

REDESIGNING THE COLLECTION OF NATIONAL EDUCATION STATISTICS

Emerson J. Elliott and Charles D. Cowan
Center for Education Statistics

Abstract

The Center for Education Statistics (CES) has undertaken a program to redesign its major elementary and secondary education surveys. This redesign broadens the focus of the surveys being conducted so that more comprehensive data will be available about schools, teachers, principals, school districts, and students. The surveys will provide descriptive information from linked sets of data that will permit resources and contextual questions concerning education to be addressed. For example, they will provide information about differences between public and private schools, differences

by State, and between background and social and economic variables that describe the milieu in which schools and teachers operate. While the focus of these surveys is being expanded, at the same time the Center is moving in the direction of combining or overlapping surveys that measure inputs to education with surveys that assess educational progress. The intent is to make the whole set of surveys responsive to policy questions, to permit analysis at the school level and to produce valid, reliable and uniform data in a timely fashion.

1. Introduction

There are three dimensions to be considered in shaping a Federal statistical system. The first is comprehensiveness--policymakers want a large quantity of data about a wide variety of topics. They need a broad description of education so that the health of the system can be monitored, needs for improvement identified, and effects of policy changes assessed.

The second dimension is timeliness--data that are old are only descriptive of where we were, not where we are. Trends and rates of change are important and useful, but policymakers and the media will not accept these as proxies for what is happening in our schools now. This dimension is especially crucial at a time of unprecedented legislative activity that has occurred in virtually every State across the nation since 1983.

The last dimension is quality--a timely and comprehensive description of the system of education in the U.S. is useless if it does not accurately reflect the conditions that actually exist in the system. Quality is the most elusive of the factors that shape a Federal statistical system, yet it may be the most important. Perceptions of poor quality may cause policymakers to search elsewhere for answers, even if other factors the data possesses are attractive to a policymaker who is trying to measure the impact of a new program or policy.

Periodically we need to assess how well our data collections address information needs of policymakers and other users of our data. The Center for Education Statistics has undertaken substantial efforts to make such assessments and, as a result, the Center is consolidating, streamlining, and systematizing data collection and analysis procedures for each of its major programs.

In this paper we will focus on changes to the system for collection of data for elementary and secondary education. Similar measures for strengthening systems used to collect data on postsecondary education are also underway. We are focusing on elementary and secondary education so that we can give an example of one ongoing process, and in particular how we have translated a wide variety of policy interests into a technical agenda for change.

2. National Statistics on Elementary and Secondary Education.

The Center for Education Statistics and the Bureau of the Census have been the primary sources of national education data and a brief description of the pertinent collections of these two agencies is a good place to begin. The Center has five surveys or clusters of surveys, some that are only a few years old, others that have antecedents to the Center's earliest days around 1870. They include the following:

- o Administrative record data from the Common Core of Data (CCD). These universe surveys provide State-by-State data on the traditional descriptors of the public education enterprise--number of schools, districts, students, teachers; the amount of spending and revenues; attendance. Limited information is included as detail to these measures, such as enrollment by grade; classroom teachers and other institutional staff; and districts by size. The data are gathered by State Departments of Education and in many cases aggregated at the State level. There is not currently any counterpart record system of basic private school universe data.
- o Survey data from samples of public and private elementary and secondary schools and teachers. Sample surveys of schools have been conducted from time to time, most often for some special issue such as the equality of educational opportunity study in the mid-1960's and recently for Congressionally mandated studies of teacher shortage and for descriptions of library and media centers. However, beginning in 1983, the Center developed the notion of separate biennial sample surveys for public and private schools as a regular series that would provide descriptive information on both schools and their teachers as well as offer a high quality and nationally representative data base suitable for analytic purposes. Such studies were conducted in private schools in 1984 and 1986 and in public schools in 1985.
- o Survey data from a largescale sample of students to assess their achievement called the National Assessment of Educational Progress. NAEP has gathered student achievement data since 1969 from samples that are representative nationally and for four regions of the country. It is the only representative data of what U.S. students know and can do in basic course areas--e.g., reading, writing, mathematics, science--and is able to provide trend data over nearly two decades. It has recently branched out to history and literature, literacy among young adults, computer sciences and is now developing a geography test. Data are gathered biennially to assess achievement of 9, 13 and 17-year olds.
- o Survey data from a series of longitudinal studies that follow student progress forward 15 to 20 years. The first of these was begun with a 12th grade cohort in 1972. The second took samples from public and private high school sophomores and seniors in 1980 and has followed them up to two-year intervals. We are starting a third cohort in 1988 with a sample of eighth graders. In all cases, of course, the point is to track

students for several years so that relationships can be described between background and educational experiences and subsequent life patterns after their formal training.

