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Technical Report and User Guide for the 2015 Program for International Student Assessment (PISA)

Data Files and Database with U.S.-Specific Variables

ies NATIONAL CENTER FOR EDUCATION STATISTICS
Institute of Education Sciences

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December 2017

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1. Overview of PISA 2015

1.1 Introduction

The Program for International Student Assessment (PISA) is a system of international assessments that focuses on 15-year-old students. PISA core assessments measure the performance of 15-year-old students in mathematics, science, and reading literacy every 3 years. PISA also gathers information from students about their learning environment, educational experiences, and attitudes towards education. In addition, school principals provide information on school context and population. Analyses of PISA data provide information on the relative performance of students and on the differences between student environments, attitudes, and experiences within and across countries.

PISA, which began in 2000, is conducted every 3 years. Each PISA data collection cycle assesses one of three core subject areas in depth (considered the major domain), although all three core subjects are assessed in each cycle (the other two subjects are considered minor subject areas for that assessment year). Assessing all three subjects every 3 years allows countries to have a consistent source of achievement data in each of the three subjects while rotating one area as the primary focus over the years. In 2015 science was the major domain, as it was during the 2006 cycle. The majority of the PISA 2015 results provide analogous information for mathematics, science, and reading. However, because science was the major domain in 2015, more in-depth information is available for science. For example, process and content subscores are provided for science, but not for reading, mathematics, financial literacy, or collaborative problem solving. In 2012 and previous years, all three subjects were assessed primarily through a paper-and-pencil assessment. In 2015, the majority of participating education systems administered PISA via computer, including the United States. PISA 2015 also collected students' demographic information, attitudes towards science, and information about learning science in school. School principals of participating schools provided information on the school's demographics and learning environment, and teachers provided information about themselves and their teaching experience, initial education and professional development, the student body, and teacher views on school policies and evaluation. In 2015, a total of 73 education systems, including the United States, participated in PISA. PISA is coordinated by the Organization for Economic Cooperation and Development (OECD), based in Paris, France and is conducted in the United States by NCES.

Figure 1. PISA administration cycle

Assessment year	2000	2003	2006	2009	2012	2015
Subjects assessed	READING Mathematics Science	Reading MATHEMATICS Science Problem Solving	Reading Mathematics SCIENCE	READING Mathematics Science	Reading MATHEMATICS Science Problem Solving Financial Literacy	Reading Mathematics SCIENCE Collaborative Problem Solving Financial Literacy

NOTE: Reading, mathematics, and science literacy are all assessed in each assessment cycle of the Program for International Student Assessment (PISA). A separate problem-solving assessment was administered in 2003 and 2012. The subject in capital letters is the major domain for that cycle.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA) 2015.

The PISA 2015 main study in the United States consisted of five major elements: (1) a 2-hour core student assessment of science literacy, reading literacy, mathematics literacy, and collaborative problem solving; (2) an assessment of financial literacy lasting approximately 1 hour administered to a subsample of students from the core PISA session; (3) a student questionnaire that required approximately 30 minutes to complete; (4) an online school questionnaire to be completed by the principal or designee that also required approximately 30 minutes to complete; and (5) an online teacher questionnaire administered to a sample of up to 25 teachers in each school that took approximately 30 minutes to complete. In addition to the United States, Massachusetts, North Carolina, and Puerto Rico also participated as separate education systems. Their results are reported separately from the U.S. national findings. The 2015 main study for Massachusetts and North Carolina consisted of the same computer-based science, reading, and mathematics, and financial literacy assessments as the 2015 main study for the United States. The assessment for Puerto Rico was paper based and consisted only of trend items in science, reading, and mathematics.

1.2 What PISA Measures

PISA assesses the application of knowledge in mathematics, science, and reading literacy to problems within a real-life context (OECD 1999). PISA's focus on 15-year-olds allows countries to compare learning outcomes as students near the end of compulsory schooling and seeks to answer the question "What knowledge and skills do students have at age 15?" Thus, PISA does not focus explicitly on curricular outcomes and uses the term "literacy" in each subject area to indicate its broad focus on the application of knowledge and skills. For example, when assessing science, PISA examines how well 15-year-old students

can understand, use, and reflect on science for a variety of real-life problems and settings that they may not encounter in the classroom. Scores on the PISA scales represent skill levels along a continuum of skills. PISA also provides ranges of proficiency levels for each subject area that describe what a student is typically capable of at each level (OECD 2006).

The PISA frameworks explain the theoretical underpinnings of the mathematics, science, and reading assessments and are described in detail in the *PISA 2015 Assessment and Analytical Framework* (OECD 2016a). Since reading and mathematics were assessed as minor domains in 2015, the reading framework in the 2015 administration of PISA did not change from 2009 and the mathematics framework was the same as the one used in 2012. However, the science framework was updated for the 2015 administration of PISA. The revised framework is intended to clarify the science relevant to 15-year-old students while ensuring that the items developed remain set in meaningful and authentic contexts and define the scientific processes in which students engage as they solve problems. More specifically, the PISA science assessment looks at three science content categories and three science process categories. The science content categories are physical systems, living systems, and Earth and space systems. The scientific process categories are explain phenomena scientifically, evaluate and design scientific inquiry, and interpret data and evidence scientifically. For more detail on the frameworks, see the *PISA 2015 Assessment and Analytical Framework* (OECD 2016a).

To provide valid estimates of an education system's population of 15-year-old students, PISA tests a sample of students that represents the full population of 15-year-old students in each education system. For the United States, this population is defined as all students born on or between July 1, 1999 and June 30, 2000 attending school in grade 7 and higher. The modal age of PISA students is 15 years. For the PISA 2015 assessment, .3 percent of the U.S. students were enrolled in 8th grade, 12 percent in 9th grade, 71 percent in 10th grade, 17 percent in 11th grade, and .2 percent in 12th grade. In addition, the PISA target population includes students in all programs of study (e.g., academic, vocational). A minimum of 5,400 students from at least 150 schools was required in each education system that administered computer-based assessment with collaborative problem solving. Countries were only allowed to exclude schools for approved reasons (e.g., schools in remote regions, special education schools). Similarly, schools were only allowed to exclude students for approved reasons (e.g., students with severe physical disabilities, students with intellectual disabilities, students with insufficient language experience). These restrictions allowed PISA to be as inclusive as possible. Overall estimated exclusions (including both school and student exclusions) were to be under 5 percent of the PISA target population. (For more information on permissible exclusions, see chapter 2; for details on the coverage of student populations, see OECD 2016b).

1.3 PISA 2015 Administration

PISA 2015 was implemented internationally by the PISA International Consortium, led by the Educational Testing Service (ETS), through a contract with the OECD. Technical standards and a series of manuals provided standardized procedures for all countries to follow. In 2015, a total of 73 education systems participated in PISA. More than 450,000 students participated worldwide.

The National Center for Education Statistics (NCES) is responsible for the U.S. implementation of PISA. PISA 2015 data collection and associated tasks were carried out through a contract with Westat and its subcontractor, Pearson. Westat was responsible for project coordination, preparation of recruitment materials, and adaptation of the international instruments. Westat was also responsible for school and student sampling, recruitment of schools and students, and data collection, analysis, and reporting. Pearson was responsible for the coding and scoring. The key personnel involved in data collection included a school coordinator (a school staff member designated by the principal), a test administrator, and one to two assistant administrators (both the test administrator and assistant administrators were Westat employees). Field managers and a field director (also Westat employees) oversaw data collection activities. Data collection occurred from October 5 through November 13, 2015, and the final report and data were released on December 6, 2016. In 2015, a total of 5,712 U.S. students and 177 U.S. schools participated.

Westat, and not NCES, was responsible for the implementation of PISA in the participating states of Massachusetts and North Carolina, as well as Puerto Rico. However, implementation was carried out in a similar manner with the same options and computer-based mode as the United States. In 2015, a total of 1,652 students participated in 48 Massachusetts schools and 1,887 students participated in 54 North Carolina schools. Massachusetts and North Carolina sampled only public schools.

1.4 Organization of This Document

This technical report and user guide is designed to provide researchers with an overview of the design and implementation of PISA 2015, as well as with information on how to access the PISA 2015 data. This information is meant to supplement that presented in OECD publications by describing those aspects of PISA 2015 that are unique to the United States. Chapter 2 provides information about sampling requirements and sampling in the United States. Chapter 3 describes participation rates at the school and student level. Chapter 4 describes the details of how schools and students were recruited, and chapter 5 provides information on instrument development. Chapter 6 describes field operations used for collecting

data, and chapter 7 provides detail concerning various aspects of data management. Chapter 8 describes international activities related to data processing, scaling, and weighting. Chapter 9 describes the data available from both international and U.S. sources, and chapter 10 discusses some special issues in analyzing the PISA 2015 data.

2. Sampling

The PISA 2015 U.S. sample for the main study was selected using a two-stage design—a sample of schools and a sample of students within sampled schools. The two-stage sample design was implemented to attain an approximately self-weighting sample of students where each 15-year-old student in the United States had an equal probability of being selected for the study.

2.1 International Requirements

To provide valid estimates of student achievement and characteristics, the sample of PISA students had to be selected in a way that represented the full population of 15-year-old students in each education system. The international desired population in each education system consisted of 15-year-olds attending school in grade 7 and higher. A minimum of 5,400 assessed students from a minimum of 150 schools was required in each education system that participated in CBA with collaborative problem solving.

The international guidelines specified that within schools, a sample of 35 students was to be selected in an equal probability sample unless fewer than 35 students age 15 were available (in which case all students were selected). International standards required that students in the sample be 15 years and 3 months to 16 years and 2 months at the beginning of the testing period. In the United States, Massachusetts, North Carolina, and Puerto Rico, sampled students were born between July 1, 1999, and June 30, 2000.

The school response rate target was 85 percent for all education systems. A minimum of 65 percent of schools from the original sample of schools were required to participate for an education system's data to be included in the international database. Education systems were allowed to use substitute schools (selected during the sampling process) to increase the response rate once the 65 percent benchmark had been reached.

PISA 2015 also required a minimum participation rate of 80 percent of sampled students from schools within each education system. A student was considered to be a participant if he or she participated in the first testing session or a follow-up or makeup testing session. Data from education systems not meeting this requirement could be excluded from international reports.

PISA's intent was to be as inclusive as possible. Guidelines allowed for schools to be excluded for approved reasons (for example, remote regions, very small schools, or special education schools). Schools used the following international guidelines on student exclusions:

- Students with functional disabilities. These were students with a moderate to severe permanent physical disability such that they could not perform in the PISA testing environment.
- Students with intellectual disabilities. These were students with a mental or emotional disability and who had been tested as cognitively delayed or who were considered in the professional opinion of qualified staff to be cognitively delayed such that they could not perform in the PISA testing environment.
- Students with insufficient language experience. These were students who met the three criteria of not being native speakers in the assessment language, having limited proficiency in the assessment language, and receiving less than 1 year of instruction in the assessment language.

Overall estimated exclusions, including both school and student exclusions, were to be under 5 percent of the PISA target population.

2.2 School Sampling in the United States

The 2015 PISA school sample was drawn for the United States in July 2014. The sample design was developed to retain most of the properties of the 2012 national sample and to follow international requirements as described in the *PISA 2015 Technical Report* (OECD forthcoming). The school universe includes all educational institutions that serve PISA-eligible students at age 15. For the United States, this included all public and private schools with grades 7 or higher that operate in the 50 states and the District of Columbia.

2.2.1 School Sampling Frame

The U.S. school sampling frame was developed from two national databases in the National Center for Education Statistics—public schools in the Common Core of Data (CCD, http://nces.ed.gov/ccd) and private schools in the Private School Universe Survey (PSS, http://nces.ed.gov/surveys/pss). These sources provide full coverage of all PISA-eligible students in the education system in the United States. The PISA 2015 school frame was constructed using the 2012-2013 CCD and the 2011-2012 PSS, the most current data at the time of the PISA frame construction.

Eligible schools in the PISA 2015 school frame included 66,646 schools. These included schools operating in the 50 states and the District of Columbia, schools with grade 7 or higher, ungraded schools, Department of Defense (DoD) domestic schools, Bureau of Indian Affairs (BIA) schools, special education schools, vocational education schools, as well as schools in hospitals and treatment and detention centers. For the U.S. national sample, schools in Puerto Rico and U.S. territories, DoD schools overseas, adult education institutions with no PISA-eligible students, and non-education institutions (e.g., homeschools, correspondence schools) were ineligible for the study. Section 2.2.2d describes the sampling for the Massachusetts, North Carolina, and Puerto Rico samples.

2.2.1.a Enrollment of PISA-Eligible Students (ENR)

The number of PISA-eligible students (ENR) was estimated using grade enrollment and the proportion of 15-year-olds in each grade. Student enrollment was the reported enrollment for public schools and the average enrollment per grade for private schools. Missing enrollment data by grade were imputed using the average enrollment for the school or a minimum size of 20 students. For ungraded schools, the ENR was set at 14 students.

The percentage of 15-year-olds in each grade was estimated using the observed distribution of age-eligible students in PISA 2012 (Kastberg, Roey, Lemanski, Chan, and Murray, 2012, table 1). Table 1 shows the percentage distribution of ENR students by grade in PISA 2012 and the student enrollment, estimated number ENR, and percentage distribution of ENR students in the PISA 2015 school frame. Most 15-year-olds in the United States were high school students—71.2 percent in 10th grade, 16.6 percent in 11th grade, 11.7 percent in 9th grade, and 0.2 percent in 12th grade. Less than 1 percent of them were middle school students—0.2 percent in 8th grade and 0.1 percent in 7th grade.

For each school in the PISA 2015 school frame, the estimated ENR for each grade was a product of the student enrollment and the percentage ENR in PISA 2012. For example, for a school with an enrollment of 100 students in grade 10, the estimated ENR was 71.2 students. Likewise for a school with 100 students in grade 11, the estimated ENR was 16.6 students. For each school, the total ENR was the sum of the ENR in grades 7 through 12.

Table 1. Percentage of PISA-eligible students in 2012 and student enrollment, number, and percentage of PISA-eligible students in PISA 2015, by grade

	PISA 2012[1]	PISA 2015 school frame	
Grade	Percent ENR	Number of students enrolled	Number ENR
Total	100.0	23,821,204	3,992,053
Grade 7	0.1	4,035,304	3,992
Grade 8	0.2	4,020,190	7,984
Grade 9	11.7	3,979,610	467,070
Grade 10	71.2	3,964,444	2,842,341
Grade 11	16.6	4,016,456	662,681
Grade 12	0.2	3,805,200	7,984

[1] Technical Report and User Guide for the Program for International Student Assessment (PISA). (NCES 2014-025), table 1.
NOTE: ENR means enrollment.
SOURCE: U.S. 2015 PISA School Sample, Final Report.

The total estimated number of ENR students in the PISA 2015 school frame was 3,992,053 students. The census population estimate of 15-year-old children during the 2009-2010 academic year was 4,220,325 children as of June 2011 (http://www.census.gov/programs-surveys/popest.html).The ENR estimated from enrollment data was 95 percent of the census estimate. Since enrollment data were not reported by age, the census estimate is a more reliable data source for the 15-year-old population in the United States.

For comparison, the percentage ENR in PISA 2015 was computed using the ENR by grade relative to the total ENR summed across grades in the school frame. This percentage distribution is fairly consistent with the distribution observed in PISA 2012.

2.2.1.b School Exclusions

A small fraction of PISA eligible schools were excluded in the United States because administration of the PISA assessment within these schools would not be feasible. The excluded schools were special education schools for students with physical disabilities, schools in hospitals, training centers, and detention centers. A total of 1,018 schools were excluded from sampling. The student loss as a result of these exclusions was estimated at 10,574 students, or 0.26 percent of the ENR.

2.2.1.c Stratification

Stratification was used for sample efficiency. Nine[1] explicit strata were formed by the following variables, shown in alphabetical order:

- Census region—Northeast, Midwest, South, and West[2];
- Modal grade—school has grade 10 and school does not have grade 10; and
- School type—indicates whether the school is under public control (operated by publicly elected or appointed officials) or private control (operated by privately elected or appointed officials and derives its major source of funds from private sources).

Within each stratum, schools were sorted by

- gender;
- grade range—schools with grade 7 or 8 as highest grade, schools with grade 9 as highest grade, schools with grades 9 through 12 as highest grade, schools with grades 10 through 12 as highest grade, and all other schools;
- locale—urban-centric locale code, i.e., city, suburb, town, rural[3];
- race/ethnicity status— student population in the school is "15 percent and above" or "below 15 percent" Black, Hispanic, Asian, Hawaiian/Pacific Islander, American Indian and Alaska Native, and multiracial students;
- state; and
- estimated grade enrollment.

[1] Some variables were collapsed when forming the explicit strata due to small samples sizes per international requirements, so a full cross-classification of 16 strata was not possible.

[2] Northeast consists of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest consists of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South consists of Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West consists of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

[3] Locale was derived from the urban-centric locale code that is based on the urbanicity of the school location: *Central city* consists of a large territory inside an urbanized area and inside a principal city with population of 250,000 or more, midsize territory inside an urbanized area and inside a principal city with a population less than 250,000 and greater than or equal to 100,000, or small territory inside an urbanized area and inside a principal city with a population less than 100,000. *Suburb* consists of a large territory outside a principal city and inside an urbanized area with population of 250,000 or more, midsize territory outside a principal city and inside an urbanized area with a population less than 250,000 and greater than or equal to 100,000, or small territory outside a principal city and inside an urbanized area with a population less than 100,000. *Town* consists of a fringe territory inside an urban cluster that is less than or equal to 10 miles from an urbanized area, distant territory inside an urban cluster that is more than 10 miles and less than or equal to 35 miles from an urbanized area, or remote territory inside an urban cluster that is more than 35 miles from an urbanized area. *Rural* consists of a fringe census-defined rural territory that is less than or equal to 5 miles from an urbanized area, as well as rural territory that is less than or equal to 2.5 miles from an urban cluster, distant census-defined rural territory that is more than 5 miles but less than or equal to 25 miles from an urbanized area, as well as rural territory that is more than 2.5 miles but less than or equal to 10 miles from an urban cluster, or remote census-defined rural territory that is more than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster.

The following tables show the total number and percentage of ENR students and schools in the PISA 2015 U.S. school frame by census region (table 2), modal grade (table 3), school type (table 4), gender (table 5), grade range (table 6), locale (table 7), race/ethnicity status (table 8), and sampling stratum (table 9). Section 2.2.2.d describes the stratification used in the Massachusetts, North Carolina, and Puerto Rico samples.

Table 2. Number and percentage of students and schools included in the PISA U.S. school sampling frame, by region: 2015

Region	ENR students	Percent	Schools	Percent
Total	3,981,478	100	66,646	100
Northeast	693,078	17.4	12,210	18.5
Midwest	863,304	21.7	17,559	26.7
South	1,459,401	36.7	21,443	32.0
West	965,695	24.3	15,434	22.8

NOTE: Detail may not sum to totals because of rounding. Region of country is based on census definitions.
SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 3. Number and percentage of students and schools included in the PISA U.S. school sampling frame, by modal grade: 2015

Modal grade	ENR students	Percent	Schools	Percent
Total	3,981,478	100	66,646	100
School has grade 10	3,935,135	98.84	32,622	48.95
School does not have grade 10	46,344	1.16	34,024	51.05

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 4. Number and percentage of students and schools included in the PISA U.S. school sampling frame, by school type: 2015

School type	ENR students	Percent	Schools	Percent
Total	3,981,478	100.00	66,646	100
Private	320,975	8.1	20,713	31.1
Public	3,660,503	91.9	45,933	68.9

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 5. Number and percentage of students and schools included in the PISA U.S. school sampling frame, by gender: 2015

Gender	ENR students	Percent	Schools	Percent
Total	3,981,478	100	66,646	100
>=95% female	33,022	0.8	691	1.0
Other	3,907,928	98.2	64,779	97.2
>=95% male	40,528	1.0	1,176	1.8

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 6. Number and percentage of students and schools included in the PISA U.S. school sampling frame, by grade range: 2015

Grade range	ENR students	Percent	Schools	Percent
Total	3,981,478	100.00	66,646	100
Highest grade 07 or 08	10,568	0.3	31,581	47.4
Highest grade 09	20,246	0.5	1,152	1.7
High schools: Grades 09-12	3,338,491	83.9	16,616	24.9
High schools: Grades 10-12	144,748	3.6	1,821	2.7
Other	467,424	11.7	15,476	23.2

NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 7. Number and percentage of students and schools included in the PISA U.S. school sampling frame, by locale: 2015

Locale	ENR students	Percent	Schools	Percent
Total	3,981,478	100	66,646	100
City	1,233,911	31.0	19,099	28.7
Suburb	1,578,048	39.6	19,247	28.9
Town	438,951	11.0	8,389	12.6
Rural	730,567	18.3	19,911	29.9

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 8. Number and percentage of students and schools included in the PISA U.S. school sampling frame, by race/ethnicity status: 2015

Race/ethnicity status	ENR students	Percent	Schools	Percent
Total	3,981,478	100.00	66,646	100
15 percent and above non-White students	3,074,679	77.2	44,661	67.0
Below 15 percent non-White students	906,800	22.8	21,985	33.0

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 9. Number and percentage of students and schools included in the PISA U.S. school sampling frame, by region, modal grade, and school type: 2015

Region	Modal grade	School type	Students	Percent	Schools	Percent
Total			3,981,478	100	66,646	100
Northeast	Has grade 10	Private	86,147	2.2	2,144	3.2
Northeast	Has grade 10	Public	599,487	15.1	3,411	5.1
Northeast	Does not have grade 10	Private	3,018	0.1	2,991	4.5
Northeast	Does not have grade 10	Public	4,426	0.1	3,664	5.5
Midwest	Has grade 10	Private	67,133	1.7	1,729	2.6
Midwest	Has grade 10	Public	787,522	19.8	6,487	9.7
Midwest	Does not have grade 10	Private	887	0.0	3,286	4.9
Midwest	Does not have grade 10	Public	7,761	0.2	6,057	9.1
South	Has grade 10	Private	102,088	2.6	3,894	5.8
South	Has grade 10	Public	1,341,095	33.7	7,430	11.1
South	Does not have grade 10	Private	2,296	0.1	2,558	3.8
South	Does not have grade 10	Public	13,923	0.3	7,561	11.3
West	Has grade 10	Private	58,185	1.5	1,963	2.9
West	Has grade 10	Public	893,477	22.4	5,564	8.3
West	Does not have grade 10	Private	1,221	0.0	2,148	3.2
West	Does not have grade 10	Public	12,812	0.3	5,759	8.6

NOTE: Detail may not sum to totals because of rounding. Region of country is based on census definitions.
SOURCE: U.S. 2015 PISA School Sample, Final Report.

2.2.2 School Sample

The U.S., Massachusetts, North Carolina, and Puerto Rico samples used a two-stage design—a sample of schools and then students within sampled schools. The school selection probability was configured such that all enrolled age-eligible (ENR) students in the United States would have approximately equal probability of being selected in the sample. The target cluster size (TCS) for the U.S. sample was 42 ENR students in each school. This means that in each large school with at least 42 ENR students, the sample target is to sample with equal probability 42 ENR students at random. In each small school with fewer than 42 students, the target is to sample all ENR students with certainty.

The Australian Council for Educational Research (ACER) selected the U.S. school sample for PISA 2015. Detailed information on sampling steps can be found in the *PISA 2015 Technical Report* (OECD

forthcoming). Very briefly, school sampling involved stratification, sample allocation by stratum, small school analysis, and selecting a systematic sample with probability proportional to a measure of size based on the TCS. For the small school analysis in 2015, the very small schools (VSS) were split into two groups, VSS1 and VSS2, as described below.

Table 10 shows the number of schools in the U.S. sample by stratum. The sample included 240 schools—22 very small schools (VSS1, ENR<=2), 16 very small schools (VSS2, 2<ENR<21), 9 moderately small schools (21<=ENR<42), and 193 large schools (ENR>=42). The sample allocation by stratum was proportional to the distribution of ENR students in each stratum. For the U.S. school sample, very small schools (VSS1) were undersampled by a factor of 4 and very small schools (VSS2) were undersampled by a factor of 2 as compared to equal-probability sampling.

Table 10. Number of schools in the PISA U.S. school sample, by sampling stratum: 2015

Stratum	All schools	Very small schools (VSS1)	Very small schools (VSS2)	Moderately small schools (MSS)	Large schools
Total	240	22	16	9	193
Northeast Private	9	2	3	0	4
Northeast Public, has grade 10	31	0	0	0	31
Midwest Private	6	1	2	0	3
Midwest Public, has grade 10	43	0	2	6	35
South Private	10	2	2	1	5
South Public, has grade 10	70	0	1	0	69
West Private	5	1	2	0	2
West Public, has grade 10	48	0	2	2	44
Public, does not have grade 10	18	16	2	0	0

SOURCE: U.S. 2015 PISA School Sample, Final Report.

2.2.2.a Measure of Size and Small Schools

The measure of size (MOS) for school sampling was set equal to the TCS for large schools and for moderately small schools. It was set to TCS/4 for very small schools because of the relatively large proportion of small schools in the U.S. (about 3 percent of ENR students were in VSS). The VSS schools were undersampled to reduce the administrative burden of handling small schools. This same MOS was used in the Massachusetts, North Carolina and Puerto Rico samples. Table 11 shows the estimated student yield from the U.S. sample by stratum and the parameters used to estimate student yield.

Table 11. Estimated student yield and estimation parameters for PISA U.S. school sample, by sampling stratum: 2015

Stratum	Estimated student yield	Proportion ENR from school: VSS1 P1	VSS2 P2	MSS Q	Large R	Factor L= 1+ P/4	Mean ENR: VSS2 (V1ENR)	VSS2 (V2ENR)	MSS (MENR)
Total	8,539	0.3	2.8	3.5	93.4	1.0163	0.4	9.5	30.7
Northeast Private	194	0.4	13.6	9.2	76.8	1.0714	0.1	8.7	30.3
Northeast Public, has grade 10	1,302	0.0	0.4	1.2	98.4	1.0000	0.0	0.0	0.0
Midwest Private	142	0.6	11.7	9.1	78.6	1.0626	0.1	8.0	31.2
Midwest Public, has grade 10	1,680	0.0	2.1	4.1	93.7	1.0108	1.7	11.8	31.1
South Private	256	0.6	19.6	15.0	64.8	1.1029	0.2	8.1	29.5
South Public, has grade 10	2,909	0.0	1.0	1.9	97.0	1.0052	1.5	11.2	31.4
West Private	100	0.8	17.1	9.7	72.4	1.0913	0.2	7.8	29.9
West Public, has grade 10	1,930	0.0	1.7	2.9	95.3	1.0089	1.5	10.6	30.4
Public, does not have grade 10	25	26.0	16.0	21.1	36.8	1.2754	0.5	9.0	31.2

NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. 2015 PISA School Sample, Final Report.

The *PISA 2015 Technical Report* (OECD forthcoming) shows the method for conducting the small school analyses and calculating the estimated student yield. For example, in stratum 3—public schools in the Midwest region that have grade 10—the percentage of ENR was P1 = 0.0 percent in very small schools (VSS1), P2 = 2.1 percent in very small schools (VSS2), Q = 4.1 percent in moderately small schools (MSS), and R = 93.7 percent in large schools. The small school sampling factor was L = 1 + P/4 = 1.0108. The mean ENR was 1.7 for very small schools (V1ENR), 11.8 for very small schools (V2ENR), 31.1 for moderately small schools (MENR), and 42 for large schools (i.e., the mean is equal to the TCS for all large schools). The sample size allocation in this stratum was 43 schools—0 VSS1, 2 VSS2, 6 MSS, and 35 large schools. The number of students to sample from these schools was estimated by the product of the number of sampled schools and the mean ENR summed across the three school size groups: (0*1.7 + (2*11.8) + (6*31.1) + (35*42)) = 1,680 students. The total estimated student yield summed across the eight strata was 8,539 students.

2.2.2.b Substitute Schools

The *PISA 2015 Technical Report* (OECD forthcoming) describes the use of substitute schools for sampled schools that refused participation (OECD forthcoming). Although efforts were made to secure the participation of all schools selected, it was anticipated that not all schools would choose to participate. Therefore, as each school was selected in the sample, the two neighboring schools in the sampling frame were designated as substitute schools. The first school following the sample school was the first substitute and the first school preceding it was the second substitute. For each school sample (U.S. national, Massachusetts, North Carolina, and Puerto Rico), if an original school refused to participate, the first substitute was then contacted. If that school also refused to participate, the second substitute was then contacted.

There were several constraints on the assignment of substitutes. One sampled school was not allowed to be a substitute for another, and a given school could not be assigned to be a substitute for more than one sampled school. Furthermore, substitutes were required to be in the same explicit stratum as the sampled school. If the sampled school was the first or last school in the stratum, then the second school following or preceding the sampled school was identified as the substitute. If the first substitute school did not have the same implicit stratification values as the sampled school, the first and second substitute schools could be switched. Under these rules, it was possible to identify two substitutes for each sampled school.

2.2.2.c Tabulations Within Subgroups for Frame and Sample

This section provides an overview of the frame and sample distribution by each of the stratification variables. Each table shows the total number and percentage of ENR students in the sampling frame (data shown in tables 2 through 9) and the total number and percentage of schools in the PISA 2015 school sample. By each stratification variable, the tables are Census region (table 12), modal grade (table 13), school type (table 14), gender (table 15), grade range (table 16), locale (table 17), race/ethnicity status (table 18), and school type and region (table 19).

