

# STATS IN BRIEF

U.S. DEPARTMENT OF EDUCATION SEPTEMBER 2017 NCES 2018-007

## Adult Education Attainment and Assessment Scores: A Cross-National Comparison

### AUTHORS

**Saida Mamedova**  
American Institutes for Research

**Dinah Sparks**  
**Kathleen Mulvaney Hoyer**  
Activate Research, Inc.

### PROJECT OFFICER

**John Ralph**  
National Center for Education Statistics

**Statistics in Brief** publications present descriptive data in tabular formats to provide useful information to a broad audience, including members of the general public. They address topical issues and questions. They do not investigate more complex hypotheses, account for inter-relationships 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](http://nces.ed.gov) and references noted in the body of this document for more information.

### The Organization for Economic

Cooperation and Development (OECD) conducted the Program for the International Assessment of Adult Competencies (PIAAC), a multi-domain adult skills assessment with an extensive background questionnaire, in 2012. PIAAC is a global effort to understand how individuals' education, workplace experiences, and other background factors relate to cognitive skills in the domains of literacy, numeracy, and problem solving in technology-rich environments.

This Statistics in Brief builds upon the findings in the earlier National Center for Education Statistics (NCES) report (Goodman et al. 2013) to provide additional cross-national comparisons of adult literacy and numeracy proficiencies by education attainment. Specifically, the brief highlights differences between several countries in the average literacy and numeracy scores for adults at different levels of education attainment. The brief further compares gaps in literacy and numeracy scores between adults of higher and lower education attainment across participating countries.

The results from the earlier NCES reports indicated that adults in the United States performed lower than or not measurably different from the PIAAC international average in literacy and in numeracy (Goodman et al. 2013, Rampey et al.

This publication was prepared for NCES under Contract No. ED-IES-12-D-0002 with American Institutes for Research. Mention of trade names, commercial products, or organizations does not imply endorsement by the U.S. Government.

2016). Specifically, in literacy, average scores ranged from 250 in Italy to 296 in Japan. The U.S. average score was 270, while the PIAAC international average was 273. Compared with the U.S. average score, average scores were higher in 12 countries, lower in 5 countries, and not measurably different in 5 countries. In numeracy, average scores ranged from 246 in Spain to 288 in Japan. The U.S. average score was 253, while the PIAAC international average was 269. Compared with the U.S. average score in numeracy, average scores were higher in 18 countries, lower in 2 countries, and not measurably different in 2 countries (Goodman et al. 2013).

## REPORT OVERVIEW

PIAAC was first conducted in 2011–12 across 22 OECD member countries<sup>1</sup> to assess the literacy and numeracy skills of adults ages 16–65 and to collect a variety of background information from study participants.<sup>2</sup> In the United States, the study included a nationally representative sample of about 5,000 adults, with similar sample sizes across other participating countries.<sup>3</sup> The analyses in this brief rely on data collected in 2011–12 from the literacy and numeracy domains of the PIAAC assessment as well as information

on respondents' age and the highest level of formal education attained. Comparisons across the literacy and numeracy domains cannot be made because the two assessment scales were developed independently of each other.

This brief's findings are presented in three main sections, each of which corresponds to one of the three study questions presented on page 4. The first section of the brief provides a cross-national comparison of average PIAAC literacy and numeracy scores for adults at different levels of education attainment. In this section, the brief shows PIAAC scores for adults by three categories: adults who do not have a high school degree, adults who have a high school degree, and adults who have at least an associate's degree.<sup>4,5</sup>

The second section describes the within-country average PIAAC literacy and numeracy score gaps between adults who do not have a high school degree and adults who have at least an associate's degree. It discusses how these within-country gaps compare across the OECD participant countries.

Section 3 examines score gaps at additional levels. While the second section contrasts the gaps in literacy

and numeracy scores between adults at the highest (at least an associate's degree) and lowest (less than a high school degree) levels of education, section three provides more detailed information. This section examines the score gaps in literacy and numeracy between (a) those who did not finish high school and high school graduates and (b) high school graduates and those who attained at least an associate's degree. Comparison between these gaps demonstrates whether differences are more pronounced at lower levels of attainment or at higher levels of attainment.

Each section of the brief examines the findings in two discussions: all adults (ages 16–65) and, consistent with other OECD publications (OECD 2014), young adults (ages 20–29). Both areas of focus are important, since they highlight different aspects of U.S. performance. The discussion of all adults is important for understanding the U.S. national performance. The discussion of adults in their 20s is important because these adults represent the next generation of the labor force who are and will be competing globally. Moreover, this group of adults is substantial in size; one-fifth of U.S. adults with at least

<sup>1</sup> Russian Federation and Cyprus, not OECD member countries, also took part in the assessment, resulting in a total of 24 countries that participated in PIAAC. This brief focuses only on OECD member countries; thus, the analyses in this report do not include the Russian Federation and Cyprus.

<sup>2</sup> PIAAC also included an assessment of problem solving in technology-rich environments, a domain that measured adults' ability to interact with information communication technologies. Only those PIAAC respondents who took the assessment on a computer participated in this domain. In order to keep a consistent sample of respondents across domains, this brief does not include a discussion of problem solving in technology-rich environments and focuses instead only on literacy and numeracy.

<sup>3</sup> For the detailed country sample size counts please refer to Chapter 14 of the OECD's PIAAC technical report at [http://www.oecd.org/site/piaac/Technical%20Report\\_17OCT13.pdf](http://www.oecd.org/site/piaac/Technical%20Report_17OCT13.pdf).

<sup>4</sup> In order to facilitate cross-national education comparisons, the United Nations Educational, Scientific and Cultural Organization (UNESCO) created the International Standard Classification of Education (ISCED-97). The three education attainment categories used in this brief correspond to the following ISCED-97 levels: ISCED-97 2 and lower (Less than high school); ISCED-97 3 and 4a–b (High school, no associate's degree); and ISCED-97 5a–b and 6 (Associate's degree or above).

<sup>5</sup> In this report, those who had started, but not finished college—as well as those who were currently attending college—are counted as having only a high school degree. Similarly, those who had at least an associate's degree could have an associate's, bachelor's, master's, Ph.D., or professional degrees.

an associate's degree are 20 to 29 years old.<sup>6</sup> As noted by Goodman and colleagues (2013), all U.S. adults ages 16–65 scored lower than PIAAC international averages in both literacy and numeracy. Similar findings exist for young adults. In the U.S., this group of adults scored lower than the OECD average in both domains (figures 1a and 1b). This brief takes a deeper look into these findings and illustrates how scores vary based on individuals' level of education.

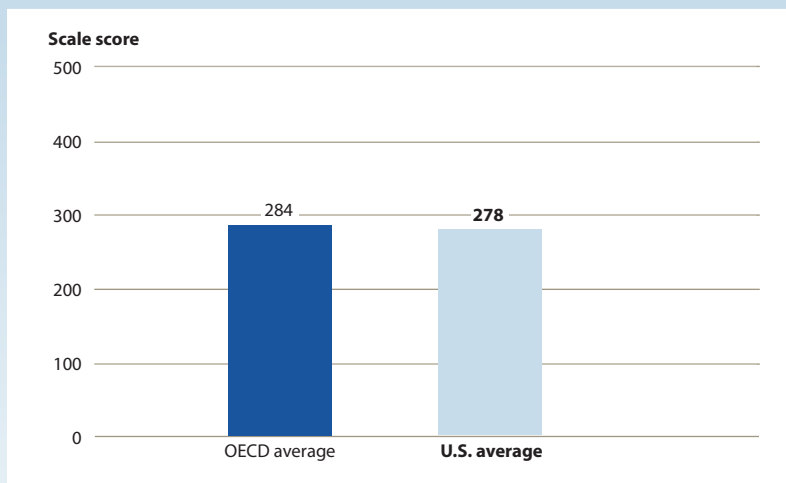
Several social and political factors, as well as policy changes over time, may impact countries' demographic and education landscape. Considerations of these contextual differences are outside the scope of this brief, but readers should keep these differences in mind as they review the findings.

The OECD average reported throughout the brief is estimated based on the 22 OECD countries that participated in PIAAC. The comparisons highlighted in the text are statistically significant at the  $p < .05$  level. No adjustments were made for multiple comparisons. Due to large standard errors, differences that seem substantial might not be statistically significant. For additional information about the data and methods used in this report, please see the **Methodology and Technical Notes** at the end of the brief.

<sup>6</sup> Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012. Retrieved February 19, 2015, from PIAAC International Data Explorer <http://nces.ed.gov/surveys/piaac/ideuspiaac>.

## FIGURE 1a.

Average PIAAC literacy scores of 20- to 29-year-olds for the OECD and the United States: 2012

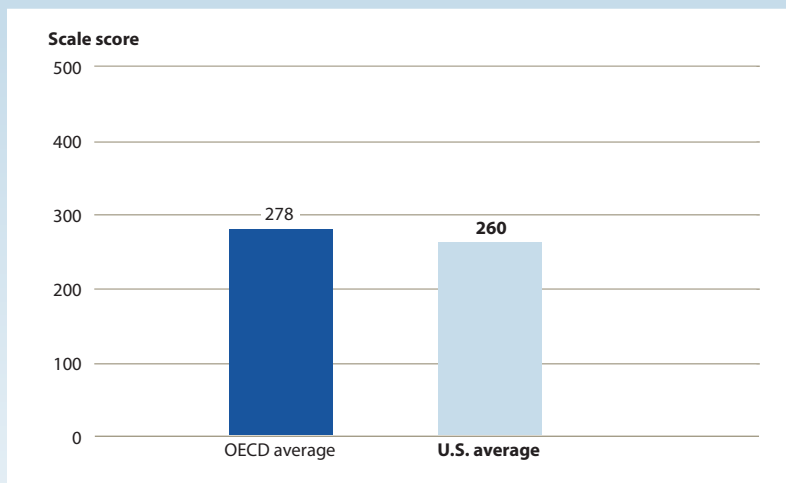


NOTE: The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC. PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs).

