Institute of Education Sciences

Health and STEM Career Expectations and Science Literacy Achievement of U.S. 15-Year-Old Students

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AUTHORS
Marissa Hall
Amy Rathbun
American Institutes for Research

PROJECT OFFICER
Patrick Gonzales
National Center for Education Statistics

Statistics in Brief publications describe key findings from statistical tables to provide useful information to a broad audience, including members of the general public. They address simple and topical issues and questions. They do not investigate more complex hypotheses, account for interrelationships among variables, or support causal inferences. We encourage readers who are interested in more complex questions and in-depth analysis to explore other NCES resources, including publications, online data tools, and public- and restricted-use datasets. See nces.ed.gov and references noted in the body of this document for more information.

Demand for jobs in many science, technology, engineering, and mathematics (STEM) fields and in the health care[1] field is projected to grow faster than the average for all occupations in the United States (Bureau of Labor Statistics 2019). However, the current STEM and health care workforces are characterized by demographic disparities and a lack of diversity in many positions (e.g., see Funk and Parker 2018). For the United States to equitably meet national demands for STEM and health care jobs, it is important to understand key factors that may be associated with students' decisions to pursue STEM and health-related careers. Some of these key factors may include student career expectations, academic achievement, and demographic characteristics.

Indeed, a student's career expectations and academic achievement can be key predictors in the decision to pursue science as a young adult. An analysis of data from 1988 through 2000 from the National Education Longitudinal Study found that eighth-grade students who expected to work in science at age 30 were almost twice as likely to graduate from college with a major in life science and almost three-and-a-half times as likely to graduate with a major in physical science and engineering than their eighth-grade peers who expected to have a nonscience career (Tai et al. 2006). The same study found that eighth-grade mathematics achievement was not a significant predictor of graduating college with a degree in life science, but it was a predictor of graduating college with a degree in physical science and engineering, with high-performing students (i.e., those whose mathematics scores were more than one standard deviation above average) more likely to obtain this degree. The probability of earning a physical science or engineering degree was 34 percent for an average-performing student with science career expectations, and it was 51 percent for a high-performing student with science career expectations.

Research also shows demographic disparities in students' post-secondary pursuits within science-related fields. In 2015-16, a greater percentage of female than male students earned bachelor's degrees in health professions and in biological and biomedical sciences, whereas a greater percentage of male students earned degrees in engineering, computer sciences, and mathematics and statistics (National Center for Education Statistics [NCES] 2018). Also in 2015-16, the percentage of Asian

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[1] In this brief, health care occupations are not considered STEM occupations; thus, health care and STEM careers are discussed and analyzed separately. For more information on this distinction, please see Appendix A: Classification of Occupations.

students who completed bachelor's degrees in STEM fields was higher than the overall percentage, while the percentages of Hispanic and Black students who received these degrees was lower (NCES 2019). Degree completion by immigration status also varied: compared to their native-born U.S. peers, Jia (2019) found that the percentage of students completing a STEM major was not measurably different for Hispanic immigrant students but was significantly greater for Asian immigrant students. Socioeconomic status was also associated with the rate at which students pursue science-related majors: a greater percentage of students from families with income in the top 25 percent or whose parents had at least a college education, for instance, declared a college major in natural sciences than did students whose family income fell in the bottom 25 percent or whose parents had a high school education or less (Chen 2009). This difference is compounded by STEM major students from low-income backgrounds dropping out of college at a higher rate than their peers from high-income backgrounds (Chen 2013).

This Statistics in Brief contributes to the understanding of U.S. high school students' expectations of health or STEM careers and their science achievement. Analyses between and within demographic groups highlight whether any disparities are evident years before young people begin their careers.

Data Sources and Methodology

This Statistics in Brief uses data on U.S. 15-year-old students from the Program for International Student Assessment (PISA) to examine whether students' health or STEM career expectations varied by demographic characteristics in 2015. The brief also uses 2015 PISA data to examine students' science achievement in relation to their career interests and background. The selected student demographic characteristics analyzed in this brief are gender; race/ethnicity; immigration status;[2] and economic, social, and cultural status[3] (ESCS). A student's ESCS falls into one of four national ESCS quarters: the top, middle-high, middle-low, or low quarters.

Students who participate in PISA are selected via a nationally representative sample. PISA results are not used to report individual scores, but rather to provide valid estimates of 15-year-old student achievement and characteristics at the country and subgroup levels. The assessment is administered every 3 years and places an emphasis on the application of knowledge and skills to real-world contexts. The core subjects assessed are science literacy, mathematics literacy, and reading literacy. At each administration, one of these subjects is the major domain, with a greater number of assessment and questionnaire items dedicated to that subject. The major domain rotates such that each core subject is the major domain every 9 years. After taking the PISA assessment, students also complete a questionnaire that includes items related to their background and interests.

In 2015, science literacy was the major PISA assessment domain, and the student questionnaire included the following question related to career expectations: *What kind of job do you expect to have when you are about 30 years old?* The PISA career question was both open-ended and administered in two cycles, two aspects that distinguished it from similar items in the questionnaires administered alongside the National Assessment of Educational Progress (NAEP) and the Trends in International Mathematics and Science Study (TIMSS). For PISA, students wrote their responses to the career question, which were then assigned International Standard Classification of Occupations (ISCO) codes during data processing.

In PISA publications, the Organization for Economic Cooperation and Development (OECD) calls both health and STEM careers "science-related" because working in these fields requires further engagement with the study of science beyond compulsory education, typically in formal postsecondary education settings (OECD 2016, 2017). Given the differences between health and STEM careers, the fields are often studied separately; however, research using non-PISA data has also studied health and STEM career trajectories together (e.g., see Kimmel, Miller, and Eccles 2012).

In this brief, the first section of each study question looks at the student career expectations and science achievement results of students expecting either a career in health or STEM, grouping these fields together to present broader findings (and including student demographic subgroups with sample sizes that are too small to analyze when health careers are analyzed separately from STEM

[2] The PISA database contains country-specific variables relating to the country of birth of the student and their mother and father and an indicator of whether the country of birth was the same as the country of assessment. The index of immigrant background was calculated from these variables into the following categories: (1) native students (those students who had at least one parent born in the country), (2) second-generation students (those students born in the country of assessment but whose parent(s) were born in another country) and (3) first-generation students (those students born outside the country of assessment and whose parents were also born in another country). Students with missing responses for either the student or for both parents were assigned missing values for this variable. The terms "native-born," "first generation," and "second generation" may be used differently in other NCES briefs or reports.
[3] The PISA 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 include possessions such as works of classical literature, books of poetry, and works of art (e.g., paintings).

careers). The next two sections of each study question offer a more specific look at health- and STEM-specific career expectation findings. The OECD career classification criteria[4] defines these careers as follows:

- **Health fields:** *For students expecting to be health professionals or health technicians.* Careers in health fields include doctors, nurses, veterinarians, and medical and pharmaceutical technicians.

- **STEM fields:** *For students expecting to be science, engineering, mathematics, or information and communication technologies (ICT) professionals or science-related technicians or associate professionals.* Examples of student-reported STEM careers include systems analysts, biologists, and civil engineering technicians.

The science literacy scores of the following demographic groups were suppressed because reporting standards were not met for the indicated career expectations: Other-race/ethnicity students[5] with health or STEM career expectations; Asian students with health and STEM career expectations; and students of Two or more races with STEM career expectations. This brief does not study specific student career expectations (e.g., mechanical engineer, medical doctor) due to sample size restrictions in some demographic groups. Due to this brief's focus on descriptive statistics, in addition to sample size limitations, the study questions do not examine interactions between demographic groups.

All differences cited in this report are statistically significant at the $p < .05$ level. Although one estimate in this brief may appear to be larger than another, a statistical test may find that the apparent difference between them is not measurable due to the uncertainty around the sample estimates. In this case, the estimates are described as having no measurable difference, meaning the difference between them is not statistically significant. No adjustments were made for multiple comparisons. For more information on data and methods, please see the Methodology and Technical Notes at the end of the report.

Interpreting Score Gaps

PISA scores are reported on a scale from 0 to 1,000. The OECD transforms student scores to the PISA scale such that the mean science literacy score for OECD countries is set at 500 score points, with a standard deviation of 100.

The OECD (2016) writes that "PISA scores are represented on a scale whose units do not have substantive meaning (unlike physical units, such as meters or grams) but are set in relation to the variation in results observed across all test participants." One way to contextualize PISA results is through analysis of student scores at various percentiles, which can be used to make comparisons between or within countries.

For instance, the 50th percentile score is the score below which 50 percent of students scored; in the United States, the 2015 science literacy score at the 50th percentile was 495 points (figure 1, table A-1).

FIGURE 1. Distribution of U.S. students' scores on the PISA science literacy assessment: 2015

Percentile	Cut score
10	367.6
20	408.5
30	440.1
40	468.6
45	481.9
50	495.2
55	508.7
60	522.5
70	551.5
80	584.1
90	625.5

NOTE: This table shows the threshold (or cut) scores for selected percentiles. The percentile range is specific to the distribution of science literacy scores of U.S. students.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

[4] The OECD career classification used in this brief counts careers in the behavioral or social sciences as nonscience fields.
[5] Although data for "Other race" students are not shown in the figures because reporting standards were not met, they are included in the "All students" estimate. "Other race" includes both American Indian/Alaska Native and Native Hawaiian/Other Pacific Islander students.