Table 12. Number and percentage of students and schools included in the PISA U.S. school sample, by Census region: 2015

	Frame		Sample	
Region	ENR students	Percent	Schools	Percent
Total	3,981,478	100	240	100
Northeast	693,078	17.4	43	17.9
Midwest	863,304	21.7	53	22.1
South	1,459,401	36.7	86	35.8
West	965,695	24.3	58	24.2

NOTE: Detail may not sum to totals because of rounding. Region of country is based on Census definitions.
SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 13. Number and percentage of students and schools included in the PISA U.S. school sample, by modal grade: 2015

	Frame		Sample	
Modal grade	ENR students	Percent	Schools	Percent
Total	3,981,478	100	240	100
School has grade 10	3,935,135	98.8	215	89.6
School does not have grade 10	46,344	1.2	25	10.4

SOURCE: U.S. 2015 PISA School Sample, Final Report

Table 14. Number and percentage of students and schools included in the PISA U.S. school sample, by school type: 2015

	Frame		Sample	
School type	ENR students	Percent	Schools	Percent
Total	3,981,478	100	240	100
Private	320,975	8.1	30	12.5
Public	3,660,503	91.9	210	87.5

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 15. Number and percentage of students and schools included in the PISA U.S. school sample, by gender: 2015

	Frame		Sample	
Gender	ENR students	Percent	Schools	Percent
Total	3,981,478	100	240	100
≥95% female	33,022	0.8	1	0.4
Other	3,907,928	98.2	238	99.2
≤95% male	40,528	1.0	1	0.4

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 16. Number and percentage of students and schools included in the PISA U.S. school sample, by grade range: 2015

	Frame		Sample	
Grade range	ENR students	Percent	Schools	Percent
Total	3,981,478	100	240	100
Highest grade 07 or 08	10,568	0.3	21	8.8
Highest grade 09	20,246	0.5	2	0.8
High schools: Grades 09-12	3,338,491	83.9	176	73.3
High schools: Grades 10-12	144,748	3.6	9	3.8
Other	467,424	11.7	32	13.3

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 17. Number and percentage of students and schools included in the PISA U.S. school sample, by locale: 2015

	Frame		Sample	
Locale	ENR students	Percent	Schools	Percent
Total	3,981,478	100	240	100
City	1,233,911	31.0	72	30.0
Suburb	1,578,048	39.6	94	39.2
Town	438,951	11.0	22	9.2
Rural	730,567	18.3	52	21.7

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 18. Number and percentage of students and schools included in the PISA U.S. school sample, by race/ethnicity status: 2015

Race/ethnicity status	Frame		Sample	
	ENR students	Percent	Schools	Percent
Total	3,981,478	100	240	100
15 percent and above non-White students	3,074,679	77.2	179	74.6
Below 15 percent non-White students	906,800	22.8	61	25.4

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table 19. Number and percentage of students and schools included in the PISA U.S. school sample, by region, modal grade, and school type: 2015

Region	Modal grade	School type	Students	Percent	Sample schools	Sample percent
Total			3,981,478	100	240	100
Northeast	Has grade 10	Private	86,147	2.2	7	2.9
Northeast	Has grade 10	Public	599,487	15.1	31	12.9
Northeast	Does not have grade 10	Private	3,018	0.1	2	0.8
Northeast	Does not have grade 10	Public	4,426	0.1	3	1.3
Midwest	Has grade 10	Private	67,133	1.7	4	1.7
Midwest	Has grade 10	Public	787,522	19.8	43	17.9
Midwest	Does not have grade 10	Private	887	0.0	2	0.8
Midwest	Does not have grade 10	Public	7,761	0.2	4	1.7
South	Has grade 10	Private	102,088	2.6	8	3.3
South	Has grade 10	Public	1,341,095	33.7	70	29.2
South	Does not have grade 10	Private	2,296	0.1	2	0.8
South	Does not have grade 10	Public	13,923	0.3	6	2.5
West	Has grade 10	Private	58,185	1.5	4	1.7
West	Has grade 10	Public	893,477	22.4	48	20.0
West	Does not have grade 10	Private	1,221	0.0	1	0.4
West	Does not have grade 10	Public	12,812	0.3	5	2.1

NOTE: Detail may not sum to totals because of rounding. Region of country is based on census definitions.
SOURCE: U.S. 2015 PISA School Sample, Final Report.

2.2.2.d State and Territory School Samples

The state school samples were selected in Massachusetts and North Carolina in public schools only and independently from the U.S. national sample. The school frame was identical to the national frame of public schools in those states. The rest of the design was similar to the national design where possible. There were no explicit strata, as the national strata did not apply to state samples. The frame was again implicitly stratified by grade range, locale, high/low race/ethnicity status, gender, and student enrollment. The MOS for each school was the same as in the national design. Substitute schools were assigned using the same procedure.

Eligible schools in the PISA 2015 school frame for Massachusetts included 785 schools and 1,209 schools for North Carolina. The total estimated number of ENR students in the school frame for Massachusetts was 71,900 and 110,215 students for North Carolina. A total of 4 and 15 schools for Massachusetts and North Carolina, respectively, were excluded from sampling. The student loss as a result of these exclusions in Massachusetts was estimated at 18, or 0.03 percent of the ENR. For North Carolina, the student loss as a result of these school exclusions was estimated at 157 students, or 0.14 percent of the ENR for North Carolina.

Each state sample was selected using a version of the Keyfitz procedure (Keyfitz 1951; Chowdhury, Chu, and Kaufman 2000), which has described the implementation of the procedure to minimize overlap between one or more surveys. Ideally, the state samples would not include the schools that were previously selected as part of the PISA national sample. By following the Keyfitz procedure outlined in table 2 of Chowdhury, Chu, and Kaufman, the procedure allowed us to minimize the overlap with the PISA national sample. By minimizing the overlap with the national sample, the assessed students could be included in only one study with proper probabilities. This was accomplished by partitioning the frame into the following two groups shown in order as in table 2 of the paper. The two groups were as follows:

1. Schools not selected for the PISA national sample; and
2. Schools selected for the PISA national sample.

With this design, the method accomplished the goal of selecting the entire state samples from group 1 and none from group 2. For the schools in group 2, this was due to the sum of the school's probabilities of being selected for the state sample and the national sample was always less than one. In that case, their conditional probabilities are zero. Tables for the state samples are provided in appendix A.

The school sample in Puerto Rico was selected using both public and private schools. The school frame was provided by the Puerto Rico Department of Education following the international guidelines. The design was similar to the U.S. national design where possible. Two explicit strata were formed by school type. The frame was implicitly stratified by grade range, district, high/low race/ethnicity status, and student enrollment. The MOS for each school was the same as in the national design. Substitute schools were assigned using the same procedure as the national design. There was no overlap control as Puerto Rico was not in the U.S. national design.

Eligible schools in the PISA 2015 school frame included 990 schools and the total estimated number of ENR students in the school frame was 44,613 students for Puerto Rico. A total of 19 schools were excluded from sampling. The student loss as a result of these exclusions was estimated at 716, or 1.60 percent of the ENR.

2.3 Student Sampling in the United States

To achieve the required student yield of 35 assessed students per school (taking into account student exclusions and absences), the United States set a target cluster size (TCS) of 42 students per national school. The TCS for the main study was slightly smaller than the TCS used on PISA 2012 in the United States because the assessment design was changed for financial literacy assessment in 2015. Of the 42 students, 42 were sampled to take the science, reading, and mathematics literacy assessment. Of these 42 students, up to 12 were subsampled to also take the financial literacy assessment in a second session. If fewer than 42 age-eligible students were enrolled in a school, all 15-year-old students in that school were selected. The U.S. national TCS and student sampling plans were approved by the international consortium.

In each of the two state samples, 42 students were sampled within each school. As in the student sampling for the national schools, a subsample of up to 12 students were selected to take financial literacy in a second session. In the Puerto Rico sample, up to 42 students were sampled, but no subsample was selected since Puerto Rico did not participate in the financial literacy optional assessment. If fewer than 42 age-eligible students were enrolled in a school, all 15-year-old students in that school were selected. The state TCS and student sampling plans were also approved by the international consortium.

School coordinators were asked to provide lists of all 15-year-old students (defined as students with birth dates between July 1, 1999, and June 30, 2000) in their schools.

A total of 92,799 students were listed from the 330 participating schools. This included 56,570 students from 178 national schools, 13,441 students from 48 Massachusetts schools, 17,431 students from 54 North Carolina schools, and 5,357 students from 47 Puerto Rico schools. The average list size was 281 students. Once the list of students was received from a school, it was formatted for importing into KeyQuest, the sampling and data management software provided by the international core contractors.

After importing the list from a school, the appropriate validation checks were run, the students were sampled, and the student tracking and session attendance forms were output from KeyQuest (exhibits 1 and 2). Westat provided the lists of sampled students to schools 2 to 4 weeks before the scheduled testing date, depending on when the school provided the list of age-eligible students. A total of 13,051 students (an average of 39.5 per school) were randomly sampled. This included 6,941 students from national schools, 2,124 students from Massachusetts schools, 2,234 students from North Carolina schools, and 1,752 students from Puerto Rico schools.

Exhibit 1. Student Tracking Form

Codes to enter into SEN column:	Codes to enter into N/P column:	Codes to enter into ACCOMM column:	
1 – Functional disability	2 – Parent refusal	SMG – Small Group	AUD – Auditory Amplification
2 – Cognitive, behavioral, or emotional disability	3 – Excluded on SEN basis	ONE – One-on-One	OTR – other accommodation
3 – Limited assessment language experience	4 – Now enrolled at another school	EQP – Special Equipment	NAP – accommodation(s) not allowed on PISA
4 – Home schooled	5 – Not enrolled in this school, enrollment unknown	SLD – Directions in Sign Language	
	n – Does not meet PISA criteria for eligibility		

FID: «FileId»

VDT: «VerificationDT»

P15 - STUDENT TRACKING FORM

School Name	School ID	School Coordinator	Test Administrator	Assessment Date(s)
«School»	«WESID»	«SC»	«TA»	«AssessDate1» / «AssessDate2»

	(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)	(11)	(12)	(13)	(14)
Line #	Student Name	Line #	SUBID	Region	Stratum ID	School ID	Student ID	Grade	Gender (F=1; M=2)	Birth Date (MM-YYYY)		SEN[1]	N/P[2] PISA	ACCOMM	UH	COMMENTS
01	«Student_Name»	01	«SubID»	«Region»	«Stratum_ID»	«School_ID»	«Student_ID»	«Grade»	«Gender_F1M2»	«Birth_Date_MM»	«Birth_Date_YYYY»	«SEN»				
02	«Next Record»«Student_Name»	02	«SubID»	«Region»	«Stratum_ID»	«School_ID»	«Student_ID»	«Grade»	«Gender_F1M2»	«Birth_Date_MM»	«Birth_Date_YYYY»	«SEN»				
03	«Next Record»«Student_Name»	03	«SubID»	«Region»	«Stratum_ID»	«School_ID»	«Student_ID»	«Grade»	«Gender_F1M2»	«Birth_Date_MM»	«Birth_Date_YYYY»	«SEN»				
04	«Next Record»«Student_Name»	04	«SubID»	«Region»	«Stratum_ID»	«School_ID»	«Student_ID»	«Grade»	«Gender_F1M2»	«Birth_Date_MM»	«Birth_Date_YYYY»	«SEN»				
05	«Next Record»«Student_Name»	05	«SubID»	«Region»	«Stratum_ID»	«School_ID»	«Student_ID»	«Grade»	«Gender_F1M2»	«Birth_Date_MM»	«Birth_Date_YYYY»	«SEN»				

[1] SEN = Special Education Needs
[2] N/P = Non-Participant

Exhibit 2. Session Attendance Form

FID: «FileId» VDT: «VerificationDT»

Codes to enter into TEST and StQ columns:
0 – absent (not due to technical problems)
1 – present
2 – partially present (absence not due to technical problems)
3 – partially present (absence due to technical problems)
4 – absent (due to technical problems)
5 – absent (due to lack of computers)

P15 - SESSION ATTENDANCE FORM – Main Session

School Name	School ID	Session ID	Test Administrator	Date: «AssessDate1» Time: «Time1PB» Location: «Loc1PB»	TEST: A. Total # **absent** (all students with a 0 in the Test column): _____ B. Total # **N/P-Absent** (students with "N/P-Absent" in the Comments column): ____ C. Total **# students listed**: _____
«School»	«WESID»		«TA»		

	STUDENT DETAILS					SCHOOL DETAILS			STUDENT DETAILS			ATTENDANCE			
	(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Line #	Student Name	Line #	Comp #	FIDr#	SUB ID	Region	Stratum ID	School ID	Student ID	Grade	Form	Test	StQ	Comments*	Password
01	«Student_Name»	01			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
02	«Next Record»«Student_Name»	02			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
03	«Next Record»«Student_Name»	03			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
04	«Next Record»«Student_Name»	04			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
05	«Next Record»«Student_Name»	05			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
06	«Next Record»«Student_Name»	06			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
07	«Next Record»«Student_Name»	07			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
08	«Next Record»«Student_Name»	08			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
09	«Next Record»«Student_Name»	09			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
10	«Next Record»«Student_Name»	10			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»
11	«Next Record»«Student_Name»	11			«SubID	«Region	«Stratum_	«School	«Student_	«Grad	«Form»				«Password»

*If a student was partially present during the CBA session, please record in this column the length of time he or she was absent.

3. Response Rates

As described in chapter 2, PISA 2015 international requirements stipulated that the school response rate target needed to be 85 percent for all education systems. A minimum of 65 percent of schools from the original sample of schools were required to participate for an education system's data to be included in the international database. Education systems were allowed to use substitute schools (selected during the sampling process) to increase the response rate once the 65 percent benchmark had been reached.

PISA 2015 also required a minimum participation rate of 80 percent of sampled students from schools within each education system. A student was considered to be a participant if he or she responded to specific questions in the student questionnaire and/or one block of cognitive items. Data from education systems not meeting this requirement could be excluded from international reports.

The PISA 2015 standards also required that nonresponse bias analyses needed to be conducted if school response rates were less than 85 percent. NCES standards for assessment surveys stipulated that a nonresponse bias analysis is required at any stage of data collection with a weighted unit response rate of less than 85 percent. The U.S. national sample and the sample for Massachusetts required a nonresponse bias analysis, but the North Carolina and the Puerto Rico samples did not require a nonresponse bias analysis. The national and Massachusetts nonresponse bias analysis is provided in appendix I.

The response rates presented in this chapter reflect the OECD criteria for inclusion and exclusion into the national database and inclusion as a participant in the response rate report. For PISA 2015, a total of 177 schools are included in the U.S. database.

The information below pertains to the U.S. national sample. Response rate tables for the state samples are provided in appendix B.

3.1 School Participation

Table 20 provides the response status of original and substitute schools. Of the 177 participating schools, 142 schools were original schools and 35 schools were substitutes. The unweighted and weighted school response rates before and after replacements are shown in table 21.

Table 20. PISA U.S. schools, by response status: 2015

Response status	Original		Substitute[1]		Total	
	Number of schools	Percentage of schools	Number of schools	Percentage of schools	Number of schools	Percentage of schools
Total schools	240	100.0	480	100.0	720	100.0
Total eligible schools	213	88.8	119	24.8	332	44.0
Participating	142	66.7	35	29.4	177	50.9
Refusal	71	33.3	83	69.7	154	49.1
Ineligible/closed/excluded	27	11.3	4	3.4	31	4.3
Other (pending, no contact)	0	0.0	358	74.6	358	51.3

[1] One substitute school was assessed but is marked here as ineligible/closed/excluded and is not included in the data, as the original school for this substitute participated.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

Table 21. PISA U.S. school response rates: 2015

	Unweighted response rate percentage	Weighted response rate percentage[1]
Before substitution	66.67	66.67
After first substitute	77.00	76.83
After second substitute	83.10	83.32

[1] Students at one substitute school were assessed but are not included in the data, as the original school for this substitute participated.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

3.2 Student Participation

Table 22 reports the participation status of students to be assessed for the PISA 2015 assessment, including categories of nonparticipating students as defined by PISA. For the assessment, a total of 523 students (7.6 percent of students sampled) were coded as nonparticipating due to special education needs or having been withdrawn from school. Students excluded because of special education needs were considered nonparticipating, as were students who were homeschooled or who had withdrawn. However, refusals were reported under students to be assessed because the calculation of the response rate includes in the denominator students who were absent and refused. Similar tables for Massachusetts, North Carolina, and Puerto Rico are included in Appendix B.

Table 22. Status of sampled U.S. PISA students: 2015

	Number of students	Percentage of students
Total students sampled	6,899	100.0
To be assessed	6,376	92.4
Non-participation[1]		
Functional disability	16	0.2
Cognitive disability	120	1.7
Insufficient language ability	44	0.6
Ineligible for population	0	0.0
Homeschooled	13	0.2
Withdrawn	330	4.8

[1] Student nonparticipation numbers are reported only for schools that are counted as a participant in OECD response rates.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

4. School and Student Recruitment

4.1 Overview

The PISA 2015 main study recruitment began in March 2015, eight months prior to the data collection window, and ended in September 2015. The general approach taken with schools was to contact them well before the 2014-2015 school year came to a close. As in past rounds of PISA, this early contact was believed to be necessary for schools to get PISA on their calendars before the start of the next school year. The second element to the recruitment of schools was to offer an incentive structure that paid schools, school coordinators, and students. Under this incentive structure, schools and school coordinators were each paid $200, and students received $25 and 4 hours of community service for participating in the main session and an additional $15 if they were selected and participated in the financial literacy assessment. Teachers that participated by completing a teacher questionnaire received $20.

Despite this incentive structure, there was some resistance of schools to participate in PISA, and this required several approaches to build the school response rate. Examples of such approaches include contacting states, districts, and education organizations for letters of endorsement, using NAEP State Coordinators (NSCs) to assist in recruiting, making in-person visits to certain pending and refusing schools, developing a website to assist with recruiting schools and facilitating participation, and offering an increased incentive amount later in the recruitment window. Resistance from schools also required the recruitment period to extend beyond what was planned.

Table 23. Summary of U.S. PISA school recruitment activities: 2015

Date	Activity
October 2014	School sampled selected
January 2015	NSCs and other state DOE staff informed of PISA sample and provided materials for contacting districts and schools
March 2015	School recruitment training for Westat gaining cooperation recruiters
March 2015	Notification packages sent to private schools and public schools and districts in states where NSCs were not assisting with recruitment
March – September 2015	Special district approval in required districts
Early November 2015	School recruitment ended

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

4.2 Recruitment Training

Five recruiters with experience in gaining cooperation were hired to recruit schools for the PISA main study. Each gaining cooperation recruiter (GCR) was responsible for approximately 48 schools. The GCR training for gaining cooperation was designed to incorporate a large amount of independent study along with distance training via a 2-day webinar. This training took place on March 23 and 25, 2015.

One week before training, each GCR received a manual containing specific procedures for completing their work as well as gaining cooperation techniques tailored to the PISA study. GCRs also received a home study memo that included several exercises designed to familiarize the GCRs with the PISA procedures in advance of the WebEx training sessions.

The WebEx delivered PowerPoint presentations that walked GCRs through an introduction to PISA, an overview of their role, materials for their assignment, contacting schools, security and confidentiality, conversion techniques, using the online Field Management System (FMS), and administrative procedures. A few days after training, the field manager followed up with each GCR to ensure that all questions had been answered and that GCRs were ready to proceed with recruitment activities.

4.3 Recruitment of Schools

During November 2014 PISA information packages were sent to the Chief Education Officer in each state with sampled schools, NAEP State Coordinators (NSCs), and State testing directors. The information packages contained the following:

- letter from the NCES Commissioner;
- PISA 2015 overview brochure;
- summary of activities for schools;
- study timeline;
- FAQs for states; and
- affidavit of nondisclosure.

Westat and NCES met with the NSCs over a series of WebExes and individual phone calls to alert them about PISA and discuss the participation of the selected schools in their state. An ideal plan for notifying

schools, gaining their participation, and handing the schools off to Westat's GCRs was reviewed with the NSCs. Once the NSCs completed an affidavit of nondisclosure, Westat provided them with information on the sampled schools, and they began their outreach to the schools. The level of involvement from the NSCs varied drastically, with some doing all of the work to contact schools and obtain their cooperation, some only notifying schools of their selection for the study (and then passing it over to the GCRs to do the recruitment), some providing a letter from the state that Westat could use to contact schools, and some opting to not assist with PISA recruitment. NSCs in Massachusetts, North Carolina, and Puerto Rico gained the cooperation for their respective sample schools.

Some districts required explicit approval before schools could be contacted. In states where the NSCs were assisting, they obtained the necessary approval for PISA. Westat identified six districts (3 percent of districts with original schools) where special approval was required in states where the NSCs did not assist with this process. Formal research requests were prepared and sent to these districts. This process for gaining district approval was different in each district, and in some districts, approval took months. Fortunately, once approved, most districts assisted with getting the school(s) to participate.

School packages were mailed to principals in mid-March with phone contact from recruiters beginning a few days after the mailing. Recruiters began contacting schools in March 2015 and continued working their assignments through summer 2015 when the recruitment period began to wind down. Over the course of the recruitment period, GCRs, Westat project staff, NCES, state and district school officials, and other recruiting contact resources engaged in efforts to achieve a satisfactory school response rate in hopes of improving the U.S. school response rate from PISA 2012. All recruitment materials can be found in appendix C.

4.3.1 Contacting States, Districts, and Schools

The school sample for the main study was drawn in October 2014. The contact information for each state, district, and school office was then verified, and additional contact information was gathered for key personnel such as state and district superintendents, state and district testing directors, and school principals. Contact of states and districts began in January 2015. School contacts began in January in states where NSCs were contacting schools and in March in states where Westat staff were contacting schools. The mailing sequence for states, districts and schools contacted by Westat was as follows:

- state mailing: November 2014;
- district mailing: March 18, 2015; and

- school mailing: March 24, 2015.

4.3.1.a State Contact

As described above, in states where NSCs were assisting with school recruitment, the NSC, Chief Education Officer, and state testing director received the state package, and an affidavit was returned in order to release the sample schools to the NSC. In states where NSCs were not assisting school recruitment, the package was sent to the state leadership, and implied consent to approach districts and schools was assumed.

4.3.1.b District Contact

District contacts were made by GCRs only in states where NSCs were not assisting with recruitment. District superintendents and test administrators were sent similar packages to that of the states. Generally, districts were not actively recruited. However, our experience with PISA 2012 school recruitment showed that it was advantageous to allow GCRs to conduct a courtesy call with all districts a few days after the delivery of the package. This alerted the district to the delivery of the packet of information and provided the GCR the opportunity to answer any questions about the study. In states where NSCs were actively helping with school recruitment, the NSCs took care of the district notification and let Westat know when the GCRs could begin making contact with the schools.

4.3.1.c Special Handling Districts

Special handling districts are those that require a formal review and approval of the study prior to allowing school contact. Westat compiled a list of known special handing districts across the nation and submitted a complete proposal to each of these districts in states where NSCs were not assisting with recruitment. Six proposals were submitted. Of those, one district never gave approval and the school did not participate in the study. This district was understaffed and had difficulty processing the request in a timely fashion. In states where NSCs assisted with recruitment, the NSC took care of any special approval procedures with the districts.

4.3.1.d Initial School Contact

Between January and April 2015, schools were contacted with an initial request to participate and received a PISA information package. Following the mailing of the package, GCRs began contacting schools to gain cooperation. In their contact(s) they verified the receipt of the notification package by the school and discussed participation of the school.

The GCR recorded other information such as specific issues or questions the school had regarding participation and the general disposition of the school in both the school folder and the FMS. These were reviewed in the weekly calls with the field manager, particularly with initial refusals in order to generate strategies to convert the schools.

In states where the NSCs gained the cooperation of the schools, the GCRs' initial contact with the schools served to confirm the assessment date and other logistics and answer any question they had regarding PISA. In these cases, the GCR was not required to actively recruit the schools, as they were already planning to participate in the study before the school contact was handed over to the GCR.

4.3.2 Reasons for School Refusal to Participate

The most prevalent reasons for refusal were the time burden and too much testing being conducted in the schools. There was significant pushback from many refusing schools because of the instructional time students would lose. In addition, mandated state and federal testing currently in place for the target population of 15-year-old students, who are mostly 10th-graders in the United States, was the reason cited by many of the refusal schools. Both of these reasons were mentioned across states, and in both public and private schools.

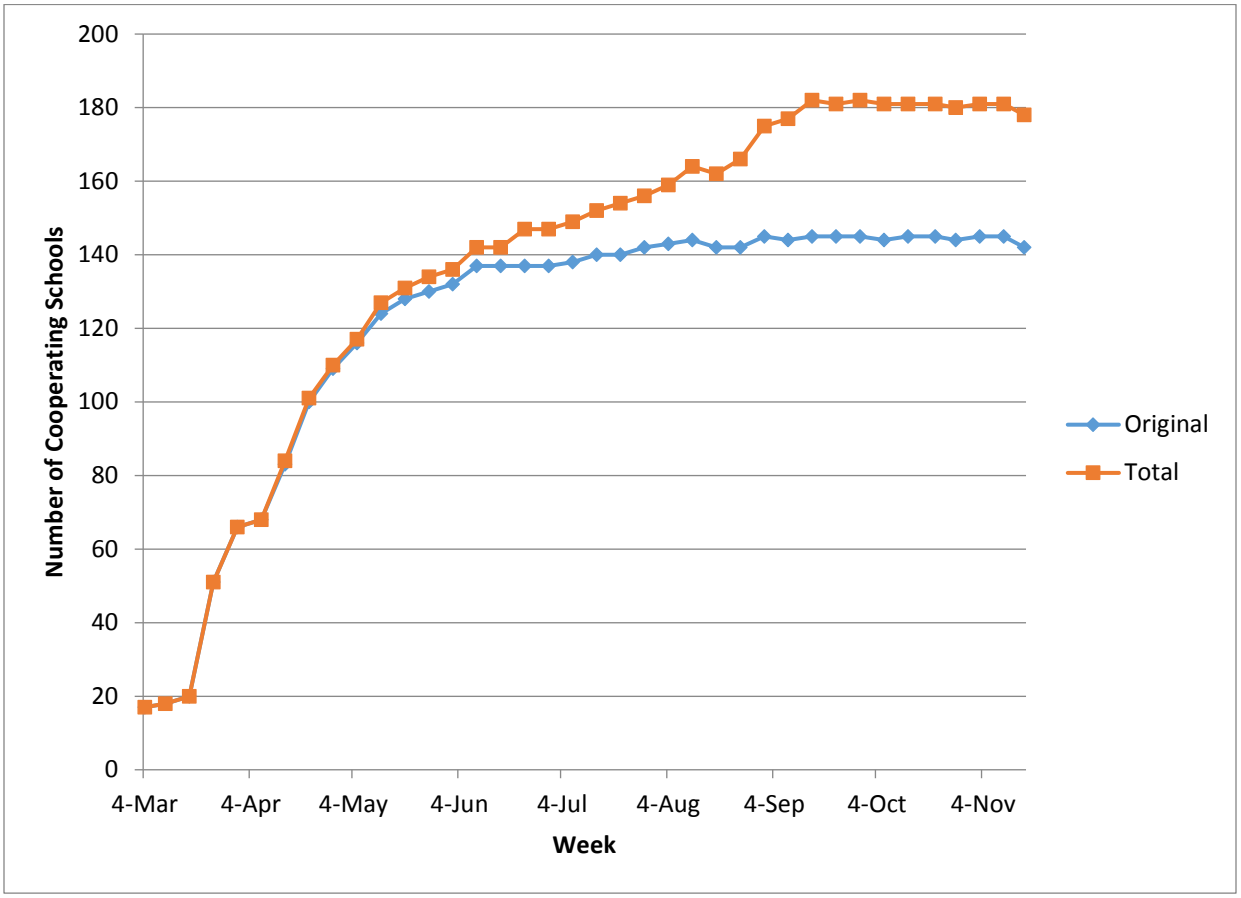
School attrition was another factor impacting school participation. Later in summer 2015, as recruitment staff were attempting to verify the assessment schedule of the participating schools, some schools that had initially agreed to participate withdrew their participation. The reasons tended to involve the reasons stated above. Also, staff turnover caused some schools to drop out because the decision-maker who had initially agreed to participate was no longer at the school when school began in fall 2015. Four schools withdrew their participation.

4.3.3 Solutions and Approaches Used With Refusing Schools

Several approaches at the school, district, and state levels were implemented to increase participation. PISA recruiters made personal visits to schools in June 2015. Westat employed a visit or home office contact with district personnel on several occasions, and NCES made contact at the state level. In addition, Westat emailed status updates to NSCs who requested them. This email was targeted to states that were especially difficult to recruit, and the email proved fruitful in some cases. In July 2015, those original schools that were still pending or interim refusals were offered an increased school incentive of $800. Thirty-one schools were offered this increased incentive, and six schools accepted.

Figure 2 shows the school cooperation by each week of recruitment from the first status report on March 4, 2015, to the final report on November 4, 2015. PISA showed an overall number of 182 schools (85 percent) participating on September 4. That number reduced by four as the data collection was carried out. Similarly, the original school participation number reached 145 schools (68 percent) on September 1 but reduced by 3 to 142 (67 percent).

Figure 2. PISA 2015 original and total school participation, by week



SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

4.3.4 Final Results of School Recruitment

On November 6, 2015, recruitment of schools closed, 44 weeks after the official start of the recruitment period. Table 24 provides the response status of original and substitute schools. Similar tables for Massachusetts, North Carolina and Puerto Rico are included in Appendix B.

