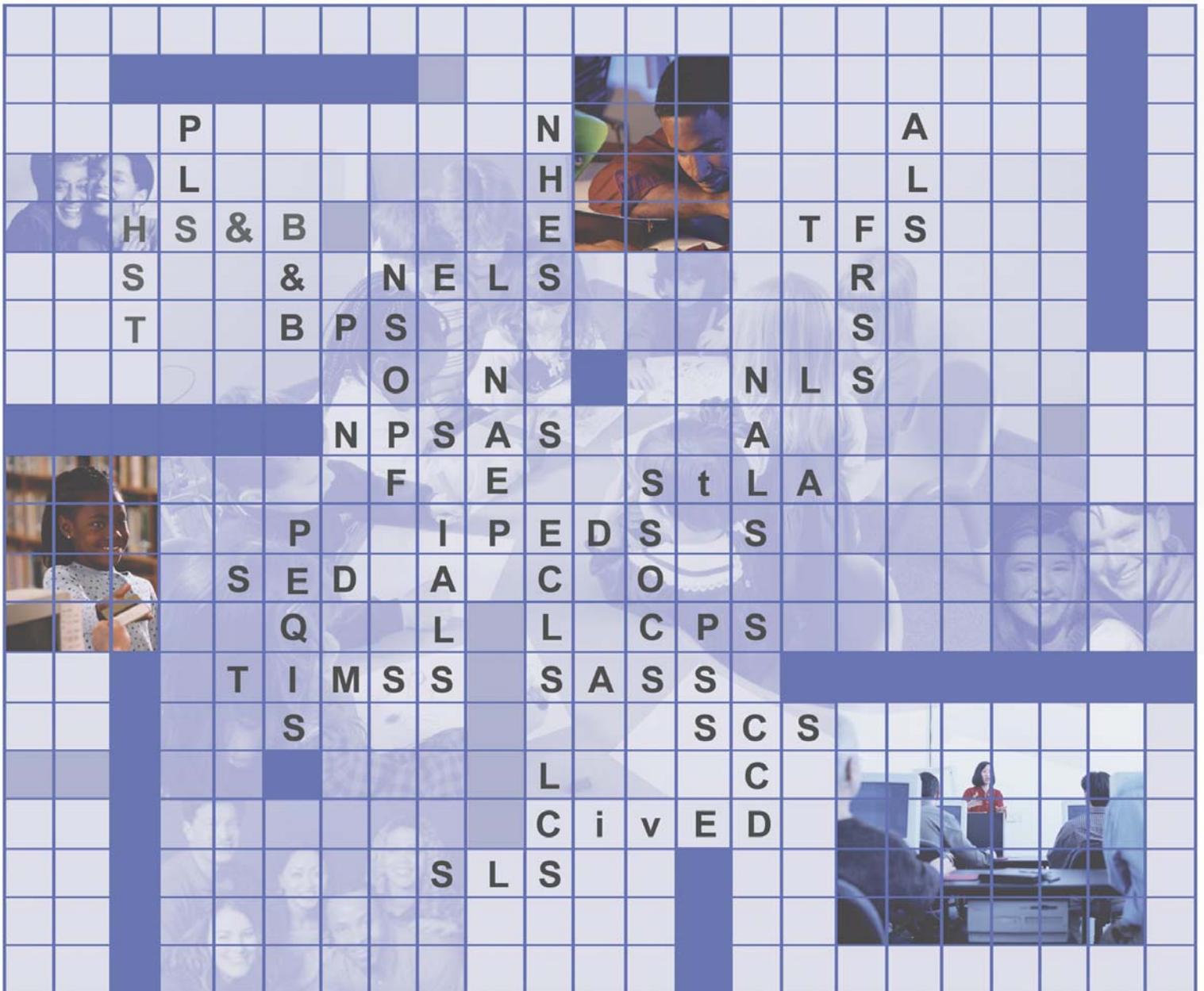


NCES Handbook of Survey Methods

Technical Report

U.S. Department of Education
Institute of Education Sciences
NCES 2003-603





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April 2003

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List of Acronyms

3PL	Three-parameter logistic scaling model
<hr/>	
AE	Adult Education Survey (see NHES)
AELL	Adult Education and Lifelong Learning Survey (see NHES)
AERA	American Educational Research Association
ALA	American Library Association
ALA-ORS	American Library Association's Office of Research and Statistics
ALL	Adult Literacy and Lifeskills Survey (see NALS)
ALS	Academic Library Survey
API	Asian/Pacific Islander
APGAR	Activity (muscle tone)/Pulse/Grimace (reflex irritability)/Appearance (skin color)/Respiration; the APGAR score is given to newborns (see ECLS)
AQS	Attachment Q-Sort (see ECLS)
ASPA	Before- and After-School Programs and Activities Survey (see NHES)
<hr/>	
B&B	Baccalaureate and Beyond Longitudinal Study
BHR	Balanced Half-sample Replication
BHS	Balanced Half-sample (BHS) method (weighing)
BIA	Bureau of Indian Affairs
BIB	Balanced Incomplete Block Spiraling (a type of matrix sampling)
BILOG	computer software used in scaling (see IALS)
BJS	Bureau of Justice Statistics, U.S. Department of Justice
BLS	Bureau of Labor Statistics, U.S. Department of Labor
BPS	Beginning Postsecondary Students Longitudinal Study
BRR	Balanced Repeated Replication
BSID	Bayley Scales for Infant Development (see ECLS)
BYI	Base Year Ineligible Study (see NELS:88)
<hr/>	
C	Completions (see IPEDS)
CACE	Computer Assisted Coding and Editing (see HST)
CADE	Computer-Assisted Data Entry
CAO	Chief Administrative Officer (NSOPF)
CAPI	Computer-Assisted Personal Interview
CASES	Computer-Assisted Survey Execution System (see SCS)
CATI	Computer-Assisted Telephone Interviewing
CCD	Common Core of Data
CCSSO	Council of Chief State School Officers
CEO	Chief Executive Officer
CES	Civic Education Study (see CivEd)
CHAID	Chi-Squared Automatic Interaction Detector
CI	Civic Involvement Survey (see NHES)
CIDS	Career Information Delivery Systems (see IPEDS)
CIP	Classification of Instructional Programs
CivEd	Civic Education Study
CN	Consolidated Form (see IPEDS)
CN-F	Consolidated Form, "finance" part (see IPEDS)
COSLA	Chief Officers of State Library Agencies

CPS	Current Population Survey
CSSC	Classification of Secondary School Courses (see HST)
DAS	Data Analysis System
DIF	Differential Item Functioning (see NAEP)
DOD	Department of Defense
DODEA	Department of Defense Education Activity
DOL	Department of Labor
DRC	Data Recognition Corporation
DRF	Doctorates Record File (see SED)
EA	Institutional Activity survey (see IPEDS)
EAP	Employees by Assigned Position (see IPEDS)
ECB	Electronic Code Book
ECE	Early Childhood Education Survey (see NCES)
ECLS	Early Childhood Longitudinal Study
ECLS-B	Early Childhood Longitudinal Study, Birth Cohort
ECLS-K	Early Childhood Longitudinal Study, Kindergarten Cohort
ECPP	Early Childhood Program Participation Survey (see NHES)
ED	United States Department of Education
EDI	Electronic Data Interchange (see NPSAS)
EEOC	U.S. Equal Employment Opportunity Commission (see IPEDS)
EF	Fall Enrollment (see IPEDS)
EFC	Expected Family Contribution (see NPSAS)
EIAC	Education Information Advisory Council
EP	Fall Enrollment in Occupationally-specific Programs (see IPEDS)
ESL	English as a Second Language
ETS	Educational Testing Service
F	Finance (see IPEDS)
FASB	Financial Accounting Standards Board (see IPEDS)
FEDLINK	Federal Library and Information Network (see Federal Libraries)
FICE	Federal Interagency Committee on Education
FIMS	First International Mathematics Study (see TIMSS)
FIPS	Federal Information Processing Standards
FISS	First International Science Study (see TIMSS)
FLICC	Federal Library and Information Center Committee (see Federal Libraries)
FMS	Field Management System (see ECLS)
FRSS	Fast Response Survey System
FSCS	Federal-State Cooperative System (see PLS)
FSES	Followback Study of Excluded Students (see NELS:88)
FTB	First-time beginning/beginners (see BPS)
FTE	Full-time Equivalency
FY	Fiscal Year
GASB	Government Accounting Standards Board
GED	General Equivalency Diploma
GPA	Grade-Point Average
GPC	Generalized Partial Credit model (see CivEd and NAEP)
GRS	Graduation Rate Survey (see IPEDS)
GVF	Generalized Variance Function