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

## FIGURE 1b.

Average PIAAC numeracy scores of 20- to 29-year-olds for the OECD and the United States: 2012



NOTE: The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC. PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

## STUDY QUESTIONS

1

How did U.S. adults compare to the OECD averages and to other participating countries in literacy and numeracy by education attainment level?

2

What were the within-country literacy and numeracy score gaps among participating countries between adults with the lowest (did not graduate from high school) and highest (at least an associate's degree) levels of education? How did these score gaps differ across countries?

3

Among the participating countries, how did the score gaps between high school graduates and non-graduates compare with the score gaps between high school graduates and those who had attained at least an associate's degree? How did these score gaps differ across countries?

## KEY FINDINGS

- Among adults with at least an associate's degree, neither the full population nor those in their 20s differed measurably from the OECD average for their respective groups in literacy. However, adults in both age groups who had not completed high school scored lower in literacy than the OECD average for the respective groups. In numeracy, all adults and the subset of adults in their 20s scored lower than the OECD average in their respective age groups at each level of education studied (figures 2 and 3).
- The score gaps in both literacy and numeracy between adults who did not have a high school degree and adults who had at least an associate's degree were higher in the United States than in almost any other OECD country that participated in PIAAC except France. (figure 4). The score gaps for U.S. adults in their 20s were wider than those for all adults (figures 4 and 5).
- Adults in their 20s in almost all of the participating countries had a larger gap between those who did not finish high school and high school graduates compared to the gap between high school graduates and those with at least an associate's degree. This was true for both literacy and numeracy (figure 7).

# 1

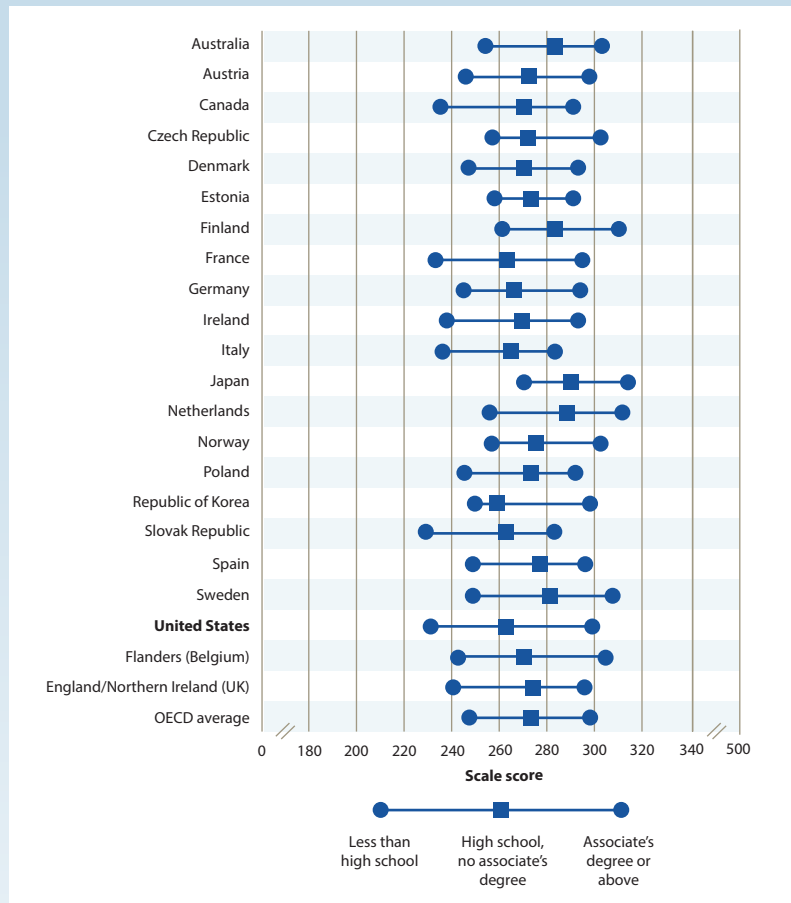
## How did U.S. adults compare to the OECD averages and to other participating countries in literacy and numeracy by education attainment level?

### All adults (16- to 65-year-olds)

In literacy, the performance of U.S. adults with at least an associate's degree did not differ measurably from the OECD average for adults at the same level of education attainment (figure 2a). However, U.S. adults who had only a high school diploma or those with no high school diploma scored below the OECD average for adults at those levels of education. Comparing U.S. adults with their peers in participating countries revealed various differences in performance by education levels. In literacy, U.S. adults with no high school diploma scored lower than their peers in all countries (except four countries, where the scores were not measurably different).<sup>7</sup> U.S. adults with a high school diploma scored higher than their peers in all other countries (except three countries, where the scores were not measurably different).<sup>8</sup> U.S. adults with an associate's degree or above scored higher than their peers in eight countries, lower than their peers in seven countries, and did not differ from their peers in six countries.<sup>9</sup> Additionally, adults who did not finish high school in Finland had average literacy scores that were not

### FIGURE 2a.

Average PIAAC literacy scores of adults ages 16 to 65 across education attainment levels, by participating country and region: 2012



NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

<sup>7</sup>The countries that did not differ from the U.S. were Canada, France, Italy, and Spain.

<sup>8</sup>The countries that did not differ from the U.S. were France, Italy, and Spain.

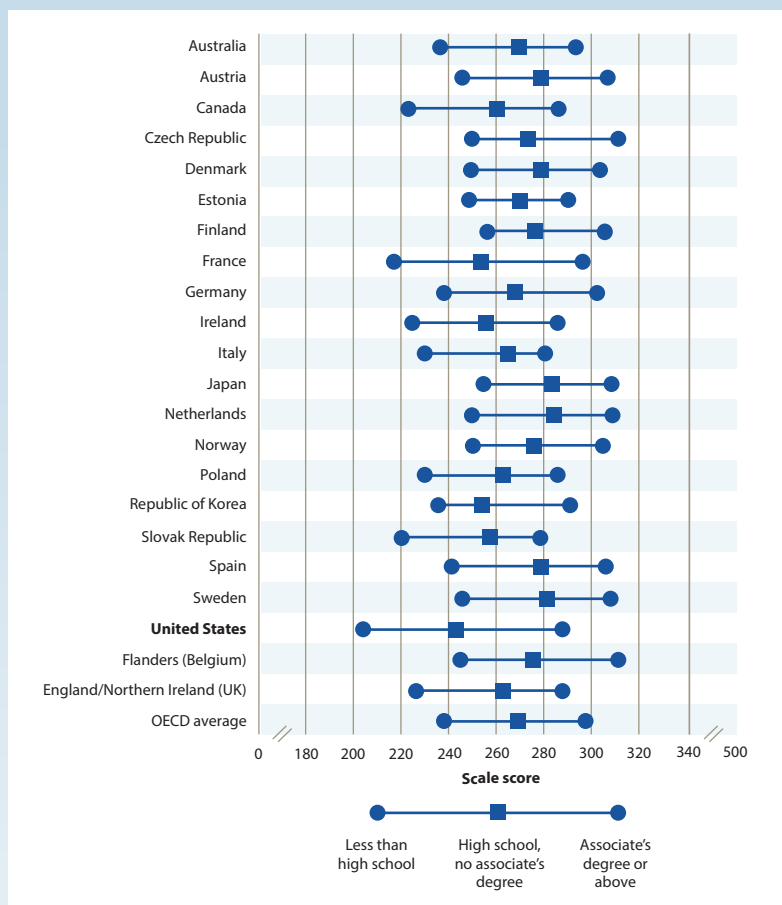
<sup>9</sup>U.S. scores were higher than the scores for Canada, Denmark, Estonia, Germany, Ireland, Italy, the Republic of Korea, and Spain. U.S. scores were lower than the scores for Australia, Finland, Japan, Netherlands, Norway, Sweden, and Flanders (Belgium). U.S. scores were not measurably different from Austria, Czech Republic, France, Poland, Slovak Republic, and England/Northern Ireland (United Kingdom).

measurably different from those of U.S. high school graduates. Adults who did not finish high school in every other participating OECD country, except Japan, had lower average literacy scores than U.S. high school graduates. Adults in Japan who did not finish high school had a higher average literacy score than U.S. high school graduates.

In numeracy, U.S. adults at each of the three levels of education attainment performed lower than the OECD average (figure 2b). In numeracy, U.S. adults with no high school diploma scored lower than all other participating countries. U.S. adults with a high school diploma also scored lower than all other participating countries. U.S. adults with an associate's degree or above scored higher than their peers in Italy and Spain and lower than their peers in all other countries (except five countries, where the scores were not measurably different).<sup>10</sup> Additionally, in seven countries, adults who did not finish high school had a higher average numeracy score than U.S. high school graduates.<sup>11</sup> There was no measurable difference in the average scores between adults in the Netherlands with a high school degree and U.S. adults who had at least an associate's degree.

## FIGURE 2b.

Average PIAAC numeracy scores of adults ages 16 to 65 across education attainment levels, by participating country and region: 2012



NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

<sup>10</sup> The countries that did not differ from the U.S. were Canada, Ireland, the Republic of Korea, Poland, and England/Northern Ireland (United Kingdom).

<sup>11</sup> Adults who did not finish high school in Czech Republic, Denmark, Estonia, Finland, Japan, Netherlands, and Norway had a higher average numeracy score than U.S. high school graduates.