Table 24. PISA 2015 school type, by response status

	Original schools		Substitute schools		Total schools	
	Number	Percent	Number	Percent	Number	Percent
Total eligible	213	100.0	119	100.0	332	100.0
Participating	142	66.7	36	30.3	178	53.0
Refusal	71	33.3	83	69.7	154	45.0
Ineligible/closed	27	12.7	3	2.6	30	9.0
Other (Pending, No Contact)	0	0.0	0	0.0	0	0.0

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

Of the 178 participating schools, 142 schools were original schools (66.7 percent original unweighted response rate) and 36 schools were replacements (83.6 percent overall unweighted response rate). The original response rate satisfied the international requirement of obtaining 65 percent of original sample schools. The total overall response rate satisfied the international requirement of obtaining 80 percent of all schools.

4.4 Student Recruitment

Once the student sample was selected within a school, PISA staff worked with the school coordinator to obtain parental consent, and school coordinators distributed student invitations to participate (provided in appendix D). Study recruiters and test administrators also worked with school coordinators to answer any student or parent questions, including sharing the PISA fact sheet for parents (provided in appendix D). In addition, test administrators conducted a student meeting with the selected students before assessment day to encourage and motivate students to participate and do their best.

There were three levels of parent consent: (1) explicit consent (parent consent agreement was required); (2) implicit consent (parents could opt out of study by returning a form); and (3) notification (parents were informed of the study). The level of consent used was determined by school or district requirements.

5. Instrument Development and Distribution

5.1 Test Instrument Design

PISA 2015 marked the transition from paper to computer-based assessment. The 2015 assessment instruments were developed by international experts and PISA international contractors. The assessment also included items submitted by participating education systems. Representatives of each education system and PISA subject-matter expert groups reviewed these items for relevance to PISA's goals and for possible bias. Building on the work from the PISA 2012 computer-based mathematics and problem solving assessments, participating education systems were required to field-test the assessment items in spring 2014 along with paper assessments to conduct a mode effect study, enabling the transition to fully computer-based assessment and online questionnaires.

The final assessment consisted of 185 science items (99 new science items were developed since science is the major domain), 83 mathematics items, 108 reading items, 135 collaborative problem solving items, and 43 financial literacy items, arranged in units. PISA items are designed so that related questions are asked about a single stimulus, typically based on a real-life scenario such as buying vegetables at a market or possible pizza topping combinations. These item-to-stimulus groupings are referred to as units. The items listed above make up 30 trend science and 26 new science units, 40 mathematics units, 29 reading units, 6 collaborative problem solving, and 32 financial literacy units. Units are situated within clusters based on content and timing and form the major unit grouping for assignment to assessment forms. All together there were 12 science clusters (6 trend, 6 new), 6 mathematics clusters, 6 reading, 3 collaborative problem solving, and 2 financial literacy clusters. Each cluster is designed to be approximately 30 minutes of material. Clusters, which are specific unit sets, are assigned to test forms that are approximately 2 hours in length, so each student is assigned 4 clusters. Unlike the paper assessment where cluster assignment is relatively fixed due to paper layout and printing constraints—PISA 2012, for example, used only 17 forms—the computer assessment design for 2015 included 66 base forms with rotating science clusters.

Table 25. Item format type, by number and percentage for science, mathematics, reading, and financial literacy

	Science		Mathematics		Reading		Financial literacy		Total*	
Item Format	Number	%	Number	%	Number	%	Number	%	Number	%
Simple multiple choice	55	30	19	23	37	35	10	23	121	29
Complex multiple choice	69	37	13	16	12	11	12	28	106	25
Open response	61	33	51	61	59	54	21	49	192	46
Total	185	100	83	100	108	100	43	100	419	100

* All PISA collaborative problem solving items were multiple choice.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

The items each student received varied by domain and response type, although all students received some science items (major domain feature). A little more than half of the items were multiple choice, and about 46 percent were open responses (for which students typed in answers that were either computer scored or human scored by trained scorers using an international scoring guide). The computer-based assessment used a Mozilla Firefox platform to run and administer the assessment on the flash drive. The forms were assigned to each student randomly assigned by the international sampling software, KeyQuest. Each student was assigned a login ID and password that when entered routed the student to the appropriate form.

In addition to the cognitive assessment, students also completed a 30-minute questionnaire asking about themselves, their attitudes, and their experiences in school. The student questionnaire session was administered on computer after the cognitive assessment in all schools. Up to 25 teachers (up to 10 science and 15 general teachers) in each school were also sampled to take a 30-minute online questionnaire about teaching practices, their school, and their experience as teachers. Science teachers received a domain-specific questionnaire. Principals in schools where PISA was administered also completed a 45-minute questionnaire about their schools.

5.2 Assessment Materials Development

The materials for PISA 2015 in the United States included (1) computer-based assessment (500+ items); (2) student questionnaire; (3) two teacher questionnaires (science and general); (4) school questionnaire; (5) a test administrator manual and an assistant administrator manual; (6) a school coordinator handbook; (7) four separate coding guides for test items assessing reading literacy, mathematics literacy, science literacy, financial literacy; and (8) a UH (*une heure* or "one hour" in French) computer-based assessment form for use with special needs students. The UH form is designed with one hour's worth of assessment

items administered in a longer assessment session that allows some extra time. Source versions of all instruments were prepared in English and French and translated into the primary language or languages of instruction in each education system. NCES adapted the questionnaires, test booklets, coding guides, and administration manuals and handbooks for use in the United States. Even in countries where English is the primary language of instruction, adaptation was needed to ensure that the materials used spelling and vocabulary that were most commonly used in the United States (but did not change meaning) and that reflected the actual U.S. administration plans. This involved (1) changing spellings and vocabulary into common U.S. usage (e.g., changing "lift" to "elevator and "biscuits" to "cookies" for the United States); (2) adding a limited number of U.S. national items to the school and student questionnaires (e.g., adding items on racial/ethnic groups to the student questionnaire); and (3) adapting the administration manuals and handbooks to follow the U.S. plans for data collection.

These adaptations were checked and reviewed by the international contractors through an iterative process that occurred from November 2014 to March 2015. After the adaptations had been approved by the international contractors, the final versions of the cognitive instruments and questionnaire were produced by the international contractors and checked a final time before fielding. The coding guides, manuals and handbooks were all adapted, negotiated, reviewed, and verified in a similar manner. The final approved versions of all instruments were also administered in Massachusetts and North Carolina. In Puerto Rico, adaptations to the paper-based instruments were made to a Spanish source version of the instruments. This work was performed by Pearson and approved by the international contractors.

5.3 Preparation of Instruments

The PISA 2015 data collection instruments for the United States were prepared according to the international guidelines, which included adaptation and verification for all cognitive and non-cognitive materials and manuals. The student cognitive and non-cognitive instruments were prepared using software provided by the international contractors, and once final, the instruments were loaded onto USB sticks for field deployment. The online teacher and school questionnaires were developed using a questionnaire authoring tool provided by the international contractors and hosted on servers in the United States. Along the with USB sticks, laptop computers were prepared by Westat to be carried into schools and used to administer the assessments.

5.4 Packaging and Distribution of Materials to Field Staff

In each school, up to 42 students may be eligible to be assessed. Each test administrator (TA) was assigned 45 flash drives, 42 assessment machines, 1 administrative laptop, and 1 MiFi device. Each assessment machine consisted of a laptop, a mouse, and cords. Each flash drive contained all forms of the assessment and the student questionnaire. These materials were shipped to test administrators prior to the data collection period. Sampling forms that listed the students and teachers sampled to participate in PISA were distributed to TAs using a secure website. Once sampling for a school was complete, the TA was alerted via email to log in and print the school's forms. These forms included the student login forms that were created for each student and then destroyed after the assessment.

6. Field Operations

Data collection consisted of the following six major elements:

- an online school questionnaire requiring approximately 45 minutes that was emailed to principals prior to data collection (with hardcopy backup);
- online teacher questionnaires requiring approximately 30 minutes that was emailed to selected teachers prior to data collection (with hardcopy backup);
- a core computer-based student assessment administered in a 2-hour testing session, with a short break in the middle;
- a computer-based financial literacy student assessment administered in a 1-hour testing session to a subsample of students;
- a shortened form (UH booklet) of the computer-based assessment administered to students who would otherwise be excluded; and
- a computer-based student questionnaire taking approximately 30 minutes for students to complete.

Data collection for Massachusetts and North Carolina also consisted of the above elements.

Data collection in Puerto Rico consisted of the following elements:

- a paper-based school questionnaire requiring approximately 45 minutes that was provided to principals prior to data collection;
- a core paper-based student assessment administered in a 2-hour testing session, with a short break in the middle;
- a paper-based student questionnaire taking approximately 30 minutes for students to complete.

6.1 Preassessment Contacts with School Staff

Each participating school was asked to designate a staff member to serve as school coordinator. School coordinators were responsible for arranging the logistics of the assessment with PISA staff. School coordinators were an integral part of the data collection process from beginning to completion. School coordinators received a school coordinator handbook to use in preparing for the assessment. A significant

portion of this document provided instruction on identifying students with special education needs (SEN) and their required accommodations and determining which students could not participate in the assessment.

Prior to beginning their activities, all school coordinators from participating schools were invited to attend a School Coordinator training held June 25-26 in Washington D.C. The training had two purposes: (1) to prepare school coordinators for the activities and tasks to be completed prior to the assessment and (2) to provide information about the overall PISA project through presentations and discussions with other National Project Managers from other PISA education systems, representatives from the U.S. Department of Education, the OECD and other education experts. To further prepare school coordinators for the tasks ahead, Westat staff met with them in small groups to go over the steps required of a school coordinator and to answer questions.

The primary responsibilities of the school coordinator were scheduling the assessment and providing lists of eligible students and teachers to PISA for sampling. The international version of the handbook instructed schools to include a special needs code on the list of PISA eligible students. The United States adapted this by sampling the students first and then asking that students with special needs be identified from the sampled students listed on the Student Tracking Form, combining this step with determining nonparticipation. This reduced the burden on the school by significantly reducing the number of students that needed to be evaluated. In many cases, school coordinators were required to consult other student records or meet with special education staff to identify these students' specific needs and whether or not they could participate.

Prior to the assessment, each school coordinator was contacted at least four times.

1. In July 2015, school coordinators were emailed instructions for preparing and submitting their student and teacher lists for sampling on the secure MyPISAUSA.com website. An electronic student listing form was attached in this email. The E-Filing of student and teacher lists began on August 3, 2015.

2. After the student list was received, study staff processed the list following PISA guidelines and using the required international sampling software, KeyQuest. This process resulted in the production of a Student Tracking Form (STF) indicating which students in the school had been chosen to participate and a Teacher Tracking Form (TTF) indicating which teachers had been chosen to participate. Once the STF and TTF were complete, an email was sent to school coordinators notifying them that their forms were available for download from MyPISAUSA. The email explained the next steps of identifying students with any special education needs (SEN) and their accommodations, indicating any students who would not be able to participate (either due to an SEN, parent refusal, or the student transferring out of the school), solidifying arrangements for the assessment, and discussing parent consent and the importance of student participation. School coordinators were also asked to inform the sampled teachers of their selection to participate in the teacher questionnaire.

3. In mid-August 2015, school coordinators were sent the school coordinator handbook and a cover letter outlining the process for reviewing and updating the STF and TTF and preparing for the preassessment visit with the PISA test administrator (TA).

4. An in-person preassessment visit was scheduled and conducted by the TA staff, typically 2 weeks prior to the scheduled assessment. Following the preassessment contact booklet, TAs reviewed the logistics for assessment day (e.g., room location, school entry procedures), the Student Tracking Form, and anticipated student participation (e.g., known parent or student refusals, SEN exclusions). During the preassessment visit, TAs also asked school coordinators to encourage the selected teachers and principal to complete the teacher and school questionnaires, if not already completed.

As a general rule, test administrators were instructed to make a courtesy call or email to the school coordinator 1 to 2 days before the assessment. The courtesy call was implemented to determine if student participation was a problem and if the test administrator could assist in any way and to cover any last-minute questions or concerns with the school coordinator.

In many cases, additional contacts were made in fielding questions from school coordinators via the PISA help desk telephone line or email. These contacts generally dealt with questions or clarifications about student and teacher sampling. A majority of the student and teacher lists required some level of verification or further contact with the school.

6.2 Data Collection Training

Training for data collection was held August 19-21, 2015, at the Westat headquarters in Rockville, Maryland. Twenty-three national TAs attended this training—one for each work area and one troubleshooter. Ten state TAs also attended the training—five for each state. One week before training, each test administrator received a test administrator manual containing the instructions for preassessment work and for conducting the assessment in schools. Test administrators were given 6 hours of home-study time to familiarize themselves with the PISA procedures. The test administrators also completed a short quiz prior to training. This was designed to take the test administrator through the manual and become familiar with specific information about PISA procedures. The training agenda is provided in appendix F.

Day 1 focused on an introduction and overview of the study, key PISA forms and materials, procedures for handling SEN students and accommodations, the preassessment call and visit with the school coordinator, and the Field Management System (FMS). Day 2 focused on preparing materials for the assessment and the assessment day activities, including arriving at the school and setting up the assessment area, administering the computer-based assessment, and distributing student incentives. Day 3 focused on the procedures and

activities after the assessment, including determining if a makeup session is needed, organizing the school folder, and updating the FMS and transmitting student assessment data. Throughout the training the importance of maintaining security of equipment and materials and the confidentiality of respondents was emphasized.

Since only TAs attended the in-person training, they were responsible for training their assistant administrators (AAs) prior to the start of the first assessment in their areas. Each test administrator was supplied with training scripts, a PowerPoint file, and necessary exercises. Prior to the assistant administrator training, each AA was provided an assistant administrator manual, similar to the test administrator manual, but focusing primarily on the assessment day activities. The test administrators were instructed to spend approximately 1 day training the assistant administrators.

6.3 Data Collection Approach

The study employed 23 national test administrators and 10 state TAs, one assigned to each work area (except for the troubleshooter, who did not have an assigned work area). TAs were assigned to one of two field managers who coordinated and monitored their work. During the testing period, TAs reported to their field manager almost on a daily basis. To assist test administrators, 66 AAs were hired to create three-person assessment teams. These AAs assisted in preparing assessment materials, transporting computer equipment, setting up the testing areas, and monitoring students during the testing sessions.

Test administrators were responsible for

- familiarizing themselves with the test administrator manual;
- successfully completing training prior to the start of assessments;
- training assistant administrators;
- conducting preassessment calls and visits with school coordinators within 2 weeks of the assessment;
- conducting follow-up contacts with school coordinators 1-2 days before the assessments to ascertain if any problems with student attendance;
- maintaining the security of the computer-based assessment equipment and successfully transporting it to/from the school on assessment day;
- ensuring that each student received the correct testing materials;

- administering the test(s) in accordance with the internationally specified procedures, including following the correct session script;
- ensuring the correct timing of the testing sessions;
- recording student participation on the Session Attendance Form;
- transmitting student assessment data to Westat, typically within 24 hours after the completion of the assessment;
- reporting any issues or problems with the assessment to the field manager immediately after the assessment; and
- updating the Field Management System (FMS) with final student counts and changes from the STF and recording that the assessment is complete.

The computer-based assessment main session administration consisted of three segments. The students were assessed in two cognitive segments, each 1 hour long. These were to be administered on the same day, with a short break of approximately 5 minutes in between. After the second hour the students received another break and were then administered the student questionnaire in the third segment. This questionnaire took approximately 30 minutes.

The timing of the computer-based assessment sessions was as follows:

Table 26. Timing of PISA 2015 assessment session

Activity	CBA Timing
Room setup	60 minutes (approximately)
Student logons, passwords, and introduction of the assessment	15 minutes (approximately)
Introduction/orientation	5 minutes (approximately)
First 60 minutes of the assessment	60 minutes (exactly)
Short break	Generally, no more than 5 minutes
Introduction to second 60 minutes	5 minutes (approximately)
Second 60 minutes of the assessment	60 minutes (exactly)
Break	15 minutes
Student questionnaire	30 minutes (approximately)
Collecting the materials and ending the session	5 minutes (approximately)
Packing up and resetting room	30-40 minutes (approximately)
Total	Student time: 3 hours, 30 minutes (approximately) Room time: 5 hours (approximately)

In the United States, Massachusetts, and North Carolina, the UH session was also offered to schools. The UH option was not administered in Puerto Rico. UH stands for *une heure* ("one hour" in French) and is a session in which students who would otherwise be excluded were given a shorter version of the assessment. A different session script was used to administer the session, and the assessment timing was different from the standard computer-based assessment. Students received the same general orientation but were given two 30-minute assessment segments (a total of 1 hour of cognitive items), and these segments could each be extended by an additional 20 minutes. The total assessment time allowed was 1 hour and 40 minutes. Students in the UH session also received an abbreviated version of the student questionnaire, which took approximately 15 minutes. A total of 122 students (1.4 percent) were assessed with the UH option. In the U.S. national sample 35 students (0.6 percent) took UH, while in Massachusetts and North Carolina, 36 (2.6 percent) and 51 students (2.7 percent), respectively, were assessed with the UH option.

The timing of the UH session was as follows:

Table 27. Timing of PISA 2015 UH assessment session

Activity	Timing
Room setup	20 minutes (approximately)
Student logons, passwords, and introduction of the assessment	15 minutes (approximately)
General orientation	5 minutes (approximately)
First 30 minutes of the assessment	30 minutes (can extend by 20 minutes if necessary)
Short break	Generally, no more than 5 minutes
Second 30 minutes of the assessment	30 minutes (can extend by 20 minutes if necessary)
Break	15 minutes
Student questionnaire	15 minutes (approximately) (can be extended by 10 minutes if necessary)
Collecting the materials and ending the session	5 minutes (approximately)
Packing up and resetting room	20 minutes (approximately)
Total	Student time: 2 hours and 10 minutes (approximately) Room time: 3 hours (approximately)

In all participating schools in the U.S., Massachusetts, and North Carolina, a subsample of up to 11 students who took the main assessment were selected to take the financial literacy assessment. After the main session, typically after lunch, the selected students returned to participate in the 65-minute financial literacy assessment. The financial literacy assessment tested students' knowledge of personal finances and their ability to apply it to their financial problems. The knowledge tested includes (a) dealing with bank accounts and credit/debit cards, (b) planning and managing finances, (c) understanding taxes and savings, (d) risk and rewards, and (e) consumer rights and responsibilities in financial contracts.

The timing of the financial literacy session was as follows:

Table 28. Timing of PISA 2018 financial literacy session

Activity	Student Time	Room Availability Time
Room setup	Not applicable	20 minutes (approximately)
Distributing the materials and reading the general directions	10-15 minutes (approximately)	10-15 minutes (approximately)
Completing the financial literacy assessment	65 minutes (approximately)	65 minutes (approximately)
Collecting the materials and ending the session	10 minutes (approximately)	10 minutes (approximately)
Packing up and resetting room	Not applicable	20 minutes (approximately)
Total	1 hour and 30 minutes (approximately)	2 hours (approximately)

6.4 Data Collection Activities

The PISA 2015 data collection was administered between October 5 and November 17, 2015. The initial data collection window of 6 weeks, from October 2 to November 13, was extended by Westat to accommodate schools assessed during the week of November 9 that needed a makeup session. Table 26 shows the number of national and state assessments that were completed in each month. One school requested a Saturday assessment in October. All other assessments were conducted during school hours.

Table 29. PISA school assessments for U.S., Massachusetts, North Carolina, and Puerto Rico schools, by month: 2015

Sample group	PISA 2015 assessment month		Total school assessments
	October	November	
National[1]	125 (70%)	53 (30%)	178
Massachusetts[1]	46 (90%)	5 (10%)	51
North Carolina	48 (89%)	6 (11%)	54
Puerto Rico	42 (89%)	5 (11%)	47

[1] One national substitute school and two substitute schools in Massachusetts were assessed but are not included in the data, as the original schools for these substitutes participated.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

Makeup sessions were scheduled only if the schools had a very low student response rate and if three or more students were likely to show up for the makeup session. Thirty-four makeup sessions were conducted in the national sample. Table 27 below describes makeup sessions for PISA 2015 in detail by sample group. The reason for schools needing but not completing a makeup session was that most schools declined due to not wanting their students to miss more class time or that the absent students likely would not show up for the makeup session.

Table 30. PISA makeup sessions for U.S., Massachusetts, North Carolina, and Puerto Rico schools:2015

Sample Group	Identified makeup schools/ total schools	Makeup needed (%)	Schools where makeup completed/ makeups needed	Completed makeup (%)
National[1]	48/178	27	34/48	71
Massachusetts[1]	11/51	22	9/11	82
North Carolina	2/54	3.7	2/2	100
Puerto Rico	19/47	40	19/19	100

[1] One national substitute school and two substitute schools in Massachusetts were assessed but are not included in the data, as the original schools for these substitutes participated.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

7. Data Management

Westat was responsible for extracting the computer-based student assessment and student questionnaire data from the Student Delivery System (SDS), the tracking data from the KeyQuest system, and the computer-based school and teacher questionnaire data from the Online Survey System (OSS), and for receiving the coded open-ended and occupational data from Pearson. Westat imported data into the Data Management Expert (DME) software, completed the required validation checks in the DME, reconciled the data, and prepared data files for delivery to the international core contractors.

7.1 Occupational Coding

Coding of the approximately 9,900 student responses to questionnaire items about parents' occupations and their own future occupation was conducted October 26–December 9, 2015. Pearson used its electronic scoring system to code the students' responses.

These responses were provided to Pearson in a comma-delimited formatted file from Westat that had been extracted from the DME. Pearson converted these responses into a text file, which was then uploaded into their scoring system. This approach minimized the potential for human error while maximizing the coding efficiency.

Trained Pearson project staff viewed the student responses on a PC screen and entered the appropriate ISCO-08 occupational code. Six project staff members coded the occupational student responses. A 50 percent reliability was completed on each set of occupational responses. After coding was completed, the codes were uploaded into a mainframe file. Pearson's development staff formatted the files based on the international codebook and sent them to Westat.

7.2 Coding Open-Ended Student Responses

The PISA 2015 main study computer-based design was based on 18 clusters or blocks of trend items—six each of reading, mathematics, and science literacy— and six of the new science materials developed for 2015. A subsample of the PISA students selected also completed items on financial literacy.

Training and coding of the constructed-response items were completed at Pearson's Iowa City facility December 7–21, 2015. Additional recoding of 12 new and trend science items occurred in Pearson's Mesa, Arizona, facility February 8–12, 2016.

Approximately 700,000 constructed-response items from the national sample on 16 financial literacy, 18 mathematics, 43 reading, 30 new science, and 28 science trend items were coded. This included responses selected for multiple-coding and anchor responses.

The Open Ended Coding System (OECS), provided by the international contractor, was used to facilitate coding of the open-ended constructed-response items. The OECS contained 10 possible coding designs for coding the constructed-response items. The coding designs were configurations of the number of coders for each domain based on the sample size and the desired time to complete coding. These designs met the psychometric and reliability requirements needed to ensure comparability both within and across countries. Countries were not permitted to deviate from these designs. The design chosen by the United States was based on the student sample size of 9,000 to 13,000 students and used 16 coders for science, 12 coders for reading, 6 coders for mathematics, and 6 coders for financial literacy.

7.2.1 Lead Coder Training

Pearson's content lead attended the 2015 PISA international training in Lisbon, Portugal, in late January 2015. Information from this training, including the coding guides and training materials, was used to train the scoring directors, lead coders, and coders.

The scoring directors were responsible for organizing and managing the coding process. This included training the lead coders, arranging coder training, assigning users, allocating items for coding, and monitoring overall progress.

The scoring directors trained eight lead coders—four for science, two for reading, and one each for math and financial literacy on the items—who each then trained their teams. The lead coder's responsibilities included training the coding of the items, monitoring the quality of individual coders' work, answering coder questions, and escalating content questions/issues to the appropriate scoring director. Any unresolved questions about an item or response content were to be posted to the PISA Coder Query Service for further review and resolution. The United States did not need to utilize this service for the main study coding.

7.2.2 Coder Training/Coding

Based on the coding design selected, Pearson hired six financial literacy, six mathematics, twelve reading, and sixteen science coders. The lead coders used the final verified coding guides and workshop materials to train the coders. The lead coder presented one item at a time. Due to the "set" arrangement of items by group in science and reading, there were times when several items were originally presented to coders in a longer training session. However, there was a review of the rubric and materials immediately before coding of an individual item commenced. The lead coder and coders coded all responses for that item before moving on to their next item.

7.2.3 Open Ended Coding System (OECS)

FTE (free text entry) files containing the students' constructed responses were provided to Pearson by Westat through a secure FTP site. These files were imported into the coding system. Once imported, PDFs were created for an item or series of items.

The scoring directors copied the PDFs created in the OECS onto flash drives. The flash drives were given to the appropriate subject coders. The coders viewed the item responses on a computer and selected the appropriate code on the PDF based on the training they received and coding guides for the item.

The PDFs were imported back into the coding system from the flash drives. At least once per day, the coding supervisors would generate reliability reports to assess how the coding process was proceeding.

The careful monitoring of coding reliability was important to ensure consistency within and across countries and to identify coding inconsistencies or problems early in the coding process so they could be resolved as soon as possible. In general, inconsistencies or problems were often due to misunderstanding general coding rules and/or a specific rule relating to a particular item.

In PISA, a portion of the items were coded multiple times. This was done to document the degree to which the responses were being classified into the same categories (i.e., full, partial, or no credit) regardless of the coder, and also to identify items and coders that had low levels of agreement.

The level of agreement between two coders was represented by an index called inter-rater reliability. In PISA, inter-rater reliability represented the extent to which any two coders agreed on how a particular

response should be coded, and thus the comparability in how the coding rubric was being interpreted and applied. The inter-rater reliability for the PISA 2015 items is presented in appendix G.

The goal in PISA coding is to reach a within-country inter-rater reliability of 92 percent agreement across all items, with at least 85 percent agreement for each item.

The OECS generated the following three types of reliability reports:

- proportion agreement – average agreement per item across all coders, average agreement per coder across all items, and coder/item agreement;
- coding category distributions – comparison of coding distributions across coders for each item; and
- deferred and missing responses – counts of responses that had not been imported and coded during the coding process because they were either deferred or uncoded.

The scoring directors used the OECS to generate CSV files to be sent to Westat, which imported them back into the DME.

7.3 Data Editing and File Delivery

Pearson provided data files of the occupational codes. These were all formatted based on the international codebooks and sent to Westat via a secure website. These data were imported into the DME by Westat.

8. Processing, Scaling, and Weighting

8.1 International Data File Cleaning and Editing

The Educational Testing Service (ETS) applied two procedures to ensure that data cleaning was standardized and validated among all participating education systems for PISA 2015. The first procedure was a set of automated and systematic edit checks. Prior to successful data submission, all national data had to pass through a series of ETS's automated and systemic edit checks. National project managers had to ensure that all data met all requirements for proper data structure and that the identification system within and between files was consistent and correct.

The second cleaning process was the identification of logical errors/inconsistencies and specific edit questions by ETS that were shared with the national data managers. The national data managers reviewed the data and provided ETS with revisions to coding or solutions to anomalies to resolve the inquiries. The audit trail and final results of the data cleaning processes were documented by ETS and shared with the national project managers for final questionnaire data review. ETS compiled background univariate statistics and preliminary classical and Rasch item analysis for final national data manager review of the assessment items. These data were verified by the national centers to ensure that they linked back correctly to the student IDs.

8.2 Missing Data

PISA does not impute missing information for questionnaire variables. The international and U.S. databases contain five kinds of missing data codes that are used across all countries:

1. Missing/blank or not reached – In the test data, missing/blank is used to indicate the respondent was not presented the question according to the survey design, and not reached is used when the respondent ended the assessment early and did not see the question. Not reached was assigned during data processing. In the questionnaire data, missing/blank is used to indicate that the respondent ended the questionnaire early or despite the opportunity, did not take the questionnaire.
2. No Response/Omit – The respondent had an opportunity to answer the question but did not respond.

3. Invalid – Used to indicate a questionnaire item was suppressed by country request or that an answer was not in an acceptable range of responses, e.g., the response to a question asking for a percentage was greater than 100.
4. Not Applicable – A response was provided even though the response to an earlier question should have directed the respondent to skip that question, or the response could not be determined due to a printing problem or torn booklet. In the questionnaire data, it is also used to indicate missing by design (i.e. the respondent was never given the opportunity to see this question, or the country did not participate in the questionnaire instrument).
5. Valid Skip – The question was not answered because a response to an earlier question directed the respondent to skip the question. This code was assigned during data processing.

8.3 Weights for U.S. Data

The use of sampling weights is necessary for the computation of statistically sound, nationally representative estimates. Survey weights adjust for the probabilities of selection for individual schools and students, for school or student nonresponse, or for errors in estimating the size of the school or the number of 15-year-olds in the school at the time of sampling. Survey weighting for all education systems participating in PISA 2015 was carried out by Westat as part of the PISA consortium.

The internationally defined weighting specifications for PISA 2015 included base weights and adjustments for nonresponse. The school base weight was defined as the reciprocal of the school's probability of selection. (For substitute schools, the school base weight was set equal to the base weight of the original school it replaced.) The student base weight was given as the reciprocal of the probability of selection for each selected student from within a school.

