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Technical Report and User Guide for the 2016 Program for International Student Assessment (PISA) Young Adult Follow-up Study

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Technical Report and User Guide for the 2016 Program for International Student Assessment (PISA) Young Adult Follow-up Study

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1. Overview of the Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS)

The Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS) is a follow-up study with students who participated in PISA 2012 in the United States. The study is designed to measure how performance on PISA 2012 relates to subsequent measures of outcomes and skills of young adults on an online assessment, Education and Skills Online (ESO). PISA is administered in the United States every 3 years, and is intended to measure the mathematics, science, and reading literacy skills of students who are approaching the end of compulsory schooling, at approximately age 15 when the majority of these students are in the 10th grade. The second set of data needed for the PISA YAFS study was conducted in 2016, approximately 3.5 years after PISA 2012.[1]

PISA data suggest that U.S. students are not as prepared for the global economy as their peers in other high-performing countries (Organization for Economic Cooperation and Development [OECD] 2014). This, in turn, has generated interest in how students' skills and experiences at age 15, as measured through PISA, relate to their subsequent literacy, numeracy, and problem-solving skills and other outcomes such as educational attainment and work experiences. Thus, PISA YAFS was developed to explore these relationships. Measuring the skills of PISA students after a lapse of about 3.5 years provides a frame for comparing students' skills at two crucial points: at age 15, as students near the end of compulsory education and are beginning to think about their future, and at around age 19, as these students start adulthood.

To measure these students' subsequent literacy, numeracy, and digital problem-solving skills, the study used the Education and Skills Online assessment (ESO), an online assessment developed by OECD. The ESO's design is based on the Program for the International Assessment of Adult Competencies (PIAAC), a study of adult literacy, numeracy, and digital problem-solving skills focused on those aged 16 to 65 (see https://nces.ed.gov/surveys/piaac/). Like PIAAC, the ESO aims to measure cognitive skills needed for successful participation in 21st-century society and the global economy.

PISA YAFS used the ESO along with a few additional questions on current education participation to assess participants in literacy, numeracy, and problem-solving domains, as well as to collect information

[1] PISA 2012 data were collected in October-November 2012 in the United States. PISA YAFS data were collected in March-July 2016. At the time of PISA 2012 data collection, students were between the ages of 15 years 3 months and 16 years 2 months. At the start of PISA YAFS data collection, some 3.5 years later, the PISA 2012 students were between the ages of 18 years 8 months and 19 years 7 months.

on educational attainment, work experiences, and career intentionality of the PISA 2012 participants. These data were collected in 2016 following a successful field test in 2015. To learn more about the ESO, visit https://www.oecd.org/skills/ESonline-assessment/abouteducationskillsonline/.

By examining students' performance on PISA in relation to their subsequent cognitive and noncognitive outcomes in young adulthood, as measured through the ESO, the study provides supporting evidence needed to understand how well PISA measures the skills that are considered crucial for successful participation in adult life. PISA YAFS also strengthens our understanding of U.S. performance on PISA and its implications for U.S. college and career readiness and for the skills of our future workforce. This information can, in turn, also be used to inform the further development of PISA and future surveys of adult skills.

1.1 Introduction

This technical report provides information related to the PISA YAFS data collection with a focus on what it purports to measure, data processing and weighting, linking to U.S. PISA 2012 data, and how to use the data files.

This document is organized into eight sections with appendixes, exhibits, and tables listed in the table of contents. This report includes bookmarked chapters and is searchable by keyword. This online version is 508-compliant and includes optimizations for people with access challenges.

1.2 PISA 2012

The Program for International Student Assessment (PISA) is a system of international assessments that focuses on 15-year-old students. PISA assesses the application of knowledge in mathematics, science, and reading literacy to problems within a real-life context (OECD 2014). 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. PISA also gathers information from students about their learning environment, educational experiences, and attitudes toward 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.

The majority of the PISA 2012 results provide analogous information for mathematics, science, and reading. However, because mathematics was the major domain in 2012, more in-depth information is available for mathematics. In 2012 and previous years, all three subjects were assessed primarily through a paper-and-pencil assessment. However, additional computer-based assessments in mathematics, reading, and problem solving were introduced in 2012, as was a financial literacy assessment, all of which were optional for countries. PISA 2012 also collected information on students' backgrounds, attitudes toward mathematics, and learning strategies. School principals provided information on the school's demographics and learning environment. Sixty-five education systems, including the United States, participated in PISA**.**

The PISA 2012 main study in the United States consisted of four major elements: (1) a 2-hour student assessment of reading literacy, mathematics literacy, and science literacy; (2) a student questionnaire that required approximately 30 minutes to complete; (3) a school questionnaire to be completed by the principal or designee that also required approximately 30 minutes to complete; and (4) a 40-minute computer-based assessment that was completed by a subset of students who also took the paper-based assessment. The optional financial literacy assessment was included in the main paper-based assessment for countries that opted to participate (the United States participated in the financial literacy assessment in 2012). In 2012, a total of 6,094 U.S. students were assessed and 162 U.S. schools participated.

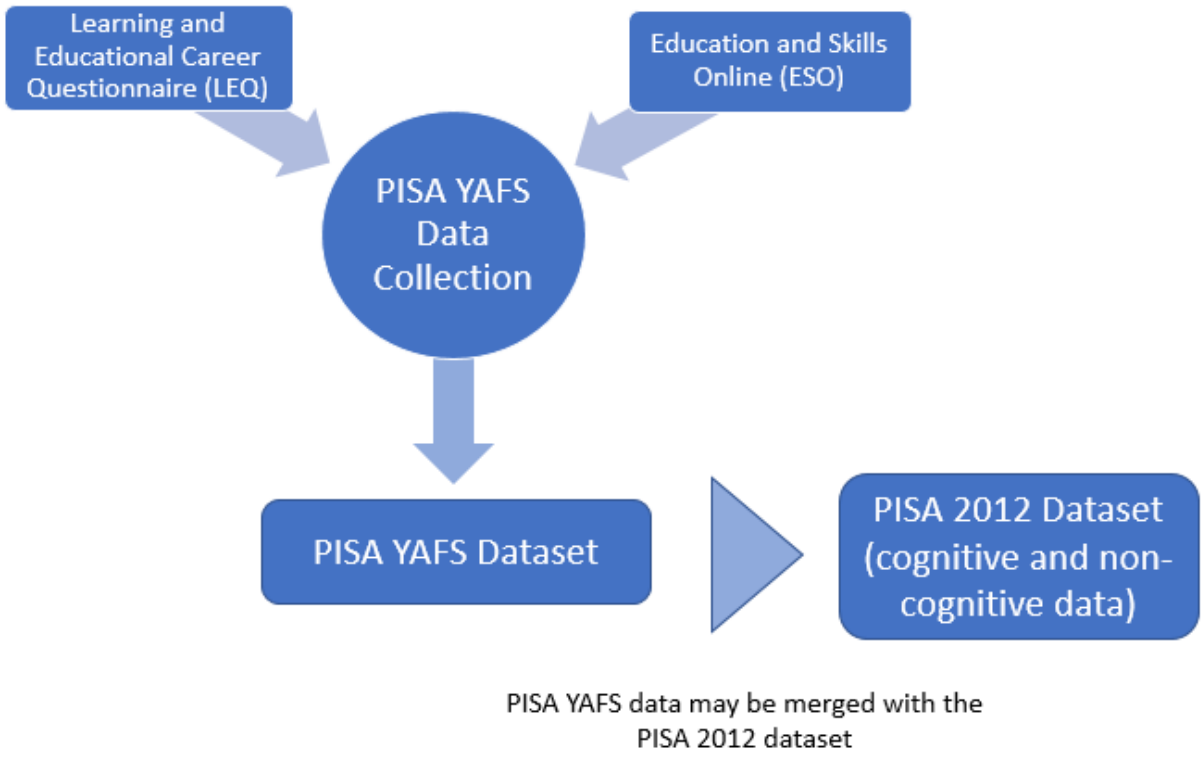
The PISA YAFS study utilized the financial literacy component of PISA 2012 to help define the PISA YAFS field test and main study samples. Students participating in financial literacy in PISA 2012 were defined as the field test sample for PISA YAFS. The remaining PISA 2012 students (those not assessed in financial literacy) were defined as the main study sample for PISA YAFS.

1.3 What PISA YAFS Measures

PISA YAFS measures both cognitive and noncognitive constructs related to adult-life preparedness, skill-use, and achievement in young adulthood. The PISA YAFS data comes from two instruments—the ESO assessment and questionnaire and an additional module, called the Learning Experience Questionnaire (LEQ), added to supplement the ESO's background questionnaire (BQ). As the ESO did not have information on current educational status and could not be edited to add content, the LEQ questionnaire module was developed to more fully realize the aims of PISA YAFS. In particular, the questionnaire

items in the LEQ component allowed the examination of the relationship between PISA outcomes, either in cognitive performance or student characteristics, and the paths that young adults chose after leaving high school. The questionnaire items in the LEQ were selected from questionnaire items in PIAAC that were not included in ESO. Exhibit 1 provides the components of the PISA YAFS instrumentation and data. More detailed information about the LEQ and ESO content is shown in appendixes A and B, respectively.

Exhibit 1. Components of PISA YAFS



The ESO includes a core set of background items, two cognitive assessment blocks, and multiple noncognitive questionnaire modules administered to all respondents after the assessments. The noncognitive indicators collected through PISA YAFS include categorical and continuous data from the LEQ and ESO-noncognitive BQ modules.

The LEQ module gathered information on:

- current education study status (participation; level of degree; area of study);
- formal education activities; and
- nonformal learning activities in the 12 months preceding the study.

The ESO noncognitive modules collected information on:

- basic demographics;
- career interests and intentionality (CII); and
- subjective well-being and health (SWBH).

Each of these modules is represented in the PISA YAFS database by item-level and indexed data. See appendixes A and B – Questionnaires to view the administered questionnaire items.

1.4 PISA YAFS Administration

Planning for the PISA YAFS started prior to PISA 2012 data collection in the United States. As part of the PISA 2012 field administration, respondents were asked to voluntarily provide contact information to the National Center for Education Statistics (NCES) if they were willing to be contacted in the future for a follow-up study. A total of 6,094 respondents participated in PISA 2012 in the United States. More than 90 percent of these respondents voluntarily provided a completed form after the assessment (table 1).

Table 1. Contact forms returned from PISA 2012: PISA YAFS 2016

Status of contact forms	Count	Percent
Total PISA 2012 participating students	6,094	100.0
Returned form	5,675	93.1
Did not return form	419	6.9
PISA YAFS field test sample	1,116	18.3
Returned form	1,063	17.4
Did not return form	53	0.9
PISA YAFS main study sample	4,978	81.7
Returned form	4,612	75.7
Did not return form	366	6.0

NOTE: The PISA YAFS field test sample was defined as PISA 2012 participating students selected for financial literacy. The PISA YAFS main study sample was defined as PISA 2012 participating students who were not selected for financial literacy.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Since the ESO was administered 3.5 years later (in 2016) to PISA 2012 participants, much time was spent maintaining reliable communications. These steps are referred to as tracing, tracking, and recruitment herein. Tracing tasks locate the PISA participant while tracking tasks maintain channels of

communication with the respondent over time. Recruitment tasks get the respondents to begin and finish the survey.

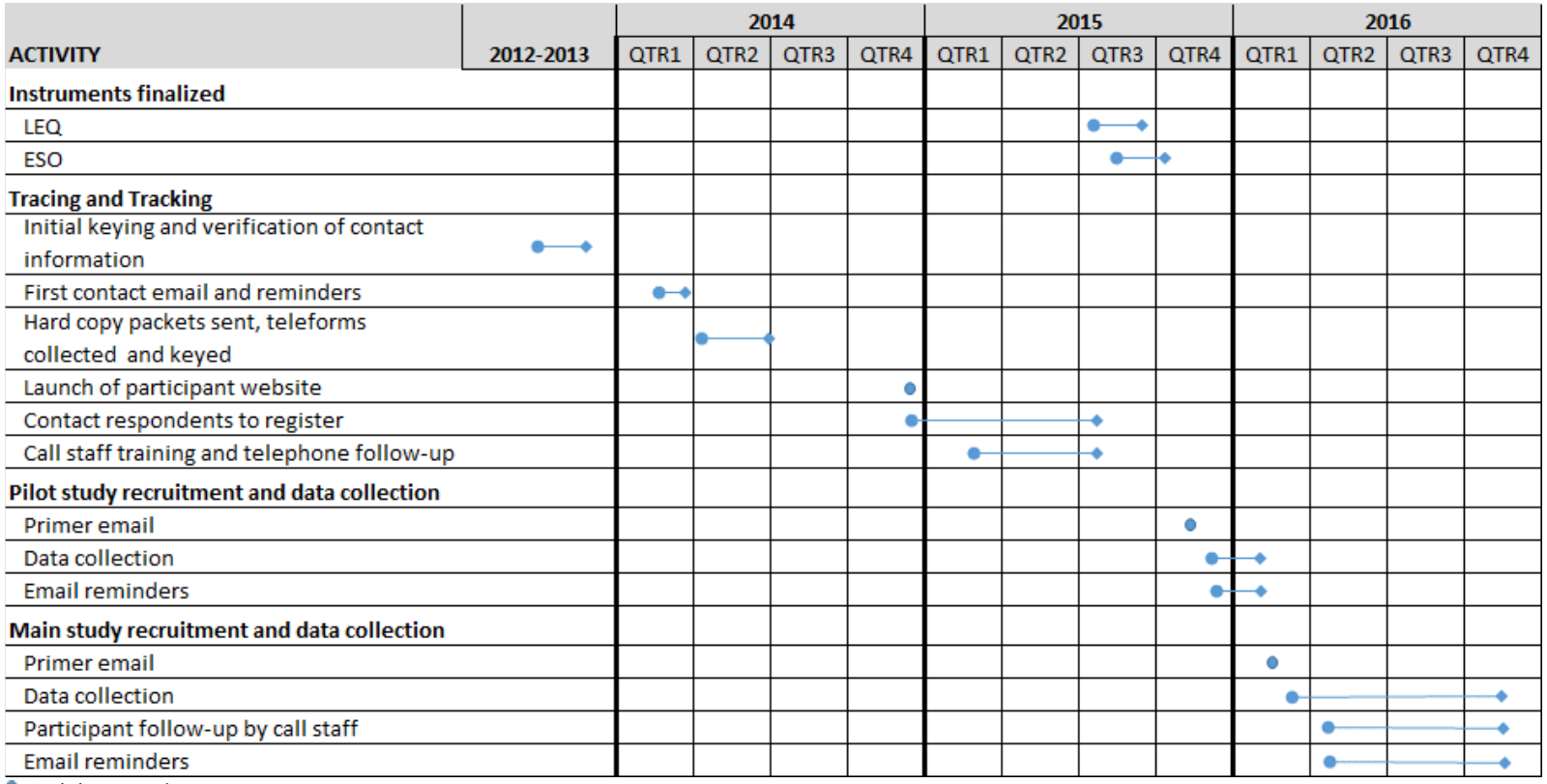
To aid tracing and tracking, Westat developed a participant website where potential respondents were able to update their contact information online. Tracing formally ended once a participant registered on the website and then tracking and recruitment formally began. The participant website was also used to disseminate updates on the study, monitor participation, distribute incentives, and access the LEQ and the ESO. The website registration activity provided a proxy for gauging anticipated response to the PISA YAFS instruments.

The registration for the study website opened in 2014, and over the course of the ensuing year and a half, all of the field test sample participants registered, and more than half of the total potential main study participants registered. A number of other tracing and tracking activities took place prior to launching website registration. These activities are discussed in chapter 3.

The PISA YAFS field test study was conducted December 2015 – January 2016 with a subset of the PISA 2012 participants who took the financial literacy assessment. These participants were field test candidates because they participated in PISA 2012, provided contact information, and were not slated to be included in the PISA 2012 main dataset (these students were included in a separate dataset for financial literacy as part of the 2012 data release). The purpose of the field test was to evaluate operational procedures and refine the background items. Since the ESO software was administered as an off-the-shelf product, the field test was primarily focused on proving that respondents were willing and able to self-administer the ESO and LEQ instruments.

The main study data collection for PISA YAFS then occurred between March and July of 2016. Originally scheduled to last 12 weeks, the data collection window was extended to meet minimum response thresholds. The overall timeline of these activities is shown in exhibit 2.

Exhibit 2. Timeline of contact activities and administration of PISA YAFS 2016



Activity started.
Activity completed.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

1.5 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 YAFS, as well as with information on how to access the PISA YAFS data. This information is meant to incorporate information presented in OECD publications for the ESO, as the ESO was a component of PISA YAFS. Chapter 2 provides information about sampling requirements and sampling in the United States. Chapter 3 describes the data collection for PISA YAFS and participation rates. Chapter 4 describes weighting and variance estimation, and chapter 5 provides a nonresponse bias analysis. Chapter 6 describes population modeling, IRT analysis, and scaling of PISA YAFS scores. Chapter 7 provides detail concerning data processing and preparation. Chapter 8 describes the data available from both international and U.S. sources, and discusses some special issues in analyzing the PISA YAFS data. The noncognitive questionnaire items and respondent-outreach materials are included in the appendices.

2. Sampling

The PISA YAFS sample comprised all respondents who participated in the PISA 2012 assessment in the United States and who did not take the PISA 2012 financial literacy component.[2] Of the 4,978 PISA 2012 participants, 366 did not provide contact information.

This section describes the selection of the PISA 2012 sample and eligibility criteria and the process of translating those criteria to current age and eligibility at the time of the PISA YAFS data collection. This section does not include breakouts of the field test sample because it was a convenience sample. Field test information is found in chapter 3.

2.1 Overview of the PISA and PISA YAFS Sample

PISA seeks to show the overall yield (outcomes) of an education system and the cumulative effects of all learning experiences for respondents who are nearing the end of compulsory education. PISA's focus on students at age 15 provides an opportunity to measure broad learning outcomes when most students are still required to attend school. Drawing on an age-based sample of students makes comparisons across countries somewhat easier than a grade-based sample because years of education vary among countries.

The PISA YAFS results are nationally representative of the PISA 2012 population of 15-year-olds some 3.5 years later when the majority of respondents were age 19.

2.2 Target Population

For students to be eligible for PISA 2012 in the United States, they must have been born between July 1, 1996, and June 30, 1997. This means that PISA 2012 students in the United States were between 15 years and 3 months and 16 years and 2 months at the time of the assessment (Fall 2012). They must also be enrolled in a sampled, participating school, at grade 7 or higher.

[2] Although three U.S. states—Connecticut, Florida, and Massachusetts—participated in PISA 2012 with separate state samples, these participants were not part of the PISA YAFS data collection effort. Only students who were part of the U.S. national sample were eligible to participate in PISA YAFS.

Additional eligibility criteria include English language literacy and ability to access the assessment with allowed (but limited) accommodations. For more information about PISA eligibility criteria, exclusion rates, and accommodations, see the PISA 2012 technical report (available at https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2014025).

Considering PISA 2012 eligibility criteria and knowing that PISA YAFS is a follow-up study conducted approximately 3.5 years later, the population that participated in the PISA 2012 assessment, when contacted to take PISA YAFS in 2016, was between 18 years 8 months and 19 years 7 months old. Thus, since PISA employed a nationally representative sample, the PISA YAFS sample is representative of U.S. 15-year-olds some 3.5 years later, in 2016, when the majority were age 19. Chapter 4 covers the nonresponse adjustment and weighting used by PISA YAFS to account for those students who took PISA 2012 but did not participate in PISA YAFS.

2.3 Respondent Definition

Respondents were contacted to participate in PISA YAFS if they voluntarily returned a student information form in PISA 2012. The PISA 2012 core assessment had 4,978 participating U.S. students. Of these, 4,612 students (92.6 percent) returned an information form. Respondents in PISA YAFS were considered participating if they completed at least one Learning Experience Questionnaire (LEQ) item regardless of whether or not they went on to complete any of the Education and Skills Online (ESO) noncognitive or cognitive sections. Chapter 3 describes the data collection for the field test and main study and response rates.