The 45th percentile is associated with a score of 482 points, which is 13 points lower than the 50th percentile score. U.S. students at the 40th, 30th, 20th, and 10th percentiles scored lower than students at the 50th percentile by 27, 55, 87, and 128 points, respectively. Associating these score gaps with percentile gaps helps illustrate the varying magnitude of achievement differences.

Study Questions

1. In 2015, did the percentage of 15-year-olds who expected to have a health or STEM career vary by student demographic characteristics?
2. In 2015, were there science achievement differences between students expecting health or STEM careers and students expecting nonscience careers?
3. In 2015, among only those students expecting health or STEM careers, were there science achievement differences by student demographic characteristics?

Key Findings

- In 2015, some 40 percent of all U.S. 15-year-old students expected to have either a health or STEM career at age 30 (figure 2, table A-2). Specifically, 23 percent expected to have a health career and 16 percent expected to have a STEM career. Greater percentages of female, second-generation, and high-ESCS students expected to work in health or STEM fields than did male, native-born, and lower-ESCS[6] students, respectively. Additionally, a greater percentage of Asian students than Black, Hispanic, and students of Two or more races expected to have health or STEM careers. While a greater percentage of female students expected to have a health career than did male students (37 percent vs. 9 percent), a greater percentage of male students expected to have a STEM career than did female students (26 percent vs. 7 percent).

- On the PISA 2015 science literacy assessment, students who expected to work in health or STEM fields scored 516 points on average, outperforming by 28 points their peers with expectations of nonscience careers (figure 3, table A-3). The average score of students expecting health or STEM careers (516 points) corresponds to the 57th percentile[7] of the U.S. distribution of scores, and the average score of nonscience career students (488 points) corresponds to the 47th percentile. Apart from female students, the health or STEM career vs. nonscience career score gap was significant within every key displayed demographic group examined in this brief. Students with health career expectations and students with STEM career expectations outperformed their peers with nonscience career expectations by 9 and 56 score points on average, respectively (figures 4 and 5).

- Among students expecting health or STEM careers, science score gaps were seen by gender, race/ethnicity, immigration status, and ESCS (figure 6, table A-3). While males expecting careers in health outperformed females expecting careers in health by 41 points on average (figure 7), there was no measurable score gap between males and females expecting STEM careers (figure 8). The score gap between White and Black students with STEM career expectations was 113 points: the average score of White students (575 points) corresponds to the 77th percentile of the U.S. distribution of scores, and the average score of Black students (462 points) corresponds to the 37th percentile (figure 8). The score gap between low-ESCS students (449 points) and high-ESCS students (544 points) expecting health careers was 95 points. These scores correspond to the 33rd percentile and 70th percentile, respectively, of the U.S. distribution of scores.

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[6] "Lower-ESCS students" refers to all those students who do not fall within the high-ESCS quarter (i.e., the low, middle-low, and middle-high quarters).

[7] In this brief, scores by demographics are associated with a single percentile for ease of interpretation, although *t* tests, which account for estimates' standard errors, reveal a range of percentiles from which a demographic score is not measurably different. For more information, see the Methodology and Technical Notes.

STUDY QUESTION 1: In 2015, did the percentage of 15-year-olds who expected to have a health or STEM career vary by student demographic characteristics?

Health or STEM Career Expectations

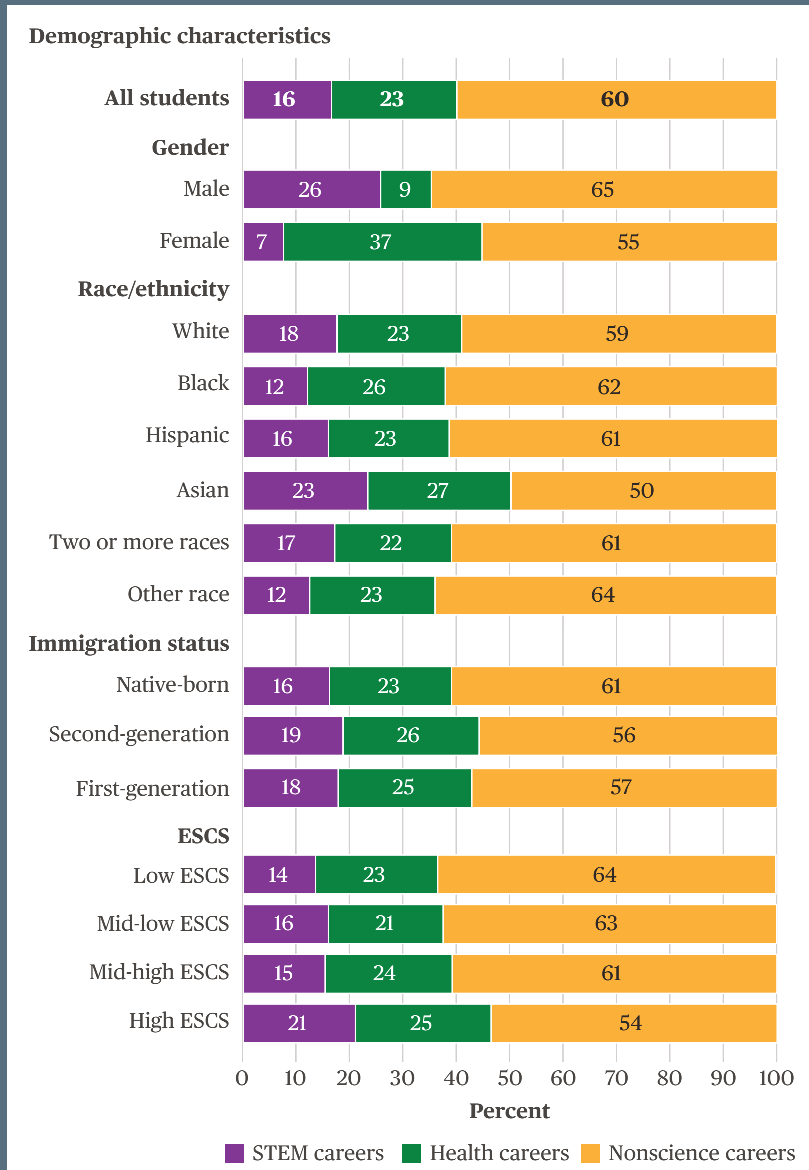
In 2015, some 40 percent of all U.S. 15-year-old students expected to have a either a health or STEM career at about age 30 (figure 2, table A-2). Differences in the percentages of students expecting to have these careers were seen by gender, race/ethnicity, immigration status, and ESCS.

A greater percentage of females than males foresaw themselves working in health or STEM fields (45 percent of female students vs. 35 percent of male students, table A-2). Although the percentage of White students with health or STEM career expectations (41 percent) was not measurably different from that of students of any other race/ethnicity, a greater percentage of Asian students reported health or STEM career expectations (50 percent) than did Black students (38 percent), Hispanic students (39 percent), and students of Two or more races (39 percent). In addition, a greater percentage of second-generation students expected to have health or STEM careers than did native-born students (44 percent vs. 39 percent), as did students in the high ESCS quarter (46 percent) compared to students in all lower quarters, where the percentages ranged from 36 to 39 percent.

Health-Specific Career Expectations

Twenty-three percent of all students expected to have a career in health (figure 2, table A-2). For the most part, the percentage of students expecting to have a health career did not differ by displayed demographic characteristics.

FIGURE 2. Percentage of U.S. 15-year-old students expecting careers in STEM, health, and nonscience fields, by demographic characteristics: 2015



NOTE: Detail may not sum to totals due to rounding. STEM and health careers were classified according to the OECD (2016) definition and refer to those jobs in science that require further science-related studies beyond compulsory education. PISA defines "second-generation" as students who were born in the United States but whose parent(s) were born in another country, and "first-generation" as those students born outside the United States and whose parents were also born in another country. "Other race" includes both American Indian/Alaska Native and Native Hawaiian/Other Pacific Islander students. Black includes African American, and Hispanic includes Latino. Race categories exclude persons of Hispanic ethnicity. The PISA 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). Although rounded numbers are displayed, the figures are based on unrounded data.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

However, the percentage of female students reporting health career expectations was approximately four times that of male students (37 percent vs. 9 percent).

STEM-Specific Career Expectations

Sixteen percent of U.S. students expected to have a STEM career, and differences in STEM career expectations were seen by gender, race/ethnicity, immigration status, and ESCS (figure 2, table A-2). For example, almost four times as many males (26 percent) as females (7 percent) expected to have a STEM career, which contrasts the pattern of gender differences in health career expectations. In contrast to no differences in health career expectations by race/ethnicity, the percentage of White students expecting to have a STEM career (18 percent) was greater than that of Black students (12 percent), and the percentage of Asian students expecting to have a STEM career (23 percent) was greater than that of Black students (12 percent), Hispanic students (16 percent), and students of other races (12 percent).

