IES Institute of Education Sciences

2012–2016 Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS)

How reading and mathematics performance at age 15 relate to literacy and numeracy skills and education, workforce, and life outcomes at age 19

Research and Development Report

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How reading and mathematics performance at age 15 relate to literacy and numeracy skills and education, workforce, and life outcomes at age 19

Research and Development Report

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Executive Summary

The Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS) is a new study that allows research into the characteristics, cognitive skills, and other life outcomes of young adults as they transition from high school to postsecondary life. This Research and Development report provides a snapshot of outcomes at the outset of this important transition, as well as preliminary examinations of how these outcomes are related to individuals' competencies in high school. It is intended to serve as an example of using multiple data sources in longitudinal research and to contribute to the literature on education and employment pathways.

Study design

PISA YAFS was conducted in the United States in 2016 with a sample of young adults (at age 19) who participated in PISA 2012 when they were in high school (at age 15). In PISA YAFS, students took the Education and Skills Online (ESO) literacy and numeracy assessments, which are based on the Program for the International Assessment of Adult Competencies (PIAAC).

Both PISA and PIAAC, on which ESO is based, were designed to meet the overarching goal to "identify and develop the knowledge and skills that drive better jobs and better lives, generate prosperity and promote social inclusion" (OECD n.d.). As such, both assessments seek to measure key competencies that are applicable across a wide range of culturally and linguistically diverse countries, recognize a continuum of competency, and reflect real-world demands and contexts. While each study has its own unique framework, there are similarities in the content and skills measured and the overall approach and philosophy between the two. Table A provides a brief overview of the assessment components of PISA 2012 and ESO. Each also included a background questionnaire for participants.

Table A. Overview of assessment data sources in PISA YAFS: 2012 and 2016

	PISA 2012	ESO (based on PIAAC)
Time frame of data collection	October–November 2012	March–July 2016
Age at data collection	15 years old	19 years old[1]
Subjects included for PISA YAFS	Reading and Mathematics Literacy[2]	Literacy and Numeracy
Mode	Paper-and-pencil	Computer-based, adaptive
Effective scales (for each subject)[3]	200–800 points	100–400 points
Proficiency-level categories[4]	Low (Below level 2) Middle (Levels 2–4) High (Level 5 or above)	Low (Below level 2) Middle (Levels 2–3) High (Level 4 or above)

[1] Estimates for 19-year-olds are for individuals who were 15-year-old students in fall 2012 and who participated in PISA YAFS in 2016.
[2] To avoid confusion with the ESO literacy and numeracy assessments, PISA subjects are referred to as "reading" and "mathematics" when reporting the results.
[3] Effective scales are estimated using three standard deviations up and down from the mean, as determined for each program. Score distributions show that few students score outside these ranges (OECD 2020; Woodworth 2019).
[4] Both the individual and categorized proficiency levels have their own assessment-specific definitions. Because the groupings were based on the same rationales for each assessment, they are similar enough for general comparison but should not be considered fully equivalent.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Highlights

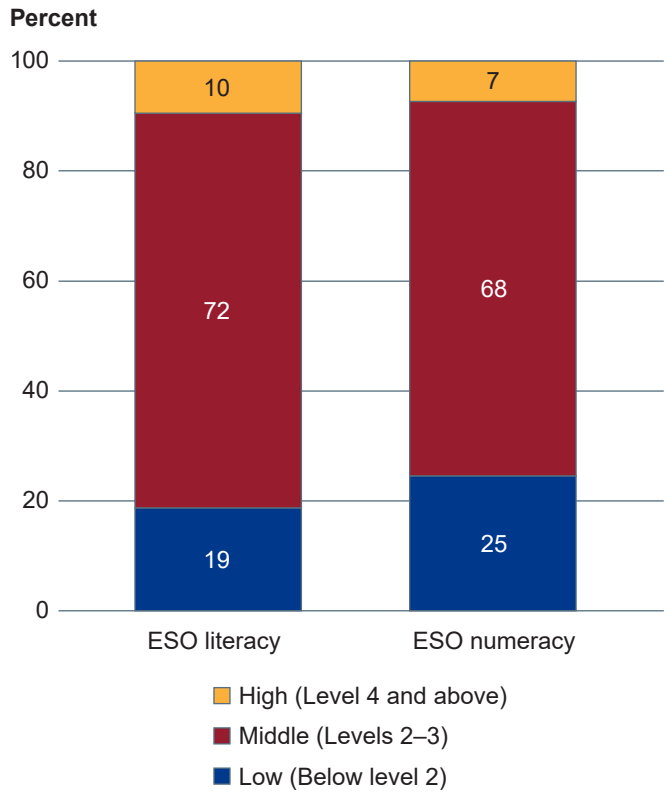
Because of its design, PISA YAFS is able to provide data on literacy, numeracy, and life outcomes at age 19, as well as their relationship to individuals' reading and mathematics literacy at age 15. This summary focuses on those outcomes and relationships and explores whether they differ based on individuals' background characteristics or the socioeconomic status of the schools they attended at age 15.

Results are described mainly by proficiency levels, which are based on descriptions of the types of tasks that individuals at the various levels have demonstrated they can perform. For reporting, the levels for each assessment have been grouped into low, middle, and high levels (see table A).

Proficiency in ESO at age 19

- In 2016, in both subjects, most 19-year-olds performed at the middle level of proficiency in ESO: 72 percent in literacy and 68 percent in numeracy (see figure A). About one-fifth to one-quarter performed at the low level, and small percentages (10 percent or less) performed at the high level.
- The distribution across ESO proficiency levels was not statistically different in either subject by sex, language spoken at home, or whether a student was born in the United States, but it did differ by race/ethnicity. Proportionately more Black 19-year-olds were in the low level of proficiency in ESO numeracy compared with the population overall (45 vs. 25 percent, respectively).

Figure A. U.S. 19-year-olds' proficiency in ESO, by subject and level: 2016



NOTE: See appendix B for additional detail. Detail may not sum to totals due to rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Relationship of proficiency in ESO at age 19 to proficiency in PISA at age 15

Proficiency at age 19 was most closely related to proficiency at age 15 among the middle performers, who were the largest group in the PISA YAFS population at age 15 as well (77 percent in reading and 68 percent in mathematics) (see table B).

- Of the U.S. 19-year-olds who performed at the middle level of proficiency in PISA 2012 reading at age 15, about 78 percent also performed at the middle level of proficiency in ESO literacy at age 19. Seven percent of these PISA middle performers were at the high level of proficiency in ESO literacy at age 19, and 15 percent were at the low level.
- Of the 19-year-olds who performed at middle level of proficiency in PISA 2012 mathematics at age 15, about 79 percent also performed at the middle level of proficiency in ESO numeracy at age 19. Four percent of these PISA middle performers were at the high level of proficiency in ESO numeracy at age 19, and 17 percent were at the low level.

The pattern for 19-year-olds who were high and low performers in PISA 2012 was not as stark: They were not as consistently in the same-labeled proficiency-level categories as they were at age 15. In fact, among the PISA 2012 high performers, at least half were in a different category in ESO at age 19—mainly in the middle proficiency level (57 percent in literacy and 54 percent in numeracy). Additionally, 49 percent of PISA 2012 low performers in literacy and 40 percent in numeracy were, by age 19, in the ESO middle proficiency level. In the case of both high and low performers, however, the overall percentages in these PISA 2012 categories were relatively small (22 percent or less).

When examined separately for different subgroups, the pattern of a predominant and stable middle group held true, regardless of 19-year-olds' background characteristics such as sex and race/ethnicity. However,

Table B. Percentage of PISA 2012 middle performers, by ESO proficiency levels: 2012 and 2016

PISA 2012 subject	Percent of PISA YAFS population who were PISA 2012 middle performers (age 15)	Percent of PISA 2012 middle performers, by ESO proficiency levels (age 19)		
		High (Level 4 and above)	Middle (Levels 2–3)	Low (Below level 2)
Reading	77	7	78	15
Mathematics	68	4	79	17

NOTE: See appendix B for additional detail. Detail may not sum to totals due to rounding. Results for middle performers (levels 2-4) in PISA 2012 reading are distributed across proficiency levels in ESO literacy and those in PISA 2012 mathematics across proficiency levels in ESO numeracy.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

the pattern diverged for 19-year-olds who, at age 15, were in schools with high percentages of students eligible for free or reduced-price lunch (FRPL).[1]

- In both subjects, proportionately more PISA 2012 middle performers who had been in the most economically challenged schools (i.e., those with 75 percent or more of students receiving FRPL) scored at the low level of proficiency in ESO in 2016 than did the population overall (28 vs. 15 percent in literacy and 36 vs. 17 percent in numeracy, respectively).
- In mathematics, proportionately fewer of the PISA 2012 middle performers who had been in the most economically challenged schools scored at the middle level of proficiency in ESO numeracy than did the population overall (62 vs. 79 percent, respectively).

Correlations between ESO scores at age 19 and PISA 2012 scores at age 15

Correlation describes the strength of a relationship between two measures. In this report, analyses examine the correlation of ESO and PISA scores—or the degree to which performance at age 19 was associated with that at age 15.

- U.S. 19-year-olds with higher literacy and numeracy scores in ESO tended to have had higher reading and mathematics scores in PISA 2012, respectively, at age 15. The correlation between ESO literacy and PISA 2012 reading is 0.59 and between ESO numeracy and PISA 2012 mathematics is 0.69, indicating strong positive relationships.[2]
- In both subjects, however, correlations were weaker for 19-year-olds who at age 15 had attended the most or the least economically challenged schools (i.e., those with more than 75 percent or less than 25 percent of students receiving FRPL) than for the PISA YAFS population overall.

Relationship of education, workforce, and life outcomes at age 19 to proficiency in PISA at age 15

The report also examined 19-year-olds' education outcomes (degrees currently pursued, area of study currently pursued, and participation in nonformal education); workforce outcomes (employment status, combined employment and education status, and current occupation); and life outcomes (self-efficacy, life satisfaction, and vocational interests) in 2016 in relationship to their proficiency in PISA 2012 at age 15. Significant relationships were found for five of the nine outcome areas examined in the study, including the following:

- High reading and mathematics proficiency at age 15 were associated with higher education trajectories and other potentially advantageous life outcomes at age 19. The following examples are for high performers in reading, but the patterns apply to high performers in mathematics as well.
  - High performers in PISA 2012 reading were enrolled in bachelor's degree programs at a higher rate (84 percent) than the population overall (45 percent) at age 19.
  - About 27 percent of high performers in PISA 2012 reading were pursuing a postsecondary degree in sciences and 15 percent in engineering at age 19, compared with 12 and 7 percent, respectively, in the population overall. Science and engineering are two fields that policymakers and researchers

[1] The percentage of students eligible for free or reduced-price lunch was available for public schools only.
[2] Cohen's (1988) convention is used for interpreting correlation effect sizes. For more information, see section 2 of the report.

generally consider critical to meeting the workplace and problem-solving demands of the future (U.S. Department of Education 2018, 2020).

- Low reading and mathematics proficiency at age 15 was associated with lower education trajectories at age 19. The following examples are for low performers in reading, but the patterns apply to low performers in mathematics as well.
  - Low performers in PISA 2012 reading (i.e., below level 2) were more commonly still in high school (23 percent) than the population overall (9 percent) at age 19.
  - Low performers in PISA 2012 reading were less commonly enrolled in bachelor's degree programs (12 percent) than the population overall (45 percent) at this age.
- Patterns of vocational interest at age 19 also differed based on proficiency in PISA 2012 at age 15. The following examples are for high performers in reading, but the patterns apply to high performers in mathematics as well.
  - High performers in PISA 2012 reading had a higher level of interest in investigative vocations than the population overall at age 19 (scoring 20 vs. 18, respectively, out of a total of 40 points).[3] Investigative vocations include work that involves ideas and thinking rather than physical activity or leading people.
  - High performers in PISA 2012 reading had a lower level of interest in enterprising vocations than the population overall at age 19 (scoring 17 vs. 19, respectively). Enterprising vocations include work that involves starting up and carrying out business projects.

Together, the results from PISA YAFS provide a snapshot of the cognitive skills of U.S. 19-year-olds as they move from high school to postsecondary life and an analysis of how their skills, outcomes, attitudes, and interests at that age are related to the academic proficiency they demonstrated at age 15. By documenting generally strong, positive relationships between individuals' reading and mathematics performance at age 15 and their literacy skills, numeracy skills, and educational trajectories 4 years later, this report provides an indication of the degree to which success on PISA 2012 is related to various outcomes at this important transitional stage and the outset of adult life.

[3] The results on vocational interest come from 19-year-olds' responses to questions about the degree to which they would like or dislike various activities across six dimensions originally identified in the Holland (1997) RIASEC model: realistic, investigative, artistic, social, enterprising, and conventional. The questions were on a 5-point scale, and individuals' responses were added for each dimension and ranged from 0 to 40. The higher the score, the higher the interest in the given type of vocation. See appendix B for additional details.

Foreword

The Research and Development series of reports at the National Center for Education Statistics (NCES) has been initiated to

- share studies and research that are developmental in nature. The results of such studies may be revised as the work continues and additional data become available;
- share the results of studies that are, to some extent, on the cutting edge of methodological developments. Emerging analytical approaches and new computer software development often permit new and sometimes controversial analyses to be done. By participating in frontier research, we hope to contribute to the resolution of issues and improved analysis; and
- participate in discussions of emerging issues of interest to education researchers, statisticians, and the federal statistical community in general. Such reports may document workshops and symposia sponsored by NCES that address methodological and analytical issues or may share and discuss issues regarding NCES practices, procedures, and standards.

The common theme in all three goals is that these reports present results or discussions that do not reach definitive conclusions at this point in time, because the data are tentative, the methodology is new and developing, or the topic is one on which there are divergent views. Therefore, the techniques and inferences made from the data are tentative and subject to revision. To facilitate the process of closure on the issues, we invite comment, criticism, and alternatives to what we have done. Such responses should be directed to

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1. Introduction

Overview of PISA YAFS

The Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS) is a new study that uses international assessment data to examine the characteristics and outcomes of U.S. young adults at a key stage in their development—the transition from high school to their postsecondary lives. It provides a snapshot of their outcomes in 2016 at about age 19 and examines how those outcomes are related to the knowledge and skills they demonstrated at age 15. The study is coordinated by the National Center for Education Statistics (NCES).

For data on 19-year-olds, PISA YAFS used the Education and Skills Online (ESO) survey, which is based on the Organization for Economic Cooperation and Development's (OECD) Program for International Assessment of Adult Competencies (PIAAC). ESO is a streamlined version of PIAAC, and both ESO and PIAAC include assessments in literacy, numeracy, and problem solving in technology-rich environments that were developed to measure the skills of people ages 16 to 65. In 2016, PISA YAFS also included a questionnaire about education, employment, and other characteristics.

For data on 15-year-olds, the study relied on the 2012 administration of the Program for International Student Assessment (PISA), which is the OECD's flagship student assessment program that, every 3 years, assesses reading, mathematics, and science literacy and collects relevant background data on students and their schools. The PISA YAFS design involved recruiting students who had participated in PISA in 2012, when they were about 15 years old, to take the ESO literacy and numeracy assessments 4 years later, in the spring and summer of 2016, when they were about 19 years old.[1]

This Research and Development report describes the literacy and numeracy performance of 19-year-olds along with other outcomes such as their engagement in postsecondary education, participation in the workforce, attitudes toward their lives and ability to make their own choices, and vocational interests. Moreover, it examines whether and how these outcomes are related to the 19-year-olds' earlier performance in PISA 2012 and whether those relationships differ for various subgroups of individuals. This report thus provides an indication of the degree to which success on PISA 2012 is related to various outcomes at the important transition from high school to postsecondary life, and it extends NCES's long tradition of longitudinal research on postsecondary outcomes (which will be described in the next section along with other literature on youth transitions).

Importance of youth transitions

PISA YAFS is part of a body of national and international research on youth transitions. Youth transitions are the key stages of development that occur when youth move from one school level to another (or when they leave school), and they tend to represent shared experiences. Commonly studied youth transitions include those that occur at the beginning of adolescence and at the beginning of young adulthood, as in PISA YAFS.

The transition into young adulthood has received attention in recent years, particularly because of well-documented cultural and economic shifts that have affected that transition. Over the past two decades, there has been an upward trend in postsecondary enrollment and attainment, which has delayed workforce entry for some young adults (Chen et al. 2017; Furstenberg 2010). At the same time the costs of that education have risen dramatically (Horn and Paslov 2014). This has left increasing percentages of individuals with substantial amounts of college debt that, together with an uncertain economy, could dampen their pursuit of future

[1] Literacy and numeracy were selected from among ESO's domains for PISA YAFS because these are the subjects ESO and PISA 2012 have in common and can be examined over time.

educational, employment, or family goals (College Board 2017; Settersen and Ray 2010; Woo and Shaw 2015). Other traditional aspects of the transition to young adulthood, such as independent living, marriage, and building a family, can also be increasingly delayed (Furstenberg 2010; Settersen and Ray 2010). It is important to understand the competencies young adults have and to know the choices they are making at this important stage—and whether those competencies and choices are related to any antecedent factors.

Several recent international studies have followed—as PISA YAFS does—the 15-year-old students who participated in PISA to determine how their performance in PISA is related to their outcomes as young adults. At least seven countries have undertaken such studies (Borgonovi et al. 2017). In some cases (e.g., Australia, Switzerland, and Uruguay), these were longitudinal studies and they either linked PISA students to ongoing administrative records or conducted periodic follow-up surveys (which did not have skills assessment components) with the students. In Denmark, the Ministry of Education administered the PIAAC assessment to a sample of students 12 years after they had initially taken PISA 2000; in Canada, the PISA reading assessment was readministered to a sample of PISA 2000 students 9 years after it was initially administered to them as 15-year-olds. As mentioned, the PISA YAFS study is designed in a similar vein as these studies, albeit generally on a shorter time horizon and without the multiple follow-ups that some of them have.

These international studies generally found strong associations between PISA performance and participants' outcomes as young adults, validating PISA as a potential predictor of students' future success. For example, in Switzerland, PISA 2000 reading performance was positively associated with high school completion and college entry, and in Uruguay, PISA 2003 and 2006 mathematics performance was positively associated with completing high school and negatively associated with dropping out of school (Borgonovi et al. 2017). In Canada, poor PISA 2000 performance was associated with a higher risk of poor labor market outcomes and lower uptake of postsecondary education (OECD 2010a). In Denmark, the nature of the study allowed it to examine the link between competencies across time (Rosdahl 2014). This study showed that that the higher the PISA 2000 reading score, the higher the probability the participant was in the top third of performers on the PIAAC literacy scale. However, this study also noted certain mitigating factors that were associated with either an increase or decrease in competencies. For example, those participants whose parents were better educated, who themselves had received further education, or who had not had disruptions (e.g., illness or unemployment) that necessitated social welfare payments increased their relative competency level in PIAAC compared to those at similar initial competency levels in PISA 2000. Increased learning opportunities were also found to mitigate the relationship between higher socioeconomic status and stronger performance in the study in Australia (Borgonovi et al. 2017). Similarly, a cross-sectional study that compared PISA 2000 students with their comparable age cohort in PIAAC 2012 suggested that the negative effects of socioeconomic status on the decline of competencies was stronger for the lowest performers than for the highest performers (OECD 2017).[2]

Each of these forgoing examples shared PISA as the lens through which youth transitions were examined, and each showed how international data can be used nationally, without a comparative aspect, to answer research questions of interest. In this way, they seem to have the most in common with PISA YAFS. However, PISA YAFS also builds from and extends the research on youth transitions that have used national data sources. National research includes the numerous studies that have been undertaken by NCES (which sponsored PISA YAFS) and the National Assessment Governing Board (NAGB), which aim to identify specific factors that are predictive of successful outcomes for young adults or preparedness for their postsecondary paths.[3]

NCES research on the topic can be categorized into three groups of studies: (1) longitudinal studies that follow U.S. students in and beyond their educational careers, (2) transcript studies that examine the relationship between coursetaking patterns and outcomes, and (3) other cross-survey studies, such as PISA YAFS. Examples of longitudinal studies include High School and Beyond, the National Education Longitudinal Study of 1988, the Education Longitudinal Study of 2002, and the High School Longitudinal Study of 2009. These studies have demonstrated, for example, that mathematics coursetaking and GPA in high school are strong predictors of students' enrollment in postsecondary education (Kena et al. 2016). Similarly, the Beginning

[2] In the referenced OECD study, socioeconomic status was measured by parental educational attainment and number of books in the home at 15 to 16 years of age.
[3] NCES also conducts longitudinal studies at other key transition points, such as early childhood (https://nces.ed.gov/ecls/) and the middle grades (https://nces.ed.gov/surveys/mgls/).

Postsecondary Students Longitudinal Study found, at the 3-year check-in with 2011 first-time postsecondary students, a significant relationship between mathematics coursetaking and enrollment in 4-year colleges (Ifill et al. 2016). Diving deeper on coursetaking, the High School Transcript Study showed that, in 2009, high school graduates who completed a rigorous curriculum, an Advanced Placement or International Baccalaureate course, or another higher-level course in ninth grade had higher average National Assessment of Educational Progress (NAEP) scores compared with those who had completed a mid-level or standard curriculum (Nord et al. 2011).

Within NAGB, research on the transition from high school has focused on exploring whether the NAEP grade 12 assessments can be validated as indicators of preparedness for either academic or job training endeavors. For example, Fields (2014) explored identifying postsecondary preparedness indicators that include both education and career pathways, utilizing NAEP and other existing data sources.

The results of the PISA YAFS study extend this body of international and domestic research that has followed students over time to better understand what predicts and supports their success as young adults.

Organization of the report

The next sections of this report are organized as follows:

- Section 2: Study methods, including information on data sources and measures, reporting of results, sample, and data limitations
- Section 3: Findings on performance in ESO and its relationship to PISA 2012
- Section 4: Findings on the transition from high school to postsecondary life

The report concludes with a brief summary of the findings.

Exhibits and figures are included in the main body of the report, while all data tables are provided in appendix A. Appendix B describes the variables used in analyses, and appendix C provides brief technical notes.

A full technical report will be available following the publication of this current report. It will include additional details on the data collection instruments, response rates, and nonresponse bias, among other topics.

Where to find more information

More information on the assessments described in this report can be found at the links below.

- **Program for International Student Assessment (PISA) 2012**–the assessment of 15-year-olds and pool for the PISA YAFS participants in 2016

  International website

  National website

- Education and Skills Online (ESO)–the assessment tool used to collect data from 19-year-olds in PISA YAFS in 2016

- **Program for the International Assessment of Adult Competencies (PIAAC)**–the study on which ESO's scales and proficiency levels are based

  International website

  National website

  PIAAC Gateway

For general information on PISA YAFS, see the PISA YAFS study website. For additional information, reports, and data tools on these and other international assessments, see the NCES international assessments website.

2. Study Methods

Data sources and measures

PISA YAFS used two assessment tools to make longitudinal comparisons. Participants were first assessed in PISA 2012 at age 15 and later assessed in ESO at age 19. This section thus addresses the *content and skills* in which PISA YAFS young adults were assessed at ages 15 and 19 as well as the *background information* collected about them in each assessment.

Content and skills measured by PISA 2012 at age 15

PISA 2012 was designed to meet the OECD Education Directorate's overarching goal to "identify and develop the knowledge and skills that drive better jobs and better lives, generate prosperity and promote social inclusion" (OECD n.d.). The PISA 2012 framework specifies three main content domains—reading literacy, mathematics literacy, and scientific literacy—and two additional domains—problem solving and financial literacy. Only reading and mathematics literacy were used in PISA YAFS. In 2012, PISA was administered as a paper-and-pencil assessment.

PISA 2012 reading literacy assessment

In PISA 2012, reading literacy was defined as "understanding, using, reflecting on, and engaging with written texts in order to achieve one's goals, develop one's knowledge and potential, and participate in society" (OECD 2013b, p. 2). This was measured by providing respondents with a set of texts about which they answered questions or performed related tasks in various contexts.

In terms of texts, PISA includes continuous text (which is prose text made up of sentences formed into paragraphs, such as in newspaper and magazine articles, brochures, manuals, e-mails, and many web pages) as well as noncontinuous text (which uses explicit typographic features, rather than paragraphs, to organize information into a matrix, such as in tables, graphs, charts, and forms). Additionally, some texts in PISA 2012 include elements of both continuous and noncontinuous text (mixed text), and some present multiple texts.

In terms of the cognitive skills required by the questions and tasks in PISA 2012, these can be categorized into three broad strategies that are necessary for achieving a full understanding of texts:

- *Accessing and identifying,* which require the reader to locate and select items of information in the text
- *Integrating and interpreting,* which require the reader to process what is read to make internal sense of the text, whether by connecting various pieces of information or making meaning from something not stated
- *Reflecting and evaluating,* which require the reader to draw on knowledge, ideas, or attitudes beyond the text and to relate them to the text

Finally, the real-world contexts from which the PISA 2012 tasks are drawn include work and occupation, personal situations (i.e., related to home and family, health, shopping, or leisure), community and citizenship, and education and training.

PISA 2012 mathematics literacy assessment

In PISA 2012, mathematics literacy was defined as "an individual's capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals to recognise the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens" (OECD 2013b, p. 17). This was measured by asking respondents to demonstrate their knowledge of mathematics content and processes to solve problems in a variety of problem scenarios and contexts.

The mathematical content covered in PISA 2012 includes four areas that generally overlap with school-based mathematics disciplines: quantity, space and shape, change and relationships, and uncertainty and data. In terms of the required mathematical processes, the PISA 2012 mathematics literacy assessment represents a range: formulate situations mathematically; employ mathematical concepts, facts, procedures, and reasoning; and interpret, apply, and evaluate mathematical outcomes. Finally, as with reading literacy, PISA 2012 mathematics tasks draw from a broad range of real-world contexts. For mathematics literacy, these include occupational, personal, societal, and scientific.

Content and skills measured in ESO for PISA YAFS at age 19

ESO was initially developed to provide individual-level results that were linked to PIAAC and could be obtained at any time, not limited to PIAAC's decennial administration. As such, the content and skills that ESO measures are based on the PIAAC assessment framework (OECD 2012) and—like PISA 2012—were selected to meet the OECD Education Directorate's overarching goal to "identify and develop the knowledge and skills that drive better jobs and better lives, generate prosperity and promote social inclusion" (OECD n.d.).

The PIAAC (and thus ESO) framework specifies three content domains: literacy, numeracy, and problem solving in technology-rich environments. Literacy and numeracy were selected as the focus in PISA YAFS because these are the two ESO subjects that overlap with PISA 2012. ESO is a computer-based, adaptive assessment. Participants answer questions in the literacy and numeracy content domains.

ESO literacy assessment

The ESO literacy assessment is designed to measure everyday literacy, which is defined as "understanding, evaluating, using and engaging with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential" (OECD 2012, p. 3). This is accomplished by providing respondents with a set of texts about which they must answer questions or perform related tasks in various contexts.

Several types of texts are included in ESO, such as continuous text (i.e., prose text) and noncontinuous text (i.e., nonprose text that uses explicit typographic features to organize information). Additionally, some texts in ESO include elements of both continuous and noncontinuous text (mixed text), and some present multiple texts.

The range of cognitive skills required by the questions and tasks in the ESO literacy assessment can be categorized into three broad strategies that are necessary for achieving a full understanding of texts:

- *Accessing and identifying,* which require the reader to locate items of information in text either through locating explicit text or by inferring or having a rhetorical understanding of the text
- *Integrating and interpreting,* which require the reader to understand the relationships between different parts of a text, which again may be explicit or may require inference
- *Evaluating and reflecting,* which require the reader to draw on knowledge, ideas, or values external to the text

Finally, the ESO literacy tasks are drawn from a broad range of real-world contexts, including work and occupation, personal situations (i.e., related to home and family, health, shopping, or leisure), community and citizenship, and education and training.

ESO numeracy assessment

The ESO numeracy assessment is designed to evaluate basic mathematical and computational skills that are considered fundamental for functioning in everyday work and social life. Numeracy is defined as "the ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life" (OECD 2012, p. 4). This is accomplished by providing respondents with a set of materials or problem situations that contain mathematical information, about which they must answer questions or perform related tasks in various contexts.

Four key areas of mathematical content, information, and ideas are covered in ESO: quantity and number; dimension and shape; patterns, relationships, and change; and data and chance. Across these key areas, mathematical information may be presented in a variety of forms, including objects and pictures; numbers and mathematical symbols; formulas; diagrams, maps, graphs, and tables; texts; and technology-based displays.

The tasks in the ESO numeracy assessment represent a range of numeracy demands requiring mathematical

processes and responses that can be categorized under three broad headings:

- *Identify, locate, or access* mathematical information that is present in the task or situation and relevant to the respondent's purpose or goal
- *Act upon or use* already known mathematical procedures or mathematical information such as that required in counting, computing, ordering, sorting, estimating, measuring, or using or developing formulas
- *Interpret, evaluate or analyze, and communicate* mathematical information

All ESO numeracy tasks replicate real-world situations in which numeracy skills are needed to achieve a goal or purpose, and these situations may be related to work, everyday life, society or community, or further learning.

