have consistently exceeded those for private schools. Response rates improved in Round 2 for each of the four basic surveys for both sectors. Response rates for the Teacher and Teacher Followup Surveys are composite rates, reflecting losses from schools that did not supply teacher lists and nonresponding teachers from schools that did supply lists. Consequently these rates were, with one exception, lower than those for the other three surveys.

There was considerable variation in response rates within each sector. For the public school sector in Round 1, in each of the four basic surveys a few states had response rates of less than 80 percent. This was due in part to a small number of LEAs, some of them fairly large, that declined to participate in any of the surveys. For the private school sector, one or more affiliation groups had response rates of less than 60 percent in each of the four basic surveys in Round 1.

The forthcoming report (Jabine, 1993) will also present detailed data on item nonresponse. The analysis of item nonresponse that occurred in Round 1 led to significant changes in the content and format of the questionnaires used in Round 2.

Measurement error Information about measurement (response) errors associated with SASS data collection comes from several sources: reinterviews, a record-check study, in-depth interviews using cognitive

research techniques, methodological experiments, reviews of completed questionnaires and analyses of errors and inconsistencies detected during data processing. The main findings from these sources were:

- Reinterviews have shown that the items asking for the opinions, perceptions and future expectations of teachers and school administrators are, almost without exception, subject to high response variability.

- Evidence from several sources suggests that the quality of information obtained by mail is superior to that obtained in telephone followups to nonrespondents.

- An experiment, the State Data Project, was undertaken in connection with the Pretest for Round 2 of SASS to test the feasibility of obtaining data for the public sector Teacher Demand and Shortage Survey from state rather than local education agencies. A comparison of data collected from both sources for the same sample of LEAs showed a high frequency of substantial differences (more than 10 percent in either direction) for several variables. Based on these findings, it was decided not to try to collect the data for LEAs from state agencies in Round 2.

- Some of the concepts adopted for SASS data collection appear to be unfamiliar to respondents and to cause them considerable difficulty in formulating appropriate responses. One such concept is that of full-time equivalent (FTE) teachers used in the School and the Teacher Demand and Shortage Surveys. A school that has part-time teachers should report numbers of FTE teachers that are lower than their teacher counts. Nevertheless, many such schools reported the same numbers for teacher counts and FTE teachers.

- A record-check study, the Teacher Transcript Study, compared teachers' self-reports of their educational backgrounds with data from college transcripts. The main conclusion was that self-reports of types and years of degrees earned and major fields were reasonably accurate, but that self-reported information on courses and credit hours in specific fields was less accurate.

- For all surveys and in both rounds of SASS, it was common for respondents to ignore skip instructions and consequently to try to answer questions that did not apply to them. Such errors have little or no direct effect on the quality of data, because most inapplicable responses can readily be deleted in clerical and computer edits.

The foregoing and other findings relating to measurement error led to numerous changes in survey instruments and procedures between Rounds 1 and 2, and additional changes are planned for Round 3.

Data processing and estimation error In contrast to the preceding sources of error, there is not much quantitative information available for data processing and estimation errors in the SASS surveys. A recent study of the correlates of nonresponse in the School Survey led to a recommendation for some changes in the definitions of the nonresponse adjustment cells and the order of collapsing small cells in the weighting process.

Sampling error At present, there are two ways for users of SASS data to determine the sampling errors of estimates that are of interest to them. Publications of SASS data include standard errors for many of the published estimates. Users of microdata files can compute standard errors for any estimate by employing readily available software for variance estimation by the balanced half-sample replication method. Half-sample replication weights for this purpose are included in the microdata files.

A recent study has confirmed the feasibility of including generalized variance functions in SASS publications. These functions, which relate the sampling error of an estimate to its size, can be used by those who do not work with microdata files, or lack the software for the replication method, to produce approximations to the sampling errors associated with their estimates of interest.

Comparisons with data from external sources Results of comparisons of SASS data with data available from sources other than NCES include the following:

- The Census Bureau collects data on school enrollment annually in the October Supplement to the Current Population Survey (CPS). SASS estimates of *private* elementary and secondary school enrollment from Round 1 exceeded the CPS estimates for the same school year by 15 percent. NCES surveys of private schools prior to SASS had shown similar differences with CPS enrollment estimates during the 1980s.