These base weights were then adjusted for school and student nonresponse. The school nonresponse adjustment was done individually for each education system using the implicit and explicit strata defined as part of the sample design. In the case of the United States, two variables were used for stratification: school control (public/private) and census region. The student nonresponse adjustment was done based on school's explicit stratum; within the final school nonresponse adjustment cells, grade and gender were also used to define nonresponse adjustment. Trimming factors at the school and student levels were used to reduce the size of large weights, since large weights can substantially increase sampling variance. All PISA analyses were conducted using these adjusted sampling weights.

The sample base weights for Massachusetts, North Carolina, and Puerto Rico were similarly adjusted for school and student nonresponse. However, because the state samples did not have school control or census region as explicit strata, the school nonresponse adjustment was done only using the implicit strata defined as part of the sample design. The student nonresponse adjustment was done within the final school nonresponse adjustment cells, and grade and gender were also used to define nonresponse adjustment. Trimming factors at the school and student level were also used to reduce the size of large weights, since large weights can substantially increase sampling variance. All analyses for Massachusetts, North Carolina, and Puerto Rico were conducted using these adjusted sampling weights.

8.4 Scaling of Student Test Data

For PISA 2015, the final computer-based assessment consisted of 66 forms for science, reading, mathematics, and collaborative problem solving items for both the United States and the two states—Massachusetts and North Carolina—that participated as separate education systems. The final paper-based items used for Puerto Rico consisted of 30 forms for science, reading and mathematics trend items.
The United States, Massachusetts, and North Carolina also participated in the optional financial literacy assessment. Two additional forms were used for financial literacy.

Scaling techniques were used to establish a common scale for all students. Item response theory (IRT) was used to estimate scores for science, reading, and mathematics literacy, as well as for science literacy subscales: content (physical science, living systems and earth and space) and process (explaining, understanding, and interpreting).[4]

IRT identifies patterns of response and uses statistical models to predict the probability of answering an item correctly as a function of the student's proficiency in answering other questions. With this method, the performance of a sample of students in a subject area or sub-area can be summarized on a simple scale or series of scales, even when students are administered different items.

[4] The combined science scale and the science subscales are each computed separately through item response theory (IRT) models. Therefore, the combined science scale score is not the average of the science subscale scores. No subscale scores were produced for education systems administering paper-based trend assessments, such as Puerto Rico.

9. The PISA 2015 Data

9.1 PISA 2015 International Datasets

Data from PISA 2015 for all countries can be obtained from the OECD website at http://www.oecd.org/pisa/data. Financial literacy data and results were made available in May 2017 and collaborative problem solving data and are available in November 2017. Users can download entire files, choose only selected variables, or run simple queries. Files available for download include the following (note that the parent questionnaire, the information and communication technology questionnaire, and the education career questionnaire were not administered in the United States):

- **Questionnaires**
  - student questionnaire
  - school questionnaire
  - teacher questionnaire (optional)
  - parent questionnaire (optional - not administered in the U.S.)
  - information and communication technology (ICT) questionnaire (optional - not administered in the U.S)
  - education career (EC) questionnaire (optional - not administered in the U.S)
- **Codebooks**
  - codebook for student questionnaire data file
  - codebook for school questionnaire data file
  - codebook for teacher questionnaire
  - codebook for parent questionnaire data file
  - codebook for scored and raw cognitive (assessment) item response data file

- **SAS dataset files** *Note that some of these files are very large*
  - SAS dataset of student questionnaire data
  - SAS dataset of school questionnaire data
  - SAS dataset of teacher questionnaire data
  - SAS dataset of scored and raw cognitive (assessment) item response data
  - SAS dataset of questionnaire timing data
- **SPSS dataset files** *Note that some of these files are very large*
  - SPSS dataset of student questionnaire data file
  - SPSS dataset of school questionnaire data file
  - SPSS dataset of teacher questionnaire data file
  - SPSS dataset of scored and raw cognitive (assessment) item response data file
  - SPSS dataset of questionnaire timing data
- **Compendia.** *The compendia provide the distribution of students according to the variables collected through the student, information and communication technology, parent, and school questionnaires. The performance means per category are also provided.*
  - compendium for the student questionnaire
  - compendium for the school questionnaire
  - compendium for the teacher questionnaire
  - compendium for the parent questionnaire
  - compendium for the ICT and EC questionnaire
  - compendium for the scored cognitive item responses

9.2 U.S. National Data Files

Data collected in the United States for PISA 2015 can be downloaded from the international site or from the NCES website at http://nces.ed.gov/surveys/pisa/datafiles.asp. The files on the international website contain data for all countries, including the United States (national sample). The NCES files include data

for the national sample in the United States only; data for Massachusetts, North Carolina, and Puerto Rico are available via a restricted-use license. The U.S. data are described below.

Cognitive assessment item data are comprised of multiple variables per item, including number of actions per item, total item time (in milliseconds), raw response(s), and scored or coded response(s). The number of actions and timings variables are unique to computerized assessments and provide rich data on the amount of time spent per item (timings) and amount of effort involved in responding (number of actions). Raw response refers to actual response selected for categorical items, and are converted to scored response (correct, partially correct, incorrect). Open-ended items are coded by trained staff and converted to coded response(s) (correct, partially correct, incorrect).

Student Data

- The data are contained in ascii file US_ST15_PUD.DAT. This file contains questionnaire items and derived variable and index scores based on the student questionnaire; plausible values for overall science, science subscales, reading scale, and the mathematics scale from the assessment; and student sampling weights and replicate weights. There are 5,712 cases in this file. Since the data are hierarchical (students are clustered within schools), each student record contains identification variables that enable the user to merge the school data with the student data, using the variable CNTSCHID.
- An SPSS syntax file, US_ST15_PUD.SPS, to read the ascii file into SPSS.
- A SAS syntax file, US_ST15_PUD.SAS, to read the ascii file into SAS.
- A codebook file (US_ST15_PUD.HTML) that includes variable names, variable location and format information, variable labels, question text, values, and frequencies.

School Data

- The data are contained in ascii file US_SC15_PUD.DAT. This file contains items from the school questionnaire, derived variables and index scores based on the school questionnaire, and the school sampling weight. There are 177 cases in this file. The variable CNTSCHID can be used to merge school data with the student data.
- An SPSS syntax file, US_SC15_PUD.SPS, to read the ascii file into SPSS.
- A SAS syntax file, US_SC15_PUD.SAS, to read the ascii file into SAS.
- A codebook file (US_SC15_PUD.HTML) that includes variable names, variable location and format information, variable labels, question text, values, and frequencies.

Teacher Data

- The data are contained in ascii file US_TC15_PUD.DAT. This file contains items from the teacher questionnaire, derived variables and index scores based on the teacher questionnaire. There are 3,680 cases in this file. As no teacher weights were developed for the teacher questionnaire data, the teacher data should be merged with the school data to conduct analyses. The variable CNTSCHID can be used to merge the teacher data with the school data.
- An SPSS syntax file, US_TC15_PUD.SPS, to read the ascii file into SPSS.
- A SAS syntax file, US_TC15_PUD.SAS, to read the ascii file into SAS.
- A codebook file (US_TC15_PUD.HTML) that includes variable names, variable location and format information, variable labels, question text, values, and frequencies.

Scored and Raw Cognitive (Assessment) Item Data

- The data are contained in ascii file US_ASSESM15.DAT. This file contains scores of student responses to each item in the assessment. Data are in two response formats: (1) valid scores = 0, 1; 0 = no credit, 1 = full credit; and (2) valid scores = 0, 1, 2; 0 = no credit, 1 = partial credit, 2 = full credit. The majority of the items have not been released, so there is little descriptive information about them.
- An SPSS syntax file, US_ASSESM15.SPS, to read the ascii file into SPSS.
- A SAS syntax file, US_ASSESM15.SAS, to read the ascii file into SAS.
- A codebook file (US_ASSESM15.HTML`) that includes variable names, variable location and format information, variable labels, question text, values, and frequencies.

U.S. Questionnaires

- Two versions of the U.S. student questionnaire were administered in 2015:
  - Student_Q_CommonPart_English.html
  - Student_Q_UH_English.html
- The U.S. version of the school questionnaire is in the file School_Q_English.html.
- The U.S. version of the teacher questionnaires are in the files:
  * Science_Teacher_Q_English.html

* General_Teacher_Q_English.html

PISA 2015 Technical Report and User Guide

This document contains information on the administration of PISA in the United States.

9.3 National and International Variables

The U.S. national data contain both the "international variables" (questionnaire and assessment variables used by all countries) and a few "national variables" (questionnaire variables adapted or used only in the United States). Note that the same assessment items were used by all countries. There are also some variables that appear in the international files that are missing for the U.S. cases. These include three questionnaires not used in the United States: the parent questionnaire, the information and communication technology (ICT) questionnaire, and the education career (EC) questionnaire. Variables used only in the United States and those not used in the United States are shown in tables 28 and 29, respectively.

Table 31. Variables used only in the United States: 2015

Variable name	Questionnaire item wording
	Student Questionnaire
RACETHC	Race/ethnicity derived from Q.4 and Q.5
ST127A01TA	Have you ever repeated a grade? (in Kindergarten)
ST011C17	Which of the following are in your home?...A guest room
ST011C18	Which of the following are in your home?...A high-speed Internet connection
ST011C19	Which of the following are in your home?...A musical instrument
	School Questionnaire
FRPL	Approximately what percentage of students at this school last year were eligible for free or reduced-price lunches through the National School Lunch Program? (Collapsed from SC801A01NA)

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

Table 32. Variables not used in the United States: 2015

Variable name	Questionnaire item wording
	Student Questionnaire
ST002Q01TA	Which one of the following programmes are you in?

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

International Variables Recoded From U.S. Questionnaire Variables

Three international questionnaire items on the student questionnaire and one on the school questionnaire needed to be rewritten to be applicable for U.S. questionnaires, and thus required international recoding.

- The international questions ST005Q01TA and ST007Q01TA ("What is the highest level of education completed by your mother/father?") included five options, one of which (ISCED level 3B, 3C) was not relevant in the United States. Thus the U.S. versions of these variables (ST005C01TA and ST007C01TA) have four valid responses rather than five and have value labels different from the international versions.

- The international question ST111Q01TA ("Which of the following do you expect to complete?") included six options, one of which (ISCED level 3B or C) was not relevant in the United States, and one of which (ISCED level 5A or 6) was split into two in the United States. Thus the U.S. version of this variable (ST111C01TA) has six valid responses that have value labels different from the international versions.

- The international questions SC010Q01 through SC010Q12 ("Regarding your school, who has a considerable responsibility for the following tasks?") collapsed categories of

regional and local education authorities while the U.S. version adapted value labels different from the international version that are relevant in the United States.

9.4 Variable Names

The variable names created by the SPSS and SAS syntax files are those used in international datasets. It should be noted that the variable names do not necessarily correspond with the question numbers on the student and school questionnaires. For convenience, variable item numbers are listed next to each question on the questionnaires.

9.5 Derived Variables

The international contractors for PISA have developed a number of derived variables for use in their analyses, and these variables have been included in the student and school files. They appear after the questionnaire variables and have variable names that do not contain numerals. Explanations of several of these variables are included in appendix H, which is abstracted from the second volume of the international report (OECD 2016c). A more complete explanation of these variables will be provided in the international *PISA 2015 Technical Report* (OECD forthcoming).

10. Using the PISA 2015 Data Files

10.1 Special Considerations—Plausible Values and Replicate Weights

Three aspects of PISA's design need careful attention in any analysis. The first stems from the sample design. The use of sampling weights is necessary for the computation of statistically sound, nationally representative estimates when random sampling is not employed. Although schools and students had known probabilities of selection, these probabilities were unequal. Adjusted survey weights adjust for the probabilities of selection for individual schools and students, for school or student nonresponse, and for errors in estimating the size of the school or the number of 15-year-olds in the school at the time of sampling. Thus, to generalize to the population sampled, analyses will need to apply the sampling weights provided in the file.

The second aspect to be considered also stems from the sampling design and involves the calculation of standard errors. Since the sample design is complex (a two-stage, stratified cluster design), most software packages, operating on the assumption of a simple random sample, will produce biased estimates of standard errors. To use the replicate weights contained in the data file, one must use special procedures to produce unbiased estimates of the standard errors. These procedures involve the use of Fay's method of balanced repeated replicates (BRR) with 80 replicates and the Fay coefficient set to 0.5 to estimate the standard errors and are described in detail in the *PISA Data Analysis Manual: SPSS, Second Edition* (OECD 2009a).

The third aspect arises from the design of PISA's performance variables and the use of plausible values in analysis. In PISA, as in many national and international assessments, students are not administered every assessment item. Each item has missing student responses, though these are missing by design. Thus, it is not possible to estimate scores for individual students. Instead, the results of individual students are aggregated to produce a set of scores for groups of students (e.g., all U.S. 15-year-old students or U.S. 15-year-old female students). The distribution of scores indicates a set of plausible values, which represent a range of abilities for a certain group of students.[5] For analysis purposes, PISA datasets include sets of ten plausible values for each of the PISA 2015 scales. Thus, if any analysis were to be undertaken with any of the PISA scales, it should be undertaken ten times, once for each plausible value. The results would then be averaged, and any significance tests would have to be adjusted for variation between the first ten sets of

[5] For theoretical and empirical justification of the procedures used, see Mislevy (1988). For more information about the methodology used in PISA see the *PISA 2015 Technical Report* (OECD forthcoming).

results. A special provision also needs to be made in the estimation of the standard errors and is best done using the IDB Analyzer developed for this purpose and described below.

These aspects can be handled by using IEA's IDB Analyzer. The IDB Analyzer is available at www.iea.nl/data. The IDB Analyzer can be used to combine and analyze data from PISA. The analyzer is a downloadable tool that creates SPSS or SAS syntax that can be used to combine files from across different countries and levels (student, teacher, school, etc.) and perform analysis. It generates SPSS or SAS syntax that takes into account information from the sampling design in the computation of sampling variance, and handles the plausible values. The code generated by the IEA IDB Analyzer enables the user to compute descriptive statistics and conduct statistical hypothesis testing among groups in the population without having to write any programming code. The following analyses can be performed with the analysis module:

- percentages and means,
- linear regression,
- logistic regression,
- calculation of benchmarks,
- correlations,
- percentiles, and
- differences by performance groups.

The NCES International Data Explorer is another tool available to researchers for summarizing and describing the PISA data. The IDE produces tabular reports and, like the IDB Analyzer, performs statistical hypothesis testing and significance tests, gap analysis and simple linear regression. The IDE is available at https://nces.ed.gov/surveys/international/ide.

10.2 Nonresponse Bias

Detailed analyses were conducted to determine if nonresponse at either the school or questionnaire item level resulted in apparent biases in the results. The results indicated that school nonresponse to the study resulted in limited apparent bias of results. (The full nonresponse bias analysis report is included in appendix I.)

10.3 Merging School, Student, and Teacher Data

The PISA sample was designed to yield a nationally representative sample of 15-year-old students enrolled in schools; the school sample was designed to optimize the selection of these students. For meaningful and valid analyses, it is typically recommended that the school data be disaggregated across students and school attributes be treated as "student characteristics." This disaggregation can be accomplished by merging the school-level data to the student file using CNTSCHID and the resulting file analyzed at the student level using the replicate weights (W_FSTURWT1– W_FSTURWT80).

Treatment of teacher data in PISA 2015

In PISA 2015, teacher variables are treated as descriptors of the school-level learning environment. Therefore, as a rule, teacher variables should be aggregated at the school level and treated as school-level measures. Aggregated variables need to be matched with the school-file based on the school ID variable (CNTSCHID.) These data may then be merged with the student data.

Please note that teacher variables may represent either (1) the population of science teachers eligible for teaching 15-year old students, or (2) the population of non-science teachers eligible for teaching 15-year old students. Teachers are not linked to individual students and are not treated or analyzed as a representative sample of teachers.

When conducting specialized analyses solely on the school level (e.g., computing descriptive information for school variables, teacher variables, or connecting information from the teacher questionnaire with information from the school questionnaire), use school weights provided in the school data file.

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Appendix A. State Sampling Tables

Table A-1. Number and percentage of students and schools included in the PISA Massachusetts school sample, by grade range, locale, and race/ethnicity status: 2015

			Frame		Sample	
Grade range	Locale	Race/ethnicity status	ENR	Percent	Schools	Percent
Total			71,882	100.0%	58	100.0%
Highest grade 07 or 08	City	15 percent and above	28	0.0%	1	1.7%
Highest grade 07 or 08	City	Below 15 percent		0.0%		0.0%
Highest grade 07 or 08	Urban fringe	15 percent and above	86	0.1%	2	3.4%
Highest grade 07 or 08	Urban fringe	Below 15 percent	61	0.1%	1	1.7%
Highest grade 07 or 08	Town	15 percent and above	1	0.0%		0.0%
Highest grade 07 or 08	Town	Below 15 percent	1	0.0%		0.0%
Highest grade 07 or 08	Rural MSA	15 percent and above	2	0.0%		0.0%
Highest grade 07 or 08	Rural MSA	Below 15 percent	15	0.0%	1	1.7%
Highest grade 09	City	15 percent and above	14	0.0%		0.0%
Highest grade 09	City	Below 15 percent		0.0%		0.0%
Highest grade 09	Urban fringe	15 percent and above	1	0.0%		0.0%
Highest grade 09	Urban fringe	Below 15 percent		0.0%		0.0%
Highest grade 09	Town	15 percent and above		0.0%		0.0%
Highest grade 09	Town	Below 15 percent		0.0%		0.0%
Highest grade 09	Rural MSA	15 percent and above		0.0%		0.0%
Highest grade 09	Rural MSA	Below 15 percent		0.0%		0.0%
High schools: grades 09-12	City	15 percent and above	8,937	12.4%	7	12.1%
High schools: grades 09-12	City	Below 15 percent	184	0.3%		0.0%
High schools: grades 09-12	Urban fringe	15 percent and above	27,210	37.9%	19	32.8%
High schools: grades 09-12	Urban fringe	Below 15 percent	20,383	28.4%	16	27.6%
High schools: grades 09-12	Town	15 percent and above	106	0.1%		0.0%
High schools: grades 09-12	Town	Below 15 percent	167	0.2%	1	1.7%
High schools: grades 09-12	Rural MSA	15 percent and above	1,479	2.1%	1	1.7%
High schools: grades 09-12	Rural MSA	Below 15 percent	5,794	8.1%	4	6.9%
High schools: grades 10-12	City	15 percent and above	8	0.0%		0.0%
High schools: grades 10-12	City	Below 15 percent		0.0%		0.0%
High schools: grades 10-12	Urban fringe	15 percent and above	11	0.0%		0.0%
High schools: grades 10-12	Urban fringe	Below 15 percent	6	0.0%		0.0%
High schools: grades 10-12	Town	15 percent and above		0.0%		0.0%
High schools: grades 10-12	Town	Below 15 percent		0.0%		0.0%
High schools: grades 10-12	Rural MSA	15 percent and above	3	0.0%		0.0%
High schools: grades 10-12	Rural MSA	Below 15 percent		0.0%		0.0%
Other	City	15 percent and above	2,398	3.3%	1	1.7%
Other	City	Below 15 percent		0.0%		0.0%
Other	Urban fringe	15 percent and above	1,907	2.7%	2	3.4%
Other	Urban fringe	Below 15 percent	1,257	1.7%	1	1.7%
Other	Town	15 percent and above	99	0.1%		0.0%
Other	Town	Below 15 percent	453	0.6%		0.0%
Other	Rural MSA	15 percent and above	237	0.3%		0.0%
Other	Rural MSA	Below 15 percent	1,036	1.4%	1	1.7%

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Table A-2. Number and percentage of students and schools included in the PISA North Carolina school sample, by grade range, locale, and race/ethnicity status: 2015

Grade range	Locale	Race/ethnicity status	Frame		Sample	
			ENR	Percent	Schools	Percent
Total			110,057	100.0%	59	100.0%
Highest grade 07 or 08	City	15 percent and above	88	0.1%	1	1.7%
Highest grade 07 or 08	City	Below 15 percent	1	0.0%		0.0%
Highest grade 07 or 08	Urban fringe	15 percent and above	73	0.1%	1	1.7%
Highest grade 07 or 08	Urban fringe	Below 15 percent	7	0.0%		0.0%
Highest grade 07 or 08	Town	15 percent and above	31	0.0%		0.0%
Highest grade 07 or 08	Town	Below 15 percent	1	0.0%		0.0%
Highest grade 07 or 08	Rural MSA	15 percent and above	115	0.1%	1	1.7%
Highest grade 07 or 08	Rural MSA	Below 15 percent	20	0.0%	1	1.7%
Highest grade 09	City	15 percent and above	34	0.0%		0.0%
Highest grade 09	City	Below 15 percent		0.0%		0.0%
Highest grade 09	Urban fringe	15 percent and above	17	0.0%		0.0%
Highest grade 09	Urban fringe	Below 15 percent		0.0%		0.0%
Highest grade 09	Town	15 percent and above	28	0.0%		0.0%
Highest grade 09	Town	Below 15 percent		0.0%		0.0%
Highest grade 09	Rural MSA	15 percent and above	105	0.1%		0.0%
Highest grade 09	Rural MSA	Below 15 percent	24	0.0%		0.0%
High schools: Grades 09-12	City	15 percent and above	27,801	25.3%	13	22.0%
High schools: Grades 09-12	City	Below 15 percent		0.0%		0.0%
High schools: Grades 09-12	Urban fringe	15 percent and above	24,527	22.3%	12	20.3%
High schools: Grades 09-12	Urban fringe	Below 15 percent	2,892	2.6%	2	3.4%
High schools: Grades 09-12	Town	15 percent and above	9,423	8.6%	4	6.8%
High schools: Grades 09-12	Town	Below 15 percent	1,788	1.6%	1	1.7%
High schools: Grades 09-12	Rural MSA	15 percent and above	32,682	29.7%	16	27.1%
High schools: Grades 09-12	Rural MSA	Below 15 percent	5,495	5.0%	3	5.1%
High schools: Grades 10-12	City	15 percent and above	70	0.1%		0.0%
High schools: Grades 10-12	City	Below 15 percent		0.0%		0.0%
High schools: Grades 10-12	Urban fringe	15 percent and above		0.0%		0.0%
High schools: Grades 10-12	Urban fringe	Below 15 percent		0.0%		0.0%
High schools: Grades 10-12	Town	15 percent and above		0.0%		0.0%
High schools: Grades 10-12	Town	Below 15 percent		0.0%		0.0%
High schools: Grades 10-12	Rural MSA	15 percent and above	428	0.4%		0.0%
High schools: Grades 10-12	Rural MSA	Below 15 percent	137	0.1%		0.0%
Other	City	15 percent and above	1,600	1.5%	2	3.4%
Other	City	Below 15 percent		0.0%		0.0%
Other	Urban fringe	15 percent and above	823	0.7%	1	1.7%
Other	Urban fringe	Below 15 percent	225	0.2%		0.0%
Other	Town	15 percent and above	410	0.4%		0.0%
Other	Town	Below 15 percent	82	0.1%		0.0%
Other	Rural MSA	15 percent and above	835	0.8%		0.0%
Other	Rural MSA	Below 15 percent	294	0.3%	1	1.7%

SOURCE: U.S. 2015 PISA School Sample, Final Report.

Appendix B. State Response Rate Tables

Table B-1. Number and percentage of PISA Massachusetts schools, by response status: 2015

Response status	Original		Substitute[1]		Total	
	Number of schools	Percentage of schools	Number of schools	Percentage of schools	Number of schools	Percentage of schools
Total schools	61	100.0	116	100.0	177	100.0
Total eligible schools	53	86.9	18	15.5	71	40.1
Participating	41	77.4	8	44.4	49	69.0
Refusal	12	22.6	10	55.6	22	31.0
Ineligible/closed	5	8.2	2	1.7	7	4.0
Other (pending, no contact)	3	4.9	96	82.8	99	55.9

[1] Two substitute schools were assessed but is marked here as ineligible/closed/excluded and are not included in the data, as the original schools for these substitute participated.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA) 2015.

Table B-2. Number and percentage of PISA North Carolina schools, by response status: 2015

Response status	Original		Substitute		Total	
	Number of schools	Percentage of schools	Number of schools	Percentage of schools	Number of schools	Percentage of schools
Total schools	59	100.0	118	100.0	177	100.0
Total eligible schools	54	91.5	0	0.0	54	30.5
Participating	54	100.0	0	NA	54	100.0
Refusal	0	0.0	0	NA	0	0.0
Ineligible/closed	5	8.5	0	0.0	5	2.8
Other (pending, no contact)	0	0.0	118	100.0	118	66.7

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA) 2015.

Table B-3. Number and percentage of PISA Puerto Rico schools, by response status: 2015

Response status	Original		Substitute		Total	
	Number of schools	Percentage of schools	Number of schools	Percentage of schools	Number of schools	Percentage of schools
Total schools	55	100.0	110	100.0	165	100.0
Total eligible schools	47	85.5	0	0.0	47	28.5
Participating	47	100.0	0	NA	47	100.0
Refusal	0	0.0	0	NA	0	0.0
Ineligible/closed	8	14.6	0	0.0	8	4.9
Other (pending, no contact)	0	0.0	110	100.0	110	66.7

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

Table B-4. PISA Massachusetts status of sampled students: 2015

	Number of students	Percentage of students
Total students sampled	2,040	100.0
To be assessed	1,853	90.8
Non-participation		
Functional disability	4	0.2
Cognitive disability	70	3.4
Insufficient language ability	6	0.3
Homeschooled	1	0.1
Withdrawn	106	5.2

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2015.

Table B-5. PISA North Carolina status of sampled students: 2015

	Number of students	Percentage of students
Total students sampled	2,234	100.0
To be assessed	2,038	91.2
Non-participation		
Functional disability	13	0.6
Cognitive disability	57	2.6
Insufficient language ability	14	0.6
Homeschooled	5	0.2
Withdrawn	107	4.8

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA) 2015.

Table B-6. PISA Puerto Rico status of sampled students: 2015

	Number of students	Percentage of students
Total students sampled	1,752	100.0
To be assessed	1,493	85.2
Non-participation		
Functional disability	2	0.1
Cognitive disability	18	1.0
Insufficient language ability	4	0.2
Homeschooled	0	0.0
Withdrawn	235	13.4

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA) 2015.

Table B-7. Massachusetts participation status of students to be assessed: 2015

	Number of students	Percentage of students
Total students to be assessed	1,853	100.0
Assessed	1,652	89.2
Absent	100	5.4
Parent refusal	101	5.5

NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA) 2015.

Table B-8. North Carolina participation status of students to be assessed: 2015

	Number of students	Percentage of students
Total students to be assessed	2,038	100.0
Assessed	1,887	92.6
Absent	70	3.4
Parent refusal	81	4.0

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA) 2015.

Table B-9. Puerto Rico participation status of students to be assessed: 2015

	Number of students	Percentage of students
Total students to be assessed	1,493	100.0
Assessed	1,398	93.6
Absent	85	5.7
Parent refusal	10	0.7

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA) 2015.

Appendix C. PISA 2015 School Recruiting Materials

Exhibit C-1. State PISA 2015 letter from the NCES Commissioner

[Date]
[Title] [Name First] [Name Last]
[Title/Department]
[State]
[Address 1]
[Address 2]
[City], [State] [Zip code]

Dear [Title] [Name Last]:

In the fall of 2015, the United States will once again participate in the Program for International Student Assessment (PISA), a triennial sample assessment and survey of 15-year-old students. Across the country, about 240 schools and about 42 students per school will participate. Some schools in your state have been drawn for this year's U.S. PISA sample. I am writing to ask your agency to support the participation of these schools.

PISA, the largest on-going international education study in the world, compares the performance of U.S. 15-year-old students in science, reading, and mathematics with that of 15-year-old students in other countries. PISA 2015 will also include assessments of students' collaborative problem-solving and financial literacy. In order to minimize the study's disruption to schools and students, we draw a relatively small sample of schools and students nationwide. We also coordinate the administration of PISA with NAEP and other National Center for Education Statistics (NCES) activities. We are in contact with your state assessment director and NAEP State Coordinator to try to ensure that we are not conflicting with other state efforts and that districts and schools understand how PISA fits in with other national data collections sponsored by NCES.

PISA is described in more detail in the enclosed materials. NCES directs the PISA project in the United States and has entered into a contract with Westat in Rockville, Maryland to implement the study. The U.S. Office of Management and Budget has approved the data collection under OMB #1850-0755. For information on the confidentiality of the data collected, please see the enclosed FAQ. If you any have questions about the study, please do not hesitate to call David Kastberg at 1-888-638-2597 or send an email to PISAHELP@westat.com or contact Dana Kelly at NCES at 202-219-7101 or dana.kelly@ed.gov or by visiting the PISA website at http://nces.ed.gov/surveys/pisa.

While participation in this study is voluntary, we ask your support of the participation of schools in your state so that the United States has a representative sample of schools across the country. Because we attempt to draw a small sample of schools and students, it is vitally important that as many as possible of those sampled participate. In addition, a small number of schools in [STATE] will be invited to participate in a field trial for the Progress in International Reading Literacy Study (PIRLS), which will be conducted in spring 2015. You will receive more information on PIRLS soon. Thank you for your time and support.

Sincerely,

Peggy Carr, Ph.D.
Acting Commissioner

Exhibit C-2. School district PISA 2015 letter from the NCES Commissioner

[Date]

[Title] [Name First] [Name Last], [Title/Department]
[School District]
[Address 1]
[City], [State] [Zip code]

Dear [District Superintendent name]:

I am writing to notify you that 1 school in your district has been randomly selected to participate in an important international study in the fall of 2015: the Program for International Student Assessment (PISA). PISA is the largest international education study in the world. Administered every 3 years since 2000, the United States has participated in each cycle of PISA. More than 70 countries representing approximately 90 percent of the world economy participate in PISA. Results are used by researchers and policymakers to chart national progress against international benchmarks and the educational progress of our economic peers and competitors. I am asking your district to support the participation of your schools.