Similarities and differences between PISA 2012 and ESO

As the prior descriptions suggested, despite each assessment having its own unique framework, purpose, and target population, there are substantial similarities in the content and skills measured and the overall approach and philosophy between PISA 2012 and ESO/PIAAC (exhibit 1). At a broad level, both measure key competencies that are applicable across a wide range of culturally and linguistically diverse countries, recognize a continuum of competency, and reflect real-world demands and contexts.[4]

In terms of their frameworks, PISA 2012 and ESO also both have the same set of organizing dimensions (content, cognitive, and context), and the categories within them are similarly named and are, in most cases, defined in similar ways. For example, both PISA 2012 and ESO define the content dimension of (reading) literacy to include continuous, noncontinuous, mixed, and multiple texts, and both define the cognitive dimension to include accessing and identifying, integrating and interpreting, and reflecting and evaluating. This likely owes to their largely similar domain definitions, which emphasize the deployment of reading skills for pursuit of personal goals and development and for participation in society. Similarities also exist between PISA 2012 mathematics literacy and ESO numeracy, as each identifies four areas of content that—despite slightly differing terminology—are generally underpinned by knowledge and skills in the disciplines of number, geometry, algebra, and probability and statistics.

There are some subtle framework distinctions, however, and these are most apparent in mathematics. For example, ESO's definition of numeracy is slightly broader than PISA 2012's definition of mathematics literacy. This is because numeracy is rooted in the real-world demands in which mathematics plays a role rather than—as mathematical literacy is—rooted in mathematical skills and how these can be applied in the real world. ESO also includes a communication aspect in its mathematics cognitive dimension, which could require a respondent to describe their mathematical actions or interpretations in addition to interpreting or evaluating, as are the limits in PISA 2012. Finally, in the context dimension (for both literacy and numeracy), ESO's categories are slightly broader than those in PISA 2012 to account for its adult (and not exclusively student) population. For example, ESO literacy includes an education and training context category compared to PISA 2012's education category in reading literacy.

The most significant potential distinctions in both subjects, however, relate less to content and more to the different target populations. For example, because PISA 2012 is administered to students, it does not have to account for as wide a range of skills as are present in the PIAAC/ESO adult population and thus starts at a higher point on the performance continuum (Gal and Tout 2014). The different populations could also have an impact on how the frameworks' context dimensions are operationalized, because the younger PISA target population may not be as familiar with the same types of situations as PISA YAFS's 19-year-olds would be, even within similarly named context categories. Finally, while neither framework is limited to what is typically included in school curricula, the tasks in PISA may be somewhat more academically oriented than those in ESO.

In this report, ESO provides the key performance outcomes, while PISA 2012 results are examined for the possible relationship with the ESO outcomes. For simplicity and to avoid confusion with the ESO literacy and numeracy assessment, the PISA domains will be abbreviated as "PISA 2012 reading" and "PISA 2012 mathematics" when discussing scores and results.

[4] See Borgonovi et al. (2017) for additional detail about the similarities and differences between PIAAC and PISA. The discussion in this section draws from this work. See also Gal and Tout (2014).

Exhibit 1. Similarities and differences between PISA 2012 reading and mathematics literacy and ESO literacy and numeracy

PISA 2012 and ESO generally	PISA 2012 reading literacy and ESO literacy frameworks	PISA 2012 mathematics literacy and ESO numeracy frameworks
Similarities that enable comparisons of the two measures		

• Were designed under auspices of same organization for same overarching goal
• Measure key competencies applicable across wide range of culturally and linguistically diverse countries
• Recognize a continuum of competency
• Reflect real-world demands and contexts
	• Domains are similarly defined
	• Share the same set of organizing dimensions for frameworks:
	  ▪ Content
	  ▪ Cognitive
	  ▪ Context
	• Similarly named and define categories within the content and cognitive dimensions
		• Share the same set of organizing dimensions for frameworks:
		  ▪ Content
		  ▪ Cognitive
		  ▪ Context
		• Similarly define categories (despite variations in naming) within the content dimension

Differences to keep in mind in interpreting results		

• PISA student (vs. ESO adult) population suggests PISA assessment tasks may
  ▪ Start at higher point on the performance continuum
  ▪ Be placed in a more limited range of contexts
  ▪ Be somewhat more academically oriented
	• ESO specifies a broader range within the context dimension to reflect its adult population	• ESO numeracy is slightly more broadly defined than PISA mathematics literacy
		• ESO includes a communication aspect in its mathematics cognitive dimension that PISA does not
		• ESO specifies a broader range within the context dimension to reflect its adult population

NOTE: PISA 2012 also measured science literacy, problem solving, and financial literacy, and ESO also measured problem solving in technology-rich environments. These content areas are not included in the analysis because they were not common across the two assessments and were not examined in PISA YAFS.
SOURCE: OECD 2012, 2013b, 2019a; Borgonovi et al. 2017; Gal and Tout 2014.

Background information collected by PISA 2012 at age 15 and PISA YAFS at age 19

PISA 2012 included background questionnaires: one about students and one about schools. The student questionnaire collected information on the 15-year-old students' demographic backgrounds, the highest level of parental education, and their attitudes and behaviors toward school ("feeling happy toward school" and frequency of skipping whole days of school). PISA 2012's school questionnaire collected information from school administrators on school type (public or private), school locale, and students' receiving free or reduced-price lunch (FRPL). These student and school responses were used to identify subgroups for analysis. Additionally, this report draws on two PISA indices–which were developed based on students' responses to multiple, associated questionnaire items–to identify student subgroups for analysis. These were the index of economic, social, and cultural status and index of openness to problem solving. In these cases, students are identified by quarters of the index (e.g., students in the bottom quarter are those in the lowest 25 percent of values on the index; those in the top quarter are those in the highest 25 percent).

In addition to the ESO content and skills assessments, PISA YAFS included a background questionnaire that asked the 19-year-old respondents about their characteristics, activities, and attitudes. This questionnaire used questions from both the ESO background questionnaire and a new set of questions

developed for PISA YAFS that are critical for its population.[5]

Specific topics included in the questionnaire and described in this report are education characteristics, employment characteristics, attitudes (i.e., self-efficacy and life satisfaction), and vocational interests. The questionnaire also asked demographic background questions about respondents' sex, race/ethnicity, nativity, and language at home, which are used to analyze PISA YAFS results for different subgroups.

Reporting results

Average scale scores and proficiency levels

Definitions in PISA 2012

PISA 2012 results are reported on scales for each content domain. The scales for both reading literacy and mathematics literacy range from 0 to 1,000, with a standard deviation of 100 points. Using three standard deviations up and down from a scale mean of 500, the effective scale is 200 to 800 points. The scale averages for the countries that participated in 2012 are 493 for reading and 490 for mathematics (OECD 2013d).

PISA 2012 also uses proficiency levels, which divide the scales by score-point ranges that are associated with the specific sets of knowledge and skills required to complete the assessment tasks within the levels (exhibits 2 and 3). The proficiency levels thus are defined in terms of what 15-year-olds at a given level know and can do, and the levels show, generally, how proficiency varies along the scales. PISA 2012's proficiency levels are labeled numerically (exhibits 2 and 3): from level 1b and 1a at the low end to level 6 at the high end of the reading literacy scale and from level 1 at the low end to level 6 at the high end of the mathematics literacy scale. Additionally, there is a "below level 1" category for each domain.

For the purposes of this report, proficiency levels have been combined and thus results are presented for below level 2, levels 2 through 4, and level 5 and above. This grouping of proficiency-level categories was previously used in international reports to designate lower performance, middle performance, and higher performance, respectively (see, e.g., OECD 2016a). On identifying the threshold between lower and middle performance, for example, the OECD recently stated that students at level 2 are at the "baseline level of proficiency that all students should be expected to attain in order to take advantage of further learning opportunities and participate fully in the social, economic, and civic life of modern societies in a globalized world" (OECD 2016a, p. 64).

Definitions in ESO

ESO results are reported on PIAAC's scale, which is from 0 to 500 points and represents a continuum of proficiency.[6] There are separate scales for literacy and numeracy, each of which has a standard deviation of 50 points. Using three standard deviations up and down from a scale mean of 250, the effective scale is 100 to 400 points. The scale averages for the countries that participated in PIAAC in 2012 were 272 points in literacy and 269 points in numeracy (OECD 2013a).

ESO also uses PIAAC's proficiency levels, which are defined in terms of what individuals at a given level know and can do, and the levels show, generally, how proficiency varies along the scales (exhibits 4 and 5). The ESO proficiency levels are labeled numerically: levels 1 through 5 as well as "below level 1" for both literacy and numeracy. Respondents at levels 1 to 5 demonstrate not only the knowledge and skills associated with a particular level but also the proficiencies required at lower levels. Respondents who score "below level 1" demonstrate proficiency lower than what is needed to accomplish successfully at level 1.

For the purposes of this report, proficiency levels have been combined and thus results are presented for below level 2, levels 2 and 3, and level 4 and above—which, again, were previously used in international reports to designate lower performance, middle performance, and higher performance, respectively (see, e.g., OECD 2013a, 2016b). Similar to PISA, the threshold between the low and middle groups represents the expected baseline of proficiency.

Uses in this report and notes on comparing proficiency levels

This report uses the ESO average scale scores and the percentages of the PISA YAFS population reaching low, middle, and high proficiency levels in ESO to provide a picture of literacy and numeracy performance at 19 years old (in section 3). These results are examined for the

[5] The tailored set of questions was developed based on questions in the PIAAC background questionnaire and is referred to as the Learning Experience Questionnaire. It is described in more detail, along with the standard set of ESO questions, in appendix C.
[6] For additional detail on how scales were established (including the use of plausible values) and other methodologies, see appendix C.

overall population as well as for demographic groups by sex, race/ethnicity, U.S. nativity, and language spoken at home.

The report uses the PISA 2012 average scale scores and the percentages reaching low, middle, and high proficiency levels in PISA 2012 to describe how the PISA YAFS population's performance at age 15 relates to ESO performance at age 19 (in section 3). In such analyses that relate PISA performance at age 15 to ESO performance at age 19, results are examined not only by demographic variables but also by additional variables that capture prior socioeconomic and other conditions at age 15 that are relevant for studying relationships over time.

The percentages of the PISA YAFS population that reached the low, middle, and high proficiency levels in PISA 2012 are also used to analyze educational, employment, and other outcomes at age 19 (section 4).

The question arises as to the comparability of the proficiency levels in the two assessments, and it is important to point out that both the individual and categorized levels have their own program-specific nuances and are not necessarily directly comparable—though the categories may broadly indicate similar relative performance within the assessments.

The individual proficiency levels are based on scales unique to each specific assessment, and there are a different number of levels in each assessment (and sometimes in each content domain). The categorized levels, too, are based on these unique scales. However, because the thresholds for these categorizations were set based on the same rationale for both assessments, the low, middle, and high levels in each assessment might be indicative of broadly similar categories. For example, the low-performing category in ESO literacy and PISA 2012 reading requires only the most basic skills executed in familiar texts or contexts with clear instructions, no inferring, and minimal distractions present. The high-performing category in ESO literacy and PISA 2012 reading literacy is characterized by items of increased complexity and abstractness with increased requirements for interpreting, reasoning, or communicating ideas. However, again, these similarities are only at the broad level, and program-specific nuances should be kept in mind and related results interpreted with caution.

Note on analysis and presentation

All calculations in this report are based on unrounded data and thus, in some cases, differences cited in the text may differ slightly from calculations based on the rounded data that are presented in tables and figures.

All estimates in the report include standard errors, which express the sampling and measurement variance that could occur if a different sample from the same population was used, or if respondents answered a different set of tasks in the assessment than they did. All differences in percentages described in this report were tested using *t* tests. Correlations were tested using the conversion to Fisher's *z* values and the statistical procedures as described in Cohen (1988). For interpreting correlation effect sizes, this report uses Cohen's (1988) convention: a correlation coefficient (*r*) of 0.1 is small, 0.3 is medium, and 0.5 is large. No statistical adjustments to account for multiple comparisons were used.

Differences that are statistically significant at the .05 level are discussed using comparative terms such as "higher" and "lower." Differences that are not statistically significant are either not discussed or referred to as "not statistically significantly different." The failure to find a statistically significant difference does not necessarily mean that there was not a difference; it could be that a real difference could not be detected by the significance test because of a small sample size or an imprecise measurement. If the statistical test is significant, it means that there is no more than a 5 percent probability that the observed differences could be attributed to chance and therefore they are likely indicative of true differences in the population. However, it is important to remember that statistically significant results do not necessarily identify those findings that have policy significance or practical importance.

Correlations

This report also describes the correlation between scale scores (expressed in Fisher's *z* units) in ESO and PISA 2012, or the degree to which the two are related and vary together. For example, are higher scores in PISA 2012 associated with higher scores in ESO, with lower scores in ESO, or is there no relationship at all? Section 3 presents the correlation statistics for ESO literacy and PISA 2012 reading literacy and for ESO numeracy and PISA 2012 mathematics literacy. This statistic varies between -1.0 and 1.0, with negative values indicating a negative relationship and positive values indicating a positive relationship (and values farther from zero indicating a stronger relationship than those closer to zero); zero indicates no relationship.

Exhibit 2. Description of PISA 2012 proficiency levels in reading literacy

Level[1]		Score point range	Description
Low	Level 1b	262 to less than 335	Tasks require the reader to locate a single piece of explicitly stated information in a prominent position in a short, syntactically simple text with a familiar context and text type, such as a narrative or a simple list. The text typically provides support to the reader, such as repetition of information, pictures, or familiar symbols. There is minimal completing information. In tasks requiring interpretation, the reader may need to make simple connections between adjacent pieces of information.
	Level 1a	335 to less than 407	Some tasks require the reader to locate one or more pieces of information, which may need to be inferred and may need to meet several conditions. Others require recognizing the main idea in a text, understanding relationships, or construing meaning within a limited part of the text when the information is not prominent and the reader must make low-level inferences. Tasks at this level require readers to make a comparison or several connections between the text and outside knowledge, by drawing on personal experience and attitudes.
Middle	Level 2	407 to less than 480	Tasks require the reader to locate—and, in some cases, recognize the relationship between—several pieces of information that must meet multiple conditions. Interpretative tasks at this level require the reader to integrate several parts of a text in order to identify a main idea, understand a relationship, or construe the meaning of a word or phrase. They need to take into account many features in comparing, contrasting, or categorizing. Often the required information is not prominent or there is much competing information, or there are other text obstacles, such as ideas that are contrary to expectation or negatively worded. Reflective tasks at this level may require connections, comparisons, and explanation, or they may require the reader to evaluate a feature of the text. Some reflective tasks require the reader to demonstrate a fine understanding of the text in relation to familiar, everyday knowledge. Other tasks do not require detailed text comprehension but require the reader to draw on less common knowledge.
	Level 3	480 to less than 553	Tasks that involve retrieving information require the reader to locate and organize several pieces of embedded information. Some tasks at this level require interpreting the meaning of nuances of language in a section of text by taking into account the text as a whole. Other interpretative tasks require understanding and applying categories in an unfamiliar context. Reflective tasks at this level require the reader to use formal or public knowledge to hypothesize about or critically evaluate a text. The reader must demonstrate an accurate understanding of long or complex texts whose content may be unfamiliar.
	Level 4	553 to less than 626	Tasks that involve retrieving information require the reader to locate and organize several pieces of embedded information. Some tasks at this level require interpreting the meaning of nuances of language in a section of text by taking into account the text as a whole. Other interpretative tasks require understanding and applying categories in an unfamiliar context. Reflective tasks at this level require the reader to use formal or public knowledge to hypothesize about or critically evaluate a text. The reader must demonstrate an accurate understanding of long or complex texts whose content may be unfamiliar.

See notes at end of table.

Exhibit 2. Description of PISA 2012 proficiency levels in reading literacy—continued

Level[1]		Score point range	Description
High	Level 5	626 to less than 698	Tasks that involve retrieving information require the reader to locate and organize several pieces of deeply embedded information, inferring which information in the text is relevant. Reflective tasks require critical evaluation or hypothesis, drawing on specialized knowledge. Both interpretative and reflective tasks require a full and detailed understanding of a text whose content or form is unfamiliar. For all aspects of reading, tasks at this level typically involve dealing with concepts that are contrary to expectations.
	Level 6	698 or higher	Tasks typically require the reader to make multiple inferences, comparisons, and contrasts that are both detailed and precise. They require demonstration of a full and detailed understanding of one or more texts and may involve integrating information from more than one text. Tasks may require the reader to deal with unfamiliar ideas, in the presence of prominent competing information, and to generate abstract categories for interpretations. Reflect and evaluate tasks may require the reader to hypothesize about or critically evaluate a complex text on an unfamiliar topic, taking into account multiple criteria or perspectives and applying sophisticated understanding from beyond the text. A salient condition for access and retrieve tasks at this level is precision of analysis and fine attention to detail that is inconspicuous in the texts.

[1] Indicates individual proficiency level definitions and the categories into which the levels have been combined for the purposes of this report.
NOTE: The scores in the "Score point range" column have been rounded to the nearest whole number. For exact cut scores, see https://nces.ed.gov/surveys/pisa/pisa2012/pisa2012highlights_5.asp.
SOURCE: OECD 2013d.

Exhibit 3. Description of PISA 2012 proficiency levels in mathematics literacy

Level[1]		Score point range	Description
Low	Level 1	358 to less than 420	Students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are almost always obvious and follow immediately from the given stimuli.
Middle	Level 2	420 to less than 482	Students can interpret and recognize situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulas, procedures, or conventions to solve problems involving whole numbers. They are capable of making literal interpretations of the results.
	Level 3	482 to less than 545	Students can execute clearly described procedures, including those that require sequential decisions. Their interpretations are sufficiently sound to be a base for building a simple model or for selecting and applying simple problem-solving strategies. Students at this level can interpret and use representations based on different information sources and reason directly from them. They typically show some ability to handle percentages, fractions, and decimal numbers and to work with proportional relationships. Their solutions reflect that they have engaged in basic interpretation and reasoning.
	Level 4	545 to less than 607	Students can work effectively with explicit models for complex concrete situations that may involve constraints or call for making assumptions. They can select and integrate different representations, including symbolic, linking them directly to aspects of real-world situations. Students at this level can utilize their limited range of skills, and can reason with some insight, in straightforward contexts. They can construct and communicate explanations and arguments based on their interpretations, arguments, and actions.

See notes at end of table.

Exhibit 3. Description of PISA 2012 proficiency levels in mathematics literacy—continued

Level[1]		Score point range	Description
High	Level 5	607 to less than 669	Students can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare, and evaluate appropriate problem-solving strategies for dealing with complex problems related to these models. Students at this level can work strategically using broad, well-developed thinking and reasoning skills, appropriate linked representations, symbolic and formal characterizations, and insight pertaining to these situations. They begin to reflect on their work and can formulate and communicate their interpretations and reasoning.
	Level 6	669 or higher	Students can conceptualize, generalize, and utilize information based on their investigations and modeling of complex problem situations and can use their knowledge in relatively nonstandard contexts. They can link different information sources and representations and flexibly translate among them. Students at this level are capable of advanced mathematical thinking and reasoning. These students can apply this insight and understanding, along with a mastery of symbolic and formal mathematical operations and relationships, to develop new approaches and strategies for attacking novel situations. Students at this level can reflect on their actions and can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments, and the appropriateness of these to the original situation.

[1] Indicates individual proficiency level definitions and the categories into which the levels have been combined for the purposes of this report.
NOTE: The scores in the "Score point range" column have been rounded to the nearest whole number. For exact cut scores, see https://nces.ed.gov/surveys/pisa/pisa2012/pisa2012highlights_3.asp.
SOURCE: OECD 2013d.

Exhibit 4. Description of ESO proficiency levels in literacy

Level[1]		Score point range	Description
Low	Below level 1	Below 176	The tasks at this level require the respondent to read brief texts on familiar topics to locate a single piece of specific information. There is seldom any competing information in the text, and the requested information is identical in form to information in the question or directive. The respondent may be required to locate information in short continuous texts. However, in this case, the information can be located as if the text were noncontinuous in format. Only basic vocabulary knowledge is required, and the reader is not required to understand the structure of sentences or paragraphs or make use of other text features. Tasks below Level 1 do not make use of any features specific to digital texts.
	Level 1	176 to less than 226	Most of the tasks at this level require the respondent to read relatively short digital or print continuous, noncontinuous, or mixed texts to locate a single piece of information that is identical to or synonymous with the information given in the question or directive. Some tasks, such as those involving noncontinuous texts, may require the respondent to enter personal information into a document. Little, if any, competing information is present. Some tasks may require simple cycling through more than one piece of information. Knowledge and skill in recognizing basic vocabulary determining the meaning of sentences, and reading paragraphs of text, is expected.
Middle	Level 2	226 to less than 276	At this level, the medium of texts may be digital or printed, and texts may comprise continuous, noncontinuous, or mixed types. Tasks at this level require the respondent to make matches between the text and information and may require paraphrasing or low-level inferences. Some competing pieces of information may be present. Some tasks require the respondent to cycle through or integrate two or more pieces of information based on criteria, compare and contrast or reason about information requested in the question, or navigate within digital texts to access and identify information from various parts of a document.

See notes at end of table.

Exhibit 4. Description of ESO proficiency levels in literacy—continued

Level[1]		Score point range	Description
Middle	Level 3	276 to less than 326	Texts at this level are often dense or lengthy, and include continuous, noncontinuous, mixed, or multiple pages of text. Understanding text and rhetorical structures becomes more central to successfully completing tasks, especially navigating complex digital texts. Tasks require the respondent to identify, interpret, or evaluate one or more pieces of information and often require varying levels of inference. Many tasks require the respondent to construct meaning across larger chunks of text or perform multistep operations in order to identify and formulate responses. Often tasks also demand that the respondent disregard irrelevant or inappropriate content to answer accurately. Competing information is often present, but it is not more prominent than the correct information.
High	Level 4	326 to less than 376	Tasks at this level often require the respondent to perform multistep operations to integrate, interpret, or synthesize information from complex or lengthy continuous, noncontinuous, mixed, or multiple type texts. Complex inferences and application of background knowledge may be needed to perform the task successfully. Many tasks require identifying and understanding one or more specific, noncentral ideas in the text in order to interpret or evaluate subtle evidence-claim or persuasive discourse relationships. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent. Competing information is present and sometimes seemingly as prominent as correct information.
	Level 5	376 or higher	At this level, tasks may require the respondent to search for and integrate information across multiple, dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments. Application and evaluation of logical and conceptual models of ideas may be required to accomplish tasks. Evaluating reliability of evidentiary sources and selecting key information is frequently a requirement. Tasks often require the respondent to be aware of subtle, rhetorical cues and make high-level inferences or use specialized background knowledge.

[1] Indicates individual proficiency level definitions and the categories into which the levels have been combined for the purposes of this report.
SOURCE: OECD 2013a.

Exhibit 5. Description of ESO proficiency levels in numeracy

Level[1]		Score point range	Description
Low	Below level 1	Below 176	Tasks at this level require the respondent to carry out simple processes, such as counting, sorting, performing basic arithmetic operations with whole numbers or money, or recognizing common spatial representations in concrete, familiar contexts where the mathematical content is explicit with little or no text or distractors.
	Level 1	176 to less than 226	Tasks at this level require the respondent to carry out basic mathematical processes in common, concrete contexts where the mathematical content is explicit with little text and minimal distractors. Tasks usually require one-step or simple processes involving counting, sorting, performing basic arithmetic operations, understanding simple percents (such as 50 percent), and locating and identifying elements of simple or common graphical or spatial representations.
Middle	Level 2	226 to less than 276	Tasks at this level require the respondent to identify and act on mathematical information and ideas embedded in a range of common contexts where the mathematical context is fairly explicit or visual with relatively few distractors. Tasks tend to require the application of two or more steps or processes involving calculations with whole numbers and common decimals, percents, and fractions; simple measurement and spatial representation; estimation; and interpretation of relatively simple data and statistics in texts, tables, and graphs.

See notes at end of table.

Exhibit 5. Description of ESO proficiency levels in numeracy—continued

Level[1]		Score point range	Description
Middle	Level 3	276 to less than 326	Tasks at this level require the respondent to understand mathematical information that may be less explicit, embedded in contexts that are not always familiar, and represented in more complex ways. Tasks require several steps and may involve the choice of problem-solving strategies and relevant processes. Tasks tend to require the application of number sense and spatial sense; recognizing and working with mathematical relationships, patterns, and proportions expressed in verbal or numerical form; and interpretation and basic analysis of data and statistics in texts, tables, and graphs.
High	Level 4	326 points to less than 376	Tasks at this level require the respondent to understand a broad range of mathematical information that may be complex, abstract, or embedded in unfamiliar contexts. These tasks involve undertaking multiple steps and choosing relevant problem-solving strategies and processes. Tasks tend to require analysis and more complex reasoning about quantities and data; statistics and chance; spatial relationships; and change, proportions, and formulas. Tasks at this level may also require understanding arguments or communicating well-reasoned explanations for answers or choices.
	Level 5	376 or higher	Tasks at this level require the respondent to understand complex representations and abstract and formal mathematical and statistical ideas, possibly embedded in complex texts. The respondent may have to integrate multiple types of mathematical information where considerable translation or interpretation is required; draw inferences; develop or work with mathematical arguments or models; and justify, evaluate, and critically reflect on solutions or choices.

[1] Indicates individual proficiency level definitions and the categories into which the levels have been combined for the purposes of this report.
SOURCE: OECD 2013a.

PISA YAFS population

Sampling procedures

The PISA YAFS starting sample was the pool of 15-year-old students who took the PISA 2012 mathematics, reading, and science assessments and completed a Student Information Form (SIF) with their contact information.[7] Nearly 5,000 students took the PISA 2012 mathematics, reading, and science assessments, and 93 percent of them completed the SIF, resulting in a PISA YAFS starting sample of 4,612 students (exhibit 6).

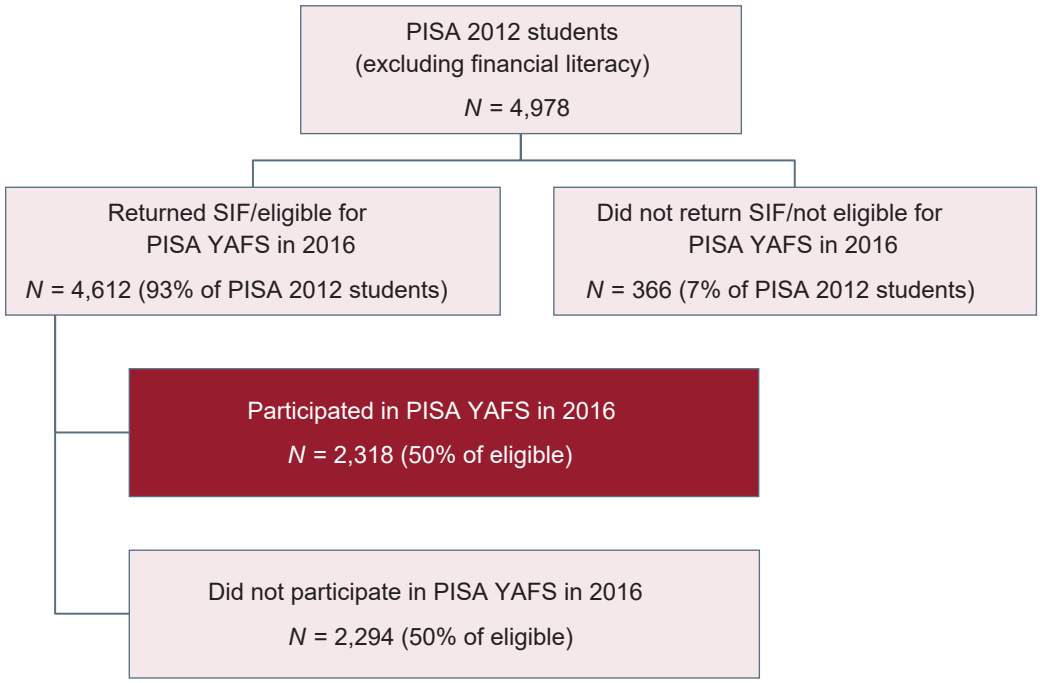
These students were contacted periodically over the next 4 years through an extensive tracing and recruitment effort to maximize participation in PISA YAFS, which was voluntary. The PISA YAFS final sample included 2,318 students, which represented 50 percent of the starting sample. The primary reason for nonparticipation was a lack or loss of contact with the students after they completed the SIF, sometime during the tracing and recruitment effort. This was the case for nearly all nonparticipants, although a small number (1) were excluded (due to lack of access to a computer, serving in the military abroad, or serving on a church mission) or (2) explicitly refused to participate.

Because of the level of nonparticipation in the final sample, nonresponse bias analyses were undertaken to identify any systematic differences between participants and nonparticipants. The study then made weighting adjustments to reduce any bias detected. (The biases detected and the adjustments made are described in appendix C.) As a result, the participants and nonparticipants (or starting and final samples) are considered comparable, and the results reported are weighted estimates for the PISA YAFS population. It should also be noted that although ESO literacy and numeracy assessments were administered together, a small number of PISA YAFS participants completed only literacy or only numeracy items, so the characteristics (and performance) of the student populations are estimated separately for each subject and are described as the "YAFS literacy" or "YAFS numeracy" population in this report.

The PISA 2012 sample—and thus the pool of students on which the PISA YAFS samples was based—reflected a two-stage design. First, schools were sampled from the universe of U.S. public and private schools that contained at least one 7th- through 12th-grade class; second, 50 eligible students were sampled within those schools. Eligible students were between 15 years and

[7] This excluded PISA 2012 students who took the financial literacy assessment. These students instead participated in the field test of the PISA YAFS instruments (ESO assessment, ESO background questionnaire, and supplemental background questions added from the PIAAC background questionnaire).