- The National Catholic Education Association conducts an annual census of Catholic schools. SASS Round 1 estimates of the number of Catholic schools and their enrollment exceeded the Association's census counts by 6.1 and 7.8 percent, respectively.

- Public school administrators' salaries reported in the Round 1 School Administrator Survey were compared with data obtained directly from state education agencies in selected states. The values were similar and there were no obvious inconsistencies.

- Round 1 estimates of teachers' salaries were compared with data from private organizations. The Teacher Survey estimate of average base salary, $26,231, was 6.6 percent below a $28,071 estimate of average salary for the same school year from a 1989 survey by the American Federation of Teachers and 6.4 percent below an estimated average salary of $28,029 reported by the National Education Association.

2.3 Research in progress

Several SASS-related research, development, and evaluation activities are in various stages of completion. Some are just getting under way. For others, data have been collected or compiled and the results are being analyzed.

Two projects are related to plans to expand the coverage and content of SASS. As part of a pretest for Round 3 of SASS, questionnaires for collecting data about public and private school library media centers and library media staff specialists were tested. Item nonresponse and other features of the pretest responses are being analyzed and the questionnaires are being redesigned for use in Round 3 of SASS.

Collection of data about students is another possible area of expansion for SASS. Procedures for selecting samples of students and obtaining information about them from school records were tested in 1991. The completeness and quality of the data provided by the schools for the sample students are being evaluated.

Possible changes in the modes of data collection for SASS are being evaluated. Development and testing of computer-assisted methods of response for schools and LEAs has begun. Interactive diskettes with the survey questions will be mailed to respondents, who will complete them using their own computers. This method of data collection has already been used successfully by the NCES for completion, by state offices, of questionnaires relating to public libraries and completion of questionnaires for academic libraries.

A first attempt to evaluate the feasibility of collecting data for LEAs from state education agencies was inconclusive. There were substantial differences between items reported directly by LEAs and the corresponding values reported by the state agencies. However, further testing of the collection of at least some of the LEA information from the states is planned.

Efforts to improve response rates are continuing. When telephone followups are necessary for teachers who do not mail in their questionnaires, it has proved difficult to reach them at their schools and complete the interviews by telephone while they are there. In the pretest for Round 3 of SASS, conducted during school year 1991-92, postcards were sent to teachers during the mail followup phase asking them to supply their home telephone numbers if they were willing to be contacted at home. The results of this test are being analyzed. A study is underway, using data from all of the SASS surveys in Round 2, to compare the characteristics of nonrespondents and respondents, based on the sampling frame information that is available for both groups. It is hoped that the results of the study will suggest methods of improving response rates for problem groups and also possible improvements in the nonresponse adjustments used in developing estimates from the data for responding units.

The quality of SASS data is affected in many ways by the quality of the sampling frames for schools, LEAs and teachers. Several current evaluation and research projects are aimed at the improvement of the sampling frames and other features of the SASS surveys that relate to coverage. For public schools and LEAs, the Common Core of Data was adopted, starting in Round 2, as the frame of choice. As discussed in the next section of this paper, a plan has been developed for a detailed assessment of the quality of data collected in the CCD surveys, including the data that are used to create and maintain the LEA and public school sampling frames. For private schools, NCES has requested the Census Bureau to undertake a detailed analysis of the private school list and area frames and the procedures for updating them. As part of this study, the two frames will be matched for the sample of areas that are covered by the area frame.

Two other activities are also relevant to coverage improvement. Work is continuing on efforts to redesign the instructions and initial items on the school and LEA questionnaires to make it clearer to respondents which schools or LEAs they are being asked to report for. The forms and procedures for the teacher listing operations that provide the sampling frames for the Teacher and Teacher Followup Surveys are being

evaluated, with emphasis on completeness and on the accuracy of information about teacher characteristics used in the sample selection processes.

For several variables, SASS obtains information from more than one survey. Estimates of the number of teachers, for example, can be obtained from the School, Teacher and Teacher Demand and Shortage Surveys. When aggregate estimates for school districts, states and other domains are compared, the differences are sometimes larger than could be accounted for by sampling variability. A Cross-Questionnaire Estimates Comparison Study is being undertaken to document comparable estimates that can be produced from more than one SASS survey, compare them at several levels of aggregation, and identify possible reasons for differences.