HEGIS	Higher Education General Information System
HHL	Household and Library Use Survey (see NHES)
HLM	Hierarchical Linear Modeling
HS&B	High School and Beyond
HSES	High School Effectiveness Study (see NELS:88)
HST	High School Transcript studies

IAEP	International Assessment of Educational Progress (see NAEP)
IALS	International Adult Literacy Survey
IC	Institutional Characteristics (see IPEDS)
ICC	International Coordinating Center
ICS	Integrated Control System (see BPS)
IDEALS	microcomputer program for reporting library data
IEA	International Association for the Evaluation of Educational Achievement
IEP	Individual Education Program (see CCD and IEA Reading) or Individualized Educational Program (see HST) or Individualized Education Plan (see NAEP)
IES	Institute of Education Sciences
IHE	Institution of Higher Education
IPEDS	Integrated Postsecondary Education Data System
IRT	Item Response Theory
ISA	International Study of Adults (see IALS)
ISC	International Steering Committee
ISCED	International Standard Classification of Education (see IALS)
ISIC	International Standard Industrial Classification (see IALS)
ISOC	International Standard Occupational Classification (see IALS)

JRR	Jackknife Repeated Replication
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LEA	Local Education Agency
LCS	Library Cooperatives Survey
LEP	Limited English Proficiency
LSCA	Library Services and Construction Act (see StLA)
LSTA	Library Services and Technology Act

MAS	Massey Attachment Sort (see ECLS)
MIL	Missing Information Letter (see SED)
MML	Marginal Maximum Likelihood (see NAEP)
MOSS	Method of Successive Sorts (see ECLS)
MSA	Metropolitan Statistical Area

NAAL	National Assessments of Adult Literacy
NAEP	National Assessment of Educational Progress
NAGB	National Assessment Governing Board (see NAEP)
NALS	National Adult Literacy Survey
NCATS	Nursing Child Assessment Teaching Scale (see ECLS)
NCEA	National Catholic Educational Association
NCES	National Center for Education Statistics
NCHS	National Center for Health Statistics
NCLIS	U.S. National Commission on Libraries and Information Science
NCS	National Computer Systems
NCVS	National Crime Victimization Survey

NELS:88	National Education Longitudinal Study of 1988
NHES	National Household Education Survey
NIH	National Institutes of Health
NORC	National Opinion Research Center
NPEC	National Postsecondary Education Cooperative
NPEFS	National Public Education Financial Survey
NPSAS	National Postsecondary Student Aid Study
NRC	National Research Coordinator (see TIMSS)
NSF	National Science Foundation
NSOPF	National Study of Postsecondary Faculty
NTID	National Technical Institute for the Deaf
OECD	Organization for Economic Cooperation and Development (see IEA Reading Literacy Study)
OERI	Office of Educational Research and Improvement (name changed to Institute of Education Sciences, or IES, in 2002)
OLDS	Oral Language Development Scale (see ECLS)
OMB	Office of Management and Budget
OPE	Office of Postsecondary Education (see IPEDS)
PAPI	Paper-and-pencil interviewing
PC CARP	computer statistical package
PEPS	Postsecondary Education Participants System (see IPEDS)
PEQIS	Postsecondary Education Quick Information System
PETS	Postsecondary Education Telephone System (see IPEDS); Postsecondary Education Transcript Study (see NLS-72 and HS&B)
PFI	Parent and Family Involvement in Education Survey (see NHES)
PIRLS	Progress in Reading Literacy Study (see IEA Reading Literacy Study)
PISA	Program for International Assessment (see IEA Reading Literacy Study)
PLS	Public Libraries Survey
PMSA	Primary Metropolitan Statistical Area
PPA	Program Participation Agreement (see IPEDS)
PPS	Probability Proportional to Size (a sampling method)
PROC IMPUTE	a regression-based imputation method developed for NCES by American Institutes for Research
PSS	Private School Universe Survey
PSU	Primary Sampling Unit
QED	Quality Education Data, Inc.
RDD	Random Digit Dialing (telephone survey technique)
ROTC	Reserve Officers Training Corps
RTD	Registered Time-to-Degree (see SED)
RTI	Research Triangle Institute
S	Fall Staff (see IPEDS)
SAQ	Self-Administered Questionnaire
SAS	computer statistical package; computer language designed specifically for the manipulation of statistical data
SASS	Schools and Staffing Survey
SAVD	School Associated Violent Death Study
SCS	School Crime Supplement
SD	Students with Disabilities
SDR	Survey of Doctorate Recipients (see SED)

SEA	State Education Agency (see CCD)
SED	Survey of Earned Doctorates
SES	Socioeconomic status
SFA	Student Financial Aid (see IPEDS)
SIF	School Information Form (see HST)
SIMS	Second International Mathematics Study (see TIMSS)
SIPP	Survey of Income and Program Participation (see NHES)
SISS	Second International Science Study (see TIMSS)
SLS	School Library Survey
SPSS	computer statistical package
SR	School Readiness Survey (see NHES)
SRIF	Student Record Information Form (see NLS-72)
SSD	School Safety and Discipline Survey (see NHES)
SSOCS	School Survey on Crime and Safety
StLA	State Library Agency Survey
SUDAAN	SURvey DATA ANalysis, a computer statistical package
SUREG	a computer program used in HS&B
<hr/>	
TCMA	Test-Curriculum Matching Analysis (see TIMSS)
TFS	Teacher Follow-up Survey
TIGER	Topologically Integrated Geographical Encoding and Referencing (see NALS)
TIMSS	Third International Mathematics and Science Study
TIMSS-R	Third International Mathematics and Science Study-Repeat
TRP	Technical Review Panel (see IPEDS)
TSA	Trial State Assessment (see NAEP)
TTD	Total Time-to-Degree (see SED)
<hr/>	
USDA	United States Department of Agriculture
USU	Ultimate Sampling Unit
<hr/>	
WesVar	computer statistical package
<hr/>	
YALS	Young Adult Literacy Survey
YCI	Youth Civic Involvement Study (see NHES)
YRBS	Youth Risk Behavior Survey (see SCS)

Introduction

Since its inception, the National Center for Education Statistics (NCES) has been committed to the policy of explaining its statistical methods to its customers and of seeking to avoid misinterpretation of its published data. The reason for this policy is to assure customers that proper statistical standards and techniques have been observed, to guide them in the appropriate use of information from NCES, and to make them aware of the known limitations of NCES data.

This first edition of the *NCES Handbook of Survey Methods* continues this commitment by presenting current explanations of how each survey program in NCES obtains and prepares the data it publishes. NCES statistics are used for many purposes, and sometimes data well suited to one purpose may have limitations for another. This handbook aims to provide users of NCES data with the most current information necessary to evaluate the suitability of the statistics for their needs, with a focus on the methodologies for survey design, data collection, and data processing. It is intended to be used as a companion report to *Programs and Plans of the National Center for Education Statistics*, which provides a summary description of the type of data collected by each program at the Center.

LAYOUT OF HANDBOOK CHAPTERS

- ▶ Overview
- ▶ Uses of Data
- ▶ Key Concepts
- ▶ Survey Design
- ▶ Data Quality & Comparability
- ▶ Contact Information
- ▶ Methodology & Evaluation Reports

NCES Role and Organization

Among federal agencies collecting and issuing statistics, NCES is a general-purpose statistical collection agency in the broad field of education. The Center's data serve the needs of Congress, other federal agencies, national education associations, academic education researchers, business, and the general public. NCES is a component of the Institute of Education Sciences (IES), formerly the Office of Educational Research and Improvement (OERI), within the Department of Education.