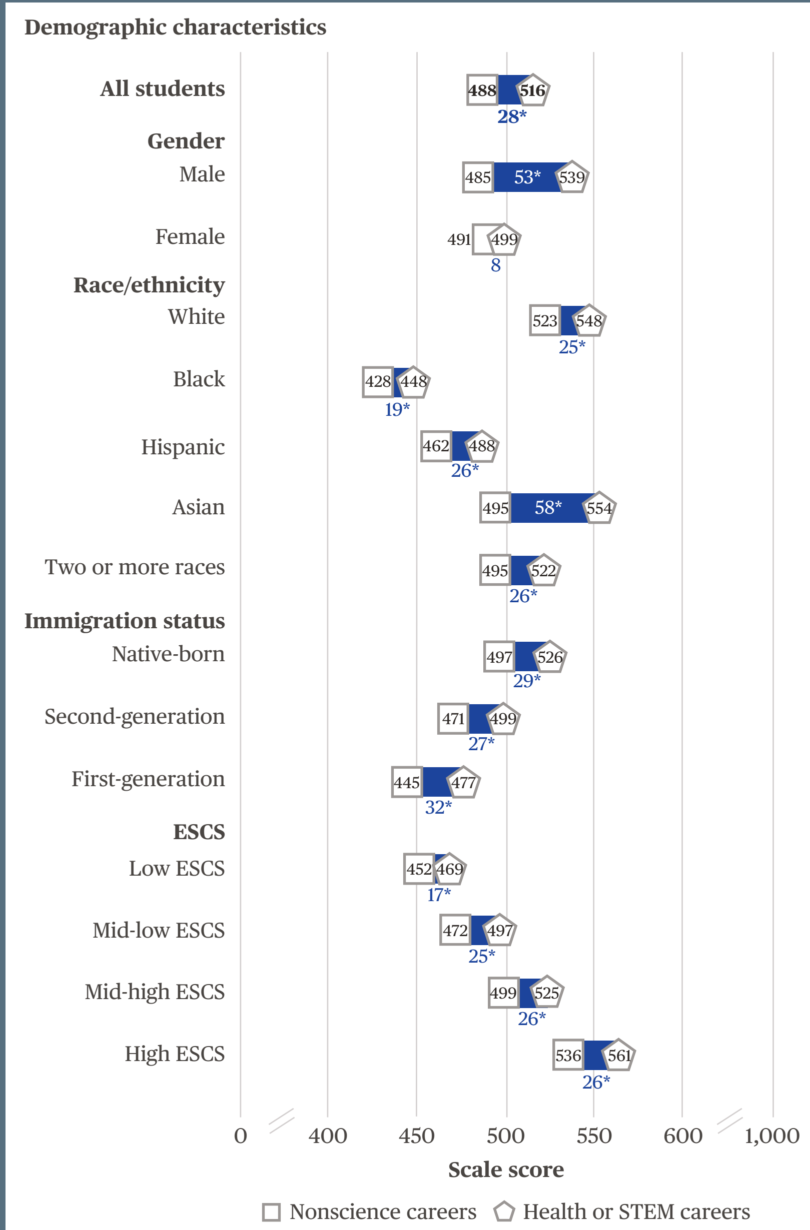
STUDY QUESTION 2: In 2015, were there science achievement differences between students expecting health or STEM careers and students expecting nonscience careers?

Health or STEM Career Expectations

On the PISA science literacy assessment, students expecting a career in health or STEM fields outperformed their 15-year-old peers expecting a nonscience career by an average of 28 score points; the average score of students intending to hold a health or STEM job was 516 points, compared to a score of 488 points for students intending to hold a nonscience job (figure 3, table A-3).

The achievement gap between students expecting a health or STEM job and students expecting a nonscience job was significant within every displayed demographic group except for female students. For example, male students with health or STEM career expectations scored, on average, 53 points higher than males expecting nonscience careers. Within racial/ethnic groups, score gaps between students expecting health or STEM careers and those expecting nonscience careers ranged from 19 points for Black students to 58 points for Asian students.

FIGURE 3. Average science literacy scores and score gaps between U.S. 15-year-old students with expectations of health or STEM careers and those with expectations of nonscience careers, by demographic characteristics: 2015



* $p < .05$ Average science score of students expecting health or STEM careers is significantly different from that of students expecting nonscience careers.

NOTE: Scores are reported on a scale from 0 to 1,000. Health and STEM careers were classified according to the OECD (2016) definition and refer to those jobs that require further science-related studies beyond compulsory education. PISA defines "second-generation" as students who were born in the United States but whose parent(s) were born in another country, and "first-generation" as those students born outside the United States and whose parents were also born in another country. Although data for "Other race" students are not shown because reporting standards were not met, they are included in "All students." "Other race" includes both American Indian/Alaska Native and Native Hawaiian/Other Pacific Islander students. Black includes African American, and Hispanic includes Latino. Race categories exclude persons of Hispanic ethnicity. The PISA 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). Although rounded numbers are displayed, the figures are based on unrounded data.

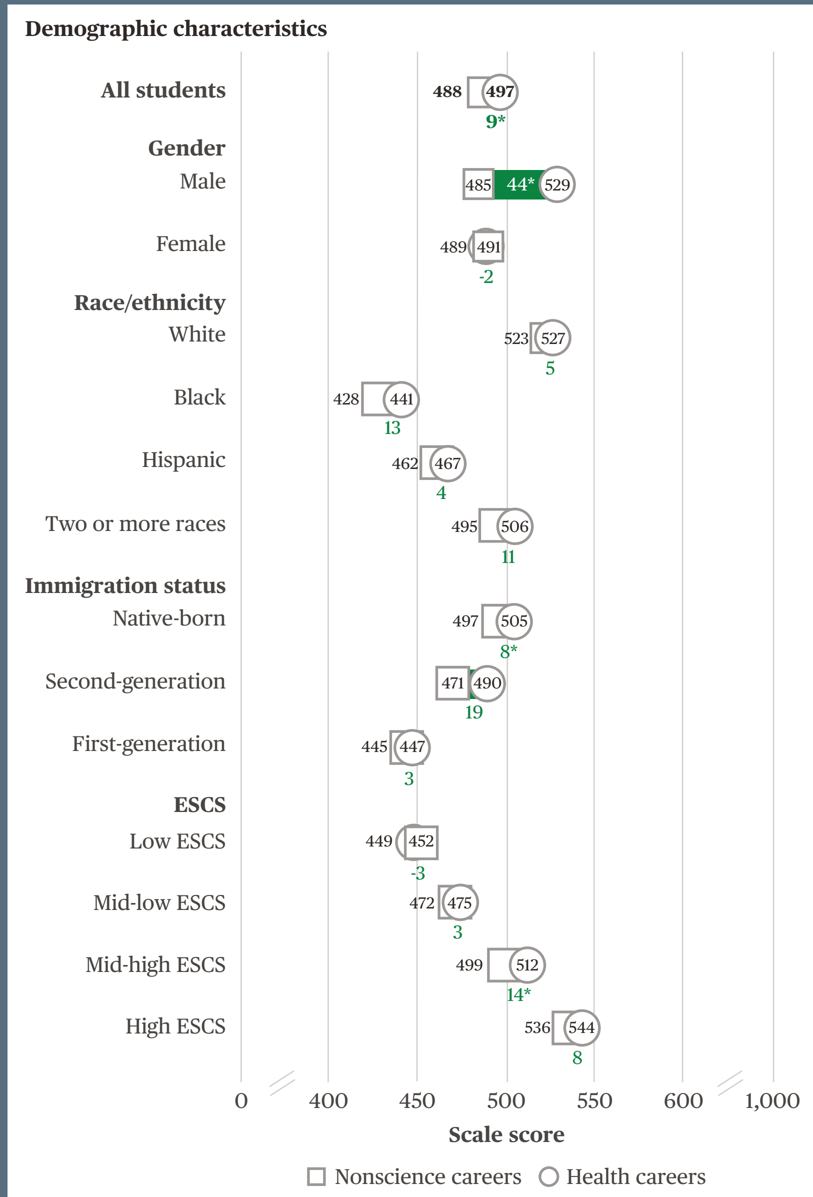
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Health-Specific Career Expectations

Fifteen-year-olds expecting to work in a health field scored 497 points on the science literacy assessment, outperforming their peers expecting to work in a nonscience field by an average of 9 score points (figure 4, table A-3). The average score of nonscience career students corresponds to the 47th percentile of the U.S. distribution of scores, and the average score of health career students corresponds to the 50th percentile.

There were few measurable differences between the science scores of health and nonscience career students, with measurable gaps observed for three groups: male students, native-born students, and students at the mid-high ESCS quarter. For example, there was a 44-point score gap between the average score of a male student intending to work in a health field (529 points) and a male student intending to work in a nonscience field (485 points).

FIGURE 4. Average science literacy scores and score gaps between U.S. 15-year-old students with expectations of health careers and those with expectations of nonscience careers, by demographic characteristics: 2015



* $p < .05$ Average science score of health career students is significantly different from that of nonscience career students.