- o Survey data from a sample of adults one year after college graduation. This sample survey, called Recent College Graduates (RCG) is conducted biennially to provide information on employment, other activities, salary and related information. It is especially useful in describing college majors and preparation of beginning teachers in elementary and secondary education.

The Census Bureau has collected information about student enrollment and other variables in its October supplement to the Current Population Survey (CPS). These data are only suitable to give national estimates of enrollment for elementary and secondary schools separately, and estimates for public school enrollment. The sample is not of sufficient size to give reliable estimates for private school enrollment. The CPS, being a survey of households, yields no information about schools, teachers, or other components of the educational system. But it has been a source of information that households can supply such as private school tuition payments.

The Census Bureau also collects a great deal of financial information on school districts every year that every five years serves as input to the Census of Governments reports.

3. Statistics in an Era of School Reform

In the report, A Nation at Risk (NCEE, 1983), the National Commission on Excellence in Education voiced its frustration with a lack of data needed for comprehensive analysis of the condition of elementary/secondary education. In fact, over the past two decades there have been a number of efforts to collect data on specific parts of the elementary/secondary system, but efforts were disjointed and at times inconsistent. And the criticisms have been widespread.

Increasing interest in education data, and concern for its gaps, inconsistencies, contradictions and tardiness led the Center to begin a substantial top to bottom review. Beginning in 1985, the Center solicited around seventy papers from data users, analysts, associations and researchers to comment on the status of the system and make recommendations for its improvement. These papers were distilled in a report: Synthesis of Invited Papers, issued in Fall 1985. The next phase, carried out through a commission with four national experts, was the development of a "ideal" data plan that could address the concerns raised in the first report. That plan was issued in a second report in December 1985: Alternatives for a National Data System on Elementary and Secondary Education (Hall et al, 1985).

The Center also funded a three-year project with the Council of Chief State School Officers on

administrative records found in the States and collected by the Center. The goal was to canvass State practice and develop common definitions for statistics that would serve to describe the basic U.S. public school universe data. A summary report describing the first year's activities was issued in November of 1986: Recommendations for Improving the National Education Statistical Data Base: Universe Data on Schools and School Districts.

The Rand Corporation was awarded a contract to design a major new survey of elementary and secondary schools and teachers intended to fill a major hole in Center data--information on teachers, supply and demand, characteristics, working conditions--important to education reform legislation.

Based on these efforts and discussions with representatives of associations and individuals, the Center made a first attempt to synthesize a remodeled elementary and secondary data program in the spring of 1986. This paper, Plan for the Redesign of the Elementary and Secondary Data Collection Program, Working Paper Number 1, was distributed to members of the education data community for still further discussion and reaction.

And finally, in mid-1986, the Department of Education formed a study group to review the nearly 20-year-old methods for assessing student achievement called the National Assessment of Educational Progress. The report of this group, The Nation's Report Card, was released in March 1987.

From this process we learned a great deal about CES data collections and reports that needed repair--even re-creation. On data content, our many advisers said there were huge gaps in many areas that are important to education reform legislation such as teacher characteristics, supply and demand, teacher incentives; curricular offerings and enrollments; use of funds especially for instructional staff, administration, and instructional materials. CES data were not gathered or reported on sufficiently representative dimensions--especially States, district or school size and demographically diverse service areas, and private as well as public schools. This interest in representativeness encompasses reports on student performance as well as on school and teacher characteristics, governance and finance. On timeliness, there were criticisms that some respondents were late, but an admonition to the Center to be more systematic and persistent about following up and expeditious processing of data that had been returned. On data quality, lack of uniformity in reporting across States and districts, use of questions that did not elicit full or accurate information, existence of measures from different sources that could not be reconciled and the aggregation of data at the State level that precluded analysis were all pointed out.

Our consultants told us, in effect, that a new structure was called for in which the

several parts would gather information directly from the source--students, parents, schools, teachers, and school districts--but all would be linked into a single framework that provided data addressing a wide variety of policy questions.

4. A New Data System

How these sources are being modified or recreated, how data from the sources will be combined, and a specific example of how policy questions have been translated into technical questions and then addressed will be the subject of the remainder of this paper. We have organized these comments around topics that can be aligned with our introductory assertion that there are three dimensions to be considered in shaping a Federal statistical program. Here our headings are "comprehensiveness", "structure and analysis" (which parallels "quality" in our introduction) and "uniformity and management" (which covers, but is broader than, "timeliness" in the introduction).