Results of all of these ongoing research, development and evaluation activities will be documented in internal memoranda, contractor reports and, where appropriate, in NCES working papers, technical reports and papers presented at professional association meetings or in journals. NCES also expects to provide updates to the *SASS Quality Profile* at appropriate intervals, possibly after each round of the survey. References to documentation for all of the findings mentioned in this presentation will be included in the *Quality Profile*.

3. Development of a Design for an Ongoing Assessment of Data Quality in the Common Core of Data (CCD) Survey System

3.1 Background Information on the CCD Surveys

Survey descriptions The CCD surveys provide basic statistical information about public elementary and secondary students, staffs, schools, and agencies. The CCD survey system is managed and directed by NCES, with major operational responsibilities delegated to the U.S. Bureau of the Census under an interagency agreement. The CCD system collects annual universe data reflecting three levels of aggregation (state, agency and school) from state education agency (SEA) administrative records. In summary, the information collected includes:

- State Aggregate Fiscal. Detailed information (for 56 states and outlying areas) about revenues and expenditures for public elementary and secondary education, reported in accord with the NCES Fiscal Handbook.
- State Aggregate Nonfiscal. Counts of public education staff, students, school completers (56 states and outlying areas).
- Agency Universe. Public education agency name, mailing address, telephone, agency type, county code, locale code; counts of education staff, students, school completers and dropouts (approximately 17,000 agencies).
- School Universe. School name, mailing address, telephone, school type, operating status and locale codes; counts of students and teachers (approximately 83,000 schools).

Counts of dropouts by sex within racial/ethnic status for each of grades 7 through 12 were added to the Agency Universe Survey for the 1992-1993 school year. Education staff counts were added to the Agency Universe Survey in that year also.

The nonfiscal surveys are distributed to SEAs in December of the reported school year (that is, December 1992 for the 1992-1993 school year and 1992 fiscal year reports). Completed reports are due on March 15; late and revised data are accepted until approximately September 1. The fiscal surveys follow a different schedule. Data edits are conducted by screening for missing or unacceptable responses, incorrect totals for summed variables, and values that diverge widely from the previous year's reports.

Work to improve data Over the past eight years, NCES has engaged in considerable redesign of the CCD surveys. The State Aggregate Fiscal Survey increased in detail from approximately 30 to 130 items, and NCES contracted for the development of individualized state "crosswalk" software programs that reconcile the state's fiscal reports with the requirements of the NCES survey. Through a contract with the Council of Chief State School Officers (CCSSO), NCES and the majority of the states agreed upon definitions for the data elements collected on the CCD surveys and negotiated Data Plans and Technical Assistance Plans that outline each state's existing and projected capability to comply with CCD reporting requirements. CCSSO technical reports, based on analysis of state reporting forms and conversation with state personnel, document all of these activities. By the end of 1991, both NCES and the majority of SEAs had subscribed to common definitions and reporting procedures for the CCD data, with documentation of those items each state did not report.

The CCD redesign effort to date has concentrated on establishing standard definitions and reporting periods for data items, and identifying which items

SEAs cannot report. Most of this work has been conducted through discussions between NCES contractors and CCD Coordinators at the individual SEAs. The fiscal crosswalk project has examined SEA fiscal reports and state procedures for converting these into CCD fiscal reporting requirements, with some on-site examination of SEA records and consultation with SEA staff. There has been virtually no on-site examination of SEA nonfiscal record systems.

3.2 A Perspective on Assessing CCD Data Quality

For the most part, the CCD gathers from the states information that the states already gather at their own initiative, following data requirements and definitions designed to accord with state education law and policy and to meet state needs. The questions cover all public schools and districts in the state. The state is under no legal compulsion to respond. This arrangement has great strengths and significant limitations. The strengths are:

- **The data are objective**, although not without error. Because the data are drawn from records, responses are not subject to the errors of recall, perception of meaning, and sensitivity to question wording and question sequence that create response problems in many surveys. The key respondent, the State CCD Coordinator, is an experienced professional who has worked in the state education department for some time, has secured from the schools and school districts the administrative information required by the state, and in many cases has responded to CCD surveys in prior years.