3. Data Collection Activities

The PISA YAFS ESO assessment was administered in 2016, 3.5 years after the respondents had taken PISA 2012. From the end of the PISA assessment in fall of 2012 through March 2015, respondents were traced using the contact information they provided after the 2012 assessment (meaning they were located via e-mail, by phone, or through a physical address) and tracked so that the study maintained communication with respondents through the data collection period via e-mail, hard-copy mailing, registration on a project-specific participant website, and phone follow-up. This time prior to data collection is referred to as tracing and tracking herein. During tracing and tracking, potential participants were asked to log into the system and update their contact information.

As the data collection window approached, the study launched a recruitment effort utilizing the tracing and tracking results. Since the tracing and tracking stages did not include responding to any instruments or other tasks along the way, as long as the participant was not marked as an active refusal and the study had "working" contact information, recruitment was attempted and participants accessed the instruments through the participant website. The PISA YAFS field test, conducted December 2015 – January 2016 with PISA 2012 financial literacy participants, was primarily focused on proving that the design and operations for collecting the data were feasible and robust.

As noted in chapter 1, the main study data collection for PISA YAFS occurred between March and July of 2016. Originally scheduled to be completed in 12 weeks, the data collection window was extended to maximize response by an additional 6 weeks.

This section describes the data collection instruments, tracing and tracking, recruitment, field test and main study data collection, and quality control procedures.

3.1 Data Collection Instruments

As described in chapter 1, the PISA YAFS data collection utilized two instruments: the Learning Experience Questionnaire (LEQ) and the ESO assessment, which participants accessed through the participant website. The ESO platform required users to use a single specific browser type (Firefox) and to access the assessment from a laptop or PC (i.e., no tablets or cellphones). The LEQ did not have any device-type or browser restriction. The LEQ was administered prior to the ESO. The cognitive and noncognitive pieces of these instruments are described in the following sections.

3.1.1 Cognitive Instruments

By design, the ESO produces individual scale scores in literacy, numeracy, and problem solving in technology-rich environments. The cognitive portion of the ESO is adaptive, so depending on how a respondent performs on initial cognitive items, additional reading comprehension components rather than problem-solving items may be administered. Therefore, some participants in PISA YAFS will not have problem-solving or reading comprehension scores depending on their success with the initially presented cognitive items. For more detailed information on the ESO cognitive constructs, refer to the *Education & Skills Online Technical Documentation*, available at https://www.oecd.org/skills/ESonline-assessment/assessmentdesign/technicaldocumentation/ESOnline_Technical_Doc_Ch1-8_Oct2016.pdf. In particular, chapters 2 and 3 of this document ("Development of the Cognitive Instruments" and "Development of the Noncognitive Instruments") provide more general information on the cognitive and noncognitive instruments administered through ESO.

Unlike PIAAC, the ESO was self-administered and offered only on the computer; there was no paper-and-pencil component. As in PIAAC, the ESO items for all three cognitive domains were designed to be authentic, culturally appropriate, and drawn from real-life situations that were expected to be important or relevant in different contexts. Item contents and questions were intended to reflect the purposes of adults' daily lives across cultures, even if they were not necessarily familiar to all adults in all countries.

The definition of literacy in the ESO, as in PIAAC, is "understanding, evaluating, using and engaging with written text to participate in society to achieve one's goals and to develop one's knowledge and potential" (OECD 2012). The ESO literacy items included continuous texts (e.g., text in sentences and paragraphs); noncontinuous texts (e.g., schedules, graphs, and maps); and electronic texts (including hypertext or text in interactive environments, such as forms and blogs).

In the ESO, as in PIAAC, numeracy is defined as: "the ability to access, use, interpret, and communicate mathematical information and ideas, to engage in and manage mathematical demands of a range of situations in adult life" (OECD 2012). The ESO numeracy items involved objects or pictures, text, numbers, graphs, and technology-based displays. These items required basic mathematical skills in computation, proportions, and percentages; an understanding of measurement concepts and procedures; and an ability to work with simple formulas. Respondents also encounter more complex items that required using models to predict future needs, as well as an understanding of basic statistical concepts and displays.

In the ESO and PIAAC, problem solving in technology-rich environments (PS-TRE) is defined as: "using digital technology, communication tools, and networks to acquire and evaluate information, communicate with others, and perform practical tasks" (OECD 2012). As its name implies, PS-TRE measures skills and abilities that are required for solving problems while operating in a technology-rich environment. Specifically, it assesses the cognitive processes of problem solving—goal setting, planning, selecting, evaluating, organizing, and communicating results.

Post-data collection, two adjustments were made to the resulting PISA YAFS data collected via the online survey tools. First, statistical adjustments (reweighting) were made to the original PISA 2012 weights. Nonresponse adjustments (NRAs) were performed on the PISA 2012 student weights so that data collected in PISA YAFS are statistically valid for making comparisons with the PISA 2012 U.S. national sample data. The NRA process is described in detail in chapter 4, with nonresponse bias analyses presented in chapter 4. Second, to improve the utility and statistical power of the ESO cognitive data, the ESO scale scores were transformed into plausible values (PVs) using an Item Response Theory (IRT) 2-parameter logistic model, which provides more accurate measurement of student performance than the ESO scale scores.[3] The plausible values are multiple imputations which represent a range of abilities for a certain group of respondents (e.g., all female respondents) (von Davier, Gonzalez, and Mislevy 2009). Respondents are not administered every assessment item so each item has missing responses, though these are missing by design. Thus, it is not possible to estimate scores for individual respondents. Instead, the results of individual respondents are aggregated to produce a set of scores for groups of respondents. A description of the re-scaling methodology and considerations is provided in chapter 6.

3.1.2 Noncognitive Instruments

The PISA YAFS noncognitive instruments used were the LEQ, the ESO core-background questions, and the ESO additional noncognitive background modules.

The LEQ instrument was developed after close review of the ESO items determined that certain items from PIAAC that were not included in ESO were necessary based on the goal of the study and the planned analyses. For example, current education participation in formal education and specific types of

[3] The ESO calculates a score for each individual who completes the literacy, numeracy, and problem-solving assessments. While the scores produced by the ESO are designed to place respondents' achievement on the same scale as PIAAC, the online version of the ESO produces scores that are calculated in increments of 10 (e.g., 350, 360, 370) and do not include standard errors that take into account measurement error. To allow for more nuanced analyses, the ESO scores collected through PISA YAFS were recalibrated to more closely mimic the scores produced by PIAAC—that is, scores anywhere along a scale from 0-500 and a standard error associated with that score. See chapter 6 for more details.

training/instruction recently received were not captured by the ESO. The LEQ questionnaire can be found in appendix A.

The ESO core-background questions are a set of questions that every participant must complete to get access to the cognitive assessment. The responses to these questions impact the scale-score value received for each individual test-taker. These questions are included in appendix B.

The other background modules include Subjective Well-being and Health, Career Interest and Intentionality, and Skills. The items from these modules can also be found in appendix B.

3.2 Data Collection Activities

At a high level, the steps to collect PISA YAFS data involved three main phases: (1) tracing, or the process associated with initially validating participation-provided contact information (tracing the participant to their location); (2) recruitment for participating in PISA YAFS, or the period directly before data collection when participants were directly asked to register for the study website, then establishing and maintaining lines of communication (tracking them over time); and (3) data collection, when participants were asked to take the survey. These three phases are described in the following subsections, and then for the field test and main study separately.

The PISA YAFS field test frame consisted of the 1,063 U.S. PISA 2012 participants who took the PISA 2012 financial literacy assessment and returned the contact form. The PISA YAFS main study frame consisted of the 4,612 U.S. PISA 2012 participants who returned the contact forms and did not take the PISA financial literacy assessment.

3.2.1 Tracing and Tracking

The initial tracing and tracking phase was implemented to establish a communication contact with the respondents. E-mail and hard-copy mail were the preferred modes of contact across the tracking and tracking, recruitment, and data collection phases of the study. Telephone outreach also proved fruitful during recruitment and data collection. The reasons for the preference were the ability to send communications *en masse*, and the relatively low cost as opposed to telephone or household interviewing. During the tracing and tracking phase, specific information about when the study would take place was not provided, nor were participants solicited to take questionnaires or surveys, prior to data collection.

Rather, participants were told about the goals of the PISA YAFS, their importance and role in PISA YAFS, and that specific, further details would be provided when available. Along with reaching out with study information, month-based birthday cards were sent to participants.

After identifying the untraceable group of PISA 2012 participants using electronic and hard-copy mailings, address updates services were used to identify addresses that were updatable. Of the PISA 2012 participants that provided contact information, 99 participants were identified as "hard to trace" or untraceable because complete contact information was not initially provided, the information was wrong, or unavailable via follow-up with schools or a locating service. A participant website was launched after the initial mailing actions to maintain contact and allow participants to easily update their contact information. Table 2 shows the overall results of the tracing effort. In total, 5,191 individuals (92 percent) were located through the mailing and e-mail contact efforts.

Table 2. Overall summary of PISA YAFS 2016 tracing effort

	PISA 2012 participants	
Response count	Number	Percentage (unweighted)
Total participants to locate (field test and main study combined)	5,634	100.0
Hard to trace	99	1.8
E-mail returned	650	11.5
Hard-copy packet sent	4,885	86.7
Packet sent successfully	4,541	80.6
Total located	5,191	92.1

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Of the total participants, 99 were removed because they could not be traced. E-mails were returned from 650 participants. The remaining 4,885 participants were sent hard-copy mailings with informational materials describing the study, their selection, and assurances that further information would be forthcoming.

The PISA YAFS participant website launched in December 2014. The site provide several functions including:

- serving as a central location for respondents to access information about the study;
- tracking respondent contact information;

- allowing respondents to access and complete the survey; and
- releasing the incentive to the respondent after completing the survey.

Several actions were initiated to facilitate registration on the site. Like the previous tracing work, announcement e-mails were sent to the sampled PISA participants to register on the site. For those without verified e-mail addresses or who had indicated that hard-copy mailing was their preferred way to receive study information, hard-copy mailings were sent with a letter announcing that the site was open and encouraging them to register for the study. Appendix D provides examples of the registration materials.

Beginning in March 2015, a telephone contact effort contacted the sample to encourage them to register on the site and continue to update participant contact information. This effort continued through May 2015.

3.2.2 Recruitment

Recruitment involves contacting the respondent, presenting a description of what is involved in participating in the upcoming study, inviting the respondent to participate and providing the respondent with the necessary information to access the survey. The purpose of the recruitment effort is to maximize the number of respondents who complete the data collection phase of the study while maintaining the contact that was established during the tracing efforts. Appendix D provides the example contact materials.

Recruitment for the field test began November 2015 with priming e-mails to the e-mail addresses on file. The priming e-mail contained information about the survey launch and informed potential participants that they would need to use Firefox to access the ESO. The priming e-mail also asked participants to update their mailing address so that a cash card could be sent to them via FedEx. Hard-copy packets were sent via FedEx that contained an official invitation letter from NCES, and a YAFS information flyer. The recruitment yielded 371 registrations for the PISA YAFS field test.

Recruitment for the main study followed a similar priming e-mail and hard-copy mail approach and began in February 2016. The contact was made to the 4,612 U.S. PISA 2012 participants who voluntarily returned the contact forms. Follow-up calls by Westat staff were made throughout the data collection period to nonrespondents to encourage their participation. The recruitment yielded 2,448 registered users for the main study.

3.2.3 Data Collection

Data collection was conducted for both a field test and main study. The data collection periods for both the field test and main study were kicked off using primer e-mails, which announced when the survey would open and reminded respondents about the activation of the incentive card after completing the survey, and hard-copy notifications with redundant information (see appendix D for example materials). Along with notifying participants of the upcoming data collection and incentives, specific information was provided about the ESO's Firefox browser requirement and supported device types.

Throughout the 12-week data collection period, e-mails, hard-copy notices, and telephone reminders were utilized at key times to drive response.

PISA YAFS Field Test Data Collection

The PISA YAFS field test was conducted December 2015 – January 2016. The purpose of the field test was twofold:

1. To examine the operational stability of the online components (e.g., participant website, LEQ, ESO, electronic incentive distribution).
2. To obtain a general feel for the data (i.e., that normal performance distributions were evident, and that data were valid).

Response rates for the PISA YAFS field test are shown in table 3. In total, 258 respondents responded to the PISA YAFS field test survey in some way. There were 213 respondents who completed both the LEQ and ESO instruments, an additional 34 respondents who completed the LEQ and part of the ESO, and a further 11 respondents who completed only the LEQ.

Timing data was gathered and examined showing that the variation in response times and the number of sessions used by respondents to complete the survey. These timings were within the expected limits for completing the survey.

Table 3. Status of sampled participants selected for the PISA YAFS field test: 2016

Response status	PISA YAFS participation	
	Number of respondents	Percentage of respondents (unweighted)
Total registered	371	100.0
Responded to LEQ	265	71.4
Responded to ESO	247	66.6
Complete	213	57.4
Partially complete	34	9.2
Not started	11	3.0

NOTE: LEQ refers to the additional noncognitive survey items in the Learning Educational Career Questionnaire and ESO refers to Education and Skills Online assessment.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

The PISA YAFS field test was also useful for examining the effectiveness of the messaging and communication with respondents during the survey window and provided metrics to use in evaluating response patterns over time for the main data collection. A schedule of e-mails and call contact efforts was applied at specific points at regular intervals. As the end of the field test window approached, messaging was able to create a deadline effect that added a large boost in response.

PISA YAFS Main Study Data Collection

The PISA YAFS main study data collection occurred between March and July 2016. As described in section 3.2.1, the main study work began with tracing and tracking participants from 2012. In late 2015, participants began registering for the PISA YAFS website and then were formally recruited to participate whether or not they had registered for the website.

The main study data collection was originally scheduled to run for 12 weeks. However, given that there was no requirement that data collection end at a specific time, the data collection window was extended by an additional 2 weeks to maximize participant response.

Data collection opened on March 7, 2016 and ran through June 15, 2016. The original data collection window was to close on May 30 and messaging to respondents who had not completed the survey was sent on May 21, 2016. The data collection was extended to June 15 in an effort to maximize participant response.

Table 4. Status of sampled participants selected for the PISA YAFS main study: 2016

	PISA YAFS participants	
	Number	Percentage (weighted)
U.S. PISA 2012 student sample (core assessment only)	4,978	
PISA students completing student information forms	4,612	100.0
PISA YAFS 2016 participants	2,318	50.1
Participated in LEQ	2,318	50.1
Participated in ESO	2,008	43.6
Did not participate in ESO	310	6.6

NOTE: Of the 4,612 PISA 2012 participants who returned the contact forms, 2,448 registered on the PISA YAFS recruitment website. LEQ refers to the additional noncognitive survey items in the Learning Experience Questionnaire. ESO refers to the online assessment known as Education and Skills Online.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

In total, 2,318 respondents interacted with the PISA YAFS survey in some way. There were 2,008 respondents who responded to both the LEQ and ESO instruments, and a further 310 respondents who completed only the LEQ.

3.3 Quality Control

Several quality control measures were implemented to ensure: (1) respondents could successfully access the survey; (2) accurate and valid data were being collected (e.g., confirming identity using PISA 2012 administrative data); and (3) any issues were promptly identified and fixed (e.g., daily and weekly help desk reports).

A PISA YAFS study help desk was established to answer questions from respondents needing technical assistance accessing the PISA YAFS participant website as well as the survey instruments. The help desk staff also assisted with answering questions about timing and availability of the survey, as well as incentive-related questions about the cash cards. The help desk was reached by both e-mail and a toll-free 800 line. Formal trainings with outbound callers and help desk staff were conducted.

An important aspect to online data collection surveys is verifying that those individuals responding are the intended respondents. The PISA YAFS online system construction built in specific data-driven checks from the PISA administrative data (such as respondent gender and birth date) to verify, as much as possible, the authenticity of the respondents. Respondents were asked to provide this information when they registered for the study and created their personal login credentials.

Weekly progress reports detailing the success of data collection were provided to project staff and the National Center for Education Statistics (NCES). The reports provided update of respondent completions counts and percentages. This report also included overall participation outcomes—number of complete surveys with both LEQ and ESO, LEQ only or ESO only, and reported overall rates of participation.

In addition to the weekly reports, standing weekly project meetings were attended by project staff and NCES to review progress and discuss issues.

4. Weighting and Nonresponse Adjustment

4.1 Justification

Generally in a survey, the base weights are computed from the inverse of the probability of selection for the sample. However, since the Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS) is a follow-up to PISA 2012, the base weights for PISA YAFS are the final PISA 2012 student weights. These PISA 2012 student weights were then adjusted to compensate for PISA YAFS nonresponse. There were two sources of nonresponse—those PISA students that did not provide follow-up contact information in 2012 during the PISA assessment, and those that did not respond to the PISA YAFS survey.

4.2 Response Propensity Scores

Nonresponse adjustment (NRA) to the PISA 2012 student weights was conducted to create new weights for the PISA YAFS data. The NRA was a two-step process that first adjusted for those participants who did not provide contact information after the 2012 assessment, then adjusted for the participants who did not respond to the Education and Skills Online assessment (ESO).

The weighting classes for the NRA are created through a two-step procedure to group participants with similar characteristics related to nonresponse. The first step is the variable selection, which selects a subset of variables for use in model construction. The second step employs a regression analysis to estimate response propensities for creating the weighting classes. The weights are then adjusted within the weighting classes as described in the next section.

First, the variable selection step was performed through Least Absolute Shrinkage and Selection Operator (LASSO) regression, which is a penalized or regularized regression from the field of machine learning (Tibshirani 1996). The LASSO regression shrinks nonsignificant regression coefficient estimates to zero and produces a simpler model that includes only a subset of the predictors. A tuning parameter controls the strength of the penalty that helps determine the number of remaining predictors. LASSO solutions are quadratic programming problems that are solved the same as minimizing the sum of squares with constraints on the summation of the coefficients. The main assumption in the LASSO regression is that response status has a sparse model and can be explained by a small subset of predictors. Only the

variables most predictive of PISA YAFS nonresponse identified by LASSO are retained for the subsequent step.

PISA YAFS is unusual in that there are a large number of possible predictor variables available from the PISA 2012 background questionnaire. There were over 450 PISA background variables entered into LASSO that identified 53 variables for response propensity modeling. The bias increases as the penalty increases and more coefficients are set to zero. A propensity score analysis was run that showed a reasonable overlap in the distributions for the responding and nonresponding groups that indicated the groups have common support that helped determine the number of variables kept in the final model. Response propensity scores were created using this subset of variables. Logistic regression was performed to get an estimate of the response propensity for each case and to create weighting classes.

4.3 Nonresponse Adjusted Weights

The propensity response was sorted and 20 equal-sized NRA weighting classes were created. The nonresponse adjustment factors were then calculated and NRA weights created in each weighting class.

The weight adjustments between the nonresponse cells varied. For one group in particular, the weighted response rate was very low, at 5.57 percent, leading to a high NRA factor of 17.97. The maximum value of PISA YAFS student weight (W_YFSTUWT) is 16181.9, compared to the maximum value of PISA student weight (W_FSTUWT of 2597.9). It was decided the weights would be left as is, without trimming the highest weights or collapsing the lowest nonresponse cells. This decision was made based on a series of factors. The increase in the weight variation, as measured by the Coefficient of Variation, was not very large, increasing from 41.22 to 75.61. Thus, the design effect increased from 1.17 to 1.57 which was deemed reasonable given the overall response rate and the size of the adjustment factors. Further, characteristics of PISA respondents across the 20 nonresponse cells were examined to see whether there was evidence that the nonresponse cells were related to educational attainment. Across many variables, but in particular the plausible values for reading, math, and science, it was clear that proficiency increases as propensity to respond increases across the nonresponse cell groups. This indicates a large nonresponse bias, substantially reduced by the NRA.

5. Nonresponse Bias Analysis

5.1 Introduction

The PISA YAFS total eligible sample comprised young adults who, as students, participated in the PISA 2012 assessment and did not take the PISA 2012 financial literacy component. This resulted in a total eligible sample of 4,978 young adults, as they were all determined to be eligible. Of these, 2,318 participated (the participating sample) for an unweighted response rate of 46.6 percent (45.9 percent weighted).

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 of less than 85 percent. Since the PISA YAFS weighted response rate is below 85 percent, NCES standards require an investigation into the potential magnitude of nonresponse bias in the sample.