NOTE: Scores are reported on a scale from 0 to 1,000. Health careers were classified according to the OECD (2016) definition and refer to those jobs in health fields that require further science-related studies beyond compulsory education. PISA defines "second-generation" as students who were born in the United States but whose parent(s) were born in another country, and "first-generation" as those students born outside the United States and whose parents were also born in another country. Although data for "Asian" and "Other race" students are not shown because reporting standards were not met, they are included in "All students." "Other race" includes both American Indian/Alaska Native and Native Hawaiian/Other Pacific Islander students. Black includes African American, and Hispanic includes Latino. Race categories exclude persons of Hispanic ethnicity. The PISA 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). Although rounded numbers are displayed, the figures are based on unrounded data.

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

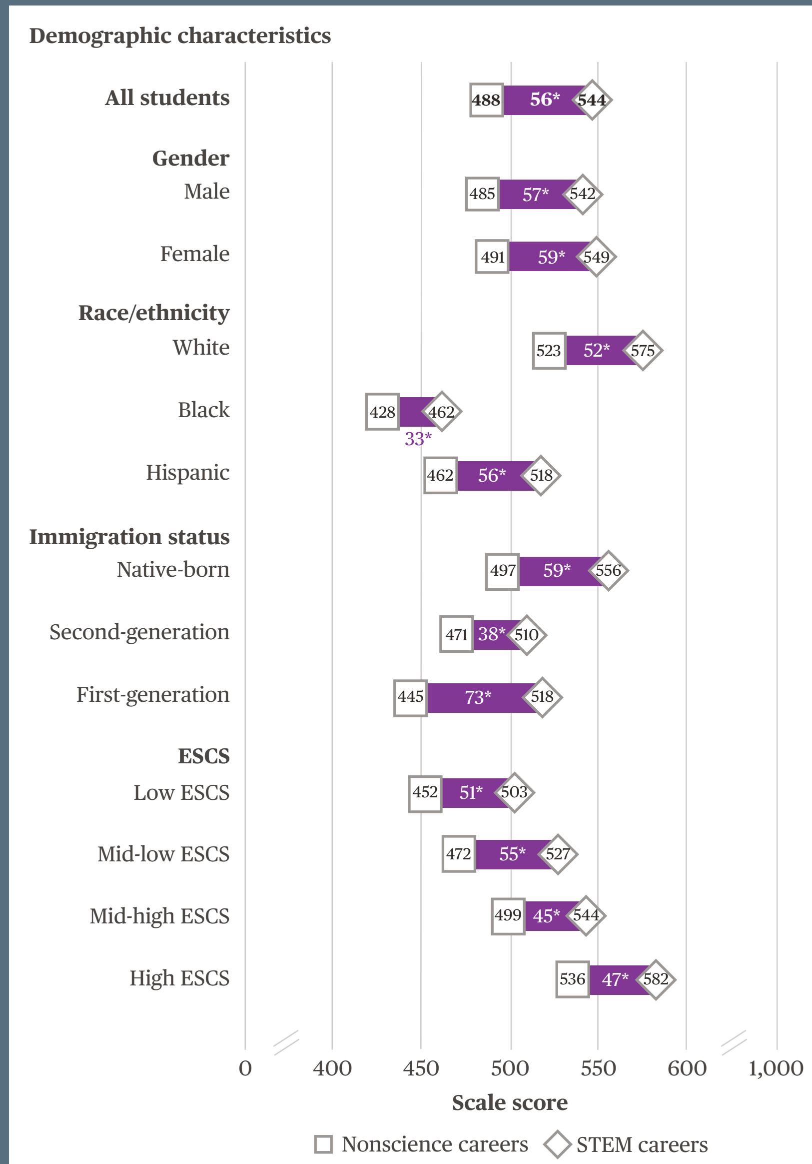
STEM-Specific Career Expectations

Students anticipating STEM careers scored 544 points on the science literacy assessment on average, outperforming their peers anticipating nonscience careers by an average of 56 score points (figure 5, table A-3). The average score of nonscience career students corresponds to the 47th percentile of the U.S. distribution of scores; the average score of STEM career students corresponds to the 67th percentile.

The science score gap between nonscience and STEM career students was significant within every displayed demographic group examined in this report. The score gap ranged from 33 points for Black students to 73 points for first-generation students.

Although there was no measurable science achievement gap between female students expecting either a health or STEM career and female students expecting a nonscience career (figure 3), different results were obtained when the gap was analyzed separately by health and STEM career expectations. While the average science achievement scores of females expecting a health career (489) and a nonscience career (491) were not measurably different (figure 4), the average science score of females expecting a STEM career (549) was higher than the score of females expecting a nonscience career (figure 5). However, since the percentage of female students expecting a health career (37 percent) was higher than the percentage expecting a STEM career (7 percent), the overall comparison of achievement scores–that is, the score gap between those female students expecting either a health or a STEM career and those expecting a nonscience career–follows the same pattern as that between female students expecting a health career and female students expecting a nonscience career.

FIGURE 5. Average science literacy scores and score gaps between U.S. 15-year-old students with expectations of STEM careers and those with expectations of nonscience careers, by demographic characteristics: 2015



* $p < .05$ Average science score of STEM career students is significantly different from that of nonscience career students.

NOTE: Scores are reported on a scale from 0 to 1,000. STEM careers were classified according to the OECD (2016) definition and refer to those jobs in STEM fields that require further science-related studies beyond compulsory education. PISA defines "second-generation" as students born in the United States but whose parent(s) were born in another country, and "first-generation" as those students born outside the United States and whose parents were also born in another country. Although data for "Asian" students, students of "Two or more races," and "Other race" students are not shown because reporting standards were not met, they are included in "All students." "Other race" includes both American Indian/Alaska Native and Native Hawaiian/Other Pacific Islander students. Black includes African American, and Hispanic includes Latino. Race categories exclude persons of Hispanic ethnicity. The PISA 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). Although rounded numbers are displayed, the figures are based on unrounded data.

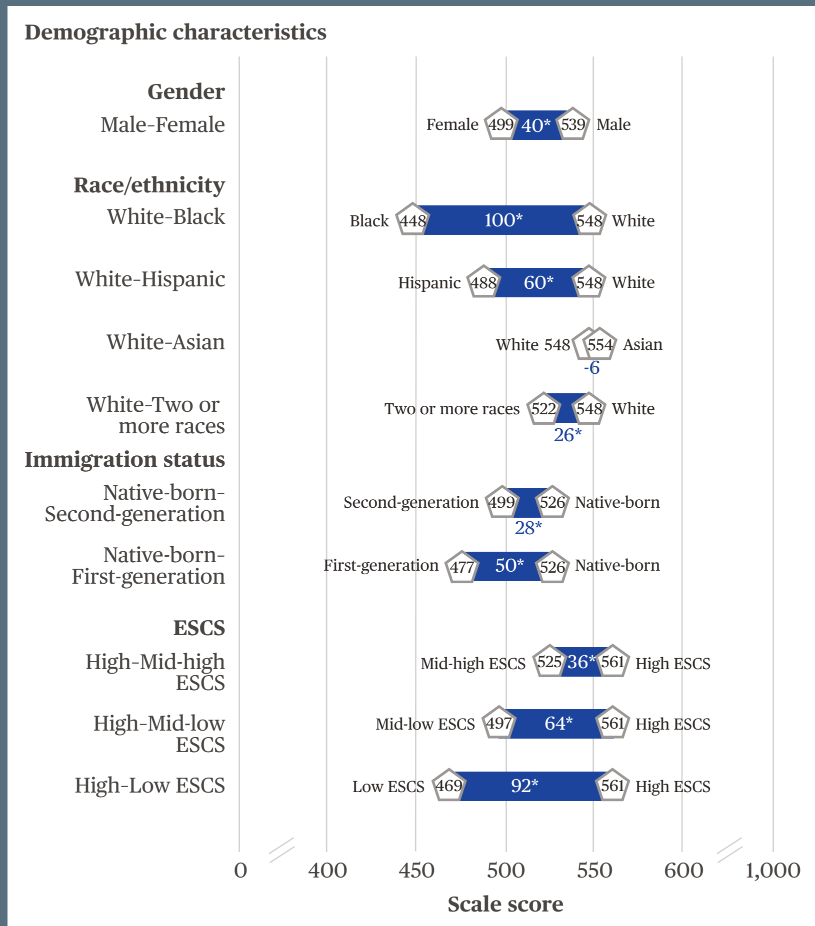
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

STUDY QUESTION 3: In 2015, among only those students expecting health or STEM careers, were there science achievement differences by student demographic characteristics?

Health or STEM Career Expectations

Among 15-year-old students anticipating careers in health or STEM fields, achievement gaps were evident by gender, race/ ethnicity, immigration status, and ESCS (figure 6, table A-2). Although there was no measurable difference between the science scores of White and Asian students expecting health or STEM careers, achievement gaps were evident by all other displayed demographic categories. For instance, native-born students, who scored 526 points on average, outperformed their second-generation and first-generation counterparts by an average of 28 and 50 points, respectively. These scores correspond to the 61st percentile (native-born students), 51st percentile (second-generation students), and 42nd percentile (first-generation students) of the U.S. distribution of scores. By ESCS, average scores of students expecting health or STEM careers ranged from 469 points (low-ESCS students) to 561 points (high-ESCS students), a gap of 92 points.