- **Coverage is likely to be generally good,** and

- **Response rates of schools and school districts are typically high**. The states have direct administrative relationships with the school districts and schools that help to ensure that they have current information on active and inactive districts and schools. The authority that the states exercise over the districts and schools helps to ensure that these subordinate units answer state inquiries promptly and accurately and respond to followup questions prompted by review of their information. As we have seen in our review, not all schools, districts, and states have the information that CCD requests. This means that item nonresponse rates may be high, especially for new topics, such as dropouts, and topics that are perceived to be outside the core interests of school administrators, such as school support staff.

The limitations of the arrangement are:

- **NCES has only a "cajoling authority"** over the coverage, content, and quality of the survey. Public education is the province of the states and localities, which provide 93% of the funding for public education. Accordingly, **control of the CCD data** rests mainly with the states and their representatives such as the Council of Chief State School Officers (CCSSO), not with the federal government. The states, not NCES, control survey coverage, the availability of information, and the definitions and classifications according to which the data are collected. NCES operates separate data collections for private schools because they are inadequately covered by state governments. NCES consults intensively with the states and their representatives and conducts technical assistance projects that seek to improve state capabilities to produce data that meet national standards. But NCES does not exercise control. NCES does have more than a cajoling authority in regard to the reporting of State Per Pupil Expenditure (SPPE). Because the figure is used to distribute $6 billion in federal aid each year, the incentive to report is high. Even so, the states employ a variety of definitions in calculating the number of pupils used in the denominator of the SPPE (see Morgan, 1991).

- **There is great variety in the availability, content, and quality of data**, including nonstandard definitions of measures, some of which are governed by state law, nonstandard names and identification codes. The variety in state definitions seems to be part of the price the nation pays for a federal system of education.

- **Complexity.** The CCD enumerates a variety of populations simultaneously (school districts, schools, students, staff), and data users expect to find sensible relationships among the figures for these populations. Moreover, CCD is conducted at several levels of aggregation simultaneously (state, school district, school). Data for each of these levels have to make sense in relation to one another. However, the encompassing of multiple levels of administration and multiple populations in the CCD produces many complexities and anomalies. There are students and staff that do not nest within schools; students, staff, and schools that do not nest within districts; and districts that do not nest within states. At the state level these anomalies may reflect, for example, educational programs run by correctional institutions and by

state health and welfare agencies. At the local level, anomalies may reflect, for example, students for whose educational expenses the district is responsible but who are not schooled within the district. Such students may be "assigned" to existing schools even though they never attend there. It may be that figures for higher levels of aggregation (school district, state) cannot be arrived at by a simple summing of counts at lower levels because complex counting rules are necessary to avoid double counting; hence there are schools without pupils, schools without teachers, teachers without pupils, and pupils without teachers.

- **Errors are "lumpy"**. While it is rare for an entire state to fail to respond to one of the CCD surveys, it can be serious when it happens because the reporting units are so large. For example, CCD data for the school year 1991-92 were never submitted by the SEA in Virginia because of difficulties experienced in the changeover to a new computer system. That omission alone means that data on one in every 40 American schoolchildren were unavailable. There are about 16,000 school districts in the United States. Together, the largest 16 of them enroll one in every 10 American schoolchildren. Data problems in any one of the large districts are likely to mean data problems for their states and the national totals.

- In some states, the **CCD may be perceived as peripheral** and its data requests may be accorded less attention than in other states.

The strengths of the CCD and its shortcomings derive from the same source: its nature as a voluntary, universe, administrative record survey. On balance, these characteristics make the CCD a difficult data source from a statistical administrator's point of view. It is difficult in the lack of a central decision process, the lack of uniformity in definitions, the variety of state units responsible for data collection and initial processing, and the varying level of statistical capability among states. It is difficult from a data user's point of view for many of the same reasons, which raise doubts in the user's mind about the level of trust to be placed in the data. That is why it is essential to evaluate the data quality of the CCD, and to find a way to assess it that respects the nature of the CCD. NCES is now considering a new design framework within which it can specify and implement an ongoing assessment of data quality in the CCD survey system.

4. Nonresponse in the NAEP Trial State Assessments

4.1 Background of the Study

In 1990 the National Center for Education Statistics (NCES) launched a National Assessment of Educational Progress (NAEP) Trial State Assessment (TSA) of eighth-grade public school students in mathematics. This State Assessment Program assessed mathematics skills among over 2,000 eighth grade public school students in each of thirty-seven participating states and the District of Columbia.