5.2 Methodology

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

The general approach taken involves an analysis in two parts as described below:

- Analysis of the participating sample: the distribution of the participating sample (N = 2,318) was compared with that of the total eligible sample (N = 4,978). In each sample, young adults were weighted by their base weights, excluding any PISA YAFS nonresponse adjustment factor. The base weight for each young adult is the final PISA 2012 student weight that includes both the PISA school and student nonresponse adjustments (NRAs).
- Analysis of the NRA sample: the same sets of young adults were compared as in the first analysis but this time, when analyzing the participating young adults, the PISA YAFS NRAs were applied to the weights. The total eligible sample was again weighted by their base weights, excluding any PISA YAFS NRA factor.

The first analysis indicates the potential for nonresponse bias that was introduced through young adult nonresponse. The second analysis indicates the potential for bias after accounting for the mitigating effects of nonresponse weight adjustments.

Participating young adults and the total eligible young adult sample were compared by student responses to selection questions from the PISA 2012 background questionnaire that might provide information about the presence of nonresponse bias. Comparing these responses between participating young adults and the total eligible 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, it is the best approach available since PISA YAFS data are not available for nonparticipating young adults.

There are a large number of variables available from the PISA 2012 student background questionnaire. To select the variables for this analysis, we started with the variables that were used in the nonresponse adjustment described in chapter 4. This was because variables had to be highly related to participation for inclusion in the final weighting model. We included all the weighting variables in a preliminary analysis, and the results were the same for all the variables in that they were highly significant for the participating sample in part one of the analysis and not significant with nonresponse-adjusted weights applied in the second part. These results confirmed that the nonresponse adjustment worked as expected and met the objective of reducing the bias in all the weighting variables. Thus, rather than showing all 52 variables with the same result, we only show the results for 6 categorical variables that had a p value of 0.1 or less in the second analysis that is representative of all weighting variables, plus the key demographic variables: gender and race/ethnicity. Additionally, a few key variables used in the YAFS analysis but not used in weighting were also included. All the variables are given in appendix A. The variables used in the YAFS analysis but not used in weighting are identified with an (A) in the following lists.

The following categorical variables were available for all young adults:

- Derived race/ethnicity—missing, White, Black or African American, Hispanic, Asian, Two or more races, and other;
- Gender—female and male;
- Attended preschool or kindergarten—missing, no, yes, for 1 year or less, and yes, for more than one year;
- Attended preschool—missing, no, yes, for one year or less, and yes, for more than 1 year;

- Truancy - skipped whole school day—missing, none, one or two times, three or four times, and five or more times;
- Highest grade expected to complete—
  - missing,
  - less than high school,
  - high school (HS diploma or GED),
  - vocational, or technical certificate,
  - associate's degree (2-year college degree),
  - bachelor's degree (4-year college degree),
  - master's degree, and
  - doctoral or professional degree;
- Highest level of parental educational attainment completed (classified into International Standard Classification of Education, or ISCED level) (A)—
  - missing,
  - none,
  - grade 6,
  - grade 9,
  - high school diploma, GED, vocational, or technical certificate/diploma,
  - associate's degree (2-year college degree), and
  - bachelor's degree (4-year college degree), master's degree, and doctoral or professional degree;
- Father's current job status (A)—missing, working full-time for pay, working part-time for pay, not working, but looking for a job, and other (e.g., home duties, retired);
- Language spoken at home most of the time (A)—missing, Spanish, English, and another language; and
- Sense of belonging - feel happy at school (A)—missing, strongly agree, agree, disagree, strongly disagree.

The following continuous variables were available for all young adults:

- The first plausible value in mathematics, reading, and science; and
- Openness for problem solving (A).

For categorical variables, the distribution of frame characteristics for participants was compared with the distribution for all eligible young adults. 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 participants being a subset of the full sample. The bias and relative bias are also shown in 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 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. Only the variables that had a *p* value of 0.1 or less in the second analysis were included in the regression. Gender, derived race/ethnicity, and the plausible value variables were not included in the regression model for this reason. Openness for problem solving was also not included in the regression due to the large number (1,799) of observations with missing values that would be dropped from the regression model. The concept of NRA weights does not apply to the nonresponding units; thus, a regression analysis that compares respondents with nonrespondents using NRA weights could not conducted in the second part of the analysis.

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

5.3 Participating Sample

This section presents the nonresponse bias analysis based on the sample of 4,978 eligible young adults for the PISA YAFS sample. The distribution of the participating sample was compared to the young adults in the total eligible sample. Base weights were used for both the eligible sample and the participating young adults. The unweighted response rate for PISA YAFS was 46.6 percent, with 2,318 out of 4,978 young adults participating. The weighted response rate was 45.9 percent.

5.3.1 Categorical Variables

The distribution of participating and eligible young adults by the characteristics are shown in tables 5, 6, and 7. The Chi-square statistic for derived race/ethnicity, gender, attended preschool or kindergarten, attended preschool, truancy - skipped whole school day, highest grade expected to complete, highest level of parental educational attainment, and father's current job status was significant, suggesting evidence of relationships with participation in the assessment. Significant differences between eligible young adults and those that participated are as follows:

- Black or African American young adults were underrepresented among participating young adults relative to eligible young adults (9.1 versus 12.5 percent, respectively), while White young adults were overrepresented among participating young adults (53.8 versus 50.4 percent, respectively), table 5.
- Male young adults were underrepresented among participating young adults relative to eligible young adults (44.7 versus 51.0 percent, respectively), while female young adults were overrepresented among participating young adults (55.3 versus 49.0 percent, respectively), table 5.
- Young adults who did not attend preschool or kindergarten were underrepresented among participating young adults relative to eligible young adults (1.2 versus 1.5 percent, respectively), while young adults who attended preschool or kindergarten for more than 1 year were overrepresented among participating young adults (74.8 versus 73.7 percent, respectively), table 5.
- Young adults who attended preschool for 1 year or less were underrepresented among participating young adults relative to eligible young adults (43.4 versus 45.7 percent, respectively), while young adults who attended for more than 1 year were overrepresented among participating young adults (31.5 versus 27.5 percent, respectively), table 5.

- Young adults who were truant one or two times were underrepresented among participating young adults relative to eligible young adults (16.5 versus 17.7 percent, respectively), while young adults who were never truant were overrepresented among participating young adults (81.0 versus 78.1 percent, respectively), table 6.

- Young adults who expected to complete high school were underrepresented among participating young adults relative to eligible young adults (4.9 versus 7.7 percent, respectively), while young adults who expected to complete a doctoral or professional degree were overrepresented among participating young adults (27.0 versus 22.9 percent, respectively), table 6.

- Young adults with the highest level of parental educational attainment of High school, GED, vocational, or technical certificate/diploma were underrepresented among participating young adults relative to eligible young adults (28.2 versus 31.7 percent, respectively), while young adults with Bachelor's, master's, and doctoral or professional degree were overrepresented among participating young adults (48.9 versus 43.2 percent, respectively), table 7.

- Young adults whose father's current job status was working part-time with pay were underrepresented among participating young adults relative to eligible young adults (5.7 versus 6.4 percent, respectively), while young adults whose father was working full-time for pay were overrepresented among participating young adults (76.0 versus 72.8 percent, respectively, table 7.

There were no statistically significant relationships between participation status and language spoken at home most of the time or sense of belonging – feel happy at school (table 7).

Table 5. Percentage distribution of eligible and participating young adults in the PISA YAFS participating sample, by derived race/ethnicity, gender, attended preschool or kindergarten, and attended preschool: 2016

Characteristic	Sample: Eligible (percent) (N = 4,978)	Sample: Participating (percent) (N = 2,318)	Bias	Relative bias	Chi-square *p* value
Derived race/ethnicity					**0.000**
Missing	1.4	0.6	-0.80	-0.571	
White	50.4	53.8	3.40	0.067	
Black or African American	12.5	9.1	-3.40	-0.272	
Hispanic	24.5	24.0	-0.50	-0.020	
Asian	4.7	6.7	2.00	0.426	
Two or more races	4.6	4.3	-0.30	-0.065	
Other	2.0	1.5	-0.50	-0.250	
Gender					**0.000**
Female	49.0	55.3	6.30	0.129	
Male	51.0	44.7	-6.30	-0.124	
Attended preschool or kindergarten					**0.000**
Missing	1.2	0.3	-0.90	-0.750	
No	1.5	1.2	-0.30	-0.200	
Yes, for 1 year or less	23.7	23.8	0.10	0.004	
Yes, for more than 1 year	73.7	74.8	1.10	0.015	
Attended preschool					**0.000**
Missing	1.8	0.8	-1.00	-0.556	
No	25.0	24.4	-0.60	-0.024	
Yes, for 1 year or less	45.7	43.4	-2.30	-0.050	
Yes, for more than 1 year	27.5	31.5	4.00	0.145	

NOTE: Detail may not sum to totals because of rounding. The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Young adults were weighted by their PISA YAFS base weights that did not include a PISA YAFS nonresponse adjustment factor. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Table 6. Percentage distribution of eligible and participating young adults in the PISA YAFS participating sample, by truancy and highest grade expected to complete: 2016

Characteristic	Sample: Eligible (percent) (N = 4,978)	Sample: Participating (percent) (N = 2,318)	Bias	Relative bias	Chi-square *p* value
Truancy – Skipped whole school day					**0.000**
Missing	1.1	0.2	-0.90	-0.818	
None	78.1	81.0	2.90	0.037	
One or two times	17.7	16.5	-1.20	-0.068	
Three or four times	2.4	1.9	-0.50	-0.208	
Five or more times	0.8	0.4	-0.40	-0.500	
Highest grade expected to complete					**0.000**
Missing	1.7	0.6	-1.10	-0.647	
Less than high school	1.5	0.8	-0.70	-0.467	
High school (HS diploma or GED)	7.7	4.9	-2.80	-0.364	
Vocational or technical certificate	3.8	2.5	-1.30	-0.342	
Associate's degree	6.1	4.7	-1.40	-0.230	
Bachelor's degree	34.0	35.1	1.10	0.032	
Master's degree	22.3	24.3	2.00	0.090	
Doctoral or professional degree	22.9	27.0	4.10	0.179	

NOTE: Detail may not sum to totals because of rounding. The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Young adults were weighted by their PISA YAFS base weights that did not include a PISA YAFS nonresponse adjustment factor. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Table 7. Percentage distribution of eligible and participating young adults in the PISA YAFS participating sample, by highest level of parental educational attainment, father's current job status, language spoken at home, and sense of belonging: 2016

Characteristic	Sample: Eligible (percent) (N = 4,978)	Sample: Participating (percent) (N = 2,318)	Bias	Relative bias	Chi-square *p* value
Highest level of parental educational attainment					**0.000**
Missing	2.2	1.0	-1.20	-0.545	
None	0.9	1.1	0.20	0.222	
Grade 6	2.6	2.3	-0.30	-0.115	
Grade 9	5.4	4.4	-1.00	-0.185	
High school, GED, vocational, or technical certificate/diploma	31.7	28.2	-3.50	-0.110	
Associate's degree	14.1	14.0	-0.10	-0.007	
Bachelor's, master's, and doctoral or professional degree	43.2	48.9	5.70	0.132	
Father current job status					**0.000**
Missing	7.8	5.9	-1.90	-0.244	
Working full-time for pay	72.8	76.0	3.20	0.044	
Working part-time for pay	6.4	5.7	-0.70	-0.109	
Not working, but looking for a job	4.4	4.2	-0.20	-0.045	
Other (e.g., home duties, retired)	8.6	8.2	-0.40	-0.047	
Language spoken at home most of the time					0.078
Missing	2.2	0.8	-1.40	-0.636	
Spanish	10.7	9.6	-1.10	-0.103	
English	83.7	85.8	2.10	0.025	
Another language	3.4	3.8	0.40	0.118	
Sense of belonging - feel happy at school					0.075
Missing	35.6	35.5	-0.10	-0.003	
Strongly agree	13.6	14.4	0.80	0.059	
Agree	37.7	37.8	0.10	0.003	
Disagree	11.0	10.8	-0.20	-0.018	
Strongly disagree	2.1	1.5	-0.60	-0.286	

NOTE: Detail may not sum to totals because of rounding. The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Young adults were weighted by their PISA YAFS base weights that did not include a PISA YAFS nonresponse adjustment factor. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

5.3.2 Continuous Variables

Summary means for each continuous variable for participating and eligible young adults are shown in tables 8 and 9. The *t* test statistic for all continuous variables in this section were significant, suggesting evidence of relationships with participation in the assessment.

Participating young adults had a higher mean of plausible value 1 in mathematics, reading, and science than the eligible sample (507.6 versus 480.7, 525.2 versus 497.0, and 524.8 versus 497.2, respectively; table 8) and a higher mean of openness for problem solving than the eligible sample (0.3 versus 0.2; table 9).

Table 8. Mean scores of plausible value 1 for eligible and participating young adults in the PISA YAFS participating sample: 2016

	Sample				
Characteristic	Eligible (mean score) (N = 4,978)	Participating (mean score) (N = 2,318)	Bias	Relative bias	*t* test *p* value
Plausible value 1 in					
Mathematics	480.7	507.6	26.83	0.056	**0.000**
Reading	497.0	525.2	28.22	0.057	**0.000**
Science	497.2	524.8	27.61	0.056	**0.000**

NOTE: Mathematics, reading, and science scores are based on original student PISA 2012 scores. The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Young adults were weighted by their PISA YAFS base weights that did not include PISA YAFS nonresponse adjustment factor. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Table 9. Mean values of openness for problem solving for eligible and participating young adults in the PISA YAFS participating sample: 2016

	Sample young adults				
Characteristic	Eligible (mean) (N = 3,179)	Participating (mean) (N = 1,515)	Bias	Relative bias	*t* test *p* value
Openness for problem solving	0.2	0.3	0.11	0.611	**0.000**

NOTE: The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Young adults were weighted by their PISA YAFS base weights that did not include a PISA YAFS nonresponse adjustment factor. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

5.3.3 Logistic Regression Model

To examine the joint relationship of various characteristics to nonresponse, the analysis used a logistic regression model with participation status as the binary dependent variable and frame characteristics as predictor variables. To limit the number of predictor variables in the model, only those weighting variables with a *p* value less than 0.1 with nonresponse-adjusted weights in section 5.4 and the categorical analysis variables were included.

Standard errors and tests of hypotheses for the full model parameter estimates are presented in table 10. Eleven characteristics and the interaction term were significant predictors of school participation. The positive parameter estimates indicate that:

- young adults with missing data were somewhat overrepresented among participating young adults relative to young adults who reported a low sense of belonging (sense of belonging - feel happy at school = strongly disagree, table 10).

The negative parameter estimates indicate that

- young adults who attended preschool 1 year or less were somewhat underrepresented among participating young adults relative to young adults who attended preschool for more than 1 year;
- young adults with other educational expectations (highest grade expected to complete being missing, less than high school, high school [HS diploma or GED], vocational or technical certificate, associate's degree [2-year college degree], and bachelor's degree [4-year college degree]), were somewhat underrepresented among participating young adults relative to participating young adults who expected to complete a doctoral or professional degree;
- young adults whose parents' highest completed level of education was High school, GED, vocational, or technical certificate/diploma were somewhat underrepresented among participating young adults relative to young adults whose parents' highest completed level of education was bachelor's, master's, and doctoral or professional degree; and
- young adults with missing data were somewhat underrepresented among participating young adults relative to young adults who spoke another language at home other than English or Spanish, table 10.

Table 10. Logistic regression model parameters using the PISA YAFS young adult sample: 2016

Parameter	Parameter estimate	Standard error	*t* test for H_0: parameter = 0	*p* value
Intercept	-0.68	0.523	-1.310	0.194
Attended pre-school or kindergarten				
missing	-0.46	0.528	-0.867	0.388
No	0.02	0.371	0.043	0.966
Yes, for 1 year or less	0.45	0.282	1.587	0.116
Attended pre-school				
missing	-0.54	0.460	-1.171	0.245
No	-0.54	0.288	-1.863	0.066
Yes, for 1 year or less	-0.28	0.082	-3.446	**0.001**
Truancy - Skipped whole school day				
missing	0.23	0.722	0.314	0.754
None	0.87	0.478	1.812	0.074
One or two times	0.79	0.490	1.606	0.112
Three or four times	0.58	0.505	1.154	0.252
Highest grade expected to complete				
missing	-0.92	0.395	-2.335	**0.022**
Less than high school	-1.05	0.292	-3.589	**0.001**
High school (HS diploma or GED)	-0.86	0.142	-6.082	**0.000**
Vocational or technical certificate	-0.87	0.199	-4.362	**0.000**
Associate's degree	-0.65	0.127	-5.123	**0.000**
Bachelor's degree	-0.25	0.070	-3.610	**0.001**
Master's degree	-0.16	0.092	-1.779	0.079
Highest level of parental educational attainment				
missing	-0.43	0.271	-1.574	0.119
None	0.63	0.323	1.953	0.054
Grade 6	-0.11	0.261	-0.415	0.679
Grade 9	-0.28	0.164	-1.688	0.095
High school, GED, vocational, or technical certificate/diploma	-0.27	0.092	-2.939	**0.004**
Associate's degree	-0.17	0.124	-1.355	0.179
Father current job status				
missing	-0.11	0.165	-0.684	0.496
Working full-time for pay	0.10	0.096	1.038	0.302
Working part-time for pay	-0.07	0.151	-0.434	0.666
Not working, but looking for a job	0.08	0.161	0.474	0.637
Language spoken at home most of the time				
Missing	-1.15	0.364	-3.155	**0.002**
Spanish	-0.33	0.208	-1.603	0.113
English	-0.21	0.178	-1.166	0.247
Sense of belonging - Feel happy at school				
missing	0.45	0.223	2.004	**0.048**
Strongly agree	0.49	0.225	2.173	**0.033**
Agree	0.41	0.223	1.853	0.067
Disagree	0.43	0.262	1.641	0.105

NOTE: Young adults were weighted by their PISA YAFS base weights that did not include PISA YAFS nonresponse adjustment factor. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

5.4 Nonresponse Adjusted Sample

This section presents the nonresponse bias analysis based on the NRA sample of 4,978 eligible young adults for the PISA YAFS sample. The distribution of the participating sample was compared to the young adults in the total eligible final sample, just like the previous section. However, in the analyses that follow, base weights were used for the eligible sample of young adults, whereas PISA YAFS NRA weights were used for the participating young adults.

5.4.1 Categorical Variables

The distribution of participating and eligible young adults by the characteristics is shown in tables 11, 12, and 13. Only the Chi-square statistic for "attended preschool" and "highest grade expected to complete" remained significant once nonresponse adjusted weights were applied, which suggests that there is some evidence of relationships with participation in the assessment. In particular:

- Young adults who attended preschool for 1 year or less were overrepresented among participating young adults relative to eligible young adults (46.6 versus 45.7 percent, respectively), while young adults who attended for more than 1 year were underrepresented among participating young adults (26.6 versus 27.5 percent, respectively), table 11.
- Young adults who expected to complete high school as the highest level of educational attainment were overrepresented among participating young adults relative to eligible young adults (8.7 versus 7.7 percent, respectively), while young adults who expected to complete a master's degree were underrepresented among participating young adults (21.6 versus 22.3 percent, respectively), table 12.

For both of these characteristics, the NRA slightly over-adjusted for most of the categories (as seen by the change in the sign of the bias) but still greatly reduced the bias in all categories of "highest grade expected to complete" (table 12) and all but one in "attended preschool" (table 11).