Within NCES, the Statistical Standards Program, under the direction of the NCES Chief Statistician, provides expertise in statistical standards and methodology, technology, and customer service activities across subject matter lines. Specific survey programs of NCES have developed around subject matter areas. As a result, the rest of NCES is organized according to subject matter areas, with each of the survey programs falling under one of the following four NCES divisions:

- ▶ Assessment
- ▶ Early Childhood, International, and Crosscutting Studies
- ▶ Elementary/Secondary and Libraries Studies
- ▶ Postsecondary Studies

Organization of the Handbook

The handbook contains 28 chapters. Chapters 1 to 26 each focus on one of the 26 major NCES survey programs. To facilitate locating similar information for the various

programs, the information in each of these chapters is presented in a uniform format with the following standard sections and headings:

1. *Overview.* This section includes a description of the purpose of the survey, the type of information collected in the survey, and the periodicity of the survey.
2. *Uses of Data.* This section summarizes the range of issues addressed by the data collected in the survey.
3. *Key Concepts.* This section provides the definitions of a few important concepts specific to the survey.
4. *Survey Design.* This section describes the target population, the sample design, the data collection and processing procedures, the estimation methods, and future plans for the survey. Note that the handbook does not include a list of the data elements collected by each survey. That information can be found in the survey questionnaires, electronic codebooks, or data analysis systems, many available through the NCES web site (<http://nces.ed.gov>). However, some general remarks about the data collected can be made here:
 - ▶ All race/ethnicity data are collected by Office of Management and Budget (OMB) standards.
 - ▶ All data on individuals can be disaggregated by sex.
 - ▶ All data on individuals can also be disaggregated by Black, White, and Other, and, for some surveys, data can be disaggregated by Hispanic and Asian/Pacific Islander.
 - ▶ All elementary/secondary student-level data collections include information on limited-English proficiency and student disability.
 - ▶ School-level data collections include information on programs and services offered.
5. *Data Quality and Comparability.* This section describes the appropriate method to use for estimating sampling error for sample surveys and also presents important findings related to nonsampling error such as coverage error, unit and item nonresponse error, and measurement error. In addition, this section provides summary descriptions of recent design and/or questionnaire changes as well as information on comparability of similar data collected in other studies.
6. *Contact Information.* This section lists the name of the main contact person for each survey along with a telephone number, e-mail address, and mailing address. Note that at NCES, telephone numbers are assigned according to survey program; staff members leaving one survey program for another have to change telephone numbers. To find out the current number for a particular staff member, see

the NCES Staff Directory (<http://nces.ed.gov/ncestaff/>). To find out the current contacts for a particular survey program, please check the program's web site (NCES survey web site addresses are listed in appendix D).

7. *Methodology and Evaluation Reports.* This section lists the primary recent methodological reports for the survey. Use the NCES number provided to find a particular report through the NCES Electronic Catalog (<http://nces.ed.gov/pubsearch/>). Each NCES survey Web site also contains a list of that survey's publications.

Note that some of the chapters include cautions to data users. The cautions usually appear in section 5, Data Quality and Comparability. For example, in chapter 5, section 5, caution is urged in the interpretation of change estimates between the 1991–92 and 1994–95 Teacher Follow-up Survey (TFS) because specific questions were not always worded the same in both TFS surveys. In chapter 11, section 5, users of Academic Library Survey data are reminded to be careful when comparing state estimates since nonresponse varies by state. These cautions are italicized throughout the report.

The first 26 chapters are organized under the following subject matter rubrics:

- ▶ Early Childhood Education Survey
 - ▶ Chapter 1: Early Childhood Longitudinal Study (ECLS)
- ▶ Elementary and Secondary Education Surveys
 - ▶ Chapter 2: Common Core of Data (CCD)
 - ▶ Chapter 3: Private School Universe Survey (PSS)
 - ▶ Chapter 4: Schools and Staffing Survey (SASS)
 - ▶ Chapter 5: SASS Teacher Follow-up Survey (TFS)
 - ▶ Chapter 6: National Education Longitudinal Study of 1988 (NELS:88)
 - ▶ Chapter 7: National Longitudinal Study of the High School Class of 1972 (NLS-72)
 - ▶ Chapter 8: High School and Beyond (HS&B) Longitudinal Study
- ▶ Library Surveys
 - ▶ Chapter 9: SASS School Library Survey (SLS)
 - ▶ Chapter 10: Public Libraries Survey (PLS)
 - ▶ Chapter 11: Academic Libraries Survey (ALS)
 - ▶ Chapter 12: State Library Agencies (StLA) Survey

- ▶ Chapter 13: Federal Libraries and Information Centers Survey
- ▶ Postsecondary and Adult Education Surveys
 - ▶ Chapter 14: Integrated Postsecondary Education Data System (IPEDS)
 - ▶ Chapter 15: National Study of Postsecondary Faculty (NSOPF)
 - ▶ Chapter 16: National Postsecondary Student Aid Study (NPSAS)
 - ▶ Chapter 17: Beginning Postsecondary Students (BPS) Longitudinal Study
 - ▶ Chapter 18: Baccalaureate and Beyond (B&B) Longitudinal Study
 - ▶ Chapter 19: Survey of Earned Doctorates (SED)
- ▶ Educational Assessment Surveys
 - ▶ Chapter 20: National Assessment of Educational Progress (NAEP)
 - ▶ Chapter 21: Third International Mathematics and Science Study (TIMSS)
 - ▶ Chapter 22: IEA Reading Literacy Study (IEA)
 - ▶ Chapter 23: National Adult Literacy Survey (NALS)
 - ▶ Chapter 24: International Adult Literacy Survey (IALS)
- ▶ Household Surveys
 - ▶ Chapter 25: National Household Education Surveys (NHES) Program
 - ▶ Chapter 26: Current Population Survey—October and September Supplements (CPS)

Chapters 27 and 28 cover multiple surveys or survey systems. The format is similar to that for chapters 1 to

26, but is somewhat abbreviated to allow adequate coverage of multiple surveys within each chapter.

- ▶ Small Special-Purpose NCES Surveys
 - ▶ Chapter 27: Fast Response Surveys
 - ▶ Fast Response Survey System (FRSS)
 - ▶ Postsecondary Education Quick Information System (PEQIS)
 - ▶ Chapter 28: Other NCES Surveys and Studies
 - ▶ School Crime Supplement (SCS)
 - ▶ School Survey on Crime and Safety (SSOCS)
 - ▶ High School Transcript (HST) Studies
 - ▶ Library Cooperatives Survey (LCS)
 - ▶ Civic Education Study (CivEd)

To avoid repetition within the handbook, some of the statistical terms and procedures that are referred to in multiple chapters of the handbook are defined in **Appendix A, Glossary of Statistical Terms**.

Appendix B describes the various ways in which NCES publications and data files may be obtained. It also provides the reader with information on how to obtain a license for restricted-use data files.

Appendix C provides a list of the web-based and standalone tools for use with each of the NCES surveys.

Appendix D contains a list of the web site addresses for each of the NCES surveys.

Appendix E contains an index.

Chapter 1: Early Childhood Longitudinal Study (ECLS)

1. OVERVIEW

The Early Childhood Longitudinal Study program is one of four active longitudinal surveys sponsored by NCES, and the first to provide data about young children. The ECLS program has been designed to include two overlapping cohorts: a birth cohort and a kindergarten cohort. The birth cohort component (ECLS-B) will follow a sample of children born in 2001 from birth through the 1st grade, while the kindergarten component (ECLS-K) will follow a sample of children who were in kindergarten in the 1998–99 school year through the 5th grade. ECLS will provide a comprehensive and reliable data set with information about the ways in which children are prepared for school and how schools and early childhood programs affect the lives of the children who attend them.

Purpose

ECLS provides national data on (1) children's status at birth and at various points thereafter; (2) children's transitions to nonparental care, early education programs, and school; and (3) children's experiences and growth through the 5th grade. These data enable researchers to test hypotheses about the effects of a wide range of family, school, community, and individual variables on children's development, early learning, and early performance in school.

Components

ECLS has two cohorts—the *kindergarten* cohort study (ECLS-K) and the *birth* cohort study (ECLS-B)—and each of these has its own components.

Kindergarten cohort study. ECLS-K collects data from children, parents, classroom teachers, special education teachers, school administrators, and student records. The various components are described below.

Direct child assessments. The direct child assessments consist of three cognitive domains (reading, mathematics, and general knowledge); a psychomotor assessment (fall kindergarten only), including fine and gross motor skills; and height and weight measurements. An English language proficiency screener, the Oral Language Development Scale (OLDS), is administered if the school records indicate that the child's home language is not English. The child has to demonstrate a certain level of English proficiency to be administered the ECLS-K cognitive assessment in English. If a child speaks Spanish at home and does not have the English skills required by the ECLS-K battery, the child is administered a Spanish version of the OLDS, and the mathematics and psychomotor assessments are administered in Spanish. Each cognitive assessment domain subtest includes a routing test (to determine a child's approximate skills) and level tests.

EARLY CHILDHOOD LONGITUDINAL SAMPLE SURVEY: BIRTH COHORT AND KINDERGARTEN COHORT

ECLS collects data from:

- ▶ Children
- ▶ Parents/guardians
- ▶ Child care providers and preschool teachers
- ▶ Teachers
- ▶ School administrators

Parent interviews. Parents/guardians are asked to provide key information about their children on subjects such as family demographics (e.g., age, relation to child, race/ethnicity), family structure (household members and composition), parent/guardian involvement, home educational activities, childcare experience, child health, parental/guardian education and employment status, and their child's social skills and behaviors.