Approximately 100 schools were selected in each state. The sample of schools in each state was selected with probability proportionate to size, where the measure of size was equal to the number of students enrolled in the eighth grade per school. The schools within each state were stratified by the following variables: urbanicity, percentage of black and hispanic students enrolled and median household income. All states, except for those with 100 schools or fewer, were stratified by urbanicity and income variables. Only states with significant minority populations were stratified based on minority enrollment. A sample of about 30 students were selected within each sample school. The student sample size of 30 for each school was chosen to ensure at least 2,000 students participating from each state, accounting for school nonresponse, exclusion of students, inaccuracies in the measures of enrollment, and student absenteeism from the assessment. Some students were excluded from the sample for various reasons and the number and reason for each excluded student was accounted for in each state. Each sample student completed a 55 minute assessment including 10 minutes of background information and 45 minutes of mathematics items.

4.2 Preliminary Results

There was nonresponse at the school district level, the school level, and the student level. When the state coordinator reported the nonparticipation of a school, a substitute school was selected. The process of selecting a substitute for a school involved identifying the most similar school in terms of the following characteristics: urbanicity, percent of black enrollment, percent of hispanic enrollment, eighth grade enrollment, and median income. Schools that substituted for a refusing school were assigned the base weight of the refusing school, if they agreed to participate. The base weight assigned to a school was the reciprocal of the probability of selection of that school.

In cases where there was nonresponse of the substituted schools there were also separate weight adjustments. Further there was adjustment for student nonresponse and poststratification adjustments as a result of a raking process. The base weight for a participating school was adjusted for nonparticipating schools for which no substitute participated. This procedure involved creating nonresponse classes based on urbanicity and minority strata. In states where no minority stratification was used, nonresponse classes were created based on median household income. The objectives in forming the nonresponse classes was to create as many classes as possible, as homogeneous as possible, but such that the resulting nonresponse adjustment factors were not subject to large random variations resulting from sampling error.

Nonresponse adjustments had to be recalculated according to the initial nonresponse. The schools were sorted into nonresponse classes and the following counts and ratios were listed for each initial nonresponse class:

- Total in-scope schools from the original sample
- Participating in-scope schools from the sample (both original and substitutes)
- Total in-scope schools from the original sample divided by participating in-scope scope schools from the sample.

The following procedures were adopted for reviewing these counts and ratios and determining what collapsing should be done. Within an initial nonresponse class, if the ratio of inscope schools to participating schools was less than 1.35, with at least six participating schools in the class, there was no need to collapse the particular cell. If any nonresponse class had fewer than 6 schools or a ratio greater than or equal to 1.35, it was collapsed with another class such that the new class met these conditions. The results obtained from application of these procedures are now being analyzed and the implications for design and control of future state assessments will be assessed.

* * *

Other work by NCES and its technical assistance contractor in support of data quality improvements is ongoing and will be reported in NCES methodology reports and in supplements to survey documentation that will be available to data users.

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SURVEYS OF EDUCATIONAL INSTITUTIONS - DISCUSSANT'S NOTES

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Sampling Frames for Educational Surveys at the U.S. National Center for Education Statistics

P. Planchon, M. McMillen, D. Kasprzyk

The paper provides an excellent overview of the frames used in NCES for the collection of education statistics. Of particular interest is the establishment of the Common Core of Data (CCD), updated annually, as the basis for samples of specific aspects of education (schools, teachers, students, finance) to be collected in more detail on a less frequent basis. This represents the most significant departure between the approach used by NCES and by Statistics Canada, where there is no direct surveying of elementary or secondary institutions or staff (other than for private schools).

While there are obvious advantages of obtaining information which goes beyond that which can be found in administrative sources directly from schools, etc., most of our current difficulties arise from having to obtain the initial base of information from the provincial ministries (timeliness, coverage, using the surveys as a political lever, fallout from other federal/provincial conflicts). Therefore, we would have to address these issues before it would be likely that we could consider exploiting this level of information as a sample frame which we could depend upon. There is some indication that similar problems might arise from time to time in the U.S., which would have an increased impact if they affected the ability to conduct follow-up sample surveys. No mention is made of the way this kind of situation might be handled.