Table 11. Percentage distribution of eligible and participating young adults in the PISA YAFS nonresponse-adjusted sample, by derived race/ethnicity, gender, attended preschool or kindergarten, and attended preschool: 2016

Characteristic	Sample: Eligible (percent) (N = 4,978)	Sample: Participating (percent) (N = 2,318)	Bias	Relative bias	Chi-square *p* value
Derived race/ethnicity					0.107
Missing	1.4	0.6	-0.80	-0.571	
White	50.4	51.1	0.70	0.014	
Black or African American	12.5	12.6	0.10	0.008	
Hispanic	24.5	24.7	0.20	0.008	
Asian	4.7	5.0	0.30	0.064	
Two or more races	4.6	4.1	-0.50	-0.109	
Other	2.0	2.0	0.00	0.000	
Gender					0.955
Female	49.0	48.9	-0.10	-0.002	
Male	51.0	51.1	0.10	0.002	
Attended preschool or kindergarten					0.054
Missing	1.2	0.5	-0.70	-0.583	
No	1.5	1.4	-0.10	-0.067	
Yes, for 1 year or less	23.7	24.2	0.50	0.021	
Yes, for more than 1 year	73.7	73.9	0.20	0.003	
Attended preschool					**0.029**
Missing	1.8	1.0	-0.80	-0.444	
No	25.0	25.8	0.80	0.032	
Yes, for 1 year or less	45.7	46.6	0.90	0.020	
Yes, for more than 1 year	27.5	26.6	-0.90	-0.033	

NOTE: Detail may not sum to totals because of rounding. The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating young adults were weighted by their PISA YAFS nonresponse adjusted weight. Eligible young adults were weighted by their PISA YAFS base weights. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Table 12. Percentage distribution of eligible and participating young adults in the PISA YAFS nonresponse-adjusted sample, by truancy and highest grade expected to complete: 2016

Characteristic	Sample: Eligible (percent) (N = 4,978)	Sample: Participating (percent) (N = 2,318)	Bias	Relative bias	Chi-square *p* value
Truancy – Skipped whole school day					0.076
Missing	1.1	0.3	-0.80	-0.727	
None	78.1	77.6	-0.50	-0.006	
One or two times	17.7	18.6	0.90	0.051	
Three or four times	2.4	2.5	0.10	0.042	
Five or more times	0.8	1.0	0.20	0.250	
Highest grade expected to complete					**0.034**
Missing	1.7	0.8	-0.90	-0.529	
Less than high school	1.5	1.2	-0.30	-0.200	
High school (HS diploma or GED)	7.7	8.7	1.00	0.130	
Vocational or technical certificate	3.8	4.6	0.80	0.211	
Associate's degree	6.1	6.0	-0.10	-0.016	
Bachelor's degree	34.0	33.5	-0.50	-0.015	
Master's degree	22.3	21.6	-0.70	-0.031	
Doctoral or professional degree	22.9	23.6	0.70	0.031	

NOTE: Detail may not sum to totals because of rounding. The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating young adults were weighted by their PISA YAFS nonresponse adjusted weight. Eligible young adults were weighted by their PISA YAFS base weights. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Table 13. Percentage distribution of eligible and participating young adults in the PISA YAFS nonresponse-adjusted sample, by highest level of parental educational attainment, father's current job status, language spoken at home, and sense of belonging: 2016

Characteristic	Sample: Eligible (percent) (N = 4,978)	Sample: Participating (percent) (N = 2,318)	Bias	Relative bias	Chi-square *p* value
Highest level of parental educational attainment					0.217
Missing	2.2	1.4	-0.80	-0.364	
None	0.9	0.9	0.00	0.000	
Grade 6	2.6	3.0	0.40	0.154	
Grade 9	5.4	5.6	0.20	0.037	
High school, GED, vocational, or technical certificate/diploma	31.7	31.1	-0.60	-0.019	
Associate's degree	14.1	15.1	1.00	0.071	
Bachelor's, master's, and doctoral or professional degree	43.2	42.9	-0.30	-0.007	
Father current job status					0.224
Missing	7.8	8.8	1.00	0.128	
Working full-time for pay	72.8	72.1	-0.70	-0.010	
Working part-time for pay	6.4	5.5	-0.90	-0.141	
Not working, but looking for a job	4.4	4.8	0.40	0.091	
Other (e.g., home duties, retired)	8.6	8.8	0.20	0.023	
Language at home					0.704
Missing	2.2	2.2	0.00	0.000	
Spanish	10.7	10.6	-0.10	-0.009	
English	83.7	83.4	-0.30	-0.004	
Another language	3.4	3.8	0.40	0.118	
Sense of belonging – feel happy at school					0.111
Missing	35.6	36.5	0.90	0.025	
Strongly agree	13.6	14.4	0.80	0.059	
Agree	37.7	36.5	-1.20	-0.032	
Disagree	11.0	11.1	0.10	0.009	
Strongly disagree	2.1	1.4	-0.70	-0.333	

NOTE: Detail may not sum to totals because of rounding. The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating young adults were weighted by their PISA YAFS nonresponse adjusted weight. Eligible young adults were weighted by their PISA YAFS base weights. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

5.4.2 Continuous Variables

Summary means for each continuous variable for participating and eligible young adults are shown in tables 14 and 15. There were no statistically significant differences between participating and eligible young adults across any of the characteristics shown in tables 14 and 15 once NRA weights were applied.

Table 14. Mean scores of plausible values for eligible and participating young adults in the PISA YAFS nonresponse-adjusted sample: 2016

	Sample				
Characteristic	Eligible (mean score) (N = 4,978)	Participating (mean score) (N = 2,318)	Bias	Relative bias	*t* test *p* value
Plausible value 1 in					
Mathematics	480.72	481.70	0.98	0.002	0.560
Reading	497.02	498.65	1.63	0.003	0.416
Science	497.19	498.38	1.19	0.002	0.501

NOTE: Mathematics, reading, and science scores are based on original student PISA 2012 scores. The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating young adults were weighted by their PISA YAFS nonresponse adjusted weight. Eligible young adults were weighted by their PISA YAFS base weights. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Table 15. Mean values of openness for problem solving for eligible and participating young adults in the YAFS nonresponse-adjusted sample: 2016

	Sample				
Characteristic	Eligible (mean) (N = 3,179)	Participating (mean) (N = 1,515)	Bias	Relative bias	*t* test *p* value
Openness for problem solving	0.18	0.16	-0.02	-0.111	0.474

NOTE: The bias is calculated as the difference between the respective estimates for the participating and eligible sample. The relative bias is calculated as the bias divided by the estimate from the eligible sample. Participating young adults were weighted by their PISA YAFS nonresponse adjusted weight. Eligible young adults were weighted by their PISA YAFS base weights. Bolded *p* values indicate statistical significance at the 5 percent level.
SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

5.5 Summary

Since the PISA YAFS weighted response rate was below 85 percent, NCES standards require an investigation into the potential magnitude of nonresponse bias at the young adult level in the sample. The investigation into nonresponse bias for the PISA YAFS data collection effort showed statistically

significant relationships between response status and some of the available student characteristics that were examined in the analyses.

For the analysis of the participating sample of young adults *without* NRAs applied to the weights, most variables were found to be statistically significantly related to participation in the bivariate analysis: derived race/ethnicity, gender, attended preschool or kindergarten, attended preschool, truancy - skipped whole school day, highest grade expected to complete, highest level of parental educational attainment, father's current job status, plausible value 1 in mathematics, reading, and science, and openness for problem solving (table 5, table 6, table 7, table 8, and table 9). This was confirmed when all of these factors were considered simultaneously in a regression analysis; 11 of the parameter estimates were significant predictors of participation (table 10) important.

For the participating sample of young adults *with* NRAs applied to the weights, only two variables remained statistically significantly related to participation in the bivariate analysis: attended preschool (table 11) and highest grade expected to complete (table 12). The multivariate regression analysis could not be conducted after the NRAs were applied to the weights. The concept of nonresponse-adjusted weights does not apply to the nonresponding units and thus, we could not conduct an analysis that compares respondents with nonrespondents using NRA weights.

In sum, the investigation into nonresponse bias in the PISA YAFS sample provides evidence that there is limited nonresponse bias in the PISA YAFS participating sample based on the characteristics studied. This result is not surprising, and the bias is in the expected direction. For example, females responded at a higher level than males and higher achieving young adults responded at a higher level than other young adults did. However, after the application of NRAs, there is limited evidence of resulting potential bias in the sample. It is also important to note none of the variables used in the YAFS analysis but not used in weighting were significant after the application of NRAs.

Overall, the nonresponse weighting reduced the bias on all the variables tested. The weighting did over-adjust somewhat on "attended preschool" and "highest grade expected to complete." Since the nonresponse adjustment was based on many variables, not every variable can be controlled for in the adjustment. However, in every category for "highest grade expected to complete," the *absolute* bias was reduced and by more than half for the majority, although the biases as a whole remained statistically significant.

6. Data Analysis and Scaling

The systems of test administration and scoring employed for cognitive items were those in the ESO (OECD 2015), which are similar to the system used in PIAAC (OECD 2013). The analysis methods and procedures for PISA YAFS are based on identical psychometric principles as the methods and procedures used for the ESO and PIAAC (OECD 2013; 2015).

Given the ESO assessment design described in chapter 3, each PISA YAFS respondent was administered a subset of ESO items from the total item pool. As a consequence of the design, different groups of respondents answered different sets of items, which makes it inappropriate to use any statistic based on the number of correct responses in reporting the survey results. Differences in total scores among respondents who took different sets of items may be due to variations in difficulty in the adaptively administered test forms. Unless one makes very strong and incorrect assumptions, such as perfectly parallel test forms, the performance of the different groups cannot be directly compared using total-score statistics. This limitation can be overcome by using Item Response Theory (IRT) scaling. Regularities in response patterns can be modeled using the underlying commonalities among the items and can be used to characterize respondents by estimating so-called person or ability parameters through IRT models. Response patterns can also be used to characterize items by estimating certain item parameters through IRT models; for example, item difficulty in terms of a common scale, even if not all respondents took identical sets of items. In other words, if an item pool is used to measure a certain unidimensional skill, respondents can be compared with each other even if they responded to different sets of items from this item pool. IRT makes it possible to describe distributions of performance in a population or subpopulation and to estimate the relationships between proficiency and background variables.

Before data can be used for analyses, the quality of the data has to be evaluated. This evaluation was done by reviewing the item responses to determine whether each respondent received the items as planned in the design and performing quality checks to evaluate the handling and pattern of the missing values (i.e., missing by design, omitted by the respondent). During the scaling analyses, item fit statistics were evaluated to determine the extent to which item parameters obtained from the ESO field test (which was used to create the final ESO item parameters) work similarly for PISA YAFS (information on the ESO development can be found at https://www.oecd.org/skills/ESonline-assessment/). As a final step, plausible values (PVs) were generated – which are multiple imputations – drawn from a posterior distribution by combining the IRT scaling of the cognitive items with a latent regression model using information from the background questionnaire (BQ) in a population model.

In the following sections, more details about the data evaluation process, the scaling process, and the population model used for PISA YAFS are described.

6.1 Data Handling and Data Quantity for ESO-modified Items

The assurance of the data quality is an important step prior to the IRT scaling and population modeling. Reasonable and meaningful results can only be provided if the analyses are based on correct data. Procedures for the handling of missing data, data completion, and item analyses are illustrated below. All the items administered in PISA YAFS were automatically scored; thus, evaluation of scoring reliability was not needed.

6.1.1 Handling of Missing Data

Plausible values were estimated for the cognitive items; thus, this section discusses how the data from the core literacy, numeracy, and problem solving assessments were handled. The same scoring guidelines and procedures were followed as those applied in the ESO and PIAAC for the computer-based administration, except for data completion (see the section below). The literacy and numeracy items were dichotomously scored: correct responses were scored as 1, and incorrect responses as 0. For data analysis purposes, missing data were handled with a procedure similar to that used in ESO and PIAAC in order to maintain comparability among the studies. The structure of missing responses is mainly derived from the multistage adaptive testing design such as the following:

- Missing by design (scored as 9): Items that were not presented to each respondent due to the multistage adaptive design used in PISA YAFS. Accordingly, these structural missing data, unrelated to respondents' literacy and numeracy skills, were ignored when calculating respondent proficiencies.
- Omitted responses (scored as 8): Missing responses that occurred when respondents chose not to perform one or more presented items, either because they were unable or for some other reason. Any missing response followed by a valid response (whether correct or incorrect) was defined as an omitted response.
- Not reached or not attempted responses (scored as 9): Missing responses at the end of a test were treated as if they were not presented due to the difficulty of determining if the respondent was unable to finish these items or simply abandoned them.

6.1.2 Data Quantity

To ensure accurate proficiency estimations, the PISA YAFS sample respondents needed to provide valid, non-missing responses on both the BQ and cognitive items to be included in the item analysis described in section 6.1.4. A complete cognitive assessment, with a minimum of five attempted items per domain, was necessary to assure sufficient information about the proficiency of respondents. There were 2,318 respondents in total who responded to at least three BQ items. Out of these respondents, 1,885 respondents responded both to the BQ and completed at least one of the domains, either literacy or numeracy, or both domains. Thus, these 1,885 respondents served as the basis for the calculation of the standardized weights and evaluation of the item fits in the IRT scaling stage, and they received the plausible values in the population modeling stage.

6.1.3 Data Completion - Treatment of Respondents With Fewer Than 5 Cognitive Item Responses

This section addresses the level of response required for a respondent to be eligible to receive PV scores. PISA YAFS followed the PIAAC Main Study procedure with respect to cases with responses to fewer than five cognitive items per domain. There were 1,790 respondents who provided sufficient background information and completed the cognitive assessment for both domains (literacy and numeracy). An additional 95 respondents (31 respondents completed all questions in the literacy domain, 62 respondents completed all questions in the numeracy domain, and 2 respondents completed both domains, but did not click to the final "thank you" screen) were considered to have enough data to be include in the analysis. In total, 1,790 respondents who completed both domains and 95 respondents who completed only one of the domains or did not click to the final screen to complete the test were considered eligible to receive the plausible values (PVs) (N = 1,885).

6.1.4 Classical Test Theory Statistics: Item Analyses

Once the data were prepared, item analyses were conducted separately for each domain (literacy and numeracy). The purpose of the item analyses was to identify outliers or unexpected patterns due to technical issues in the computer-based assessment data, such as data not following predictable patterns related to item difficulty or inconsistent response patterns. All descriptive statistics were examined for

observed responses as well as the various missing response codes. The following statistics for each item were computed and examined:

- Item difficulties (proportion of correct responses, or P+);
- frequencies of scores (number of respondents attempted, correct and incorrect responses, omitted items, not-reached items); and
- point biserial correlations.

Additional details about the ESO item analyses procedures can be found in the international ESO technical documentation at https://www.oecd.org/skills/ESonline-assessment/assessmentdesign/technicaldocumentation/ESOnline_Technical_Doc_Ch1-8_Oct2016.pdf.

6.2 IRT Scaling: Evaluation and Estimation of Item Parameters

The ESO cognitive assessment consisted of 78 items: 40 items in the literacy domain and 38 items in the numeracy domain. The ESO computer delivery platform successfully delivered, captured, and exported information for these items. The IRT scaling provided estimations of item parameters and the preliminary proficiency distribution of the population. The IRT scaling was carried out separately for the domains of literacy and numeracy. Similar to ESO and PIAAC, PISA YAFS used the two-parameter logistic model (2PL) (Birnbaum 1968) for dichotomously scored responses. Incorrect responses were coded as 0, and correct responses were coded as 1 in the 2PL model; omitted responses were treated as incorrect responses, and missing by design responses and not reached items were treated as missing values.

The 2PL model is a mathematical model for the probability that an individual will respond correctly to a particular item from a single domain of items. The probability of solving an item (i) depends only on the ability or proficiency (θj) of the respondent (j) and two item parameters characterizing the properties of the item (item difficulty β_i and item discrimination α_i). This is related to the central assumption of conditional independence (sometimes also called local independence). That is, item response probabilities depend only on the respondent's ability and the specified item parameters – there is no dependence on any demographic characteristics of the examinees or responses to any other items presented in a test or the survey administration conditions. Moreover, the 2PL model assumes unidimensionality, that is, a single latent variable, the ability or proficiency θ, accounts for an individual's performance on a set of items. For more details about the models and IRT scaling process see the technical report for ESO (OECD 2015) and the PIAAC main study (OECD 2013).

As PISA YAFS uses the ESO literacy and numeracy assessment items to provide a link to PIAAC, the analyses evaluated whether the ESO items worked similarly for the PISA YAFS sample as for the ESO field test (which was used to create the final ESO item parameters). During the IRT scaling stage, the item parameters were fixed to the values used in the ESO based on a method known as fixed item parameter linking. This permitted the item fit statistics based on the mean deviation (MD) and the root mean square deviation (RMSD) to be used to evaluate the performance of ESO item parameters in PISA YAFS. Poorly fitting items, or item misfits, indicate that these items relate differently to the skills in PISA YAFS than in ESO. Both item fit statistics (MD and RMSD) quantify the magnitude and direction of deviations in the observed data from the estimated item characteristic curve (ICC) for each single item. While the MD is most sensitive to the deviations of observed item difficulty parameters from the estimated ICC, the RMSD is sensitive to the deviations of both the observed item difficulty parameters and item slope parameters. Item misfits were identified using a RMSD > 0.15, and a MD > 0.15 and < -0.15 criterion, where a value of 0 indicates no discrepancy (in other words, a perfect fit of the model).

Based upon data of the 1,885 respondents, three items were flagged as misfitting items. Estimating the new item parameters for these items would eliminate the potential bias to the linkage to the PIAAC scale, yet contribute to reduce measurement errors. Because these items showed misfit, it was considered inappropriate to use the established ESO-PIACC item parameters and therefore, unique item parameters had to be estimated in a separate step. Because unique parameters were only needed for a few items and because the common and unique item parameters were estimated to be on the same latent scale, the linkage and comparability was maintained across the two studies through most items sharing common item parameters.

Most of the items had 5 or more responses and were used to evaluate fit of item parameters. However, three items in literacy had less than 5 observations due to the multistate adaptive design, and were not included in the evaluation. The three items are shown in table 16. All numeracy items had sufficient number of responses for the evaluation.

Table 16. Items with insufficient number of responses for the IRT parameters evaluation: PISA YAFS 2016

Domain	Item	Weighted number of observations
Literacy (3 items)	D311701S	4.91
	E321001S	4.91
	E321002S	4.91
Numeracy (0 items)	—	—

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

The three items in literacy belong to a particular testlet. Because of the multistage adaptive testing design, only five of the PISA YAFS respondents were assigned to this testlet (i.e., literacy testlet L1-1). The assignment of the first literacy testlet (L1-1, L1-2, or L1-3) and the first numeracy testlet (N1-1, N1-2, or N1-3) is based on a preliminary estimate of the test taker's proficiency score, calculated using responses to the BQ in combination with information on how test takers with similar backgrounds performed on PIAAC (OECD 2015). Because the threshold values for literacy and numeracy are different (250 for literacy, 255 for numeracy), there is no one-to-one relationship between the assignment to literacy and numeracy testlets. In other words, if someone is assigned to testlet L1-1, he or she is not necessarily assigned to testlet N1-1. The design and test flow of the ESO is fully described in the international ESO technical documentation found at https://www.oecd.org/skills/ESonline-assessment/assessmentdesign/technicaldocumentation/ESOnline_Technical_Doc_Ch1-8_Oct2016.pdf.

Although these three items could not be included in the IRT scaling to evaluate the item fit (due to the limited sample sizes), they were included in the population modeling with the ESO item parameters. In most cases, the items in the PISA YAFS ESO were accurately described by the already established ESO item parameters previously developed using PIAAC. Only two literacy items (out of 37 included in the analysis from 40 in total) and one numeracy item (out of 38) needed a unique item parameter in the PISA YAFS data (Literacy: item C405S002 and item C407S003; Numeracy: item C602503S). Thus, results demonstrated that establishing comparability between PISA YAFS and ESO, as well as the PIAAC main study, was successful: the data from PISA YAFS can be described on a common scale with ESO and PIAAC. Additional information about the item content of the ESO is described in the international ESO technical documentation at https://www.oecd.org/skills/ESonline-assessment/assessmentdesign/technicaldocumentation/ESOnline_Technical_Doc_Ch1-8_Oct2016.pdf.

6.3 Population Modeling and Generating Plausible Values

The population or conditioning model used for PISA YAFS was a combination of the IRT models described above and a latent regression model using information from the PISA 2012 student questionnaire (OECD 2017; von Davier and Sinharay 2013) with the goal to generate PVs. The posterior distribution of the ability variable from which PVs were drawn assumed to depend not only on the item responses on cognitive assessments but also on a large number of student questionnaire predictors (e.g., gender, country of birth, education, occupation, employment status, reading practices).