PISA provides comparative information on the performance of U.S. 15-year-old students in science, reading, and mathematics with 15-year-old students in other countries. PISA 2015 will also include assessments of students' collaborative problem-solving and financial literacy. Schools that achieve a high level of student participation will receive a confidential report with information about how the school performed on PISA. Participating schools will receive $200, and each school's PISA school coordinator (school staff person designated to liaise with PISA staff) will receive $200 as compensation for the coordinator's time and effort. Selected teachers will receive $20 for completing a brief questionnaire about themselves. Each student who participates will receive $25 and a volunteer service certificate of 4 hours from the U.S. Department of Education. A delegate from each participating school is also invited and sponsored by NCES to attend a 1 ½ day meeting in Washington, D.C. to learn about participating in PISA.

PISA is sponsored in the United States by the National Center for Education Statistics (NCES) within the U.S. Department of Education and is conducted by Westat in Rockville, Maryland. The U.S. Office of Management and Budget has approved the data collection under OMB #1850-0755. For information on the confidentiality of the data collected, please see the enclosed FAQ. While participation in this study is voluntary, we ask your district to support participation of schools in your district so that the United States has a representative sample across the country.

The PISA assessment window is October 5 to November 13, 2015. Within the next few days, a representative of Westat will contact the following school or schools in your district that have been selected for PISA: [LIST SAMPLED SCHOOLS HERE…].

If you have any questions, please do not hesitate to call 1-888-638-2597 or send an email to PISAHELP@westat.com. You may also get more information by contacting Patrick Gonzales at NCES at 415-920-9229 or patrick.gonzales@ed.gov or by visiting the PISA website at http://nces.ed.gov/surveys/pisa.

Thank you for your time and support.

Peggy Carr, Ph.D.
Acting Commissioner

cc:

Enclosures: PISA Folders
NCES is authorized to conduct this study under the Education Sciences Reform Act of 2002 (ESRA 2002), 20 U.S. Code, § 9543. By law, the data provided by your schools, staff, and students may only be used for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose except as required by law (20 U.S. Code, § 9573).

Exhibit C-3. School principal 2015 letter from the NCES Commissioner

[Date]
[Title] [Name First] [Name Last], [Title/Department]
[School Name]
[Address 1]
[City], [State] [Zip code]

Dear [Title] [Name Last]:

I am writing to inform you that (school name) has been randomly selected to represent schools across the United States by participating in an important international study in the fall of 2015: the Program for International Student Assessment (PISA). Administered every 3 years since 2000, the United States has participated in each cycle of PISA. Your school's participation is important to PISA's success as your school is one of only 240 across the United States that has been selected. The assessment window is October 5 – November 13, 2015.

PISA is the world's largest international education study with more than 70 countries participating, representing approximately 90 percent of the world economy. PISA is sponsored in the United States by the National Center for Education Statistics (NCES) within the U.S. Department of Education and is conducted by Westat in Rockville, Maryland. The U.S. Office of Management and Budget has approved the data collection under OMB #1850-0755.

NCES recognizes the burden of assessments on schools and works to reduce that burden as much as possible both in terms of time and resources. Under contract to NCES, Westat is responsible for all aspects of the assessment administration and will work with you to make PISA a success in your school. PISA takes a relatively small sample of 42 15-year old students and up to 25 teachers in each school, so entire classes and grades are not disrupted. For information on the confidentiality of the data collected and for more general information, please see the enclosed informational materials. Two folders of materials have been enclosed for you to share with faculty.

Schools that achieve at least 85% student participation will receive a confidential report with information about how the school performed on PISA. In addition, as a token of appreciation for participating in PISA, your school will receive $200. Students who take PISA will receive $25 and a volunteer service certificate of 4 hours from the U.S. Department of Education. Your school's PISA school coordinator (a staff person you designate to liaise with PISA staff) will receive $200 for his or her time and effort coordinating PISA in the school, and selected teachers will receive $20 for completing a brief questionnaire about themselves. NCES will also sponsor a delegate from your school to attend a 2-day PISA conference in Washington, D.C. during the summer of 2015.

Within the next few days, a representative of Westat will contact you to discuss your participation. If you have any questions, please do not hesitate to call 1-888-638-2597 or send an email to PISAHELP@westat.com. You may also get more information by contacting Patrick Gonzales at NCES at 415-920-9229 or patrick.gonzales@ed.gov or by visiting the PISA website at http://nces.ed.gov/surveys/pisa.

Your participation in PISA 2015 is vital to the overall success of the study in the United States. Thank you for your time and for supporting this important international study.

Peggy Carr, Ph.D.
Associate Commissioner
National Center for Education Statistics

CC: Test Coordinator

Enclosures: PISA information folders

NCES is authorized to conduct this study under the Education Sciences Reform Act of 2002 (ESRA 2002), 20 U.S. Code, § 9543. By law, the data provided by your schools, staff, and students may only be used for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose except as required by law (20 U.S. Code, § 9573)

PISA USA

PROGRAM FOR INTERNATIONAL STUDENT ASSESSMENT OVERVIEW

PISA 2015

What is PISA?

The Program for International Student Assessment (PISA) is an international assessment of 15-year-old students, conducted every 3 years, that measures how well students apply their knowledge and skills in science, reading, and mathematics to problems in real-life contexts. In 2015, students from more than 70 countries and education systems, including the United States, will participate.

PISA is coordinated by the Organization for Economic Cooperation and Development (OECD) and managed in the United States by the National Center for Education Statistics (NCES) within the U.S. Department of Education.

Why is PISA important and what are the benefits of participating?

PISA provides a unique opportunity for the United States to understand its educational standing in comparison to other nations. Through participating in PISA, schools, teachers, and students contribute to the improvement of education.

PISA can help us identify U.S. students' strengths and weaknesses in these subjects and learn about successful policies and practices that in other countries.

In addition to receiving a U.S. national report with PISA 2015 results, schools may also receive a school-level report. The school report presents comparisons of your school's average scores with the average scores of participating education systems including the United States. The report also provides comparisons of your school with other similar U.S. schools based on specific school-level characteristics. PISA offers a modest token of appreciation to schools, the school coordinator, students, and teachers who participate. NCES also sponsors one delegate from each school to attend a summer conference in Washington, D.C. to learn about PISA.

What type of assessment is PISA?

PISA is developed through an international consensus-building process involving input from U.S. and international experts in science, reading, mathematics, financial literacy, collaborative problem solving, and educational measurement. The PISA assessment materials are thoroughly reviewed by within-country experts to make sure the materials are appropriate for each country's students. Finally, the resulting assessment materials are endorsed by all participating countries.

What kinds of questions does PISA include?

PISA includes a mix of question types: some items require students to select appropriate responses, while others require that students solve problems and provide written answers. Examples of PISA assessment questions are available at http://nces.ed.gov/surveys/pisa/educators.asp.

Who is participating in PISA 2015?

Albania
Algeria
Argentina
Australia
Austria
Belgium
Brazil
Bulgaria
Canada
Chile
China
Chinese Taipei
Colombia
Costa Rica
Croatia
Czech Republic
Denmark
Dominican Republic
Estonia
Finland
Former Yugoslav Republic of Macedonia
France
Georgia
Germany
Greece
Hong Kong-China
Hungary
Iceland
Indonesia
Ireland
Israel
Italy
Japan
Jordan
Kazakhstan
Korea
Kosovo
Latvia
Lebanon
Lithuania
Luxembourg
Macao-China
Malaysia
Malta
Mexico
Moldova
Montenegro
Netherlands
New Zealand
Norway
Peru
Poland
Portugal
Qatar
Romania
Russian Federation
Singapore
Slovak Republic
Slovenia
Spain
Sweden
Switzerland
Thailand
Trinidad and Tobago
Tunisia
Turkey
United Arab Emirates
United Kingdom
United States of America
Uruguay
Vietnam

What organizations have endorsed PISA 2015?

Council of Chief State School Officers
National Association of Secondary School Principals
Council for American Private Education
National Science Teachers Association
National Council of Teachers of Mathematics
Association for Middle Level Education
International Reading Association
Alliance for Excellence in Education
Council of Great City Schools
American Federation of Teachers

How do I get more information?

Visit the PISA website at http://nces.ed.gov/surveys/pisa.

For additional questions about PISA 2015, contact the PISA U.S. home office at 1-888-638-2597 or email PISAHELP@westat.com.

NCES is authorized to conduct PISA under the Education Science Reform Act (ESRA 2002), 20 U.S. Code, Section 9543. Information collected will help the U.S. Department of Education's ongoing efforts to benchmark student achievement in the United States. Participation is voluntary. Data collected may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose (20 U.S.C., § 9573). Individual responses will be combined with those from other participants to produce summary statistics and reports. The U.S. Office of Management and Budget has approved this data collection under OMB# 1850-0755.

ies NATIONAL CENTER FOR EDUCATION STATISTICS
Institute of Education Sciences

PISA USA

Please feel free to contact the PISA U.S. home office with any questions via email at PISAHELP@westat.com or by calling 1-888-638-2597

O.M.B. No. 1850-0755

DEPARTMENT OF EDUCATION · UNITED STATES OF AMERICA

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Exhibit C-4. PISA 2015 study brochure and schedule of activities—Continued

PISA 2015

Exhibit C-4. PISA 2015 study brochure and schedule of activities—Continued

What will schools, students, and teachers be asked to do in PISA 2015?

PISA 2015 has four primary components: (1) a core student assessment of science, mathematics, reading, and collaborative problem solving and a student questionnaire, (2) a financial literacy assessment administered to a sub-sample of students who take the core assessment, (3) an online school questionnaire, and (4) an online teacher questionnaire.

The principal of each school will be asked to appoint a staff member to act as the PISA school coordinator. The school coordinator will work with Westat staff to coordinate the assessment and submit student and teacher lists for sampling.

Up to 42 students in each school will be selected to participate in the core PISA assessment, which takes about 3 hours, including instructions, breaks, and a questionnaire. A sub-sample of up to 11 students in each school will be asked to return for an additional 1-hour assessment in financial literacy that will be held on the same day as the core assessment.

The principal of each school will also be asked to complete a 30-minute online questionnaire about school and student body characteristics and policies. Up to 25 teachers in each school will be asked to complete a 30-minute online teacher questionnaire about their background, education, and teaching experiences.

SUMMARY OF ACTIVITIES FOR PISA 2015

	Mar–Aug 2015	Aug–Sep 2015 Preassessment Contact	Sep–Oct 2015 Assessment Visit	Benefits
Principal and Teachers	▪ Identify a school coordinator.	▪ Complete an online School Questionnaire on the characteristics of the school. ▪ Complete an online Teacher Questionnaire on education and teaching experience.		▪ Represent other similar U.S. schools. ▪ Receive U.S. national report with with PISA 2015 results. ▪ Schools will receive $200 for participating. ▪ Teachers will receive $20 for completing the teacher questionnaire.
School Coordinator	▪ Select an assessment date convenient for your school. ▪ Arrange for the use of a classroom or an alternative quiet space for the assessment. ▪ Determine parent notification procedures. ▪ Provide list of eligible students and teachers.	▪ Notify teachers, selected students, and students' parents of the study and benefits of participating. ▪ Coordinate the principal's completion of the School Questionnaire. ▪ Coordinate the teachers' completion of the Teacher Questionnaire. ▪ Confirm the date and location of the assessment for PISA staff.	▪ Help ensure all sampled students attend the assessment. ▪ Meet with PISA staff after the assessment.	▪ Receive U.S. national report with PISA 2015 results. ▪ Receive $200 for participating. ▪ Attend the PISA summer conference in Washington, D.C.
Students			▪ Take the assessment and complete a Student Questionnaire.	▪ Receive a Certificate of Volunteer Service for 4 hours of community service. ▪ Represent other U.S. students like themselves and contribute to the profile of what our nation's students know and can do. ▪ Receive $25 for participating. Students participating in the financial literacy assessment will receive an additional $15.
PISA Staff	▪ Provide school with materials explaining PISA and its importance. ▪ Work with the school coordinator to set an assessment date. ▪ Maintain school and student confidentiality.	▪ Call the school coordinator to discuss assessment day, space, and student participation. ▪ Select a random sample of eligible students and teachers to participate. ▪ Provide online access information for the teacher and school questionnaires to the school coordinator.	▪ Conduct assessment from start to finish. ▪ Furnish all the assessment computers. ▪ Meet with school coordinator after the assessment. ▪ Pack up the materials to ensure that the assessments are complete and secure.	
Find Out More	http://nces.ed.gov/surveys/pisa			

Exhibit C-5. PISA 2015 School FAQ

PISA USA

PISA 2015

Program for International Student Assessment

FREQUENTLY ASKED QUESTIONS

Information for Schools

What is PISA?

The Program for International Student Assessment (PISA) is an international assessment of 15-year-old students, conducted every three years, that measures how well students apply their knowledge and skills in science, reading, and mathematics to solve problems in real-life contexts. In 2015, students from more than 70 countries and education systems, including the United States, will participate. PISA is coordinated by the Organization for Economic Cooperation and Development (OECD) and managed in the United States by the National Center for Education Statistics (NCES) within the U.S. Department of Education.

The entire assessment process will be undertaken by trained staff from Westat, a research organization under contract to NCES. NCES is conducting this study under authorization of the Education Sciences Reform Act of 2002 (20 U.S.C., § 9543) and with the approval of the U.S. Office of Management and Budget under OMB # 1850-0755.

What does participating in PISA entail?

Each school is asked to designate a school coordinator to work with Westat and to submit a list of all students born between July 1, 1999 and June 30, 2000 and teachers eligible to teach 10th grade (the modal grade of 15 year olds). Up to 42 students in each school will be sampled to participate in the core PISA assessment, which takes about 3 hours of total time, including instructions, breaks, and a questionnaire. A sub-sample of up to 11 students in each school will be asked to return for an additional 1-hour assessment in financial literacy that will be held on the same day as the core assessment. Up to 25 teachers in each school will be asked to complete a 30-minute online teacher questionnaire about their background, education, and teaching experiences. The principal of each school will also be asked to complete a 30-minute online questionnaire about school and student body characteristics and policies.

Why should my school participate?

The participation of selected schools in the United States is vital to ensuring an accurate representation of the overall 15-year-old student population across the country. Although participation is voluntary, we rely on school and student participation to ensure the results are complete and accurate. We cannot do that without the support of schools like yours. By participating in PISA, your school will have the opportunity to impact the bigger picture of education in the United States and across the world.

In addition to receiving a U.S. national report with PISA 2015 results, schools may also receive a school-level report. The school report presents comparisons of your school's average scores with the average scores of participating education systems including the United States. The report also provides comparisons of your school with other similar U.S. schools based on specific school-level characteristics.

PISA offers a modest token of appreciation for schools, the school coordinator, students, and teachers who participate.

What school resources are required on assessment day?

All that is required from a school resource perspective is a space for up to 42 students that can be used for the entire day and that has accessible power outlets. PISA 2015 is completely computer-based, and Westat field staff will bring laptops and all necessary equipment to the school on assessment day. The assessment does not require network or internet access. No IT staff or resources will be needed from your school.

PISA USA

PISA 2015

Will all of our 15-year-old students be asked to participate?

Probably not. In each school, all 15-year-old students will have an equal chance of selection, but only 42 will be selected to participate. Student selection is not based on any student characteristic other than being 15 years old. Only in very small schools with less than 42 15-year-old students enrolled will the sample include all available students. While PISA does allow accommodations for students with special educational needs, some students with disabilities or limited English proficiency may be excused from the assessment.

How long does the assessment take?

The PISA assessment session is approximately 3 hours for students, including time for instructions, the assessment, and a student questionnaire. Up to eleven students will be asked to return in the afternoon to take an additional 1-hour financial literacy assessment. In total, the assessment location will be used for about 5 hours for the main assessment, and about 2 hours for the financial literacy assessment, including setup and breakdown by Westat staff. All assessment activities will take place in one day.

Do teachers need to help administer the assessment?

No, no teachers or other staff from your school are required to administer PISA. Westat staff will come to your school on the day of the assessment and will bring all materials required including laptops for administering PISA. Westat staff will handle the entire administration from start to finish.

How are teacher and school questionnaires administered?

The teacher and school questionnaires are both administered online from a secure website. Up to 25 teachers (10 science and 15 non-science) will be sampled to complete an online 30-minute questionnaire that asks about their education and teaching experience, among other topics. The school questionnaire, which looks at school characteristics, such as enrollment and school practices, is also administered online and takes about 30 minutes to complete. Principals and teachers will receive login and password information via email or from their school's PISA school coordinator.

What will happen with the collected data?

By law, data provided by schools, staff, and students may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose except as required by law [Education Sciences Reform Act of 2002 (ESRA 2002), 20 U.S. Code, Section 9573]. Reports of the findings will not identify participating districts, students, or individual staff. Individual responses will be combined with those from other participants to produce summary statistics and reports. For a recent example of how PISA data are reported, please visit http://nces.ed.gov/pubs2014/2014024rev.pdf.

When will the assessment take place?

PISA will be conducted October 5 - November 13, 2015. Westat will work with schools to identify a convenient date during that time period.

Where can I find more information?

If you have any questions, please contact the PISA U.S. home office at 1-888-638-2597 or email PISAHelp@westat.com.

For more information on PISA, including results from previous data collections, please visit http://nces.ed.gov/surveys/pisa.

DEPARTMENT OF EDUCATION · UNITED STATES OF AMERICA

ies NATIONAL CENTER FOR EDUCATION STATISTICS
Institute of Education Sciences

O.M.B. No. 1850-0755

41995.1114.6128020301

Exhibit C-6. PISA 2015 Teacher FAQ

Program for International Student Assessment

FREQUENTLY ASKED QUESTIONS

Information for Teachers

What is PISA?

The Program for International Student Assessment (PISA) is an international assessment of 15-year-old students, conducted every three years, that measures how well students apply their knowledge and skills in science, reading, and mathematics to solve problems in real-life contexts. In 2015, students from more than 70 countries and education systems, including the United States, will participate. PISA is coordinated by the Organization for Economic Cooperation and Development (OECD) and managed in the United States by the National Center for Education Statistics (NCES) within the U.S. Department of Education.

PISA provides a unique opportunity for the United States to understand its educational standing in comparison to other nations. Through participating in PISA, schools, teachers, and students contribute to the improvement of education. PISA can help us identify U.S. students' strengths and weaknesses in these subjects and help us learn about successful policies and practices in other countries.

What role do teachers have in PISA?

Beginning with PISA 2015, teachers are asked to complete an online questionnaire. This gives you an opportunity to provide information that is critical to understanding student performance as well as to voice your perspectives on teaching and learning at your school. The teacher questionnaire asks about your background and teaching experience, the student body, and your views on school policies and evaluation.

How was I selected to take the PISA teacher questionnaire?

The PISA school coordinator in your school (the person designated by your school principal to communicate with PISA staff) provided a list of all teachers eligible to teach 10th grade students in your school. You are one of about 25 teachers from your school who were selected to participate. Your participation in PISA is vital to reaching a high response rate.

How long will it take to complete the PISA teacher questionnaire?

The teacher questionnaire will take approximately 30 minutes to complete online, and you do not have to complete it all in a single session. The online software automatically saves your responses to each question as you navigate through the questionnaire so that if you wish to complete the questionnaire later, you may pick up right where you left off.

How can I access the PISA teacher questionnaire?

To access the teacher questionnaire (https://www.mypisausa.com/teacherquestionnaire), you will need to have an internet connection, a suitable internet browser (see list below), and your login credentials. You will be emailed a unique hyperlink that you can click on to access the questionnaire directly. The PISA staff are ready to work with you to make access and completion of the teacher questionnaire as easy and efficient as possible.

The following browsers are supported by PISA and can be downloaded for free if you do not already have them installed on the computer:

- *Firefox*: Version 19 and above
- *Internet Explorer*: Version 8 and above
- *Google Chrome*: Version 25 and above
- *Safari (Mac version)*: versions 6 and above

What is done with the information you collect from me?

Your responses to the PISA teacher questionnaire will be combined with those from other participating teachers across the United States to produce summary statistics and reports. By law, data provided by schools, staff, and students may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose except as required by law [Education Sciences Reform Act of 2002 (ESRA 2002), 20 U.S. Code, Section 9573]. The U.S. Office of Management and Budget has approved this data collection under OMB # 1850-0755. Reports of the findings will not identify participating districts, students, or individual staff. For a recent example of how PISA data are reported, please visit http://nces.ed.gov/pubs2014/2014024rev.pdf.

Where can I go for help or technical support?

If you have any questions or experience any difficulties, please contact the PISA U.S. home office at 1-888-638-2597 or email PISAHelp@westat.com.

For more information on PISA, including results from previous data collections, please visit http://nces.ed.gov/surveys/pisa.

O.M.B. No. 1850-0755

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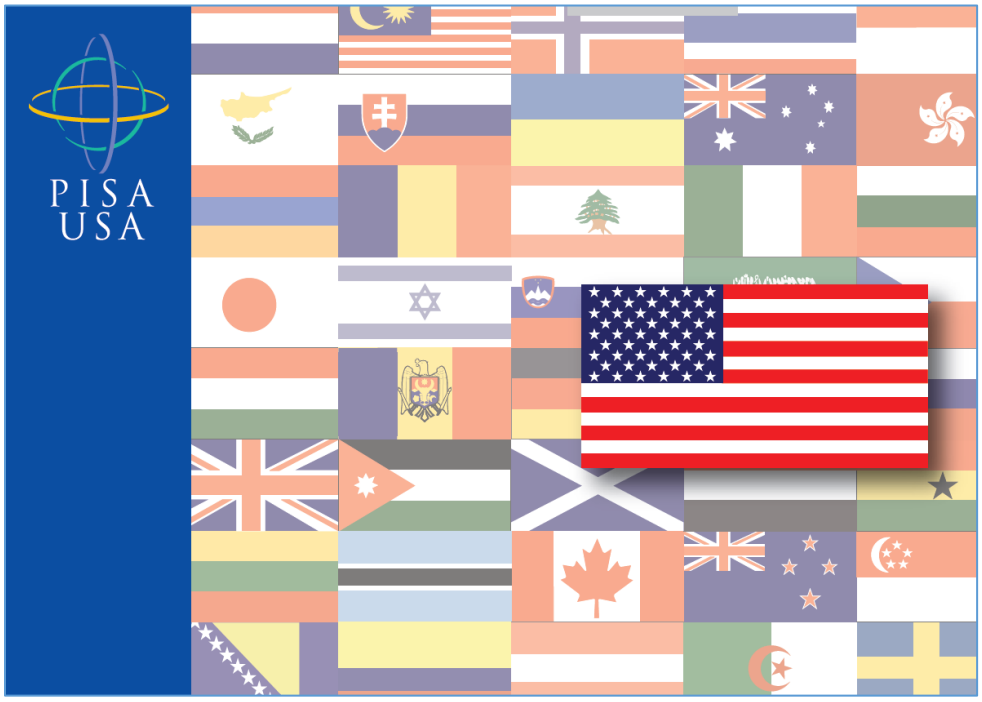
Appendix D. Student and Parent Materials

Exhibit D-1. PISA 2015 Student invitation



PISA
USA

Welcome to the U.S. PISA Team!

Student Name

Congratulations, you have been selected to be part of a special group of students representing the United States in the

Program for International Student Assessment (PISA) 2015.

This fall, selected students from the United States will match their knowledge and skills in science, reading, mathematics, collaborative problem solving, and financial literacy against students from more than 70 other countries and education systems.

Join us on....

PISA Date:

PISA Time:

PISA Location:

Exhibit D-2. PISA 2015 Explicit parent materials

Sample Main Study Explicit Consent Letter, PISA

SCHOOL LETTERHEAD

Dear Parent or Guardian,

This letter is to inform you about an important international study of student learning being conducted in our school this fall. This study is called the Program for International Student Assessment, or PISA. PISA provides important information for internationally benchmarking performance in science, reading, and mathematics of 15-year-old students in the United States against top countries around the world.

Our school has accepted an invitation from the National Center for Education Statistics (NCES), U.S. Department of Education, to participate in PISA. A select few of our 15-year-old students, along with your teenager, will take part in this study. The enclosed summary sheet provides some background to PISA, explains what is involved for each student selected to participate in the study, and gives a contact phone number and email address where you can find answers to any questions you might have.

To have an accurate picture of what U.S. 15-year-old students can do, it is important that each student selected take part in the study. Students will answer questions administered on a computer. Also, students will be asked to complete a brief questionnaire about themselves. I urge you to support this effort by encouraging your teenager to take part; however, participation in this study is entirely voluntary. Previous experience suggests that students enjoy taking part, and all participating students will receive $25 and a certificate from the U.S. Department of Education for 4 hours of volunteer service. Some of the students will also be selected to participate in a second session assessing financial literacy. These students will receive an additional $15. NCES may contact your teenager after the PISA assessment for a follow up study to look at the relationship between performance on PISA and other outcomes. In order to do so NCES will ask your teenager for contact information.

All of the information collected is kept completely confidential, as required by law. NCES is authorized to conduct this study under the Education Sciences Reform Act of 2002 (ESRA, 2002), 20 U.S. Code, Section 9543. Under that law, the data provided by schools, staff, and students may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose except as required by law (20 U.S.C., § 9573). Students and schools are never identified in any reports. All reported statistics refer to the United States as a whole.

Before we can allow your teenager to join in PISA we must have your written consent. Please let us know by completing the attached form and returning it to the school.

Thank you for taking the time to learn about this important study and consider your teenager's participation in it.

Sincerely,

Enclosures:
Facts for Parents About PISA
Parent/Guardian Consent Form
Main Study Explicit Consent Form

Program for International Student Assessment (PISA)
Parent/Guardian Consent Form

Your teenager has been asked to participate in an international study of student learning called the Program for International Student Assessment (PISA). Each student who participates will receive $25 and a volunteer service certificate of 4 hours from the U.S. Department of Education. Some of the students will also be selected to participate in a second session assessing financial literacy. These students will receive an additional $15. This assessment will be conducted by a team of researchers from Westat who are operating under contract on behalf of the U. S. Department of Education. In the fall of 2015, approximately 165 schools across the United States will participate in the study.

☐ Yes, I do grant permission for my teenager to participate in PISA.

☐ No, I do not grant permission for my teenager to participate in PISA.

Exhibit D-3. PISA 2015 Implicit parent materials

Sample Main Study Implicit Consent Letter, PISA

SCHOOL LETTERHEAD

Dear Parent or Guardian,

This letter is to inform you about an important international study of student learning being conducted in our school this fall. This study is called the Program for International Student Assessment, or PISA. PISA provides important information for internationally benchmarking performance in science, reading, and mathematics of 15-year-old students in the United States against top countries around the world.

Our school has accepted an invitation from the National Center for Education Statistics (NCES), U.S. Department of Education, to participate in PISA. A select few of our 15-year-old students, along with your teenager, will take part in this study. The enclosed summary sheet provides some background to PISA, explains what is involved for each student selected to participate in the study, and gives a contact phone number and email address where you can find answers to any questions you might have.

To have an accurate picture of what U.S. 15-year-old students can do, it is important that each student selected take part in the study. Students will answer questions administered on a computer. Also, students will be asked to complete a brief questionnaire about themselves. I urge you to support this effort by encouraging your teenager to take part; however, participation in this study is entirely voluntary. Previous experience suggests that students enjoy taking part, and all participating students will receive $25 and a certificate from the U.S. Department of Education for 4 hours of volunteer service. Some of the students will also be selected to participate in a second session assessing financial literacy. These students will receive an additional $15.

All of the information collected is kept completely confidential, as required by law. NCES is authorized to conduct this study under the Education Sciences Reform Act of 2002 (ESRA, 2002), 20 U.S. Code, Section 9543. Under that law, the data provided by schools, staff, and students may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose except as required by law (20 U.S.C., § 9573). Students and schools are never identified in any reports. All reported statistics refer to the United States as a whole.

If you have any objection to your teenager joining in the PISA activities, please let us know by completing the attached consent form and returning it to the school.

Thank you for taking the time to learn about this important study.

Sincerely,

Enclosures:
Facts for Parents About PISA
Parent/Guardian Consent Form

Exhibit D-3. PISA 2015 Implicit parent materials—Continued

Main Study Implicit Consent Form

Program for International Student Assessment (PISA)
Parent/Guardian Consent Form

Your teenager has been asked to participate in an international study of student learning called the Program for International Student Assessment (PISA). Each student who participates will receive $25 and a volunteer service certificate of 4 hours from the U.S. Department of Education. Some of the students will also be selected to participate in a second session assessing financial literacy. These students will receive an additional $15.This assessment will be conducted by a team of researchers from Westat, who are operating under contract on behalf of the National Center for Education Statistics within the U. S. Department of Education.

If you grant permission for your teenager to participate in the PISA, you do not need to return this form.

If you do not consent to your teenager's participation in the PISA, please return this form to your teenager's school as soon as possible.

I do not grant permission for my teenager, _____, to participate in the Program for International Student Assessment.

_____
(Signature of parent or guardian)

Date of signature: _____/_____/_____

PLEASE PRINT:

Student name: _____

School name: _____

FOR OFFICE USE ONLY:

Student ID: _____

Exhibit D-4. PISA 2015 Parent notification

Sample Main Study Notification Letter, PISA

SCHOOL LETTERHEAD

Dear Parent or Guardian,

This letter is to inform you about an important international study of student learning being conducted in our school this fall. This study is called the Program for International Student Assessment, or PISA. PISA provides important information for internationally benchmarking performance in science, reading, and mathematics of 15-year-old students in the United States against top countries around the world.