Comprehensiveness

Perhaps the most obvious characteristic to data users is our move to make data content more complete. In this case, our data collections are greatly expanding the questions about teachers and schools so that such areas as teacher job experience, work incentives, activities and use of time, compensation, and attitudes will be covered. For principals, data will be gathered on job preparation and experience, attitudes and roles. These studies will gather information about schools, also, including incentive programs, graduates, college enrollment rates, etc. In the universe surveys, information on racial composition of schools and proxies for socio-economic status will be added. All of these data elements apply to private, as well as public, schools and our surveys are designed to begin filling long standing gaps about these important parts of the nation's education system. We are beginning a major revamping of financial information that will restore detailed data on the purposes for which funds are spent. And we also are taking a look at a possible household survey, compatible with CPS, that could describe the extent and status of dropouts and might eventually provide information about preschool and family roles in education.

The expanded data coverage of the Center's system will include development of a State-by-State forecasting model for public schools. Elementary and secondary enrollment, pupil-to-teacher ratios, and other variables that describe the basic parameters of the system will be projected forward a decade. These forecasts will give an indication of shifting demand for resources among States.

Two forecasting models have been developed. The first relies on estimation of grade retention rates and numbers of students passing through the system from year-to-year, given numbers of births over the past 18 years by State and assuming low State-to-State

mobility rates. The second model relies on enrollment rates from the age 5 to age 18 population, and depends heavily on forecasts by the Census Bureau of the size and spatial distribution of this population by State. These latter forecasts would include corrections for mobility among States. The second method is more realistic in the way it deals with population mobility, whereas the first method has been shown to be more accurate in national forecasts of enrollments. Ultimately a combined estimator will be developed to take advantage of the best features of both. Enrollment forecasts serve as the basis for projecting teacher demand, and methods are currently being developed to add this component to the overall model.

Structure and Analysis

We have taken steps to build more rational and integrated data collections that will vastly strengthen the analytic potential of our data. They would:

- o make the school sample surveys regular at two-year intervals and combine previously separate studies of teacher shortage and other topics into the same instruments.
- o conduct public and private surveys in the same year.
- o maintain data at the school and teacher level, rather than aggregated, so that micro-analysis is possible.
- o link the universe and sample surveys by use of common terms and common questions and use of our universe data (instead of commercial sources) as the basis for selection of the samples.
- o nest the samples around schools so that teacher, administrator and even school district samples are all derived from schools.
- o provide representative data for schools in different settings--urban, rural, rich, poor, large, small, high and low minority enrollment, public and private.
- o provide State representative data and integrate school with student achievement data.

These last two qualities of our upgraded and structured data system are ones we will comment on at greater length.

An innovative feature of the school and teacher sample survey is that its design evolved from attempts to satisfy a number of policy interests simultaneously. Senior Government officials, representatives of States, private schools, large city schools and other interest groups wanted detailed estimates of comparisons to be made for different parts of the education system. The sample was designed to provide:

- o National estimates of various characteristics for both schools and teachers;
- o Comparisons of elementary, secondary, and combined grades for schools and for teachers;
- o Comparisons between public and private schools and teachers;
- o Comparisons among States of school characteristics and teacher characteristics;
- o Comparisons by field of teaching for secondary and combined schools at the national level.

In addition, efforts were made to ensure that the smallest of the religious affiliations for private schools covered in the survey would yield national estimates at least as reliable as the State with the smallest school sample.

This was accomplished by considering ways in which the variance of different estimates could be minimized. For example, the optimum allocation of the school sample to States for the purpose of making a national estimate of school characteristics would be to allocate the school sample to States in proportion to the number of schools in the State. However, for the purpose of making State-to-State comparisons, where all States are of equal importance, one would allocate the same number of schools in each State. To satisfy both of these desires, given a fixed sample size for schools, one chooses the number of schools in each State to be the number that minimizes both variances simultaneously.

In this case, the problem is also complicated by a cost constraint which allows for differential costs of collection for schools, teachers and school districts. It is further complicated by the fact that the number of schools in some States is relatively small, and so the finite population correction factors for each State estimate have to be included in the calculation. The overall system of solution is quite complicated and will be the subject of discussion at other conferences.

Our intent in this example is to record an instance where a sample was designed as a technical response to policy interest for use of the data. A more conventional approach might have left the choices to statisticians to maximize on only one or two dimensions for available funds, but that could have compromised some of the analysis goals. Incidentally, the final mix has three times the number of schools that early planning assumed and a somewhat smaller group of teachers with a heavier secondary school weighting. Despite the school sample size, (one-eighth of U.S. schools), criticism has--so far--been slight, perhaps because the Center is able to offer compelling explanations for both the design goals and the expected precision of the estimates.