In the item calibration stage, an IRT model was used to estimate item parameters for items in each cognitive domain (e.g., literacy and numeracy), and unique item parameters were estimated for a few items only (see above). Then, in the conditioning or population modeling stage, a multidimensional latent regression model for the domains literacy and numeracy was applied to the data, using the item parameters obtained in the item calibration stage and principal components based on BQ variables.

Usually, a considerable number of background variables (predictors) are collected in large-scale assessments such as PISA and PIAAC, and a principal component analysis is conducted to extract the components that explain substantial portion of the variation for further analysis. In alignment with PIAAC (OECD 2013), the background variables in PISA YAFS were contrast coded; a list of variables that were contrast-coded and included in the population modeling is provided in appendix C. The increased number of variables obtained through contrast coding is substantial and needs to be reduced through a principal component analysis, which captures most of the common variance in the contrast-coded background questions but offers a reduced set of variables. The use of principal components also serves to retain information for examinees with missing responses to one or more background variables. In PISA YAFS, 68.5 percent of explained variance was used to avoid numerical instability due to potential over-parameterization, while pertaining to the 1/20 ratio to balance the number of principal components given the sample size (i.e., at least unweighted 20 respondents observed for one principal component). For more details about the population model and the computational procedure, please see the technical report for the PIAAC 2012 main study at https://www.oecd.org/skills/piaac/_Technical%20Report_17OCT13.pdf.

As in the PIAAC main study, a minimum of five attempted items per domain is necessary to assure sufficient information about the proficiency of respondents. Thus, a two-step procedure was taken: in the first round, respondents who responded to at least five items within at least one domain (N = 1,868) were used to fit the multidimensional latent regression models, and in the second round, all respondents, including those who responded to fewer than five items (N = 17), received PVs fixing the regression parameters to the ones obtained from the first run. This procedure ensures that the cases with fewer item

responses did not contribute to the estimation of the proficiency distribution, but did receive the PVs in the domain that they responded to.

Based on the latent regression estimates (variance-covariance matrix and regression parameters), multidimensional PVs (Mislevy, Johnson, and Muraki 1992; von Davier, Gonzalez, and Mislevy 2009) were generated and then transformed on the reporting scale that is linked to other assessments (ESO, PIAAC). The generated PVs were transformed on the PIAAC scale using the same transformation constants. In PISA YAFS, 10 independent PVs were drawn for each respondent in each cognitive domain. Each set of PVs was equally well designed to estimate population statistics (such as group means and standard deviations); however, multiple PVs were required to represent the uncertainty in the domain measures appropriately (von Davier, Gonzalez, and Mislevy 2009). The statistics based on scores were always computed at population or subpopulation levels and should never be used to draw inferences at the individual level. For information on how to use PVs for secondary analysis, please see the technical report for the PIAAC 2012 main study at https://www.oecd.org/skills/piaac/_Technical%20Report_17OCT13.pdf.

7. Data Management

The PISA YAFS data were collected online via a secure web survey that linked to the Education and Skills Online (ESO). Data were extracted from the website and imported into the Data Management Expert software. The data were given validation checks, were reconciled, and data files were prepared. After the dataset was assembled, a review of the confidentiality procedures for PISA 2012 relative to the data collected in PISA YAFS was undertaken to ascertain the procedures for evaluating disclosure risk and the treatments that would need to be applied to the PISA YAFS data.

7.1 Data Cleaning and Validation

Ensuring consistent data involves checking for valid responses and basic agreement among responses. Data cleaning and validation checks were not guided by previous cycle precedence because this is the first PISA YAFS data collection. PISA YAFS data were examined for consistency between the ESO and PISA 2012 background data and cleaning and validation checks were employed. When in question, PISA 2012 published data were maintained. For example, gender information from 2012 overwrote discrepant ESO gender values.

Open text responses to PISA YAFS questions were reviewed and minimally edited (such as back-coding, correction of spelling, or interpretation of anagrams or abbreviations). From the PISA YAFS field test review with NCES, it was decided that the field of study open-text response (B_Q02cUSX) would not be coded. A treatment to truncate and shorten responses was applied and then reviewed and approved by NCES.

Westat validated respondents by considering discrepant data, such as age and gender mismatch with PISA 2012 along with some other indicators such as “Bq_q4 - born in country.” The data were reviewed for unrealistic performance differences to have some basic check for respondent authenticity.

7.2 Reducing the Risk of Data Disclosure

Since the sample design of PISA YAFS has no new strata or identifying design information and does not include refreshment of the sample with new respondents, there is nothing that can be used in the sampling design for PISA YAFS that would cause a disclosure risk for institutions or individuals. Since the sample

design has no new strata or identifying design information, and does not include refreshment of the sample with new respondents, there is nothing that can be used in the sampling design for YAFS that would cause a disclosure risk for institutions or individuals. No new information on the PISA sample is included in the final data. Only the new weights based upon the nonresponse adjustments to the original PISA 2012 weights will differ from the original PISA 2012 sampling and weights data.

Westat conducted the disclosure analysis by following the DRB-approved procedures described in the Disclosure Analysis Plan. These procedures minimize disclosure risk for data dissemination to a level acceptable to NCES. That is, PISA 2012 data were examined and made confidential by implementing a number of procedures prior to their release:

- IDs (school and student) were randomly assigned with no link to the original schools and students;
- Direct identifying variables were suppressed;
- PISA YAFS data were matched against the publicly available databases (CCD and PSS). Any school identified as a potential risk based on the "Rule of 3" confidentiality standard of NCES was masked/perturbed in order to longer be a close match with the CCD/PSS school. We then conducted the requisite confidentiality step of random swapping (DataSwap) on a set of variables identified in the DAP. This step adds another layer of uncertainty that a school or individual could be identified;
- Weights and sampling variables were analyzed to determine if institutions could be identified. These variables were deemed safe for PISA 2012 national data release;
- A set of variables from the PISA files were randomly swapped using a swapping rate designated by the Institute for Education Science Disclosure Review Board (DRB) chair; and
- The DRB reviewed the procedures and results of the procedures that were implemented for statistical disclosure control and approved for the PISA 2012 data release.

8. The PISA-YAFS 2016 Data

Data collected in the United States for the PISA YAFS are available as a public-use file and can be downloaded from the NCES website at https://nces.ed.gov/surveys/pisa/datafiles.asp. The PISA YAFS files include data for the national sample in the United States only for those respondents that responded to the PISA YAFS survey, and they do not include data for PISA 2012. The PISA 2012 data are a separate dataset and can also be downloaded at the NCES website at https://nces.ed.gov/pubsearch/getpubcats.asp?sid=098 (alternatively, they can be found under the "Data Products" section of the NCES PISA website). The PISA YAFS data are described in this chapter.

8.1 PISA YAFS Dataset

The PISA-YAFS public-use dataset includes several files to provide information to users and help them navigate the data. These files are listed below:

- The data are contained in ASCII file PISA_YAFS2016_Data.dat. This file contains questionnaire items, derived variables, and index scores based on the Learning Experience Questionnaire (LEQ), the Education and Skills Online (ESO) core questionnaire, and ESO cognitive and noncognitive items; plausible values for the literacy scale, the numeracy scale from the assessment; and student nonresponse adjusted PISA sampling weights and replicate weights. There are 2,318 cases in this file. Since the data are of respondents who took PISA in 2012, each record contains identification variables that enable the user to merge the data with the PISA 2012 student data, using the variable STIDSTD and with the PISA 2012 school data, using the variable SCHOOLID.
- An SPSS syntax file, PISA_YAFS2016_SPSS.SPS, to read the ASCII file into SPSS.
- A SAS syntax file, PISA_YAFS2016_SAS.SAS, to read the ASCII file into SAS.
- A codebook file (PISA_YAFS2016_Codebook.HTML) that includes variable names, variable location, format information, variable labels, question text, values, and frequencies.
- A Read me document (PISAYAFS2016 README_PUBLIC_USE.doc) that lists the file names associated with the public-use data set.
- A Quick Guide (PISA_YAFS2016 QuickGuide.doc) that lists the public-use data file contents, how to create working files, and a data-use agreement.

- A record layout file (Layout-YAFS2016.pdf) that provides the variable sequence, variable name, column position, variable type, field width, number of decimals, and variable label.
- Illustrative code for SPSS and SAS to merge PISA YAFS and PISA 2012 datasets (Merging_Code_Illustrative_for_PISA_YAFS2016 Public Use Data.doc).

8.2 Variable Names

The variable names do not necessarily correspond with the question numbers in the LEQ and ESO instruments. For example, the LEQ variable names refer to PIAAC source variables, which are the original sources of the LEQ items. For convenience, variable item numbers are listed next to each item on the questionnaires (see appendixes A and B for the questionnaire items).

8.3 Derived Variables

Several derived variables were created for use in analyses, and these variables have been included in the PISA YAFS files. They appear after the ESO noncognitive variables measuring skill use, beginning with GOODFITJOB_1 and continuing through SKILLUSE_WRITING_WORK. Explanations of these variables are included below and are abstracted from Education and Skills Online technical documentation (OECD 2015). Section 8.3.1 describes measures related to skill use, section 8.3.2 describes measures derived from the Career Interest and Intentionality module, and section 8.3.3 describes measures derived from the subjective well-being items.

8.3.1 Skill Use

The Skill Use module for Education & Skills Online includes 57 items across 8 scales. The scales focus on the frequency with which respondents use the skills associated with reading, writing, numeracy, and information and communications technology (ICT) at home and at work.

The reading scale measures how often respondents use the skills required to read documents such as directions, instructions, letters, memos, e-mails, articles, books, manuals, bills, invoices, diagrams, and maps. The writing scale measures how often respondents use the skills required to write documents such as letters, memos, e-mails, articles, reports, and fill-in forms. The numeracy scale measures how often respondents use the skills required to calculate prices, costs, or budgets; use fractions, decimals, or

percentages; use calculators; prepare graphs or tables; use algebra or formulas; and use advanced math or statistics. The ICT scale measures how often respondents use the skills required to use e-mail, the Internet, spreadsheets, word processors, and programming languages; conduct transactions online; and participate in online discussions (conferences, chats).

For each scale, respondents are asked four to eight questions about how often they use these skills in their home or work lives. The response options are (1) never, (2) less than once a month, (3) less than once a week but at least once a month, (4) at least once a week but not every day, and (5) every day. For ICT skill use, respondents were first asked whether they had ever used a computer; questions assessing the domain are not presented to those without any previous contact with computers. In contrast, reading, writing, and numeracy skills used at home are assessed for all respondents. The corresponding scales for skills used at work are assessed only for those respondents who are part of the labor force or have been in the labor force at some time, as determined by their answer to the background question on their current employment status and a question at the beginning of the Skill Use module asking if they have ever been employed.

Respondents receive scores of not applicable, low, moderate, or high for each of the skill use scales, defined as follows:

- Not applicable: The respondent reported that he or she never engaged in any of the activities involving this skill.
- Low: The respondent reported that he or she rarely engaged in most of the activities involving this skill.
- Moderate: The respondent reported that his or her engagement in activities varied in terms of how many activities were done and how often they were done.
- High: The respondent reported that he or she engaged in most activities on most days or every day.

Respondent receive a score of not applicable when they indicate that they have never engaged in any of the activities mentioned in the module for that scale. To determine whether a respondent should receive a score of low, moderate, or high for a particular skill, the respondent's responses are compared to responses from participants in the 24 countries in the Program for the International Assessment of Adult Competencies (PIAAC). Test takers receive a score of low if their responses indicate they are in the bottom quintile (one-fifth of the distribution) of individuals internationally who use that skill. Test takers receive a score of moderate if their responses indicate they are in the middle three quintiles of individuals

internationally who use that skill. Test takers receive a score of high if their responses indicate they are in the top quintile of individuals internationally who use that skill.

8.3.2 Career Interest and Intentionality Items and Related Indices

Career Interest Areas: PERSON_A_TOTAL—PERSON_S_TOTAL

The Career Interest and Intentionality module consists of 60 items from the O*NET Interest Profiler Short Form (Rounds et al. 2010). This set of items is composed of 10 items from each of the six RIASEC scales (realistic, investigative, artistic, social, enterprising, and conventional) (Holland 1997). All items had a five-point Likert response scale from 1) strongly dislike to 5) strongly like. Scores for each RIASEC dimension are calculated by averaging the 10 item values within each dimension. The respondents received a score of 0 to 40 in each interest area. Table 17 describes the interest areas. Higher scores indicate the respondent's interests are more aligned with that interest area.

Table 17. Interest area description

Interest area	Description	Examples of work
Realistic	People with realistic interests like work that includes practical, hands-on problems and answers. Often people with realistic interests do not like careers that involve paperwork or working closely with others.	■ Working with plants and animals ■ Real-world materials like wood, tools, and machinery ■ Outside work
Investigative	People with investigative interests like work that has to do with ideas and thinking rather than physical activity or leading people.	■ Searching for facts ■ Figuring out problems
Artistic	People with artistic interests like work that deals with the artistic side of things, such as acting, music, art, and design.	■ Creativity in their work ■ Work that can be done without following a set of rules
Social	People with social interests like working with others to help them learn and grow. They like working with people more than working with objects, machines, or information.	■ Teaching ■ Giving advice ■ Helping and being of service to people
Enterprising	People with enterprising interests like work that has to do with starting up and carrying out business projects. They like taking action rather than thinking about things.	■ Persuading and leading people ■ Making decisions ■ Taking risks for profits
Conventional	People with conventional interests like work that follows set procedures and routines. They prefer working with information and paying attention to details rather than working with ideas.	■ Working with clear rules ■ Following a strong leader

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Job Interest: JOB_FIT_CURRENT_CATEGORIZED and JOB_FIT_INTENDED_CATEGORIZED

The career interest assessment uses the interest profile for 436 occupations from the O*NET database to determine how well the respondent's interests match the interest profile of the respondent's current and desired occupations. Using the respondent's RIASEC profile, a job fit score from minus-100 to 100 is calculated for the current and desired occupations. The occupation is considered a low fit if the job fit score is less than 10 points, a moderate fit if the score is between 10 and 50 points, and a high fit if the score is 50 points or above. If the respondent indicates in the background questionnaire that he or she is "unemployed, not looking for work" then no score will be provided for the fit of current and desired jobs. A job fit score also is calculated for each of the 436 occupations, and a list of the highest scoring 20 occupations and the lowest scoring 10 occupations are provided for the respondent. The highest scoring occupations are considered the best fit for the respondent's interests and the lowest scoring are considered the worst fit.

Job Fit: GOODFITJOB and POORFITJOB indices

Occupational interest profiles in O*NET were developed using subject matter expert ratings. Two groups of three trained raters considered those occupations included in the O*NET database. The appropriateness of each RIASEC category for each occupation based on O*NET data for the occupation was evaluated. The mean rating for the three reviewers was calculated for each of the six interest dimensions across occupations. Inter-rater agreement and validity evidence were also assessed. A high degree of rater reliability was found, as was alignment to Holland's theoretical RIASEC model.

Job Seeking and Training Intentionality: SEEKJOB_GROUP, SEEKTRAINING_GROUP, SELFEFFICACY_GROUP, TAKEACTIVE_STEPS_GROUP

The career intentionality portion of the assessment consists of 26 items.[4] This set of items is composed of six items that measure job-seeking intentionality, six that measure training intentionality, four that measure job-seeking and training self-efficacy, and 10 that measure taking active steps. Job-seeking intentionality, training intentionality, and job-seeking and training self-efficacy scales had a six-point

[4] These items are not included in the PISA YAFS 2016 dataset. The items are proprietary and cannot be released publicly.

response scale from 1) strongly disagree to 6) strongly agree. Scores are calculated for each scale by averaging item responses. The "taking active steps" scale had a binary response of yes or no. The total number of yes responses is used as the score. If the test taker indicates in the background questionnaire that he or she is "unemployed, not looking for work" then no score was provided for the career intentionality assessment.

The job-seeking intentionality, training intentionality, and job-seeking and training self-efficacy scales use stanine (nine-point standard scale) scores to determine low, moderate, and high scoring groups. Scores were placed on the scale, using lower and upper bounds to establish a range for each group (note: stanines 8 and 9 were combined due to small N-count). Cutoffs for low, moderate, and high are included in Table 18. Though gaps existed in the values of the upper and lower bounds, none of the calculated intentionality scores will equal those values. For the taking active steps scale, low (~50 percent of norm group; score = 0), moderate (~25 percent; score between 1 and 3), and high groups (~25 percent; score between 4 and 8) were established using test takers' raw scores from the Field Test.

Table 18. Career Intentionality score cutoffs

	Score		
Scale	Low	Moderate	High
Job-seeking intentionality	1.00 – 1.67	1.83 – 4.84	5.00 – 6.00
Training intentionality	1.00 – 2.67	2.83 – 5.00	5.16 – 6.00
Job-seeking and training self-efficacy	1.00 – 3.25	3.50 – 5.25	5.50 – 6.00
Taking active steps	0	1.00 – 3.00	4.00 – 8.00

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

8.3.3 Subjective Well-Being and Health

The subjective well-being portion of the module focuses on a respondent's attitudes and feelings toward his or her life, using cognitive and emotional measures of life satisfaction. The cognitive measure is an adapted version of the Satisfaction with Life Scale (SWLS) (Diener et al. 1985). The adapted SWLS includes four items on a six-point Likert type response scale including 1) strongly disagree, 2) disagree, 3) slightly disagree, 4) slightly agree, 5) agree, and 6) strongly agree. Scores are calculated by averaging the four item responses, resulting in a total score from 1 to 6, and then comparing them to the scores collected during the Field Test. A quartile (one-fourth of the distribution) approach, appropriate for cross-cultural comparisons, was used to define scoring cutoffs for reporting. Scores in the first quartile are reported as low, in the second and third quartiles as moderate, and in the fourth quartile as high.

Positive and Negative Affect: POSITIVE_AFFECT_LABEL and NEGATIVE_AFFECT_LABEL

The second element of subjective well-being is an emotional evaluation describing the respondent's emotional experience of his or her life. While life satisfaction is assessed on a single dimension, the emotional evaluation is composed of two distinct dimensions: positive affect (PA) and negative affect (NA). The Education & Skills Online measure for emotional evaluation is an adapted version of the Positive and Negative Affect Schedule (PANAS) (Watson, Clark, and Tellegen 1988) and I-PANAS-SF (Thompson 2007), an internationally validated short form of the instrument. The Education & Skills Online scale is composed of nine items, including four PA items and five NA items. Respondents are asked to rate their experience of each emotion during the previous week, measured using a five-point scale including 1) very slightly or not at all, 2) a little, 3) moderately, 4) quite a bit, and 5) extremely. Scores for PA are calculated by averaging the four positive item responses, while NA is calculated by averaging the five negative item responses, resulting in one total score for each dimension. Dimension scores are then compared to the 1,890 scores collected during the Field Test. A quartile approach, appropriate for cross-cultural comparisons, is used to define scoring cutoffs, reporting PA and NA scores in the first quartile as low, in the second and third quartiles as moderate, and in the fourth quartile as high.

Health is a complex multidimensional construct whose definition has evolved from a purely biological measure to include psychosocial factors considered critical to the assessment of overall well-being. Gathering health data is an integral component of the ongoing effort to monitor economic and social progress across countries and promote policies aimed at improving overall life quality (OECD 2011). The Education & Skills Online measures of subjective and behavioral health include 14 survey items on the feelings and behaviors most relevant to health as described in the OECD agenda. These include items on subjective health, body mass index (BMI), nutrition, exercise, sleep, and smoking status. Reporting of subjective and behavioral health is presented in an informational format as the respondent's self-reported health perceptions and behaviors are compared to the accepted international health recommendations (World Health Organization; [WHO 2015]) for each category.

Subjective Health: SUBJ_HEALTH_LABEL

Subjective health is a single item measure on a respondent's self-perception of his or her health, measured with a six-point response scale, including 1) very poor, 2) poor, 3) fair, 4) good, 5) very good, and 6) excellent. Based on the response, a health outlook is reported as poor for scores 1 or 2, fair for 3 or 4, and positive for 5 or 6.

Body Mass Index (BMI): BMI_CLASS

BMI, an internationally accepted health measure, is calculated using the self-reported responses for height and weight. The corresponding report element offers a definition of BMI as well as a classification of underweight, normal weight, or overweight based on the international classification of the WHO (WHO 2015).