Our school has accepted an invitation from the National Center for Education Statistics (NCES), U.S. Department of Education, to participate in PISA. A select few of our 15-year-old students, along with your teenager, will take part in this study. The enclosed summary sheet provides some background to PISA, explains what is involved for each student selected to participate in the study, and gives a contact phone number and email address where you can find answers to any questions you might have.

To have an accurate picture of what U.S. 15-year-old students can do, it is important that each student selected take part in the study. Students will answer questions administered on a computer. Also, students will be asked to complete a brief questionnaire about themselves. I urge you to support this effort by encouraging your teenager to take part; however, participation in this study is entirely voluntary. Previous experience suggests that students enjoy taking part, and all participating students will receive $25 and a certificate from the U.S. Department of Education for 4 hours of volunteer service. Some of the students will also be selected to participate in a second session assessing financial literacy. These students will receive an additional $15. NCES may contact your teenager after the PISA assessment for a follow up study to look at the relationship between performance on PISA and other outcomes. In order to do so NCES will ask your teenager for contact information.

All of the information collected is kept completely confidential, as required by law. NCES is authorized to conduct this study under the Education Sciences Reform Act of 2002 (ESRA, 2002), 20 U.S. Code, Section 9543. Under that law, the data provided by schools, staff, and students may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose except as required by law (20 U.S.C., § 9573). Students and schools are never identified in any reports. All reported statistics refer to the United States as a whole.

Thank you for taking the time to learn about this important study.

Sincerely,

Enclosures:
Facts for Parents about PISA

Exhibit D-5. PISA 2015 Fact sheet for parents

Main Study Facts for Parents About PISA

Facts for Parents About PISA 2015

Between October and November of this year, your teenager's school will be one of about 165 nationwide taking part in PISA 2015. The schools were selected randomly to represent the nation's schools and, within each school, about 42 students were selected randomly to take part. Your teenager was among those students selected to take part in the study.

What is PISA?

PISA (the Program for International Student Assessment) is the world's largest international assessment that measures student learning in science, reading, and mathematics. More than 70 countries representing more than 90 percent of the world's economy participate in PISA. The assessment occurs every 3 years (2000, 2003, 2006, 2009, 2012, and 2015), and provides information about how students in the U.S. compare in achievement with students in other countries. The National Center for Education Statistics within the U.S. Department of Education sponsors U.S. participation in PISA.

What is involved?

PISA staff will visit the school and administer PISA. The assessment will take approximately 3 hours; it includes time for instructions, the administration of the assessment, and a brief questionnaire that students complete about themselves. Some students will be asked to return for an additional 1-hour assessment of financial literacy. The assessment and questionnaire are administered on a computer.

What are the benefits?

The nation as a whole benefits from PISA by having a greater understanding of how the knowledge and skills of U.S. students compare with those of students from other countries. Schools that participate in PISA will receive $200, and each student who participates will receive $25 and a certificate from the U.S. Department of Education for 4 hours of volunteer service. Students who also participate in the financial literacy assessment will receive an additional $15.

Where can I find out more about PISA?

More information about PISA is available at the PISA website at http://www.nces.ed.gov/surveys/pisa. If you have specific questions you can call PISA staff at

1-888-638-2597 or email us at PISAHelp@westat.com.

Exhibit D-6. PISA 2015 Student FAQ

PISA USA

PISA 2015

Program for International Student Assessment

FREQUENTLY ASKED QUESTIONS

Information for Students

What is PISA?

The Program for International Student Assessment (PISA) is an international assessment of 15-year-old students, conducted every three years, that measures how well students apply their knowledge and skills in solving problems in science, reading, mathematics, financial literacy, and collaborative problem solving. PISA presents problems that students are likely to encounter in the real world. In 2015, students like yourself from more than 70 countries and education systems, including the United States, will participate in PISA.

Why should I participate in PISA?

You are one of about 42 students in your school who have been selected to participate in PISA. Because you are one of a select few in your school your participation is very important. If you participate in PISA you will….

- Receive a certificate for 4-hours of volunteer service from the U.S. Department of Education.
- Represent students like you across the country.

Only 5,000 students will have the unique opportunity to participate in PISA 2015 in the United States. How often do you get to represent your country?

Participating in PISA is a national service. You can have an impact on the bigger picture of education in the United States and around the world.

What subjects are assessed in PISA?

Each student participating in PISA will be assessed in two or three of the following subjects: science, mathematics, reading, financial literacy, or collaborative problem solving. No student takes every PISA test question, and most students will be assessed in only two of the subjects. PISA is administered on a computer.

How long does PISA take?

The PISA assessment takes approximately 3 hours to complete. This includes time for instructions, the assessment, and a brief survey of questions about yourself. Some students will also be selected to participate in an additional 1-hour assessment in financial literacy that is held after the main PISA assessment.

How did my school get selected to take PISA?

The schools that participate in PISA in the United States are randomly selected from a list of all schools in the country that enroll 15-year-old students. This is done to ensure that U.S. participants accurately represent the entire population of 15-year-old students in the United States and not just particular types of schools or groups of students.

PISA USA

PISA 2015

How did I get selected to take PISA?

From a list of all 15-year-old students provided by your school, 42 students are randomly selected to participate. Every 15-year-old student enrolled in a PISA-selected school has an equal chance of being selected. Students in other countries are selected in the same way to make sure each country is fairly represented and no country is advantaged or disadvantaged because of the types of schools or groups of students selected.

What types of questions will I see on PISA?

Based on situations you might encounter in real life, PISA questions assess the knowledge and skills students have learned, both in and out of school. Some PISA questions require that you select from a set of provided answers; other PISA questions require that you write out your response.

PISA is administered on computer. Many of the items are interactive, where you manipulate different pieces of information. To try PISA items on your own, please visit http://nces.ed.gov/surveys/pisa/items_cba.asp

What is done with the information you collect from me?

PISA is not designed to produce individual test scores and your individual performance is not shared with your school in any way. Student responses are combined with other student responses and are only used for statistical purposes. By law, data provided by schools, staff, and students may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose except as required by law [Education Sciences Reform Act of 2002 (ESRA 2002), 20 U.S. Code, Section 9573].

Where can I find more information?

Visit the PISA website at http://nces.ed.gov/surveys/pisa.

For additional questions about PISA, contact the PISA U.S. home office at 1-888-638-2597 or email PISAHelp@westat.com.

ies NATIONAL CENTER FOR EDUCATION STATISTICS
Institute of Education Sciences

O.M.B. No. 1850-0755

41995.1114.6128020301

Exhibit D-7. PISA 2015 Certificate of volunteer service

Appendix E. PISA 2015 School, Teacher and Student Questionnaires

The PISA 2015 school and teacher questionnaires were administered online via a secure server at Westat. The student questionnaire was administered as part of the PISA Student Delivery System following the cognitive portion of the assessment. These instruments have been adapted for presentation online and may be found on the NCES PISA study website at https://nces.ed.gov/surveys/pisa/questionnaire.asp.

Appendix F. Training Agendas

Exhibit F-1. Test administrator training agenda – national

Program for International Student Assessment (PISA) 2015

Test Administrator Training Agenda
Westat, 1600 Research Blvd., Rockville, MD
August 19-21, 2015

Day 1 – Wednesday, August 19, 2015, 9:00 – 5:30

SESSION	TOPICS
SESSION 1: Welcome and Overview	▪ Introductions ▪ Welcome from Dr. Patrick Gonzales, NCES ▪ Overview of PISA 2015 ▪ Roles and Responsibilities ▪ Overview of MyPISAUSA.com ▪ Student Presentation
SESSION 2: Key PISA Materials	▪ Receiving PISA materials and supplies ▪ Adhering to security and confidentiality guidelines ▪ Understanding sampling and tracking forms
SESSION 3: Understanding SEN Students and PISA Accommodations	▪ Understanding students with Special Education Needs (SEN) ▪ PISA accommodations ▪ UH sessions
Morning Break	
	Exercise: Coding SEN and Exclusions
SESSION 4: Preassessment Activities	▪ Conducting preassessment calls *Role Plays: Conducting Preassessment Scheduling Calls* *Exercise: Preassessment Call Scenarios*
Lunch *(ID Pictures)*	
	▪ Conducting preassessment visits (PAVs) *Role Plays: Conducting Preassessment Visits*
Afternoon Break	
SESSION 5: Introduction to the FMS	▪ Overview of the FMS ▪ Entering PAV information *Exercise: Entering Preassessment Information into the FMS*
Day 1 Wrap-up	▪ Remaining questions from Day 1 ▪ Meet with Field Manager

Exhibit F-1. Test administrator training agenda – national—Continued

PISA 2015
Test Administrator Training Agenda
August 19-21, 2015

Day 2 – Thursday, August 20, 2015, 9:00 – 5:30

SESSION	TOPICS
Welcome to Day 2	▪ Remaining Questions from Day 1
SESSION 6: Activities to Complete Before Assessment Day	▪ Preparing materials *Exercise: Preparing Materials* • Gathering materials to bring to the assessment
SESSION 7: Assessment Day Activities	▪ Arriving at the school ▪ Meeting with school coordinator ▪ Setting up the laptops ▪ Beginning the session ▪ Monitoring the session ▪ Ending the session and dismissing students ▪ Repacking the Pelican Cases *Group Work: Session Script* *Exercise: Assessment Day Scenarios* *Exercise: Completing the Session Report Form*
Morning Break	
SESSION 8: Conducting the Computer-Based Assessment	• Flash drive and equipment overview • Mock assessment demonstration by trainers
Lunch	
	Group Work: Setting up the Laptops, Logging Students into the Assessment, Repacking the Pelican Cases
Day 2 Wrap-up	▪ Remaining questions from Day 2

2

Exhibit F-1. Test administrator training agenda – national—Continued

PISA 2015
Test Administrator Training Agenda
August 19-21, 2015

Day 3 – Friday, August 21, 2015, 9:00 – 5:30

SESSION	TOPICS
Welcome to Day 3	▪ Remaining Questions from Day 2
SESSION 9: Activities to Complete After the Session	▪ Determining a Makeup *Exercise: Determining a Makeup* ▪ Finalizing assessment materials ▪ Finalizing the School Storage Envelope *Exercise: How to Organize Materials and Forms* ▪ Conducting the School Coordinator Debriefing Interview
Morning Break	
SESSION 10: Activities to Complete at Home	▪ Updating the FMS with post-assessment information ▪ Finalizing the School Folder
Lunch	
	▪ Uploading and transmitting student data to Westat *Exercise: Uploading and Transmitting Student Data*
SESSION 11: Training Your AAs	▪ Conducting the AA Training
Afternoon Break	
SESSION 12: TA Training Wrap-up	▪ Administrative activities ▪ DCIUFs ▪ Meet with Field Manager

Exhibit F-2. Assistant administrator training agenda – national

Program for International Student Assessment (PISA) 2015

Assistant Administrator Training Agenda
August 2015

SESSION	TOPICS
SESSION 1: Welcome and Overview	▪ Overview of PISA 2015
SESSION 2: Key PISA Materials	▪ Adhering to Security and Confidentiality Guidelines ▪ Understanding sampling and tracking forms ▪ PISA accommodations
SESSION 3: Activities to Complete Before Assessment Day	▪ Preparing the assessment materials *Exercise: Preparing Materials* ▪ Gathering Materials to Bring to the Assessment
SESSION 4: Activities to Complete Upon Arriving at the School	▪ Arriving at the school ▪ Setting up the room
Lunch	
SESSION 5: Conducting the Assessment Sessions	▪ Beginning the session and logging students into the assessment ▪ Monitoring the session ▪ Ending the session and dismissing students ▪ Repacking the Pelican Cases *Group Work: Reviewing Session Scripts (Main, FL, and UH)* *Exercise: Setting Up for CBA Sessions (Setting up and Breaking Down Computers)*
SESSION 6: Activities to Complete After the Session	▪ Finalizing Sampling and Tracking Forms
SESSION 7: Training Wrap-up	▪ Any remaining questions from training? ▪ Share assessment schedule (if not already done) ▪ Discuss outstanding travel details (if necessary) ▪ View electronic timesheet videos ▪ View Code of Conduct and Ethics Training video

Appendix G. Item Reliability

Table G-1. PISA 2015 Item reliabilities

Item	Item description	2015 IRR Percent
	New Science	
14USPS131Q02	Good Vibrations_02	89
14USPS131Q04	Good Vibrations_04	89
14USPS268Q02	Algae	91
14USPS269Q01	Earths Temperature_01	96
14USPS269Q03	Earths Temperature_03	88
14USPS304Q01	Water_01	90
14USPS304Q03A	Water_03a	97
14USPS304Q03B	Water_03b	97
14USPS326Q01	Milk_01	86
14USPS326Q02	Milk_02	86
14USPS408Q03	Wild Oat Grass	92
14USPS416Q01	The Moon	99
14USPS425Q03	Penguin Island_03	89
14USPS425Q04	Penguin Island_04	94
14USPS428Q05	Bacteria in Milk	93
14USPS437Q06	Extinguishing Fires	95
14USPS438Q03	Green Parks	87
14USPS458Q01	The Ice Mummy	94
14USPS465Q01	Different Climates	90
14USPS495Q03	Radiotherapy	88
14USPS498Q04	Experimental Digestion	92
14USPS510Q04	Magnetic Hovertrain	88
14USPS514Q02	Development and Disaster_02	95
14USPS514Q03	Development and Disaster_03	93
14USPS514Q04	Development and Disaster_04	100
14USPS519Q01	Airbags_01	92
14USPS519Q03	Airbags_03	88
14USPS524Q07	Penicillin Manufacture	92
CS620Q04	Tornadoes	86
CS638Q05	Oil Spills	95
CS603Q02	Elephants and Acacia Trees	91
CS604Q04	Water from Fog	89
CS608Q04	Ammonoids	92
CS643Q03	Comparing Light Bulbs	98
CS643Q05	Comparing Light Bulbs	90
CS645Q04	Carbon Dioxide in Earth's Atmosphere	89
CS645Q05	Carbon Dioxide in Earth's Atmosphere	99
CS646Q04	Nanoparticles	97
CS646Q05	Nanoparticles	92

Table G-1. PISA 2015 Item reliabilities—Continued

Item	Item description	2015 IRR Percent
	New Science	
CS605Q04	Geothermal Energy	96
CS610Q01	Brain-Controlled Robotics	89
CS635Q03	Save the Fish	95
CS635Q05	Save the Fish	92
CS656Q02	Bird Migration	90
CS629Q01	Solar Cooker	94
CS629Q03	Solar Cooker	92
CS607Q03	Birds and Caterpillars	94
CS625Q01	Wildfires and the Fire Triangle	87
CS648Q01	Habitable Zone	86
CS648Q05	Habitable Zone	87
CS657Q04	Invasive Species	85
CS637Q01	Slope-Face Investigation	85
CS637Q05	Slope-Face Investigation	93
CS634Q03	Vaccination and Spreading of Disease	86
CS634Q05	Vaccination and Spreading of Disease	93
CS626Q04	Sounds in Marine Habitats	98
CS649Q02	Weather Balloon	98
CS602Q03	Urban Heat Island Effect	87
	Reading	
14USPR055Q02	Drugged Spiders_02	92
14USPR055Q03	Drugged Spiders_03	95
14USPR055Q05	Drugged Spiders_05	95
14USPR067Q04	Aesop_04	87
14USPR067Q05	Aesop_05	87
14USPR102Q04A	Shirts_04A	97
14USPR102Q05	Shirts_05	100
14USPR111Q02B	Exchange_02	85
14USPR111Q06B	Exchange_06	86
14USPR219Q01 - Part A	Employment_01	99
14USPR219Q01- Part B	Employment_01	100
14USPR219Q01- Part C	Employment_01	99
14USPR219Q01- Part D	Employment_01	100
14USPR219Q01- Part E	Employment_01	95
14USPR219Q02	Employment_02	92
14USPR227Q03	Optician_03	94
14USPR227Q06	Optician_06	96
14USPR404Q10A	Sleep_10A	93
14USPR404Q10B	Sleep_10B	86
14USPR406Q01	Kokeshi Dolls_01	99
14USPR406Q02	Kokeshi Dolls_02	85
14USPR406Q05	Kokeshi Dolls_05	95
14USPR412Q08	World Languages	92
14USPR420Q02	Children's Futures_02	100
14USPR420Q06	Children's Futures_06	85
14USPR420Q09	Children's Futures_09	100

Table G-1. PISA 2015 Item reliabilities—Continued

Item	Item description	2015 IRR Percent
	Reading	
14USPR420Q10	Children's Futures_10	94
14USPR432Q01	About a book_01	100
14USPR432Q05	About a book_05	94
14USPR437Q07	Narcissus	92
14USPR442Q02	Galileo_02	94
14USPR442Q03	Galileo_03	94
14USPR442Q05	Galileo_05	94
14USPR442Q06	Galileo_06	91
14USPR446Q06	Job Vacancy_06	98
14USPR453Q04	Summer Job_04	86
14USPR453Q06	Summer Job_06	97
14USPR455Q02	Chocolate and Health_02	92
14USPR455Q03	Chocolate and Health_03	100
14USPR456Q02	Biscuits_02	95
14USPR456Q06	Biscuits_06	97
14USPR460Q01	Gulf of Mexico	97
14USPR466Q02	Work Right_02	95
	Mathematics	
14USPM00KQ02	Wheelchair Basketball	100
14USPM155Q02	Population Pyramids_02	96
14USPM155Q03	Population Pyramids_03	90
14USPM406Q01	Running Tracks_01	98
14USPM406Q02	Running Tracks_02	100
14USPM446Q02	Thermometer Cricket_02	100
14USPM462Q01	Third Side	91
14USPM828Q02	Carbon Dioxide_02	99
14USPM905Q02	Tennis balls	96
14USPM906Q02	Crazy Ants	91
14USPM949Q03	Roof Truss Design	99
14USPM953Q02	Flu test_02	95
14USPM953Q04	Flu test_04	98
14USPM954Q02	Medicine doses_02	97
14USPM955Q01	Migration_01	100
14USPM955Q02	Migration_02	98
14USPM992Q03	Spacers_03	100
14USPM998Q02	Bike Rental_02	100
	Financial Literacy	
14USPF004Q03	Income tax	99
14USPF024Q02	Jacket sale	87
14USPF028Q02	Phone plans	87
14USPF036Q01	Online Shopping	91
14USPF051Q01	Bicycle Shop_01	93
14USPF051Q02	Bicycle Shop_02	93
14USPF054Q01	Email	93
14USPF058Q01	Personal Identification Number	90
14USPF068Q01	Job Change	91

Table G-1. PISA 2015 Item reliabilities—Continued

Item	Item description	2015 IRR Percent
	Financial Literacy	
14USPF082Q01	New Bike	98
14USPF102Q02	Gantica_02	92
14USPF103Q01	Investing	96
14USPF106Q01	Family Holiday (Vacation)	95
14USPF200Q01	Charitable Giving	90
14USPF201Q01	Emergency Funds	96
14USPF203Q01	No Credit	93

Appendix H. Selected Indices From OECD and U.S. Composites

This section explains the indices derived from the student and school questionnaires used in PISA 2015. This section of the appendix only covers indices that were used for the PISA 2015 National Report. For a detailed description of other PISA indices used in the international report and details on the methods used to create indices, see *PISA 2015 Technical Report* (OECD forthcoming).

Several PISA measures reflect indices that summarize responses from students and school representatives (typically principals) to a series of related questions. The questions were selected from a larger pool of questions on the basis of theoretical considerations and previous research. Structural equation modeling was used to confirm the theoretically expected behavior of the indices and to validate their comparability across countries when possible. For this purpose, a model was estimated separately for each country and collectively for all OECD countries.

There are two types of indices: simple indices and scale indices.

Simple indices are the variables that are constructed through the arithmetic transformation or recoding of one or more items, in exactly the same way across assessments. Here, item responses are used to calculate meaningful variables, such as the recoding of the four-digit ISCO-08 codes into "highest parents' socio-economic index (HISEI)."

Scale indices are the variables constructed through the scaling of multiple items. Scale scores for these indices are usually estimates of latent traits derived through item response theory (IRT) scaling of dichotomous or Likert-type items. Unless otherwise indicated, the index was scaled using a weighted maximum likelihood estimate (WLE) (Warm 1989), using a one-parameter item response model (a partial credit model was used in the case of items with more than two categories).

The scaling was done in three stages:

- The item parameters were estimated from equal-sized subsamples of students from each OECD country.
- The estimates were computed for all students and all schools by anchoring the item parameters obtained in the preceding step.
- The indices were then standardized so that the mean of the index value for the OECD student population was zero and the standard deviation was one (i.e., countries were weighted equally in the standardization process).

Sequential codes were assigned to the different response categories of the questions based on the question's location within the student or school questionnaire. It is important to note that negative values for an index do not necessarily imply that students responded negatively to the underlying questions. A negative value merely indicates that the respondents answered less positively than all respondents did on average. Likewise, a positive value on an index indicates that the respondents answered more favorably, or more positively, than respondents did, on average.

Terms enclosed in brackets < > in the following descriptions were replaced in the national versions of the student questionnaire by the appropriate national equivalent. For example, the term <qualification at ISCED level 5A> was translated in the United States into "Bachelor's degree, post-graduate certificate program, master's degree program or first professional degree program." Similarly the term <classes in the language of assessment> in Luxembourg was translated into "German classes" or "French classes," depending on whether students received the German or French version of the assessment instruments.

In addition to simple and scaled indices described in this annex, there are a number of variables from the student, school and teacher questionnaires that correspond to single items not used to construct indices. These non-recoded variables have prefix of "ST" for the student questionnaire item, "SC" for the items in the school questionnaire, and "TC" for the items in the teacher questionnaire. All the context questionnaires as well as the PISA international database, including all variables, are available through www.pisa.oecd.org.

Student-Level Simple Indices

Age

The variable AGE was calculated as the difference between the middle month and the year in which students were assessed and their month and year of birth, expressed in years and months.

Race/Ethnicity

Race/ethnicity data is indicated through a composite variable (RACETHC) and is obtained by asking two questions in the student questionnaire. Students were asked whether or not they were Hispanic or Latino (ST801). They were also asked about their race (ST802). In the case that students indicated they were more than one race, they were coded as multiracial. However, if a student indicated that they were Hispanic or Latino, their race/ethnicity was coded as such, regardless of what they identified for their race

Study Program

In PISA 2015, study programs available to 15-year-old students in each country were collected through the student questionnaire (ST002) and/or the student tracking form. All study programs were classified using ISCED (OECD, 1999). In the PISA international database, all national programs are indicated in a variable (PROGN) where the first six digits refer to the national center code and the last two digits to the nationally specific program code.

The following internationally comparable indices were derived from the data on study programs:

- Program level (ISCEDL) indicates whether students are (1) primary education level (ISCED 1); (2) lower secondary education level; or (3) upper secondary education level.
- Program designation (ISCEDD) indicates the designation of the study program: (1) = "A" (general programs designed to give access to the next program level); (2) = "B" (programs designed to give access to vocational studies at the next program level); (3) = "C" (programs designed to give direct access to the labor market); or (4) = "M" (modular programs that combine any or all of these characteristics).
- Program orientation (ISCEDO) indicates whether the program's curricular content is (1) general, (2) pre-vocational, (3) vocational, or (4) modular programs that combine any or all of these characteristics.

Occupational Status of Parents

Occupational data for both a student's mother and a student's father were obtained by asking constructed-response questions in the student questionnaire (ST014 and ST015). The responses were coded to

four-digit ISCO codes (ILO 1990) and then mapped to Ganzeboom *et al.*'s (1996) SEI index. Higher scores of SEI indicate higher levels of occupational status. The following three indices were obtained:

- mother's occupational status (OCOD1);
- father's occupational status (OCOD2); and
- the highest occupational level of parents (HISEI) that corresponds to the higher SEI score of either parent or to the only available parent's SEI score.

Educational Level of Parents

The educational level of parents was classified using ISCED (OECD 1999) based on students' responses in the student questionnaire (ST005, ST006, ST007 and ST008). It should be noted that the question format for school education in PISA 2015, PISA 2012, and PISA 2009 differs from the one used in PISA 2006, 2003 and 2000, but the method used to compute parental education has remained the same.

As in all previous years, indices were constructed by selecting the highest level for each parent and then assigning them to the following categories: (0) None, (1) ISCED 1 (primary education), (2) ISCED 2 (lower secondary), (3) ISCED Level 3B or 3C (vocational/pre-vocational upper secondary), (4) ISCED 3A (upper secondary) and/or ISCED 4 (non-tertiary post-secondary), (5) ISCED 5B (vocational tertiary), (6) ISCED 5A, 6 (theoretically oriented tertiary and post- graduate). The following three indices were developed:

- mother's educational level (MISCED);
- father's educational level (FISCED); and
- highest educational level of parents (HISCED) that corresponds to the higher ISCED level of either parent.

The index scores for HISCED were also converted into estimated years of schooling (PARED). For the conversion of level of education into years of schooling, see table H-1.

Table H-1. Levels of parental education converted into years of schooling: 2015

Education system	ISCED Level 1	ISCED Level 2	ISCED Levels3B or 3C	ISCED Level 3A and/or ISCED Level 4	ISCED Level 5A or ISCED Level 5B	ISCED Level 6
Albania	6.0	10.0	12.0	12.0	16.0	16.0
Algeria	5.0	9.0	11.0	12.0	12.0	15.0
Argentina	6.0	10.0	12.0	12.0	14.5	17.0
Australia	6.0	10.0	11.0	12.0	14.0	15.0
Austria	4.0	9.0	12.0	12.5	15.0	17.0
Belgium[1]	6.0	9.0	12.0	12.0	15.0	17.0
Brazil	5.0	9.0	12.0	12.0	14.5	17.0
B-S-J-G (China)	6.0	9.0	12.0	12.0	15.0	16.5
Bulgaria	4.0	8.0	10.0	12.0	15.0	17.5
Canada	6.0	9.0	12.0	12.0	15.0	17.0
Chile	6.0	8.0	12.0	12.0	16.0	17.0
Chinese Taipei	6.0	9.0	12.0	12.0	14.0	16.0
Colombia	5.0	9.0	11.0	11.0	14.0	15.5
Costa Rica	6.0	9.0	11.0	12.0	14.0	16.0
Croatia	4.0	8.0	11.0	12.0	15.0	17.0
Cyprus	6.0	9.0	12.0	12.0	15.0	16.5
Czech Republic	5.0	9.0	11.0	13.0	16.0	16.0
Denmark	7.0	10.0	13.0	13.0	16.0	18.0
Dominican Republic	6.0	9.0	11.0	12.0	14.0	16.0
Estonia	6.0	9.0	12.0	12.0	15.0	16.0
Finland	6.0	9.0	12.0	12.0	14.5	16.5
France	5.0	9.0	12.0	12.0	14.0	15.0
Georgia	5.0	9.0	13.0	13.0	15.0	17.0
Germany	6.0	9.0	11.0	12.0	13.0	15.5
Greece	4.0	10.0	13.0	13.0	15.0	18.0
Hong Kong (China)	6.0	9.0	11.5	12.0	15.0	17.0
Hungary	6.0	9.0	11.0	13.0	14.0	16.0
Iceland	4.0	8.0	10.5	12.0	13.5	16.5
Indonesia	7.0	10.0	13.0	14.0	16.0	18.0
Ireland	6.0	9.0	12.0	12.0	14.0	15.0
Israel	6.0	9.0	12.0	12.0	14.0	16.0
Italy	6.0	9.0	12.0	12.0	15.0	15.0
Japan	5.0	8.0	12.0	13.0	16.0	17.0
Jordan	6.0	9.0	12.0	12.0	14.0	16.0
Kazakhstan	6.0	10.0	12.0	12.0	14.5	16.0
Korea	4.0	9.0	11.5	12.5	14.0	15.0
Kosovo	6.0	9.0	12.0	12.0	14.0	16.0
Latvia	5.0	9.0	12.0	14.0	16.0	18.0
Lebanon	4.0	8.0	11.0	11.0	14.0	16.0
Lithuania	3.0	8.0	11.0	11.0	15.0	16.0
Luxembourg	6.0	9.0	12.0	13.0	16.0	17.0

See note at end of table.