We might now turn to the NAEP merger with the schools and staffing survey, for now this is a goal we expect to achieve in part by 1990, but the operational details and conceptual problems are not resolved by any means. The combination of these two surveys would allow policymakers for the first time to have detailed descriptive data on resources in the schools as a context for the outcomes of the educational process. Research in how the two surveys might be combined is just starting now, but the joining of the surveys holds great promise for new analyses about the efficacy of policies and their long term impact. You can readily understand the complexity of the problem, however. NAEP samples are drawn from schools that contain 4th, 8th or 12th grades while the school and teacher sample is drawn to represent elementary, secondary, combined, or other schools. While background data are gathered from teachers of NAEP sample students, such data are not gathered from a representative sample of all teachers in those schools. Then, too, NAEP students participate in a "Bib spiral" sample design that keeps the administration time for a student to an hour while the total content coverage for a subject may be seven hours. One result is that background data items have been very restricted in use, necessitating a move away from the 1984 sampling approach. These statistical design questions all leave aside the enormously sensitive issue of how decisions are made about NAEP itself--almost entirely outside the Government--in contrast with how decisions are made for the school and teacher surveys. How this is worked out may be the subject of future conferences.

Uniformity and Management

The final area we will describe about the new design concerns production matters--the management of a system that will produce uniform and reliable data. Again, let us mention the principal efforts we are making. These have been to:

- o adopt a set of consensus definitions of common terms developed by the Chief State School Officers and begin to require these in annual universe collections.
- o continue work with the Chiefs on definitional areas not yet covered, especially "finance" and "staff."
- o review the wording of questions across sample surveys for schools and teachers, NAEP, and longitudinal studies to make them consistent.
- o arrange with the Census Bureau to be our data collection agent for the school and teacher survey, drawing on their acknowledged expertise in this area.
- o develop and adopt a set of written technical standards that serve as guidelines for all CES work from design of a survey to publication of results and that pertain to both CES staff and contractors as well.

- o begin a series of management improvements such as returning reports to State data suppliers within 60 days of the data collection cut off and standardizing our reporting dates and formats for each survey.

We especially mention here the Center's actions to develop a national cooperative education statistics program with the States. In this effort we have borrowed liberally from the experience of the Bureau of Labor Statistics, National Center for Health Statistics and other agencies that have worked--for decades--to improve the consistency of data, timeliness of reporting and comprehensiveness of statistical collections involving States and administrative record systems. Secretary Bennett has proposed legislation that would underwrite this purpose that has been passed by the House and is pending in a Senate bill to be taken up this fall and next winter. Meanwhile, under our existing authority, we are able to make a start on several components of these measures such as:

- o Developing agreements between CES and the States as to what data will be provided and on what timelines;
- o Publishing both preliminary and final data on schools;
- o Developing, with State cooperation, early estimates of selected variables;
- o Offering training for individuals in States responsible for the completion of forms;
- o Offering technical assistance to the States for completion of the surveys; and,
- o Independent monitoring of State data collection activities.

Two four-day-long conferences have been held with States this summer to initiate these

efforts. The pending legislation would provide further endorsement of this work, make collegial decisions on data content a matter of law, and authorize financial assistance for additional costs imposed on States as a result of their voluntary participation in the new cooperative system.

Timing of data releases will also be enhanced by this system in two ways. In the past, the Center has waited to publish data until reports from all States were in. The Center has established a time schedule for the collection and dissemination of data. Preliminary reports and data releases in the form of tapes will be issued, and revisions will follow on an orderly basis. For some data elements of particular interest, calls to the States will elicit early reports or estimates to be released in advance of the main body of the data. These early estimates will serve both the purpose of informing policy makers of impending change, and as data for forecasting models which have been developed for each State.

5. Conclusion

We have tried to show that a Federal statistical agency can, with hard work and perseverance, and in a relatively short time, develop a program that is comprehensive in scope and that can generate timely data of high quality. We expect that improvements in the way the Center collects and analyzes data will continue.

Indeed, even while these measures are underway, we are looking toward the future for education statistics. We refer to a project supported by the National Science Foundation that has brought three ASA fellows to the Center. This summer Ingram Olkin, Larry Hedges, and Ed Haertel joined the Center as our first ASA Fellows. Their goal is to develop an automated integrated data collection system, tailor-made for education. We like to think of this as the next generation of education statistics and conclude by thanking ASA and NSF for lending their support to this important undertaking.

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