Exhibit 6. PISA YAFS sample selection process



NOTE: SIF = Student Information Form. Every PISA 2012 student who returned a SIF was contacted. Nonparticipants were mainly those who did not respond to any contact attempts or with whom the study lost contact during the tracing and recruitment effort. Nonparticipants also include small percentages who were excluded or refused to participate. See appendix table C-1 for additional detail.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

3 months and 16 years and 2 months at the beginning of the assessment period (fall/winter 2012) and had basic English language literacy and the ability to access the assessment with the allowed accommodations. Schools were sampled proportionately to their estimated enrollment of 15-year-olds, and students were sampled randomly from the eligible population in each school.[8] The PISA 2012 sample is representative of the U.S. population of 15-year-olds in 2012.[9]

Because the original PISA 2012 sample was nationally representative of the 15-year-old population, and because of the nonresponse bias adjustments in the current study, the PISA YAFS population is nationally representative of individuals who were approximately 19 years old in 2016 and who were 15-year-old students in 2012. Throughout the report, the PISA YAFS population is generally referred to as such or as "U.S. 19-year-olds," which describes people who are about 19 years old and who had attended school at age 15.

Characteristics of the PISA YAFS population

Table 1 describes the performance and demographic characteristics of the PISA YAFS population. Of note, the PISA YAFS literacy population had an average PISA 2012 reading score of 507 points and the numeracy population had an average PISA 2012 mathematics score of 491 points when they were 15. Neither of the scores were statistically significantly different from the respective U.S. averages in PISA 2012 (for U.S. averages not shown, see Kelly et al. 2013). Additionally, in terms of nativity, 92 percent of the PISA YAFS population were born in the United States, including those whose parents were also born in the country and those whose parents were not (i.e., "first generation"). About 86 percent of the PISA YAFS population spoke English as their primary language at home, with the remaining population speaking either Spanish or another language.

[8] Each student did not take all but rather a combination of the subjects included in PISA 2012 (reading, mathematics, etc.), the information on which was used to impute a score for the population.
[9] These students were mostly in grades 9, 10, and 11, with grade 10 being the modal grade (71 percent).

Table 1. Performance and demographic characteristics of the PISA and PISA YAFS populations: 2012 and 2016

Demographic characteristics	PISA 2012		PISA YAFS 2016[1] ESO Literacy		PISA YAFS 2016[1] ESO Numeracy	
	[Standard errors appear in parentheses]					
Average PISA 2012 reading score	498	(3.74)	507	(4.86)	—	(†)
PISA 2012 reading proficiency (percent)						
Low (Below level 2)	16.6	(1.26)	13.7	(1.99)	—	(†)
Middle (Levels 2–4)	75.5	(1.05)	77.5	(1.82)	—	(†)
High (Level 5 and above)	7.9	(0.67)	8.9	(0.83)	—	(†)
Average PISA 2012 mathematics score	481	(3.60)	—	(†)	491	(4.55)
PISA 2012 mathematics proficiency (percent)						
Low (Below level 2)	25.8	(1.39)	—	(†)	22.4	(2.13)
Middle (Levels 2–4)	65.4	(1.13)	—	(†)	67.6	(1.92)
High (Level 5 and above)	8.8	(0.78)	—	(†)	10.1	(1.02)
Demographic characteristics (percent)						
Gender						
Male	51.0	(0.72)	51.1	(1.56)	51.4	(1.58)
Female	49.0	(0.72)	48.9	(1.56)	48.6	(1.58)
Race/ethnicity						
White	51.1	(2.37)	52.5	(2.53)	52.7	(2.58)
Black or African American	12.7	(1.33)	12.3	(1.72)	12.5	(1.71)
Hispanic or Latino	24.8	(1.81)	23.0	(1.75)	22.9	(1.72)
Asian	4.8	(0.84)	5.8	(1.28)	5.8	(1.29)
Other	6.6	(0.81)	6.4	(1.07)	6.1	(1.05)
Born in the United States						
Native	77.4	(1.96)	77.1	(2.36)	77.1	(2.30)
First-generation native	14.6	(1.35)	15.2	(1.64)	15.1	(1.61)
Nonnative	8.0	(0.81)	7.7	(1.06)	7.8	(1.02)
Language at home						
English	85.6	(1.30)	86.4	(1.35)	86.3	(1.30)
Spanish	10.9	(1.21)	9.4	(1.04)	9.4	(1.01)
Other languages	3.4	(0.44)	4.2	(0.73)	4.2	(0.73)

— Not available.
† Not applicable.
[1] Although the ESO literacy and numeracy assessments are administered together, a small number of PISA YAFS participants completed only literacy or only numeracy items, and, thus, the scales and populations are estimated separately.
NOTE: ESO stands for Education and Skills Online. Estimates for the PISA YAFS population (19-year-olds) are for individuals who were 15-year-old students in the fall of 2012. As part of PISA YAFS, participants completed the ESO assessments in 2016. Race categories exclude persons of Hispanic ethnicity. "Other" includes those who identified themselves as "Two or more races," "American Indian/Alaska Native," and "Native Hawaiian/Other Pacific Islander." There are no statistically significant differences between the percentages in the PISA YAFS 2016 and PISA 2012 populations by demographic characteristics. The percentages of the PISA YAFS 2016 population who had low proficiency (below level 2) or middle proficiency (levels 2–4) in PISA 2012 are significantly different than the percentages of the PISA 2012 population in the respective levels ($p < .05$). See exhibits 2 and 3 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Comparisons of characteristics between PISA YAFS students and the PISA 2012 population

Statistically, the PISA YAFS population was similar to the original PISA 2012 population. There were no statistically significant differences between the two in average PISA 2012 performance in reading or mathematics or in the distribution across 2012 proficiency levels (table 1). Additionally, there were no statistically significant differences between the two populations by any of the demographic characteristics examined. This reinforces that the PISA YAFS population is a valid representation of the PISA 2012 population.

Throughout the report, the PISA YAFS population is referred to as the "population overall" when being compared with student subgroups of the PISA YAFS population.

Data limitations

In considering the results of PISA YAFS, it is important to understand a few caveats.

First, each assessment used in PISA YAFS was developed independently and for distinct purposes. Thus, the results for each assessment are placed on its own scale in each subject. Therefore, while readers can compare general trends in scale scores, they should not compare exact scale scores and average scale scores between subjects within assessments, nor within subjects across the two assessments. This means that while proficiency levels of equivalent labeling (e.g., level 2) are similar enough for general comparisons, they should not be considered fully equivalent. These broad relationships explain why grouping of proficiency levels into high, middle, and low categories indicative of broadly similar categories because the thresholds were set based on similar rationales are still appropriate for comparison. However, these similarities are only at the broad level, and program-specific nuances should be kept in mind and related results interpreted with caution.

Second, while both assessments were voluntary, the nature of the sample selection processes led to different sources of nonparticipation. Because PISA 2012 first drew a school sample and then sampled students within schools, nonparticipation tended to be at the school level. In PISA YAFS, all students who took the PISA 2012 reading, mathematics, and science assessments and completed an SIF were eligible to take ESO; therefore, all nonparticipation was at the individual level. While there were differences between the starting and final PISA YAFS samples related to background characteristics, the study's sampling adjustments mitigated nearly all of them (differences of less than 1 percentage point remained for preschool attendance and educational expectations; see appendix C).

Finally, there were differences in the mode of assessment. PISA 2012's assessments were administered via paper and pencil in the classroom, whereas ESO was computer-based and self-administered by participants in their home or a place with access to a computer. While the equivalence of scoring the assessment items between paper-and-pencil and computer formats have been examined and reported for ESO/PIAAC and PISA, no examination of the classroom versus home settings have taken place (OECD 2010b, 2019b).

For additional detail on how scales were established (including the use of plausible values) and other methodologies, see appendix C.

3. Performance in ESO at Age 19 and How It Relates to PISA Performance at Age 15

This section examines how U.S. 19-year-olds performed in the ESO literacy and numeracy assessments administered in 2016 in PISA YAFS—in terms of average score and proficiency level—and how proficiency relates to their proficiency in reading and mathematics 4 years earlier in PISA 2012.

It opens with a description of their average performance in ESO and the percentages at different proficiency levels. It then examines the distributions across ESO proficiency levels based on PISA 2012 proficiency—asking how students of different PISA 2012 proficiency levels later performed as 19-year-olds in ESO. In these analyses, the report uses the groupings of proficiency levels that designate low, middle, and high performance. As described earlier (on p. 9), both the individual and grouped proficiency levels have their own program-specific definitions and are not necessarily directly comparable; however, the grouped proficiency levels might be indicative of similar relative performance in each assessment. This section concludes with correlation analyses asking how closely related individuals' scores on the two assessments were.

The estimates and standard errors for the statistics presented in this section can be found in appendix A.

Average scores and proficiency in ESO at age 19

U.S. 19-year-olds had an average score of 266 points in ESO literacy, with scores ranging from a low of 80 points to a high of 419 points (table A-1). Overall, 19 percent of U.S. 19-year-olds were low performing (i.e., below level 2), 72 percent were middle performing (i.e., at level 2 or 3), and 10 percent were high performing (i.e., at level 4 or above) in ESO literacy (table A-2). Looking at subgroups of 19-year-olds, there were no differences in the percentages at these proficiency levels by sex, race/ethnicity, language spoken at home, or whether they were born in the United States.

In ESO numeracy, U.S. 19-year-olds had an average score of 260 points, with scores ranging from a low of 91 points to a high of 419 points (table A-3). Overall, 25 percent of U.S. 19-year-olds were low-performing (i.e., below level 2), 68 percent were middle-performing (i.e., at level 2 or 3), and 7 percent were high-performing (i.e., at level 4 or above) in ESO numeracy (table A-4). As in literacy, there were no differences in the percentages at these proficiency levels by sex, language spoken at home, or whether they were born in the United States, but there was a difference by race/ethnicity. In numeracy, proportionately more Black 19-year-olds were low performing (45 percent) than the population overall (25 percent).

Relating proficiency in ESO at age 19 to proficiency in PISA 2012 at age 15

As it was at age 19 (tables A-2 and A-4), performance at age 15 (in 2012) was predominantly in the middle level of proficiency. For example, 77 percent of U.S. 19-year-olds performed at the middle level of proficiency in PISA 2012 reading at age 15 and 68 percent performed at the middle level of proficiency in PISA 2012 mathematics at age 15 (table 1). Moreover, looking across the time points, most U.S. 19-year-olds who were middle performers at age 15 remained middle performers at age 19.[10]

[10] As a reminder, the grouped proficiency levels (low, middle, and high) were based on models used in international reporting, which set thresholds according to demonstrated skills rather than to the performance distribution. Although for most international participants the middle group was the largest group, the percentages in this group ranged widely (e.g., from 33 to 82 percent of 16- to 34-year-olds in the countries participating in PIAAC literacy between 2012 and 2017, and from 40 to 86 percent in the countries in PISA 2012).

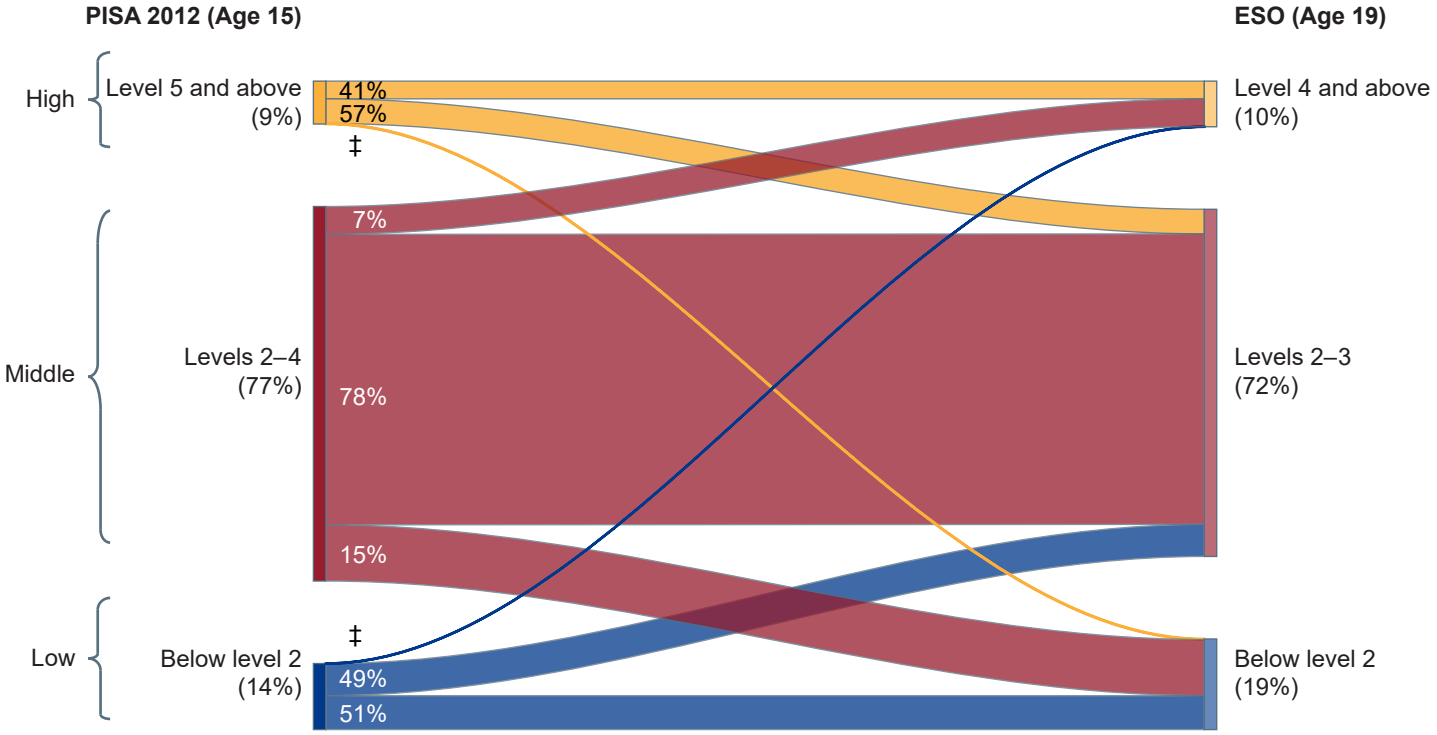
ESO literacy at age 19 and PISA 2012 reading at age 15

Seventy-seven percent of the PISA YAFS population had performed at the middle proficiency levels (levels 2 to 4) of PISA 2012 reading at age 15 (table 1 and figure 1). Of this group, about three-quarters (78 percent) also performed at the middle level (level 2 or 3) of ESO literacy at age 19 (figure 1). Seven percent of middle performers in PISA 2012 reading performed at the high proficiency level (level 4 and above) in ESO literacy, and 15 percent demonstrated performance at the low level (below level 2) at age 19. This is represented by the majority of the red bar remaining in the middle proficiency level between PISA 2012 and ESO in 2016, and relatively smaller segments moving to other proficiency levels (figure 1).

The pattern for high and low performers remaining in the same-labeled proficiency level categories 4 years later was not as stark. For example, 9 percent of the PISA YAFS population had performed at the high proficiency level (level 5 and above) of PISA 2012 reading at age 15. Of this group, 41 percent also performed at the high level (level 4 and above) in the ESO literacy assessment at age 19. However, 57 percent of the high performers in PISA 2012 reading performed at the middle level of proficiency (levels 2 and 3) in ESO literacy.

Additionally, 14 percent of the PISA YAFS population had performed at the low proficiency level (below level 2) on PISA 2012 reading at age 15. Of this group, 51 percent also performed at the low proficiency level (below level 2) in ESO literacy at age 19. Forty-nine percent of the low performers in PISA 2012 reading performed at the middle proficiency (levels 2 and 3) in ESO literacy. In other words, about half of the students who demonstrated low proficiency in reading as 15-year-olds were no longer in the low proficiency level (below level 2) in the ESO literacy assessment as 19-year-olds.

Figure 1. Percentage distribution of U.S. 19-year-olds in PISA 2012 reading proficiency levels at age 15 and in ESO literacy proficiency levels at age 19: 2012 and 2016



HOW TO READ THE FIGURE: At age 15, nine percent of U.S. 19-year-olds performed at the high level of proficiency in PISA 2012 (i.e., level 5 and above). Of this group, 41 percent were in the high level of proficiency in ESO (level 4 and above) at age 19. Altogether, 10 percent of U.S. 19-year-olds were at the high level of proficiency (level 4 and above) in ESO.

‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. Percentages of U.S. 19-year-olds by their PISA and ESO proficiency levels appear in parentheses below the category labels. See tables 1, A-2, and A-5 for standard errors of the estimates. See exhibits 2 and 4 for descriptions of proficiency levels. Detail may not sum to totals due to rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

When examined separately for different subgroups, the pattern of a predominant and stable middle group held true, largely regardless of 19-year-olds' background characteristics. Compared to the overall population (table A-5), there were no statistically significant differences between males and females (table A-6), by socioeconomic background—as measured by PISA's index of economic, social, and cultural status (ESCS) (table A-7)—or by race/ethnicity (table A-9).

The only observed difference was by the free or reduced-price lunch (FRPL) status of U.S. 19-year-olds' schools when they were 15, which is an indicator of economic resources in schools' student populations. Among the middle performers in PISA 2012 reading who were in the most economically challenged circumstances—schools with 75 percent or more of students receiving FRPL—proportionately more were at the low proficiency level relative to the population overall (28 vs. 15 percent, respectively) (tables A-5 and A-8).

ESO numeracy at age 19 and PISA 2012 mathematics at age 15

Patterns in the relationship between mathematics and numeracy were similar to those between reading and literacy, with proficiency most closely related among the middle performers.

Sixty-eight percent of the PISA YAFS population had performed at the middle proficiency level (levels 2 to 4) of PISA 2012 mathematics at age 15 (table 1, figure 2). Of this group, 79 percent also performed at the middle level (levels 2 to 3) of ESO numeracy at age 19 (figure 2). A small percentage (4 percent) of middle performers on PISA 2012 mathematics performed at the high proficiency level (level 4 and above) in ESO numeracy, and 17 percent demonstrated low performance (below level 2).

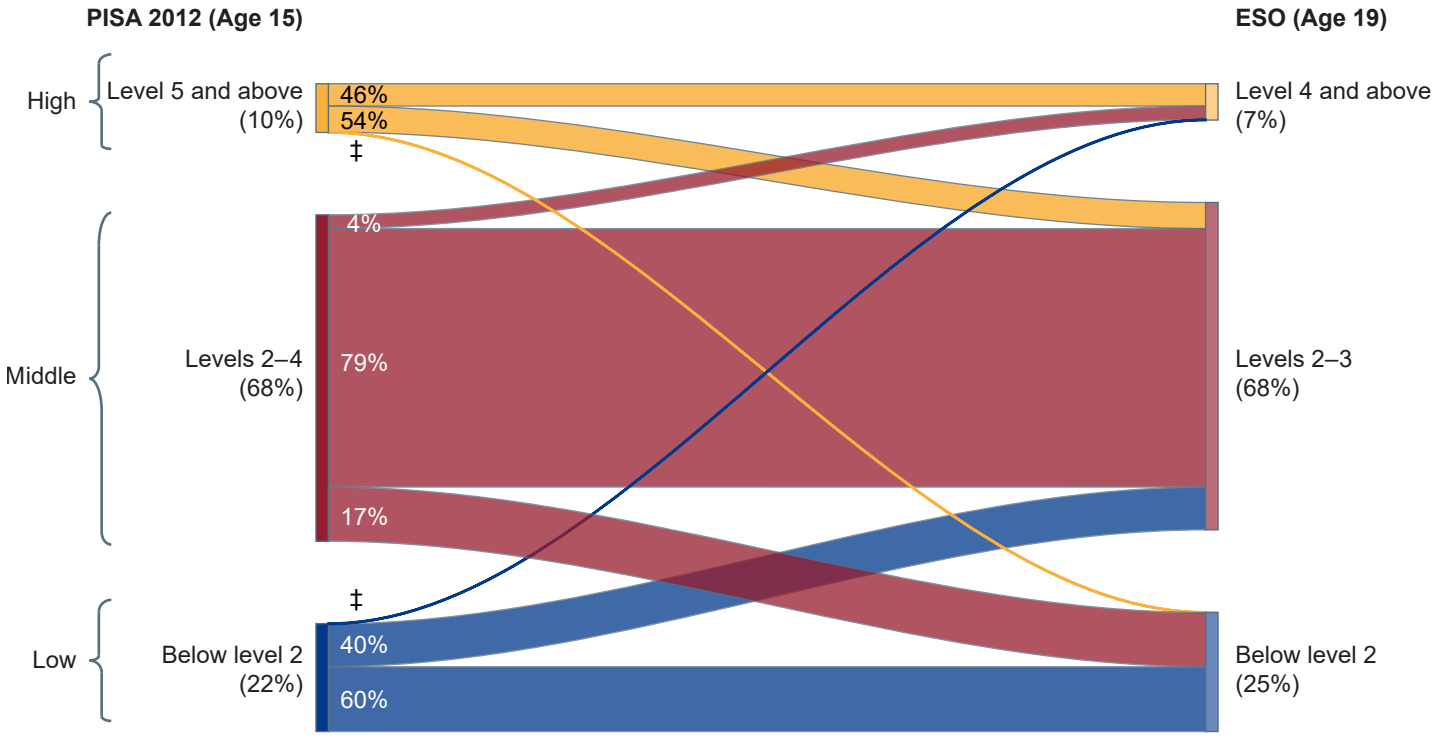
Ten percent of the PISA YAFS population had performed at the high proficiency level (level 5 and above) of PISA 2012 mathematics at age 15. Of this group, 46 percent also performed at the high level (level 4 and above) of the ESO numeracy assessment at age 19. However, 54 percent of the high performers in PISA 2012 mathematics performed at the middle level (levels 2 and 3) of proficiency in ESO numeracy.

Twenty-two percent of the PISA YAFS population had performed at the low proficiency level (below level 2) on PISA 2012 mathematics at age 15. Of this group, 60 percent also performed at the low level (below level 2) in ESO numeracy at age 19. However, 40 percent performed at the middle level (level 2 or 3) of ESO proficiency at age 19. In other words, about two-fifths of low performers on PISA 2012 mathematics at age 15 were able to demonstrate higher proficiency relative to the ESO numeracy assessment at age 19.

As with reading and literacy, when comparing the patterns of distribution for PISA 2012 mathematics and ESO numeracy at age 19 between the overall population (table A-10) and various subgroups, no differences were observed by sex (table A-11), the ESCS index (table A-12), or race/ethnicity (table A-14).

Again, observed differences were related to the FRPL status of 19-year-olds' schools at age 15. Among the middle performers in PISA 2012 mathematics who were in the most economically challenged circumstances—schools with 75 percent or more of their students receiving FRPL—proportionately fewer performed at the middle proficiency level (levels 2 and 3) in ESO numeracy relative to the population overall (62 vs. 79 percent, respectively). Proportionately more performed at the low level of proficiency (below level 2) relative to the population overall (36 vs. 17 percent, respectively) (tables A-10 and A-13).

Figure 2. Percentage distribution of U.S. 19-year-olds in PISA 2012 mathematics proficiency levels at age 15 and in ESO numeracy proficiency levels at age 19: 2012 and 2016



HOW TO READ THE FIGURE: At age 15, ten percent of U.S. 19-year-olds performed at the high level of proficiency in PISA 2012 (i.e., level 5 and above). Of this group, 46 percent were in the high level of proficiency in ESO (level 4 and above) at age 19. Altogether, 7 percent of U.S. 19-year-olds were at the high level of proficiency (level 4 and above) in ESO.

‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. Percentages of U.S. 19-year-olds by their PISA and ESO proficiency levels appear in parentheses below the category labels. See tables 1, A-4, and A-10 for standard errors of the estimates. See exhibits 3 and 5 for descriptions of proficiency levels. Detail may not sum to totals due to rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

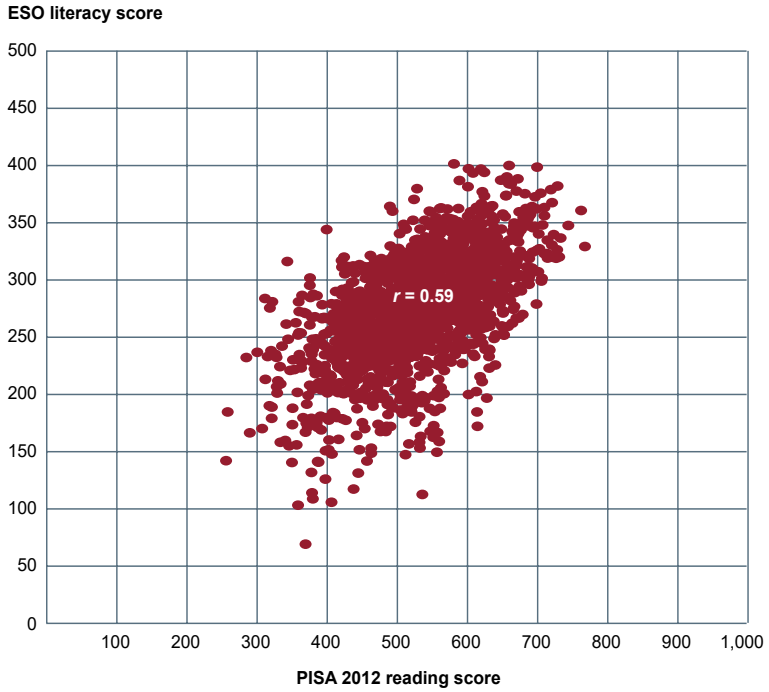
Correlations between ESO scores at age 19 and PISA 2012 scores at age 15

This section describes the correlation between scale scores in ESO and PISA 2012 to determine what, if any, relationship there is between scores on the two assessments over time. Correlation describes the degree to which the two are related and vary together.

Overall, the correlation between ESO literacy at age 19 and PISA 2012 reading at age 15 is 0.59, which indicates a strong positive relationship (figure 3 and table A-15).[11] That is, U.S. 19-year-olds with higher literacy scores in ESO tended to have had higher reading scores in 2012 at age 15. The correlation between ESO and PISA 2012 mathematics and ESO numeracy is 0.69, which indicates an even stronger positive relationship (figure 4 and table A-16).

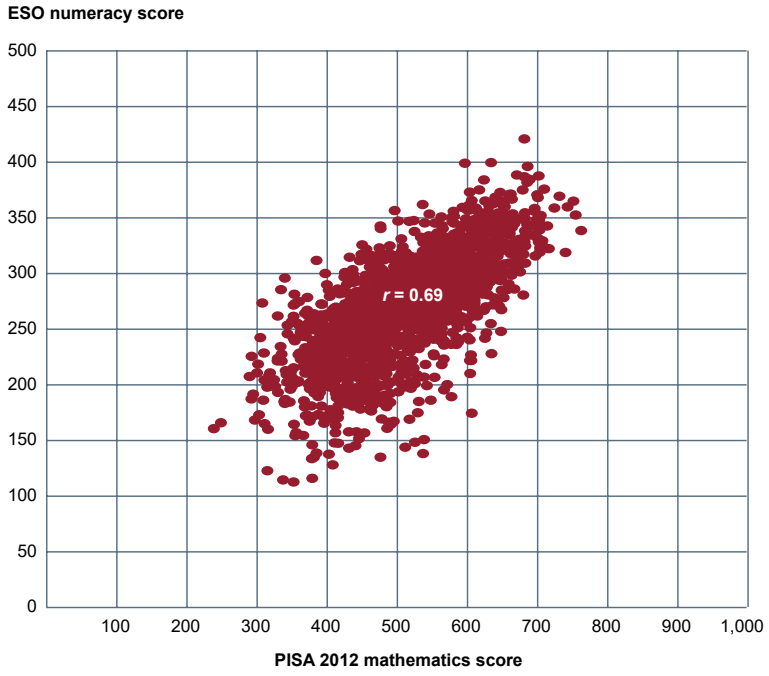
[11] For interpreting effect sizes, this report uses Cohen's (1988) convention, for lack of other relevant benchmark metrics. Cohen has shown that a correlation coefficient (*r*) of 0.1 is small, 0.3 is medium, and 0.5 is large.

Figure 3. Correlation of PISA 2012 reading score and ESO literacy score for U.S. 19-year-olds: 2012 and 2016



NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. Scatterplot is based on the first plausible value for PISA 2012 reading and the first plausible value for ESO literacy. For more information on the plausible values, refer to appendix C.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Figure 4. Correlation of PISA 2012 mathematics score and ESO numeracy score for U.S. 19-year-olds: 2012 and 2016



NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. Scatterplot is based on the first plausible value for PISA mathematics and the first plausible value for ESO numeracy. For more information on the plausible values, refer to appendix C.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Demographics

For most demographic subgroups, the strength of the correlation between ESO at age 19 and PISA 2012 at age 15 was not statistically significantly different from that of the overall PISA YAFS population. In fact, there were no statistically significant differences in the correlation statistics for U.S. 19-year-olds by sex, language spoken at home, or whether they were born in the United States for either reading/literacy or mathematics/numeracy (tables A-15 and A-16). Additionally, there were no statistically significant differences in the correlation statistics for U.S. 19-year-olds by race/ethnicity for reading/literacy.