Classroom teacher questionnaire. In the base year, all kindergarten teachers in the ECLS-K schools were asked to provide information on their educational backgrounds, teaching practices, experiences, and the classroom settings where they taught. Kindergarten teachers who taught ECLS-K-sampled children also completed a child-specific questionnaire that collected information on each child's social skills and approaches to learning, academic skills, and education placements. In the 1st grade and later waves of the study, only teachers of the sampled children are included.

Special Education Teacher Questionnaire. The special education teacher questionnaires were introduced in the spring data collection. ECLS-K supervisors reviewed accommodation and inclusion information for children who received special education services. During the preassessment visit, field supervisors specified primary special education teachers of sampled children and listed special education staff working with each child (e.g., speech pathologists, reading instructors, audiologists). These questionnaires were given to special education teachers who taught sampled children. If a child received special education services from more than one special education teacher, a field supervisor determined the child's primary special education teacher. Items in the special education teacher questionnaires addressed topics such as the child's disability, Individual Education Program goals, the amount and type of services used by sampled students, and communication with parents and general education teachers.

School Administrator Questionnaire. School administrators are asked about school characteristics (e.g., school type, enrollment, and student body composition), school facilities and resources, community characteristics and school safety, school policies and practices, school-family-community connections, school programs for special populations, staffing and teacher characteristics, school governance and climate, and their own characteristics.

Student Records Abstract. School staff members are asked to complete a student records abstract form for each

sampled child after the school year closed. These instruments were used to obtain information about the child's attendance record, the presence of an individualized education plan, the type of language or English proficiency screening that the school used, and (in the kindergarten year collection) whether the child participated in Head Start prior to kindergarten. A copy of each child's report card was also requested.

School Facilities Checklist. The checklist collects information about the (1) availability and condition of the selected schools' facilities such as classrooms, gymnasiums, toilets, etc.; (2) presence and adequacy of security measures; (3) presence of environmental factors that may affect the learning environment; and (4) overall learning climate of the school. An additional set of questions on portable classrooms was added to the spring-1st-grade data collection.

Birth cohort study. The ECLS-B, implemented in October 2001, is designed to study children's early learning and development from birth through 1st grade. Over the course of the study, data will be collected from multiple sources, including birth certificates, children, parents, nonparental care providers, teachers, and school administrators. These components are described below.

Birth certificates. These records provide information on the date of birth, child's sex, parents' education, parents' race and ethnicity (including Hispanic origin), mother's marital status, mother's pregnancy history, prenatal care, medical and other risk factors during this pregnancy and complications during labor and birth, and child's health characteristics (such as congenital anomalies and abnormal conditions of the baby and the baby's APGAR score).

Parent/guardian interviews. A parent/guardian interview is conducted in the children's home at each data collection point to capture information about the children's early health and development, their experiences with family members and others, the parents/guardians as caregivers, the home environment, and the neighborhood in which they live. In most cases, the parent/guardian interviewed is the child's mother or female guardian.

Child assessments. Beginning at 9 months, children participate in activities designed to measure important developmental skills in the cognitive, social, emotional, and physical domains. ECLS-B uses adapted forms of the Bayley Scales for Infant Development (BSID-II) and the Nursing Child Assessment Teaching Scale (NCATS). The children's height, weight, and middle upper arm

circumference are assessed at the 9-month home visit. In addition, during the home visit children's psychomotor skills and emotion regulation will be assessed. At the 18-month home visit, the Massey Attachment Sort (MAS) will be used to assess children's levels of attachment with their caregivers. (For further details, see Assessment Design.)

Care provider and preschool teacher interviews. Individuals and organizations who provide regular care for a child will be interviewed with the permission of the child's parents. They will be asked about their backgrounds, teaching practices, and experience, the children in their care, and children's learning environments. This information will be collected when the children are 18 months of age and again at 48 months.

School administrator/teacher questionnaires. Once the children enter formal schooling, school administrators and teachers will provide information on the physical and organizational characteristics of their schools and on the schools' learning environments, educational philosophies, and programs. Teachers will also provide information on the classroom, and they represent important potential sources of information about children's cognitive and social development.

Father questionnaire. Fathers will complete a self-administered questionnaire reviewing the particular role fathers play in the development of their children, providing information about children's well-being and the activities fathers engage in with their children as well as key information about themselves as caregivers. This information will be collected when the children are 9 and 18 months old and at least two additional times during the study.

Periodicity

Each of the ECLS cohorts has its own follow-up schedule.

The ECLS-K schedule is for data collection in the fall and spring of the kindergarten year (1998–99), a 30 percent fall 1st-grade subsample (1999), and a full sample for spring of the 1st (2000), 3rd (2002), and 5th (2004) grades.

The ECLS-B schedule is for data collection at 9 months (2001–02), 18 months (2002–03), 30 months (2003–04), 48 months (2005), kindergarten (2006 and 2007), and 1st grade (2007 and 2008). Note that because of age requirements for school entry, children sampled in ECLS-B will be entering kindergarten, and thus 1st grade, in two different years.

2. USES OF DATA

ECLS-K provides information critical to establishing policies that can respond sensitively and creatively to diverse learning environments. In addition, ECLS-K will enable researchers to study how a wide range of family, school, community, and individual variables affect early childhood success in school. The information collected during the kindergarten year serves as baseline data to examine how schooling shapes later development. The longitudinal nature of the study will enable researchers to study children's reading achievement, growth in mathematics, and knowledge of the physical and social worlds in which they live. It will also permit researchers to relate trajectories of growth and change to variations in children's school experiences in kindergarten and the early grades.

Like the kindergarten cohort study, ECLS-B has two goals, descriptive and analytic. The study will provide descriptive data on children's health status at birth; children's experiences in the home, nonparental care, and school; and children's development and growth through 1st grade. The study will also collect data that can be used to explore the relationships between children's developmental outcomes and their family, health care, nonparental care, school, and community. Data collected during the first year of life (around 9 months) will serve as a baseline for examining how children's home environment, health status, health care, and early childcare and education shape their development. The longitudinal nature of the study will enable researchers to study children's physical, social, and emotional growth and to relate trajectories of growth and change to variations in children's experience.

3. KEY CONCEPTS

IRT scale scores. These scores are overall, criterion-reference measures of status at a point in time. They are useful in identifying cross-sectional differences among subgroups in overall achievement level and provide a summary measure of achievement useful for correlations analysis with status variables. The IRT scale scores are used as longitudinal measures of overall growth. Gain scores may be obtained by subtracting children's scale scores at two points in time.

Standardized scores (T-scores). These scores provide norm-referenced measurements of achievement; that is, estimates of achievement level relative to the population

as a whole. A high mean T-score for a particular subgroup indicates that the group's performance is high in comparison to other groups. A change in mean T-scores over time reflects a change in the group's status with respect to other groups. In other words, they provide information on status compared to children's peers.

Proficiency probability scores. These scores are criterion-referenced measures of proficiency in specific skills. Because each proficiency score targets a particular set of skills, they are ideal for studying the details of achievement. They are useful as longitudinal measures of change because they show not only the extent of gains but also where on the achievement scale the gains are taking place. The following proficiencies were identified in the reading and mathematics assessments:

Reading proficiencies:

- ▶ Letter recognition: identifying upper- and lower-case letters by name
- ▶ Beginning sounds: associating letters with sounds at the beginning of words
- ▶ Ending sounds: associating letters with sounds at the end of words
- ▶ Sight words: recognizing common words by sight
- ▶ Comprehension of words in context: reading words in context

Mathematics proficiencies:

- ▶ Number and shape: identifying some one-digit numerals, recognizing geometric shapes, and one-to-one counting of up to 10 objects
- ▶ Relative size: reading all single-digit numerals, counting beyond 10, recognizing a sequence of patterns, and using nonstandard units of length to compare objects
- ▶ Ordinality, sequence: reading two-digit numerals, recognizing the next number in a sequence, identifying the ordinal position of an object, and solving a simple word problem
- ▶ Addition/subtraction: solving simple addition and subtraction problems
- ▶ Multiplication/division: solving simple multiplication and division problems and recognizing more complex number patterns

Race/ethnicity. New Office of Management and Budget guidelines were followed under which a respondent could select one or more of five dichotomous race

categories. In addition, a sixth dichotomous variable was created for those who simply indicated that they were multiracial without specifying the race. Each respondent additionally had to identify whether the child was Hispanic. Using the six dichotomous race variables and the Hispanic ethnicity variable, a race/ethnicity composite variable was created. The categories were: White, non-Hispanic; Black or African-American, non-Hispanic; Hispanic, race specified; Hispanic, no race specified; Asian; Native Hawaiian or other Pacific Islander; American Indian or Alaskan Native; and more than one race specified, non-Hispanic.