Diet Score: DIET_LABEL

As an indicator of nutrition and based on the international nutritional recommendations (WHO 2015), four questions elicit the number of servings per day and days per week that the respondent consumes fruits and vegetables (DIET_LABEL). Self-reported servings and frequencies of fruit and vegetable consumption are used to provide an evaluation of the respondent's diet. The corresponding report element on diet and nutrition details the current recommendation and indicates whether the respondent consumes no fruits and vegetables, insufficient amounts of fruits and vegetables, or greater than or equally sufficient amounts of fruits and vegetables per the current recommendations.

Smoking: SMOKE

One item elicits the smoking status of the respondent by asking if he or she currently smokes any tobacco products including cigarettes, cigars or pipes, offering response options of no, yes, sometimes, or "yes, daily." Because smoking is a recognized health risk and not recommended at any level, the corresponding report element describes the health risk of smoking and indicates whether the respondent has reported smoking behavior.

Physical Activity Score: PHYSICAL_ACTIVITY_LABEL

Based on the international recommendations (WHO 2015) for physical activity, which suggest 75 minutes of intense activity or 150 minutes of moderate activity per week, four items eliciting information on the frequency and intensity of physical activity are included. These four items request the amount of time and number of days a respondent engages in both moderate and vigorous exercise. Total times are calculated for both moderate and intense activity and equated to a common scale (weekly minutes of intense exercise times 2), which is compared to the 150 minutes recommendation. The corresponding report element on

exercise details the current recommendation and indicates whether the respondent does not exercise, exercises at a level insufficient to the stated standard, or meets or exceeds the recommendation.

Sleep Categorization: SLEEP_LABEL

Two items elicit duration and quality of sleep, as these are core features of commonly accepted sleep recommendations. The item on sleep quality offers responses of very bad or fairly bad for indicators of insufficient sleep quality, and fairly good or very good as indicators of adequate sleep quality. The sleep duration item requests the average amount of sleep in hours for the past month. The health behavior report details the current recommendation of seven to nine hours of quality sleep and related health benefits while reporting whether the test taker meets the recommendation.

8.3.4 Adapted Variable

Question B-Q02bUS asked, "What type of degree or certificate are you currently studying for?" with the following categories: Grades 1-6; Grades 7-9; High school diploma; Pre-associate education; Attended trade school, college, or university; no certificate or degree received; A certificate from a college or trade school for completion of a program prior to the associate/bachelor's degree; Associate degree; Bachelor's degree (e.g., BA, AB, BS); Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA); Professional degree (e.g., MD, DDS, DVM, LLB, JD); or Doctorate degree (e.g., PhD, EdD). See appendix A for the full question format.

The categories Professional degree and Doctorate degree were cells that were too small to be useful for analysis and could potentially be identifying if a student's school were known (though this is improbable given the data available). These categories were collapsed to a single category, Professional/Doctorate degree.

8.4 Missing Value Codes

Table 19 provides missing value codes in the SAS and SPSS datasets.

Table 19. Missing value codes in SAS and SPSS datasets

Missing value code description	Text data file missing value code	SAS missing value code	SPSS missing value code
N/A	0	0	0
ESO nonrespondent	9995	9995	9995
Valid skip	9996	9996	9996
Missing	4 blanks	.	.
Not answered	1 to 17 blanks depending on width of variable	.	.

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

8.5 Special Considerations

Three aspects of the PISA YAFS 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 because simple random sampling was not employed. Although respondents had known probabilities of selection, these probabilities were unequal. Adjusted survey weights adjust for the probabilities of selection for nonresponse. 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. Further descriptions can be found in the PISA Data Analysis Manual: SPSS, Second Edition (OECD 2009).

The third aspect arises from the design of the PISA YAFS performance variables and the use of PVs in the analysis. While the data has individual scores for respondents on ESO cognitive items, in PISA YAFS, as in many national and international assessments, respondents are not administered every

assessment item. Each item has missing responses, though these are missing by design. Thus, it is not possible to estimate scores for individuals. Instead, the results of individual respondents are aggregated to produce a set of scores for groups of respondents (e.g., U.S. female students). The distribution of scores indicates a set of plausible values, which represent a range of abilities for a certain group of students. For analysis purposes, the PISA YAFS dataset includes a set of 10 plausible values for each of the PISA YAFS scales. Thus, if any analysis were to be undertaken with any of the PISA YAFS scales, it should be undertaken 10 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 10 sets of results. A special provision also needs to be made in estimating the standard errors and is best done using the appropriate software developed for this purpose (EdSurvey; WesVar), which is described next. Further discussion of the use of PVs can be found in the PISA Data Analysis Manual: SPSS, Second Edition (OECD 2009) available at https://www.oecd.org/pisa/pisaproducts/pisadataanalysismanualspssandsassecondedition.htm.

EdSurvey is an R statistical package designed for the analysis of national and international education data from NCES, including the PISA YAFS data.

How to install and load EdSurvey:

1. Inside R, run the following command to install EdSurvey as well as its package dependencies:

   linstall.packages("EdSurvey")

2. Once the package is successfully installed, EdSurvey can be loaded with the following command:

   library(EdSurvey)

For additional information on EdSurvey, visit: https://www.air.org/project/nces-data-r-project-edsurvey.

An alternative to EdSurvey is WesVar. WesVar is a statistical software package used to compute estimates and replicate variance estimates from complex survey data. WesVar utilizes a user interface allowing users to create weights, specify tables, and define regression models. Users can create survey weights using three methods of jackknife replication and two versions of balanced repeated replication. Users select the variables that identify strata and primary sampling units and choose a replication method. WesVar creates a set of weights for each replicate subsample. Users can then adjust the weights for nonresponse, poststratify the weights, or rake weights to control totals.

With WesVar, you can perform the following functions:

- Import data from many types of files, including SAS, SPSS, Excel, text files, or other data files that comply with the Object Database Connectivity (ODBC) standard;
- Create replicate weights if they are not already on the file;
- Recode, relabel, and reformat variables;
- Calculate estimates and standard errors for means, totals, and other statistics in cells and marginals of multiway tables;
- Calculate standard errors for complex transformations of variables and for linear and logistic regression parameters;
- Organize your analyses in easy-to-use, tree-structured workbooks;
- Control and customize the output; and
- Export data files to SPSS, SAS Transport, or ASCII formats.

WesVar is available free of charge from Westat at https://www.westat.com/capability/information-systems-software/wesvar.

PISA YAFS data can also be used with the International Association for the Evaluation of Educational Achievement (IEA) International Database Analyzer (IDB Analyzer) (https://www.iea.nl/data-tools/tools#spy-para-308). The IDB Analyzer is a free software tool that can be used to combine and analyze data from many large-scale assessments. In order for the PISA YAFS file to be read into the IDB Analyzer, the user has to add and rename a few variables to match the PISA YAFS pre-2015 file structure, which are outlined below:

- Variable CNT, for a country, has to be created and assigned a string value of "USA."
- Variables W_YFSTR1 to W_YFSTR80, i.e., replicate weights, have to be renamed W_FSTR1 to W_FSTR80.
- Variable W_YFSTUWT, i.e., final sample weight, has to be renamed to W_FSTUWT.

When the estimates are run on the ESO plausible values only, it is recommended to change the SPSS/SAS code to pick up all 10 plausible values.

Other commercial packages that include support for the weighting and replication methods used in PISA YAFS, among others, are SAS 9.4, SUDAAN 11 (2013), and Stata 13 (2013).

References

Birnbaum, A. (1968). Some Latent Trait Models and Their Use in Inferring an Examinee's Ability. In F.M. Lord and M.R. Novick (Eds.), *Statistical Theories of Mental Test Scores*. Reading, MA: Addison-Wesley.

Diener, E., Emmons, R.A., Larsen, R.J., and Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, *49*: 71-75.

Holland, J.L. (1997). *Making Vocational Choices: A Theory of Vocational Personalities and Work Environments* (3rd ed.). Odessa, FL: Psychological Assessment Resources.

Mislevy, R.J., Johnson, E., and Muraki, E. (1992). Chapter 3: Scaling Procedures in NAEP. *Journal of Education and Behavioral Statistics, 17*(2): 131-154.

Organization for Economic Cooperation and Development (OECD). (2009). *PISA Data Analysis Manual: SPSS* (2nd ed.). Paris: Author.

Organization for Economic Cooperation and Development (OECD). (2011). *How's Life?: Measuring Wellbeing*. Paris: Author.

Organization for Economic Cooperation and Development (OECD). (2012). *Literacy, Numeracy, and Problem Solving in Technology-Rich Environments: Framework for the OECD Survey of Adult Skills*. Paris: Author. Retrieved February 5, 2018, from https://www.oecd.org/skills/piaac/PIAAC%20Framework%202012--%20Revised%2028oct2013_ebook.pdf.

Organization for Economic Cooperation and Development (OECD). (2013). *Technical Report of the Survey of Adult Skills (PIAAC),* Ch. 17 (pp. 406-438). Paris: Author. Retrieved January 2019, from https://www.oecd.org/skills/piaac/_Technical%20Report_17OCT13.pdf.

Organization for Economic Cooperation and Development (OECD). (2014). *PISA 2012 Results: What Students Know and Can Do – Student Performance in Mathematics, Reading and Science (Volume I, Revised edition, February 2014)*. Paris: Author.

Organization for Economic Cooperation and Development (OECD). (2015). *Education & Skills Online Technical Documentation*. Paris: Author. Retrieved January 2019, from https://www.oecd.org/skills/ESonline-assessment/assessmentdesign/technicaldocumentation/.

Organization for Economic Cooperation and Development (OECD). (2017). *PISA 2015 Technical Report*. Paris: Author. Retrieved January 2019, from: https://www.oecd.org/pisa/data/2015-technical-report/.

Rao, J.N.K., and Thomas, D.R. (2003). Analysis of Categorical Response Data From Complex Surveys: an Appraisal and Update. In R.L. Chambers and C.J. Skinner (Eds.), *Analysis of Survey Data* (pp. 85-108). West Sussex, England: John Wiley and Sons LTD.

Rounds, J., Su, R., Lewis, P., and Rivkin, D. (2010). *O*NET® Interest Profiler Short Form Psychometric Characteristics: Summary*. Raleigh, NC: National Center for O*NET Development.

Thompson, E.R. (2007). Development and Validation of an Internationally Reliable Short-Form of the Positive and Negative Affect Schedule (PANAS). *Journal of Cross-Cultural Psychology, 38*: 227-242. doi:10.1177/0022022106297301.

Tibshirani, R.J. (1996). Regression Shrinkage and Selection via the LASSO. *Journal of the Royal Statistical Society*, Series B, *58*: 267-288.

von Davier, M., Gonzalez, E., and Mislevy, R. (2009). What Are Plausible Values and Why Are They Useful? In *IERI Monograph Series: Issues and Methodologies in Large Scale Assessments, Vol. 2*. Retrieved January 2019, from: https://www.ierinstitute.org/fileadmin/Documents/IERI_Monograph/IERI_Monograph_Volume_02_Chapter_01.pdf.

von Davier, M., and Sinharay, S. (2013). Analytics in International Large-Scale Assessments: Item Response Theory and Population Models. In L. Rutkowski, M. vonDavier, and D. Rutkowski (Eds.), *Handbook of International Large Scale Assessment* (pp. 155-174). Boca Raton, FL: CRC Press.

Watson, D., Clark, L.A., and Tellegen, A. (1988). Development and Validation of Brief Measures of Positive and Negative Affect: The PANAS Scales. *Journal of Personality and Social Psychology, 54*(6): 1063-1070.

Westat. (2007). *WesVar 5.0 User's Guide.* Rockville, MD: Westat.

World Health Organization (WHO). (2015). Global database on body mass index. Retrieved August 5, 2015, from https://www.who.int/nutrition/databases/bmi/en/

Appendix A. Learning Experience Questionnaire (LEQ)

Table A-1. Learning Experience Questions (LEQ) – Additional Background Questions

Question Description	Question	Theme
B_Q02a	Are you currently studying for any kind of formal degree or certificate?	Current studies; level of degree; area of study
1	Yes	
2	No	
B_Q02bUS	What type of degree or certificate are you currently studying for?	Current studies; level of degree; area of study
1	Grades 1-6	
2	Grades 7-9	
3	High school diploma	
4	Pre-associate education. Attended trade school, college, or university; no certificate or degree received	
6	A certificate from a college or trade school for completion of a program prior to the associate/bachelor's degree	
7	Associate degree	
8	Bachelor's degree (e.g., BA, AB, BS)	
9	Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA)	
10	Professional degree (e.g., MD, DDS, DVM, LLB, JD)	
11	Doctorate degree (e.g., PhD, EdD)	
B_Q02cUSX	What was the area of study, emphasis, or major for this degree or certificate? If there was more than one, please choose the one you consider most important.	Current studies; level of degree; area of study
B_Q02c	Now, looking at this card, in which category would you place ^B_Q02cUSX? Again, if there was more than one, please choose the one you consider most important.	Current studies; level of degree; area of study
1	General programs	
2	Teacher training and education studies	
3	Humanities, languages and arts	
4	Social sciences, business and law	
5	Science, mathematics and computing	
6	Engineering, manufacturing and construction	
7	Agriculture and veterinary	
8	Health and welfare	
9	Services	
B_Q04a	During the last 12 months, that is since ^MonthYear, have you studied for any formal degree or certificate, either full-time or part-time?	Studies in the last 12 months
1	Yes	
2	No	

See note at end of table.

Table A-1. Learning Experience Questions – Additional Background Questions—Continued

Question Description	Question	Theme
B_R12	[TU-EN-Question-B_R12-1]We would now like to turn to other organized learning activities you may have participated in during the last 12 months, including both work and non-work-related activities. We will distinguish between courses mentioned on this show card. When answering the next questions, please exclude any activity you engaged in as part of the study you already reported on.[TU-EN-Question-B_R12-2]We would now like to turn to other organized learning activities you may have participated in during the last 12 months, including both work and non-work-related activities. We will distinguish between courses mentioned on this show card.	
B_Q12a	During the last 12 months, have you participated in courses conducted through open or distance education?	Nonformal learning activities (distance education, on-the-job courses, seminars, other private lessons)
1	Yes	
2	No	
B_Q12c	During the last 12 months, have you attended any organized sessions for on-the-job training or training by supervisors or co-workers?	Nonformal learning activities (distance education, on-the-job courses, seminars, other private lessons)
1	Yes	
2	No	
B_Q12e	During the last 12 months, have you participated in seminars or workshops?	Nonformal learning activities (distance education, on-the-job courses, seminars, other private lessons)
1	Yes	
2	No	
B_Q12g	During the last 12 months, have you participated in courses or private lessons, not already reported?	Nonformal learning activities (distance education, on-the-job courses, seminars, other private lessons)
1	Yes	
2	No	

See note at end of table.

Table A-1. Learning Experience Questions – Additional Background Questions—Continued

Question Description	Question	Theme
[B_Q26a]	[TU-EN-Question-B_Q26a-1] In the last 12 months, were there more learning activities you wanted to participate in but did not? Include both learning activities that lead to formal degrees and other organized learning activities. [TU-EN-Question-B_Q26a-2] In the last 12 months, were there any learning activities you wanted to participate in but did not? Include both learning activities that lead to formal degrees and other organized learning activities.	More/any learning activities, wanted, but could not participate in; reasons for non-participation.
1	Yes	
2	No	
[B_Q26b]	Which of the following reasons prevented you from participating in education and training? Please indicate the most important reason.	More/any learning activities, wanted, but could not participate in; reasons for non-participation.
1	I did not have the prerequisites.	
2	Education or training was too expensive/I could not afford it.	
3	Lack of employer support.	
4	I was too busy at work.	
5	The course or program was offered at an inconvenient time.	
6	I did not have time because of child care or family responsibilities.	
7	Something unexpected came up that prevented me from taking education or training.	
8	Other	
[B_R27aUSX]	During the past 12 months, did you take any classes or have a tutor.	
[B_Q27aUSX]	to improve your basic reading, writing, and math skills?	Basic education courses in the last 12 months (reading/ writing/math, GED, some other adult education)
1	Yes	
2	No	

See note at end of table.

Table A-1. Learning Experience Questions – Additional Background Questions—Continued

Question Description	Question	Theme
[B_Q27bUSX]	to prepare to take the General Educational Development test, or GED?	Basic education courses in the last 12 months (reading/ writing/math, GED, some other adult education)
1	Yes	
2	No	
[B_Q27cUSX]	in some other high school equivalency program or adult high school program?	Basic education courses in the last 12 months (reading/ writing/math, GED, some other adult education)
1	Yes	
2	No	
[B_Q29aUSX]	During the past 12 months, were you in a formal apprenticeship program leading to journeyman status in a skilled trade or craft?	Formal apprenticeship in the last 12 months
1	Yes	
2	No	

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Appendix B. ESO Noncognitive Items

Table B-1. ESO Noncognitive Battery – Core Background Questionnaire

Item	Item Text	Item Directions Text	Routing Rules	Response Options	Concept/ Construct
bq_q1	How old are you? (years old)	Use the number keys to type your answer.		Open-ended item	Age
bq_q2	Are you female or male?	Click on your answer.		Female//Male	Gender
bq_q3	What is the highest level of education you have completed?	Click on your answer.		No education//Primary education//Secondary education without a diploma//Secondary Education (i.e., High School diploma, GED or equivalent)// Some Post-Secondary Education (including community, technical or vocational)//4-year College or University degree//Beyond a College or University degree	Education
bq_q4	Were you born in [country]?			Yes//No	Country of Origin
bq_q5	In what year did you first come to live in [country]?	Use the pull-down menu to select your answer.	If No (2) to bq_q4	Drop-down options: Before 1970//1971-2013 (individual year options)//After 2013	Country of Origin
bq_q6	What is the language that you first learned at home in childhood and still understand?	Click on your answer.		[national language 1]//[national language 2, if applicable]// [other common language in your country]//Other	Language First Learned
bq_q7	Enter your native language:		If Other (4) to bq_q6	Open-ended item. Note, even though this item is on the same screen as bq_q6, the response in the text box should be coded as bq_q7.	Language First Learned "Other"

See note at end of table.

Table B-1. SO Noncognitive Battery – Core Background Questionnaire—Continued

Item	Item Text	Item Directions Text	Routing Rules	Response Options	Concept/ Construct
bq_q8	Which of the following best describes your current employment status?	Click on your answer.		Full-time employed (including self-employed)//Part-time employed (including self-employed)//Unemployed (not employed and looking for work)//Unemployed and not looking for work (e.g., student, retired, homemaker or permanently disabled)// Apprentice, intern//Other	Employment Status
bq_q9	What is your current occupation (or intended occupation if currently unemployed)? Please select a broad occupation category on this screen and more specific occupation groups and job titles on the following screens.		If answered full-time (1), part-time (2), or Unemployed and looking for work (3) to bq_q5	SEE Worksheet: ISCO-08 structure ENg09 for US-English version text. PDF document includes mock-up of screens to illustrate screen contents/sequencing.	Current Occupation

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Table B-2. ESO Noncognitive Battery – Career Interest and Intentionality (CII)

Question	Description
STEM: CII_02-61	This inventory contains a list of activities to help you explore your vocational interests. Please indicate how much you would like to do each activity by clicking on the response that most closely represents how you feel about it. 1-Strongly dislike 2-Dislike 3-Neutral 4-Like 5-Strongly Like
(102) CII_02	Build kitchen cabinets.
(112) CII_12	Develop a new medicine.
(122) CII_22	Write books or plays.
(132) CII_32	Teach an individual an exercise routine.
(142) CII_42	Buy and sell stocks and bonds.
(152) CII_52	Develop a spreadsheet using computer software.
(103) CII_03	Lay brick or tile.
(113) CII_13	Study ways to reduce water pollution.
(123) CII_23	Play a musical instrument.
(133) CII_33	Help people with personal or emotional problems.
(143) CII_43	Manage a retail store.
(153) CII_53	Proofread records or forms.
(104) CII_04	Repair household appliances.
(114) CII_14	Conduct chemical experiments.
(124) CII_24	Compose or arrange music.
(134) CII_34	Give career guidance to people.
(144) CII_44	Operate a beauty salon or barber shop.
(154) CII_54	Load computer software into a large computer network.
(105) CII_05	Raise fish in a fish hatchery.
(115) CII_15	Study the movement of planets.
(125) CII_25	Draw pictures.
(135) CII_35	Perform rehabilitation therapy.
(145) CII_45	Manage a department within a large company.
(155) CII_55	Operate a calculator.
(106) CII_06	Assemble electronic parts.
(116) CII_16	Examine blood samples using a microscope.
(126) CII_26	Create special effects for movies.
(136) CII_36	Do volunteer work at a nonprofit organization.
(146) CII_46	Start your own business.
(156) CII_56	Keep shipping and receiving records.
(107) CII_07	Drive a truck to deliver packages to offices and homes.
(117) CII_17	Investigate the cause of a fire.
(127) CII_27	Paint sets for plays.
(137) CII_37	Teach children how to play sports.
(147) CII_47	Negotiate business contracts.
(157) CII_57	Calculate the wages of employees.
(108) CII_08	Test the quality of parts before shipment.
(118) CII_18	Develop a way to better predict the weather.