The only differences from the overall PISA YAFS population were in the correlation between mathematics and numeracy for Asian and for White 19-year-olds (table A-16), who demonstrated opposite effects from each other. For Asian 19-year-olds, the correlation between ESO numeracy and PISA 2012 mathematics (0.79) was stronger than for the population overall (0.69). For White 19-year-olds, the correlation between ESO numeracy and PISA 2012 mathematics (0.65) was weaker than for the population overall (0.69).

Socioeconomic background

Two socioeconomic background characteristics were related to the strength of the correlations between ESO at age 19 and PISA at age 15. The most consistent differences were seen related to schools' FRPL status (tables A-17 and A-18). For U.S. 19-year-olds who had attended schools with either less than 25 percent or with 75 percent or more of students receiving FRPL at age 15, correlations were weaker than for the population overall in both subjects. For these subgroups, the correlation between ESO literacy at age 19 and PISA 2012 reading at age 15 was 0.50 for students in the least economically challenged schools and 0.48 for those in the most economically challenged schools, compared to 0.59 for the population overall. The correlation between ESO numeracy at age 19 and PISA 2012 mathematics at age 15 was 0.63 for students in the least economically challenged schools and 0.54 for those in the most economically challenged schools, compared to 0.69 for the population overall. That is, PISA 2012 performance at age 15 was less strongly related to ESO performance at age 19 for these groups of 19-year-olds than for the PISA YAFS population overall.

The other difference in correlation statistics from the overall population was related to school locale and only for the mathematics/numeracy correlation. The correlation between ESO numeracy at age 19 and PISA 2012 mathematics at age 15 was stronger for those who had attended schools in cities (100,000 to about 1,000,000 people) (0.76) than for the population overall (0.69) (table A-18). In contrast, the correlation was weaker for those whose schools were in villages (fewer than 3,000 people) (0.54) than for the population overall.

Behavioral and affective characteristics

As with other characteristics, there were few differences in the strength of the correlations between ESO and PISA 2012 by behavioral and affective characteristics. There were no statistically significant differences in correlation statistics for U.S. 19-year-olds by their frequency of skipping school or their happiness (or lack) at school for either the reading/literacy or the mathematics/numeracy correlations (tables A-19 and A-20). Additionally, there were no measurable differences in correlation statistics for reading/literacy related to 19-year-olds' openness to problem solving, which is described by an index created from student responses to questions asking about the extent to which they feel they resemble someone who can handle a lot of information, is quick to understand things, seeks explanations for things, can easily link facts together, and likes to solve complex problems.

The only difference from the overall population was for the numeracy/mathematics correlation for students in the bottom and second-to-bottom quarters of the index on openness to problem solving (table A-20). U.S. 19-year-olds who had been in these quarters in PISA—who represent those expressing the least openness to problem solving—had weaker correlations between ESO numeracy at age 19 and their PISA mathematics scores at age 15 (0.60 for both quarters) than the population overall (0.69).

Looking across performance outcomes

Looking across different subgroups of the PISA YAFS population, there are only a few subgroups for whom the relationship between proficiency at age 15 and 19 differed from the overall pattern or who exhibited different strengths of correlations between scores on the two assessments. Exhibit 7 summarizes the movements of the middle performers in PISA 2012 (i.e., levels 2–4) into the low and middle levels of ESO proficiency, identifying the one subgroup for whom patterns differed from the PISA YAFS population overall. Exhibit 8 presents information on the subgroups that showed a stronger or weaker correlation between PISA 2012 reading and ESO literacy scores and PISA 2012 mathematics and ESO numeracy scores, respectively.

Exhibit 7. Percentage of 19-year-old middle performers in PISA 2012, by ESO proficiency level and subject: 2016

	Low ESO proficiency in 2016		Middle ESO proficiency in 2016	
	ESO literacy	ESO numeracy	ESO literacy	ESO numeracy
U.S. PISA YAFS population overall	15	17	78	79
From schools with 75 percent or more of students receiving free or reduced-price lunch	28 ▲	36 ▲	68	62 ▼

▲ Percentage is significantly higher than the PISA YAFS population overall.

▼ Percentage is significantly lower than the PISA YAFS population overall.

NOTE: ESO = Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in fall 2012 and who participated in PISA YAFS in 2016. Middle proficiency in PISA 2012 indicates levels 2 to 4. See exhibits 2 through 5 for descriptions of proficiency levels. Data for students eligible for free or reduced-price lunch were available for public schools only. For data for other subgroups, see tables A-6 to A-9 for literacy/reading and A-11 to A-14 for numeracy/mathematics.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Exhibit 8. Subgroup differences in the strength of correlation between PISA 2012 and ESO scores from the U.S. PISA YAFS population overall, by subgroup and subjects: 2012 and 2016

Subgroups with statistically significantly different strength of correlation from U.S. PISA YAFS population overall	Correlation between PISA 2012 reading and ESO literacy in 2016	Correlation between PISA 2012 mathematics and ESO numeracy in 2016
U.S. PISA YAFS population overall	$r = 0.59$	$r = 0.69$
White	$r = 0.55$	$r = 0.65$ ▼
Asian	$r = 0.69$	$r = 0.79$ ▲
From schools in villages (fewer than 3,000 people)	$r = 0.49$	$r = 0.54$ ▼
From schools in cities (between 100,000 and 1,000,000 people)	$r = 0.64$	$r = 0.76$ ▲
From schools with less than 25 percent of students receiving free or reduced-price lunch	$r = 0.50$ ▼	$r = 0.63$ ▼
From schools with 75 percent or more of students receiving free or reduced-price lunch	$r = 0.48$ ▼	$r = 0.54$ ▼
In bottom quarter of index on openness to problem solving	$r = 0.53$	$r = 0.60$ ▼
In second-to-bottom quarter of index on openness to problem solving	$r = 0.52$	$r = 0.60$

▲ Correlation between PISA 2012 and ESO scores is stronger for the subgroup than for the PISA YAFS population overall.

▼ Correlation between PISA 2012 and ESO scores is weaker for the subgroup than for the PISA YAFS population overall.

NOTE: ESO = Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in fall 2012 and who participated in PISA YAFS in 2016. Subgroups for which the strength of correlation between PISA 2012 and ESO scores is not statistically significantly different from the PISA YAFS population overall are not shown. Data for students eligible for free or reduced-price lunch were available for public schools only.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

4. Transitions From High School to Postsecondary Life

This section examines U.S. 19-year-olds' transitions from high school to young adulthood—focusing on their transitions to (1) postsecondary education, (2) the workforce, and (3) adult life. For each of these areas, the report summarizes the paths pursued by the U.S. PISA YAFS population overall and then examines whether those paths differed based on their proficiency in PISA 2012 at age 15. The summaries are based on the percentages of U.S. 19-year-olds in the ESO literacy assessment, which closely mirror the percentages of U.S. 19-year-olds in the ESO numeracy assessment. The estimates and standard errors for both the ESO literacy and numeracy populations can be found in appendix A.

Transitions to postsecondary education

The variables examined for the transitions to postsecondary education come from some of the literature discussed in the Introduction. These variables include the degrees and areas of study being pursued as well as participation in nonformal education opportunities, and they provide information on the extent to which U.S. 19-year-olds of different skill levels are participating in education after high school.

Degree currently pursued

In 2016, when PISA YAFS was conducted, 85 percent of U.S. 19-year-olds had completed a high school diploma (table A-21 and figure 5).[12] This includes 45 percent of 19-year-olds who were pursuing a bachelor's degree or higher, 20 percent who were pursuing a pre-associate's or associate's degree, and 20 percent who were not studying or pursuing any degree after attaining a high school diploma. About 15 percent of U.S. 19-year-olds had not completed a high school diploma at the time of the study: 9 percent were still pursuing it and 6 percent had left school without attaining it (i.e., dropped out).

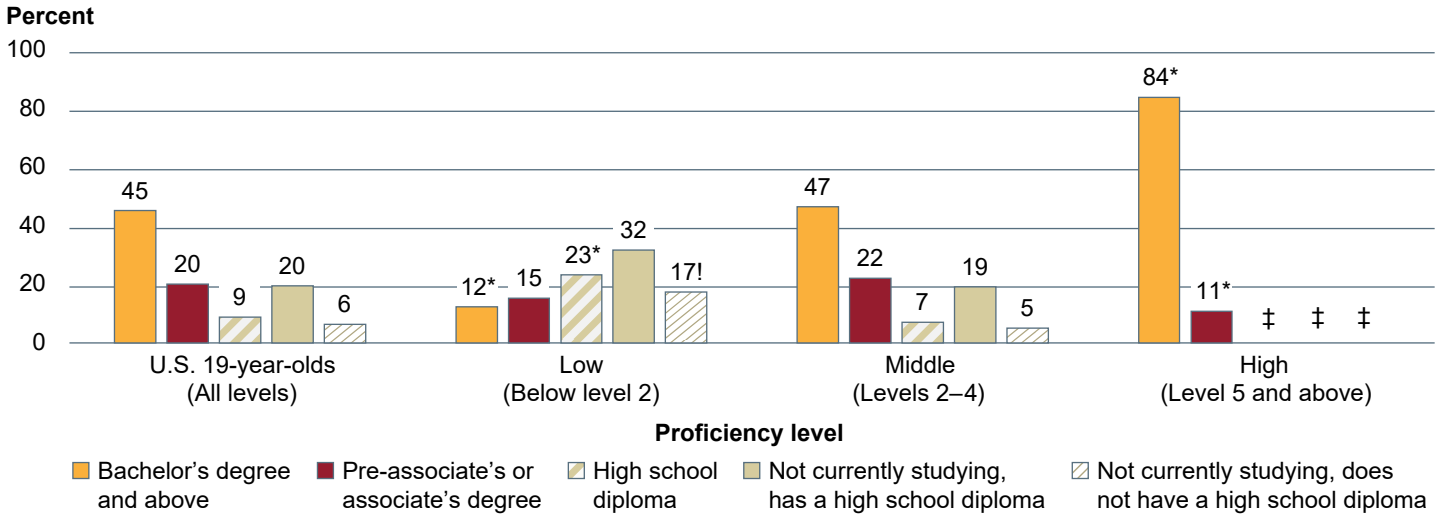
The percentages of U.S. 19-year-olds pursuing these various educational paths often related to the proficiency they showed as 15-year-olds in PISA 2012. Among high performers in PISA 2012 reading (i.e., at level 5 or above), 98 percent had completed a high school diploma by 2016—with 84 percent pursuing a bachelor's degree or higher, which was larger than the percentage of the population doing so overall (45 percent) (table A-21 and figure 5). Conversely, the percentage of high performers in PISA 2012 reading pursuing pre-associate's or associate's degrees (11 percent) at age 19 was smaller than in the population overall (20 percent). The same patterns held for high performers in PISA 2012 mathematics (table A-22 and figure 6).

Among U.S. 19-year-olds who were low performers in PISA 2012 reading (i.e., below level 2), 59 percent had completed a high school diploma by 2016, which was a smaller percentage than in the population overall (85 percent) (table A-21 and figure 5). In addition, proportionately fewer low performers in PISA 2012 reading than in the population overall were pursuing a bachelor's degree or higher (12 vs. 45 percent). In contrast, proportionately more low performers in PISA 2012 reading were still pursuing their high school diploma (23 percent) at age 19 than the population overall (9 percent). The same patterns held for low performers in PISA 2012 mathematics (table A-22 and figure 6).

There were no statistically significant differences in degrees pursued between middle performers in PISA 2012 reading or mathematics (i.e., at levels 2–4) and the population overall (tables A-21 and A-22).

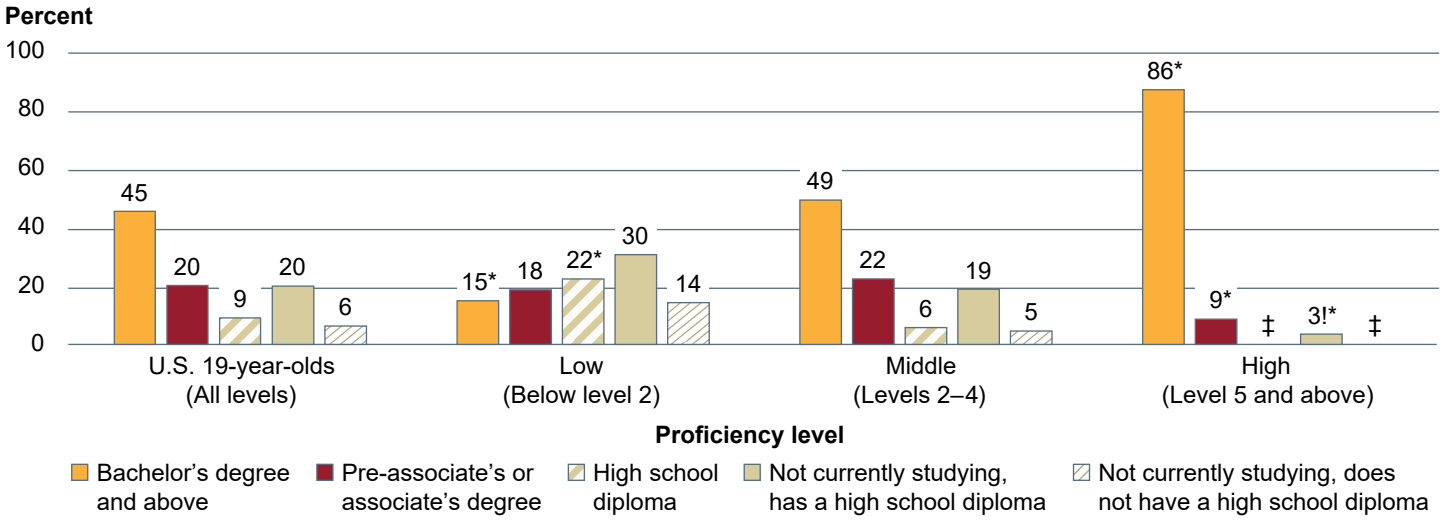
[12] This percentage is the sum of the percentages of U.S. 19-year-olds shown in table A-21 and figure 5 who were (1) pursuing pre-associate's and associate's degrees, (2) pursuing bachelor's degrees and above, and (3) not currently studying but had a high school diploma.

Figure 5. Percentage distribution of U.S. 19-year-olds, by PISA 2012 reading proficiency levels and degrees currently pursued: 2016



! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents pursuing the given degree is significantly different for this proficiency level than it is for the overall population ($p < .05$).
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The education characteristics data in this figure are from a background questionnaire that they completed as part of PISA YAFS. Solid columns indicate U.S. 19-year-olds who have completed a high school diploma. Striped columns indicate those who have not completed a high school diploma. There were no 19-year-olds in a sixth category: not currently studying, degree unknown. See exhibit 2 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Figure 6. Percentage distribution of U.S. 19-year-olds, by PISA 2012 mathematics proficiency levels and degrees currently pursued: 2016



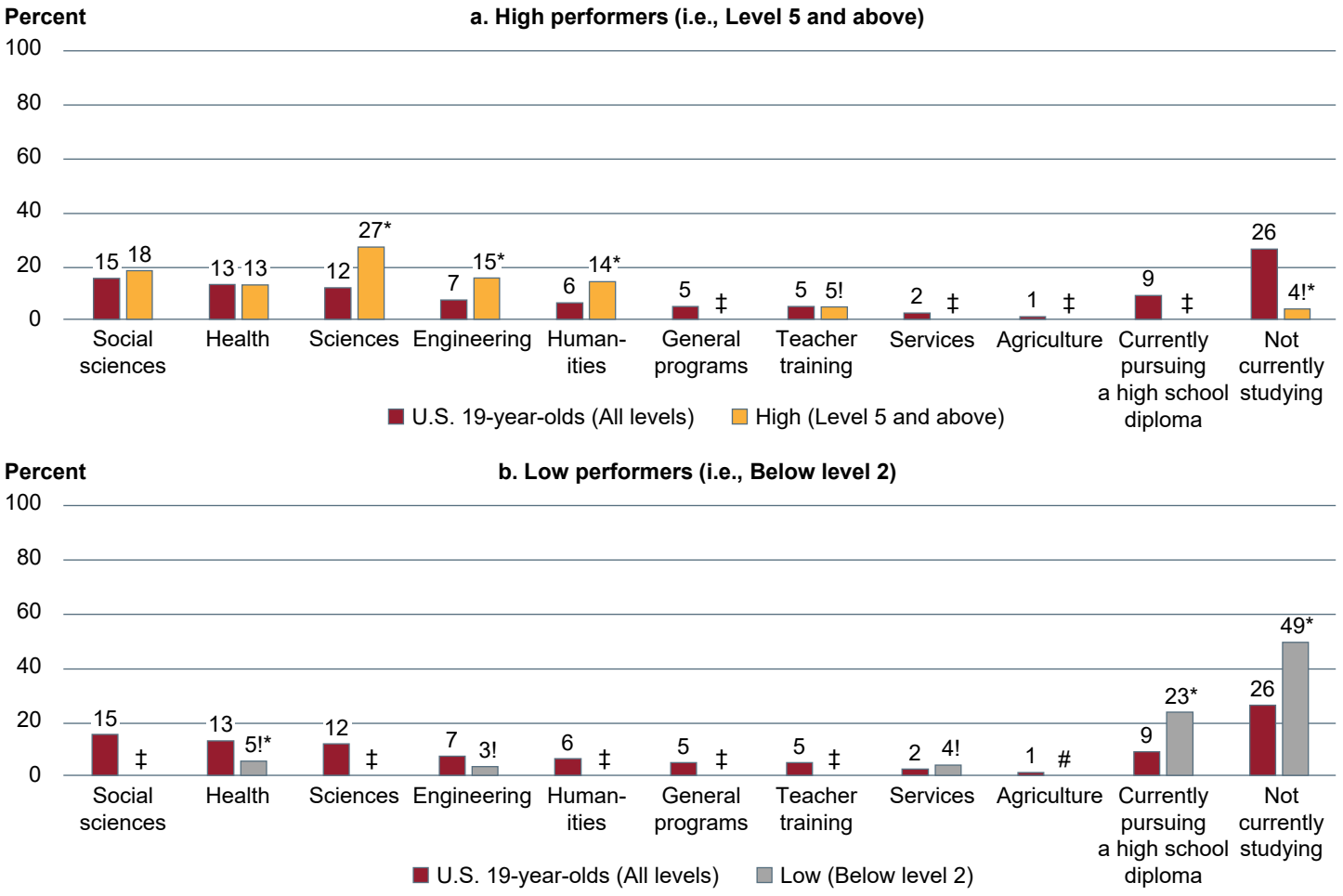
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents pursuing the given degree is significantly different for this proficiency level than it is for the overall population ($p < .05$).
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The education characteristics data in this figure are from a background questionnaire that they completed as part of PISA YAFS. Solid columns indicate U.S. 19-year-olds who have completed a high school diploma. Striped columns indicate those who have not completed a high school diploma. There were no 19-year-olds in a sixth category: not currently studying, degree unknown. See exhibit 3 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Area of study currently pursued

In 2016, about 65 percent of U.S. 19-year-olds were pursuing a degree, including pre-associate's or associate's degrees and bachelor's or higher degrees (table A-21). The most common areas of study pursued by these 19-year-olds were social sciences (15 percent), health (13 percent), and the sciences (12 percent). Additionally, 7 percent of U.S. 19-year-olds were studying engineering, and 6 percent were studying the humanities. Five percent or less of U.S. 19-year-olds were pursuing degrees in each of the areas of general studies, teaching, services, and agriculture.[13]

The area of study pursued by U.S. 19-year-olds varied by their proficiency in PISA 2012 at age 15. The high performers in PISA 2012 reading (i.e., at level 5 and above) more frequently pursued studies in science, engineering, and humanities than did the population overall (figure 7a). For example, 27 percent of high performers in reading were studying science, which was 15 percentage points higher than the percentage in that field in the population overall. Similarly, 15 percent of high performers were studying engineering, and 14 percent were studying humanities; in each case,

Figure 7. Percentage of U.S. 19-year-olds, by PISA 2012 reading proficiency levels and areas of study currently pursued: 2016



Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents pursuing the given area of study is significantly different for this proficiency level than it is for the overall population ($p < .05$).
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The education characteristics data in this figure are from a background questionnaire that they completed as part of PISA YAFS. See exhibit 2 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

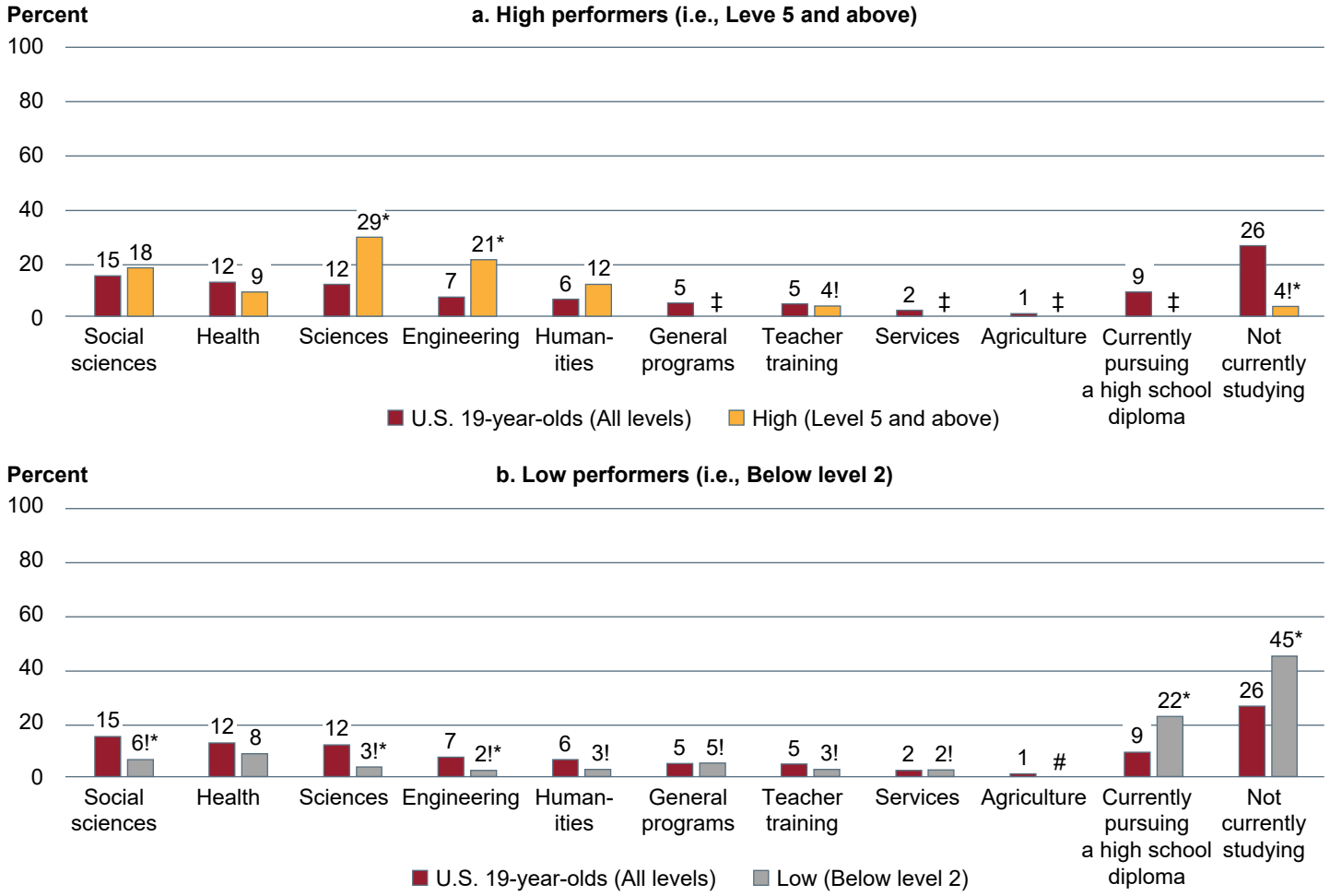
[13] This section does not consider the percentages of 19-year-olds currently pursuing a high school diploma or those not currently studying. The former is equivalent to the percentage of 19-year-olds pursuing a high school diploma described in the prior section, and the latter is equivalent to earlier described percentages of 19-year-olds not currently studying, either with or without a high school diploma.

the percentage was 8 percentage points higher than that in the population overall. Except for humanities, these patterns held for high performers in PISA 2012 mathematics as well (table A-22 and figure 8a).

The low performers in PISA 2012 reading (i.e., below level 2) were less represented than the population overall in one of the three reportable areas of study;[14] 5 percent of low performers were studying health compared with 13 percent in the population overall (figure 7b). This is likely related to the lower incidence of low performers pursuing postsecondary degrees at all: 28 percent of low performers were pursuing a postsecondary degree at the time of the survey, compared to 65 percent of the population overall (table A-21).

This difference did not hold for low performers in PISA 2012 mathematics, who differed from the population overall in other areas of study (some of which were not reportable in reading) (table A-22 and figure 8b). Among low performers in mathematics, the rates of pursuing three of the seven reportable areas of study at age 19 were

Figure 8. Percentage of U.S. 19-year-olds, by PISA 2012 mathematics proficiency levels and areas of study currently pursued: 2016



Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents pursuing the given area of study is significantly different for this proficiency level than it is for the overall population ($p < .05$).
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The education characteristics data in this figure are from a background questionnaire that they completed as part of PISA YAFS. See exhibit 3 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

[14] "Reportable areas of study" focuses on the disciplines listed in tables A-21 and A-22 and figures 7a, 7b, 8a, and 8b, excluding 19-year-olds still pursuing a high school diploma or not currently studying. The number of reportable areas differs based on the subject and the proficiency level of 19-year-olds, with nonreportable areas presented in the referenced tables and figures.

lower than in the population overall, including social sciences (6 vs. 15 percent), sciences (3 vs. 12 percent), and engineering (2 vs. 7 percent). There were no statistically significant differences in the areas of study pursued between middle performers in PISA 2012 reading or mathematics (i.e., those at proficiency levels 2–4) and the PISA YAFS population overall (tables A-21 and A-22).

Nonformal education participation in the last 12 months

In addition to formal education, U.S. 19-year-olds were asked about participation in nonformal education, defined as structured learning activities that take place outside the formal education system. Examples of nonformal education include courses conducted through open or distance education, organized sessions for on-the-job training or training by supervisors or coworkers, seminars or workshops, and other kinds of courses or private lessons.

In 2016, in the literacy and numeracy populations, 66 to 67 percent of U.S. 19-year-olds had participated in nonformal education in the prior 12 months (tables A-21 and A-22), and about one-third (33 percent) had not. Unlike formal education, participation in nonformal types of education activities was not related to prior proficiency in PISA 2012 reading or mathematics.

Transitions to the workforce

The variables examined for the transitions to the workforce also come from some of the literature discussed in the Introduction. The first two variables examine employment status—the first without considering concurrent education status and the second considering the interaction of education and employment (i.e., combined education and employment status).[15] The third variable examines occupation. Together, these variables provide insight into the extent to which U.S. 19-year-olds of different proficiency levels are participating in the workforce, and in which jobs, and how they might be balancing that with educational pursuits.

Employment status

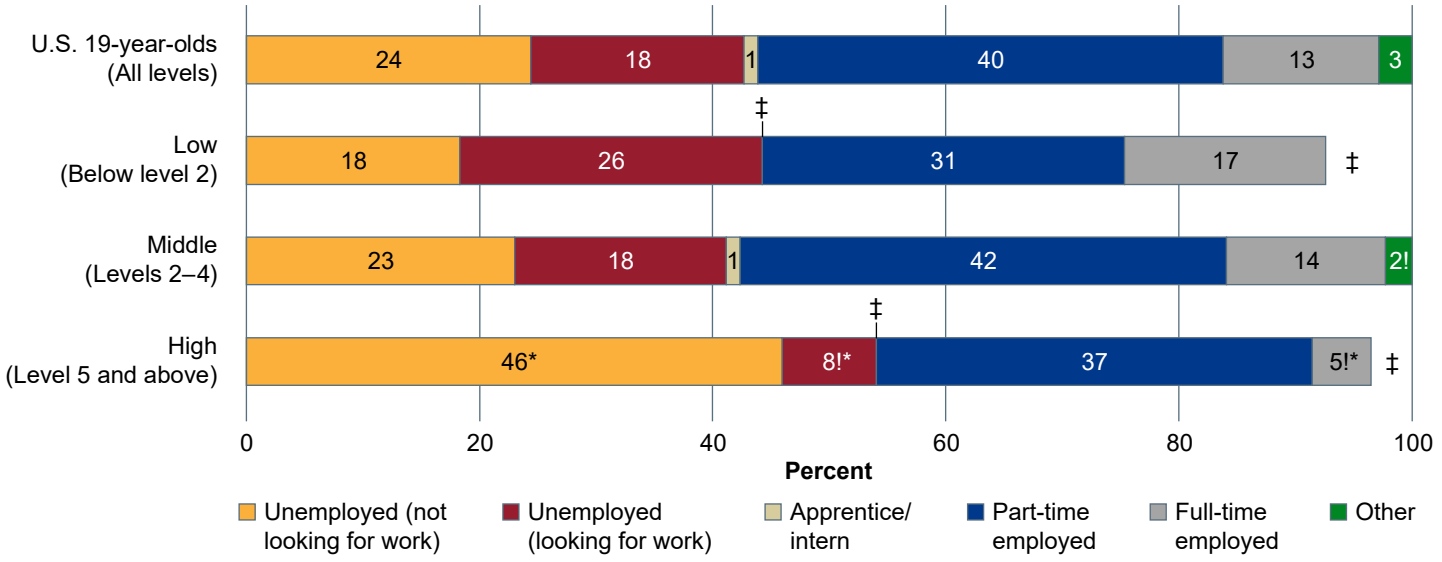
Forty-three percent of U.S. 19-year-olds were unemployed in 2016, which includes both those who were not looking for work at the time of the study (24 percent) and those who were looking for work (18 percent) (table A-23 and figure 9). Most commonly, U.S. 19-year-olds were employed part time (40 percent). About 13 percent were employed full time, 3 percent identified as having "other" employment status, and 1 percent were working as an apprentice/intern.