Socioeconomic scale. The socioeconomic scale (SES) variable was computed at the household level for the set of parents who completed the parent interview in ECLS-K. The SES variable reflects the socioeconomic status of the household at the time of data collection. The components used to create the SES variable were: father/male guardian's education, mother/female guardian's education, father/male guardian's occupation, mother/female guardian's occupation, and household income. Each parent's occupation was scored using the average of the 1989 General Social Survey prestige scores for the 1980 Census occupational category codes that correspond to the ECLS-K occupation code.

4. SURVEY DESIGN

Target Population

Representative samples of kindergartners and babies will be studied longitudinally for 6 or more years. Kindergarten children enrolled during the 1998–99 school year will be the baseline for the ECLS-K cohort, babies born during 2001 will consist of the baseline for the ECLS-B cohort.

Sample Design

The sampling design is discussed separately for the kindergarten and birth cohorts.

Kindergarten Cohort (ECLS-K). ECLS-K is following a nationally representative cohort of children from kindergarten through 5th grade.

Base Year Survey. A nationally representative sample of 22,782 children enrolled in 1,277 kindergarten programs during the 1998–99 school year was sampled for participation in the study. These children were selected from both public and private kindergartens, offering both full-day and part-day programs. The sample was designed to

support separate estimates of public and private school kindergartners; Black, Hispanic, White, and Asian and Pacific Islander (API) children; and children grouped according to socioeconomic status.

The sample design for ECLS-K was a dual-frame, multi-stage sample. First, 100 primary sampling units (PSUs) were selected from an initial frame of 1,404 PSUs, representing counties or groups of contiguous counties. The 24 PSUs with the largest measures of size (where the measure of size is the number of 5-year-olds, taking into account a factor for oversampling 5-year-old APIs) were designated as certainty selections and were set aside. The remaining PSUs were partitioned into 38 strata of roughly equal measure of size. The frame of noncertainty PSUs was first sorted into eight superstrata by metropolitan statistical area (MSA) status and by Census region. Within the four MSA superstrata, the variables used for further stratification were race/ethnicity (high concentration of API, Black, or Hispanic), size of class, and 1988 per capita income. Within the four non-MSA superstrata, the stratification variables were race/ethnicity and per capita income. Two PSUs were selected from each noncertainty stratum using Durbin's Method. This method selects two first-stage units per stratum without replacement, with probability proportional to size and a known probability of inclusion. The Durbin method was used because it allows variances to be estimated as if the units were selected with replacement.

The school selection occurred within these PSUs. Public schools were sampled from a public school frame (the 1995–96 Common Core of Data—CCD), and private schools were sampled from a private school frame (the 1995–96 Private School Survey—PSS). The school frame was freshened in the spring of 1998 to include newly-opened schools that were not included in the CCD and PSS and schools that were in the CCD and PSS but did not offer kindergarten according to these sources. A school sample supplement was selected from the freshened frame. In fall 1998, approximately 23 kindergarten children were selected on average from each of the sampled schools. API children and private schools were oversampled.

Fall-1st grade. This study was a design enhancement whose goal was to enable researchers to measure the extent of summer learning loss and the factors that contribute to such loss and to better disentangle school and home effects on children's learning. Data collection was limited to 26.7 percent of the base year children in 30 percent of the ECLS-K originally sampled schools; that is, a total of

5,650 (4,446 public and 1,204 private) children and 311 schools (228 public and 83 private). Data collection was attempted for every eligible child (i.e., a base year respondent) found still attending the school in which he or she had been sampled during kindergarten. To contain the cost of collecting data for a child who transferred from the school in which he or she was originally sampled, a random 50 percent of children were flagged to be followed for fall-1st-grade data collection in the event that they had transferred.

Spring-1st grade. This data collection targeted all base year respondents. In addition, the spring student sample was freshened to include current 1st graders who had not been enrolled in kindergarten in 1998–99 and, therefore, had no chance of being included in the ECLS-K base year kindergarten sample. While all students still enrolled in their base year schools were recontacted, only a 50 percent subsample of base year sampled students who had transferred from their kindergarten school was followed for data collection. The sample of base year respondents numbered 18,084 (14,248 public and 3,836 private) children. Student freshening brought 165 1st graders into the ECLS-K sample.

Birth Cohort (ECLS-B). ECLS-B sampled approximately 16,000 babies born in the year 2001. The sample includes children from different racial/ethnic and socioeconomic backgrounds. Chinese children, other API children, moderately low birth weight children (1500–2500 grams), very low birth weight children (under 1500 grams), and twins were oversampled. There was also a special supplemental component to oversample American Indian children (with an initial sample size of 1,299).

The ECLS-B sample design consists of a two-stage sample of PSUs and children born in the year 2001 within sampled PSUs. The PSUs are MSAs, counties, or groups of counties, and were selected with probability proportional to a function of the expected number of births occurring within the PSU in 2001. Births were sampled by place of occurrence, rather than by place of current residence. As a result, a different PSU sample had to be selected from the PSU sample used in ECLS-K, which uses residence-based population data. Within the sampled PSUs, children born in the year 2001 were selected by systematic sampling from birth certificates using the National Center for Health Statistics (NCHS) vital statistics record system. The sample was selected on a flow basis, beginning with January 2001 births (who were first assessed 9 months later, in October 2001). Approximately equal numbers of infants were sampled from each month.

Different sampling rates were used for births in different subgroups, as defined by race/ethnicity, birth weight, and plurality (that is, whether or not the sampled newborn is a twin).

The sample of American Indian newborns drew from additional PSUs in three states that are not included in the ECLS-B main study. Because these three additional states would not allow use of their birth certificate information, an alternate frame was used. A hospital sample frame was chosen based on an evaluation of available sample frames.

Due to state-imposed operational restrictions and passive and active consent procedures, certain PSUs had low expected response rates. For states where expected response rates were only slightly lower than planned, a larger sample was selected in order to achieve adequate numbers of respondents. Substitutions were made for PSUs in states where very low response rates were expected. The original PSU was matched with potential substitute PSUs on the criteria of median income, percent of newborns in poverty, percent of minority newborns, population density, and birth rate. American Indian PSUs were also matched on tribal similarity. A Mahalanobis distance measure of similarity was used to create initial rankings. Sampling rates from the original PSU were applied within the substitute PSU to obtain the original expected yield.

Assessment Design

The design of the ECLS assessments is discussed separately for the kindergarten and birth cohorts.

Kindergarten Cohort (ECLS-K). The design of the ECLS-K assessment was guided by the domain assessment framework proposed by the National Education Goals Panel's Resource Group on School Readiness. A critical component of ECLS-K is the assessment of children along a number of dimensions, such as physical development, social and emotional development, and cognitive development. These domains were chosen because of their importance to success in school. ECLS-K will monitor the status and growth of its children along these domains:

- ▶ *Physical and psychomotor development:* Children's height and weight will be measured at each data collection period in ECLS-K. In the fall of kindergarten, kindergartners were asked to demonstrate their fine and gross motor skills through activities such as building a structure using blocks, copying shapes, drawing figures, balancing, hopping,

skipping, and walking backwards. Parents and teachers report on other related issues such as general health, nutrition, and physical activity.

- ▶ *Social and emotional development:* ECLS-K assessments of social and emotional development focus on the skills and behaviors that contribute to social competence. Aspects of social competence include social skills (e.g., cooperation, assertion, responsibility, self-control) and problem behaviors (e.g., impulsive reactions, verbal and physical aggression). Parents and teachers are the primary sources of information on children's social competence and skills, at least from kindergarten through 2nd grade. The measurement of children's social and emotional development at grades 3 and 5 will include instruments completed by the children themselves along with data reported by parents and teachers.
- ▶ *Cognitive development:* ECLS-K focuses on three broad areas of competence: language and literacy, mathematics, and general knowledge of the social and physical worlds. The skills measured in each of these domains are a sample of the typical and important skills that are taught in American elementary schools and that children are expected to learn in school. ECLS-K was developed to describe the behaviors, skills, and knowledge within broad cognitive domains that are most relevant to school curricula at each grade level and to measure children's growth from kindergarten to 5th grade. The ECLS-K assessment framework was based on current curricular domain frameworks for reading, mathematics, science, and social studies, as well as assessment frameworks such as the National Assessment of Educational Progress. (See chapter 20.)