FIGURE 6. Average science literacy scores and score gaps of U.S. 15-year-old students with expectations of health or STEM careers, by demographic characteristics: 2015

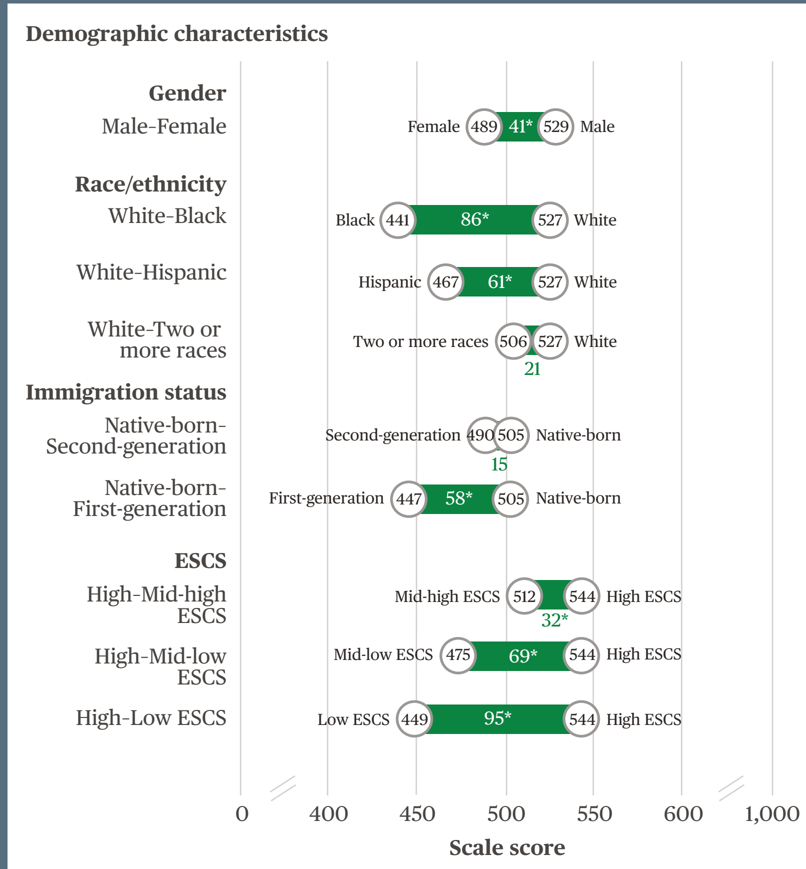


* $p < .05$ Science score gap is statistically significant.
NOTE: Scores are reported on a scale from 0 to 1,000. Health and STEM careers were classified according to the OECD (2016) definition and refer to those jobs that require further science-related studies beyond compulsory education. PISA defines “second-generation” as students born in the United States but whose parent(s) were born in another country, and “first-generation” as those students born outside the United States and whose parents were also born in another country. Data for “Other race” students are not shown because reporting standards were not met. “Other race” includes both American Indian/Alaska Native and Native Hawaiian/ Other Pacific Islander students. Black includes African American, and Hispanic includes Latino. Race categories exclude persons of Hispanic ethnicity. The PISA 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). Although rounded numbers are displayed, the figures are based on unrounded data.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Health-Specific Career Expectations

Analyzing only students expecting health careers, science achievement gaps were seen by all displayed demographic categories, although there was no measurable difference between the average scores of two sets of students (native-born versus second-generation students and White students versus students of Two or more races) (figure 7, table A-2). For example, male students outperformed female students by an average of 41 points, with the average score of male students (529 points) and the average score of female students (489 points) corresponding to the 62nd and 47th percentiles of the U.S. distribution of scores, respectively. Native-born students expecting a health career scored 58 points higher than their first-generation peers. The average achievement difference between low-ESCS students (449 points) and high-ESCS students 544 points) expecting health careers was 95 points. These scores correspond to the 33th percentile and 70th percentile, respectively, of the U.S. distribution of scores.

FIGURE 7. Average science literacy scores and score gaps of U.S. 15-year-old students with expectations of health careers, by demographic characteristics: 2015



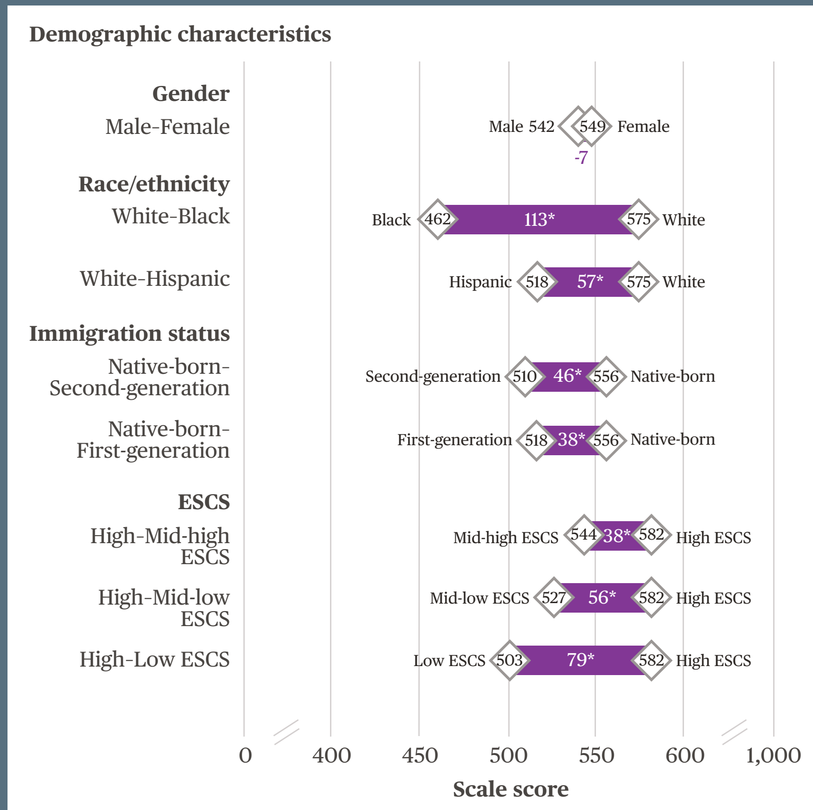
* $p < .05$ Science score gap is statistically significant.
NOTE: Scores are reported on a scale from 0 to 1,000. Health careers were classified according to the OECD (2016) definition and refer to those jobs in health fields that require further science-related studies beyond compulsory education. PISA defines "second-generation" as students born in the United States but whose parent(s) were born in another country, and "first-generation" as those students born outside the United States and whose parents were also born in another country. Data for "Asian" and "Other race" students are not shown because reporting standards were not met. "Other race" includes both American Indian/Alaska Native and Native Hawaiian/Other Pacific Islander students. Black includes African American, and Hispanic includes Latino. Race categories exclude persons of Hispanic ethnicity. The PISA 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). Although rounded numbers are displayed, the figures are based on unrounded data.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

STEM-Specific Career Expectations

Among students expecting STEM careers, there were achievement gaps by almost every displayed demographic category, although no measurable difference was observed in the average science scores of male and female students expecting STEM careers (figure 8, table A-3). On average, White students scored 575 points, which was 113 points higher than Black students' average score of 462 points and 57 points higher than Hispanic students' average score of 518 points. These average scores correspond to the 77th percentile (White students), 58th percentile (Hispanic students), and 37th percentile (Black students) of the U.S. distribution of scores.

While lower percentages of females expected STEM careers than health careers (7 vs. 37 percent), those expecting STEM careers scored higher, on average, in science achievement. Specifically, the average score for a female student expecting a STEM career was 549 points, corresponding to the 69th percentile, while the average score for a female expecting a health career was 489 points, corresponding to the 46th percentile.

FIGURE 8. Average science literacy scores and score gaps of U.S. 15-year-old students with expectations of STEM careers, by demographic characteristics: 2015



* $p < .05$ Science score gap is statistically significant.
NOTE: Scores are reported on a scale from 0 to 1,000. STEM careers were classified according to the OECD (2016) definition and refer to those jobs in STEM fields that require further science-related studies beyond compulsory education. PISA defines "second-generation" as students born in the United States but whose parent(s) were born in another country, and "first-generation" as those students born outside the United States and whose parents were also born in another country. Data for "Asian" students, students of "Two or more races," and "Other race" students are not shown because reporting standards were not met. "Other race" includes both American Indian/Alaska Native and Native Hawaiian/Other Pacific Islander students. Black includes African American, and Hispanic includes Latino. Race categories exclude persons of Hispanic ethnicity. The PISA 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). Although rounded numbers are displayed, the figures are based on unrounded data.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

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To access and explore PISA data, visit the PISA International Data Explorer at **http://nces.ed.gov/surveys/international/ide/**.

Methodology and Technical Notes

The estimates provided in this Statistics in Brief come from the 2015 administration of the Program for International Student Assessment (PISA). PISA is a cross-national comparative study that measures 15-year-old students' reading, mathematics, and science literacy, and, in 2015, collaborative problem solving and financial literacy. It is coordinated by the Organization for Economic Cooperation and Development (OECD), with governmental sponsors in each participating education system. In the United States, PISA is conducted by the National Center for Education Statistics (NCES) within the U.S. Department of Education.