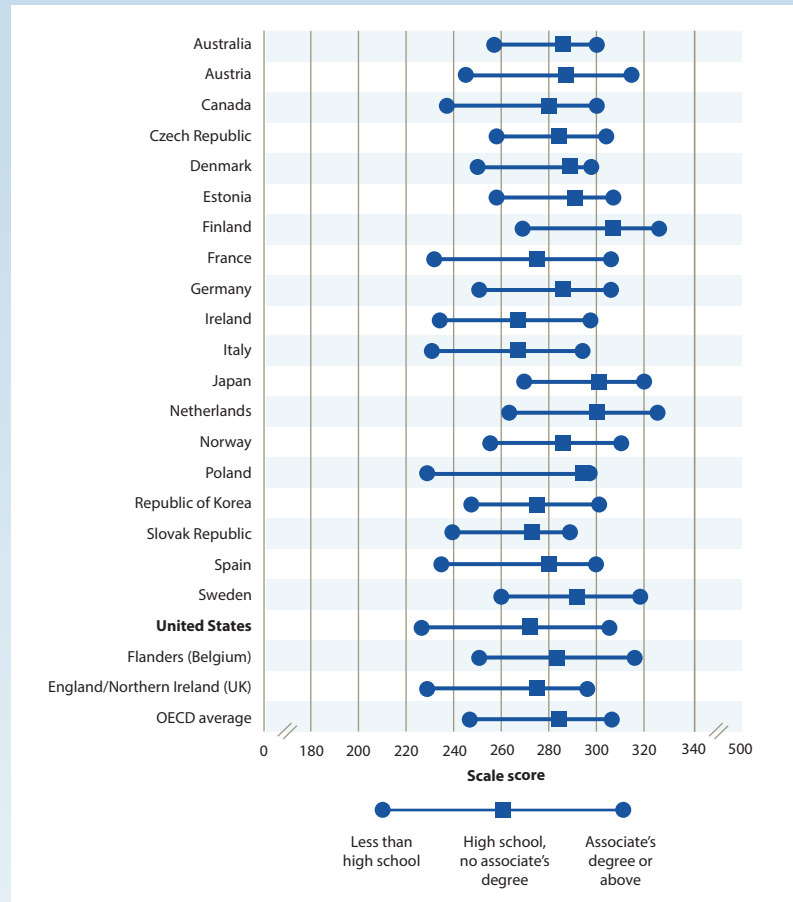
### Adults in their 20s (20- to 29-year-olds)

U.S. adults in their 20s with at least an associate's degree were not measurably different from the OECD average in literacy for adults with this level of education attainment. However, U.S. adults in their 20s with at least an associate's degree were not measurably different from the OECD average in literacy for adults with this level of education attainment. However, U.S. adults in their 20s in both of the other groups (those who had no high school diploma and those who graduated from high school) scored lower than the OECD average for adults in their 20s. In literacy, U.S. adults in their 20s with no high school diploma scored lower than their peers in all countries (except seven countries, where the scores were not measurably different).<sup>12</sup> U.S. adults in their 20s with a high school diploma scored lower than their peers in all other countries (except six countries, where the scores were not measurably different).<sup>13</sup> Adults in the U.S. with an associate's degree or higher scored higher than their peers in five countries, lower than their peers in six countries, and did not differ from their peers in 10 countries.<sup>14</sup>

Additionally, in literacy, there was no measurable difference between the Finnish, Japanese, Dutch, and Swedish adults in their 20s who did not finish high school and U.S. adults in their 20s who were high school graduates (figure 3a).

## FIGURE 3a.

Average PIAAC literacy scores of 20- to 29-year-olds across education attainment levels, by participating country and region: 2012



NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

<sup>12</sup> The countries that did not differ from the U.S. were Canada, France, Ireland, Italy, the Republic of Korea, Slovak Republic, and England/Northern Ireland (United Kingdom).

<sup>13</sup> The countries that did not differ from the U.S. were France, Ireland, Italy, Poland, Spain, and England/Northern Ireland (United Kingdom).

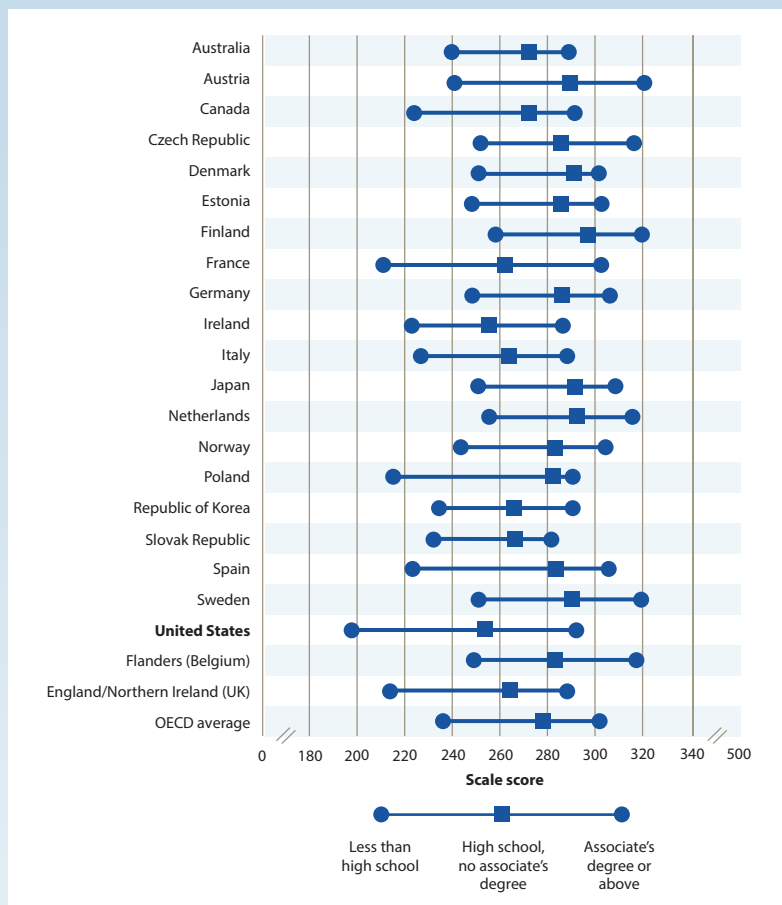
<sup>14</sup> U.S. scores were higher than scores in Ireland, Italy, the Republic of Korea, Spain, and England/Northern Ireland (United Kingdom). U.S. scores were lower than scores in Austria, Finland, Japan, Netherlands, Sweden, and Flanders (Belgium). U.S. scores did not differ from scores in Australia, Canada, Czech Republic, Denmark, Estonia, France, Germany, Norway, Poland, and Slovak Republic.

In numeracy, U.S. adults in their 20s who did not finish high school scored lower than the average score of adults in their 20s of the same education attainment in every other participating OECD country with the exception of France and the Republic of Korea. (figure 3b).<sup>15</sup>

At each of the three attainment levels the U.S. numeracy scores were lower than the corresponding OECD average. In numeracy, U.S. adults in their 20s with no high school diploma scored lower than their peers in all countries (except two countries, where the scores were not measurably different).<sup>16</sup> U.S. adults in their 20s with a high school diploma also scored lower than their peers in all other countries, except Ireland, where the scores did not differ. U.S. adults in their 20s with an associate's degree or above scored higher than their peers in Spain and lower than their peers in all other countries (except seven countries, where the scores did not differ).<sup>17</sup>

## FIGURE 3b.

Average PIAAC numeracy scores of 20- to 29-year-olds across education attainment levels, by participating country and region: 2012



NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

<sup>15</sup> In France and the Republic of Korea, the scores of adults in their 20s who did not finish high school were not measurably different from the scores of U.S. adults in their 20s who did not finish high school.

<sup>16</sup> The countries that did not differ were France and the Republic of Korea.

<sup>17</sup> The countries that did not differ were Australia, Canada, Ireland, Italy, the Republic of Korea, Poland, and England/Northern Ireland (United Kingdom).



## 2 What were the within-country literacy and numeracy score gaps among participating countries between adults with the lowest (did not graduate from high school) and highest (at least an associate's degree) levels of education? How did these score gaps differ across countries?

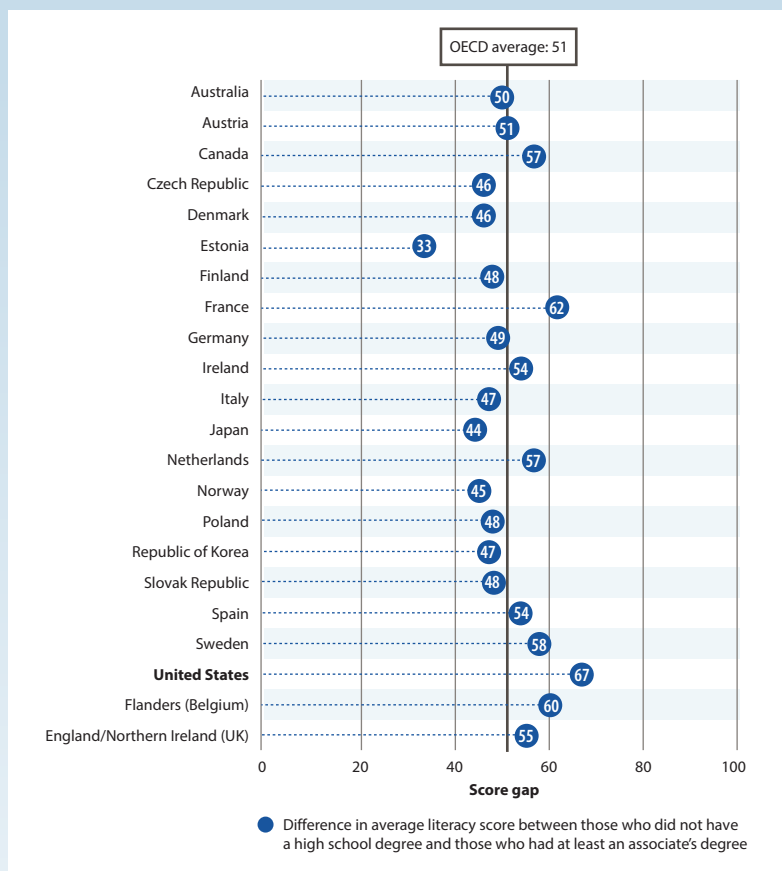
The findings in this section explore the sizes of the differences in skills between countries' most and least educated adult populations. Since education attainment is one major source of skill development, examinations of the gaps between the most and least educated adults in each country can illuminate the value, in terms of skill gain, of attaining higher levels of education.

### All adults (16- to 65-year-olds)

Figures 4a and 4b display the score gaps in literacy and numeracy between adults who did not finish high school and adults with at least an associate's degree. The score gaps within countries ranged from 33 to 67 points in literacy and from 42 to 83 points in numeracy. Estonia's score gaps in literacy and numeracy were the lowest among the OECD participating countries.