These assessments were developed after extensive field testing and analysis. The final items were selected based on their psychometric properties and content relevance. The measure of language and literacy competency includes vocabulary comprehension, listening and reading comprehension, and basic skills (e.g., knowledge of the alphabet, phonetics, print recognition and orientation, and sight vocabulary). The mathematics subdomain measures the knowledge and skills necessary to solve mathematical problems and reason with numbers. The items measuring children's quantitative and analytic skills in kindergarten and 1st grade include recognizing numbers, counting, comparing and ordering numbers, and solving word problems. Other measures of mathematical concepts include recognizing and solving problems involving graphic and numeric patterns and geometric relationships. Items involving the interpretation of picture graphs measure beginning analysis and statistics skills. Children's knowledge and skills in the natural and social sciences are measured in the general knowledge

subdomain. The contents of this subtest, classified as science and social sciences, survey children's knowledge and understanding of relevant concepts.

Each direct child domain subtest consists of a routing test and level tests. All children are first administered a short routing test of domain-specific items having a broad range of complexity or difficulty levels. Performance on the routing test is used to determine the appropriate level assessment form that will be administered next to the child. The use of multilevel forms for each domain subtest minimizes the chances of administering items that are all very easy or all very difficult for the child. Children demonstrate their competency in these domains through one-on-one, untimed sessions with a trained child assessor. If necessary, the session can take place over multiple periods.

Birth Cohort (ECLS-B). The ECLS-B direct child assessment relies on instruments considered “gold standards” in the field. However, adaptations have been necessary to take these instruments from a laboratory or clinic setting to a home setting. The ECLS-B child assessment, therefore, is designed for ease of and flexibility in administration while at the same time being psychometrically and substantively sound. The key instruments are a shortened research edition of the BSID-II, NCATS, and an attachment measure—MAS.

- ▶ *Cognitive development and fine and gross motor skills:* BSID-II is considered the gold standard for assessing early childhood development (ages 1 to 42 months). Children's cognitive development, as well as their receptive and expressive language skills, are assessed through the mental scale of the BSID-II. Children retrieve hidden toys and look at pictures books, and their production of vowel-consonant combinations is noted. Fine and gross motor skills are assessed through the motor scale of the BSID-II. Children grasp small objects and are observed crawling and walking. The Bayley assessment was originally expected to take about 20 minutes. However, a field test of the 9-month ECLS-B data collection revealed that it actually required an average of 40 minutes to complete. As a result, modifications were implemented to the original BSID-II. The ECLS-B contractor, Westat, worked with experts to identify a reduced-item set that can be administered in less time and can produce reliable, valid scores equivalent to the full set of Bayley items. The ECLS-B reduced-item Bayley for 9-month-olds takes approximately 25 minutes to administer.
- ▶ *Parent-child interaction:* NCATS is designed to assess parent-child interaction (ages 0 to 36 months). Parents are asked to teach their child a task that she or he cannot do

from a standard list using NCATS materials. Tasks include turning pages of a book and stacking blocks. The interaction is videotaped and later coded along six subscales. The teaching scale provides information on child cues, parent responsiveness, and the fostering of socio-emotional and cognitive growth. It captures variables that are precursors to later social and cognitive development, such as attachment and language.

- ▶ *Attachment with caregivers:* The Strange Situation and the Attachment Q-Sort (AQS) are the commonly used measures for assessing and discussing toddlers' attachment relationships. These measures require a significant amount of time to complete and are fairly complex for a field staff. MAS is an alternative to the laboratory-based Strange Situation measure, developed exclusively for ECLS-B. It uses the Method of Successive Sorts (MOSS), which is considered to be operationally easier than the Q-sort. MAS features 39 AQS items, which have been edited to an elementary reading level. Parents and field staff work with a deck of cards and sort descriptions of parent/child behavior for how much it is like the child. Card descriptions include scenarios to assess the child's proximity to the parent and exploration behavior and the occurrence of differential responsiveness. Aspects of children's affect, sociability, and independence are also assessed. MAS can be completed by respondents and field staff from different backgrounds, and it can be completed in less than 10 minutes.

Data Collection and Processing

ECLS-K compiles data from four primary sources: children, children's parents/guardians, teachers, and school administrators. Data collection began in fall 1998 and will continue through spring 2004. Westat has collected the kindergarten and 1st-grade data. ECLS-B compiles data from multiple sources, including administrative records, children, parents, nonparental care providers, teachers, and school administrators. Data collection began in 2001 and will continue through 2008. Self-administered questionnaires, one-on-one assessments, and telephone or personal interviews will be used to collect the data. Westat is the 9- and 18-month data collection contractor.

Reference dates. For ECLS-K, baseline data for the fall were obtained from September to December 1998. For ECLS-B, baseline data was collected from October 2001 through December 2002.

Data collection. ECLS-K and ECLS-B are discussed separately.

Kindergarten Cohort (ECLS-K). The data collection schedule for ECLS-K is based on a desire to capture information

about children as critical events and transitions are occurring rather than measuring these events retrospectively. A large-scale field test of the kindergarten and 1st-grade assessment instruments and questionnaires was conducted in 1995–96. This field test was used primarily to collect psychometric data on the ECLS-K assessment item pool and to evaluate questions in the different survey instruments. Data from this field test were used to develop the first- and second-stage tests for the ECLS-K kindergarten and 1st-grade direct cognitive assessment battery and to finalize the parent, teacher, and school administrator instruments. A pilot test of the systems and procedures, including field supervisor and assessor training, was conducted in April and May 1998 with 12 elementary schools in the Washington, DC metropolitan area. Modifications to the data collection procedures, training programs, and systems were made to improve efficiency and reduce respondent burden. Modifications to the parent interview to address some issues raised by pilot test respondents were also made at this time.

Data on the kindergarten cohort were collected twice during the base year of the study—once in the beginning (fall) and once near the end (spring) of the 1998–99 school year. The fall 1998 data collection obtained baseline data on children prior to their exposure to the influences of school, providing measures of the characteristics and attributes of children as they entered formal school for the first time. The data collected in spring 1999, together with the data from the beginning of the school year, are used to examine children's first encounter with school. Data were collected from the child, the child's parents/guardians, and teachers. For the fall 1998 and spring 1999 collections, all child assessment measures were obtained through untimed CAPI, administered one-on-one from the assessor to child. Most of the parent data were collected through CATI, though some of the interviews were collected through CAPI when respondents did not have a telephone or were reluctant to be interviewed by telephone. All kindergarten teachers with sampled children were asked to fill out two self-administered questionnaires providing information on themselves and their teaching practices. For each of the sampled children they taught, the teachers also completed a child-specific questionnaire. In addition, school staff members were asked to complete a student record abstract after the school year closed; they were reimbursed five dollars for every student record abstract they completed.

In fall 1999—when most of the kindergarten cohort had moved on to 1st grade—data were collected from a 30 percent subsample of the cohort. School administrators

were contacted in late summer 1999, and parental consents were reviewed (and re-obtained, if necessary). The direct child assessment was administered during a 12-week field period (September–November 1999). It was normally conducted in a school classroom or library and took approximately 50 to 70 minutes per child. As in the spring-kindergarten data collection, children with a language other than English in the home who did not take the English ECLS-K battery in the prior were first administered the OLDS to determine what path was followed in fall-1st grade. Children who fell below the cut score for the OLDS and whose language was Spanish were administered a Spanish language version of the OLDS and the ECLS-K mathematics assessment, and had their height and weight measured. Children who fell below the cut score and whose language was other than Spanish had only their height and weight measured. The parent interview was administered between early September and mid-November 1999; it averaged 35 minutes, and was conducted primarily by telephone.

Spring data collection included direct child assessments, parent interviews, teacher and school questionnaires, student records abstracts, and the facilities checklist. As in other rounds, the child assessments were administered with CAPI assistance (March–June 2000), while both CATI and CAPI were used for the parent interview (March–July 2000). Self-administered questionnaires were used to gather information from teachers, school administrators, and student records (March–June 2000, but field staff prompted by telephone for the return of these materials through October 2000). Teachers were reimbursed seven dollars for each child rating they completed, and school staff were reimbursed seven dollars for every student record abstract they completed.