To ensure comparability of the data across participating countries and education systems, the OECD provided detailed international requirements on the various aspects of data collection and implemented quality control procedures. Participating education systems were obliged to follow these requirements. These requirements—regarding the target population, sampling design, sample size, exclusions, and defining participation rates—are described briefly below. For more detailed information, see OECD (2017) and Kastberg, Chan, and Murray (2016).

Target Population and Exclusions

This Statistics in Brief only used data from the science literacy assessment. PISA's international desired population is 15-year-olds attending both publicly and privately controlled schools in grade 7 and higher. More specifically, the technical standards required that students in the sample be 15 years and 3 months old to 16 years and 2 months old at the beginning of the testing period.

In order to keep PISA as inclusive as possible and to keep the exclusion rate down, the United States used the UH (Une Heure) instrument, designed for students with special education needs. Still, the guidelines allowed schools to be excluded for several approved reasons (for example, if they were in remote regions, very small, or provided only special education) and allowed students to be excluded in certain circumstances, including:

- **Students with functional disabilities:** Students with a moderate to severe permanent physical disability such that they cannot perform in the PISA testing environment.
- **Students with intellectual disabilities:** Students who have a mental or emotional disability and who have been found through testing to be cognitively delayed or who are considered in the professional opinion of qualified staff to be cognitively delayed such that they cannot perform in the PISA testing environment.
- **Students with insufficient language experience:** Students who meet the three criteria of not being native speakers in the assessment language, having limited proficiency in the assessment language, and having less than 1 year of instruction in the assessment language.

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

Percentiles

This brief contextualizes achievement differences by associating a specific score value with a percentile cut point within the overall distribution of U.S. scores. First, the analysis calculates the science literacy cut point scores associated with every whole-number percentile—from the 1st percentile through the 99th—for all U.S. 15-year-olds. Then, a score estimate highlighted in this brief is associated with the percentile that most closely corresponds to this score; for instance, the average score of female students expecting health careers (488.7) falls at the 47th percentile (487.5) along the distribution. It should be noted that all score estimates and cut points are associated with an error margin, or standard error, since PISA is a sample-based study. Hence, *t* tests show that the average score of female health career students is not measurably different from the cut point scores associated with the 44th, 45th, 46th, 47th, 48th, 49th, 50th, and 51st percentiles. Naming a single percentile instead of a range of percentiles was deemed preferable because sample-based studies, in which population estimates are accompanied by standard errors, consistently defer to referencing single estimates, not a range of scores.

Sampling Design and Sample Sizes

Although it is not possible to assess every single 15-year-old student, samples can provide representative values for education systems. As such, a representative sample of students was selected from a representative sample of schools (i.e., a two-stage stratified systematic sample). The sampling probabilities for cases in the sample are proportional to the estimated number of 15-year-old students in the school based on grade enrollments. The first stage refers to a sample of schools, while the second stage refers to a sample of students within schools. The PISA international contractors (hereafter referred to as "the PISA consortium"), who are responsible for the design and implementation of PISA internationally, drew the sample of schools for each participating country and education system.

A minimum of 4,500 students from a minimum of 150 schools was required in each participating country and education system. Following the PISA consortium guidelines, replacement schools were identified at the same time the PISA sample was selected by assigning the two schools neighboring the sampled school in the frame as replacements. The international guidelines specified that within schools, a sample of up to 35 students was to be selected in an equal probability sample unless fewer than 35 students age 15 were available (in which case all 15-year-old students were selected). The PISA 2015 U.S. school sample consisted of 240 schools. This number represents an increase from the international minimum requirement of 150 and was implemented to offset anticipated school nonresponse and reduce design effects. The U.S. student sample allowed up to 52 students per school to increase the accuracy and validity of the data.

Participation Rates

In order to minimize the potential for response biases, the OECD developed participation or response rate standards that apply to all participating countries and education systems and govern both whether or not a participating education system's data are included in the PISA international dataset as well as the way in which national statistics are presented in the international reports.

One hundred forty-two participating original schools and 35 replacement schools participated in the U.S. administration of PISA. This resulted in 177 participating schools and an overall weighted school response rate of 83 percent. The overall weighted student response rate was 90 percent and the U.S. overall student exclusion rate was 3 percent.

Schools were selected with probability proportionate to the school's estimated enrollment of 15-year-olds. Any school containing at least one of grades 7 through 12 was included in the school sampling frame. Participating schools provided a list of 15-year-old students (typically in August or September 2015) from which the sample was drawn using sampling software provided by the international contractor.

Nonresponse Bias Analysis

In addition to the international response rate standards described above, the U.S. sample had to meet the statistical standards of the National Center for Education Statistics (NCES) of the U.S. Department of Education. For an assessment like PISA, NCES requires that a nonresponse bias analysis be conducted when the response rate for schools or students falls below 85 percent.

Of the 240 original sampled schools in the U.S. national sample, 213 were eligible (18 schools did not have any 15-year-olds enrolled, 6 had closed, and 3 were otherwise ineligible), and 142 agreed to participate. The weighted school response rate before replacement was 67 percent, requiring the United States to conduct a nonresponse bias analysis, which was used by the PISA consortium and the OECD to evaluate the quality of the final U.S. sample.

A nonresponse bias analysis was conducted in the United States at the school level in PISA 2015 to address potential problems in the data owing to school nonresponse. The investigation provides evidence that there is little potential for nonresponse bias in the PISA-participating sample based on the characteristics studied. It also suggests that the use of substitute schools substantially reduced the potential for bias. Moreover, after the application of school nonresponse adjustments, there is no evidence of resulting potential bias in the final sample. For more details about the nonresponse bias analysis, please see **https://nces.ed.gov/surveys/pisa/pisa2015/pisa2015highlights_8k.asp**.

In this brief's analysis, 96 to 100 percent of the data were valid (i.e., not missing) for the student demographic variables of gender, race/ethnicity, immigration status, and ESCS in 2015. For the student health, STEM, and nonscience career variables, 95 percent of the data were valid.

Science Literacy Assessment Development

The 2015 assessment science instruments were developed by international experts and PISA international consortium test developers and included items submitted by participating education systems. The science items, which included both trend items and new items developed for 2015, were reviewed by representatives of each country for possible bias and relevance to PISA's goals and by PISA subject-matter expert groups. To further examine potential biases and design issues in the PISA assessment, all participating education systems field-tested the assessment items in spring 2014. After the field trial, items that did not meet the established measurement criteria or were otherwise found to include intrinsic biases were dropped from the main assessment.

Most education systems participating in PISA 2015, including the United States, used the computer-based version of the assessment, although a paper-based version was also available. Approximately 65 percent of the science items were multiple choice and 35 percent were open response. The open-response items were graded by trained scorers following international coding guidelines. After the cognitive assessment, students also completed a questionnaire designed to provide information about their backgrounds, attitudes, and experiences in school. For more information about the PISA 2015 assessment design and questionnaires, see **https://nces.ed.gov/surveys/pisa/pisa2015/index.asp**.

Weighting

The use of sampling weights is necessary for computing statistically sound, nationally representative estimates. Survey weights adjust for the probabilities of selection for individual schools and students, for school or student nonresponse, and for errors in estimating the size of the school or the number of 15-year-olds in the school at the time of sampling.

The internationally defined weighting specifications for PISA 2015 included base weights and adjustments for nonresponse (Kastberg et al. 2017). The school base weight was defined as the reciprocal of the school's probability of selection. (For substitute schools, the school base weight was set equal to the base weight of the original school it replaced.) The student base weight was given as the reciprocal of the probability of selection for each selected student from within a school.

The product of these base weights was then adjusted for school and student nonresponse. The school nonresponse adjustment was done individually for each education system by cross-classifying the explicit and implicit stratification variables defined as part of the sample design. In the case of the United States, two variables were used for stratification: school control (public/private) and census region. The student nonresponse adjustment was done within cells based first on their school nonresponse cell and their explicit stratum; within that, grade and gender were used when possible. Trimming factors at the school and student levels were used to reduce the size of large weights, since large weights can substantially increase sampling variance. All PISA analyses were conducted using these adjusted sampling weights. For more information on the nonresponse adjustments, see the OECD's **PISA 2015 Technical Report, chapter 8** (OECD 2017).

Scaling

For PISA 2015, each test form had a different subset of items. Because each student completed only a subset of all possible items, classical test scores, such as the percentage correct, are not accurate measures of student performance. Instead, scaling techniques were used to establish a common scale for all students. Item response theory (IRT) was used to estimate average scores for science, reading, and mathematics literacy for each education system, as well as for three science process and three science content subscales (Kastberg et al. 2017).

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

To keep student burden to a minimum, PISA administered a limited number of assessment items to each student—too few to produce accurate content-related scale scores for each student. To accommodate this situation, during the scaling process, plausible values were estimated to characterize students participating in the assessment, given their background characteristics. Plausible values are imputed values and not test scores for individuals in the usual sense. They represent what the performance of an individual on the entire assessment might have been, had it been observed.

Ten plausible values were estimated for each student for each scale. These values represented the distribution of potential scores for all students in the population with similar characteristics and identical patterns of item response. Statistics describing performance on the PISA science, reading, and mathematics scales are based on plausible values. In PISA, the science, mathematics and reading literacy scales are from 0 to 1,000. For more information on PISA scaling and plausible values, see the OECD's **PISA 2015 Technical Report, chapter 9** (OECD 2017).