**FIGURE 4a.**

PIAAC literacy score gaps between adults ages 16 to 65 who did not have a high school degree and those who had at least an associate's degree, by participating country and region: 2012



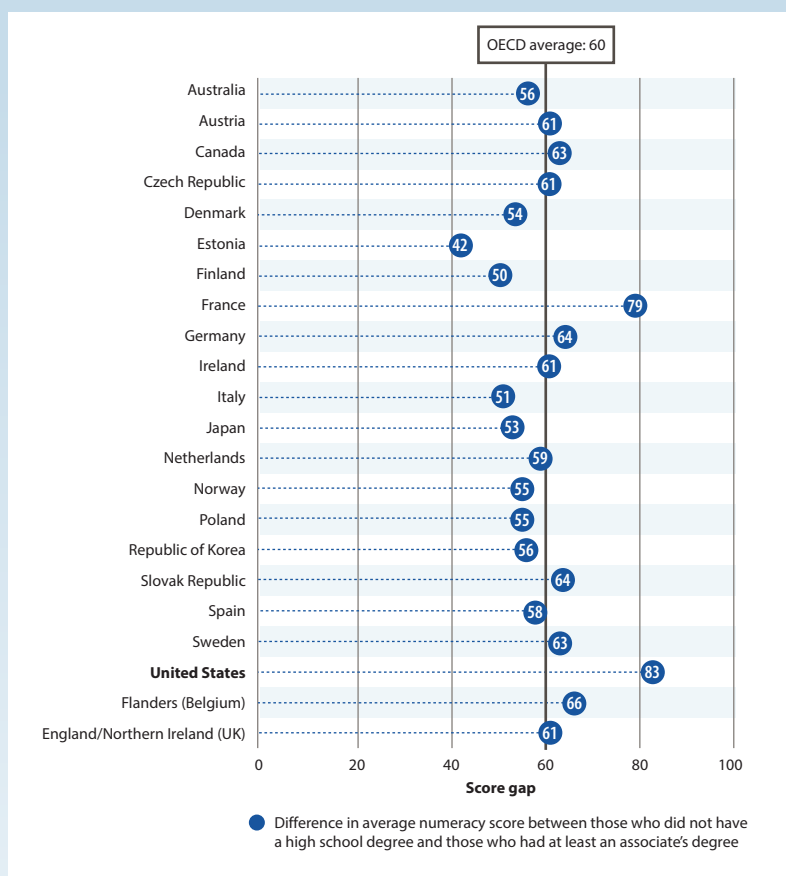
NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. All gaps are calculated using unrounded estimates. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

Compared to the OECD average gap, Denmark, Estonia, Italy, Japan, Norway, and the Republic of Korea had narrower gaps for both domains, while France, Sweden, the United States, and Flanders (Belgium) had wider gaps in both domains. The score gaps were wider in the United States than in any other OECD country that participated in PIAAC, with the exception of France. In France, score gaps were not measurably different from that of the United States.

**FIGURE 4b.**

**PIAAC numeracy score gaps between adults ages 16 to 65 who did not have a high school degree and those who had at least an associate's degree, by participating country and region: 2012**



NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. All gaps are calculated using unrounded estimates. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

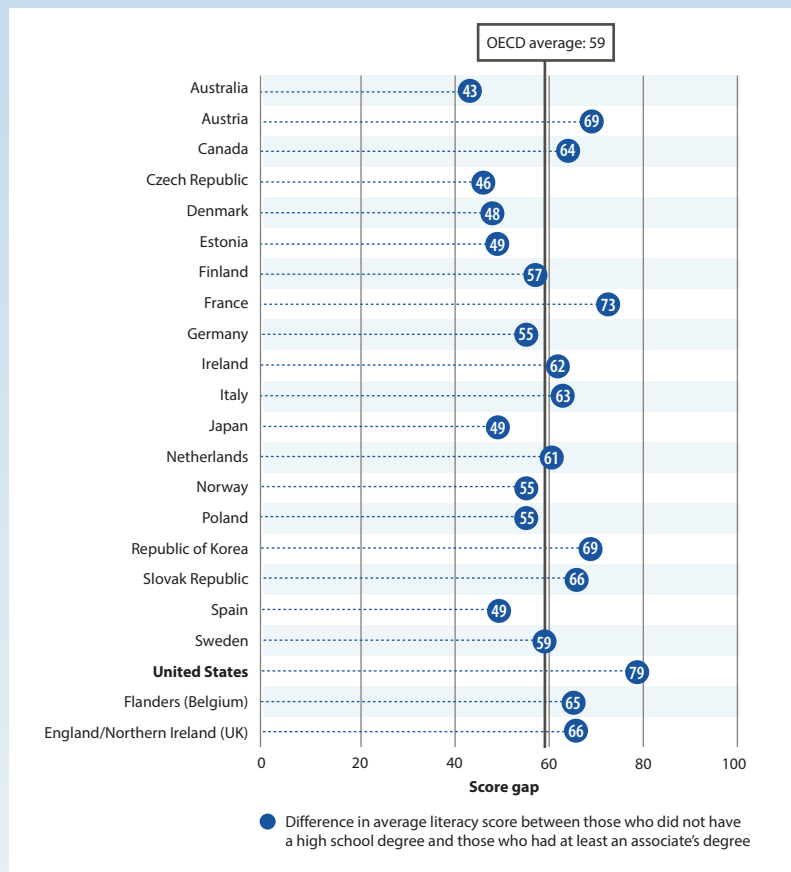
SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

### Young adults (20- to 29-year-olds)

Figures 5a and 5b display the score gaps in literacy and numeracy between 20- to 29-year-olds who did not finish high school and those with at least an associate's degree. The gaps ranged from 43 to 79 score points in literacy and from 48 to 93 score points in numeracy, with the United States having larger score gaps than 12 out of 22 countries in both domains, 79 and 93 points, respectively.<sup>18</sup> Gaps in Austria and France were also higher than the OECD participating country average in both literacy and numeracy. Australia had smaller gap than 11 other countries in literacy and in 8 other countries in numeracy. In the Czech Republic and Japan, the literacy gap was narrower than the OECD average score gap, while the numeracy gap was not measurably different from the OECD average score gap. In Australia, Denmark, Estonia, and Spain, gaps for both domains were narrower than the OECD average score gap.

## FIGURE 5a.

PIAAC literacy score gaps between 20- to 29-year-olds who did not have a high school degree and those who had at least an associate's degree, by participating country and region: 2012



NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED-97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. All gaps are calculated using unrounded estimates. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

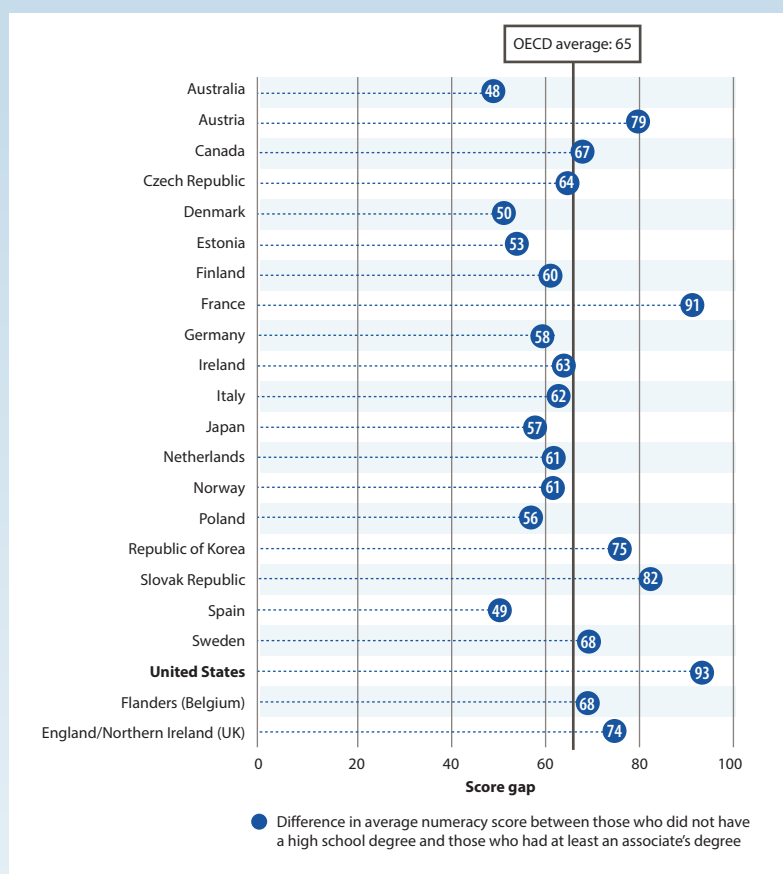
SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

<sup>18</sup> In literacy, the United States had a larger gap than Australia, Czech Republic, Denmark, Estonia, Finland, Germany, Japan, Netherlands, Norway, Poland, Spain, and Sweden. In numeracy, the United States had a larger gap than Australia, Austria, Canada, Czech Republic, Denmark, Estonia, Finland, Germany, Ireland, Italy, Japan, Netherlands, Norway, Poland, Spain, Sweden, Flanders (Belgium), and England/Northern Ireland (United Kingdom).

The score gaps for adults in their 20s in the United States were larger than those for all adults, 79 versus 67 points in literacy and 93 versus 83 points in numeracy (figures 4 and 5).

## FIGURE 5b.

PIAAC numeracy score gaps between 20- to 29-year-olds who did not have a high school degree and those who had at least an associate's degree, by participating country and region: 2012



NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. All gaps are calculated using unrounded estimates. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

# 3 Among the participating countries, how did the score gap between high school graduates and non-graduates compare with the score gaps between high school graduates and those who had attained at least an associate's degree? How did these score gaps differ across countries?

The third section of this brief discusses two levels of literacy and numeracy score gaps.

- The score gap between adults who did not have a high school degree and adults who did have a high school degree.
- The score gap between adults who had a high school degree and adults who had at least an associate's degree.