Table H-1. Levels of parental education converted into years of schooling: 2015—Continued

Education system	ISCED Level 1	ISCED Level 2	ISCED Levels3B or 3C	ISCED Level 3A and/or ISCED Level 4	ISCED Level 5A or ISCED Level 5B	ISCED Level 6
Macao (China)	6.0	9.0	11.0	12.0	15.0	16.0
Malaysia	6.0	9.0	11.0	13.0	16.0	18.0
Malta	6.0	9.0	12.0	13.0	15.0	17.0
Mexico	6.0	9.0	12.0	12.0	14.0	16.0
Moldova	4.0	9.0	11.0	12.0	14.0	16.5
Montenegro	4.0	8.0	11.0	12.0	15.0	16.0
Netherlands	6.0	10.0	13.0	12.0	15.0	16.0
New Zealand	5.5	10.0	11.0	12.0	14.0	15.0
Norway	6.0	9.0	12.0	12.0	14.0	16.0
Peru	6.0	9.0	11.0	11.0	14.0	17.0
Poland	†	8.0	11.0	12.0	15.0	16.0
Portugal	6.0	9.0	12.0	12.0	15.0	17.0
Qatar	6.0	9.0	12.0	12.0	15.0	16.0
Romania	4.0	8.0	11.5	12.5	14.0	16.0
Russia	4.0	9.0	11.0	11.0	13.0	16.0
Singapore	6.0	8.0	10.0	11.0	13.0	16.0
Slovak Republic[2]	4.0	9.0	12.0	13.0	16.0	18.0
Slovenia	4.0	8.0	11.0	12.0	15.0	16.0
Spain	5.0	8.0	10.0	12.0	13.0	16.5
Sweden	6.0	9.0	11.5	12.0	14.0	16.0
Switzerland	6.0	9.0	12.5	12.5	14.5	17.5
Thailand	6.0	9.0	12.0	12.0	14.0	16.0
Trinidad and Tobago	5.0	9.0	12.0	12.0	15.0	16.0
Tunisia	6.0	9.0	12.0	13.0	16.0	17.0
Turkey	4.0	8.0	12.0	12.0	14.0	16.0
United Arab Emirates	5.0	9.0	12.0	12.0	15.0	16.0
United Kingdom	7.0	10.0	11.0	12.0	14.0	16.0
United States	6.0	9.0	†	12.0	14.0	16.0
Uruguay	6.0	9.0	12.0	12.0	15.0	17.0
Viet Nam	5.0	9.0	12.0	12.0	†	17.0

† Not applicable.
[1] In Belgium the distinction between universities and other tertiary schools doesn't match the distinction between ISCED 5A and ISCED 5B.
[2] In the Slovak Republic, university education (ISCED 5A) usually lasts five years and doctoral studies (ISCED 6) lasts three more years. Therefore, university graduates will have completed 18 years of study and graduates of doctoral programs will have completed 21 years of study.
NOTE: The indicated levels of education are for completed levels. ISCED Level 1 is classified as primary education. ISCED Level 2 is classified as lower secondary education. ISCED Levels 3B and 3C are classified as upper secondary education providing direct access to the labor market or to ISCED 5B programs. ISCED Level 3A is classified as upper secondary education providing access to ISCED 5A and ISCED 5B programs. ISCED Level 4 is classified as nontertiary post-secondary education. ISCED Level 5A is classified as university level tertiary education and ISCED Level 6 is classified as advanced research programs. ISCED Level 5B is classified as non-university tertiary education. Italics indicate non-OECD countries and education systems.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015

Student-Level Scale Indices

Family Wealth

The *index of family wealth* (WEALTH) is based on the students' responses to two questions asking them to specify certain assets or possessions in their home. More specifically, the index is based on whether they had the following at home: a room of their own, a link to the Internet, and three other country-specific items—a guest room, a high speed internet connection, and a musical instrument (select items in ST011); and their responses on the number of televisions, cars, rooms with a bath or shower, cellular phones with internet access, computers, tablets, and E-book readers (see ST012).

Home Educational Resources

The *index of home educational resources* (HEDRES) is based on a question asking students to identify certain assets or possessions in their home (select items in ST011). The items used for this index measure the existence of educational resources at home and include having a desk and a quiet place to study, a computer that students can use for schoolwork, educational software, books to help with students' school work, technical reference books, and a dictionary.

Cultural Possessions

The *index of cultural possessions* (CULTPOSS) was based on the students' responses to whether they had the following at home: classic literature, books of poetry, works of art, books on art, music or design, and musical instruments (select items in ST011 and ST012).

Economic, Social and Cultural Status

The *PISA index of economic, social and cultural status* (ESCS) was derived from the following three indices: highest occupational status of parents (HISEI), highest educational level of parents in years of education according to ISCED (PARED), and home possessions (HOMEPOS). The *index of home possessions* (HOMEPOS) comprises all items on the indices of WEALTH , HEDRES, and CULTPOSS, as well as books in the home recoded into a four-level categorical variable (0-10 books, 11-25 or 26-100 books, 101-200 or 201-500 books, more than 500 books).

The *PISA index of economic, social and cultural status* (ESCS) was derived from a principal component analysis of standardized variables (each variable has an OECD mean of zero and a standard deviation of one), taking the factor scores for the first principal component as measures of the index of economic, social and cultural status.

Principal component analysis was also performed for each participating country to determine to what extent the components of the index operate in similar ways across countries. The analysis revealed that patterns of factor loading were very similar across countries, with all three components contributing to a similar extent to the index. For more detail on the patterns of factor loading, please see the *PISA 2015 Technical Report* (OECD forthcoming).

The imputation of components for students' missing data on one component was done on the basis of a regression on the other two variables, with an additional random error component. The final values on the *PISA index of economic, social and cultural status* (ESCS) have an OECD mean of 0 and a standard deviation of 1.

School-Level Simple Indices

School Poverty

The index for school poverty (FRPL) was derived from a question (SC801) asking schools (primarily principals) the approximate percentage of students at their school who were eligible for free or reduced-price lunches through the National School Lunch Program during the previous year. The National School Lunch Program provides free or reduced-price lunch for students meeting certain income guidelines in public schools. Thus, this index applies only to public schools.

Appendix I. PISA 2015 Nonresponse Bias Analysis Report

1. Introduction

The U.S. PISA study, supported by the National Center for Education Statistics (NCES), used a two-stage stratified sampling design. The first stage made use of a systematic probability-proportionate-to-size technique to select schools where size is the estimated age-eligible enrollment of the school. Although efforts were made to secure the participation of all schools selected in the first stage, it was anticipated that not all schools would choose to participate. Therefore, as each school was selected in the sample, the two neighboring schools in the sorted sampling frame (immediately preceding and following the selected school) were designated as substitute schools. The sampling frame was sorted by explicit strata and secondarily by implicit strata, so the replacement schools were within the same strata as the original school. If the sampled school refused to participate, the first substitute was then contacted. If that school also refused to participate, the second substitute was then contacted.

Within each school, a sample of 42 students was selected in an equal probability sample, unless fewer than 42 students aged 15 were available (in which case all students were selected). International standards required that students be sampled based on an age definition of 15 years and 3 months to 16 years and 2 months at the beginning of the testing period.

The sample of teachers was selected in a similar manner as the student sample. Eligible teachers were those eligible to teach grade 10 (the modal grade) and were selected with equal probability. A total of up to 25 teachers were selected (up to 10 science teachers and 15 non-science teachers).

The PISA national data collection was fielded in October and November 2015. There were 240 schools in the original national sample. Of these 240 sampled schools, 213 were determined to be eligible[6] (the eligible original school sample) having at least one 15-year-old student, and of these, 142 participated (the participating original sample) for an initial unweighted response rate of 67 percent before replacement (also 67 percent weighted). An additional 35 substitute schools participated for a total of 177 participating schools after replacement (the participating final sample). The unweighted response rate increased to 83 percent (also 83 percent weighted). The school participation rates for the United States, Massachusetts, North Carolina, and Puerto Rico samples are summarized in table I-1.

[6] Of the 240 original schools selected for the sample, 27 schools were ineligible or closed.

For the purposes of calculating response rates, international PISA standards stipulated that schools with a student participation rate between 25 percent and 50 percent was not considered as a participating school for the purposes of calculating and documenting response rates. However, data from such schools were included in the database and contributed to the estimates included in the initial PISA international report. Data from schools with a student participation rate of less than 25 percent were not included in the database, and such schools were regarded as nonrespondents. One Massachusetts state substitute school with less than 50 percent of students participating had a student response rate of at least 25 percent, so this school and students were included in the PISA 2015 database and the school treated as a participant in this report.

Table I-1. Selected characteristics for the nonresponse bias analysis of the U.S. PISA final school sample: 2015

			Number of participating schools		Percent			
					School participation rate before replacement		School participation rate after replacement	
Sample	Schools in original sample	Eligible schools in sample	Before replacement	After replacement	Un-weighted	Weighted	Un-weighted	Weighted
U.S.	240	213	142	177	66.7	66.7	83.1	83.3
Massachu-setts	58	53	41	49	77.4	78.4	92.5	93.8
North Carolina	59	54	54	54	100.0	100.0	100.0	100.0
Puerto Rico	55	47	47	47	100.0	100.0	100.0	100.0

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

The student and teacher participation rates after replacement for the U.S., Massachusetts, North Carolina, and Puerto Rico samples are summarized in table I-2.

Table I-2. Student and teacher participation rates after replacement of the U.S. PISA final school sample: 2015

	Percent			
	Student participation rate		Science teacher participation rate	Non-science teacher participation rate
Sample	Unweighted	Weighted	Unweighted	Unweighted
United States	89.6	89.8	87.2	88.5
Massachusetts	90.3	90.1	90.5	89.4
North Carolina	92.6	92.4	97.2	95.5
Puerto Rico	93.6	93.1	†	†

† Not applicable. Puerto Rico did not administer the teacher questionnaire.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

NCES standards for assessment surveys stipulate that a nonresponse bias analysis is required at any stage of data collection reporting a weighted unit response rate less than 85 percent. Since the United States and Massachusetts PISA weighted school response rates are below 85 percent, NCES requires an investigation into the potential magnitude of nonresponse bias at the school level in the U.S. and Massachusetts samples.

Because the U.S., Massachusetts, North Carolina, and Puerto Rico PISA weighted student response rates and U.S., Massachusetts, and North Carolina unweighted teacher response rates (weighted teacher rates are not computed) are above 85 percent, a nonresponse bias analysis at the student and teacher level is not required. Puerto Rico did not administer a teacher questionnaire.

2. Methodology

To measure the potential nonresponse bias at the school level, the characteristics of participating schools were compared to those of the total eligible sample of schools. This was conducted in a way so that the tests of statistical significance that were applied account for the fact that the participating schools are a subset of the eligible schools, and not a distinct group.

The general approach taken involves an analysis in three parts as described for the U.S. analysis below. Sections 3–6 covers the U.S. analysis, and sections 7–10 covers the Massachusetts analysis.

1. Analysis of the participating original sample: The distribution of the participating original school sample (N = 142) was compared with that of the total eligible original school sample (N = 213). The participating original sample is the sample before substitution. In each sample, schools were weighted by their school base weights and

enrollment of eligible students, excluding any nonresponse adjustment factor. The base weight for each original school is the reciprocal of its selection probability.

2. Analysis of the participating final school sample with substitutes: The distribution of the participating final school sample (N = 177), which includes 35 participating substitutes that were used as replacements for nonresponding schools from the eligible original sample, was compared to the total eligible final school sample (N = 213). The total eligible final sample includes the participating final sample plus those original nonrespondents that were not replaced by substitutes. Again, schools were weighted by their school base weights and enrollment of eligible students for both the eligible sample and the participating schools. The base weight for each substitute school is the reciprocal of its selection probability.

3. Analysis of the nonresponse adjusted final sample with substitutes: The same sets of schools were compared as in the second analysis, but this time, when analyzing the participating final schools alone, school nonresponse adjustments were applied to the weights. The international weighting procedures form nonresponse adjustment classes by cross-classifying the explicit and implicit stratification variables.

The first analysis indicates the potential for nonresponse bias that was introduced through school nonresponse. The second analysis suggests the remaining potential for nonresponse bias after the mitigating effects of substitution have been accounted for. The third analysis indicates the potential for bias after accounting for the mitigating effects of both substitution and nonresponse weight adjustments. Both the second and third analyses, however, may provide an overly optimistic scenario, resulting from the fact that substitution and nonresponse adjustments may correct somewhat for deficiencies in the characteristics examined here, but there is no guarantee that they are equally as effective for other characteristics and, in particular, for student achievement.

Participating PISA schools and the total eligible PISA school sample were compared by as many school sampling frame characteristics as possible that might provide information about the presence of nonresponse bias. Comparing frame characteristics between participating schools and the total eligible school sample is not an ideal measure of nonresponse bias if the characteristics are unrelated or weakly related to more substantive items in the survey; however, often it is the only approach available since PISA data are not available for nonparticipating schools. While the school-level characteristics used in these analyses are limited to those available in the sampling frame, each of the variables had a demonstrated relationship to achievement in previous PISA cycles.

Frame characteristics for public schools were from the 2012-13 Common Core of Data (CCD) and, for private schools, from the 2011-12 Private School Universe Survey (PSS).

The following categorical variables were available in the sampling frame for all schools:

- School control—indicates whether the school is under public control (operated by publicly elected or appointed officials) or private control (operated by privately elected or appointed officials and derives its major source of funds from private sources);
- Locale—urban-centric locale code (i.e., central city, suburb, town, rural);
- Census region—Northeast, Midwest, South, and West (see appendix A for state listing); and
- Poverty level[7]—for public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the national free and reduced-price lunch (FRPL) program, and a low poverty school is defined as one in which less than 50 percent are eligible.

The following continuous variables were available in the sampling frame for all schools:

- Estimated number of 15-year-old eligible students enrolled;
- Total number of students; and
- Percentage of students in seven race/ethnicity categories (White, non-Hispanic; Black, non-Hispanic; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and two or more races).[8]

An additional continuous variable, the percentage of students eligible to participate in the FRPL, was available only for public schools. The poverty level variable mentioned among the categorical variable is the recoded version of this continuous variable.[9]

For categorical variables, the distribution of frame characteristics for participating schools was compared with the distribution for all eligible schools. The hypothesis of independence between the characteristic and participation status was tested using a Rao-Scott modified Chi-square statistic at the 5 percent level (Rao and Thomas 2003). For continuous variables, summary means were calculated and the difference between means was tested using a *t* test. The *p*-values for the tests are presented in the tables that follow. The statistical significance of differences between participants and the total eligible sample is identical to that which would result from comparing participants and nonparticipants, since all significance tests account for the fact that the participants are a subset of the full sample. The bias and relative bias are also shown in

[7] The sample frame did not contain a direct measure of poverty. No free or reduced-price lunch (FRPL) program data were available for private schools, thus all private schools are treated as low-poverty schools.
[8] Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin.
[9] The continuous variable percentage of students eligible to participate in the FRPL is missing for private schools; however, private schools are treated as low poverty for the categorical variable poverty level. The nonresponse bias analysis was designed to measure the potential nonresponse bias for all participating schools, so no additional logistic regression was conducted using only public schools.

each table. The bias is calculated as the difference between the respective estimates for the participants and the eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. The relative bias is a measure of the size of the bias compared to the eligible sample estimate.

In addition to these tests, logistic regression models were used to provide a multivariate analysis that examined the conditional independence of these school characteristics as predictors of participation. It may be that only one or two variables are actually related to participation status. However, if these variables are also related to the other variables examined in the analyses, then other variables, which are not related to participation status, will appear as significant in simple bivariate tables. Dummy variables were created for each component of the categorical variables so that each component was included separately. The last component of each categorical variable is used as the reference category. The *p*-value of a dummy variable indicates whether there is a significant difference at the 5 percent level from the effect of the (omitted) reference category. It is not possible to include all the frame characteristics in a single model because the seven race/ethnicity variables are linearly dependent (i.e., they sum up to 100 percent for every school). Therefore, two models were used. In the first model, six race/ethnicities (Black, non-Hispanic; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and two or more races) were included in the model with "percentage White, non-Hispanic" as the reference category. In addition, an *F* test was used to determine whether the parameter estimates of these six characteristics were simultaneously equal to zero. In the second model, the summed percentage of the six race/ethnicities (Black, non-Hispanic; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and two or more races) replaced the six race/ethnicity variables with "percentage White, non-Hispanic" again as the reference category. The second model permits the analysis of differences in the percentages of White, non-Hispanic students, which is not possible in the first model. All other frame characteristics were included in both models.

Because the percentage of students eligible for free or reduced-price lunch was not included in the main logistic regression analysis, a separate analysis with public schools only was conducted. To include free or reduced-price lunch eligibility in a model, public schools were modeled separately using a third model with the summed race/ethnicity percentage and adding the percentage of students eligible for free or reduced-price lunch. Since poverty is derived from the percentage of students eligible for free or reduced-price lunch, an interaction term was also included in the model.

The logistic regression was performed using WesVar® (Westat 2007) and replicate weights to properly account for the complex sample design. The balanced repeated replication (BRR), the Fay method of BRR, was used to create the replicate weights (Westat 2007).

3. Participating Original Sample – United States

This section presents the nonresponse bias analysis based on the original sample of 207 eligible schools for PISA. The distribution of the participating original sample was compared to the schools in the total eligible original sample. School base weights were used for both the eligible sample and the participating schools. The unweighted school response rate for PISA was 67.1 percent, with 139 out of 207 schools participating. The weighted response rate was also 67.1 percent.

3.1 Categorical Variables

The distribution of participating and eligible schools by the four characteristics is shown in table I-3. The Chi-square statistic for census region is significant and suggests that there is evidence of relationships with participation in the assessment. In particular, schools in the Northeast were underrepresented among participating schools relative to eligible schools (12.6 vs. 17.1 percent, respectively), while schools in the South were overrepresented among participating schools (43.3 vs. 37.8 percent, respectively). There are no statistically significant relationships between participation status and any of the other characteristics shown in table I-3. However, the absolute value of the relative bias for private schools and schools in towns is greater than 10 percent, which indicates potential bias even though no statistically significant relationship was detected.

Table I-3. Percentage distribution of eligible and participating schools in the U.S. PISA original sample, by selected categorical variables: 2015

School characteristic	Sample schools: Eligible (percent) (N=213)	Sample schools: Participating (percent) (N=142)	Bias	Relative bias	Chi-square *p*-value
School control					0. 102
Public	92.2	94.5	2.24	0.024	
Private	7.8	5.5	-2.24	-0.288	
Locale					0.212
Central city	31.1	31.0	-0.04	-0.001	
Suburb	39.3	37.7	-1.60	-0.041	
Town	9.8	12.8	2.98	0.304	
Rural	19.9	18.5	-1.34	-0.067	
Census region					**0.020**
Northeast	17.1	12.6	-4.51	-0.264	
Midwest	20.4	18.1	-2.26	-0.111	
South	37.8	43.3	5.50	0.145	
West	24.7	26.0	1.27	0.051	
Poverty level					0.291
High	23.3	25.4	2.08	0.089	
Low	76.7	74.6	-2.08	-0.027	

NOTE: Detail may not sum to totals because of rounding. Census region is the state-based region of the country (see technical notes for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL; all private schools are treated as low-poverty schools. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

3.2 Continuous Variables

Summary means for each continuous variable for participating and eligible schools are shown in tables I-4 and I-5. No data on FRPL eligibility were available for private schools, so these are not included in the analysis.

There were no statistically significant differences between participating and eligible schools with respect to student enrollment size (table I-4). Participating schools had a lower mean percentage of White, non-Hispanic students than the eligible sample (49.1 vs. 53.1 percent, respectively; table I-4) and a higher mean percentage of Hispanic students than the eligible sample (27.4 vs. 24.6 percent, respectively; table I-4).

There was no statistically significant difference between participating and eligible schools with respect to free or reduced-price lunch (table I-5).

Table I-4. Mean values of various characteristics for eligible and participating schools in the U.S. PISA original sample: 2015

	Sample schools				
	Eligible (mean) (N=213)	Participating (mean) (N=142)	Bias	Relative bias	*t* test *p*-value
Enrollment					
Total school enrollment	1370.1	1433.0	62.91	0.046	0.232
Age-eligible enrollment	340.5	354.1	13.58	0.040	0.312
Race/ethnicity percentage					
White, non-Hispanic	53.1	49.1	-4.00	-0.075	**0.016**
Black, non-Hispanic	15.5	16.7	1.15	0.074	0.309
Hispanic	24.6	27.4	2.85	0.116	**0.038**
Asian	3.6	3.6	-0.06	-0.017	0.841
American Indian or Alaska Native	0.9	1.0	0.07	0.076	0.557
Hawaiian/Pacific Islander	0.2	0.2	-0.01	-0.055	0.662
Two or more races	2.1	2.1	0.00	0.002	0.975

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table I-5. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the U.S. PISA original sample: 2015

	Sample schools				
Students	Eligible (percent) (N=137)	Participating (percent) (N=93)	Bias	Relative bias	*t* test *p*-value
Percentage of students eligible for free or reduced-price lunch	44.0	45.1	1.10	0.025	0.517

NOTE: Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school nonresponse adjusted weights, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

3.3 Logistic Regression Model

To examine the joint relationship of various characteristics to school nonresponse, the analysis used a logistic regression model with participation status as the binary dependent variable and frame characteristics as predictor variables. Since public and private schools were modeled together using the variables available for all schools, the percentage of students eligible for free or reduced-price lunch was not included in the main logistic regression analysis.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table I-6a (with six race/ethnicity variables) and table I-6b (with summed race/ethnicity percentage). None of the parameter estimates are significant in table I-6a. The *F* test statistic to determine whether the race/ethnicity characteristics are simultaneously equal to 0 was 0.71 with a *p*-value of 0.6202, which indicates that no significant relationship with participation was detected. None of the parameter estimates are significant in table I-6b.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table I-6c (with public schools only). Town, South region, and the interaction term were significant predictors of school participation among public schools only. The positive parameter estimates indicate that:

- relative to rural public schools, public schools in towns were somewhat overrepresented among the participating public schools; and
- relative to public schools in the West region, public schools in the South region were somewhat overrepresented among the participating public schools.

The *F* test statistic to determine whether the sum of the parameter estimates for high poverty and the interaction term is equal to 0 was 3.61 with a *p*-value of 0.0611, which indicates that no significant relationship with participation was detected. The model with the six race/ethnicity variables is not shown due to complex interactions that make the results difficult to interpret.

Table I-6a. Logistic regression model parameters (with six race/ethnicity variables) using the U.S. PISA original school sample: 2015

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p*-value
Intercept	-0.187	0.7539	-0.2480	0.8048
Private school	-0.741	0.5219	-1.4201	0.1595
Central city	-0.352	0.5473	-0.6431	0.5220
Suburb	-0.251	0.4994	-0.5024	0.6168
Town	1.354	0.8898	1.5218	0.1320
Northeast	-0.488	0.5336	-0.9142	0.3633
Midwest	-0.068	0.5786	-0.1177	0.9066
South	0.588	0.6123	0.9608	0.3395
High poverty	0.171	0.4406	0.3871	0.6997
Total school enrollment	0.002	0.0011	1.7441	0.0850
Age-eligible enrollment	-0.007	0.0043	-1.6565	0.1015
Black, non-Hispanic	0.009	0.0101	0.8801	0.3814
Hispanic	0.012	0.0080	1.5263	0.1309
Asian	0.017	0.0272	0.6290	0.5311
American Indian or Alaska Native	0.048	0.0609	0.7873	0.4334
Hawaiian/Pacific Islander	-0.116	0.5301	-0.2189	0.8273
Two or more races	0.057	0.0888	0.6440	0.5214

NOTE: Census region is the state-based region of the country (see technical notes for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL; all private schools are treated as low poverty schools. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table I-6b. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. PISA original school sample: 2015

Parameter	Parameter estimate	Standard error	*t* test for H0: parameter = 0	*p*-value
Intercept	-0.009	0.6765	-0.0128	0.9898
Private school	-0.639	0.5190	-1.2317	0.2217
Central city	-0.323	0.5233	-0.6163	0.5395
Suburb	-0.221	0.4412	-0.5015	0.6174
Town	1.337	0.8794	1.5199	0.1325
Northeast	-0.611	0.5128	-1.1922	0.2367
Midwest	-0.139	0.5358	-0.2594	0.7960
South	0.485	0.4770	1.0174	0.3120
High poverty	0.100	0.4065	0.2454	0.8068
Total school enrollment	0.002	0.0011	1.7120	0.0908
Age-eligible enrollment	-0.007	0.0043	-1.6258	0.1079
Summed race/ethnicity percentage	0.011	0.0062	1.7963	0.0762

NOTE: Census region is the state-based region of the country (see technical notes for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL; all private schools are treated as low poverty schools. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table I-6c. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. PISA original public school sample: 2015

Parameter	Parameter estimate	Standard error	*t* test for H0: parameter = 0	*p*-value
Intercept	-2.234	1.1873	-1.8816	0.0635
Central city	-0.501	0.8267	-0.6055	0.5465
Suburb	-0.308	0.6624	-0.4652	0.6431
Town	13.826	1.0830	12.7666	**0.0000**
Northeast	0.228	0.7450	0.3062	0.7602
Midwest	1.135	0.8997	1.2620	0.2106
South	1.905	0.7866	2.4219	**0.0177**
High poverty	6.196	3.1553	1.9637	0.0530
Free or reduced-price lunch eligibility	0.023	0.0245	0.9467	0.3466
High poverty * free or reduced-price lunch eligibility	-0.101	0.0463	-2.1875	**0.0316**
Total school enrollment	0.003	0.0022	1.3997	0.1655
Age-eligible enrollment	-0.010	0.0085	-1.2055	0.2316
Summed race/ethnicity percentage	0.019	0.0134	1.4421	0.1532

NOTE: Census region is the state-based region of the country (see technical notes for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

4. Participating Final Sample with Substitutes – United States

This section presents the nonresponse bias analysis based on the final sample of 213 eligible schools for the U.S. PISA sample including participating substitute schools. The distribution of the participating final sample of schools was compared to the schools in the total eligible final sample. The total eligible final sample includes participating final sample plus those original nonrespondents who were not replaced by substitutes. School base weights were used for both the eligible sample and the participating schools. Through the use of substitute schools, the unweighted school response rate for PISA was 83.1 percent, with 177 out of 213 schools participating. The weighted response rate was 83.3 percent.

4.1 Categorical Variables

The distribution of participating and eligible schools by the four characteristics is shown in table I-7. There are no statistically significant relationships between participation status and any of the characteristics shown in table I-7. However, the absolute value of the relative bias for private schools, schools in towns, and the Northeast region are greater than 10 percent, which indicates potential bias even though no statistically significant relationships were detected.

Table I-7. Percentage distribution of eligible and participating schools in the U.S. PISA final sample, by selected categorical variables: 2015

School characteristic	Sample schools: Eligible (percent) (N=213)	Sample schools: Participating (percent) (N=177)	Bias	Relative bias	Chi-square *p*-value
School control					0.094
Public	92.3	94.4	2.10	0.023	
Private	7.7	5.6	-2.10	-0.272	
Locale					0.203
Central city	31.1	29.6	-1.49	-0.048	
Suburb	39.2	40.0	0.84	0.021	
Town	9.8	11.4	1.61	0.164	
Rural	19.9	18.9	-0.96	-0.049	
Census region					0.135
Northeast	17.1	14.5	-2.57	-0.150	
Midwest	20.2	19.4	-0.87	-0.043	
South	37.9	40.5	2.65	0.070	
West	24.8	25.6	0.79	0.032	
Poverty level					0.274
High	24.9	26.3	1.45	0.058	
Low	75.1	73.7	-1.45	-0.019	

NOTE: Detail may not sum to totals because of rounding. Census region is the state-based region of the country (see technical notes for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL; all private schools are treated as low poverty schools. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

4.2 Continuous Variables

Summary means for each continuous variable for participating and eligible schools are shown in tables I-8 and I-9. No data on FRPL eligibility were available for private schools, so these are not included in the analysis.

There were no statistically significant differences between participating and eligible schools with respect to student enrollment or race/ethnicity percentage (table I-8). There was also no statistically significant difference between participating and eligible schools with respect to free or reduced-price lunch (table I-9).

Table I-8. Mean values of various characteristics for eligible and participating schools in the U.S. PISA final sample: 2015

	Sample schools				
Characteristic	Eligible (mean) (N=213)	Participating (mean) (N=177)	Bias	Relative bias	*t* test *p*-value
Enrollment					
Total school enrollment	1355.0	1400.1	45.07	0.033	0.136
Age-eligible enrollment	335.7	345.4	9.67	0.029	0.210
Race/ethnicity percentage					
White, non-Hispanic	51.5	50.1	-1.36	-0.026	0.225
Black, non-Hispanic	16.9	17.0	0.08	0.005	0.928
Hispanic	24.6	26.0	1.34	0.055	0.105
Asian	3.9	3.9	-0.04	-0.009	0.879
American Indian or Alaska Native	0.9	0.8	-0.01	-0.007	0.945
Hawaiian/Pacific Islander	0.2	0.2	0.00	-0.001	0.993
Two or more races	2.0	2.0	-0.02	-0.010	0.770

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table I-9. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the U.S. PISA final sample: 2015

Students	Sample schools: Eligible (percent) (N=137)	Sample schools: Participating (percent) (N=115)	Bias	Relative bias	*t* test *p*-value
Percentage of students eligible for free or reduced-price lunch	44.6	44.7	0.07	0.002	0.950

NOTE: Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school nonresponse adjusted weights, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

4.3 Logistic Regression Model

To examine the joint relationship of various characteristics to school nonresponse, the analysis used a logistic regression model with participation status as the binary dependent variable and frame characteristics as predictor variables. Since public and private schools were modeled together using the variables available for all schools, the percentage of students eligible for free or reduced-price lunch was not included in the main logistic regression analysis.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table I-10a (with six race/ethnicity variables) and table I-10b (with summed race/ethnicity percentage). None of the parameter estimates are significant in table I-10a. The *F* test statistic to determine whether the race/ethnicity characteristics are simultaneously equal to 0 was 0.17 with a *p*-value of 0.9743, which indicates no significant relationship was detected with participation. None of the parameter estimates are significant in table I-10b.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table I-10c (with public schools only). Only town was a significant predictor of school participation among public schools only. The positive parameter estimates indicate that relative to rural public schools, public schools in towns were overrepresented among the participating public schools. The model with the six race/ethnicity variables is not shown due to complex interactions that make the results difficult to interpret.