A continuous quality assurance process has been applied to all data collection activities. Data collection quality control efforts begin with the development and testing of the CATI and CAPI applications and the FMS. As these applications are programmed, extensive testing of the system is conducted. Quality control processes continue with the development of field procedures that maximize cooperation and thereby reduce the potential for nonresponse bias. Quality control activities are also practiced during training and data collection. During the original assessor training, field staff practiced conducting the parent interview in pairs and practiced the direct child assessment with kindergarten children brought to the training site for this purpose. In later data collection periods, experienced staff use a home study training package while new staff are trained in classroom sessions.

When the fieldwork begins, field supervisors observe each assessor conducting child assessments and makes telephone calls to parents to validate the interview. Field managers also make telephone calls to the schools to collect information on the school activities for validation purposes.

Birth Cohort (ECLS-B). A field test of ECLS-B instruments and procedures was conducted in the fall of 1999. The design featured many different tasks. For example, while in the home, a field staff member had to complete approximately eleven discrete tasks, and each task had special skill requirements. Early in the field test, NCES and the ECLS-B contractor found several problems regarding the complexity of the home visit: while separately no one task was difficult, the total data collection protocol was complex, so it was necessary to simplify these tasks in order to reduce the burden on field staff and to ensure the reliable and valid administration of all tasks. As a result, several modifications were made to the original data collection design.

A second field test of ECLS-B instruments and procedures began in September 2000. A new sample was drawn consisting of 1,062 children born between January and April 2000. Home visits were conducted when the children were 9 months old and again when the children were 18 months of age. Results from this field test indicated that the changes to the design that resulted from the first field test were successful.

The ECLS-B schedule calls for information to be gathered on the babies and from the parents during an in-home visit. The children's mothers or primary providers participate in the 9-month and 18-month interviews. Fathers answer a set of questions regarding their involvement in their children's lives when the babies are 9 months of age. At the 18-month data collection point, additional information is collected in a telephone interview with the childcare provider (when applicable), and fathers are again asked to answer questions about their involvement with their children. ECLS-B uses adapted forms of BSID-II, NCATS, and MAS.

ECLS-B uses NCATS at the 9- and 18-month data collections. ECLS-B is videotaping NCATS, although it is more typical for a health or social service professional to complete NCATS via live coding (i.e., while the interaction occurs). While the interaction lasts only about 5 minutes, the ECLS-B field staff needs to observe and score 73 items of parent and child behavior. Given the other tasks the field staff must learn and complete, live

coding would limit the number of scales that could realistically be used, thereby reducing the amount of information that can be gathered. The videotapes will be coded along all scales.

In addition to the parent/guardian and childcare-provider interviews, school administrators and teachers will provide information on the physical and organizational characteristics of their schools and on the schools' learning environments, educational philosophies, and programs. Teachers also represent important potential sources of information about children's development.

Editing. Within the CATI/CAPI instruments, ECLS-K respondent answers were subjected to both "hard" and "soft" range edits during the interviewing process. Responses outside the soft range of reasonably expected values were confirmed with the respondent and entered a second time. For hard-range items, out-of-range values were usually not accepted. If the respondent insisted that a response outside the hard range was correct, the assessor could enter the information in a comments data file. Data preparation and project staff reviewed these comments. Out-of-range values were accepted if the comments supported the response.

Consistency checks were also built into the CATI/CAPI data collection. When a logical error occurred during a session, the assessor saw a message requesting verification of the last response and a resolution of the discrepancy. In some instances, if the verified response still resulted in a logical error, the assessor recorded the problem either in a comment or on a problem report.

The overall data editing process consisted of running range edits for soft and hard ranges, running consistency edits, and reviewing frequencies of the results.

Estimation Methods

Data are weighted to compensate for differential probabilities of selection at each sampling stage and to adjust for the effects of nonresponse. A hot-deck imputation methodology is used to impute for missing values of all components of the SES in the ECLS-K study.

Weighting. Several sets of weights were computed for each of the four rounds of data collection (fall-kindergarten, spring-kindergarten, fall-1st grade, and spring-1st grade). Longitudinal weights were also computed for children with data from multiple rounds of the study. Unlike surveys that have only one type of survey instrument aimed at one type of sampling unit, the ECLS-K is a

complex study with multiple types of sampling units, each having its own survey instrument. Each type of unit was selected into the sample through a different mechanism: children were sampled directly through a sample of schools; parents of the sampled children were automatically included in the survey; all kindergarten teachers in the sampled schools were included; special education teachers were in the sample if they taught any of the sampled children. Each sampled unit had its own survey instrument: children were assessed directly using a series of cognitive and physical assessments; parents were interviewed with a parent instrument; teachers filled out at least two different types of questionnaires depending on the round of data collection and on whether they were regular or special education teachers; school principals reported their school characteristics using the school administrator questionnaire. The stages of sampling in conjunction with the different nonresponse level at each stage and the diversity of survey instruments require that multiple sampling weights be computed for use in analyzing the ECLS-K data.

Essentially, weights are driven by three factors: (1) how many points in time would be used in analysis (e.g., longitudinal or cross-sectional); (2) what level of analysis would be conducted (e.g., child, teacher, or school); and (3) what source of data is used (e.g., child assessment, teacher questionnaire, parent questionnaire).

In general, weights were computed in two stages. In the first stage, base weights were computed. They are the inverse of the probability of selecting the unit. In the second stage, base weights were adjusted for nonresponse. Nonresponse adjustment cells were generated using variables with known values for both respondents and nonrespondents. Analyses using the Chi-squared Automatic Interaction Detector (CHAID) were conducted to identify variables most highly related to nonresponse. Once the nonresponse cells were determined, the nonresponse adjustment factors are the reciprocals of the response rates within the selected nonresponse cells.

The base weight for each school is the inverse of the probability of selecting the PSU multiplied by the inverse of the probability of selecting the school within the PSU. The base weights for eligible schools are adjusted for nonresponse, made separately for public and private schools.

The base weight for each child in the sample is the school nonresponse-adjusted weight for the school attended, multiplied by a poststratified within-school student weight (total number of students in the school divided by the

number of students sampled in the school). The poststratified within-school weight was calculated separately for API and non-API children because different sampling rates were used for these two groups. Within a school, all API children have the same base weights and all non-API children have the same base weights. The parent weight, which is the weight used to produce ECLS-K estimates, is the base child weight adjusted for nonresponse to the parent interview. Again, these adjustments were made separately for public and private schools.

Scaling. Item Response Theory (IRT) was employed to calculate scores that could be compared regardless of which second stage form a student took. The items in the routing test, plus a core set of items shared among the different second stage forms, made it possible to establish a common scale.

Imputation. SES component variables were computed in the base year and spring-1st grade ECLS-K. The percentages of missing data for the education and occupation variables were small (2 to 11 percent in the base year, 4 to 8 percent in spring-1st grade); however, the household income variable had higher missing rates (28.2 percent missing data in the base year and 11 to 33 percent in spring-1st grade, depending on whether a detailed income range or the exact household income was requested). A standard (random selection within class) hot-deck imputation methodology was used to impute for missing values of all SES components in both years, although the procedure used in spring-1st grade differed in that the initial step in the imputation procedure was to fill in missing values from information gathered during an earlier interview with that parent, if one had taken place.

The SES component variables were highly correlated so a multivariate analysis was more appropriate for examining the relationship of the characteristics of donors and nonrespondents. CHAID was used to divide the data into cells based on the distribution of the variable to be imputed, in addition to analyzing the data and determining the best predictors.

The variables were imputed in sequential order and separately by type of household. For households with both parents present, the mother's and father's variables were imputed separately. If this was not the case, an "unknown" or missing category was created as an addition level for the CHAID analysis. As a rule, no imputed value was used as a donor. In addition, the same donor was not used more than two times. The order of the imputation for all the variables was from the lowest percent missing to the highest. Occupation imputation involved two steps.

First, the labor force status of the parent was imputed, whether the parent was employed or not. Then the parent's occupation was imputed only for those parents whose status was identified as employed either through the parent interview or the first imputation step. The variable for income was imputed last using a three-stage procedure, where if a respondent provided partial information about income, this was used in the imputation process.

Future Plans

The ECLS-B cohort may be followed beyond 1st grade. Whether this is feasible or affordable will be evaluated over the life of the study.

5. DATA QUALITY AND COMPARABILITY

Sampling Error

The estimators of sampling variances for ECLS statistics take the ECLS complex sample design into account. Both replication and Taylor Series methods have been developed. The paired jackknife replication method using 90 replicate weights can be used to compute approximately unbiased estimates of the standard errors of the estimates. (The fall 1st-grade subsample uses 40 replicates.) When using the Taylor Series method, a different set of stratum and first-stage unit identifiers should be used for each set of weights. Both replicates and identifiers are provided as part of the ECLS-K data file.