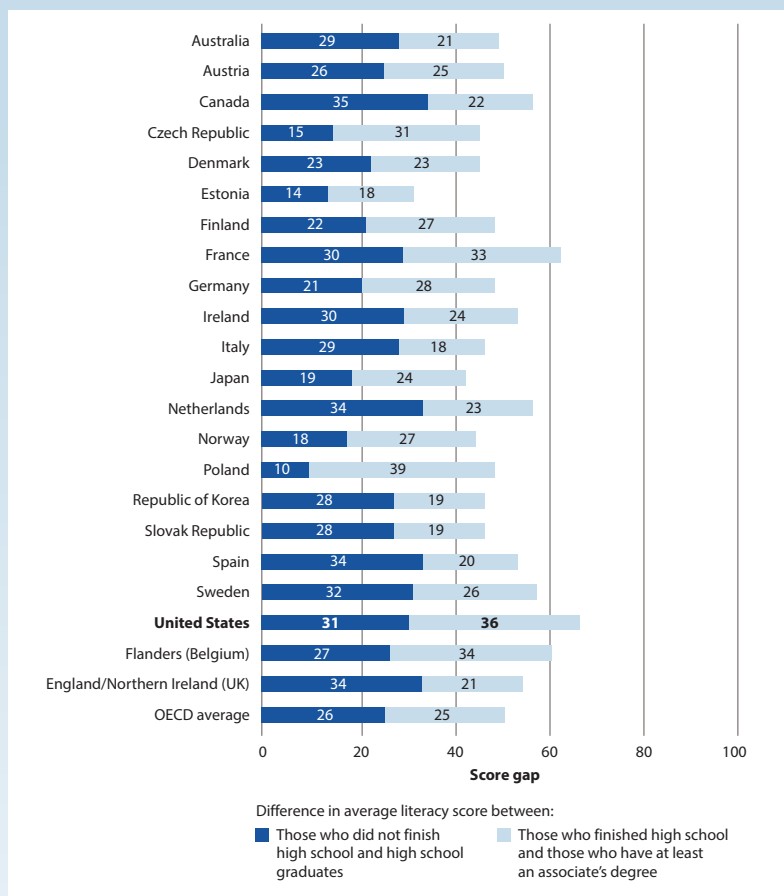
Examination of these gaps allows the reader to see whether differences described in the previous section are more pronounced at lower levels of attainment or at higher levels of attainment.

## All adults (16- to 65-year-olds)

The sizes of the gap between those who did not finish high school and high school graduates and the gap between those who finished high school and those who had at least an associate's degree differed across all but two participating countries in both literacy and numeracy (figures 6a and 6b). Austria and the United States were the exceptions. In these two countries the score gap between those who did not finish high school and high school graduates, and the score gap between high school graduates and those with at least an associate's degree did not differ measurably for both domains (literacy and numeracy).

**FIGURE 6a.**

PIAAC literacy score gaps between levels of highest education attainment of adults ages 16 to 65 by participating country and region: 2012

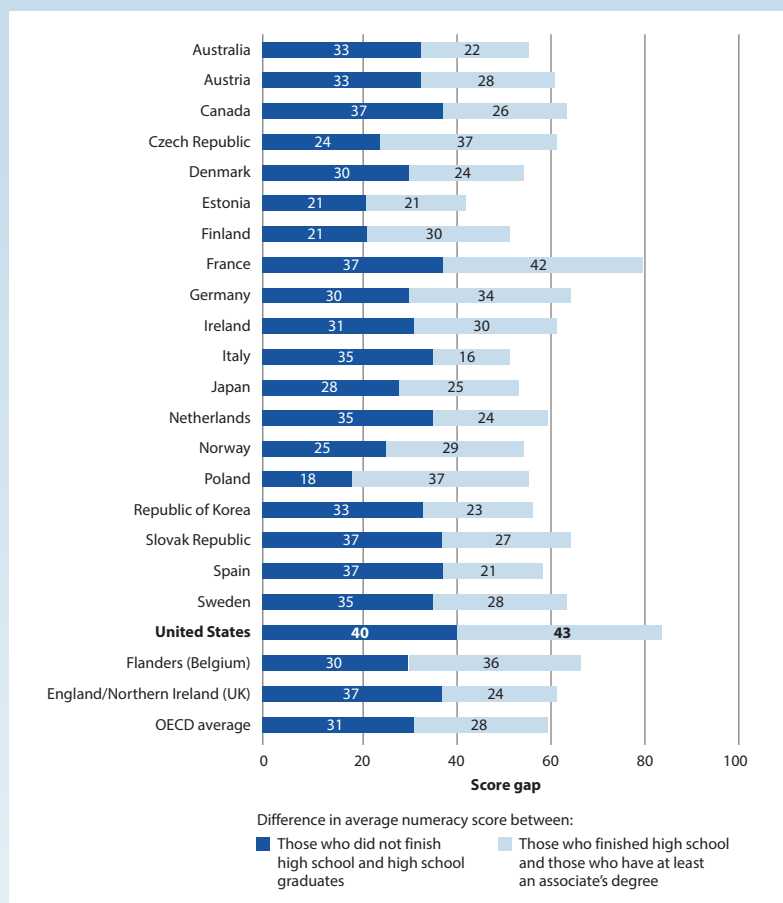


NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. All gaps are calculated using unrounded estimates. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC. SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

Specifically, the score gap between those who did not finish high school and high school graduates and the score gap between high school graduates and those with at least an associate's degree for the United States in literacy (31 and 36 points, respectively) and in numeracy (40 and 43 points, respectively) were not measurably different from one another. In both domains, in Czech Republic, Poland, and Flanders (Belgium), the score gap between high school graduates and those with at least an associate's degree was larger than the score gap between those who did not finish high school and high school graduates. In nine out of the 22 countries,<sup>19</sup> the score gap between those who did not finish high school and high school graduates was larger than the score gap between high school graduates and those with at least an associate's degree in both domains.

**FIGURE 6b.**

**PIAAC numeracy score gaps between levels of highest education attainment of adults ages 16 to 65, by participating country and region: 2012**



NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. All gaps are calculated using unrounded estimates. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

<sup>19</sup> These nine countries were Australia, Canada, Italy, the Republic of Korea, Netherlands, Slovak Republic, Spain, Sweden, and England/Northern Ireland (United Kingdom).

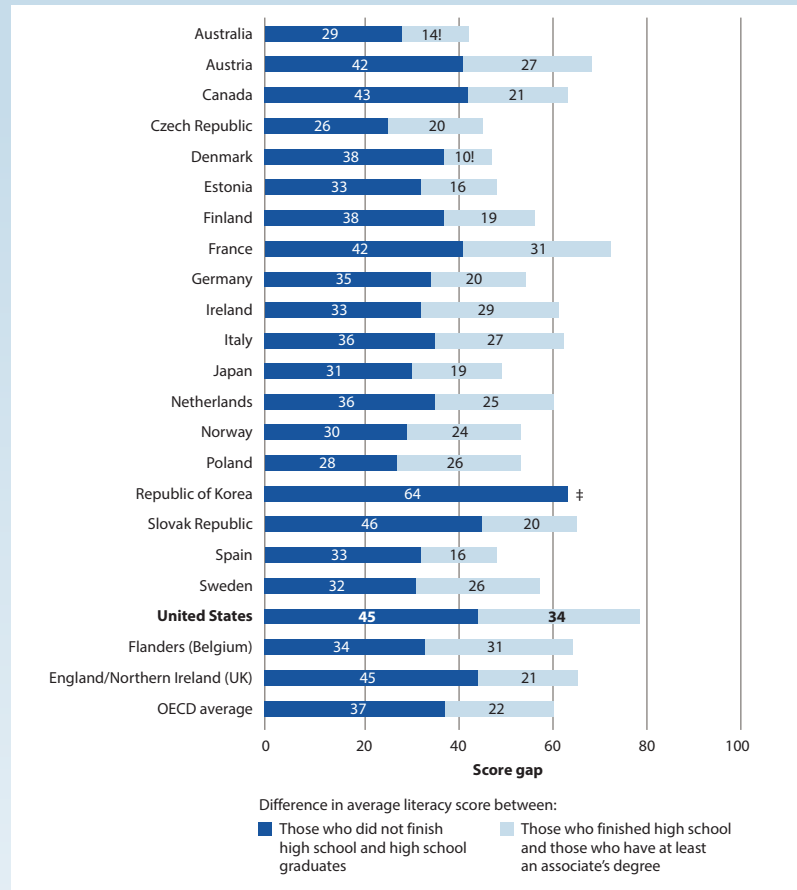
### Adults in their 20s (20- to 29-year-olds)

Figures 7a and 7b display the score gap between those who did not finish high school and high school graduates and the score gap between high school graduates and those with at least an associate's degree in literacy and numeracy for adults in their 20s. In no country was the score gap between high school graduates and those with at least an associate's degree greater than the gap between those who did not finish high school and high school graduates. This was true for both domains.

Twelve<sup>20</sup> out of 22 countries had larger score gaps between those who did not finish high school and high school graduates than score gaps between high school graduates and those who had at least an associate's degree in literacy. In the remaining 10 countries<sup>21</sup> the score gaps in literacy were not measurably different.

## FIGURE 7a.

PIAAC literacy score gaps between levels of highest education attainment of 20- to 29-year-olds, by participating country and region: 2012



! Interpret data with caution; the coefficient of variation is greater than or equal to 30 percent.

‡ Reporting standards not met. The coefficient of variation for this estimate is 50 percent or greater or the cell size is less than 3.

NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. All gaps are calculated using unrounded estimates. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

<sup>20</sup> These 12 countries were Australia, Austria, Canada, Denmark, Estonia, Finland, France, Germany, the Republic of Korea, Slovak Republic, Spain, and England/Northern Ireland (United Kingdom).