Employment status varied by their proficiency in PISA at age 15, but there were fewer differences related to proficiency than with educational outcomes (degrees and areas of study pursued). Among U.S. 19-year-olds who were high performers at age 15 in PISA 2012 reading (i.e., at level 5 and above), 54 percent were unemployed at age 19 (table A-23). The percentage of high performers who were unemployed but not looking for work (46 percent) was 22 percentage points higher than in the same category in the population overall, while the percentage who were unemployed and looking for work (8 percent) was lower by 10 percentage points (figure 9). Additionally, just 5 percent of PISA 2012 high performers in reading were employed full time, which was 8 percentage points lower than in the population overall. As discussed in the next section, these results may be related to high performers' relatively higher rates of pursuit of postsecondary degrees, suggesting that these 19-year-olds were not working, or were not looking for work, because they were enrolled in postsecondary education (table A-21). The patterns held for high performers in PISA 2012 mathematics as well (table A-24 and figure 10).

There were no statistically significant differences related to employment status between low performers in PISA 2012 reading or mathematics (i.e., below level 2) and the population overall (tables A-23 and A-24). Similarly, there were no statistically significant differences in employment status between middle performers in PISA 2012 reading or mathematics (i.e., at levels 2–4) and the population overall (tables A-23 and A-24).

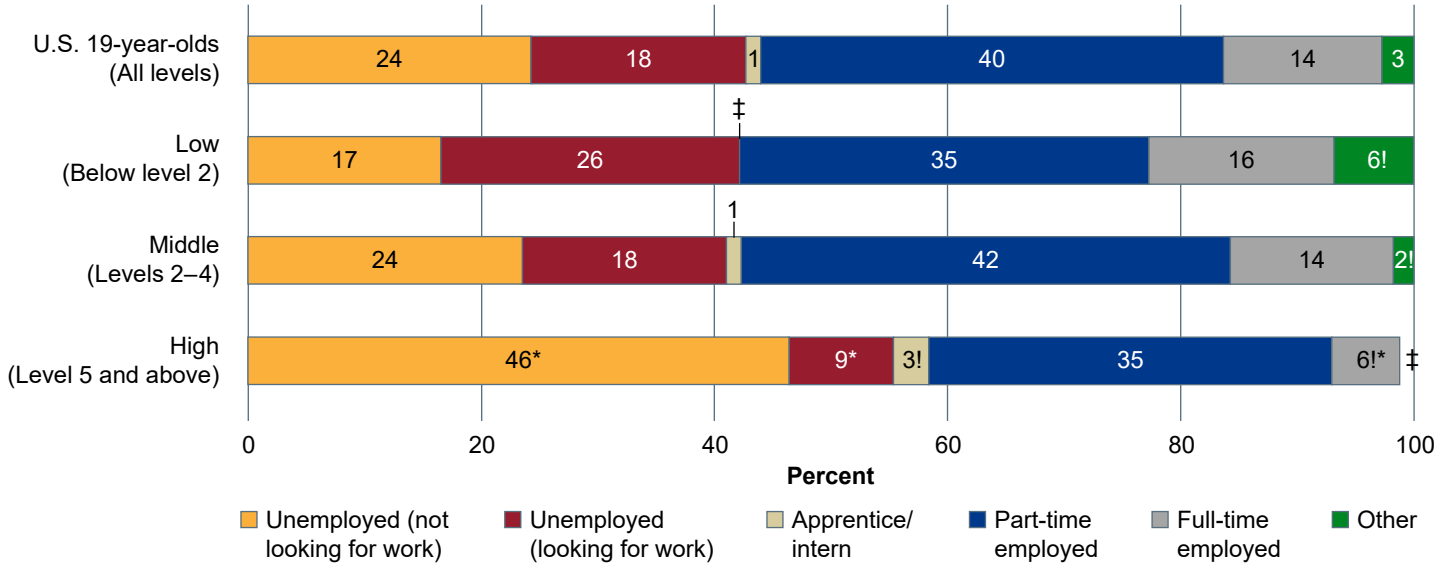
[15] These variables are based on the data available from the PISA YAFS questionnaire. They may differ from other student and employment variables available from NCES (see, e.g., Provasnik 2018).

Figure 9. Percentage distribution of U.S. 19-year-olds, by PISA 2012 reading proficiency levels and employment status: 2016



! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents in the employment status category is significantly different for this proficiency level than it is for the overall population ($p < .05$).
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The employment characteristics data in this figure are from a background questionnaire that they completed as part of PISA YAFS. U.S. 19-year-olds below level 2 and at level 5 and above had unreportable estimates for the "Apprentice/intern" and "Other" categories. See exhibit 2 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Figure 10. Percentage distribution of U.S. 19-year-olds, by PISA 2012 mathematics proficiency levels and employment status: 2016



! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents in the employment status category is significantly different for this proficiency level than it is for the overall population ($p < .05$).
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The employment characteristics data in this figure are from a background questionnaire that they completed as part of PISA YAFS. U.S. 19-year-olds below level 2 had unreportable estimates for the "Apprentice/intern" category and U.S. 19-year-olds at level 5 and above had unreportable estimates for the "Other" category. See exhibit 3 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

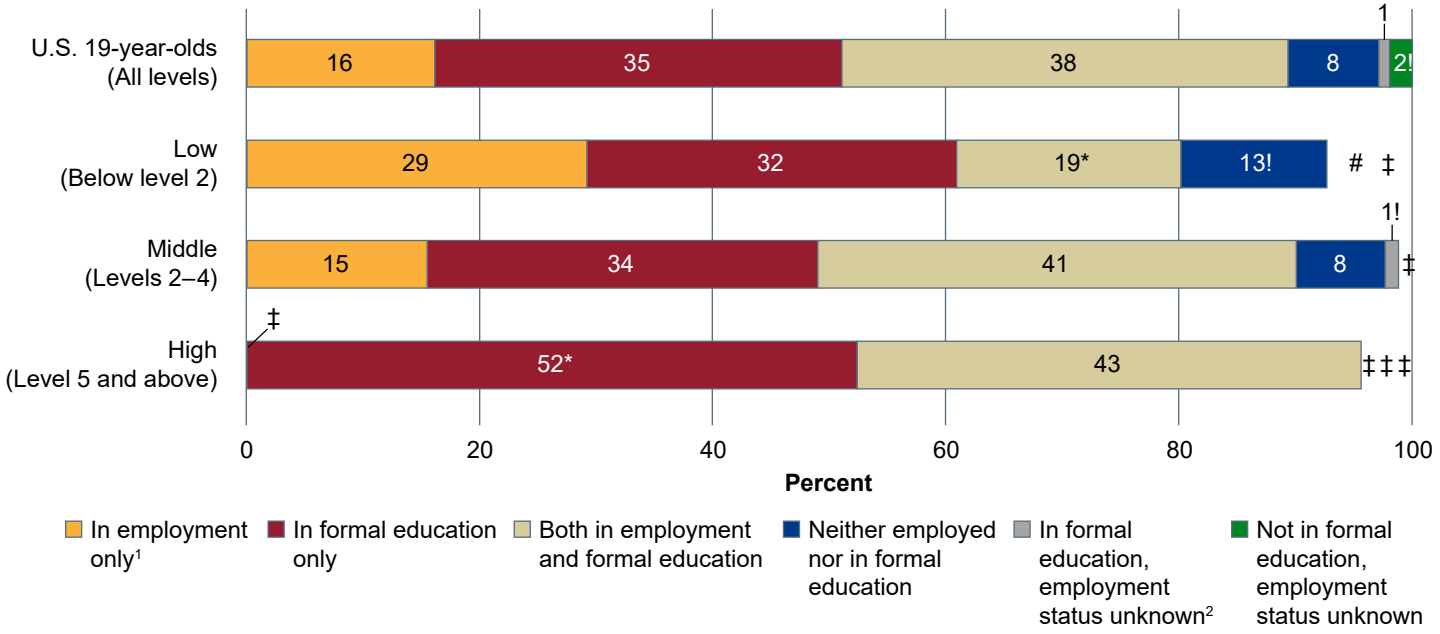
Combined education and employment status

This section examines the interaction of education and employment status. In 2016, about 35 percent of U.S. 19-year-olds were in formal education only, while 16 percent were in employment only (table A-23). More commonly, U.S. 19-year-olds were both in employment and formal education (38 percent). Eight percent were neither employed nor in formal education. For a small percentage of U.S. 19-year-olds (3 percent), employment status was unknown, which includes some 19-year-olds (1 percent) who were in formal education and some (2 percent) who were not.

As with participation in formal education, PISA performance at age 15 was related to outcomes at age 19. The majority of high performers in PISA 2012 reading (i.e., at level 5 and above) (52 percent) were in formal education only at age 19, which was 17 percentage points higher than the percentage in the population overall (table A-23 and figure 11). Forty-three percent of high performers in PISA 2012 reading were in both employment and formal education, which was not statistically significantly different from the rate for the overall population (38 percent). These patterns in employment and education paths held for PISA 2012 mathematics as well (table A-24 and figure 12).

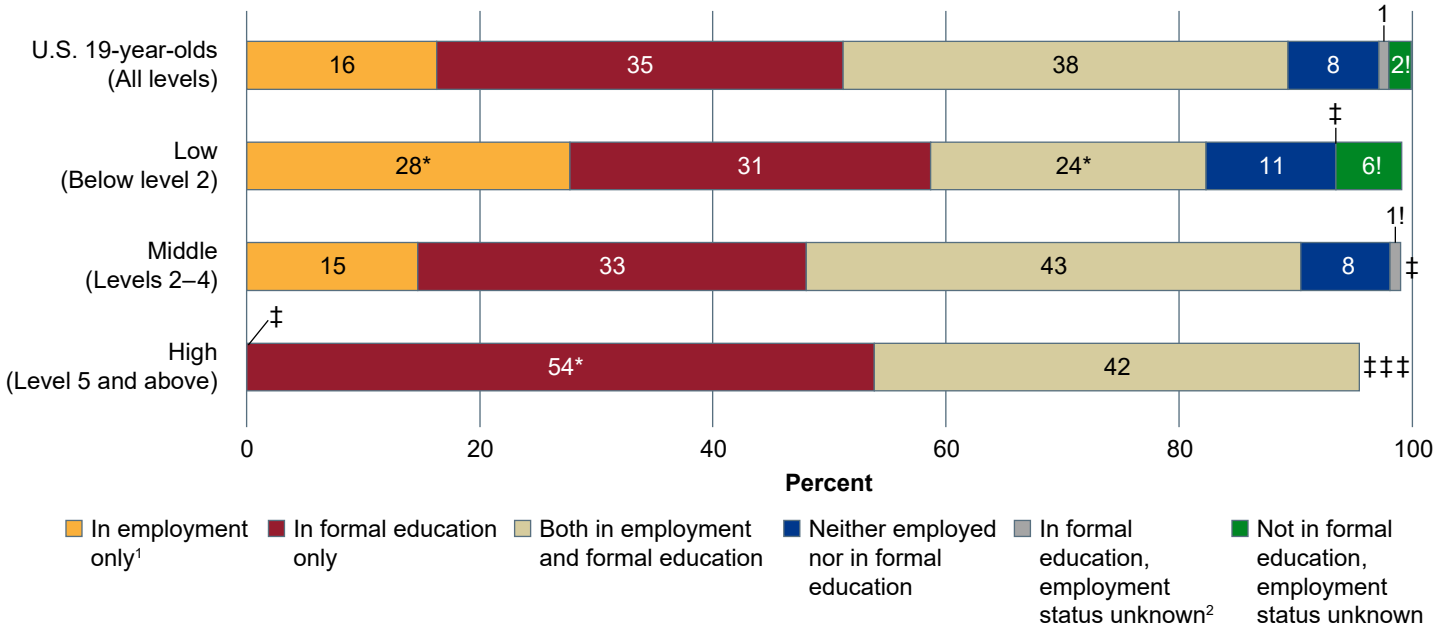
Low performers in PISA 2012 reading (i.e., below level 2) had a lower rate of combining employment and education at age 19 (19 percent) than the population overall (38 percent) (table A-23 and figure 11). This pattern held for PISA 2012 mathematics as well (table A-24 and figure 12). Additionally, low performers in mathematics had a higher rate of employment only (28 percent) than the population overall (16 percent).

Figure 11. Percentage distribution of U.S. 19-year-olds, by PISA 2012 reading proficiency levels and combined employment and education status: 2016



Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents in the combined education and employment status category is significantly different for this proficiency level than it is for the overall population ($p < .05$).
[1] Employment is defined as being either full- or part-time employed or an apprentice/intern.
[2] Employment status unknown indicates "other" was selected for the employment status.
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The employment and education characteristics data in this figure are from a background questionnaire that they completed as part of PISA YAFS. U.S. 19-year-olds below level 2 had unreportable estimates for the "Not in formal education, employment status unknown" category. U.S. 19-year-olds at level 5 and above had unreportable estimates in this category, as well as in the "In employment only," "In formal education, employment status unknown," and "Neither employed nor in formal education" categories. U.S. 19-year-olds at levels 2–4 had unreportable estimates for the "Not in formal education, employment status unknown" category. See exhibit 2 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Figure 12. Percentage distribution of U.S. 19-year-olds, by PISA 2012 mathematics proficiency levels and combined employment and education status: 2016



! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents in the combined education and employment status category is significantly different for this proficiency level than it is for the overall population ($p < .05$).
[1] Employment is defined as being either full- or part-time employed or an apprentice/intern.
[2] Employment status unknown indicates "other" was selected for the employment status.
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The employment and education characteristics data in this figure are from a background questionnaire that they completed as part of PISA YAFS. U.S. 19-year-olds below level 2 had unreportable estimates for the "In formal education, employment status unknown" category. U.S. 19-year-olds at level 5 and above had unreportable estimates in this category, as well as in the "In employment only," "Not in formal education, employment status unknown," and "Neither employed nor in formal education" categories. U.S.19-year-olds at levels 2–4 had unreportable estimates for the "Not in formal education, employment status unknown" category. See exhibit 3 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

There were no statistically significant differences in employment status between middle performers in PISA 2012 reading or mathematics (i.e., at levels 2–4) and the population overall (tables A-23 and A-24).

Current occupation

Fifty-seven percent of U.S. 19-year-olds were employed in 2016,[16] and by far the most common occupation was as sales or service workers (31 percent) (table A-23). The remaining U.S. 19-year-olds who were employed were distributed in small percentages across the other occupations. Five percent were professionals; 4 percent were craft and related trades workers or were technicians and associate professionals; 3 percent were in elementary occupations, or were clerical support workers, or were managers; 2 percent were in the armed forces; and 1 percent were in skilled agricultural, forestry, and fish.

These rates of occupations generally did not vary by PISA 2012 proficiency level, although not all categories were reportable for all proficiency levels and subjects.

Among high performers in PISA 2012 reading at age 15 (i.e., at level 5 and above), rates for the four reportable occupations—professionals, technicians and associate professionals, clerical support workers, and service and sales workers—were not statistically significantly different from those in the population overall at age 19 (table A-23). These patterns held for high performers in PISA 2012 mathematics (table A-24).

Among low performers in PISA 2012 reading (i.e., below level 2), rates for the two reportable occupations—service and sales workers, and craft and related trades workers—were not statistically significantly different at age 19 from those in the population overall (table A-23). In addition

[16] This percentage is the sum of percentages of all occupation categories. It excludes the percentages of U.S. 19-year-olds who were unemployed and looking for work (18 percent) or unemployed or not looking for work (24 percent).

to these two occupations, five others—professionals; technicians and associate professionals; clerical support workers; plant and machine operators, and assembly workers; and elementary occupations—were occupied by low performers in PISA 2012 mathematics at rates not statistically significantly different from the population overall (table A-24).

There were no statistically significant differences in occupation between middle performers in PISA 2012 reading or mathematics (i.e., at levels 2–4) and the population overall (tables A-23 and A-24).

Transitions to adult life

Transitions to adult life are another important area to study to provide a broader picture than the more frequently studied educational and workforce paths. Whereas the variables examined in the prior subsections focused on self-reports of behavior or conditions, the variables in this section focus on self-reports of beliefs, attitudes, and interests. While affective measures are not new or unstudied, they have not always been the focus of youth transition studies and thus provide supplemental information about U.S. 19-year-olds' choices and behaviors. However, it should be noted that, perhaps even more than the education and employment variables, these affective variables may be susceptible to change with maturity, and readers should remember that the current results are captured at just one point in time.

Level of self-efficacy toward job-seeking

Self-efficacy is the extent or strength of one's belief in one's own ability to complete tasks and achieve goals (Kankaraš 2017). ESO focused specifically on self-efficacy toward job-seeking and asked individuals who were employed or looking for work[17] to respond to four related questions, featuring a 6-point scale ranging from "strongly agree" to "strongly disagree." Each individual's responses were then averaged, which allowed them to be placed in one of three categories of self-efficacy toward job-seeking: low, moderate, or high (OECD 2015).

In 2016, there were more U.S. 19-year-olds who reported moderate self-efficacy toward job-seeking (39 percent) than other levels, with 22 percent having high and 8 percent having low self-efficacy toward job-seeking (table A-25). About one-quarter (24 percent) of U.S. 19-year-olds were not asked the survey questions (because they were unemployed and not looking for work), and 6 percent did not respond to the questions. These patterns did not vary by PISA 2012 proficiency (except for high performers, who had higher rates of not being asked the survey questions).

Unlike most other variables examined in the study, there were no statistically significant differences in levels of self-efficacy toward job-seeking for either high or low performers in PISA 2012 reading or mathematics and the population overall (tables A-25 and A-26). Similarly, there were no statistically significant differences in levels of job-seeking self-efficacy for middle performers in PISA 2012 reading or mathematics (i.e., levels 2–4) and the population overall (tables A-25 and A-26).

Life satisfaction

Life satisfaction describes individuals' satisfaction with their lives as a whole and is considered to be an outcome that contributes to overall well-being (Diener et al. 1985). In ESO, individuals were asked to respond to four related questions on a 6-point scale (ranging from "strongly agree" to "strongly disagree"), which allowed them to be placed in one of three categories of life satisfaction: high, moderate, or low (OECD 2015).

In 2016, at least two-thirds of U.S. 19-year-olds reported either moderate or high life satisfaction (37 and 34 percent, respectively) (table A-25).[18] About one-fifth of U.S. 19-year-olds (21 percent) reported low levels of life satisfaction, and 9 percent did not respond to the related survey questions. These percentages did not vary by PISA 2012 proficiency.

Like with self-efficacy, there were no statistically significant differences in levels of life satisfaction between any level of performers in PISA 2012 reading or mathematics and the population overall (tables A-25 and A-26).

Vocational interests

Individuals' vocational interests are thought to reflect not only the types of work they would enjoy but personality characteristics as well (Kankaraš 2017). Moreover, vocational interests have been found to influence cognitive competencies and, when well matched with individuals' educational and occupational choices, their well-being and satisfaction (Kankaraš 2017). In ESO, individuals were asked to respond, on a 5-point scale,

[17] Because the ESO background questionnaire's battery of questions on self-efficacy were related to job-seeking, U.S. 19-year-olds who were unemployed and not looking for work were routed out of this question.
[18] Like self-efficacy, life-satisfaction categories are based on 19-year-olds' responses to related survey items.

to 60 related questions about the degree to which they would like or dislike various activities. This was based on the short-form version of the O*NET Interest Profile assessing the Holland RIASEC model of vocational interest (Holland 1997; National Center for O*NET Development n.d.; Rounds et al. 2010). There were 10 questions about different types of work activities in each of six dimensions: realistic, investigative, artistic, social, enterprising, and conventional (see the following text box and OECD 2015). Individuals' responses to the questions were added for each dimension and ranged from 0 to 40. The higher the score, the higher the interest in vocations in the given dimension. This section presents these index scores averaged across the PISA YAFS population.

In 2016, U.S. 19-year-olds were most interested in social vocations, or those that involve working with other people to help them learn and grow; they scored higher for interest in these vocations (21) than any other type (table A-25). U.S. 19-year-olds scored lowest for interest in realistic or conventional vocations (15 each). There were some differences in vocational interests related to PISA 2012 proficiency.

High performers in PISA 2012 reading at age 15 (i.e., at level 5 and above) had a higher level of interest in investigative vocations than the population overall (scoring 20 vs. 18, respectively) and a lower level of interest in enterprising vocations than the population overall (scoring 17 vs. 19, respectively) at age 19. Investigative vocations include work that involves ideas and thinking rather than physical activity or leading people. Enterprising vocations include work that involves starting up and carrying out business projects (table A-25 and figure 13). These patterns were the same for high performers in mathematics (table A-26 and figure 14).

Among low performers in PISA 2012 reading (i.e., below level 2), there were no statistically significant differences in vocational interests at age 19 compared to the population overall (table A-25 and figure 13). Low performers in PISA 2012 mathematics, however, had lower interest in investigative vocations (16) than the population overall (18) (table A-26 and figure 14).

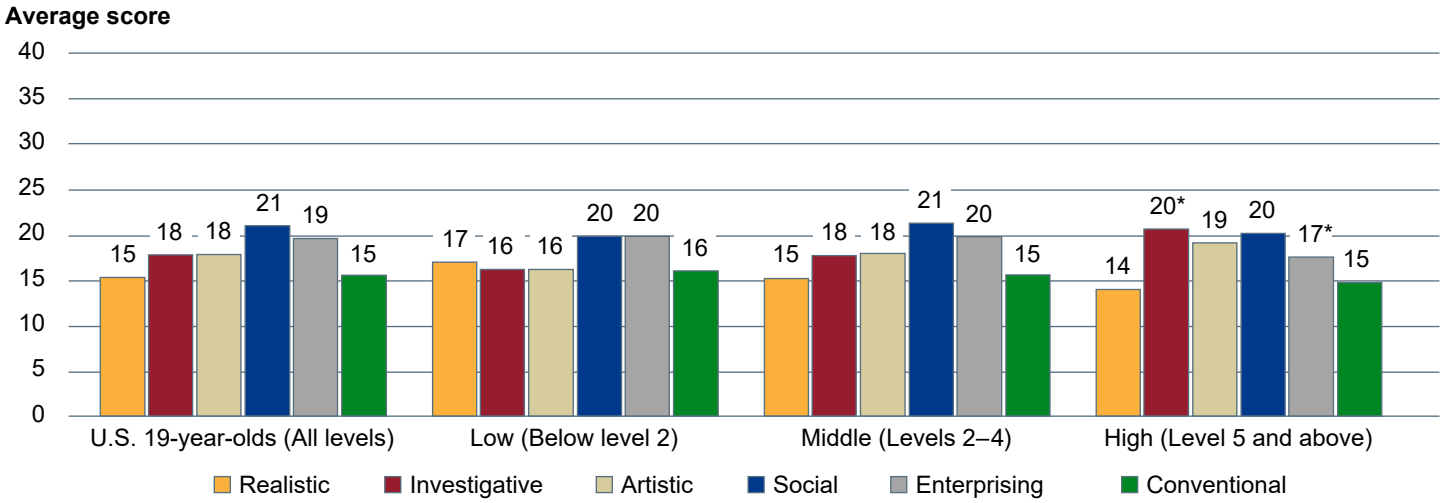
There were no statistically significant differences in the vocational interests of middle performers in either subject and the population overall (tables A-25 and A-26).

Defining vocational interests

Vocational interest	Description
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.
Investigative	People with investigative interests like work that has to do with ideas and thinking rather than physical activity or leading people.
Artistic	People with artistic interests like work that deals with the artistic side of things, such as acting, music, art, and design.
Social	People with social interests like working with others to help others learn and grow. They like working with people more than working with objects, machines, or information.
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.
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.

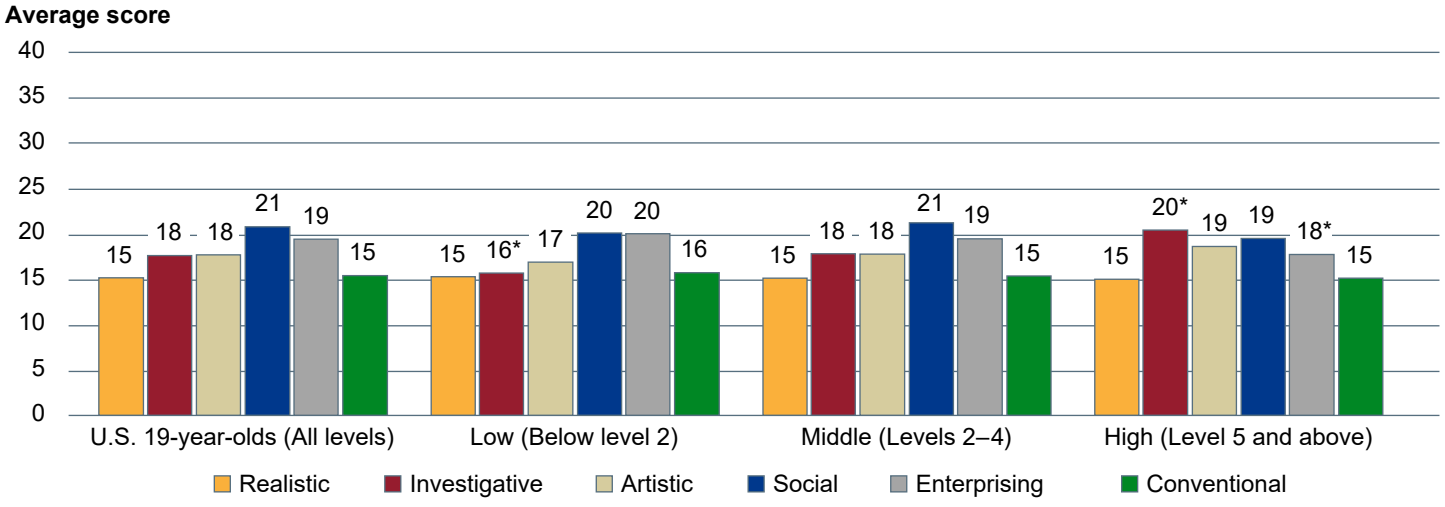
SOURCE: Education and Skills Online Technical Documentation (OECD 2015).

Figure 13. Average scores of U.S. 19-year-olds on index of vocational interest, by PISA 2012 reading proficiency levels and vocational interests: 2016



* Percentage of respondents in the vocational interest category is significantly different for this proficiency level than it is for the overall population ($p < .05$).
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The self-reported vocational interest data in this figure are from a background questionnaire that they completed as part of PISA YAFS. The scores on the vocational scales range from 0 to 40. The realistic type of individual is interested in manual types of jobs, the investigative type is curious and scientifically oriented, the artistic type prefers creative activities through different art forms, the social type is interested in working with people, the enterprising type leads and influences people, and the conventional type prefers well-structured situations. For more information on the vocational scales and interest categories, see OECD 2015. See exhibit 2 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Figure 14. Average scores of U.S. 19-year-olds on index of vocational interest, by PISA 2012 mathematics proficiency levels and vocational interests: 2016



* Percentage of respondents in the vocational interest category is significantly different for this proficiency level than it is for the overall population ($p < .05$).
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The self-reported vocational interest data in this figure are from a background questionnaire that they completed as part of PISA YAFS. The scores on the vocational scales range from 0 to 40. The realistic type of individual is interested in manual types of jobs, the investigative type is curious and scientifically oriented, the artistic type prefers creative activities through different art forms, the social type is interested in working with people, the enterprising type leads and influences people, and the conventional type prefers well-structured situations. For more information on the vocational scales and interest categories, see OECD 2015. See exhibit 3 for a description of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Looking across education, employment, and adult life outcomes

Looking across education, employment, and adult life outcomes, it does appear that proficiency in PISA 2012 at age 15—in particular, high performance on either the reading or mathematics scale—is related to many of the education and employment outcomes and one of the adult life outcomes at age 19. Exhibit 9 summarizes the outcomes that are more, or less, commonly attained for high performers (i.e., level 5 and above) and for low performers (i.e., below level 2) on the PISA 2012 reading and mathematics scales.

High performance on PISA 2012 reading and mathematics was associated with higher education trajectories and higher rates of other potentially advantageous outcomes (e.g., higher rates of enrollment in bachelor's degree programs and higher uptake in critical fields, such as science and engineering[19]). Low performance on PISA 2012 reading and mathematics was associated with lower education trajectories at age 19 (e.g., still pursuing a high school diploma) as well as lower rates of potentially advantageous outcomes (e.g., pursuing a bachelor's degree or higher or combining work and education).

Altogether, the picture of both high and low performers and their transition to adult life is substantially different than it is for the overall population on the variables studied in this report.