Table I-10a. Logistic regression model parameters (with six race/ethnicity variables) using the U.S. PISA final school sample: 2015

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p*-value
Intercept	1.045	0.8036	1.3005	0.1972
Private school	-1.247	0.7811	-1.5967	0.1143
Central city	-0.249	0.6323	-0.3943	0.6944
Suburb	0.315	0.5925	0.5314	0.5966
Town	2.095	1.1916	1.7583	0.0825
Northeast	-0.707	0.7645	-0.9250	0.3577
Midwest	-0.165	0.7477	-0.2202	0.8263
South	0.598	0.7081	0.8446	0.4008
High poverty	0.378	0.5545	0.6819	0.4972
Total school enrollment	0.002	0.0017	1.4520	0.1504
Age-eligible enrollment	-0.009	0.0065	-1.3832	0.1704
Black, non-Hispanic	#	0.0105	-0.0038	0.9970
Hispanic	0.007	0.0110	0.6798	0.4986
Asian	0.013	0.0419	0.3088	0.7583
American Indian or Alaska Native	0.024	0.0610	0.3962	0.6930
Hawaiian/Pacific Islander	0.139	0.5194	0.2677	0.7896
Two or more races	-0.020	0.1020	-0.2008	0.8414

Rounds to zero.

NOTE: Census region is the state-based region of the country (see technical notes for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL; all private schools are treated as low poverty schools. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table I-10b. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. PISA final school sample: 2015

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p*-value
Intercept	1.210	0.7799	1.5512	0.1248
Private school	-1.130	0.7626	-1.4821	0.1422
Central city	-0.287	0.6127	-0.4682	0.6409
Suburb	0.270	0.5576	0.4839	0.6298
Town	2.089	1.2013	1.7394	0.0858
Northeast	-0.906	0.7024	-1.2896	0.2009
Midwest	-0.369	0.7299	-0.5051	0.6149
South	0.366	0.6507	0.5632	0.5749
High poverty	0.297	0.5046	0.5885	0.5578
Total school enrollment	0.002	0.0016	1.4853	0.1414
Age-eligible enrollment	-0.009	0.0062	-1.374	0.1733
Summed race/ethnicity percentage	0.005	0.0075	0.6054	0.5466

NOTE: Census region is the state-based region of the country (see technical notes for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL; all private schools are treated as low poverty schools. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table I-10c. Logistic regression model parameters (with summed race/ethnicity percentage) using the U.S. PISA final public school sample: 2015

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p*-value
Intercept	-0.068	1.3334	-0.0513	0.9592
Central city	0.746	1.0455	0.7138	0.4774
Suburb	1.172	0.7855	1.4920	0.1396
Town	13.994	0.7817	17.9015	**0.0000**
Northeast	0.343	0.8394	0.4092	0.6835
Midwest	0.763	1.0099	0.7555	0.4522
South	2.476	1.4312	1.7299	0.0875
High poverty	26.437	13.9433	1.8961	0.0616
Free or reduced-price lunch eligibility	0.013	0.0305	0.4229	0.6735
High poverty * free or reduced-price lunch eligibility	-0.330	0.1700	-1.9434	0.0555
Total school enrollment	-0.005	0.0038	-1.3699	0.1745
Age-eligible enrollment	0.019	0.0143	1.3464	0.1820
Summed race/ethnicity percentage	0.006	0.0166	0.3584	0.7210

NOTE: Census region is the state-based region of the country (see technical notes for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

5. Nonresponse-adjusted Final Sample with Substitutes – United States

This section presents the nonresponse bias analysis based on the final sample of 213 eligible schools for the U.S. PISA sample. The distribution of the participating final sample, including participating substitute schools, was compared to the schools in the total eligible final sample, just like the previous section. However, in the analyses that follow, school base weights were used for the eligible sample of schools, whereas nonresponse-adjusted weights were used for the participating schools.

5.1 Categorical Variables

The distribution of participating and eligible schools by the four characteristics is shown in table I-11. There are no statistically significant relationships between participation status and any of the other characteristics shown in table I-11.

Table I-11. Percentage distribution of eligible and participating schools in the U.S. PISA nonresponse-adjusted sample, by selected categorical variables: 2015

School characteristic	Sample schools: Eligible (percent) (N=213)	Sample schools: Participating (percent) (N=177)	Bias	Relative bias	Chi-square *p*-value
School control					0.317
Public	92.3	92.3	0.00	0.000	
Private	7.7	7.7	0.00	0.001	
Locale					0.661
Central city	31.1	30.8	-0.30	-0.010	
Suburb	39.2	39.5	0.32	0.008	
Town	9.8	10.4	0.60	0.061	
Rural	19.9	19.2	-0.62	-0.031	
Census region					0.844
Northeast	17.1	17.5	0.42	0.024	
Midwest	20.2	20.4	0.16	0.008	
South	37.9	37.2	-0.75	-0.020	
West	24.8	25.0	0.17	0.007	
Poverty level					0.695
High	24.9	25.3	0.47	0.019	
Low	75.1	74.7	-0.47	-0.006	

NOTE: Detail may not sum to totals because of rounding. Census region is the state-based region of the country (see technical notes for state listing). For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL; all private schools are treated as low poverty schools. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school nonresponse adjusted weight.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

5.2 Continuous Variables

Summary means for each continuous variable for participating and eligible schools are shown in tables I-12 and I-13. No data on FRPL eligibility were available for private schools, so these are not included in the analysis.

There were no statistically significant differences between participating and eligible schools with respect to student enrollment or race/ethnicity percentage (table I-12). However, the absolute value of the relative bias for American Indian or Alaska Native is greater than 10 percent, though this is due mostly to the eligible percentage being less than 1.0 percent as the bias is relatively small. There was also no statistically significant difference between participating and eligible schools with respect to free or reduced-price lunch (table I-13).

Table I-12. Mean values of various characteristics for eligible and participating schools in the U.S. PISA nonresponse-adjusted sample: 2015

	Sample schools				
Characteristic	Eligible (mean) (N=213)	Participating (mean) (N=177)	Bias	Relative bias	*t* test *p*-value
Enrollment					
Total school enrollment	1355.0	1373.0	17.99	0.013	0.519
Age-eligible enrollment	335.7	337.9	2.25	0.007	0.730
Race/ethnicity percentage					
White, non-Hispanic	51.5	51.1	-0.35	-0.007	0.692
Black, non-Hispanic	16.9	16.7	-0.21	-0.012	0.753
Hispanic	24.6	25.1	0.47	0.019	0.501
Asian	3.9	3.9	0.01	0.002	0.979
American Indian or Alaska Native	0.9	1.0	0.13	0.148	0.332
Hawaiian/Pacific Islander	0.2	0.2	0.00	-0.005	0.922
Two or more races	2.0	2.0	-0.05	-0.025	0.497

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school nonresponse adjusted weight.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table I-13. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the U.S. PISA nonresponse-adjusted sample: 2015

Students	Sample schools: Eligible (percent) (N=137)	Sample schools: Participating (percent) (N=115)	Bias	Relative bias	*t* test *p*-value
Percentage of students eligible for free or reduced-price lunch	44.6	43.9	-0.73	-0.016	0.499

NOTE: Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school nonresponse adjusted weights.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

6. Summary – United States

Since the U.S. PISA weighted school response rates are below 85 percent, NCES requires an investigation into the potential magnitude of nonresponse bias at the school level in the U.S. sample. The U.S. PISA weighted student and unweighted teacher response rates are above 85 percent; therefore a nonresponse bias analysis at the student and teacher level is not required. The investigation into nonresponse bias at the school level for the U.S. PISA effort shows statistically significant relationships between response status and some of the available school characteristics that were examined in the analyses.

For original sample schools, three variables were found to be statistically significantly related to participation in the bivariate analysis: Census region (table I-3); White, non-Hispanic students (table I-4); and Hispanic students (table I-4). Additionally, the absolute value of the relative bias for private schools and schools in towns is greater than 10 percent (table I-3), which indicates potential bias even though no statistically significant relationship was detected. Although each of these findings indicates some potential for nonresponse bias, when all of these factors were considered simultaneously in a regression analysis, none of the parameter estimates are significant predictors of participation (tables I-6a and I-6b, with summed race/ethnicity percentage). The third model showed town, South region, and the interaction term were significant predictors of school participation among public schools only (table I-6c).

For the final sample of schools (with substitutes), no variables were found to be statistically significantly related to participation in the bivariate analysis. However, the absolute value of the relative bias for private schools, schools in towns, and the Northeast region is again greater than 10 percent (table I-7). When all of these factors were considered simultaneously in a regression analysis, none of the parameter estimates are

significant predictors of participation (tables I-10a and I-10b, with summed race/ethnicity percentage). The third model showed town was a significant predictor of school participation among public schools only (table I-10c).

For the final sample of schools (with substitutes) with school nonresponse adjustments applied to the weights, no variables were found to be statistically significantly related to participation in the bivariate analysis. We therefore conclude that there is no evidence of resulting potential bias in the final sample. The multivariate regression analysis cannot be conducted after the school nonresponse adjustments are applied to the weights. The concept of nonresponse-adjusted weights does not apply to the nonresponding units, and, thus, we cannot conduct an analysis that compares respondents with nonrespondents using nonresponse-adjusted weights.

The results of the analyses are summarized in table I-14.

Table I-14. Characteristics with *p*-values less than 0.05 and absolute relative bias greater than 10 percent, U.S. PISA schools: 2015

Analysis	Characteristics with *p*-values less than 0.05	Additional characteristics with absolute relative bias greater than 10 percent
Original sample	Census region, White, non-Hispanic, Hispanic	Private, Town
Regression model a	None	†
Regression model b	None	†
Regression model c	Town, South region, Interaction term	†
Sample with substitutes	None	Private, Town, Northeast region
Regression model a	None	†
Regression model b	None	†
Regression model c	Town	†
Nonresponse adjusted	None	American Indian or Alaska Native

† Not applicable.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

In sum, the investigation into nonresponse bias at the school level in the United States in PISA 2015 provides evidence that there is some potential for nonresponse bias in the PISA participating original sample based on the characteristics studied. It also suggests that the use of substitute schools substantially reduced the potential for bias. Moreover, after the application of school nonresponse adjustments, there is no evidence of resulting potential bias in the final sample.

7. Participating Original Sample – Massachusetts

The approach taken for the Massachusetts analysis was generally the same as for the United States. However, since the Massachusetts state sample only includes public and not private schools, school control in addition to census region do not apply and are not included in any of the analyses. Additionally, only the third regression model with public schools could be conducted.

This section presents the nonresponse bias analysis based on the original sample of 53 eligible schools for the Massachusetts PISA sample. The distribution of the participating original sample was compared to the schools in the total eligible original sample. School base weights were used for both the eligible sample and the participating schools. The unweighted school response rate for PISA was 77.4 percent, with 41 out of 53 schools participating. The weighted response rate was 78.4 percent.

7.1 Categorical Variables – Massachusetts

The distribution of participating and eligible schools by the two characteristics is shown in table I-15. There are no statistically significant relationships between participation status and any of the other characteristics shown in table I-15. However, the absolute value of the relative bias for schools in towns and rural areas are greater than 10 percent, which indicates potential bias even though no statistically significant relationships were detected.

Table I-15. Percentage distribution of eligible and participating schools in the Massachusetts PISA original sample, by selected categorical variables: 2015

School characteristic	Sample schools: Eligible (percent) (N=53)	Sample schools: Participating (percent) (N=41)	Bias	Relative bias	Chi-square *p*-value
Locale					0.261
Central city	13.9	14.7	0.80	0.057	
Suburb	72.6	73.0	0.40	0.005	
Town	1.9	2.5	0.53	0.276	
Rural	11.5	9.8	-1.73	-0.150	
Poverty level					0.404
High	28.9	31.3	2.47	0.086	
Low	71.1	68.7	-2.47	-0.035	

NOTE: Detail may not sum to totals because of rounding. For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

7.2 Continuous Variables – Massachusetts

Summary means for each continuous variable for participating and eligible schools are shown in tables I-162 and I-17.

There were no statistically significant differences between participating and eligible schools with respect to student enrollment or race/ethnicity percentage (table I-16) or free or reduced-price lunch (table I-17).

Table I-16. Mean values of various characteristics for eligible and participating schools in the Massachusetts PISA original sample: 2015

	Sample schools				
	Eligible (mean) (N=53)	Participating (mean) 41	Bias	Relative bias	*t* test *p*-value
Enrollment					
Total school enrollment	1163.1	1190.6	27.50	0.024	0.361
Age-eligible enrollment	279.9	284.6	4.68	0.017	0.518
Race/ethnicity percentage					
White, non-Hispanic	68.7	67.8	-0.94	-0.014	0.614
Black, non-Hispanic	9.0	8.6	-0.39	-0.043	0.497
Hispanic	14.6	15.4	0.81	0.056	0.527
Asian	5.2	5.7	0.49	0.093	0.116
American Indian or Alaska Native	0.2	0.2	0.00	0.017	0.796
Hawaiian/Pacific Islander	0.1	0.1	0.00	0.024	0.831
Two or more races	2.1	2.2	0.03	0.012	0.717

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table 17. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the Massachusetts PISA original sample: 2015

Students	Sample schools: Eligible (percent) (N=53)	Sample schools: Participating (percent) (N=41)	Bias	Relative bias	*t* test *p*-value
Percentage of students eligible for free or reduced-price lunch	35.0	36.1	1.06	0.030	0.559

NOTE: Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

7.3 Logistic Regression Model – Massachusetts

To examine the joint relationship of various characteristics to school nonresponse, the analysis used a logistic regression model with participation status as the binary dependent variable and frame characteristics as predictor variables. Since the Massachusetts sample only includes public schools, the first two full models with six race/ethnicity variables and with summed race/ethnicity percentage were not run. Only the third model with public schools was conducted.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table I-18 (with public schools only). Only town was a significant predictor of school participation among public schools only. The positive parameter estimates indicate that relative to rural public schools, public schools in towns were somewhat overrepresented among the participating public schools. The model with the six race/ethnicity variables is not shown due to complex interactions that make the results difficult to interpret.

Table I-18. Logistic regression model parameters (with summed race/ethnicity percentage) using the Massachusetts PISA original public school sample: 2015

Parameter	Parameter estimate	Standard error	*t* test for H0: parameter = 0	*p*-value
Intercept	-0.048	1.2050	-0.0398	0.9683
Central city	0.746	1.2019	0.6209	0.5364
Suburb	0.666	0.7156	0.9310	0.3547
Town	10.151	2.2876	4.4373	**0.0000**
High poverty	4.035	3.8048	1.0606	0.2921
Free or reduced-price lunch eligibility	0.010	0.0362	0.2709	0.7872
High poverty * free or reduced-price lunch eligibility	-0.049	0.0712	-0.6904	0.4919
Total school enrollment	0.009	0.0123	0.6969	0.4879
Age-eligible enrollment	-0.033	0.0488	-0.6744	0.5020
Summed race/ethnicity percentage	-0.009	0.0392	-0.2239	0.8234

NOTE: For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

8. Participating Final Sample with Substitutes – Massachusetts

This section presents the nonresponse bias analysis based on the final sample of 53 eligible schools for the Massachusetts PISA sample including participating substitute schools. The distribution of the participating final sample of schools was compared to the schools in the total eligible final sample. The total eligible final sample includes participating final sample plus those original nonrespondents who were not replaced by substitutes. School base weights were used for both the eligible sample and the participating schools. Through the use of substitute schools, the unweighted school response rate for PISA was 92.5 percent, with 49 out of 53 schools participating. The weighted response rate was 91.9 percent.

8.1 Categorical Variables – Massachusetts

The distribution of participating and eligible schools by the two characteristics is shown in table I-19. The Chi-square statistic for locale is significant and suggests that there is evidence of relationships with participation in the assessment. In particular, schools in the central cities were underrepresented among

participating schools relative to eligible schools (12.3 vs. 13.9 percent, respectively), while schools in rural areas were overrepresented among participating schools (12.3 vs. 11.5 percent, respectively). This suggests that the use of substitute schools added to the potential for bias which is due to all eight substitute schools being from either suburbs (six) or rural areas (two) and none from central cities.

Table I-19. Percentage distribution of eligible and participating schools in the Massachusetts PISA final sample, by selected categorical variables: 2015

	Sample schools				
School characteristic	Eligible (percent) (N=53)	Participating (percent) (N=49)	Bias	Relative bias	Chi-square *p*-value
Locale					**0.019**
Central city	13.9	12.3	-1.61	-0.116	
Suburb	72.6	73.4	0.72	0.010	
Town	1.9	2.0	0.13	0.066	
Rural	11.5	12.3	0.77	0.066	
Poverty level					0.445
High	27.0	26.2	-0.75	-0.028	
Low	73.0	73.8	0.75	0.010	

NOTE: Detail may not sum to totals because of rounding. For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

8.2 Continuous Variables – Massachusetts

Summary means for each continuous variable for participating and eligible schools are shown in tables I-20 and I-21.

There were no statistically significant differences between participating and eligible schools with respect to student enrollment (table I-20). Participating schools had a higher mean percentage of White, non-Hispanic students than the eligible sample (71.8 vs. 70.3 percent, respectively; table I-20) and a lower mean percentage of Black, non-Hispanic students than the eligible sample (7.4 vs. 8.7 percent, respectively; table I-20). There was no statistically significant difference between participating and eligible schools with respect to free or reduced-price lunch (table I-21).

Table I-20. Mean values of various characteristics for eligible and participating schools in the Massachusetts PISA final sample: 2015

Characteristic	Sample schools: Eligible (mean) (N=53)	Sample schools: Participating (mean) (N=49)	Bias	Relative bias	*t* test *p*-value
Enrollment					
Total school enrollment	1158.9	1167.5	8.65	0.007	0.297
Age-eligible enrollment	278.9	280.8	1.89	0.007	0.391
Race/ethnicity percentage					
White, non-Hispanic	70.3	71.8	1.44	0.020	**0.024**
Black, non-Hispanic	8.7	7.4	-1.29	-0.149	**0.000**
Hispanic	13.5	13.3	-0.26	-0.019	0.513
Asian	5.3	5.3	0.09	0.017	0.491
American Indian or Alaska Native	0.2	0.2	0.00	0.013	0.567
Hawaiian/Pacific Islander	0.1	0.1	0.00	-0.023	0.642
Two or more races	1.9	1.9	0.03	0.014	**0.038**

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table I-21. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the Massachusetts PISA final sample: 2015

Students	Sample schools: Eligible (percent) (N=53)	Sample schools: Participating (percent) (N=49)	Bias	Relative bias	*t* test *p*-value
Percentage of students eligible for free or reduced-price lunch	33.0	32.3	-0.65	-0.020	0.157

NOTE: Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

8.3 Logistic Regression Model – Massachusetts

To examine the joint relationship of various characteristics to school nonresponse, the analysis used a logistic regression model with participation status as the binary dependent variable and frame characteristics as predictor variables. Since the Massachusetts sample only includes public schools, the first two full models with six race/ethnicity variables and summed race/ethnicity percentage were not run. Only an analysis with public schools was conducted.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table I-22 (with public schools only). Central city and suburb were significant predictors of school participation among public schools only. The negative parameter estimates indicate that relative to rural public schools, public schools in central cities and suburbs were somewhat overrepresented among the participating public schools. The model with the six race/ethnicity variables is not shown due to complex interactions that make the results difficult to interpret.

Table I-22. Logistic regression model parameters (with summed race/ethnicity percentage) using the Massachusetts PISA final public school sample: 2015

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p*-value
Intercept	14.187	0.8774	16.1683	0.0000
Central city	-12.035	1.7223	-6.9880	**0.0000**
Suburb	-11.586	0.8139	-14.2361	**0.0000**
Town	-4.891	6.8670	-0.7123	0.4784
High poverty	0.001	0.0253	0.0284	0.9774
Free or reduced-price lunch eligibility	0.001	0.0048	0.2102	0.8341
High poverty * free or reduced-price lunch eligibility	-0.096	0.1159	-0.8304	0.4088
Total school enrollment	5.757	8.3922	0.6860	0.4947
Age-eligible enrollment	0.042	0.0647	0.6469	0.5195
Summed race/ethnicity percentage	-0.031	0.0710	-0.4329	0.6663

NOTE: For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL. Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Schools were weighted by their school base weights that did not include a nonresponse adjustment factor, and by their estimated eligible student enrollment.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

9. Nonresponse-Adjusted Final Sample with Substitutes – Massachusetts

This section presents the nonresponse bias analysis based on the final sample of 49 eligible schools for the Massachusetts PISA sample. The distribution of the participating final sample, including participating substitute schools, was compared to the schools in the total eligible final sample, just like the previous section. However, in the analyses that follow, school base weights were used for the eligible sample of schools, whereas nonresponse-adjusted weights were used for the participating schools.

9.1 Categorical Variables – Massachusetts

The distribution of participating and eligible schools by the two characteristics is shown in table I-23. There are no statistically significant relationships between participation status and any of the other characteristics shown in table I-23.

Table I-23. Percentage distribution of eligible and participating schools in the Massachusetts PISA nonresponse-adjusted sample, by selected categorical variables: 2015

	Sample schools				
School characteristic	Eligible (percent) (N=53)	Participating (percent) (N=49)	Bias	Relative bias	Chi-square *p*-value
Locale					1.000
Central city	13.9	13.9	0.00	0.000	
Suburb	72.6	72.6	0.00	0.000	
Town	1.9	1.9	0.00	0.000	
Rural	11.5	11.5	0.00	0.000	
Poverty level					0.658
High	27.0	26.5	-0.43	-0.016	
Low	73.0	73.5	0.43	0.006	

NOTE: Detail may not sum to totals because of rounding. For public schools, a high poverty school is defined as one in which 50 percent or more of the students are eligible for participation in the FRPL. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school nonresponse adjusted weight.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

9.2 Continuous Variables – Massachusetts

Summary means for each continuous variable for participating and eligible schools are shown in tables I-24 and I-25.

There were no statistically significant differences between participating and eligible schools with respect to student enrollment (table I-24). Participating schools had a higher mean percentage of White, non-Hispanic students than the eligible sample (71.3 vs. 70.3 percent, respectively; table I-24) and a lower mean percentage of Black, non-Hispanic students than the eligible sample (7.5 vs. 8.7 percent, respectively; table I-24).There was no statistically significant difference between participating and eligible schools with respect to free or reduced-price lunch (table I-25).

Table I-24. Mean values of various characteristics for eligible and participating schools in the Massachusetts PISA nonresponse-adjusted sample: 2015

	Sample schools				
Characteristic	Eligible (mean) (N=53)	Participating (mean) (N=49)	Bias	Relative bias	*t* test *p*-value
Enrollment					
Total school enrollment	1158.9	1174.0	15.15	0.013	0.248
Age-eligible enrollment	278.9	282.1	3.23	0.012	0.340
Race/ethnicity percentage					
White, non-Hispanic	70.3	71.3	0.96	0.014	**0.019**
Black, non-Hispanic	8.7	7.5	-1.14	-0.132	**0.000**
Hispanic	13.5	13.5	-0.03	-0.002	0.945
Asian	5.3	5.4	0.16	0.030	0.068
American Indian or Alaska Native	0.2	0.2	0.00	0.017	0.514
Hawaiian/Pacific Islander	0.1	0.1	0.00	-0.023	0.670
Two or more races	1.9	2.0	0.04	0.023	0.207

NOTE: Black includes African American, and Hispanic includes Latino. Racial categories exclude Hispanic origin. Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school nonresponse adjusted weight.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table I-25. Mean percentage of students eligible for free or reduced-price lunch, in eligible and participating public schools in the Massachusetts PISA nonresponse-adjusted sample: 2015

Students	Sample schools: Eligible (percent) (N=53)	Sample schools: Participating (percent) (N=49)	Bias	Relative bias	*t* test *p*-value
Percentage of students eligible for free or reduced-price lunch	33.0	32.6	-0.38	-0.012	0.358

NOTE: Eligible schools have at least one 15-year-old student. Participating schools agreed to have their students assessed. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Schools were weighted by their school nonresponse adjusted weight.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

10. Summary – Massachusetts

Since the Massachusetts PISA weighted school response rates are below 85 percent, NCES requires an investigation into the potential magnitude of nonresponse bias at the school level in the Massachusetts sample. The Massachusetts PISA weighted student and unweighted teacher response rates are above 85 percent, therefore a nonresponse bias analysis at the student and teacher level is not required. The investigation into nonresponse bias at the school level for the Massachusetts PISA effort shows statistically significant relationships between response status and some of the available school characteristics that were examined in the analyses.

For original sample schools, no variables were found to be statistically significantly related to participation in the bivariate analysis. However, the absolute value of the relative bias for schools in towns and rural areas are greater than 10 percent (table I-15), which indicates potential bias even though no statistically significant relationship was detected. When all of these factors were considered simultaneously in a regression analysis, only town is a significant predictor of participation among public schools only (table I-18).

For the final sample of schools (with substitutes), three variables were found to be statistically significantly related to participation in the bivariate analysis: locale (table I-19); White, non-Hispanic students (table I-20); and Black, non-Hispanic students (table I-20). When all of these factors were considered simultaneously in a regression analysis, central city and suburb are significant predictors of school participation among public schools only (table I-22).

For the final sample of schools (with substitutes) with school nonresponse adjustments applied to the weights, White, non-Hispanic students (table I-24); and Black, non-Hispanic students (table I-24) were found to be statistically significantly related to participation in the bivariate analysis. We therefore conclude that there is some evidence of resulting potential bias in the final sample. The multivariate regression analysis cannot be conducted after the school nonresponse adjustments are applied to the weights. The concept of nonresponse-adjusted weights does not apply to the nonresponding units, and, thus, we cannot conduct an analysis that compares respondents with nonrespondents using nonresponse-adjusted weights.

The results of the analyses are summarized in table I-26.

Table I-26. Characteristics with *p*-values less than 0.05 and absolute relative bias greater than 10 percent, Massachusetts PISA schools: 2015

Analysis	Characteristics with *p*-values less than 0.05	Additional characteristics with absolute relative bias greater than 10 percent
Original sample	None	Town, rural
Regression model c	Town	†
Sample with substitutes	Locale, White, non-Hispanic, Black, non-Hispanic	None
Regression model c	Central city, suburb	†
Nonresponse adjusted	White, non-Hispanic, Black, non-Hispanic	None

† Not applicable.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

In sum, the investigation into nonresponse bias at the school level in Massachusetts in PISA 2015 provides evidence that there is some potential for nonresponse bias in the PISA participating original sample based on the characteristics studied. It also suggests that the use of substitute schools added to the potential for bias. This is due to all eight substitute schools being from either suburbs (six) or rural areas (two) and none from central cities. Moreover, the application of school nonresponse adjustments reduced the bias but there is still evidence of resulting potential bias in the final sample.

Technical Notes

Description of Variables

Frame characteristics for public schools were taken from the 2012-13 CCD and, for private schools, from the 2011-12 PSS.

Race/Ethnicity

Students' race/ethnicity was obtained through student responses to a two-part question. Students were asked first whether they were Hispanic or Latino, and then asked whether they were members of the following racial groups: American Indian/Alaska Native; Asian; Black, non-Hispanic; Native Hawaiian or other Pacific Islander; or White, non-Hispanic. Two or more races was derived when a student chooses more than one of the racial groups. The summed race/ethnicity percentage was derived from summing the six race/ethnicities of Black, non-Hispanic; Hispanic; Asian; American Indian or Alaska Native; Hawaiian/Pacific Islander; and two or more races.

Locale

Locale was derived from the urban-centric locale code that is based on the urbanicity of the school location.

- *Central city* consists of a large territory inside an urbanized area and inside a principal city with population of 250,000 or more, midsize territory inside an urbanized area and inside a principal city with a population less than 250,000 and greater than or equal to 100,000, or small territory inside an urbanized area and inside a principal city with a population less than 100,000.
- *Suburb* consists of a large territory outside a principal city and inside an urbanized area with population of 250,000 or more, midsize territory outside a principal city and inside an urbanized area with a population less than 250,000 and greater than or equal to 100,000, or small territory outside a principal city and inside an urbanized area with a population less than 100,000.
- *Town* consists of a fringe territory inside an urban cluster that is less than or equal to 10 miles from an urbanized area, distant territory inside an urban cluster that is more than 10 miles and less than or equal to 35 miles from an urbanized area, or remote territory inside an urban cluster that is more than 35 miles from an urbanized area.

- *Rural* consists of a fringe census-defined rural territory that is less than or equal to 5 miles from an urbanized area, as well as rural territory that is less than or equal to 2.5 miles from an urban cluster, distant census-defined rural territory that is more than 5 miles but less than or equal to 25 miles from an urbanized area, as well as rural territory that is more than 2.5 miles but less than or equal to 10 miles from an urban cluster, or remote census-defined rural territory that is more than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster.

Census Region

Region is the census region of the country. Northeast consists of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest consists of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South consists of Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West consists of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Percentage of Students Eligible for Free or Reduced-Price Lunch

The proportion of students in a school eligible for the free or reduced-price lunch program (FRPL), a federally assisted meal program under the National School Lunch Act that provides nutritionally balanced, low-cost or free lunches to eligible children each school day. The question on the CCD questionnaire asked what percentage of students at the school were eligible to receive free or reduced-price lunch through the FRPL around October 1, 2012. It is available only for public schools as the NCES Private School Universe Survey (PSS) data do not provide the same information for private schools.

Poverty Level in Public Schools

The measure of school poverty is based on the percentage of students eligible for FRPL. Schools were classified as *low poverty* if less than 50 percent of the students were eligible for FRPL and as *high poverty* if 50 percent or more of the students were eligible. In the interest of retaining all of the schools and students in these analyses, private schools were assumed to be low-poverty schools—that is, they were assumed to be schools in which less than 50 percent of students were eligible for FRPL.