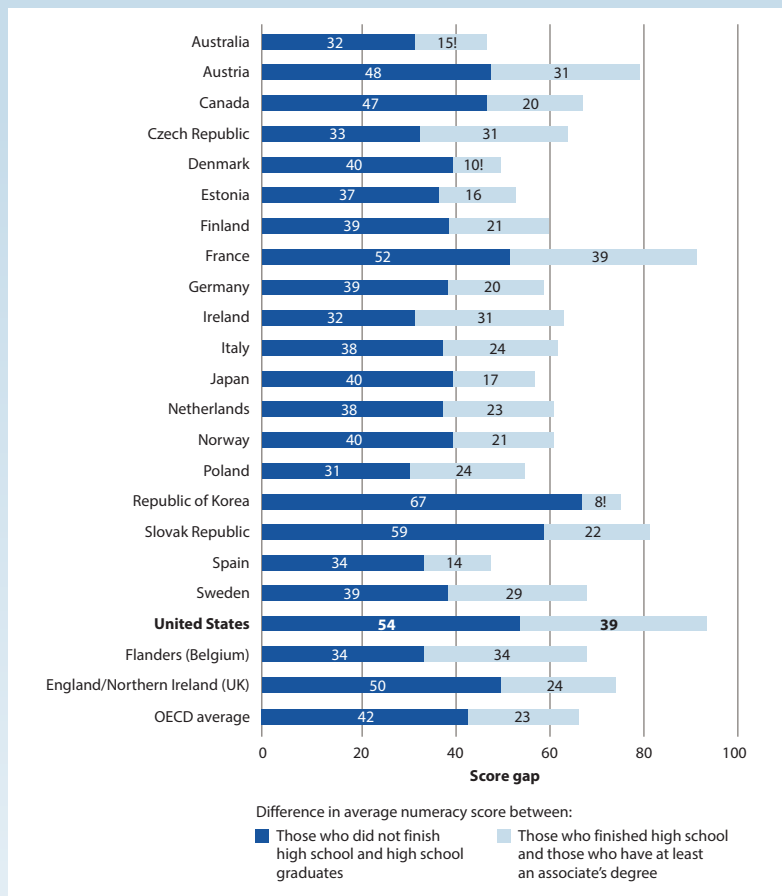
<sup>21</sup> The 10 countries were Czech Republic, Ireland, Italy, Japan, Netherlands, Norway, Poland, Sweden, United States, and Flanders (Belgium).

The numeracy score gaps in 16 countries<sup>22</sup> between those who did and those who did not finish high school were larger than the gaps between high school graduates and those with at least an associate's degree; in 6 countries,<sup>23</sup> the differences were not significant.

Score gaps in the United States reflected this pattern. The gap between adults who did not finish high school and high school graduates was greater than the gap between high school graduates and those who had at least an associate's degree in numeracy, but did not differ measurably for literacy.

## FIGURE 7b.

PIAAC numeracy score gaps between levels of highest education attainment of 20- to 29-year-olds, by participating country and region: 2012



! Interpret data with caution; the coefficient of variation is greater than or equal to 30 percent.

NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500. Most entities participating in PIAAC are countries, but a few of them are subnational regions. Following the name of each subnational region, its country is indicated in parentheses. For example, England/Northern Ireland are part of the United Kingdom. All gaps are calculated using unrounded estimates. The OECD average reported throughout this brief is estimated based on the 22 OECD countries that participated in PIAAC.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

<sup>22</sup> These 16 countries were Australia, Austria, Canada, Denmark, Estonia, Finland, France, Germany, Japan, the Republic of Korea, Netherlands, Norway, Slovak Republic, Spain, the United States, and England/Northern Ireland (United Kingdom).

<sup>23</sup> These six countries were Czech Republic, Ireland, Italy, Poland, Sweden, and Flanders (Belgium).



## FIND OUT MORE

For questions about content, to download this Statistics in Brief, or to view this report online, go to:

<http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2018007>

Readers of this brief may be interested in other PIAAC reports:

Goodman, M., Finnegan, R., Mohadjer, L., Krenzke, T., and Hogan, J. (2013). *Literacy, Numeracy, and Problem Solving in Technology-Rich Environments Among U.S. Adults: Results from the Program for the International Assessment of Adult Competencies 2012: First Look* (NCES 2014-008). <http://nces.ed.gov/pubs2014/2014008.pdf>.

Organization for Economic Cooperation and Development (OECD). (2013). *Time for the U.S. to Reskill?: What the Survey of Adult Skills Says*. OECD Skills Studies. OECD Publishing. <http://www.oecd-ilibrary.org/content/book/9789264204904-en>.

Organization for Economic Cooperation and Development (OECD). (2013). *OECD Skills Outlook 2013: First Results from the Survey of Adult Skills*. OECD Publishing. [http://www.oecd-ilibrary.org/education/oecd-skills-outlook-2013\\_9789264204256-en](http://www.oecd-ilibrary.org/education/oecd-skills-outlook-2013_9789264204256-en).

To access and explore PIAAC data, please visit the PIAAC International Data Explorer at <http://nces.ed.gov/surveys/international/ide/>.

## METHODOLOGY AND TECHNICAL NOTES

This section describes the assessment design, sampling, data collection, weighting, variance estimation, scaling, and statistical testing procedures used to collect and analyze the data for PIAAC. PIAAC's household data collection was conducted from August 25, 2011 through April 3, 2012.

The section defines the competency domains that are explored in this report, literacy and numeracy, but omits domains that are not included.

### Literacy

The PIAAC literacy framework expands the definition of literacy used in the International Adult Literacy Survey (IALS) and the Adult Literacy and Lifeskills Survey (ALL) and provides a broad definition of literacy:

*"Literacy is understanding, evaluating, using and engaging with written text to participate in the society, to achieve one's goals and to develop one's knowledge and potential."*

This definition (a) highlights the ranges of cognitive processes involved in literacy, (b) focuses on a more active role of individuals in the society (participating), and (c) includes a range of text types, such as narrative and interactive texts, in both print and electronic formats.

Based on the PIAAC framework, literacy tasks include items in both modes, paper-and-pencil and computer, that cover a range of difficulties—low,

middle, and high—to present a comprehensive picture of the range of skills of adults in each country. For descriptions of the literacy tasks that are associated with PIAAC scores and achievement levels, see table A or visit <http://nces.ed.gov/surveys/piaac/litproficiencylevel.asp>.

### Numeracy

The primary goal of PIAAC's numeracy assessment is to evaluate basic mathematical and computational skills that are considered fundamental for functioning in everyday work and social life. In the PIAAC numeracy framework, numeracy is defined as:

*"the ability to access, use, interpret, and communicate mathematical information and ideas, to engage in and manage mathematical demands of a range of situations in adult life."*

PIAAC numeracy assessment items (a) cover as many aspects as are defined in the framework, (b) are, as much as possible, authentic and culturally appropriate, (c) cover different levels of ability, and (d) are nationally adapted to use the standard measuring systems of the participating country. Assessment items include items from ALL as well as new items in paper-and-pencil and computer formats. For descriptions of numeracy tasks that are associated with PIAAC scores and achievement levels, see table B or visit <http://nces.ed.gov/surveys/piaac/numproficiencylevel.asp>.

### Assessment Design

PIAAC was designed as a computer-based assessment. Respondents

who had little or no familiarity with computers, however, were directed to a pencil-and-paper version of the assessment that tested skills in the domains of literacy and numeracy only. Approximately 15 percent of the respondents were directed to the paper-and-pencil path. Regardless of whether they took the assessment in the computer or pencil-and-paper format, all respondents first took a "Core" test to assess their capacity to undertake the full assessment. Those who were unsuccessful at the Core test were directed to the assessment of reading components. Those who succeeded at the Core test proceeded to the full assessment.

The PIAAC assessment for the United States included an adaptive element that allowed for automatic scoring. Based on their performance at different points in the assessment, respondents taking the computer-based version were directed to different "testlets" that contained items of different average difficulty in the domains of literacy and numeracy.

For more information on IALS and ALL, please see <https://nces.ed.gov/surveys/all/index.asp>.

### Sampling

The 2012 PIAAC assessment included a nationally representative probability sample of 9,468 households in the United States. This household sample was selected on the basis of a four-stage, stratified area sample: (1) primary sampling units (PSUs) consisting of counties or

**Table A. Description of PIAAC proficiency levels on the literacy scale**

Proficiency levels and cut scores for literacy	Literacy task descriptions
Level 5 (376–500)	<p>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 respondents to be aware of subtle, rhetorical cues and to make high-level inferences or use specialized background knowledge.</p>
Level 4 (326–375)	<p>Tasks at this level often require respondents to perform multiple-step operations to integrate, interpret, or synthesize information from complex or lengthy continuous, non-continuous, 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, non-central idea(s) 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.</p>
Level 3 (276–325)	<p>Texts at this level are often dense or lengthy, and include continuous, non-continuous, mixed, or multiple pages of text. Understanding text and rhetorical structures become 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 multi-step 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.</p>
Level 2 (226–275)	<p>At this level, the medium of texts may be digital or printed, and texts may comprise continuous, non-continuous, or mixed types. Tasks at this level require respondents 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</p> <ul style="list-style-type: none"> <li>• cycle through or integrate two or more pieces of information based on criteria;</li> <li>• compare and contrast or reason about information requested in the question; or</li> <li>• navigate within digital texts to access and identify information from various parts of a document.</li> </ul>
Level 1 (176–225)	<p>Most of the tasks at this level require the respondent to read relatively short digital or print continuous, non-continuous, 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 non-continuous texts, may require the respondent to enter personal information onto 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.</p>
Below Level 1 (0–175)	<p>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 non-continuous 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.</p>

**Table B. Description of PIAAC proficiency levels on the numeracy scale**

Proficiency levels and cut scores for numeracy	Numeracy task descriptions
Level 5 (376–500)	Tasks at this level require the respondent to understand complex representations and abstract and formal mathematical and statistical ideas, possibly embedded in complex texts. Respondents 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 upon solutions or choices.
Level 4 (326–375)	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 3 (276–325)	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.
Level 2 (226–275)	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 content is fairly explicit or visual with relatively few distractors. Tasks tend to require the application of two or more steps or processes involving calculation 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.
Level 1 (176–225)	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%, and locating and identifying elements of simple or common graphical or spatial representations.
Below Level 1 (0–175)	Tasks at this level require the respondents 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.

groups of contiguous counties; (2) secondary sampling units (referred to as segments) consisting of area blocks; (3) housing units containing households; and (4) eligible persons within households. Person-level data were collected through a screener, a background questionnaire, and the assessment. The screener instrument was conducted using a computer-assisted personal interviewing system

(CAPI) and collected information that included age and gender of all household members. It determined which household member or members was/were eligible for the study and selected the sampled person(s). Of the 9,468 sampled households, 1,285 were either vacant or not a dwelling unit, resulting in a sample of 8,183 households. Of the 8,183 households in the sample, there were

1,267 households without an adult age 16 to 65. A total of 5,686 of the 6,916 households with eligible adults completed the screener (up to two adults per household could be selected to complete the questionnaire), which was used to select survey respondents. The final screener response rate was 86.5 percent weighted.