Sampling and Nonsampling Error and Variance Estimation

Two broad categories of error occur in estimates generated from surveys: nonsampling errors and sampling errors. In addition, variance estimation of PISA assessment scores needs to take into account the measurement error associated with the use of plausible values (Kastberg et al. 2017).

Nonsampling error is a term used to describe variations in the estimates that may be caused by population coverage limitations, nonresponse bias, and measurement error, as well as data collection, processing, and reporting procedures. The sources of nonsampling errors are typically problems such as unit and item nonresponse, the differences in respondents' interpretations of the meaning of survey questions, and mistakes in data preparation.

Sampling errors arise when a sample of the population, rather than the whole population, is used to estimate some statistic. Different samples from the same population would likely produce somewhat different estimates of the statistic in question. This means that there is a degree of uncertainty associated with statistics estimated from a sample. This uncertainty is referred to as sampling variance and is usually expressed as the standard error of a statistic estimated from sample data. Standard errors can be used as a measure of the precision expected from a particular sample. The approach used for calculating standard errors in PISA is the Fay method of balanced repeated replication (BRR) (Judkins 1990). This method of producing standard errors uses information about the sample design to produce more accurate standard errors than would be produced using simple random sample assumptions.

For analysis purposes, PISA datasets include sets of 10 plausible values for each of the PISA 2015 scales. Thus, analysis of the PISA scales should be undertaken 10 times, once for each plausible value. Results are then averaged, and significance tests must be adjusted for variation between the 10 sets of results. A special provision also needs to be made in the estimation of the standard errors and is best done using the International Database (IDB) Analyzer, which was developed for this purpose. The IDB Analyzer, available at **www.iea.nl/data**, can be used to combine and analyze data from PISA. It is a downloadable tool that creates SPSS or SAS syntax for combining files from across different countries and levels (student, teacher, school, etc.) and performing analysis that takes into account information from the sampling design in the computation of sampling variance and handles the plausible values. For more information on variance estimation of PISA data, see the OECD's **PISA 2015 Technical Report, chapters 8 and 9** (OECD 2017).

Interpreting Statistical Significance

Comparisons of average scores and percentile cut-point scores were tested with Student's *t* statistic using the IDB Analyzer, which takes into account information from the sampling design in the computation of sampling variance and handles the plausible values to enable the user to compute descriptive statistics and conduct statistical hypothesis testing among groups in the population. Differences between estimates were tested against the probability of a Type I error[8] or significance level. The statistical significance of each comparison was determined by calculating the Student's *t* value for the difference between each pair of scores and comparing the *t* value with published tables of significance levels for two-tailed hypothesis testing.

To test differences between independent estimates, Student's *t* values were computed 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 being compared (e.g., the means of sample members of two groups) and se_1 and se_2 are their corresponding standard errors.

Because of the sampling design (in which schools and students within schools are randomly sampled), data within the education system from mutually exclusive sets of students (for example, males and females) are not independent. For example, to determine whether the performance of females differs from that of males would require estimating the correlation between females' and males' scores. A BRR procedure, mentioned above, was used to estimate the standard errors of differences between nonindependent samples within the United States. Use of the BRR procedure implicitly accounts for the correlation between groups when calculating the standard errors. When comparing differences between nonindependent groups within the education system (e.g., average science literacy scales between males and females), the following formula was used:

$$t = \frac{(E_{grp1} - E_{grp2})}{se_{(grp1 - grp2)}}$$

where E_{grp1} and E_{grp2} are the nonindependent group estimates being compared and $se_{(grp1-grp2)}$ is the standard error of the difference calculated using BRR to account for the correlation between the estimates for the two nonindependent groups. For more details on the computation of standard errors of the difference between nonindependent groups, BRR, and international data analysis products, please see the **PISA 2015 Technical Report** (OECD 2017).

[8] A Type I error occurs when one concludes that a difference observed in a sample reflects a true difference in the population from which the sample was drawn, when no such difference is present.

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Appendix A: Classification of Occupations

The following open-ended question appeared in the PISA 2015 student questionnaire: "What kind of job do you expect to have when you are about 30 years old?" Students' responses were coded to 4-digit International Standard Classification of Occupations (ISCO) codes. The list of the four job groups below appears in the *PISA 2015 Results (Volume I): Excellence and Equity in Education* (OECD 2016).

The classification used in this report includes four groups of jobs:

1. **Science and engineering professionals:** All science and engineering professionals (submajor group 21), except product and garment designers (2163) and graphic and multimedia designers (2166).
2. **Health professionals:** All health professionals in submajor group 22 (e.g., doctors, nurses, veterinarians), with the exception of traditional and complementary medicine professionals (minor group 223).
3. **ICT professionals:** All information and communications technology professionals (submajor group 25).
4. **Science technicians and associate professionals,** including:
    - physical and engineering science technicians (minor group 311)
    - life science technicians and related associate professionals (minor group 314)
    - air traffic safety electronic technicians (3155)
    - medical and pharmaceutical technicians (minor group 321), except medical and dental prosthetic technicians (3214)
    - telecommunications engineering technicians (3522).

SOURCE: OECD. (2016). *PISA 2015 Results (Volume I): Excellence and Equity in Education*. OECD Publishing: Paris.

Thus, in this brief, students expecting STEM careers were those who reported expecting to be a science and engineering professional, an ICT professional, or a nonmedical science technician or associate professional (i.e., all science technician/associate professionals listed above except for medical and pharmaceutical technicians); students expecting health careers were those who reported expecting to be a health professional or medical or pharmaceutical technician.

As the Pew Research Center (2018) discusses, "there is no standard definition of STEM workers." While some research categorizes health professionals and technicians as STEM workers, this brief did not. Since about *half* of the science, technology, engineering, mathematics, and health workforce is composed of only health care practitioners and technicians (Funk and Parker 2018), this analysis was designed to distinguish between health careers and nonhealth STEM careers.

The complete list of 2015 health and STEM careers used in this brief, and classified according to the aforementioned criteria, appears on the following pages.

STEM, 2015:

ISCO-08 Code	ISCO-08 Career Label
2100	Science and engineering professionals
2110	Physical and earth science professionals
2111	Physicists and astronomers
2112	Meteorologists
2113	Chemists
2114	Geologists and geophysicists
2120	Mathematicians, actuaries and statisticians
2130	Life science professionals
2131	Biologists, botanists, zoologists and related professionals
2132	Farming, forestry and fisheries advisers
2133	Environmental protection professionals
2140	Engineering professionals (excluding electrotechnology)
2141	Industrial and production engineers
2142	Civil engineers
2143	Environmental engineers
2144	Mechanical engineers
2145	Chemical engineers
2146	Mining engineers, metallurgists and related professionals
2149	Engineering professionals not elsewhere classified
2150	Electrotechnology engineers
2151	Electrical engineers
2152	Electronics engineers
2153	Telecommunications engineers
2160	Architects, planners, surveyors and designers
2161	Building architects
2164	Town and traffic planners
2165	Cartographers and surveyors
2162	Landscape architects
2500	Information and communications technology professionals
2510	Software and applications developers and analysts
2511	Systems analysts
2512	Software developers
2513	Web and multimedia developers

ISCO-08 Code	ISCO-08 Career Label
2514	Applications programmers
2519	Software and applications developers and analysts not elsewhere classified
2520	Database and network professionals
2521	Database designers and administrators
2522	Systems administrators
2523	Computer network professionals
2529	Database and network professionals not elsewhere classified
3110	Physical and engineering science technicians
3111	Chemical and physical science technicians
3112	Civil engineering technicians
3113	Electrical engineering technicians
3114	Electronics engineering technicians
3115	Mechanical engineering technicians
3116	Chemical engineering technicians
3117	Mining and metallurgical technicians
3118	Draughtspersons
3119	Physical and engineering science technicians not elsewhere classified
3140	Life science technicians and related associate professionals
3141	Life science technicians (excluding medical)
3142	Agricultural technicians
3143	Forestry technicians
3150	Ship and aircraft controllers and technicians
3151	Ships engineers
3152	Ships deck officers and pilots
3153	Aircraft pilots and related associate professionals
3154	Air traffic controllers
3155	Air traffic safety electronics technicians
3522	Telecommunications engineering technicians

NOTE: The table above was generated from the PISA 2015 international codebook. A career appearing in this table means that there was at least one student (out of *all PISA-participating education systems*) who had that career response; it does not mean that *U.S.* students expect to hold all of the careers above.
SOURCE: OECD. (2016). *PISA 2015 Results (Volume I): Excellence and Equity in Education*. OECD Publishing: Paris.