Design effects. In the ECLS-K, a large number of data items were collected from students, parents, teachers, and schools. Each item has its own design effect that can be estimated from the survey data. The median child-level design effect is 4.7 for fall-kindergarten (compared with 2.2 for the National Education Longitudinal Study of 1988 base year student questionnaire data) and 4.1 for spring-kindergarten (compared with 3.4 for the NELS:88 first follow up). The size of the ECLS-K design effects is largely a function of the number of children sampled per school. With about 20 children sampled per school, an intraclass correlation of 0.2 might result in a design effect of about 5. The median design effect is 3.4 for the panel of students common to both fall- and spring-kindergarten, and the lower median design effect is due to the smaller cluster size in the panel. The ECLS-K design effects are slightly higher than the average of 3.8 that was anticipated during the design phase of the study, both for estimates for proportions and for score estimates.

The median teacher-level design effect is 2.5 for both fall- and spring-kindergarten. These are lower than the child-level design effects because the number of responding teachers per school is relatively small. The design effect for teachers is largely a result of selecting a sample using the most effective design for child-level statistics.

The median school-level design effect is 1.6.

A multilevel analysis was carried out to estimate components of variance in fall- and spring-kindergarten cognitive scores associated with the: (1) student level, (2) school level, (3) team leader, and (4) individual test administrator. This secondary analysis was motivated by Westat's earlier finding of larger-than-expected design effects. In addition, the impact on the above sources of variance of the SES indicator (parent's education) was also estimated. It was expected that much of the clustering of students within neighborhood schools (hence higher design effects) could be explained by SES.

Nonsampling Error

During the survey design phase, focus groups and cognitive laboratory interviews were conducted for the purpose of assessing respondent knowledge topics, comprehension of questions and terms, and the sensitivity of items. The design phase also entailed testing for the CAPI instrument and a field test that evaluated the implementation of the survey.

Another potential source of nonsampling error is respondent bias that occurs when respondents systematically misreport (intentionally or unintentionally) information in a study. One potential source of respondent bias in this survey is social desirability bias. If there are no systematic differences among specific groups under study in their tendency to give socially desirable responses, then comparisons of the different groups will accurately reflect differences among the groups. An associated error occurs when respondents give unduly positive assessments about those close to them. For example, parents may give more positive assessments of their children's school experiences than might be obtained from school records or from the teachers.

Response bias may also potentially be introduced in the responses of the teachers about each individual student. Each teacher filled out a survey for each of the sampled children they taught in which they answered questions on the child's socio-emotional development. Since the survey was conducted in the fall it is possible that the teachers did not have adequate time to observe the

children, and thus some of the responses may be influenced by the expectations of the teacher based on which groups (e.g., sex, race, linguistic, disability) the children belonged to. In order to minimize bias, all items were subjected to multiple cognitive interviews, field tests, and actual teachers were involved in the design of the cognitive assessment battery and questionnaires. NCES also followed the criteria recommended in a working paper on the accuracy of teacher judgments of students' academic performances (*How Accurate Are Teacher Judgments of Students' Academic Performance?* NCES Working Paper 96-08).

Respondent bias may be present in ECLS-K as in any survey. It is not possible to state precisely how such bias may affect the results. NCES has tried to minimize some of these biases by conducting one-on-one, untimed assessments, and by asking some of the same questions about the sampled child of both teachers and parents.

Coverage error. By designing the ECLS-K child assessment to be both individually administered and untimed, both coverage error and bias were reduced. Individual administration decreases problems associated with group administration such as children slowing down and not staying with the group or simply getting distracted. The advantage of having untimed exams was that the study was able to include most children with learning disabilities, hearing aids, etc. The only children who were excluded from the study were those who were blind, deaf, those whose Individual Education Program (IEP) clearly stated that they were not to be tested, and non-English speaking children who were determined to lack adequate English or Spanish to meaningfully participate in the ECLS-K battery. Exclusion from the direct child assessment did not exclude children from all other parts (e.g., teacher questionnaire, parent interview).

Nonresponse error.

Unit nonresponse. Overall, 944 of the 1,277 schools (74 percent) agreed to participate in the study. More schools participated in the spring of the base year (n=940) than during the fall (n=880), due to the fact that some of the schools that originally declined to participate changed their minds and participated in the spring. Due to the lower than expected cooperation rate for public schools in the fall of the base year, 73 additional public schools were included in the sample as substitutes for schools not participating in the fall. These schools were included in order to meet the target sample sizes for students. Substitute schools are not included in the school response rate calculations.

A nonresponse bias analysis was conducted to determine if substantial bias is introduced due to school nonresponse in ECLS-K. Five different approaches were used to examine the possibility of bias in the ECLS-K sample. First, weighted and unweighted response rates for schools, children, parents, teachers, and school administrators were examined to find large response rate differences by characteristics of schools (e.g., urbanicity, region, school size, percent minority, and grade range) and children (e.g., sex, age, race/ethnicity). Second, estimates based on ECLS-K respondents were compared to estimates based on the full sample. The distributions of schools by school type, urbanicity, region, and the distributions of enrollment by kindergarten type (public versus private), race/ethnicity, urbanicity, region, and eligibility for free and reduced-price lunch were compared for the responding schools and all the schools on the sampling frame. Third, estimates using ECLS-K were compared with estimates from other data sources (e.g., Current Population Survey, National Household Education Survey, Survey of Income and Program Participation). Fourth, estimates using ECLS-K unadjusted weights were compared with estimates using ECLS-K weights adjusted for nonresponse. Large differences in the estimates produced with these two different weights would indicate the potential for bias. Fifth, and last, simulations of nonresponse are being conducted. The results of these analyses are summarized in the ECLS-K User's Manual; however, the findings from these analyses suggest that there is not a bias due to school nonresponse.

The child base-year completion rate was 92 percent; that is, 92 percent of the children were assessed at least once during kindergarten. About 95 percent of the children and 94 percent of the parents who participated in the fall of kindergarten also participated in the spring. Table 1, on the next page, shows how the response rates for those children continued through the spring-1st-grade collection.

Completion rates for the subsample of children included in the Fall-1st-grade collection were 90.3 percent for the children and 88.6 percent for parents. The completion rate for all the children in the spring-1st-grade collection (i.e., including the freshened sample) was 87.2 percent.

Table 1. Unit level and overall level weighted response rates for children sampled in kindergarten

Population	Unit level weighted completion rate		
	Base year 1 st level	Base year 2 nd level	Spring- 1 st grade
Child assessment	74.2	92.0	88.0
Parent interview	74.2	88.8	84.5

	Overall level weighted response rate		
	Base year 1 st level	Base year 2 nd level	Spring- 1 st grade
Child assessment	74.2	68.3	60.1
Parent interview	74.2	62.7	53.0

SOURCE: Tourangeau et al. *ECLS-K Base Year Public-Use Data Files and Electronic Codebook*. Tourangeau et al. *User's Manual for the ECLS-K First Grade Restricted-Use Data Files and Electronic Codebook* (NCES 2001-101).

Measurement error. In addition to the potential clustering effects related to shared parent SES within schools (described in “Design Effects,” above), there was a concern in ECLS-K that the individual mode of administration might inject additional and unwanted variance to both the individual and between-school components of variance in the cognitive scores. Since it is more difficult to standardize test administrations when tests are individually administered, this source of variance could contribute to high design effects if the individual assessors differed systematically in their modes of administration. It was found, however, that the component of variance associated with the individual test administration effect was negligible in all three cognitive areas and thus had little or no impact on the design effects.

A potential area for measurement error occurs with the NCATS component of the ECLS-B home visit. The parent-child interaction for this component of the study is videotaped, to be coded later. The process of coding the tapes, however, is not without its problems. The interaction field staff tape must be of high quality to ensure valid coding. For example, field staff should tape the very beginning of the interaction and should not interrupt. The task of coding is further complicated by the coding staff's experience. Like the ECLS-B home visit field staff, ECLS-B NCATS coders do not, for the most part, possess an extensive background in child development. Training the coding staff to reach 90 percent reliability has proven difficult at times, often requiring additional training.

Data Comparability

As a test for nonresponse bias, estimates from ECLS-K are being compared with estimates from other data sources (e.g., Current Population Survey, National Household Education Surveys, Survey of Income and Program Participation).

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7. METHODOLOGY AND EVALUATION REPORTS

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