Based on the screener data, 6,100 respondents age 16 to 65 were selected to complete the background questionnaire and the assessment; 4,898 actually completed the background questionnaire. Of the 1,202 respondents who did not complete the background questionnaire, 112 were unable to do so because of a literacy-related barrier: either the inability to communicate in English or Spanish (the two languages in which the background questionnaire was administered) or a mental disability. Twenty others were unable to complete the questionnaire due to technical problems. The final response rate for the background questionnaire—which included respondents who completed it and respondents who were unable to complete it because of a language problem or mental disability—was 82.2 percent weighted.

Of the 4,898 adults age 16 to 65 who completed the background questionnaire, 4,820 completed the adult literacy assessment. An additional 22 were unable to complete the assessment for literacy-related reasons. Another 11 were unable to do so due to technical problems. The final response rate for the overall assessment—which included respondents who answered at least one question on each scale and the 22 respondents who were unable to do so because of a language problem, mental disability, or technical problem—was 99.0 percent weighted.

As described by PIAAC Technical Standard 4.3.3 (PIAAC Consortium 2014), a completed case contained at least the following:

- Responses to key background questions, including age, gender, highest level of schooling, and employment status; and
- A completed Core<sup>24</sup> instrument (i.e., the interviewer asked the respondent all Core questions or the Core instrument was not completed for a literacy-related reason (e.g., because of a language difficulty) or because the respondent was unable to read or write in any of a country's PIAAC official languages); or
- Responses to age and gender for literacy-related nonrespondents to the background questionnaire/Job Requirements Approach.

Cases that experienced technical problems during the administration of the background questionnaire or the assessment were also counted as completed. To avoid penalizing countries for platform configuration issues with the background questionnaire and assessment software package, interviews that could not be completed due to software issues were considered “completes” for the purposes of response rate calculations. The overall weighted response rate for the household sample was 70.3 percent.

Some respondents did not complete any tasks on the literacy and numeracy

assessments. Completely omitting these individuals from the analyses would have resulted in unknown biases in estimates of the literacy skills of the national population because refusals cannot be assumed to have occurred randomly. Literacy and numeracy scores were imputed for any respondent for whom background information was available but who did not attempt any questions on the assessments.

The final household reporting sample—including the imputed cases—consisted of 5,010 respondents. These 5,010 respondents are the 4,898 respondents who completed the background questionnaire, plus the 112 respondents who were unable to complete the background questionnaire for literacy-related reasons.

The sample was subject to unit nonresponse from the screener, background questionnaire, assessment (including reading components), and item nonresponse to background questionnaire items. Although the screener had a unit response rate higher than 85 percent, the background questionnaire had a unit response rate lower than 85 percent and thus required an analysis of the potential for nonresponse bias according to the National Center for Education Statistics (NCES) Statistical Standard 4-4 (U.S. Department of Education 2012).

<sup>24</sup> For a full description of the Core instrument, see the section on Data Collection.

## Nonresponse Bias

The nonresponse bias analysis of the household sample revealed differences in the characteristics of respondents who participated in the background questionnaire compared with those who refused. In a bivariate unit-level analysis at the background questionnaire stage, estimated percentages for respondents were compared with those for the total eligible sample to identify any potential bias owing to nonresponse. Multivariate analyses were conducted to further explore the potential for nonresponse bias by identifying the domains with the most differential response rates. These analyses revealed that the subgroup with the lowest response rates for the background questionnaire had the following characteristics: (1) Hispanic, (2) age 26 and older with no children in the household, and (3) reside outside the Northeastern United States in areas with low levels of linguistic isolation (a low percentage who have some difficulty speaking English) and with unemployment rates exceeding approximately 5 percent.

In general, younger persons were found to be more available to participate, as were those with children age 16 and younger, and women. However, the variables found to be significant in the bivariate analysis—those used to define areas with low response rates—were used in weighting adjustments. The analysis

showed that weighting adjustments were highly effective in reducing the bias. The general conclusion was that the potential amount of nonresponse bias attributable to unit nonresponse at the background questionnaire stage was likely to be negligible.

## Data Collection

Whenever possible, interviewers administered the background questionnaire and assessment in a private setting (e.g., home or library). Using the computerized interview and assessment software provided by the PIAAC Consortium,<sup>25</sup> the interviewer read the background questionnaire questions from a laptop and entered all responses directly into the laptop. Skip patterns and follow-up probes for contradictory or out-of-range responses were programmed into the interview software. At the completion of the background questionnaire, the participant was administered the computer-based Core or the paper-and-pencil based Core if the participant could not or would not use the computer. Upon the completion and scoring of the Core tasks, the respondent was routed to the computer-based assessment (CBA), the paper-based assessment (PBA) of literacy and numeracy, or the paper-based reading components. The background questionnaire and the assessment took approximately two hours to complete; however the time varied by the respondent. The number of assessment items also varied based

on the respondents' performance on the Core and the adaptive routing implemented in the automated portion of the assessment.

The progress through the assessment was controlled by the computer based on the respondent's performance on various components of the assessment. The PIAAC assessment was composed of the following components:

- The Core consisted of three modules: the CBA Core Stage 1, the CBA Core Stage 2, and the PBA Core.
  - » The CBA Core Stage 1 included six tasks and was designed to determine if the participant had the basic set of skills needed to complete the CBA. To pass the CBA Core Stage 1, the participant needed to correctly complete at least three of the first five tasks, plus the sixth task (highlighting text). CBA Core Stage 1 questions were automatically scored by the computer, and a participant who passed the CBA Core Stage 1 continued on to the CBA Core Stage 2. A participant who did not pass the CBA Core Stage 1 was routed to the PBA Core.
  - » The CBA Core Stage 2 included six tasks that measured basic literacy and numeracy skills necessary to undertake the assessment. CBA Core Stage 2 questions were automatically scored by the computer, and a participant who passed the CBA

<sup>25</sup> The PIAAC Consortium includes the following organizations: Educational Testing Service (ETS), Westat, cApStAn, the Research Centre for Education and the Labor Market (ROA), gesis-ZUMA Centre for Survey Research, German Institute for International Education Research (DIPF), and the Data Processing Centre of the International Association for the Evaluation of Educational Achievement (IEA). In addition to these organizations, PIAAC is aided by numerous national contracting partners.

Core Stage 2 continued on to the CBA. A participant who did not pass the CBA Core Stage 2 was routed directly to the paper-based reading components section.

- » The PBA Core consisted of eight tasks and measured basic literacy and numeracy skills necessary to undertake the assessment. PBA Core questions were interviewer scored and entered into the computer to determine if the participant passed the PBA Core. A participant who passed the PBA Core continued on to the PBA of literacy and numeracy and then to the paper-based reading components section. A participant who did not pass the PBA Core was routed directly to the reading components section.

- The assessment was administered in CBA and PBA modes.

- » The CBA consisted of three “testlets” of tasks at Stage 1 (9 items) and four “testlets” at Stage 2 (11 items). Each respondent completed two testlets that included items from two of the three domains.

- » The PBA consisted of two booklets, one contained literacy items and one contained numeracy items. Each booklet contained 20 items for the participant to complete and each participant completed only one booklet type.

- » The reading components were completed by a participant after completing the literacy or numeracy booklet. Reading components were also completed by a respondent who failed the CBA Core Stage 2 or the PBA Core.

For more information on how PIAAC is administered, please visit the NCES PIAAC website at <http://nces.ed.gov/surveys/piaac/admin.asp>.

### ***Variables Used in This Analysis***

This report presents findings for adults at different levels of education attainment (less than high school, high school but no associate’s degree, and associate’s degree or above). In this report, the education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate’s degree); ISCED:97 5a-b and 6 (Associate’s degree or above).

Readers are cautioned to note several key issues about this variable when they interpret the results in the brief. First, the percentages of countries’ adult population that fall into each category may be uneven. Second, in this report, those who had started, but not finished college—as well as those who were currently attending college—are counted as having only a high school degree. Similarly, those who had at least an associate’s degree could have an

associate’s, bachelor’s, master’s, Ph.D., or professional degrees. Finally, several social and political factors, as well as policy changes over time, may impact countries’ demographic and education landscape. Considerations of these contextual differences are outside the scope of this brief, but readers should keep these differences in mind as they review the findings.

### ***Weighting and Variance Estimation***

A complex sample design was used to select assessment respondents. The properties of a sample selected through a complex design could be very different from those of a simple random sample in which every individual in the target population has an equal chance of selection and in which the observations from different sampled individuals can be considered statistically independent of one another. Therefore, the properties of the sample for the complex data collection design were taken into account during the analysis of the data.

One way of addressing the properties of the sample design was by using sampling weights to account for the fact that the probabilities of selection were not identical for all respondents. The sampling weights were further adjusted for nonresponse to the screener and background questionnaire, extreme weights were trimmed, and weights for all respondents calibrated to the U.S. Census Bureau’s 2010 American Community Survey population totals for those age 16 to 65. Since literacy-related nonrespondents to the

screeener, the background questionnaire, and the assessment are similar in proficiency, the weights of the literacy-related nonresponse cases were not adjusted during the screener-level nonresponse adjustment. Instead, the background questionnaire weights for the background questionnaire and assessment literacy-related cases were adjusted to account for the literacy-related screener nonrespondents. This adjustment was necessary to allow the literacy-related background questionnaire and assessment nonrespondents to represent the literacy-related screener nonrespondents in the calibration procedure.