Exhibit 9. Education, employment, and life outcomes for U.S. 19-year-old high and low performers in PISA 2012 relative to the PISA YAFS population overall: 2016

PISA 2012 performance group	More common compared to PISA YAFS population overall in 2016	Less common compared to PISA YAFS population overall in 2016
High performers in PISA 2012 reading and mathematics (Level 5 or above)	• Pursue a bachelor's degree or higher • Study sciences or engineering • Study humanities[1] • Are unemployed but not looking for work • Are in formal education only • Are interested in investigative vocations	• Pursue pre-associate's or associate's degree • Work full time • Are unemployed and looking for work • Are interested in enterprising vocations
Low performers in PISA 2012 reading and mathematics (Below level 2)	• Are still pursuing a high school diploma • Are in employment only[2]	• Pursue a bachelor's degree or higher • Study health[1] • Study social science, sciences, or engineering[2] • Are in both employment and education • Are interested in investigative vocations[2]

[1] This outcome is statistically significant for reading only.
[2] This outcome is statistically significant for mathematics only.
NOTE: Unless otherwise noted, all outcomes in the table are statistically significant for both reading and mathematics. Estimates for 19-year-olds are for individuals who were 15-year-old students in fall 2012 and who participated in PISA YAFS in 2016. High performers in PISA 2012 are those at proficiency level 5 and above; low performers are those below proficiency level 2. This table does not include outcomes for middle performers in PISA 2012 (levels 2–4) because there were no statistically significant differences between them and the population overall in either PISA 2012 reading or mathematics. See tables A-21 to A-26 for related data. See exhibits 2 and 3 for descriptions of proficiency levels. See appendix B for additional detail on vocational interests.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

[19] See Brown et al. (2018) for a brief discussion of the importance of mathematics and science in preparing students for the current and future economy. See also U.S. Department of Education (2018, 2020).

5. Conclusion

PISA YAFS provided an opportunity to examine U.S. performance at two points in time: at 15 years old (using assessment results from PISA 2012) and again at 19 years old (using assessment results from ESO, administered in 2016 in PISA YAFS). This report focused on several key questions: (1) how did U.S. 19-year-olds perform in ESO; (2) how did proficiency in ESO at age 19 relate to proficiency in PISA 2012 at age 15; (3) is there a correlation between ESO scores at age 19 and PISA 2012 scores at age 15; and (4) were education, workforce, and life outcomes at age 19 related to proficiency in PISA 2012 at age 15?

- **Performance in ESO in 2016.** In 2016, U.S. 19-year-olds had an average score of 266 points in ESO literacy and 260 points in ESO numeracy. In both subjects, most 19-year-olds performed at the middle level of proficiency–72 percent in literacy and 68 percent in numeracy. About one-fifth to one-quarter performed at the low level, and small percentages (10 and 7 percent, respectively) performed at the high level. There was one difference in the distributions across proficiency levels by race/ethnicity in numeracy, but no statistically significant differences by sex, language spoken at home, or whether they were born in the United States for either subject. This suggests that most U.S. 19-year-olds, largely regardless of background, have literacy and numeracy skills that are above the baseline needed for further learning and full participation in society, albeit below those needed for handling more abstract, complex concepts and situations.

- **Relating proficiency in ESO at age 19 to proficiency in PISA 2012 at age 15.** Proficiency at age 19 was most closely related to proficiency at age 15 among the middle performers, who were the largest group in the PISA YAFS population at both ages. Seventy-seven percent of U.S. 19-year-olds performed at the middle level of proficiency in PISA 2012 reading at age 15, and 78 percent of them also performed at the middle level of proficiency in ESO literacy at age 19. In mathematics, 68 percent of U.S. 19-year-olds performed at the middle level of proficiency in PISA 2012, and 79 percent of them also performed at the middle level of proficiency in ESO numeracy at age 19. These patterns held true for all subgroups except those individuals from the most economically challenged schools at age 15, based on free or reduced-price lunch (FRPL) status. For this subgroup, and for high and low performers, the pattern of remaining in the same-labeled proficiency level categories 4 years later was not as stark.

- **Correlations between ESO scores at age 19 and PISA 2012 scores at age 15.** The correlation between PISA 2012 reading and ESO literacy was 0.59 and between PISA 2012 mathematics and ESO numeracy was 0.69, which indicate strong positive relationships. There were some differences in the strength of correlations for different subgroups of U.S. 19-year-olds. Most notably, correlations were weaker in both subjects for those 19-year-olds who had attended the most or least economically challenged schools (based on FRPL status) at age 15.

- **Relationship of education, workforce, and life outcomes at age 19 to proficiency in PISA 2012 at age 15.** Proficiency in PISA 2012 was related to education, workforce, and life outcomes in five of nine areas examined in the study, the exceptions being participation in nonformal education, current occupation, self-efficacy, and life satisfaction. For example, high reading and mathematics proficiency at age 15 was associated with higher education trajectories and other potentially advantageous life outcomes at age 19–including higher rates of enrollment in bachelor's degree programs and higher uptake in science and engineering, two fields that policymakers and researchers generally consider critical to meeting the workplace and problem-solving demands of the future). Low reading and mathematics proficiency at age 15 was associated with lower education trajectories (e.g., being in

high school at age 19) and lower rates of potentially advantageous outcomes (e.g., pursuing a bachelor's degree or higher or combining work and education).

Together, these results provide a snapshot of the cognitive skills of U.S. 19-year-olds and an analysis of how their skills, outcomes, attitudes, and interests are related to the academic proficiency they demonstrated at age 15. Some of the results confirm previously uncovered relationships (e.g., between high performance and the pursuit of higher education or certain areas of study), while others reveal more novel findings (e.g., between performance and vocational interests).

Overall, by documenting generally strong, positive relationships between individuals' reading and mathematics performance at age 15 and their literacy skills, numeracy skills, and educational trajectories 4 years later, this report provides an indication of the degree to which success on PISA 2012 is related to various outcomes at the important transition from high school and the outset of adult life. However, it also showed that these relationships are not universal for all students, highlighting students who were in the poorest schools at age 15 as an at-risk group for skill loss. Further research might build on this development work and explore these findings in more detail.

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Appendix A. Data Tables

Table A-1. Mean, standard deviation, and range of U.S. 19-year-olds' ESO literacy assessment scores: 2016

	Mean		Standard deviation		Minimum score		Maximum score	
	[Standard errors appear in parentheses]							
Total	266.1	(1.95)	49.0	(1.35)	79.9	(16.90)	418.6	(14.09)

NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-2. Percentage distribution of U.S. 19-year-olds, by ESO literacy proficiency levels and selected demographic characteristics: 2016

			ESO literacy proficiency levels					
	Total		Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above)	
Demographic characteristics	[Standard errors appear in parentheses]							
Total	100.0	(†)	18.8	(1.55)	71.7	(1.56)	9.5	(0.90)
Gender								
Male	51.1	(1.56)	22.8	(2.46)	67.8	(2.32)	9.4	(1.10)
Female	48.9	(1.56)	14.6	(1.80)	75.8	(2.11)	9.6	(1.16)
Race/ethnicity								
White	52.5	(2.53)	14.5	(2.03)	73.0	(1.97)	12.5	(1.23)
Black or African American	12.3	(1.72)	33.0	(6.74)	65.1	(6.75)	‡	(†)
Hispanic or Latino	23.0	(1.75)	21.7	(3.14)	72.4	(3.13)	5.9	(1.23)
Asian	5.8	(1.28)	15.4 !	(6.77)	71.6	(6.71)	13.0	(3.70)
Other	6.4	(1.07)	17.0	(3.87)	72.7	(4.42)	10.3 !	(3.18)
Born in the United States								
Native	77.1	(2.36)	17.8	(1.88)	71.8	(1.99)	10.4	(1.03)
First-generation native	15.2	(1.64)	15.7	(2.83)	76.9	(2.95)	7.4	(2.18)
Nonnative	7.7	(1.06)	24.2	(6.42)	67.4	(5.98)	8.4 !	(2.74)
Language at home								
English	86.4	(1.35)	17.8	(1.64)	71.9	(1.72)	10.3	(1.01)
Spanish	9.4	(1.04)	22.9	(4.71)	71.8	(4.63)	5.3 !	(2.05)
Other languages	4.2	(0.73)	28.4 !	(9.32)	64.2	(9.07)	7.4 !	(2.65)

† Not applicable.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Race categories exclude persons of Hispanic ethnicity. "Other" includes those who identified themselves as "Two or more races," "American Indian/Alaska Native," and "Native Hawaiian/Other Pacific Islander." See exhibit 4 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-3. Mean, standard deviation, and range of U.S. 19-year-olds' ESO numeracy assessment score: 2016

	Mean		Standard deviation		Minimum score		Maximum score	
	[Standard errors appear in parentheses]							
Total	259.5	(2.13)	49.1	(1.34)	91.4	(19.83)	419.2	(13.04)

NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-4. Percentage distribution of U.S. 19-year-olds, by ESO numeracy proficiency levels and selected demographic characteristics: 2016

			ESO numeracy proficiency levels					
	Total		Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above)	
Demographic characteristics	[Standard errors appear in parentheses]							
Total	100.0	(†)	24.5	(1.88)	68.2	(1.79)	7.3	(0.77)
Gender								
Male	51.3	(1.59)	26.8	(2.74)	64.6	(2.63)	8.6	(1.12)
Female	48.7	(1.59)	22.1	(2.06)	71.9	(1.93)	6.0	(0.94)
Race/ethnicity								
White	52.6	(2.57)	17.0	(2.04)	72.9	(2.19)	10.0	(1.11)
Black or African American	12.5	(1.71)	44.6 *	(6.16)	54.5	(6.13)	‡	(†)
Hispanic or Latino	22.9	(1.72)	31.0	(3.54)	65.2	(3.44)	3.8	(1.12)
Asian	5.8	(1.29)	16.3 !	(6.89)	71.3	(6.28)	12.4	(3.55)
Other	6.1	(1.05)	30.9	(8.57)	63.1	(8.21)	6.0 !	(2.24)
Born in the United States								
Native	77.1	(2.30)	23.4	(2.16)	69.0	(2.15)	7.7	(0.85)
First-generation native	15.1	(1.60)	26.3	(3.65)	67.4	(3.41)	6.3	(1.64)
Nonnative	7.8	(1.02)	25.8	(7.41)	65.8	(7.22)	8.4 !	(2.65)
Language at home								
English	86.3	(1.30)	22.9	(1.91)	69.4	(1.91)	7.7	(0.84)
Spanish	9.4	(1.00)	33.4	(4.86)	62.2	(4.71)	4.4 !	(1.81)
Other languages	4.2	(0.73)	27.0 !	(9.89)	62.7	(9.73)	10.2 !	(4.00)

† Not applicable.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Subgroup percentage is statistically significantly different from the total percentage ($p < .05$).
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Race categories exclude persons of Hispanic ethnicity. "Other" includes those who identified themselves as "Two or more races," "American Indian/Alaska Native," and "Native Hawaiian/Other Pacific Islander." See exhibit 5 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-5. Percentage distribution of U.S. 19-year-olds, by ESO literacy proficiency level and PISA 2012 reading proficiency level: 2016

PISA 2012 reading proficiency levels	ESO literacy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
Low (Below level 2)	51.3	(6.65)	48.5	(6.71)	‡	(†)
Middle (Levels 2–4)	15.0	(1.52)	77.6	(1.76)	7.4	(0.95)
High (Level 5 and above)	‡	(†)	57.4	(4.67)	41.3	(4.72)

† Not applicable.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. See exhibits 2 and 4 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-6. Percentage distribution of U.S. 19-year-olds, by ESO literacy proficiency level, sex, and PISA 2012 reading proficiency level: 2016

PISA 2012 reading proficiency levels	ESO literacy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
	Male					
Low (Below level 2)	53.8	(7.57)	46.0	(7.63)	‡	(†)
Middle (Levels 2–4)	17.6	(2.50)	74.4	(2.77)	8.0	(1.25)
High (Level 5 and above)	‡	(†)	51.2	(8.40)	47.7	(8.65)
	Female					
Low (Below level 2)	46.8	(12.76)	53.2	(12.76)	#	(†)
Middle (Levels 2–4)	12.4	(1.84)	80.7	(2.38)	6.8	(1.09)
High (Level 5 and above)	‡	(†)	61.4	(4.42)	37.1	(4.65)

† Not applicable.
# Rounds to zero.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. See exhibits 2 and 4 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-7. Percentage distribution of U.S. 19-year-olds, by ESO literacy proficiency level, national quarters of the PISA 2012 index of economic, social, and cultural status (ESCS), and PISA 2012 reading proficiency level: 2016

PISA 2012 reading proficiency levels	ESO literacy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
	Bottom quarter					
Low (Below level 2)	59.0	(10.60)	41.0	(10.60)	#	(†)
Middle (Levels 2–4)	20.4	(3.41)	74.7	(3.74)	4.9 !	(1.62)
High (Level 5 and above)	#	(†)	85.9	(15.86)	‡	(†)
	Second quarter					
Low (Below level 2)	48.4	(13.71)	51.6	(13.71)	#	(†)
Middle (Levels 2–4)	14.9	(2.54)	78.8	(3.16)	6.3	(1.62)
High (Level 5 and above)	#	(†)	58.2	(11.81)	41.8	(11.81)
	Third quarter					
Low (Below level 2)	43.7 !	(14.12)	55.3	(14.33)	‡	(†)
Middle (Levels 2–4)	13.8	(3.42)	78.7	(3.73)	7.6	(1.79)
High (Level 5 and above)	‡	(†)	61.3	(9.33)	36.3	(9.00)
	Top quarter					
Low (Below level 2)	39.5 !	(15.42)	60.5	(15.42)	#	(†)
Middle (Levels 2–4)	10.3	(2.29)	78.9	(2.75)	10.8	(2.27)
High (Level 5 and above)	‡	(†)	52.9	(6.59)	46.0	(6.71)

† Not applicable.
# Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. The PISA 2012 index of economic, social, and cultural status (ESCS) was created using student reports on parental occupation, the highest level of parental education, and an index of home possessions related to family wealth, home educational resources and possessions related to "classical" culture in the family home. The home possessions relating to "classical" culture in the family home included possessions such as works of classical literature, books of poetry, and works of art (e.g., paintings). See exhibits 2 and 4 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-8. Percentage distribution of U.S. 19-year-olds, by ESO literacy proficiency level, free or reduced-price lunch (FRPL) status of students' schools at age 15, and PISA 2012 reading proficiency level: 2016

PISA 2012 reading proficiency levels	ESO literacy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
	Schools with less than 25 percent of students eligible for FRPL					
Low (Below level 2)	‡	(†)	65.9 !	(21.69)	‡	(†)
Middle (Levels 2–4)	9.8	(1.78)	80.4	(2.02)	9.8	(1.29)
High (Level 5 and above)	‡	(†)	55.4	(5.27)	43.1	(6.03)
	Schools with 25 to 49.9 percent of students eligible for FRPL					
Low (Below level 2)	51.7 !	(16.03)	48.3 !	(16.03)	#	(†)
Middle (Levels 2–4)	12.8	(1.82)	76.9	(2.99)	10.3	(2.25)
High (Level 5 and above)	‡	(†)	58.5	(10.72)	40.2	(10.81)
	Schools with 50 to 74.9 percent of students eligible for FRPL					
Low (Below level 2)	52.8	(9.94)	47.2	(9.94)	#	(†)
Middle (Levels 2–4)	14.5	(2.55)	80.7	(2.53)	4.7	(1.37)
High (Level 5 and above)	‡	(†)	56.2	(10.99)	43.4	(11.10)
	Schools with 75 percent or more students eligible for FRPL					
Low (Below level 2)	55.8	(14.11)	44.2 !	(14.11)	#	(†)
Middle (Levels 2–4)	28.5 *	(4.91)	67.8	(5.03)	3.7 !	(1.49)
High (Level 5 and above)	#	(†)	73.6	(16.37)	‡	(†)

† Not applicable.
# Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Subgroup percentage is significantly different from the total percentage in table A-5 (p <.05).
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Data for students eligible for free or reduced-price lunch (FRPL) were available for public schools only. See exhibits 2 and 4 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-9. Percentage distribution of U.S. 19-year-olds, by ESO literacy proficiency level, race/ethnicity, and PISA 2012 reading proficiency level: 2016

PISA 2012 reading proficiency levels	ESO literacy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
	White					
Low (Below level 2)	50.2	(14.81)	49.4 !	(15.21)	‡	(†)
Middle (Levels 2–4)	12.6	(2.36)	77.9	(2.89)	9.5	(1.51)
High (Level 5 and above)	‡	(†)	56.4	(6.05)	42.3	(5.86)
	Black or African American					
Low (Below level 2)	60.4	(12.81)	39.6 !	(12.81)	#	(†)
Middle (Levels 2–4)	22.7	(5.52)	75.0	(5.98)	‡	(†)
High (Level 5 and above)	#	(†)	90.9	(17.49)	‡	(†)
	Hispanic or Latino					
Low (Below level 2)	50.1 !	(15.61)	49.9 !	(15.61)	#	(†)
Middle (Levels 2–4)	16.5	(3.13)	78.1	(3.90)	5.4	(1.57)
High (Level 5 and above)	‡	(†)	64.3	(12.69)	33.6 !	(12.57)
	Asian					
Low (Below level 2)	69.2 !	(31.64)	‡	(†)	#	(†)
Middle (Levels 2–4)	10.5 !	(4.63)	81.9	(5.59)	7.7 !	(3.20)
High (Level 5 and above)	‡	(†)	52.9	(14.94)	46.0 !	(14.66)
	Other					
Low (Below level 2)	‡	(†)	79.7	(16.67)	#	(†)
Middle (Levels 2–4)	17.7	(4.97)	75.6	(5.08)	6.8 !	(2.64)
High (Level 5 and above)	‡	(†)	48.5 !	(15.09)	50.8	(15.22)

† Not applicable.
# Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Race categories exclude persons of Hispanic ethnicity. "Other" includes those who identified themselves as "Two or more races," "American Indian/Alaska Native," and "Native Hawaiian/Other Pacific Islander." See exhibits 2 and 4 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-10. Percentage distribution of U.S. 19-year-olds, by ESO numeracy proficiency level and PISA 2012 mathematics proficiency level: 2016

PISA 2012 mathematics proficiency levels	ESO numeracy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
Low (Below level 2)	60.1	(4.28)	39.6	(4.31)	‡	(†)
Middle (Levels 2–4)	16.6	(1.99)	79.2	(2.00)	4.2	(0.59)
High (Level 5 and above)	‡	(†)	53.6	(3.76)	45.8	(3.87)

† Not applicable.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. See exhibits 3 and 5 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-11. Percentage distribution of U.S. 19-year-olds, by ESO numeracy proficiency level, sex, and PISA 2012 mathematics proficiency level: 2016

PISA 2012 mathematics proficiency levels	ESO numeracy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
	Male					
Low (Below level 2)	63.8	(5.88)	35.6	(5.92)	‡	(†)
Middle (Levels 2–4)	18.8	(3.25)	76.0	(3.27)	5.2	(0.89)
High (Level 5 and above)	‡	(†)	49.4	(7.18)	49.6	(6.80)
	Female					
Low (Below level 2)	56.0	(5.79)	44.0	(5.79)	#	(†)
Middle (Levels 2–4)	14.3	(1.89)	82.5	(2.12)	3.2	(0.77)
High (Level 5 and above)	‡	(†)	58.3	(6.11)	41.5	(6.09)

† Not applicable.
# Rounds to zero.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. See exhibits 3 and 5 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-12. Percentage distribution of U.S. 19-year-olds, by ESO numeracy proficiency level, national quarters of the PISA 2012 index of economic, social, and cultural status (ESCS), and PISA 2012 mathematics proficiency level: 2016

PISA 2012 mathematics proficiency levels	ESO numeracy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
	Bottom quarter					
Low (Below level 2)	68.6	(7.01)	31.2	(7.16)	‡	(†)
Middle (Levels 2–4)	23.8	(5.84)	73.1	(5.90)	3.1 !	(1.23)
High (Level 5 and above)	‡	(†)	54.6 !	(16.54)	44.2 !	(16.89)
	Second quarter					
Low (Below level 2)	54.9	(7.90)	45.1	(7.90)	#	(†)
Middle (Levels 2–4)	16.9	(2.65)	79.6	(3.13)	3.5 !	(1.40)
High (Level 5 and above)	‡	(†)	56.1	(11.21)	42.6	(12.11)
	Third quarter					
Low (Below level 2)	55.5	(9.42)	43.2	(9.39)	‡	(†)
Middle (Levels 2–4)	16.7	(2.98)	78.3	(3.38)	5.0	(1.27)
High (Level 5 and above)	#	(†)	55.2	(9.20)	44.8	(9.20)
	Top quarter					
Low (Below level 2)	49.5	(12.57)	50.5	(12.57)	#	(†)
Middle (Levels 2–4)	10.0	(2.26)	85.1	(2.11)	4.9	(1.36)
High (Level 5 and above)	‡	(†)	52.2	(5.32)	47.2	(5.67)

† Not applicable.
# Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. The PISA 2012 index of economic, social, and cultural status (ESCS) was created using student reports on parental occupation, the highest level of parental education, and an index of home possessions related to family wealth, home educational resources and possessions related to "classical" culture in the family home. The home possessions relating to "classical" culture in the family home included possessions such as works of classical literature, books of poetry, and works of art (e.g., paintings). See exhibits 3 and 5 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-13. Percentage distribution of U.S. 19-year-olds, by ESO numeracy proficiency level, free or reduced-price lunch (FRPL) status of students' schools at age 15, and PISA 2012 mathematics proficiency level: 2016

PISA 2012 mathematics proficiency levels	ESO numeracy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
	Schools with less than 25 percent of students eligible for FRPL					
Low (Below level 2)	42.6 !	(14.27)	57.4	(14.27)	#	(†)
Middle (Levels 2–4)	11.2	(2.94)	84.1	(2.72)	4.7	(1.18)
High (Level 5 and above)	‡	(†)	52.1	(5.33)	47.6	(5.58)
	Schools with 25 to 49.9 percent of students eligible for FRPL					
Low (Below level 2)	55.5	(12.09)	44.1	(12.03)	‡	(†)
Middle (Levels 2–4)	14.9	(2.83)	79.8	(3.03)	5.3	(1.10)
High (Level 5 and above)	‡	(†)	52.4	(7.14)	47.1	(6.87)
	Schools with 50 to 74.9 percent of students eligible for FRPL					
Low (Below level 2)	61.3	(6.33)	38.7	(6.33)	#	(†)
Middle (Levels 2–4)	14.1	(2.78)	82.3	(2.90)	3.6 !	(1.17)
High (Level 5 and above)	‡	(†)	55.3	(10.59)	42.7	(9.97)
	Schools with 75 percent or more students eligible for FRPL					
Low (Below level 2)	67.3	(8.63)	31.9	(8.28)	‡	(†)
Middle (Levels 2–4)	35.5 *	(6.50)	62.1 *	(6.70)	‡	(†)
High (Level 5 and above)	#	(†)	65.3	(13.56)	34.7 !	(13.56)

† Not applicable.
# Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Subgroup percentage is significantly different from the total percentage in table A-10 (p <.05).
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Data for students eligible for free or reduced-price lunch (FRPL) were available for public schools only. See exhibits 3 and 5 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-14. Percentage distribution of U.S. 19-year-olds, by ESO numeracy proficiency level, race/ethnicity, and PISA 2012 mathematics proficiency level: 2016

PISA 2012 mathematics proficiency levels	ESO numeracy proficiency levels					
	Low (Below level 2)		Middle (Levels 2–3)		High (Level 4 and above	
	[Standard errors appear in parentheses]					
	White					
Low (Below level 2)	50.2	(9.80)	48.8	(9.86)	‡	(†)
Middle (Levels 2–4)	14.2	(2.57)	80.7	(2.73)	5.0	(1.01)
High (Level 5 and above)	‡	(†)	51.0	(4.26)	48.2	(4.53)
	Black or African American					
Low (Below level 2)	69.8	(7.43)	30.2	(7.43)	#	(†)
Middle (Levels 2–4)	26.1 !	(8.96)	72.4	(9.01)	‡	(†)
High (Level 5 and above)	#	(†)	85.6 !	(27.70)	‡	(†)
	Hispanic or Latino					
Low (Below level 2)	61.6	(7.36)	38.4	(7.36)	#	(†)
Middle (Levels 2–4)	18.5	(3.17)	78.7	(3.33)	2.8 !	(1.01)
High (Level 5 and above)	#	(†)	54.0	(9.29)	46.0	(9.29)
	Asian					
Low (Below level 2)	67.0 !	(27.93)	‡	(†)	#	(†)
Middle (Levels 2–4)	12.6 !	(5.32)	80.6	(5.92)	6.9 !	(3.12)
High (Level 5 and above)	#	(†)	62.1	(11.43)	37.9 !	(11.43)
	Other					
Low (Below level 2)	59.4	(14.97)	40.6 !	(14.97)	#	(†)
Middle (Levels 2–4)	20.2 !	(6.75)	76.7	(7.12)	‡	(†)
High (Level 5 and above)	#	(†)	60.3	(14.44)	39.7 !	(14.44)

† Not applicable.
# Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Race categories exclude persons of Hispanic ethnicity. "Other" includes those who identified themselves as "Two or more races," "American Indian/Alaska Native," and "Native Hawaiian/Other Pacific Islander." See exhibits 3 and 5 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-15. Percentage distribution of U.S. 19-year-olds and correlations between PISA 2012 reading scores and ESO literacy scores, by selected demographic characteristics: 2016

Demographic characteristics	Total		Correlations between PISA 2012 reading scores and ESO literacy scores in 2016	
	[Standard errors appear in parentheses]			
Total	100.0	(†)	0.59	(0.025)
Gender				
Male	51.1	(1.56)	0.59	(0.032)
Female	48.9	(1.56)	0.57	(0.034)
Race/ethnicity				
White	52.5	(2.53)	0.55	(0.035)
Black or African American	12.3	(1.72)	0.50	(0.071)
Hispanic or Latino	23.0	(1.75)	0.56	(0.044)
Asian	5.8	(1.28)	0.69	(0.129)
Other	6.4	(1.07)	0.54	(0.095)
Born in the United States				
Native	77.1	(2.36)	0.57	(0.030)
First-generation native	15.2	(1.64)	0.61	(0.050)
Nonnative	7.7	(1.06)	0.64	(0.095)
Language at home				
English	86.4	(1.35)	0.58	(0.028)
Spanish	9.4	(1.04)	0.58	(0.071)
Other languages	4.2	(0.73)	0.60	(0.151)

† Not applicable.

NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Race categories exclude persons of Hispanic ethnicity. "Other" includes those who identified themselves as "Two or more races," "American Indian/Alaska Native," and "Native Hawaiian/Other Pacific Islander." Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-16. Percentage distribution of U.S. 19-year-olds and correlations between PISA 2012 mathematics scores and ESO numeracy scores, by selected demographic characteristics: 2016

Demographic characteristics	Total		Correlations between PISA 2012 mathematics scores and ESO numeracy scores in 2016	
	[Standard errors appear in parentheses]			
Total	100.0	(†)	0.69	(0.018)
Gender				
Male	51.3	(1.59)	0.69	(0.022)
Female	48.7	(1.59)	0.69	(0.026)
Race/ethnicity				
White	52.6	(2.57)	0.65*	(0.031)
Black or African American	12.5	(1.71)	0.60	(0.064)
Hispanic or Latino	22.9	(1.72)	0.67	(0.030)
Asian	5.8	(1.29)	0.79*	(0.092)
Other	6.1	(1.05)	0.69	(0.058)
Born in the United States				
Native	77.1	(2.30)	0.68	(0.022)
First-generation native	15.1	(1.60)	0.72	(0.034)
Nonnative	7.8	(1.02)	0.75	(0.055)
Language at home				
English	86.3	(1.30)	0.69	(0.021)
Spanish	9.4	(1.00)	0.70	(0.044)
Other languages	4.2	(0.73)	0.76	(0.104)

† Not applicable.
* The correlation statistic for the subgroup is significantly different from the correlation statistic for the total ($p < .05$).
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Race categories exclude persons of Hispanic ethnicity. "Other" includes those who identified themselves as "Two or more races," "American Indian/Alaska Native," and "Native Hawaiian/Other Pacific Islander." Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-17. Percentage distribution of U.S. 19-year-olds and correlations between PISA 2012 reading scores and ESO literacy scores, by selected socioeconomic characteristics: 2016

Socioeconomic characteristics	Total		Correlations between PISA 2012 reading scores and ESO literacy scores in 2016	
	[Standard errors appear in parentheses]			
Total	100.0	(†)	0.59	(0.025)
Highest level of parental educational attainment				
High school and below	39.3	(1.98)	0.53	(0.047)
Associate's degree	14.9	(1.26)	0.60	(0.043)
Bachelor's degree or higher	45.7	(1.84)	0.59	(0.033)
School location[1]				
Village (fewer than 3,000 people)	10.8	(2.57)	0.49	(0.113)
Small town (3,000 to about 15,000 people)	13.8	(3.41)	0.60	(0.057)
Town (15,000 to about 100,000 people)	38.7	(4.56)	0.54	(0.033)
City (100,000 to about 1,000,000 people)	26.4	(3.32)	0.64	(0.048)
Large city (with over 1,000,000 people)	10.3 !	(3.18)	0.58	(0.079)
School type				
Public	94.0	(1.05)	0.58	(0.026)
Private	6.0	(1.05)	0.65	(0.079)
Percentage of students eligible for free or reduced-price lunch[2]				
< 25% (least economically challenged)	27.4	(3.86)	0.50 *	(0.066)
> = 25% but < 50%	26.2	(3.52)	0.58	(0.046)
> = 50% but < 75%	29.8	(4.45)	0.58	(0.041)
> = 75% to < 100% (most economically challenged)	16.5	(3.82)	0.48 *	(0.083)
Index of economic, social, and cultural status[3]				
Bottom quarter	24.5	(1.80)	0.53	(0.061)
Second quarter	24.1	(1.20)	0.55	(0.053)
Third quarter	24.3	(1.19)	0.55	(0.054)
Top quarter	27.1	(1.88)	0.55	(0.040)

† Not applicable.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
* The correlation statistic for the subgroup is significantly different from the correlation statistic for the total ($p < .05$).
[1] Categorization for school location is based on OECD definition and differs from the standard NCES categories.
[2] Data for students eligible for free or reduced-price lunch (FRPL) were available for public schools only.
[3] The PISA 2012 index of economic, social, and cultural status (ESCS) was created using student reports on parental occupation, the highest level of parental education, and an index of home possessions related to family wealth, home educational resources and possessions related to "classical" culture in the family home. The home possessions relating to "classical" culture in the family home included possessions such as works of classical literature, books of poetry, and works of art (e.g., paintings). The cut points are calculated using the whole U.S. PISA 2012 sample.
NOTE: ESO stands for Education and Skills Online. Results reported are weighted estimates for the PISA YAFS population, which is nationally representative of PISA 2012 students 4 years later at approximately age 19. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-18. Percentage distribution of U.S. 19-year-olds and correlations between PISA 2012 mathematics scores and ESO numeracy scores, by selected socioeconomic characteristics: 2016

Socioeconomic characteristics	Total		Correlations between PISA 2012 mathematics scores and ESO numeracy scores in 2016	
	[Standard errors appear in parentheses]			
Total	100.0	(†)	0.69	(0.018)
Highest level of parental educational attainment				
High school and below	39.3	(2.01)	0.68	(0.027)
Associate's degree	15.1	(1.29)	0.67	(0.052)
Bachelor's degree or higher	45.6	(1.90)	0.67	(0.034)
School location[1]				
Village (fewer than 3,000 people)	10.6	(2.52)	0.54 *	(0.139)
Small town (3,000 to about 15,000 people)	13.7	(3.35)	0.68	(0.045)
Town (15,000 to about 100,000 people)	38.8	(4.56)	0.66	(0.027)
City (100,000 to about 1,000,000 people)	26.5	(3.33)	0.76 *	(0.034)
Large city (with over 1,000,000 people)	10.4 !	(3.22)	0.70	(0.066)
School type				
Public	93.7	(1.11)	0.69	(0.019)
Private	6.3	(1.11)	0.68	(0.077)
Percentage of students eligible for free or reduced-price lunch[2]				
< 25% (least economically challenged)	27.5	(3.89)	0.63 *	(0.045)
> = 25% but < 50%	26.0	(3.49)	0.70	(0.035)
> = 50% but < 75%	29.7	(4.44)	0.69	(0.032)
> = 75% to < 100% (most economically challenged)	16.7	(3.87)	0.54 *	(0.086)
Index of economic, social, and cultural status[3]				
Bottom quarter	24.7	(1.82)	0.66	(0.044)
Second quarter	23.9	(1.20)	0.64	(0.042)
Third quarter	24.5	(1.22)	0.65	(0.037)
Top quarter	26.9	(1.91)	0.68	(0.033)

† Not applicable.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
* The correlation statistic for the subgroup is significantly different from the correlation statistic for the total ($p < .05$).
[1] Categorization for school location is based on OECD definition and differs from the standard NCES categories.
[2] Data for students eligible for free or reduced-price lunch (FRPL) were available for public schools only.
[3] The PISA 2012 index of economic, social, and cultural status (ESCS) was created using student reports on parental occupation, the highest level of parental education, and an index of home possessions related to family wealth, home educational resources and possessions related to "classical" culture in the family home. The home possessions relating to "classical" culture in the family home included possessions such as works of classical literature, books of poetry, and works of art (e.g., paintings). The cut points are calculated using the whole U.S. PISA 2012 sample.
NOTE: ESO stands for Education and Skills Online. Results reported are weighted estimates for the PISA YAFS population, which is nationally representative of PISA 2012 students 4 years later at approximately age 19. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-19. Percentage distribution of U.S. 19-year-olds and correlations between PISA 2012 reading scores and ESO literacy scores, by selected behavioral and affective characteristics: 2016

Behavioral or affective characteristics	Total		Correlations between PISA 2012 reading scores and ESO literacy scores in 2016	
	[Standard errors appear in parentheses]			
Total	100.0	(†)	0.59	(0.025)
Frequency of skipping whole school day				
None	78.2	(1.59)	0.57	(0.027)
One or more	21.8	(1.59)	0.63	(0.050)
Openness to problem solving[1]				
Bottom quarter	23.9	(1.47)	0.53	(0.081)
Second quarter	24.4	(1.62)	0.52	(0.068)
Third quarter	25.6	(1.84)	0.61	(0.039)
Top quarter	26.1	(1.38)	0.61	(0.045)
"I feel happy at school."				
Strongly agree and agree	80.0	(1.63)	0.61	(0.039)
Disagree and strongly disagree	20.0	(1.63)	0.52	(0.081)

† Not applicable.
[1] The PISA 2012 openness to problem solving index was created using student responses to questions asking about the extent to which they feel they resemble someone who can handle a lot of information, is quick to understand things, seeks explanations for things, can easily link facts together and likes to solve complex problems. The cut points are calculated using the whole U.S. PISA 2012 sample.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-20. Percentage distribution of U.S. 19-year-olds and correlations between PISA 2012 mathematics scores and ESO numeracy scores, by selected behavioral and affective characteristics: 2016

Behavioral or affective characteristics	Total		Correlations between PISA 2012 mathematics scores and ESO numeracy scores in 2016	
	[Standard errors appear in parentheses]			
Total	100.0	(†)	0.69	(0.018)
Frequency of skipping whole school day				
None	78.2	(1.57)	0.69	(0.024)
One or more	21.8	(1.57)	0.68	(0.047)
Openness to problem solving[1]				
Bottom quarter	23.7	(1.45)	0.60*	(0.058)
Second quarter	25.0	(1.55)	0.60*	(0.053)
Third quarter	25.3	(1.77)	0.70	(0.040)
Top quarter	26.0	(1.38)	0.72	(0.029)
"I feel happy at school."				
Strongly agree and agree	79.8	(1.60)	0.72	(0.023)
Disagree and strongly disagree	20.2	(1.60)	0.67	(0.053)

† Not applicable.
* The correlation statistic for the subgroup is significantly different from the correlation statistic for the total ($p < .05$).
[1] The PISA 2012 openness to problem solving index was created using student responses to questions asking about the extent to which they feel they resemble someone who can handle a lot of information, is quick to understand things, seeks explanations for things, can easily link facts together and likes to solve complex problems. The cut points are calculated using the whole U.S. PISA 2012 sample.
NOTE: ESO stands for Education and Skills Online. Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. As part of PISA YAFS, participants completed the ESO assessments.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-21. Percentage distribution of U.S. 19-year-olds, by PISA 2012 reading proficiency levels and selected education characteristics: 2016

Education characteristics in 2016	Total		PISA 2012 reading proficiency levels					
			Low (Below level 2)		Middle (Levels 2–4)		High (Level 5 and above)	
	[Standard errors appear in parentheses]							
Total	100.0	(†)	100.0	(†)	100.0	(†)	100.0	(†)
Degree currently pursued								
Bachelor's degree and above	45.2	(1.98)	12.4*	(3.26)	46.6	(2.03)	83.9*	(3.52)
Pre-associate's or associate's degree	20.1	(1.29)	15.3	(4.22)	22.1	(1.47)	10.8*	(2.77)
High school diploma	8.8	(1.12)	23.3*	(5.65)	7.1	(1.10)	‡	(†)
Not currently studying, has a high school diploma	19.5	(1.53)	31.7	(5.73)	19.2	(1.65)	‡	(†)
Not currently studying, does not have a high school diploma	6.3	(1.20)	17.4 !	(5.90)	5.1	(1.22)	‡	(†)
Area of study currently pursued								
Social sciences	15.0	(1.03)	‡	(†)	16.5	(1.25)	17.9	(3.03)
Health	12.8	(0.85)	5.3 !*	(2.04)	14.1	(1.03)	12.7	(2.65)
Sciences	11.6	(0.81)	‡	(†)	11.6	(1.02)	26.6*	(3.61)
Engineering	7.1	(0.66)	3.2 !	(1.38)	6.8	(0.69)	15.2*	(2.72)
Humanities	6.1	(0.60)	‡	(†)	6.0	(0.75)	13.9*	(2.75)
General programs	4.8	(0.62)	‡	(†)	5.1	(0.70)	‡	(†)
Teacher training	4.6	(0.53)	‡	(†)	5.2	(0.64)	4.5 !	(2.08)
Services	2.4	(0.36)	3.8 !	(1.53)	2.2	(0.41)	‡	(†)
Agriculture	1.0	(0.24)	#	(†)	1.1	(0.30)	‡	(†)
Currently pursuing a high school diploma	8.8	(1.12)	23.3*	(5.65)	7.1	(1.10)	‡	(†)
Not currently studying	25.9	(1.55)	49.1*	(6.37)	24.3	(1.72)	3.8 !*	(1.85)
Nonformal education participation in the last 12 months[1]								
Participated in nonformal education	66.4	(1.45)	58.7	(5.64)	67.5	(1.63)	69.2	(3.73)
Did not participate	33.2	(1.45)	40.5	(5.65)	32.3	(1.63)	30.4	(3.73)
Missing	0.3 !	(0.13)	‡	(†)	‡	(†)	‡	(†)

† Not applicable.
# Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents in proficiency level category is significantly different from percentage of total U.S. PISA YAFS population for the given education characteristic ($p < .05$).
[1] Nonformal education includes distance education, job training, seminars, and private training.
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The education characteristics data in this table are from a background questionnaire that participants completed as a part of PISA YAFS. See exhibit 2 for descriptions of proficiency levels. Data for "Area of study currently pursued" excludes five missing cases. Percentages may thus differ slightly from their analogous categories in the "Degree currently pursued" variable, for which there were no missing cases. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-22. Percentage distribution of U.S. 19-year-olds, by PISA 2012 mathematics proficiency levels and selected education characteristics: 2016

Education characteristics in 2016	Total		PISA 2012 mathematics proficiency levels: Low (Below level 2)		Middle (Levels 2–4)		High (Level 5 and above)	
	[Standard errors appear in parentheses]							
Total	100.0	(†)	100.0	(†)	100.0	(†)	100.0	(†)
Degree currently pursued								
Bachelor's degree and above	45.1	(2.00)	14.8*	(2.35)	49.0	(2.15)	86.3*	(2.63)
Pre-associate's or associate's degree	20.0	(1.29)	18.5	(3.15)	22.1	(1.59)	8.5*	(2.20)
High school diploma	9.0	(1.10)	22.2*	(3.73)	5.7	(1.05)	‡	(†)
Not currently studying, has a high school diploma	19.7	(1.50)	30.4	(4.08)	18.7	(1.81)	3.4 !*	(1.59)
Not currently studying, does not have a high school diploma	6.2	(1.19)	14.1	(4.18)	4.5	(1.07)	‡	(†)
Area of study currently pursued								
Social sciences	14.9	(1.00)	6.3 !*	(2.36)	17.3	(1.36)	17.8	(2.89)
Health	12.5	(0.83)	8.4	(1.66)	14.3	(1.10)	9.0	(2.24)
Sciences	11.7	(0.83)	3.5 !*	(1.23)	11.9	(1.07)	29.1*	(4.16)
Engineering	7.1	(0.65)	2.3 !*	(1.06)	6.6	(0.90)	20.9*	(3.40)
Humanities	6.2	(0.61)	2.7 !	(1.27)	6.5	(0.80)	11.8	(2.68)
General programs	4.9	(0.58)	4.9 !	(1.75)	5.4	(0.68)	‡	(†)
Teacher training	4.5	(0.49)	2.7 !	(1.29)	5.3	(0.72)	3.7 !	(1.51)
Services	2.3	(0.35)	2.4 !	(1.08)	2.4	(0.50)	‡	(†)
Agriculture	1.0	(0.24)	#	(†)	1.4	(0.33)	‡	(†)
Currently pursuing a high school diploma	9.0	(1.10)	22.2*	(3.74)	5.7	(1.05)	‡	(†)
Not currently studying	26.0	(1.58)	44.6*	(4.55)	23.2	(1.76)	3.6 !*	(1.54)
Nonformal education participation in the last 12 months[1]								
Participated in nonformal education	66.7	(1.44)	64.0	(4.14)	67.7	(1.70)	66.1	(3.82)
Did not participate	32.9	(1.43)	35.3	(4.16)	32.1	(1.70)	33.1	(3.95)
Missing	0.4 !	(0.14)	‡	(†)	‡	(†)	‡	(†)

† Not applicable.
# Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents in proficiency level category is significantly different from percentage of total U.S. PISA YAFS population for the given education characteristic ($p < .05$).
[1] Nonformal education includes distance education, job training, seminars, and private training.
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The education characteristics data in this table are from a background questionnaire that participants completed as a part of PISA YAFS. See exhibit 3 for descriptions of proficiency levels. Data for "Area of study currently pursued" excludes two missing cases. Percentages may thus differ slightly from their analogous categories in the "Degree currently pursued" variable, for which there were no missing cases. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-23. Percentage distribution of U.S. 19-year-olds, by PISA 2012 reading proficiency levels and selected employment, education, and occupation status: 2016

Employment, education, and occupation status in 2016	Total		PISA 2012 reading proficiency levels					
			Low (Below level 2)		Middle (Levels 2–4)		High (Level 5 and above)	
	[Standard errors appear in parentheses]							
Total	100.0	(†)	100.0	(†)	100.0	(†)	100.0	(†)
Employment status								
Unemployed (not looking for work)	24.4	(1.36)	18.3	(5.45)	23.0	(1.65)	45.9 *	(4.11)
Unemployed (looking for work)	18.3	(1.22)	25.9	(4.85)	18.2	(1.44)	8.1 !*	(2.52)
Apprentice/intern	1.2	(0.24)	‡	(†)	1.2	(0.32)	‡	(†)
Part-time employed	39.9	(1.70)	31.1	(5.74)	41.7	(2.01)	37.4	(3.78)
Full-time employed	13.4	(1.05)	17.3	(4.01)	13.6	(1.12)	5.1 !*	(1.88)
Other	2.8	(0.83)	‡	(†)	2.3 !	(0.98)	‡	(†)
Combined employment and education status								
In employment only[1]	16.2	(1.18)	29.2	(5.67)	15.5	(1.38)	‡	(†)
In formal education only	34.9	(1.73)	31.7	(6.78)	33.5	(2.14)	52.4 *	(4.84)
Both in employment and formal education	38.3	(1.54)	19.2 *	(4.36)	41.1	(1.69)	43.2	(4.31)
Neither employed nor in formal education	7.8	(1.19)	12.5 !	(4.04)	7.6	(1.26)	‡	(†)
In formal education, employment status other[2]	0.9	(0.26)	#	(†)	1.1	(0.33)	‡	(†)
Not in formal education, employment status other[2]	1.9 !	(0.75)	‡	(†)	‡	(†)	‡	(†)
Current occupation[3]								
Armed forces occupations	2.0	(0.44)	‡	(†)	2.3	(0.61)	‡	(†)
Managers	2.7	(0.43)	‡	(†)	3.2	(0.51)	‡	(†)
Professionals	4.6	(0.62)	‡	(†)	4.6	(0.64)	7.0	(2.07)
Technicians and associate professionals	4.0	(0.55)	‡	(†)	4.1	(0.61)	4.3 !	(1.66)
Clerical support workers	2.9	(0.44)	‡	(†)	3.1	(0.49)	2.1 !	(0.97)
Service and sales workers	30.7	(1.47)	32.9	(6.06)	30.8	(1.63)	26.3	(3.92)
Skilled agricultural, forestry and fish	0.9	(0.26)	‡	(†)	1.0 !	(0.30)	‡	(†)
Craft and related trades workers	4.4	(0.62)	6.1 !	(2.44)	4.5	(0.78)	‡	(†)
Plant and machine operators, and assembly	2.0	(0.48)	‡	(†)	1.8 !	(0.56)	‡	(†)
Elementary occupations[4]	3.1	(0.49)	‡	(†)	3.5	(0.61)	‡	(†)

See notes at end of table.

Table A-23. Percentage distribution of U.S. 19-year-olds, by PISA 2012 reading proficiency levels and selected employment, education, and occupation status: 2016—Continued

Employment, education, and occupation status in 2016	Total		PISA 2012 reading proficiency levels: Low (Below level 2)		Middle (Levels 2–4)		High (Level 5 and above)	
	[Standard errors appear in parentheses]							
Unemployed (not looking for work)	24.4	(1.36)	18.3	(5.45)	23.0	(1.65)	45.9*	(4.11)
Unemployed (looking for work)	18.3	(1.22)	25.9	(4.85)	18.2	(1.44)	8.1 !*	(2.52)

† Not applicable.
# Rounds to zero.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents in proficiency level category is significantly different from percentage of total U.S. PISA YAFS population for the given employment and education characteristic ($p < .05$).
[1] Employment is defined as being either full- or part-time employed or an apprentice/intern.
[2] Employment status other indicates "other" was selected.
[3] Current occupation is for those employed full or part time or as an apprentice/intern.
[4] Elementary occupations include crop farm laborer, shelf filler, kitchen helper, refuse worker, etc.
NOTE: Results reported are weighted estimates for the PISA YAFS population, which is nationally representative of PISA 2012 students 4 years later at approximately age 19. Data on employment, education, and occupation status in this table are from a background questionnaire that participants completed as a part of PISA YAFS. See exhibit 2 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-24. Percentage distribution of U.S. 19-year-olds, by PISA 2012 mathematics proficiency levels and selected employment, education, and occupation status: 2016

Employment, education, and occupation status in 2016	Total		PISA 2012 mathematics proficiency levels: Low (Below level 2)		Middle (Levels 2–4)		High (Level 5 and above)	
	[Standard errors appear in parentheses]							
Total	100.0	(†)	100.0	(†)	100.0	(†)	100.0	(†)
Employment status								
Unemployed (not looking for work)	24.3	(1.35)	16.5	(3.73)	23.5	(1.75)	46.4*	(3.32)
Unemployed (looking for work)	18.5	(1.20)	25.7	(3.47)	17.5	(1.46)	8.9*	(1.95)
Apprentice/intern	1.3	(0.25)	‡	(†)	1.3	(0.37)	3.1 !	(1.40)
Part-time employed	39.7	(1.69)	35.1	(3.74)	42.0	(1.96)	34.6	(3.78)
Full-time employed	13.6	(1.06)	15.9	(2.84)	13.9	(1.35)	5.8 !*	(1.75)
Other	2.8	(0.82)	6.4 !	(2.87)	1.8 !	(0.63)	‡	(†)
Combined employment and education status								
In employment only[1]	16.3	(1.22)	27.7*	(3.81)	14.7	(1.42)	‡	(†)
In formal education only	34.9	(1.70)	31.0	(4.17)	33.4	(1.92)	53.9*	(3.59)
Both in employment and formal education	38.2	(1.53)	23.6*	(3.31)	42.5	(1.87)	41.7	(3.83)
Neither employed nor in formal education	7.8	(1.15)	11.2	(2.68)	7.7	(1.34)	‡	(†)
In formal education, employment status other[2]	0.9	(0.26)	‡	(†)	0.9 !	(0.32)	‡	(†)
Not in formal education, employment status other[2]	1.9 !	(0.74)	5.6 !	(2.78)	‡	(†)	‡	(†)

See notes at end of table.

Table A-24. Percentage distribution of U.S. 19-year-olds, by PISA 2012 mathematics proficiency levels and selected employment, education, and occupation status: 2016—Continued

Employment, education, and occupation status in 2016	Total		PISA 2012 mathematics proficiency levels: Low (Below level 2)		Middle (Levels 2–4)		High (Level 5 and above)	
	[Standard errors appear in parentheses]							
Current occupation[3]								
Armed forces occupations	1.9	(0.44)	‡	(†)	2.3	(0.65)	‡	(†)
Managers	2.7	(0.42)	‡	(†)	3.4	(0.61)	‡	(†)
Professionals	4.6	(0.62)	3.7 !	(1.56)	4.4	(0.67)	7.8	(1.72)
Technicians and associate professionals	4.0	(0.55)	3.9 !	(1.57)	4.1	(0.69)	3.6 !	(1.29)
Clerical support workers	2.9	(0.42)	2.6 !	(1.12)	3.0	(0.51)	2.7 !	(1.16)
Service and sales workers	30.6	(1.44)	33.4	(4.34)	30.9	(1.66)	22.9	(3.43)
Skilled agricultural, forestry and fish	1.0	(0.26)	‡	(†)	1.0 !	(0.33)	‡	(†)
Craft and related trades workers	4.4	(0.62)	4.8	(1.13)	4.6	(0.83)	‡	(†)
Plant and machine operators, and assembly	2.0	(0.48)	2.9 !	(1.27)	1.9	(0.54)	‡	(†)
Unemployed (not looking for work)	24.3	(1.35)	16.5	(3.73)	23.5	(1.75)	46.4 *	(3.32)
Unemployed (looking for work)	18.5	(1.20)	25.7	(3.47)	17.5	(1.46)	8.9 *	(1.95)

† Not applicable.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
‡ Reporting standards not met. The coefficient of variation (CV) for this estimate is 50 percent or greater.
* Percentage of respondents in proficiency level category is significantly different from percentage of total U.S. PISA YAFS population for the given employment and education characteristic ($p < .05$).
[1] Employment is defined as being either full- or part-time employed or an apprentice/intern.
[2] Employment status other indicates "other" was selected.
[3] Current occupation is for those employed full or part time or as an apprentice/intern.
[4] Elementary occupations include crop farm laborer, shelf filler, kitchen helper, refuse worker, etc.
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. Data on employment, education, and occupation status in this table are from a background questionnaire that participants completed as a part of this study in 2016. See exhibit 3 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-25. Percentage distribution of U.S. 19-year-olds' personality characteristics and their averages on the vocational interests index, by PISA 2012 reading proficiency levels: 2016

Personality characteristics and averages on the vocational interests index in 2016	Total		PISA 2012 reading proficiency levels: Low (Below level 2)		Middle (Levels 2–4)		High (Level 5 and above)	
	[Standard errors appear in parentheses]							
Total	100.0	(†)	100.0	(†)	100.0	(†)	100.0	(†)
Level of self-efficacy[1]								
Low	7.9	(0.97)	14.2 !	(4.78)	7.4	(1.02)	3.2 !	(1.45)
Moderate	39.5	(1.44)	37.4	(5.81)	40.8	(1.66)	30.9	(3.81)
High	21.8	(1.27)	20.8	(5.45)	22.7	(1.48)	16.2	(3.03)
Not applicable	24.4	(1.36)	18.3	(5.45)	23.0	(1.65)	45.9 *	(4.11)
Missing	6.4	(0.70)	9.3 !	(2.89)	6.2	(0.80)	3.7 !	(1.29)
Life satisfaction								
Low	20.9	(1.24)	23.5	(5.38)	21.1	(1.31)	15.0	(2.68)
Moderate	36.9	(1.20)	30.3	(6.45)	37.9	(1.75)	38.4	(4.14)
High	33.6	(1.36)	31.1	(5.52)	33.2	(1.65)	40.2	(4.43)
Missing	8.6	(0.84)	15.1	(4.40)	7.7	(0.83)	6.3	(1.69)
Average on the vocational interests index[2]								
Realistic	15.1	(0.31)	16.8	(1.21)	15.0	(0.33)	13.8	(0.82)
Investigative	17.6	(0.28)	16.0	(1.15)	17.5	(0.36)	20.5 *	(0.81)
Artistic	17.7	(0.31)	16.0	(1.38)	17.8	(0.39)	18.9	(0.91)
Social	20.8	(0.25)	19.7	(0.94)	21.1	(0.33)	20.0	(0.69)
Enterprising	19.4	(0.25)	19.6	(1.52)	19.6	(0.31)	17.4 *	(0.61)
Conventional	15.4	(0.30)	15.9	(1.45)	15.4	(0.36)	14.6	(0.64)

† Not applicable.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
* Percentage of respondents in proficiency level category is significantly different from percentage of total U.S. PISA YAFS population for the given personality characteristic ($p < .05$).
[1] Self-efficacy questions were not asked from the unemployed, not looking for work (out of the labor force) 19-year-olds and these data are marked as "Not applicable" in this table.
[2] The scores on the vocational scales range from 0 to 40. The realistic type of individual is interested in manual types of jobs, the investigative type is curious and scientifically oriented, the artistic type prefers creative activities through different art forms, the social type is interested in working with people, the enterprising type leads and influences people, and the conventional type prefers well-structured situations. For more information on the vocational scales and interest categories, see OECD 2015.
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The personality characteristics data in this table are from a background questionnaire that participants completed as a part of PISA YAFS. See exhibit 2 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Table A-26. Percentage distribution of U.S. 19-year-olds' personality characteristics and their averages on the vocational interests index, by PISA 2012 mathematics proficiency levels: 2016

Personality characteristics and averages on the vocational interests index in 2016	Total		PISA 2012 mathematics proficiency levels: Low (Below level 2)		Middle (Levels 2–4)		High (Level 5 and above)	
	[Standard errors appear in parentheses]							
Total	100.0	(†)	100.0	(†)	100.0	(†)	100.0	(†)
Level of self-efficacy[1]								
Low	7.8	(0.95)	11.7	(2.84)	7.1	(1.12)	3.9 !	(1.66)
Moderate	38.8	(1.45)	40.2	(4.42)	39.7	(1.89)	29.7	(3.82)
High	21.5	(1.26)	21.8	(4.23)	22.3	(1.44)	15.6	(3.04)
Not applicable	24.3	(1.35)	16.5	(3.73)	23.5	(1.75)	46.4 *	(3.32)
Missing	7.6	(0.64)	9.7	(2.33)	7.4	(0.73)	4.4 !	(1.77)
Life satisfaction								
Low	20.6	(1.21)	23.6	(3.39)	20.6	(1.32)	13.9	(2.63)
Moderate	36.3	(1.24)	35.7	(4.54)	36.1	(1.61)	39.7	(3.36)
High	33.0	(1.31)	28.0	(3.58)	33.7	(1.53)	39.6	(3.17)
Missing	10.0	(0.84)	12.6	(3.15)	9.6	(0.83)	6.9 !	(2.37)
Average on the vocational interests index[2]								
Realistic	15.1	(0.31)	15.3	(0.78)	15.1	(0.37)	15.0	(0.88)
Investigative	17.6	(0.28)	15.7 *	(0.69)	17.8	(0.37)	20.4 *	(0.84)
Artistic	17.7	(0.31)	16.9	(0.73)	17.8	(0.37)	18.6	(0.81)
Social	20.8	(0.25)	20.1	(0.61)	21.2	(0.33)	19.5	(0.57)
Enterprising	19.4	(0.25)	20.0	(1.01)	19.5	(0.29)	17.7 *	(0.43)
Conventional	15.4	(0.30)	15.7	(0.84)	15.3	(0.32)	15.1	(0.68)

† Not applicable.
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
* Percentage of respondents in proficiency level category is significantly different from percentage of total U.S. PISA YAFS population for the given personality characteristic ($p < .05$).
[1] Self-efficacy questions were not asked from the unemployed, not looking for work (out of the labor force) 19-year-olds and these data are marked as "Not applicable" in this table.
[2] The scores on the vocational scales range from 0 to 40. The realistic type of individual is interested in manual types of jobs, the investigative type is curious and scientifically oriented, the artistic type prefers creative activities through different art forms, the social type is interested in working with people, the enterprising type leads and influences people, and the conventional type prefers well-structured situations. For more information on the vocational scales and interest categories, see OECD 2015.
NOTE: Estimates for 19-year-olds are for individuals who were 15-year-old students in the fall of 2012 and who participated in PISA YAFS in 2016. The personality characteristics data in this table are from a background questionnaire that participants completed as a part of PISA YAFS. See exhibit 3 for descriptions of proficiency levels. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for International Student Assessment (PISA), 2012; and Program for International Student Assessment Young Adult Follow-up Study (PISA YAFS), 2016.

Appendix B. Glossary of Terms

The variables used in the analyses for this report are described below. The names of variables that were used to produce estimates for this report appear in capital letters. Since the variables come from the PISA YAFS public-use data file (NCES 2021, forthcoming) as well as from the PISA 2012 public-use data file (NCES 2014), the source data file is noted in parentheses next to the variables. In some cases, the variables have been used in the exact format in which they appear in the data file. In other cases, variables available in the data file have been modified (e.g., when the categories have been combined to create a smaller number of categories). Such collapsing of categories and the names of original variables are noted in the descriptions. In other cases, new measures have been created specifically for this report by combining information from two or more variables in the data file. In these instances, the names of original variables used to create the new measure are also noted.