There might also be some significant resistance on the part of the provinces of allowing the federal government to have direct access to schools and teachers for statistical purposes. This would have to be negotiated and the limitations of the use of this facility would likely have to be clearly established. Have similar limitations been negotiated with the states?

However, we should not overlook this sort of approach as a means of responding to the growing demand for information which have arisen of late. In the mid-1980's Statistics Canada was required to cut back significantly on the information which it holds on the teacher workforce, for example, because of budget reductions. We have recently been looking into the use of household based surveys as a means of partially filling the information gaps which resulted from these cutbacks. While this might not be an optimum approach, it does permit the collection of information which might not otherwise be available to the department.

Much greater similarity exists between Canada and the U.S. in the data collection procedures used at the postsecondary level and from private schools at the elementary and secondary levels.

We maintain master lists of all postsecondary institutions (although in Canada they number only in the several hundreds, and so the task is not as daunting) which are updated annually from available information. Surveys at this level are conducted directly with the institutions, which maintain a fair degree of autonomy from all levels of government, and which receive a fair portion of their funding from the federal level. Is there any plan to integrate the NPSAS (the National Postsecondary Student Aid Survey) into IPEDS in a similar fashion to the integration of CCD/PSS and the sample surveys (SASS)?

For private schools at the elementary and secondary level, similar information sources have been used in Canada to develop a frame, with what appears to be similar results in terms of coverage. The greatest challenge we have in this area is obtaining financial information from these schools.

The work done on the private school frame typifies the difficulty in getting frames for institutional surveys and the "detective" work involved in building them. In fact, I think that the difficulties in frame creation and the contribution of frame problems to total survey error (i.e., as part of the overall survey data quality) are greatly underestimated not only in educational surveys but for institutional surveys in general.

Monitoring Data Quality in Educational Surveys

S. Peng, K. Gruber, W. Smith, and T. Jabine

The paper highlights a number of ideas and procedures which significantly enhance both the value of the information which is produced, and perhaps more

importantly, its credibility. The most compelling is the notion of a "framework" within which the quality of the survey results can be evaluated. The resulting production of a "quality profile" for each survey not only should ensure that users are well aware of the strengths and limitations of the data which they are using, but should provide the survey managers with clear list of issues which they must address. Furthermore, it should also provide a set of priorities for what requires the most attention.

Without this sort of framework, in the form of written standards, survey managers often react to solving the most immediate and pressing problems during and between survey cycles rather than being able to stand back and evaluate which issue would result in the greatest benefit to the results overall, or which might be likely to address a number of seemingly unrelated problems.

Data users are also better off. Without complete documentation of the quality of the survey results, they may rely on only those measures which were "available", such as response rates or variance estimates, to develop confidence in the survey data provided. Meanwhile, factors such as biases introduced into the results because of item or whole record non-response, problems with concepts, and so on, which may significantly affect the useability of the results, goes unreported.

The setting of standards is important as it contributes to improved consistency. This is important for comparability across states and, increasingly, internationally. At Statistics Canada, we have standards for informing users of data quality and methodology for all surveys. The ability of individual surveys to meet the standards is varied and will take time to achieve.

Concerning IPEDS, the emphasis in the paper is on non-response. Are there plans to perform a full quality profile for this integrated data system?

I found interesting the reference to the possible use of demographic models for education data to evaluate or improve the existing data.

Most of the surveys conducted by the education program at Statistics Canada are of the sort described under the "Common Core of Data" section of the paper. They are comprised of annual collections of administrative data from the ministries of education for each of the ten provinces and from postsecondary institutions. While this means that the results are not subject to "sampling" errors, there are a number of issues related to the collection and processing of the information which have been of some concern from time to time. Highest on this list would be specification errors, response errors, non-response error to individual items, and processing and imputation errors.

Specification and response errors arise because the provinces and institutions respond to the surveys with machine readable or hard copies of administrative files for their jurisdictions, or by referring to these sources to complete traditional questionnaires. Despite the best efforts on behalf of both Statistics Canada and respondents to try and have data requirements conform to common definitions, there inevitably are differences which arise. Some of the most problematic are in the financial data, and in reporting on full-time equivalences. Two initiatives are currently underway intended to try and reduce these sorts of errors:

1) Work is currently underway on the development of "handbooks" for the elementary/secondary, college, and university levels which will spell out as clearly as possible the expected concepts and definitions to be provided for each item contained in all surveys. With this information, it is expected that respondents will be in a better position to judge the suitability of their own data sources as the most useful reference source for the survey. At the very least, they should be able to describe to Statistics Canada how the information which was provided differed from the "ideal". This would allow the final results to be adjusted or footnoted to "correct" of identify the differences.