See note at end of table.

Table B-2. ESO Noncognitive Battery – Career Interest and Intentionality (CII)—Continued

Question	Description
STEM: CII_02-61 – continued	
(128) CII_28	Write scripts for movies or television shows.
(138) CII_38	Teach sign language to people with hearing disabilities.
(148) CII_48	Represent a client in a lawsuit.
(158) CII_58	Inventory supplies using a hand-held computer.
(109) CII_09	Repair and install locks.
(119) CII_19	Work in a biology lab.
(129) CII_29	Perform jazz or tap dance.
(139) CII_39	Help conduct a group therapy session.
(149) CII_49	Market a new line of clothing.
(159) CII_59	Record rent payments.
(110) CII_10	Set up and operate machines to make products.
(120) CII_20	Invent a replacement for sugar.
(130) CII_30	Sing in a band.
(140) CII_40	Take care of children at a day-care center.
(150) CII_50	Sell merchandise at a department store.
(160) CII_60	Keep inventory records.
(111) CII_11	Put out forest fires.
(121) CII_21	Do laboratory tests to identify diseases.
(131) CII_31	Edit movies.
(141) CII_41	Teach a high-school class.
(151) CII_51	Manage a clothing store.
(161) CII_61	Stamp, sort, and distribute mail for an organization.
(188) CII_88	If a job had been available in the week ending last Sunday, would you have been able to start within 2 weeks? 1 Yes 2 No
(189) CII_89	All things considered, how satisfied are you with your current job? Would you say you are: 1 – Extremely satisfied 2 - Satisfied 3 – Neither satisfied nor dissatisfied 4 – Dissatisfied 5 - Extremely dissatisfied
(190) CII_90	What occupation do you plan on pursuing? Please select a broad occupation category on this page and select more specific occupation groups and job titles on the following pages. Occupation: List of 10 major groups (Managers through Armed Forces)

See note at end of table.

Table B-2. ESO Noncognitive Battery – Career Interest and Intentionality (CII)—Continued

Question	Description
(190) CII_90 – continued	
Managers List2	Managers Subcategories
Professionals List2	Professionals Subcategories (6)
Professionals – Business _ Administration List	
Professionals – Health List2	
Professionals – ICT List2	
Professionals – Legal-Social_ Cultural List2	
Professionals – Science _ Engineering List2	
Professionals – Teaching List2	
Technicians _ Associates List2	Technicians and Associate Professionals Subcategories (5)
Technicians _ Associates - ICT List2	
Technicians _ Associates - Health List2	
Tech _ Assoc - Science _ Engineering List2	
Tech _ Assoc - Legal Social Cultural List2	
Tech _ Assoc - Business _ Admin List2	
Clerical Support Workers List2	Clerical Support Workers Subcategories
Services _ Sales Workers List2	Services and Sales Workers Subcategories
Skilled Ag-Forestry_ Fish Workers List2	Skilled Agricultural, Forestry, and Fishery Workers Subcategories
Crafts _ Related Trades Workers List2	Craft and Related Trades Workers Subcategories (5)
Crafts _ Rel Trades Workers - Building _ Rel List2	
Crafts _ Rel Trades Workers - Elec _ List2	
Crafts _ Rel Trades Workers - Food WW OtherList2	
Crafts _ Rel Trades Workers - Hand Print List2	
Crafts _ Rel Trades Workers - Met Mac Rel List2	
Plant _ Machine Operators _ Assemblers List2	
Elementary Occupations List2	
Armed Forces Occupations List2	
CII_91	Are you planning on going to a further training, development, or educational program?
CII_92	What type of training, development, or educational program do you plan on attending?
CII_93	In what field of education will you attend a training, development, or educational program?
End Survey	

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Table B-3. ESO Noncognitive Battery – Subjective Well-Being and Health (SWBH)

Item #	Concept/Construct	Item
		<Scale Stem> Below are statements that you may agree or disagree with. Using the scale, please indicate your agreement with each item. Please be open and honest in your responses. Scale: Strongly Disagree//Disagree//Slightly Disagree//Slightly Agree//Agree//Strongly Agree
SWB&H_07	*Life evaluation - Satisfaction with life*	In most ways my life is close to my ideal.
SWB&H_08	*Life evaluation - Satisfaction with life*	The conditions of my life are excellent.
SWB&H_09	*Life evaluation - Satisfaction with life*	I am satisfied with my life.
SWB&H_11	*Life evaluation - Satisfaction with life*	If I could live my life over, I would change almost nothing.
		<Scale Stem> Below is a list of words describing different emotions. Please indicate the extent to which you have felt this way over the past week. Scale: Very slightly or Not at all//A little//Moderately// Quite a bit//Extremely
SWB&H_22	*Affect*	Distressed
SWB&H_23	*Affect*	Excited
SWB&H_24	*Affect*	Upset
SWB&H_25	*Affect*	Happy
SWB&H_26	*Affect*	Proud
SWB&H_27	*Affect*	Ashamed
SWB&H_28	*Affect*	Nervous
SWB&H_29	*Affect*	Active
SWB&H_30	*Affect*	Frustrated
SWB&H_37	*Subjective health indicator*	Would you say your health now is: Scale: Very Poor//Poor//Fair//Good//Very Good//Excellent
		<Item Stem>The following questions will ask about various health behaviors. Use the number keys to type your answer. Please provide a numeric value between [lower limit] and [upper limit].
SWB&H_42	*Objective health indicator*	During the past month, how would you rate your overall sleep quality? Scale: Very Bad//Fairly Bad//Fairly Good//Very Good
SWB&H_46	*Objective health indicator*	During the past month, on average how many hours of actual sleep did you get at night? Scale: • Less than 7 hours • 7 to 9 hours More than 9 hours

See note at end of table.

Table B-3. ESO Noncognitive Battery – Subjective Well-Being and Health (SWBH)—Continued

Item #	Concept/Construct	Item
SWB&H_48	*Objective health indicator*	In a typical week, on how many days do you eat fruits? Scale: 0//1//2//3//4//5//6//7
SWB&H_49	*Objective health indicator*	How many servings of fruit do you eat on one of those days? Scale: 0//1//2//3//4//more than 4
SWB&H_50	*Objective health indicator*	In a typical week, on how many days do you eat vegetables? Scale: 0//1//2//3//4//5//6//7
SWB&H_51	*Objective health indicator*	How many servings of vegetables do you eat on one of those days? Scale: 0//1//2//3//4// more than 4
SWB&H_54	*Objective health indicator*	Do you currently smoke any tobacco products, such as cigarettes, cigars, or pipes? Scale: No//Yes, sometimes//Yes, daily
SWB&H_57	*Objective health indicator*	In a typical week, on how many days do you engage in moderate physical activities (e.g., walking, climbing stairs)? Scale: 0//1//2//3//4//5//6//7
SWB&H_58	*Objective health indicator*	How much time did you spend on moderate physical activities on a typical day? Scale: Minutes (---)
SWB&H_59	*Objective health indicator*	In a typical week, on how many days do you engage in vigorous physical activities (e.g., running, cycling, team sports)? Scale: 0//1//2//3//4//5//6//7
SWB&H_60	*Objective health indicator*	How much time did you spend on vigorous physical activities on a typical day? Scale: Minutes (---)

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Table B-4. ESO Noncognitive Battery – Skill Use (WST)

Variable	Question
WTST_02	Have you ever been employed?
WTST_35	In your job, how often do you usually read directions or instructions?
WTST_36	In your job, how often do you usually read letters, memos, or e-mails?
WTST_37	In your job, how often do you usually read articles in newspapers, magazines, or newsletters?
WTST_38	In your job, how often do you usually read articles in professional journals or scholarly publications?
WTST_39	In your job, how often do you usually read books?
WTST_40	In your job, how often do you usually read manuals or reference materials?
WTST_41	In your job, how often do you usually read bills, invoices, bank statements, or other financial statements?
WTST_42	In your job, how often do you usually read diagrams, maps, or schematics?
WTST_43	In your job, how often do you usually write letters, memos, or e-mails?
WTST_44	In your job, how often do you usually write articles for newspapers, magazines, or newsletters?
WTST_45	In your job, how often do you usually write reports?
WTST_46	In your job, how often do you usually fill in forms?
WTST_47	In your job, how often do you usually calculate prices, costs, or budgets?
WTST_48	In your job, how often do you usually use or calculate fractions, decimals, or percentages?
WTST_49	In your job, how often do you usually use a calculator - either handheld or computer based?
WTST_50	In your job, how often do you usually prepare charts, graphs, or tables?
WTST_51	In your job, how often do you usually use simple algebra or formulas?
WTST_52	In your job, how often do you usually use more advanced math or statistics such as calculus, complex algebra, trigonometry, or use of regression techniques?
WTST_53	For this question, please consider your current job. If you are not currently employed, please consider your most recent job. Do you use a computer at work?
WTST_54	In your job, how often do you usually Use e-mail?
WTST_55	In your job, how often do you usually Use the Internet in order to better understand issues related to your work?
WTST_56	In your job, how often do you usually conduct transactions on the Internet, for example, buying or selling products or services, or banking?
WTST_57	In your job, how often do you usually use spreadsheet software, for example, Excel?
WTST_58	In your job, how often do you usually use a word processor, for example, Word?
WTST_59	In your job, how often do you usually use a programming language to program or write computer code?
WTST_60	In your job, how often do you usually participate in real-time discussions on the Internet, for example, online conferences, or chat groups?
WTST_61	For this question, please consider your current job. If you are not currently employed, please consider your most recent job. What level of computer use is needed to perform your job?
WTST_62	Do you think you have the computer skills you need to do your job well?
WTST_63	Has a lack of computer skills affected your chances of being hired for a job or getting a promotion or pay raise?
WTST_64	In everyday life, how often do you usually read directions or instructions?
WTST_65	In everyday life, how often do you usually read letters, memos, or e-mails?

See note at end of table.

Table B-4. ESO Noncognitive Battery – Skill Use (WST)—Continued

Variable	Question
WTST_66	In everyday life, how often do you usually read articles in newspapers, magazines, or newsletters?
WTST_67	In everyday life, how often do you usually read articles in professional journals or scholarly publications?
WTST_68	In everyday life, how often do you usually read books, fiction or nonfiction?
WTST_69	In everyday life, how often do you usually read manuals or reference materials?
WTST_70	In everyday life, how often do you usually read bills, invoices, bank statements, or other financial statements?
WTST_71	In everyday life, how often do you usually read diagrams, maps, or schematics?
WTST_72	In everyday life, how often do you usually write letters, memos, or e-mails?
WTST_73	In everyday life, how often do you usually write articles for newspapers, magazines, or newsletters?
WTST_74	In everyday life, how often do you usually write reports?
WTST_75	In everyday life, how often do you usually fill in forms?
WTST_76	In everyday life, how often do you usually calculate prices, costs, or budgets?
WTST_77	In everyday life, how often do you usually use or calculate fractions, decimals, or percentages?
WTST_78	In everyday life, how often do you usually use a calculator - either handheld or computer based?
WTST_79	In everyday life, how often do you usually prepare charts, graphs, or tables?
WTST_80	In everyday life, how often do you usually use simple algebra or formulas?
WTST_81	In everyday life, how often do you usually use more advanced math or statistics such as calculus, complex algebra, trigonometry, or use of regression techniques?
WTST_82	Have you ever used a computer?
WTST_83	Do you use a computer in your everyday life now (outside work)?
WTST_84	In your everyday life, how often do you usually use e-mail?
WTST_85	In your everyday life, how often do you usually use the Internet in order to better understand issues related to, for example, your health or illnesses, financial matters, or environmental issues?
WTST_86	In your everyday life, how often do you usually do you conduct transactions on the internet, for example, buying or selling products or services, or banking?
WTST_87	In your everyday life, how often do you usually use spreadsheet software, for example, Excel?
WTST_88	In your everyday life, how often do you usually use a word processor, for example, Word?
WTST_89	In your everyday life, how often do you usually use a programming language to program or write computer code?
WTST_90	In your everyday life, how often do you usually participate in real-time discussions on the Internet, for example, online conferences or chat groups?

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Appendix C. List of Variables for Population Modeling

Variable Name	Source	Variable Info
SCHOOLID	PISA 2012	School ID 7-digit (region ID + stratum ID + 3-digit school ID)
ST01Q01	PISA 2012	International Grade
ST04Q01	PISA 2012	Gender
ST05Q01	PISA 2012	Attend pre-school or kindergarten
ST07Q01	PISA 2012	Repeat – grades 1-6
ST07Q02	PISA 2012	Repeat – grades 7-9
ST07Q03	PISA 2012	Repeat – grades 10-12
ST08Q01	PISA 2012	Truancy – Late for School
ST09Q01	PISA 2012	Truancy – Skip whole school day
ST115Q01	PISA 2012	Truancy – Skip classes within school day
ST13Q01	PISA 2012	Mother Highest Schooling
ST14Q01	PISA 2012	Mother Qualifications – Master's, doctoral, or prof. degree
ST14Q02	PISA 2012	Mother Qualifications – Bachelor's degree
ST14Q03	PISA 2012	Mother Qualifications – Associate's degree
ST14Q04	PISA 2012	Mother Qualifications – Voc/Tech cert. after HS
ST15Q01	PISA 2012	Mother Current Job Status
ST17Q01	PISA 2012	Father Highest Schooling
ST18Q01	PISA 2012	Father Qualifications – Master's, doctoral, or prof. degree
ST18Q02	PISA 2012	Father Qualifications – Bachelor's degree
ST18Q03	PISA 2012	Father Qualifications – Associate's degree
ST18Q04	PISA 2012	Father Qualifications – Voc/Tech cert. after HS
ST19Q01	PISA 2012	Father Current Job Status
ST20Q01	PISA 2012	Country of Birth International – Self
ST20Q02	PISA 2012	Country of Birth International – Mother
ST20Q03	PISA 2012	Country of Birth International – Father
ST21Q01	PISA 2012	Age of arrival in United States
ST25Q01	PISA 2012	International Language at Home
ST26Q01	PISA 2012	Possessions – desk
ST26Q02	PISA 2012	Possessions – own room
ST26Q03	PISA 2012	Possessions – study place
ST26Q04	PISA 2012	Possessions – computer
ST26Q05	PISA 2012	Possessions – software
ST26Q06	PISA 2012	Possessions – Internet
ST26Q07	PISA 2012	Possessions – literature
ST26Q08	PISA 2012	Possessions – poetry
ST26Q09	PISA 2012	Possessions – art
ST26Q10	PISA 2012	Possessions – textbooks
ST26Q11	PISA 2012	Possessions – technical reference books
ST26Q12	PISA 2012	Possessions – dictionary
ST26Q16	PISA 2012	Possessions – high-speed internet connection
ST27Q02	PISA 2012	How many – televisions
ST27Q04	PISA 2012	How many – cars

See note at end of table.

Variable Name	Source	Variable Info
ST27Q05	PISA 2012	How many – rooms bath or shower
ST28Q01	PISA 2012	How many books at home
ST37Q01	PISA 2012	Maths Self-Efficacy – Using a Train Timetable
ST37Q02	PISA 2012	Maths Self-Efficacy – Calculating TV Discount
ST37Q03	PISA 2012	Maths Self-Efficacy – Calculating Square Feet of Tiles
ST37Q04	PISA 2012	Maths Self-Efficacy – Understanding Graphs in Newspapers
ST37Q05	PISA 2012	Maths Self-Efficacy – Solving Equation 1
ST37Q06	PISA 2012	Maths Self-Efficacy – Distance to Scale
ST37Q07	PISA 2012	Maths Self-Efficacy – Solving Equation 2
ST37Q08	PISA 2012	Maths Self-Efficacy – Calculate Petrol Consumption Rate
ST81Q01	PISA 2012	Disciplinary Climate – Students Do Not Listen
ST81Q02	PISA 2012	Disciplinary Climate – Noise and Disorder
ST81Q03	PISA 2012	Disciplinary Climate – Teacher Has to Wait Until its Quiet
ST81Q04	PISA 2012	Disciplinary Climate – Students Do Not Work Well
ST81Q05	PISA 2012	Disciplinary Climate – Students Start Working Late
ST87Q01	PISA 2012	Sense of Belonging - Feel Like Outsider
ST87Q02	PISA 2012	Sense of Belonging – Make Friends Easily
ST87Q03	PISA 2012	Sense of Belonging – Belong at School
ST87Q04	PISA 2012	Sense of Belonging – Feel Awkward at School
ST87Q05	PISA 2012	Sense of Belonging – Liked by Other Students
ST87Q06	PISA 2012	Sense of Belonging – Feel Lonely at School
ST87Q07	PISA 2012	Sense of Belonging – Feel Happy at School
ST89Q05	PISA 2012	Attitude toward School – Trying Hard is Important
ST94Q05		Openness for Problem Solving – Can Handle a Lot of Information
ST94Q06	PISA 2012	Openness for Problem Solving – Quick to Understand
ST94Q09	PISA 2012	Openness for Problem Solving – Seek Explanations
ST94Q10	PISA 2012	Openness for Problem Solving – Can Link Facts
ST94Q14	PISA 2012	Openness for Problem Solving – Like to Solve Complex Problems
COBN_F	PISA 2012	Country of Birth National Categories – Father
COBN_M	PISA 2012	Country of Birth National Categories – Mother
COBN_S	PISA 2012	Country of Birth National Categories – Self
ESCS	PISA 2012	Index of economic, social and cultural status
hisced	PISA 2012	Highest educational level of parents
LANGN	PISA 2012	Language at home (3-digit code)
PV1MATH	PISA 2012	Plausible value 1 in mathematics
PV1READ	PISA 2012	Plausible value 1 in reading
PV1SCIE	PISA 2012	Plausible value 1 in science
RACETHC	PISA 2012	NAT/Derived Race/Ethnicity (collapsed)

See note at end of table.

Variable Name	Source	Variable Info
SC03Q01	PISA 2012	School Location
FRPL	PISA 2012	NAT\Pct Free/reduced lunch (categorized)
SC54A01	PISA 2012	NAT\Pct students different first language
PUBPRIV	PISA 2012	NAT\Public/Private school indicator
B_Q02a	Westat administered	Currently studying
B_Q02bUS	Westat administered	Ed. Level (recode consistent with PIAAC)
B_Q02c	Westat administered	Area of study, Category
B_Q04a	Westat administered	Study last 12 months
B_Q12a	Westat administered	Last 12 months, distance ed.
B_Q12c	Westat administered	Last 12 months, job training
B_Q12e	Westat administered	Last 12 months, seminars
B_Q12g	Westat administered	Last 12 months, private training
B_Q26a	Westat administered	Last 12 months, wanted to participate
B_Q26b	Westat administered	Last 12 months, reasons not in ed.
B_Q27aUSX	Westat administered	During 12 months, improve skills
B_Q27cUSX	Westat administered	During 12 months, HS equivalency
B_Q29aUSX	Westat administered	During 12 months, apprenticeship
BQ_Q4	E&S Online	Born in country
BQ_Q6	E&S Online	Language first learned and still understand
BQ_Q8	E&S Online	Employment status
Satisfaction_Life_Label	E&S Online	Classification of satisfaction with respondent's life
Positive_Affect_Label	E&S Online	Classification of experience of positive emotions
Negative_Affect_Label	E&S Online	Classification experience of negative emotions
Subj_Health_Label	E&S Online	Self-assessment of health categorized
SkillUse_Reading_home	E&S Online	Frequency of reading skill use at home
SkillUse_Reading_work	E&S Online	Frequency of reading skill use at work
SkillUse_Writing_home	E&S Online	Frequency of writing skill use at home
SkillUse_Writing_work	E&S Online	Frequency of writing skill use at work
SkillUse_Numeracy_ home	E&S Online	Frequency of numeracy skill use at home
SkillUse_Numeracy_ work	E&S Online	Frequency of numeracy skill use at work
SkillUse_ICT_home	E&S Online	Frequency of information and communication technology (ICT) skill use at home
SkillUse_ICT_work	E&S Online	Frequency of ICT skill use at work
SeekJob_Group	E&S Online	Intention to find a new job
SeekTraining_Group	E&S Online	Intention to seek additional training
SelfEfficacy_Group	E&S Online	Personal intention and motivation for pursuing a new job
TakeActive_Steps_Group	E&S Online	Actions and steps taken in pursuit of a new job
SWBH_37	E&S Online	Self-assessment of health, specific

SOURCE: U.S. Department of Education, National Center for Education Statistics, PISA Young Adult Follow-up Study (PISA YAFS), 2016.