Health, 2015:

ISCO-08 Code	ISCO-08 Career Label
2200	Health professionals
2210	Medical doctors
2211	Generalist medical practitioners
2212	Specialist medical practitioners
2220	Nursing and midwifery professionals
2221	Nursing professionals
2222	Midwifery professionals
2240	Paramedical practitioners
2250	Veterinarians
2260	Other health professionals
2261	Dentists
2262	Pharmacists
2263	Environmental and occupational health and hygiene professionals
2264	Physiotherapists
2265	Dieticians and nutritionists
2266	Audiologists and speech therapists
2267	Optometrists and ophthalmic opticians
2269	Health professionals not elsewhere classified
3210	Medical and pharmaceutical technicians
3211	Medical imaging and therapeutic equipment technicians
3212	Medical and pathology laboratory technicians
3213	Pharmaceutical technicians and assistants

NOTE: The table above was generated from the PISA 2015 international codebook. A career appearing in this table means that there was at least one student (out of *all PISA-participating education systems*) who had that career response; it does not mean that *U.S.* students expect to hold all of the careers above.
SOURCE: OECD. (2016). *PISA 2015 Results (Volume I): Excellence and Equity in Education*. OECD Publishing: Paris.

Appendix B: Tables

Table A-1. Distribution of U.S. students' scores on the PISA science literacy assessment: 2015

Percentile	*Cut score*	*s.e.*
1	281.7	6.62
2	303.0	5.45
3	317.6	4.81
4	328.0	4.22
5	336.4	4.13
6	343.5	3.85
7	350.6	4.22
8	356.7	4.22
9	362.3	4.02
10	367.6	3.89
11	372.4	3.81
12	377.2	3.89
13	381.7	3.90
14	386.0	3.81
15	390.1	3.6
16	393.8	3.67
17	397.8	3.74
18	401.7	3.67
19	405.1	3.55
20	408.5	3.62
21	411.9	3.69
22	415.3	3.89
23	418.7	3.60
24	421.9	3.48
25	424.9	3.68
26	428.2	3.75
27	431.4	3.70
28	434.4	3.61
29	437.3	3.61
30	440.1	3.69
31	443.2	3.92
32	446.2	3.82
33	448.9	3.78
34	451.8	3.93
35	454.7	4.05
36	457.6	3.98
37	460.5	3.92
38	463.2	3.79
39	465.8	3.74
40	468.6	3.78

Percentile	*Cut score*	*s.e.*
41	471.2	3.81
42	474.0	3.81
43	476.7	3.74
44	479.3	3.69
45	481.9	3.74
46	484.7	3.87
47	487.5	3.86
48	490.1	3.63
49	492.6	3.72
50	495.2	3.82
51	498.1	3.94
52	500.8	3.85
53	503.4	3.85
54	506.0	3.87
55	508.7	3.80
56	511.3	3.92
57	514.3	4.01
58	517.0	3.85
59	519.7	3.76
60	522.5	3.72
61	525.1	3.81
62	528.0	3.85
63	530.9	3.83
64	533.8	3.95
65	536.9	3.92
66	539.8	3.78
67	542.6	3.71
68	545.5	3.82
69	548.6	3.80
70	551.5	3.87
71	554.8	3.91
72	557.7	3.80
73	560.8	3.97
74	564.2	3.92
75	567.5	3.89
76	570.7	3.75
77	573.9	3.74
78	577.4	3.85
79	580.8	3.75
80	584.1	3.76

Percentile	*Cut score*	*s.e.*
81	588.0	3.93
82	591.7	3.76
83	595.4	3.67
84	599.3	3.70
85	603.4	3.49
86	607.2	3.35
87	611.3	3.54
88	615.8	3.66
89	620.4	3.63
90	625.5	3.89
91	630.6	3.60
92	636.3	3.94
93	642.7	4.37
94	649.9	4.27
95	658.3	4.86
96	667.4	4.62
97	678.4	4.44
98	692.5	4.75
99	714.6	6.35

NOTE: This table shows the threshold (or cut) scores for the 1st through 99th percentiles. The percentile range is specific to the distribution of science literacy scores of U.S. students. Standard error is noted by *s.e.*
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table A-2. Percentage of U.S. 15-year-olds expecting careers in health, STEM, and nonscience fields, by type of field and demographic characteristics: 2015

[Standard errors appear in parentheses]

Demographic characteristics	Nonscience careers		Health or STEM careers					
			Total		Health careers		STEM careers	
All students	60.0	(0.83)	40.0	(0.83)	23.5	(0.70)	16.5	(0.61)
Gender								
Male	64.9	(1.12)	35.1	(1.12)	9.5	(0.66)	25.7	(0.99)
Female	55.4	(1.11)	44.6	(1.11)	37.2	(1.15)	7.5	(0.63)
Race/ethnicity[1]								
White, non-Hispanic	59.1	(1.20)	40.9	(0.79)	23.3	(1.14)	17.6	(0.79)
Black, non-Hispanic	62.2	(2.17)	37.8	(1.17)	25.8	(1.67)	12.0	(1.17)
Hispanic	61.5	(1.31)	38.5	(1.03)	22.6	(1.11)	15.9	(1.03)
Asian, non-Hispanic	49.8	(4.86)	50.2	(3.24)	26.9	(3.28)	23.3	(3.24)
Two or more races	61.0	(2.89)	39.0	(2.27)	21.9	(2.55)	17.1	(2.27)
Other race	64.1	(6.98)	35.9	(3.87)	23.5	(5.47)	12.4	(3.87)
Immigration status[2]								
Native-born	61.0	(0.93)	39.0	(0.93)	22.9	(0.81)	16.1	(0.67)
Second-generation	55.8	(1.71)	44.2	(1.71)	25.5	(1.62)	18.7	(1.22)
First-generation	57.2	(2.53)	42.8	(2.53)	25.0	(2.00)	17.8	(1.91)
ESCS status[3]								
Low ESCS	63.5	(1.22)	36.5	(1.22)	22.9	(1.22)	13.5	(1.04)
Mid-low ESCS	62.6	(1.40)	37.4	(1.40)	21.5	(1.04)	15.9	(1.18)
Mid-high ESCS	60.9	(1.54)	39.1	(1.54)	23.8	(1.20)	15.3	(1.00)
High ESCS	53.6	(1.39)	46.4	(1.39)	25.4	(1.24)	21.0	(1.07)

[1] "Other race" includes both American Indian/Alaska Native and Native Hawaiian/Other Pacific Islander students. Black includes African American, and Hispanic includes Latino. Race categories exclude persons of Hispanic ethnicity.
[2] PISA defines "second-generation" as students born in the United States but whose parent(s) were born in another country, and "first-generation" as those students born outside the United States and whose parents were also born in another country.
[3] The PISA 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).
NOTE: Detail may not sum to totals due to rounding. STEM and health careers were classified according to the OECD (2016) definition and refer to those jobs that require further science-related studies beyond compulsory education.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.

Table A-3. Average science scores of U.S. 15-year-olds expecting careers in health, STEM, and nonscience fields, by type of field and demographic characteristics: 2015

[Standard errors appear in parentheses]

Demographic characteristics	Nonscience careers		Health or STEM careers: Total		Health careers		STEM careers	
All students	487.9	(2.97)	516.2	(3.74)	496.8	(3.73)	543.8	(4.83)
Gender								
Male	485.3	(3.27)	538.6	(4.62)	529.4	(5.69)	542.1	(5.68)
Female	490.9	(3.57)	498.9	(4.41)	488.7	(4.36)	549.5	(7.29)
Race/ethnicity[1]								
White, non-Hispanic	522.8	(2.97)	547.7	(3.72)	527.3	(4.08)	574.7	(5.54)
Black, non-Hispanic	428.2	(4.71)	447.5	(7.33)	441.0	(6.61)	461.6	(12.56)
Hispanic	462.3	(4.47)	487.9	(7.10)	466.8	(6.64)	518.0	(9.15)
Asian, non-Hispanic	495.5	(15.66)	553.7	(11.94)	‡	†	‡	†
Two or more races	495.4	(9.01)	521.8	(7.55)	506.0	(10.51)	‡	†
Other race	‡	†	‡	†	‡	†	‡	†
Immigration status[2]								
Native-born	497.1	(3.26)	526.3	(3.84)	505.5	(3.90)	555.9	(5.36)
Second-generation	471.2	(6.09)	498.5	(8.59)	490.4	(9.99)	509.5	(10.09)
First-generation	444.6	(6.90)	476.6	(10.87)	447.2	(13.19)	518.0	(14.95)
ESCS status[3]								
Low ESCS	452.0	(4.13)	469.2	(5.53)	449.1	(6.83)	503.3	(7.51)
Mid-low ESCS	471.9	(4.07)	497.1	(5.34)	475.3	(6.27)	526.6	(7.32)
Mid-high ESCS	498.9	(3.77)	524.8	(5.72)	512.5	(5.87)	544.1	(8.24)
High ESCS	535.6	(4.56)	561.3	(4.23)	544.0	(4.91)	582.2	(6.27)

† Not applicable.
‡ Reporting standards not met due to sample size of less than 63 students.
[1] "Other race" includes both American Indian/Alaska Native and Native Hawaiian/Other Pacific Islander students. Black includes African American, and Hispanic includes Latino. Race categories exclude persons of Hispanic ethnicity.
[2] PISA defines "second-generation" as students born in the United States but whose parent(s) were born in another country, and "first-generation" as those students born outside the United States and whose parents were also born in another country.
[3] The PISA 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).
NOTE: STEM and health careers were classified according to the OECD (2016) definition and refer to those jobs that require further science-related studies beyond compulsory education.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2015.