In this analysis, 3 percent or less of PISA 2012 variables' data for gender; race/ethnicity; nativity; language spoken at home; parents' education; school location; school type; percentage of students receiving free or reduced-price lunch; index of economic, social, and cultural status; and frequency of skipping a whole school day are missing. Index of openness to problem solving and a variable of "I feel happy at school" have higher rates of missing (35 and 37 percent, respectively). Cases that are missing are excluded for the analysis of that variable.

Variables

PISA 2012 reading proficiency levels (PISA 2012): These variables are derived based on the PISA 2012 reading plausible values, PV1READ, PV2READ, PV3READ, PV4READ, and PV5READ. The average of the five plausible values is used in the derivation of proficiency levels. If the respondent's average reading plausible values are between 0 (included) and 407.47 (included), the proficiency level is defined as below level 2. If the respondent's average reading plausible values are between 407.47 (not included) and 625.61 (included), the proficiency level is defined as level 2 to level 4. If the respondent's reading average plausible values are between 625.61 (not included) and 1,000 (included), the proficiency level is defined as level 5 and above. (Note that these score-point thresholds have been rounded in exhibit 2.) For more details on the estimation procedures using plausible values, refer to Chapter 8 of the PISA YAFS Technical Report (Kastberg et al. forthcoming).

The values for PISA 2012 reading proficiency levels are as follows:
1 = Below level 2
2 = Level 2 to level 4
3 = Level 5 and above

PISA 2012 mathematics proficiency levels (PISA 2012): These variables are derived based on PISA 2012 mathematics plausible values, PV1MATH, PV2MATH, PV3MATH, PV4MATH, and PV5MATH. The average of the five plausible values is used in the derivation of proficiency levels. If the respondent's average mathematics plausible values are between 0 (included) and 420.07 (included), the proficiency level is defined as below level 2. If the respondent's average mathematics plausible values are between 420.07 (not included) and 606.99 (included), the proficiency level is defined as level 2 to level 4. If the respondent's average mathematics plausible values are between 606.99 (not included) and 1000 (included), the proficiency level is defined as level 5 and above. (Note that these score-point thresholds have been rounded in exhibit 3.) For more details on the estimation procedures using plausible values, refer to Chapter 8 of the PISA YAFS Technical Report (Kastberg et al. forthcoming).

The values for PISA 2012 mathematics proficiency levels are as follows:
1 = Below level 2
2 = Level 2 to level 4
3 = Level 5 and above

ESO literacy proficiency levels (PISA YAFS): These variables are derived based on the ESO literacy plausible values, PVLIT1–PVLIT10. In the analysis where only ESO literacy proficiency scores or levels are involved, an average of all 10 plausible values is used in the derivation of proficiency levels. When both PISA reading and ESO literacy proficiency scores or levels are involved, an average of the first five plausible values of the ESO are used in the derivation of proficiency levels. If the respondent's average literacy plausible values are between 0 (included) and 226 (not included), the proficiency level is defined as below level 2. If the respondent's average literacy plausible values are between 226 (included) and 326 (not included), the proficiency level is defined as level 2 to level 3. If the respondent's average literacy plausible values are between 326 (included) and 500 (included), the proficiency level is defined as level 4 and above. For more details on the estimation procedures using plausible values, refer to Chapter 8 of the PISA YAFS Technical Report (Kastberg et al. forthcoming).

The values for ESO literacy proficiency levels are as follows:
1 = Below level 2 (ESO)
2 = Level 2 to level 3 (ESO)
3 = Level 4 and above (ESO)

ESO numeracy proficiency levels (PISA YAFS): These variables are derived based on the ESO numeracy plausible values, PVNUM1–PVNUM10. In the analysis where only ESO numeracy proficiency scores or levels are involved, an average of all 10 plausible values is used in the derivation of proficiency levels. When both PISA mathematics and ESO numeracy proficiency scores or levels are involved, an average of the first five plausible values of the ESO are used in the derivation of proficiency levels. If the respondent's average numeracy plausible values are between 0 (included) and 226 (not included), the proficiency level is defined as below level 2. If the respondent's average numeracy plausible values are between 226 (included) and 326 (not included), the proficiency level is defined as level 2 to level 3. If the respondent's average numeracy plausible values are between 326 (included) and 500 (included), the proficiency level is defined as level 4 and above. For more details on the estimation procedures using plausible values, refer to Chapter 8 of the PISA YAFS Technical Report (Kastberg et al. forthcoming).

The values for ESO numeracy proficiency levels are as follows:
1 = Below level 2 (ESO)
2 = Level 2 to level 3 (ESO)
3 = Level 4 and above (ESO)

Gender (PISA 2012): The variable indicates the respondent's sex. It comes directly from the respondent's response to the survey question about their sex, ST04Q01.

The values for gender are as follows:
1 = Male
2 = Female

Race/Ethnicity (PISA 2012): The variable indicates the respondent's race and ethnicity. The variable is derived from the respondent's response to the survey question about their race and ethnicity, RACETHC. The values of this variable are the same with the values of RACETHC, with only one exception: When RACETHC is multiracial or other, the race/ethnicity variable is coded as other.

The values for race/ethnicity are as follows:
1 = White
2 = Black or African American
3 = Hispanic or Latino
4 = Asian
5 = Other

Nativity (PISA 2012): The variable is derived from the respondent's country of birth (ST20Q01), the respondent's parents' country of birth (ST20Q02 and ST20Q03), and the respondent's family structure (FAMSTRUC). If the respondent and one or both parents were born in the United States, the variable is coded as native born, parent native. If the respondent was born in the United States and both parents were born outside the United States or the respondent was born in the United States and lives in a single-parent family with the parent born outside the Unites States, the variable is coded as native born, parent(s) nonnative. If the respondent was not born in the United States, regardless of the nativity status of the parent, the variable is coded as nonnative.

The values for nativity are as follows:
1 = Native born, parent native
2 = Native born, parent(s) nonnative
3 = Nonnative

Language spoken at home (PISA 2012): The variable indicates the language the respondent speaks at home. It is a derived variable based on the respondent's response to the survey question about the language they speak at home, LANGN.

The values for language spoken at home are as follows:
1 = English
2 = Spanish
3 = Other languages

Parents' Education (PISA 2012): The variable indicates the highest level of education completed by the respondent's parents. It is a derived variable based on the respondent's parents' education set into the International Standard Classification of Education (ISCED) categories, HISCED. When the parents' ISCED is none, 1, 2, 3C, 3B, 3A, or 4, the variable is coded as high school and below. When the parents' ISCED is 5B, the variable is coded as associate's degree. When the parents' ISCED is 5A or 6, the variable is coded as bachelor's degree or higher.

The values for parents' education are as follows:
1 = High school and below
2 = Associate's degree
3 = Bachelor's degree or higher

School Location (PISA 2012): The variable indicates the types of the school location. It comes directly from the response of the respondent's school administrator to the survey question about the school location, SC03Q01.

The values for school location are as follows:
1 = Village
2 = Small town
3 = Town
4 = City
5 = Large city

School Type (PISA 2012): The variable indicates whether the school is a public or private school. It is a derived variable based on the response of the respondent's school administrator to the survey question about the school type, PUBPRIV.

The values for school type are as follows:
1 = Public
2 = Private

Percentage of Free or Reduced-Price Lunch (PISA 2012): The variable indicates the percentage of students enrolled in the free or reduced-price lunch program in the school. It is a derived variable based on the response of the respondent's school administrator to the survey question about the percentage of students enrolled in the free or reduced-price lunch program in the respondent's school, FRPL.

The values for percentage of free or reduced-priced lunch are as follows:
1 = Less than 25 percent
2 = 25 to 49.9 percent
3 = 50 to 74.9 percent
4 = 75 percent or more

Index of economic, social, and cultural status (PISA 2012): This variable is derived from several variables such as parental education and occupation, the number and type of home possessions that are considered proxies for wealth, and the number of books and other educational resources available at home. For more on the index, refer to *PISA 2012 Results* (Volume II), Box II.2.1 (OECD 2013c). Students are categorized into quarters based on the index of economic, social, and cultural status. To assign students with the same index into different quarters, a random subsampling process is implemented by adding a small random variable to the index before dividing the index variable into quarters. The procedure is documented in the *PISA Data Analysis Manual* (2nd ed.), Chapter 14 (OECD 2009).

The values for index of economic, social, and cultural status are as follows:
1 = Bottom quarter
2 = Second quarter
3 = Third quarter
4 = Top quarter

Frequency of skipping whole school day (PISA 2012): The variable indicates the number of times the respondent skipped a whole school day in the last two full weeks of school. It comes directly from the respondent's response to the survey question about the number of times in the last two full weeks of school they skipped a whole school day, ST09Q01. When ST09Q01 is none, the variable is coded as none. When ST09Q01 is one or two times, three or four times, or five or more times, the variable is coded as one or more.

The values for frequency of skipping whole school day are as follows:
1 = None
2 = One or more

Index of openness to problem solving (PISA 2012): The variable is based on students' responses to questions asking about the extent to which they feel they resemble someone who can handle a lot of information, is quick to understand things, seeks explanations for things, can easily link facts together, and likes to solve complex

problems. Students are categorized into four equally sized quarters based on the index of openness to problem solving. To assign students with the same index into different quarters, a random subsampling process is implemented by adding a small random variable to the index before dividing the index variable into quarters. The procedure is documented in the *PISA Data Analysis Manual* (2nd ed.), Chapter 14 (OECD 2009).

The values for index of openness to problem solving are as follows:
1 = Bottom quarter
2 = Second quarter
3 = Third quarter
4 = Top quarter

I feel happy at school (PISA 2012): The variable indicates whether the respondent feels happy at school. It comes directly from the respondent's response to the survey question on the extent to which they agree with the "I feel happy at school" statement, ST87Q07.

The values for I feel happy at school are as follows:
1 = Strongly agree or agree
2 = Disagree or strongly disagree

Degree currently pursued (PISA YAFS): The variable indicates the degree the respondent is currently pursuing. It is derived from the respondent's response to the survey question on what type of degree or certificate they are currently studying for, B_Q02BUSYAFS, and their response to the survey question on the highest education level they have completed, BQ_Q3. When B_Q02BUSYAFS is high school diploma, the variable is coded as high school diploma. When B_Q02BUSYAFS is pre-associate/trade without a degree, associate/trade certificate, or associate's degree, the variable is coded as pre-associate's or associate's degree. When B_Q02BUSYAFS is bachelor's degree, master's degree, professional degree, or doctorate degree, the variable is coded as bachelor's degree or above. When B_Q02BUSYAFS is missing and BQ_Q3 is secondary education, some postsecondary education, 4-year college or university degree, or beyond a college or university degree, the variable is coded as not currently studying and has a high school diploma. When B_Q02BUSYAFS is missing and BQ_Q3 is no education, primary education, or secondary education without a diploma, the variable is coded as not currently studying and doesn't have a high school diploma. When B_Q02BUSYAFS is missing and BQ_Q3 is missing, the variable is coded as not currently studying and the degree is unknown.

The values for degree currently pursued are as follows:
1 = High school diploma
2 = Pre-associate's or associate's degree
3 = Bachelor's degree or above
4 = Not currently studying and has a high school diploma
5 = Not currently studying and doesn't have a high school diploma
6 = Not currently studying and the degree is unknown

Area of study currently pursued (PISA YAFS): The variable indicates the area of study the respondent is currently pursuing. It is derived from the respondent's response to the survey question on what type of degree or certificate they are currently studying for, B_Q02BUSYAFS, and their response to the follow-up survey question on the area of study, emphasis, or major for the degree or certificate they are currently studying for (if more than one, they were asked to choose the one they considered most important), B_Q02C. Most of the values come directly from B_Q02C. Other than that, when B_Q02C is NA, the variable is coded as currently pursuing a high school diploma. When B_Q02BUSYAFS is missing, the variable is coded as not currently studying.

The values for area of study currently pursued are as follows:
1 = General programs
2 = Teacher training
3 = Humanities/languages/arts
4 = Social sciences/business/law
5 = Sciences/math/computing
6 = Engineering
7 = Agriculture/veterinary
8 = Health/welfare
9 = Services
997 = Currently pursuing a high school diploma
998 = Not currently studying

Participation in nonformal education (PISA YAFS): The variable indicates whether the respondent participated in any nonformal education in the last 12 months, including distance education, job training, seminars, or private training. The variable is derived from the respondent's response to the survey questions on organized learning activities they participated in during the last 12 months, including both work and nonwork-related activities: B_Q12A (distance education), B_Q12C (job training), B_Q12E (seminars), and B_Q12G (private training). If the respondent attended any of these four activities, the variable is coded as participated in nonformal education. If the respondent attended none

of the above four activities and none of the four activities is missing, the variable is coded as not participated in nonformal education. If the respondent attended none of the above four activities and any of the four activities are missing, the variable is missing.

The values for participation in nonformal education are as follows:
1 = Participated in nonformal education
2 = Not participated in nonformal education
999 = Missing

Employment status (PISA YAFS): The variable indicates the respondent's current employment status. It comes directly from the respondent's response to the survey question on which of the following best describes their current employment status, BQ_Q8.

The values for employment status are as follows:
1 = Unemployed (not looking for work)
2 = Unemployed (looking for work)
3 = Apprentice/Intern
4 = Part-time employed
5 = Full-time employed
9 = Other
999 = Missing

Combined employment and education status (PISA YAFS): This variable is derived from the respondent's current employment status, BQ_Q8, and respondent's current studying status, B_Q02A. If the respondent is not currently studying and employed (full-time/part-time or employed as an intern), the variable is coded as in employment only. If the respondent is currently studying and is unemployed (not looking for work/looking for work), the variable is coded as in formal education only. If the respondent is currently studying and employed (full-time/part-time or employed as an intern), the variable is coded as both in employment and in formal education. If the respondent is not currently studying and not employed (not looking for work/looking for work), the variable is coded as in neither employment nor formal education. If the respondent is currently studying and the employment status is missing or other, the variable is coded as in formal education, employment status unknown. If the respondent is not currently studying and the employment status is missing or other, the variable is coded as not in formal education, employment status unknown. There is one edit to the data on file.

The values for Combined employment and education status are as follows:
1 = In employment only
2 = In formal education only
3 = Both in employment and in formal education
4 = In neither employment nor formal education
5 = In formal education, employment status unknown
6 = Not in formal education, employment status unknown

Current Occupation (PISA YAFS): The variable is derived from the respondent's employment status, BQ_Q8, and their occupation category, BQ_Q9_TOP, reported as four-digit codes of the International Standard Classification of Occupations, 2008 version (ISCO-08). When the respondent is employed, the values of the variable come directly from BQ_Q9_TOP. When the respondent is employed and BQ_Q9_TOP is missing, the variable is coded as missing. When the respondent is unemployed and not looking for work, the variable is coded as unemployed (not looking for work). When the respondent is unemployed and looking for work, the variable is coded as unemployed (looking for work).

The values for current occupation are as follows:
1 = Armed forces occupations
2 = Managers
3 = Professionals
4 = Technicians and associate professionals
5 = Clerical support workers
6 = Service and sales workers
7 = Skilled agricultural, forestry, and fish
8 = Craft and related trades workers
9 = Plant and machine operators, and assembly
91 = Elementary occupations
92 = Unemployed (not looking for work)
93 = Unemployed (looking for work)
999 = Missing

Level of job-seeking behavior (PISA YAFS): The variable is derived from the respondent's job-seeking intentionality score, SEEKJOB_GROUP, and employment status, BQ_Q8. When the respondent's employment status is not unemployed (not seeking employment), the values of the variable come directly from SEEKJOB_GROUP. If the respondent's employment status is not unemployed (not seeking employment) and SEEKJOB_GROUP is NA, the variable is coded as NA. If the respondent's employment status is not unemployed (not seeking employment) and SEEKJOB_GROUP is missing, the variable is coded as missing. If the respondent's employment status is unemployed (not seeking employment), the variable is coded as unemployed (not seeking employment).

The values for level of job-seeking behavior are as follows:
1 = Low
2 = Moderate
3 = High
4 = Unemployed (not seeking employment)
998 = NA
999 = Missing

Level of self-efficacy (PISA YAFS): The variable is derived from the respondent's job-seeking and training self-efficacy score, SELFEFFICACY_GROUP, and employment status, BQ_Q8. When the respondent's employment status is not unemployed (not seeking employment), the values of the variable come directly from SELFEFFICACY_GROUP. If the respondent's employment status is not unemployed (not seeking employment) and SELFEFFICACY_GROUP is NA, the variable is coded as NA. If the respondent's employment status is not unemployed (not seeking employment) and SELFEFFICACY_GROUP is missing, the variable is coded as missing. If the respondent's employment status is unemployed (not seeking employment), the variable is coded as unemployed (not seeking employment).

The values for level of self-efficacy are as follows:
1 = Low
2 = Moderate
3 = High
4 = Unemployed (not seeking employment)
998 = NA
999 = Missing

Satisfaction with life (PISA YAFS): The variable indicates the respondent's satisfaction level with life. It comes directly from the satisfaction with life score, SATISFACTION_LIFE_LABEL.

The values for satisfaction with life are as follows:
1 = Low
2 = Moderate
3 = High
9 = Missing

Average on the vocational interests index (PISA YAFS): These six variables are the mean scores of six career intentionality variables. The Realistic is the mean estimate of PERSON_R_TOTAL using replicate weights. The Investigative is the mean estimate of PERSON_I_TOTAL using replicate weights. The Artistic is the mean estimate of PERSON_A_TOTAL using replicate weights. The Social is the mean estimate of PERSON_S_TOTAL using replicate weights. The Enterprising is the mean estimate of PERSON_E_TOTAL using replicate weights. The Conventional is the mean estimate of PERSON_C_TOTAL using replicate weights.

Appendix C. Technical Notes

Assessment design

PISA YAFS measures both cognitive and noncognitive constructs related to adult life preparedness, skill use, and achievement in young adulthood. The PISA YAFS data for 19-year-olds come from two instruments: the Education and Skills Online (ESO) assessment and questionnaire and an additional series of questions called the Learning Experience Questionnaire (LEQ), which were selected to supplement the ESO's background questionnaire. As ESO did not have information on current educational status and could be administered only as designed, the LEQ module was developed to more fully realize the aims of PISA YAFS. In particular, the questionnaire items in the LEQ module allow examination of the paths that individuals choose after leaving high school. The questionnaire items in the LEQ were selected from questionnaire items in PIAAC that were not included in ESO.

ESO includes a core set of background items, two cognitive assessment blocks, first being the router, and multiple noncognitive questionnaire modules. The noncognitive indicators collected through PISA YAFS include categorical and continuous data from the LEQ and ESO noncognitive (background questionnaire) modules. The LEQ gathered information on (1) current education study status (participation, level of degree, area of study), (2) formal education activities, and (3) nonformal learning activities in the 12 months preceding the study. The ESO noncognitive modules collected information on respondents' (1) basic demographics, (2) career interests and intentionality (CII), (3) behavioral performance competencies (BPC), and (4) subjective well-being and health (SWBH). Each of these modules is represented in the PISA YAFS database by the questionnaire-item-level data and composite derived variables (e.g., life satisfaction index).

As in PIAAC, the ESO cognitive assessments included an adaptive element that allowed for automatic scoring. Based on respondents' performance at different points in the assessment, respondents were directed to different "testlets" that contained items of different average difficulty in the domains of literacy and numeracy.

Unlike PIAAC, ESO was self-administered and offered only via computer; there was no paper-and-pencil component. As in PIAAC, ESO task items were designed to be authentic, culturally appropriate, and drawn from real-life situations that are expected to be of importance or relevance in different contexts. Task item content and questions are intended to reflect the purposes of adults' daily lives, even if they are not necessarily familiar to all adults.

Sampling and response rates

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 (table C-1). A respondent in PISA YAFS was considered participating if they completed at least one LEQ item regardless of whether they went on to complete any of the ESO noncognitive or cognitive sections.

Nonresponse bias

The nonresponse bias analysis of the PISA YAFS sample revealed differences in the characteristics of respondents who participated in the PISA YAFS with the total eligible sample. The eligible sample are those who participated in PISA 2012 at age 15, but not necessarily in PISA YAFS at age 19. A portion of the eligible sample participated in PISA YAFS, referred to as participants:

- Black or African American individuals were underrepresented among participants relative to the eligible sample (9.1 vs. 12.5 percent, respectively), while White individuals were overrepresented among participants (53.8 vs. 50.4 percent, respectively).

Table C-1. Number of PISA 2012 respondents participating in PISA YAFS 2016 main study

Survey participants	Number	Percentage (unweighted) response rate	Percentage (weighted) response rate
U.S. PISA 2012 student sample (core assessment only)	4,978		
PISA 2012 students completing Student Information Forms	4,612	100.0	100.0
PISA YAFS 2016 participants	2,318	50.3	50.1
Participated in LEQ	2,318	50.3	50.1
Participated in ESO	2,008	43.5	43.6
Completed literacy ESO assessment	1,823[1]	39.5	39.5
Completed numeracy ESO assessment	1,854[2]	40.2	40.2

[1] Thirty-three of these respondents completed the assessment but failed to press the final "Submit" button. Their responses were recovered during data processing.
[2] Sixty-four of these respondents completed the assessment but failed to press the final "Submit" button. Their responses were recovered during data processing.
NOTE: Tracking efforts that followed up with PISA 2012 respondents on the information provided in the information forms they filled out at the end of the PISA 2012 are not reflected in this table. Of the 4,612 PISA 2012 participants who returned the 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, Program for International Student Assessment (PISA), 2012; and PISA Young Adult Follow-up Study (PISA YAFS), 2016

- Male individuals were underrepresented among participants relative to the eligible sample (44.7 vs. 51.0 percent, respectively), while female individuals were overrepresented among participants (55.3 vs. 49.0 percent, respectively).
- Individuals who did not attend preschool or kindergarten were underrepresented among participants relative to the eligible sample (1.2 vs. 1.5 percent, respectively), while individuals who attended preschool or kindergarten for more than 1 year were overrepresented among participants (74.8 vs. 73.7 percent, respectively).
- Individuals who attended preschool for 1 year or less were underrepresented among participants relative to the eligible sample (43.4 vs. 45.7 percent, respectively), while individuals who attended for more than 1 year were overrepresented among participants (31.5 vs. 27.5 percent, respectively).
- Individuals who were truant one or two times were underrepresented among participants relative to the eligible sample (16.5 vs. 17.7 percent, respectively), while individuals who were never truant were overrepresented among participants (81.0 vs. 78.1 percent, respectively).
- Individuals who expected to complete high school were underrepresented among participants relative to the eligible sample (4.9 vs. 7.7 percent, respectively), while individuals who expected to complete a doctoral or professional degree were overrepresented among participants (27.0 vs. 22.9 percent, respectively).
- Individuals with the highest level of parental educational attainment of ISCED level 3A or 4 were underrepresented among participants relative to the eligible sample (28.2 vs. 31.7 percent, respectively), while individuals with ISCED level 5A or 6 were overrepresented among participants (48.9 vs. 43.2 percent, respectively).
- Individuals whose father's current job status was working part-time with pay were underrepresented among participants relative to the eligible sample (5.7 vs. 6.4 percent, respectively), while individuals whose father was working full-time for pay were overrepresented among participants (76.0 vs. 72.8 percent, respectively).
- Individuals had a higher mean of plausible value 1 in mathematics, reading, and science than the eligible sample (507.6 vs. 480.7, 525.2 vs. 497.0, and 524.8 vs. 497.2, respectively) and a higher mean of openness for problem solving than the eligible sample (0.3 vs. 0.2).

The analysis showed that weighting adjustments were highly effective in reducing the bias. Apart from

the couple of exceptions listed below, there were no statistically significant differences between participants and the eligible sample once nonresponse adjusted weights were applied

- Individuals who attended preschool for 1 year or less were overrepresented among participants relative to the eligible sample (46.6 vs. 45.7 percent, respectively), while individuals who attended for more than 1 year were underrepresented among participants (26.6 vs. 27.5 percent, respectively).
- Individuals who expected to complete high school were overrepresented among participants relative to the eligible sample (8.7 vs. 7.7 percent, respectively), while individuals who expected to complete a master's degree were underrepresented among participants (21.6 vs. 22.3 percent, respectively).

For both of these characteristics, the nonresponse adjustment slightly overadjusted 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" and all but one in "attended preschool."

More details and a description of the rescaling methodology and considerations are provided in Chapter 5 of the PISA YAFS Technical Report (Kastberg et al. forthcoming).

Assessments and questionnaires

The PISA Young Adult Follow-up Study (PISA YAFS), including the Education and Skills Online (ESO) assessment, was administered in 2016, which was 3½ years after the respondents had taken PISA 2012. From the end of the PISA assessment in fall 2012 through March 2016, respondents were traced using the contact information they provided after the 2012 assessment (meaning they were contacted via email, phone, or physical address) and tracked meaning that the study maintained communication channels with respondents all the way through data collection. During this period 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 stage 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.

The PISA YAFS field test conducted December 2015–January 2016 with PISA 2012 financial literacy participants was focused primarily on proving that the design and operations for collecting the data were feasible and robust.

The main study data collection for PISA YAFS occurred between March and July 2016.

The PISA YAFS data collection instruments included the Learning Experience Questionnaire (LEQ) and the ESO assessment. The LEQ is a noncognitive background questionnaire about current learning experiences, based on components of the PIAAC background questionnaire that were not included in ESO. The items in the LEQ were added to supplement the ESO noncognitive measures. The ESO is a set of noncognitive and cognitive instruments that operate together to produce scale scores and noncognitive indicators (for more information, see http://www.oecd.org/skills/ESonline-assessment/abouteducationskillsonline/).

The ESO platform required users to use a single specific browser, Firefox, and 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.

More details and a description of the survey operations and questionnaires are provided in Chapter 3 of the PISA YAFS Technical Report (Kastberg et al. forthcoming).

Reporting results

The assessment tool used in PISA YAFS in 2016 was the ESO survey. The ESO was developed to provide individual results, by way of calculating and presenting a score and a proficiency level for each participant who completes the literacy and numeracy assessments. While the scores produced by the ESO are designed to place respondents' achievement on the same scale as PIAAC, ESO scores are calculated in increments of 10 (e.g., 350, 360, 370) and do not include standard errors that account for measurement error. In order to improve the utility and statistical power of the ESO cognitive data for reporting, the ESO scale scores were transformed into plausible values using item response theory (IRT), which provides more accurate measurement of student performance than the ESO scale scores. More details and a description

of the rescaling methodology and considerations are provided in Chapter 6 of the PISA YAFS Technical Report (Kastberg et al. forthcoming).

Sampling weights and standard errors

Generally, in a survey, the base weights are computed from the inverse of the probability of selection for the sample. However, since 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: PISA students who did not provide follow-up contact information in 2012 during the PISA assessment and those who did not respond to the PISA YAFS survey.

Statistical comparisons

Two types of statistical comparisons were used for this report. One tested observed differences between percentages and between means, and another tested observed differences between correlations, based on the *t* statistic.

For the percentages and means, statistical significance was determined by calculating a *t* value for the difference between a pair of means or proportions, comparing with published tables of values at a certain level of significance, called the alpha level. The alpha level is an a priori statement of the probability of inferring that a difference exists when, in fact, it does not. In this report, findings from *t* tests are reported based on a statistical significance (or alpha level) set at .05. Respondents' *t* values were computed to test differences between independent estimates using the following formula:

$$t = \frac{E_1 - E_2}{\sqrt{se_1^2 + se_2^2}},$$

where E_1 and E_2 are the estimates to be compared and se_1 and se_2 are their corresponding standard errors. In instances where comparisons were made on dependent samples, the test statistic calculation was adjusted for the shared variance in the dependent groups using the following formula:

$$t = \frac{E_1 - E_2}{\sqrt{se_1^2 + se_2^2 + 2se_1se_2}},.$$

No adjustments were made for multiple comparisons.

To compare the two correlation coefficients, both correlation coefficients were converted to Fisher *z* values, computing the difference between the two *z* values. Then a "critical value" *x* is computed for the two estimates where the sample sizes are different using this formula:

$$t = q_s \sqrt{\frac{(n_1 - 3)(n_2 - 3)}{n_1 + n_2 - 6}},$$

where q_s represents a difference between the two *z* values and n_1 and n_2 are the sample size for the two estimates, respectively. Finally, similar to measurement of statistical significance for percentages and means, the critical value *x* is compared with published tables of values at the alpha level set at .05. Here, too, no adjustments were made for multiple comparisons.

There are some potential cautions in interpreting the results of statistical tests. First, the magnitude of the *t* statistic depends not only on observed differences between means or percentages but also on the number of respondents. A small difference found in a comparison across a large number of respondents would still produce a large and possibly statistically significant *t* statistic.

A second caution stems from reliance on a sample, rather than an entire population: One can conclude that a difference found in the sample is real when there is no true difference in the population. Statistical tests are designed to limit the risk of this Type 1, or "false positive," error by setting a significance level, or alpha. The alpha level of .05 used in this report ensures that the probability of finding a false positive result is no more than 1 in 20 (.05) occurrences. However, failing to meet the significance level of .05 does not mean that there is no real difference between two quantities, only that the likelihood is less.

It is important to note that many of the variables examined in this report may be related to one another and to other variables not included in the analysis. The complex interactions and relationships among the variables were not explored. Furthermore, the variables examined in this report are just a few of those that could be examined. Thus, readers are cautioned not to draw causal inferences based on the results presented here.