2) Sources of financial data for education within several Statistics Canada are being merged. A project is currently underway which will result in Education Division, Public Institutions Division, and Health Division sharing a common database of information on revenue and expenditures for the public sector in Canada. While the project is not intended to have these three divisions move toward common definitions and outputs, it will enable Statistics Canada to provide clearer information to the provinces concerning the information which is required and it should enable the information from the three to be more easily reconciled.

Processing errors are another area which has been receiving more attention in recent years with the transfer of this function to a centralized division within Statistics Canada in recent years. Whereas prior to the transfer, survey managers might have relied upon their proximity to the staff performing this function as a means of keeping informed about the quality of the data and the

corrections which were being applied, this can no longer be the case. It has become apparent that improvements in the documentation of these activities is required and that steps must be taken to ensure that better means are developed to provide summary information on the impact of these processes on the overall data quality.

A final important point made in the paper is the use of external sources of information as a "verification" of the results of administrative surveys. There are several such sources in Statistics Canada which have not been used as well as they could or should have been over the years (Census, LFS). When differences in the results between these sources and the administrative surveys do arise, they are usually too often quickly dismissed without ensuring that they are not revealing some fundamental problem with either of the surveys. However, users who may not have such a commitment to either of the sources may not be as prepared to ignore the differences, and have forced survey managers to take a closer look at differences more closely recently. In addition, there are great advantages to be gained in being able to exploit the detailed information which is contained in some of these other data sources (demographic characteristics, geographic information, etc.) to enhance the administrative data sources, but this can only be done easily if differences between the overall results of the two can be reduced or explained.

It is difficult to obtain quantitative measures for all aspects of quality. As the paper points out, varied techniques are necessary. In addition, the importance of qualitative measures cannot be overlooked.

The paper's vision of the future is excellent. Time is required. However, the existence of standards will make a continuing program easier because of the consistent framework underlying the work. Quality assessment never ends but hopefully gets easier over time. As well, in a decentralized statistical system as in the U.S., it is hoped that the work done on the quality framework will have a spill over effect on other types of surveys.

Hierarchical Data and Models: The Case of School Effects on Literacy

S. Raudenbush and S. Ahmed

Although being less qualified to discuss the methodology presented in this paper, one can certainly recognize the value of the work for its ability to make the maximum use of survey results to understand the roles which various factors have on the development of literacy skills in young people. Especially noteworthy is the estimation of effects of schools or classrooms on the distribution of outcomes while recognizing problems associated with having a sufficiently large sample (a very real problem) to account for the large number of candidate variables (a very real situation) even when first classifying into conceptually related blocks. The authors also recognize the difficulty in the choice of a "best" model given the wider set of models now introduced.

The type of analysis described in the paper are familiar to persons currently working on the development of the National Longitudinal Survey of Children (NLSC) at Statistics Canada. This survey, which will collect information from a sample of children from birth to twelve years of age, and then biannually thereafter, is intended to provide information on the health and educational factors which contribute to their successful overall development. It will be comprised of information collected from the parents, the children themselves for some of the age groups, from teachers and other education staff, and from administrative data. The analysis planned for the survey will attempt to identify the impact of various factors on their development. It will try measure the influence of the community or school and those of the individual and their family environment in the overall learning and wellbeing development, as a basic objective.

Since the survey will use a household based sample drawn from the frame used for the national labour force survey, some of the early challenges have been to identify a sampling scheme which will yield sufficient sample within each class in order to enable the sort of modelling described in the paper to be exploited. In addition, since even ensuring that the sample will be clustered geographically will not be sufficient to ensure that there will be multiple respondents from the same school or school board, it may be necessary to identify other factors which would serve as a proxy for measuring the role of the school in order to provide information about the impact of the school.

Concerning the future, with an increasing interest in comparative international statistics, the addition of country as the third level shows the potential for expansion of the research. Also, there could be applications outside the education area, for example, in health considering hospitals, physicians and patients as levels.