Appendix D. PISA YAFS 2016 Recruiting Materials

Exhibit D-1. Text of PISA Young Adult Follow-up Study NCES initial information letter

U.S. DEPARTMENT OF EDUCATION
INSTITUTE OF EDUCATION SCIENCES

NATIONAL CENTER FOR EDUCATION STATISTICS

Dear PISA participant,

My name is Dan McGrath and I am the Director of the International Activities Program at the National Center for Education Statistics. In the fall of 2012 at your school, you participated in the Program for International Student Assessment (PISA), an international study of 15-year-olds' mathematics, science, and reading skills, implemented by the U.S. Department of Education. At that time, you provided us with your contact information.

We are contacting you to let you know that you will be invited to participate in the PISA Young Adult Follow-Up Study that we will conduct in 2015 to collect information about your education and work experiences, and your skills as a young adult. You will receive **$50** once you complete the study in 2015.

For now, we need to verify your contact information. Please **complete the attached Contact Information Update Form and return it to us in the enclosed envelope**. Information collected on the form will be used only for the purposes of this study.

We will be back in touch with you over the coming months to provide more information about the study. If you have any questions in the meantime, you may call the study's toll-free number (1-855-604-1519), email at YAFollow-up@westat.com or visit the Young Adult Follow-up Study website at http://nces.ed.gov/surveys/pisa/followup.asp.

We thank you in advance for your cooperation in this important research.

Sincerely,

Daniel J. McGrath
Director, International Activities Program
National Center for Education Statistics
Institute of Education Sciences
U.S. Department of Education
Telephone: (202) 502-7426
Email: Daniel.McGrath@ed.gov

WASHINGTON, D.C. 20006

Exhibit D-2. Text of PISA Young Adult Follow-up Study NCES contact information update form

PISA Young Adult Follow-up Study
Contact Information Update Form

Please use a black or blue pen to complete this form. Mark ☒ to indicate your answer.
If you want to change your answer, darken the box ■ and mark the correct answer.

What is your preferred method of being contacted? *(Please mark all that apply.)*

☐ Mail ☐ Home Phone ☐ Cell Phone ☐ Email
☐ Request to receive communications by Text Message

Please review the information below and make any updates in the boxes to the right. If all of the information is correct, please mark the "All information is up to date." box at the bottom.

Information on File	Updated Information
Email Address:	☐ No email address.
Home Phone:	☐ None.
Cell Phone:	☐ None.
Name (first, middle, last):	
Address 1:	
Address 2:	
City:	
State, Zip:	

☐ All information is up to date.

In the next box, please review the information you previously provided on a family member or friend who would know how to contact you two years from now. If all of the information is correct, please mark the "All information is up to date." box at the bottom.

Information on File	Updated Information
Email Address:	☐ No email address.
Home Phone:	☐ None.
Cell Phone:	☐ None.
Name (first, middle, last):	
Address 1:	
Address 2:	
City:	
State, Zip:	
Relationship to you:	☐ Parent ☐ Grandparent ☐ Aunt/Uncle ☐ Brother/Sister ☐ Friend ☐ Other

☐ All information is up to date.

Thank you for completing the form. Please return it in the postage-paid envelope provided or mail it to:

Young Adult Follow-up Study
1600 Research Blvd
Room RA 1164
Rockville, MD 20850

Toll-free number for questions or assistance 1-855-604-1519 or email YAFollow-up@westat.com.

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). The U.S. Office of Management and Budget has approved this data collection under OMB 1850-0900. Approval expires 11/30/2016.

Exhibit D-3. PISA Young Adult Follow-up Study information flyer

PISA Young Adult Follow-Up Study

What is the PISA Young Adult Follow-Up Study?

The PISA Young Adult Follow-Up Study (YAFS) is a survey of U.S. students who participated in the Program for International Student Assessment (PISA) in 2012. This is the first study of its kind to be conducted in the United States and will provide valuable information about how students' skills measured by PISA at age 15 relate to education and work experiences and key skills in young adulthood. The study is voluntary, but only students who participated in PISA 2012 and provided contact information are invited to participate, making your participation essential for the study's success.

Why are you contacting me?

You provided contact information after completing the PISA 2012 assessment so that the National Center for Education Statistics (NCES) could contact you for this follow-up study. You were also contacted to register on the PISA Young Adult Follow-up Study participant website. Only students that participated in PISA 2012 and provided contact information are eligible to participate in the study. There are no replacements or other sources for the information that you will provide. As a token of our appreciation, upon completion of the online survey, you will receive a $50 incentive.

Why is this study important?

Conducting this follow-up study with PISA participants provides a unique opportunity to learn more about the relationship between students' skills at age 15 and their education and work experiences as they enter adulthood. This information will help us better-understand the various paths (e.g. college, workforce, vocational training, etc.) U.S. students have taken after high school.

What do I need to do now?

The invitation letter accompanying this information sheet is your invitation to take the survey. Keep the enclosed cash card in a safe place. The card is not active until after you complete the survey. In a few days, you will be notified via email that the survey is open and to visit YAFStudy.org to complete the survey. Once you are notified, log in and complete the survey. Upon completion, your cash card will be activated and you can use it.

How do I find out more?

Visit us online at www.yafstudy.org or
http://nces.ed.gov/surveys/pisa/followup.asp
E-mail us at PISAFollowup@westat.com
Call us at 1-855-604-1519.

ies NATIONAL CENTER FOR EDUCATION STATISTICS
Institute of Education Sciences

PISA YAFS Young Adult Follow-Up Study

O.M.B. No. 1850-0900 Expiration date: 03/31/2018

Exhibit D-4. Text of PISA Young Adult Follow-up Study NCES participant website registration letter

U.S. DEPARTMENT OF EDUCATION
INSTITUTE OF EDUCATION SCIENCES

NATIONAL CENTER FOR EDUCATION STATISTICS

Dear [FIRST NAME],

On behalf of NCES and the U.S. Department of Education, I want to thank you for responding to our previous information update requests for the PISA Young Adult Follow-Up Study (YAFS). Your participation is vital in helping us better understand how well prepared U.S. young adults are for the global economy.

PISA YAFS will take place later in 2015. For now, we ask that you log in to the PISA YAFS participant website using the credentials below to verify your contact information so we can contact you when the survey is officially open. The information you provide will also be used to send the cash card that will be loaded with $50 when you complete the survey.

You must log in to the PISA YAFS participant website to take part in the study.

Website:	<INSERTHYPERLINK>
Initial Username:	<USERNAME>
Initial password:	<PWD>

Your username and password are unique to you, so please do not share with anyone else. Once you have logged in to the website and created a new user name and password you will receive a confirmation email. Keep your new user name and password handy because you will need them again when it is time to complete the survey.

Before the survey opens later in 2015, we will mail your cash card and instructions on how to complete the survey to the mailing address you provide on the website.

If you have any questions or need any assistance logging in to the website, you may call the study's toll-free number (1-855-604-1519) or email PISAFollowup@westat.com

We value your time and participation in the PISA Young Adult Follow-Up Study.

Sincerely,

Daniel J. McGrath
Director, International Activities Program
National Center for Education Statistics
Institute of Education Sciences
U.S. Department of Education
Telephone: (202) 502-7426
Email: Daniel.McGrath@ed.gov

WASHINGTON, D.C. 20006

Exhibit D-5. Text of PISA Young Adult Follow-up Study participant website registration confirmation

PISA YAFS
Young Adult Follow-Up Study

Dear <First name>

Welcome to the PISA Young Adult Follow-Up Study!

Thank you for completing your online account setup. Your participation in the PISA YAFS is important, as you are a unique source of information about how students' experiences and skills at age 15 relate to their experiences and skills in young adulthood. This information will inform discussions about college and career-readiness and successful transitions from high school to college and the workforce.

Your new user name is: <USER NAME>
YAFS Participant Website: www.YAFStudy.org

Please remember to keep your password handy. Answers to the security questions you selected when registering are required if you forget your password and need to reset it. Please send an email or call the PISA YAFS support staff at PISAFollowup@westat.com or 1-855-604-1519 if you need any assistance logging in.

What to expect next:

- Before the survey opens later in 2015, you will be sent an email with instructions to access the survey, and a FedEx package with your cash card.
- Once you receive the FedEx package, please log in to <website hyperlink> and complete the survey.
- Once you have completed the survey, your cash card will be loaded with $50.00.

For more information on the study, click here to visit the NCES YAFS study website.

If you have any questions or need assistance while completing any of these steps, please contact us using the email link or phone number above.

ies NATIONAL CENTER FOR EDUCATION STATISTICS
Institute of Education Sciences

Exhibit D-6. Text of PISA Young Adult Follow-up Study NCES primer e-mail: pilot and main study

Subject: The PISA Follow-up Study is launching in [Month]– Update and next steps
Dear <SP Full Name>,

We are pleased to announce that the first wave of the PISA Young Adult Follow-up Study (YAFS) is launching in the beginning of December!

You are currently registered to participate in the first wave of YAFS.

Prior to the study launch in [Month], you will receive a FedEx package with login instructions and your unloaded cash card.

Please log in to www.YAFStudy.org and update your address and phone number by [Date] so that we have the location where you want to receive your package.

Your username is: <User Name>

Your password is unknown to us for security. If you've forgotten your password you can use the "Forgot password?" link on the home page to retrieve and reset it.
After completing the study, you will be asked to enter the last four digits of the cash card to activate it and receive your $50.00 incentive.

Part of participating in the study includes completing the Education and Skills Online (ESO) assessment. You can complete the study from any laptop or desktop computer with an internet connection, though you **must use the Firefox browser**. No other browser will work and neither will tablets or cellphones.

To download and install Firefox (about 90MB) go to:
https://www.mozilla.org/en-US/firefox/new/?scene=2#download-fx

If you have questions or need help, please contact us at e-mail address or call us at 1-800-number.

Thank you for your time and participation in the first-ever PISA Young Adult Follow-up Study!
The PISA YAFS Team

Exhibit D-7. PISA Young Adult Follow-up Study NCES invitation letter

Dear <first name> <Last name>,

My name is Dan McGrath and I am the Director of the International Activities Program at the National Center for Education Statistics. I am writing to invite you to participate in the PISA Young Adult Follow-Up Study. As we have described in previous communications, this is an invitation-only online survey that collects information about your education and work experiences and your skills as a young adult. The survey should take 50 minutes on average but no more than 2 hours to complete. **Once you complete the online survey, $50 will be loaded on the enclosed cash card.** You may use this cash card anywhere MasterCard is accepted.

We will send you the web address and login information on [Month Day, Year], the day before the survey opens. In the meantime, please keep the enclosed cash card safe.

If you have any questions or need help logging in when the survey opens, please call 1-855-604-1519 (toll free), send an e-mail to YAFollow-up@westat.com, or visit the PISA Young Adult Follow-up Study website at https://nces.ed.gov/surveys/pisa/followup.asp.

On behalf of the U.S. Department of Education, I want to thank you in advance for your cooperation in this important research project.

Sincerely,

Daniel J. McGrath
Director, International Activities Program
National Center for Education Statistics
Institute of Education Sciences
U.S. Department of Education
Telephone: (202) 502-7426
E-mail: Daniel.McGrath@ed.gov

Exhibit D-8. PISA Young Adult Follow-up Study respondent reminder

Dear <First name> <Last Name>,

There are only [X] days until the PISA Young Adult Follow-up Study begins! Remember, your participation is critical to the success of the study and we are counting on you to complete the survey. [Last week] you should have received a letter from Dan McGrath of the National Center for Education Statistics in the U.S. Department of Education inviting you to participate in the PISA Young Adult Follow-up Study. Your cash card was included with that letter. If you did not receive the invitation letter, or you have lost or misplaced your card, we can issue another one for you. Just call us at 1-855-604-1519 (toll free) or e-mail us at YAFollow-up@westat.com and we can get a new card to you. Remember, the survey should take 50 minutes on average but no more than 2 hours to complete and the card will work *after* you complete the survey on [Month Day, Year].

Thanks for your participation!

The PISA Young Adult Follow-up Study team

NCES is authorized to conduct this study under the Education Sciences Reform Act of 2002 (ESRA 2002, 20 U.S.C., § 9543). Your participation is voluntary and the information you provide 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 (ESRA 2002, 20 U.S.C., § 9573). Individual responses will be combined with those from other participants to produce summary statistics and reports. NCES will securely maintain your contact information to locate you should we conduct another follow-up survey in the future.

Exhibit D-9. PISA Young Adult Follow-up Study announcement that survey is open

Dear <First name> <Last Name>,

The PISA Young Adult Follow-up Study is now open! You can access the survey through this link: [https://some link here]. Enter your login code to begin. Your login code is:

[Login code here]

You can also access the survey from your unique user account in the PISA Young Adult Follow-up Study website: https://www.YAFS.org. Once you are logged into the website, click the link [link name] and you can begin the survey.

The survey should take 50 minutes on average but no more than 2 hours to complete. After you have completed the survey and you log out, your $50 cash card will be activated and you may use it.

If you have any problems logging in to the survey or if you have other questions, please call us at 1-855-604-1519 (toll free) or e-mail us at YAFollow-up@westat.com and we can help you.

Thanks for your participation!

The PISA Young Adult Follow-up Study team

NCES is authorized to conduct this study under the Education Sciences Reform Act of 2002 (ESRA 2002, 20 U.S.C., § 9543). Your participation is voluntary and the information you provide 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 (ESRA 2002, 20 U.S.C., § 9573). Individual responses will be combined with those from other participants to produce summary statistics and reports. NCES will securely maintain your contact information to locate you should we conduct another follow-up survey in the future.

Exhibit D-10. PISA Young Adult Follow-up Study nonresponse e-mail/hardcopy – credentials sent

Dear <first name> <Last name>,

My name is Dan McGrath and I am the Director of the International Activities Program at the National Center for Education Statistics. I am writing to you about participating in our PISA Young Adult Follow-up Study.

Our records indicate you have not yet logged into the survey. It looks like we sent you the web address login information, and unloaded cash card on [Month Day, Year]. Did you receive this package? If not, please [reply to this e-mail] [call us at 1-855-604-1519 (toll free) or send an e-mail to YAFollow-up@westat.com] and we will get another one to you immediately.

As we have described in previous communications, this is an invitation-only online survey that collects information about your education and work experiences and your skills as a young adult. The survey should take 50 minutes on average but no more than 2 hours to complete. Once you complete the online survey, $50 will be loaded on your cash card. You may use this cash card anywhere MasterCard is accepted. Again, if you did not receive this card or have misplaced it, simply reply to this e-mail and we will get it to you immediately.

If you have received your credentials but have not had the time to complete the survey, don't worry. You have until MM/DD/YYYY to complete it. I will send you another reminder when the survey is close to ending so that you do not miss this opportunity to participate in this study.

If you have any questions or need help logging in or accessing the internet, please call 1-855-604-1519 (toll free) or send an e-mail to YAFollow-up@westat.com.

On behalf of the U.S. Department of Education, I want to thank you in advance for your cooperation in this important research project.

Sincerely,

Daniel J. McGrath
Director, International Activities Program
National Center for Education Statistics
Institute of Education Sciences
U.S. Department of Education
Telephone: (202) 502-7426
E-mail: Daniel.McGrath@ed.gov

Your participation is voluntary and the information you provide 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 (ESRA 2002, 20 U.S.C., § 9573). Individual responses will be combined with those from other participants to produce summary statistics and reports. NCES will securely maintain your contact information to locate you should we conduct another follow-up survey in the future.

Exhibit D-11. PISA Young Adult Follow-up Study partial complete

Dear <First name> <Last Name>,

Thank you for participating in the PISA Young Adult Follow-up Study! Your survey is almost complete, just a few more questions to go! For your responses to count, you need to complete the entire survey. Please log back in and complete the remainder of the survey.

If you have any problems logging back in to the survey or if you have other questions, please call us at 1-855-604-1519 (toll free) or e-mail us at YAFollow-up@westat.com and we can help you.

Thanks for your participation!

The PISA Young Adult Follow-up Study team

Your participation is voluntary and the information you provide 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 (ESRA 2002, 20 U.S.C., § 9573). Individual responses will be combined with those from other participants to produce summary statistics and reports. NCES will securely maintain your contact information to locate you should we conduct another follow-up survey in the future.

Exhibit D-12. PISA Young Adult Follow-up Study notification of survey closing

Dear <first name> <Last name>,

My name is Dan McGrath and I am the Director of the International Activities Program at the National Center for Education Statistics. I am writing to you about participating in our PISA Young Adult Follow-up Study.

Our records indicate that you have not yet logged into the survey. **This is your last chance to complete the survey and receive your $50!** The survey will close on MM/DD/YYYY. Your participation in the PISA Young Adult Follow-up Study is valuable and important to the success of the survey.

It looks like we sent you the web address login information, and unloaded the cash card on [Month Day, Year]. Did you receive this package? If not, please [reply to this e-mail] [call us at 1-855-604-1519 (toll free) or send an e-mail to YAFollow-up@westat.com] and we will get another one to you immediately.

As we have described in previous communications, this is an invitation-only online survey that collects information about your education and work experiences and your skills as a young adult. The survey should take 50 minutes on average but no more than 2 hours to complete. Once you complete the online survey, $50 will be loaded on your cash card. You may use this cash card anywhere MasterCard is accepted. Again, if you did not receive this card or have misplaced it, simply reply to this e-mail and we will get it to you immediately.

If you have any questions or need help logging in or accessing the internet, please call 1-855-604-1519 (toll free) or send an e-mail to YAFollow-up@westat.com.

On behalf of the U.S. Department of Education, I want to thank you in advance for your cooperation in this important research project.

Sincerely,

Daniel J. McGrath
Director, International Activities Program
National Center for Education Statistics
Institute of Education Sciences
U.S. Department of Education
Telephone: (202) 502-7426
E-mail: Daniel.McGrath@ed.gov

Your participation is voluntary and the information you provide 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 (ESRA 2002, 20 U.S.C., § 9573). Individual responses will be combined with those from other participants to produce summary statistics and reports. NCES will securely maintain your contact information to locate you should we conduct another follow-up survey in the future.

Exhibit D-13. PISA Young Adult Follow-up Study thank you e-mail for completing the survey

Dear <First Name <Last Name>

On behalf of the U.S. Department of Education, I want to thank you for your participation in the PISA Young Adult Follow-up Study. This is the first study of its kind to be conducted in the United States. Through your participation in this important research project you provided a unique opportunity for the U.S. to better understand the educational and work experiences and the use of computers and the Internet in the daily lives of our nation. Your contributions are valued and appreciated.

As a token of appreciation for your contributions to this important research, you will receive $50.00 loaded onto the cash card you received. If you did not receive a cash card or have misplaced it, simply respond to this e-mail address and request a new one, or call 1-855-604-1519 (toll free).
Again, thank you for your participation and cooperation throughout this study.

Sincerely,

Daniel J. McGrath
Director, International Activities Program
National Center for Education Statistics
Institute of Education Sciences
U.S. Department of Education
Telephone: (202) 502-7426
E-mail: Daniel.McGrath@ed.gov