All population and subpopulation characteristics based on the PIAAC data used sampling weights in their estimation. The statistics presented in this report are estimates of group and subgroup performance based on a

sample of respondents, rather than the values that could be calculated if every person in the nation answered every question on the instrument. Therefore, it is important to have measures of the degree of uncertainty of the estimates. Accordingly, in addition to providing estimates of percentages of respondents and their average scale scores, this report provides information about the uncertainty of each statistic in the form of standard errors.

Because the assessment used clustered sampling, conventional formulas for estimating sampling variability (e.g., standard errors) that assume simple random sampling and hence independence of observations would have been inappropriate for this report. For this reason, the PIAAC assessment used a paired jackknife replication approach (sometimes referred to as JK2) to estimate standard errors (Rust and Rao 1996).

## ***Scaling***

Information on scaling in the PIAAC assessment can be found on the OECD PIAAC website at <http://www.oecd.org/site/piaac>.

## ***Statistical Testing***

The statistical comparisons in this report were based on the *t* statistic. Statistical significance was determined by calculating a *t* value for the difference between a pair of means or proportions, and comparing this value 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. Findings from *t*-tests are reported based on a statistical significance (or alpha level) set at .05, without adjustments for multiple comparisons.



## REFERENCES

- Goodman, M., Finnegan, R., Mohadjer, L., Krenzke, T., and Hogan, J. (2013). *Literacy, Numeracy, and Problem Solving in Technology-Rich Environments Among U.S. Adults: Results from the Program for the International Assessment of Adult Competencies 2012: First Look* (NCES 2014-008). U.S. Department of Education. Washington, DC: National Center for Education Statistics.
- Organization for Economic Co-operation and Development (OECD). (2014). Indicator C1: Who Participates in Education? *Education at a Glance 2014: OECD Indicators*. OECD Publishing. Retrieved July 26, 2017, from [http://www.oecd.org/edu/EAG2014-Indicator%20C1%20\(eng\).pdf](http://www.oecd.org/edu/EAG2014-Indicator%20C1%20(eng).pdf).
- PIAAC Consortium. (2014). *PIAAC Technical Standards and Guidelines*. Paris: OECD. Retrieved March 20, 2017, from [http://www.oecd.org/skills/piaac/PIAAC-NPM\(2014\\_06\)PIAAC\\_Technical\\_Standards\\_and\\_Guidelines.pdf](http://www.oecd.org/skills/piaac/PIAAC-NPM(2014_06)PIAAC_Technical_Standards_and_Guidelines.pdf).
- Rampey, B.D., Finnegan, R., Goodman, M., Mohadjer, L., Krenzke, T., Hogan, J., and Provasnik, S. (2016). *Skills of U.S. Unemployed, Young, and Older Adults in Sharper Focus: Results From the Program for the International Assessment of Adult Competencies (PIAAC) 2012/2014: First Look* (NCES 2016-039rev). U.S. Department of Education. Washington, DC: National Center for Education Statistics.
- Rust, K., and Rao, J.N.K. (1996). Variance Estimation for Complex Surveys Using Replication Techniques. *Statistical Methods in Medical Research*, 5, 283–310.
- U.S. Department of Education. (2012). *2012 Revision of NCES Statistical Standards* (NCES 2014-097). Washington, DC: National Center for Education Statistics. Retrieved March 20, 2017, from <https://nces.ed.gov/statprog/2012/>.

## APPENDIX A: DATA TABLES

**Table A-1. Average PIAAC literacy scores of 16- to 65-year-olds and 20- to 29-year-olds, by participating country and region: 2012**

Participating country and region	Age	
	16–65	20–29
Australia	280	285
Austria	269	283
Canada	273	283
Czech Republic	274	285
Denmark	271	282
Estonia	276	289
Finland	288	306
France	262	280
Germany	270	284
Ireland	267	274
Italy	250	260
Japan	296	306
Netherlands	284	300
Norway	278	285
Poland	267	281
Republic of Korea	273	293
Slovak Republic	274	278
Spain	252	265
Sweden	279	292
<b>United States</b>	<b>270</b>	<b>278</b>
Flanders (Belgium)	275	292
England/Northern Ireland (United Kingdom)	272	274
OECD average	273	284

NOTE: PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table A-2. Average PIAAC numeracy scores of 16- to 65-year-olds and 20- to 29-year-olds, by participating country and region: 2012**

Participating country and region	Age	
	16–65	20–29
Australia	268	272
Austria	275	285
Canada	265	275
Czech Republic	276	287
Denmark	278	285
Estonia	273	283
Finland	282	297
France	254	270
Germany	272	283
Ireland	256	263
Italy	247	257
Japan	288	294
Netherlands	280	290
Norway	278	279
Poland	260	271
Republic of Korea	263	283
Slovak Republic	276	280
Spain	246	257
Sweden	279	290
<b>United States</b>	<b>253</b>	<b>260</b>
Flanders (Belgium)	280	293
England/Northern Ireland (United Kingdom)	262	263
OECD average	269	278

NOTE: PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table A-3. Average PIAAC literacy scores of 16- to 65-year-olds and 20- to 29-year-olds, by highest level of education attainment and participating country and region: 2012**

Participating country or region	Ages 16–65			Ages 20–29		
	Less than high school	High school, no associate's degree	Associate's degree or above	Less than high school	High school, no associate's degree	Associate's degree or above
Australia	253	282	302	256	285	299
Austria	245	271	296	244	286	313
Canada	234	269	290	236	279	299
Czech Republic	256	271	301	257	283	303
Denmark	246	269	292	249	288	297
Estonia	257	272	290	257	290	306
Finland	260	282	309	268	306	325
France	232	262	294	231	274	305
Germany	244	265	293	250	285	305
Ireland	237	268	292	233	266	296
Italy	235	264	282	230	266	293
Japan	269	289	313	269	300	319
Netherlands	254	287	311	263	299	324
Norway	256	274	301	255	285	309
Poland	249	258	297	246	274	300
Republic of Korea	244	272	291	228	292	297
Slovak Republic	248	276	295	234	279	299
Spain	228	262	282	239	272	288
Sweden	248	280	306	259	291	317
<b>United States</b>	<b>230</b>	<b>262</b>	<b>298</b>	<b>226</b>	<b>271</b>	<b>304</b>
Flanders (Belgium)	242	269	303	250	283	315
England/Northern Ireland (United Kingdom)	239	273	294	229	274	295
OECD average	246	272	297	246	283	305

NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table A-4. Average PIAAC numeracy scores of 16- to 65-year-olds and 20- to 29-year-olds, by highest level of education attainment and participating country and region: 2012**

Participating country and region	Ages 16–65			Ages 20–29		
	Less than high school	High school, no associate's degree	Associate's degree or above	Less than high school	High school, no associate's degree	Associate's degree or above
Australia	236	269	292	239	271	287
Austria	245	278	306	240	288	319
Canada	222	259	285	223	271	290
Czech Republic	249	273	310	251	284	315
Denmark	248	278	302	250	290	300
Estonia	248	269	290	247	284	301
Finland	255	276	305	257	296	318
France	216	253	295	210	261	301
Germany	237	267	301	247	285	305
Ireland	224	255	285	222	254	285
Italy	229	264	280	226	263	287
Japan	254	282	307	250	290	307
Netherlands	249	284	308	253	291	314
Norway	250	275	304	242	282	303
Poland	235	253	290	233	265	289
Republic of Korea	230	262	285	214	281	289
Slovak Republic	241	278	305	222	282	304
Spain	220	257	278	231	265	280
Sweden	245	280	307	250	289	318
<b>United States</b>	<b>204</b>	<b>243</b>	<b>287</b>	<b>197</b>	<b>252</b>	<b>291</b>
Flanders (Belgium)	244	274	310	248	282	316
England/Northern Ireland (United Kingdom)	225	262	286	213	263	287
OECD average	237	268	296	235	277	300

NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table A-5. PIAAC literacy score gaps between those who did not have a high school degree and those who had at least an associate's degree, by age group and participating country and region: 2012**

Participating country and region	Age	
	16–65	20–29
Australia	50	43
Austria	51	69
Canada	57	64
Czech Republic	46	46
Denmark	46	48
Estonia	33	49
Finland	48	57
France	62	73
Germany	49	55
Ireland	54	62
Italy	47	63
Japan	44	49
Netherlands	57	61
Norway	45	55
Poland	48	55
Republic of Korea	47	69
Slovak Republic	48	66
Spain	54	49
Sweden	58	59
<b>United States</b>	<b>67</b>	<b>79</b>
Flanders (Belgium)	60	65
England/Northern Ireland (United Kingdom)	55	66
OECD average	51	59

NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500. All gaps are based on unrounded estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table A-6. PIAAC numeracy score gaps between those who did not have a high school degree and those who had at least an associate's degree, by age group and participating country and region: 2012**

Participating country and region	Age	
	16–65	20–29
Australia	56	48
Austria	61	79
Canada	63	67
Czech Republic	61	64
Denmark	54	50
Estonia	42	53
Finland	50	60
France	79	91
Germany	64	58
Ireland	61	63
Italy	51	62
Japan	53	57
Netherlands	59	61
Norway	55	61
Poland	55	56
Republic of Korea	56	75
Slovak Republic	64	82
Spain	58	49
Sweden	63	68
<b>United States</b>	<b>83</b>	<b>93</b>
Flanders (Belgium)	66	68
England/Northern Ireland (United Kingdom)	61	74
OECD average	60	65

NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500. All gaps are based on unrounded estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table A-7. PIAAC literacy score gaps between levels of highest education attainment, by age group and participating country and region: 2012**

Participating country and region	Age			
	16–65		20–29	
	Gap between those who did not finish high school and high school graduates	Gap between those who finished high school and those who have at least an associate's degree	Gap between those who did not finish high school and high school graduates	Gap between those who finished high school and those who have at least an associate's degree
Australia	29	21	29	14!
Austria	26	25	42	27
Canada	35	22	43	21
Czech Republic	15	31	26	20
Denmark	23	23	38	10!
Estonia	14	18	33	16
Finland	22	27	38	19
France	30	33	42	31
Germany	21	28	35	20
Ireland	30	24	33	29
Italy	29	18	36	27
Japan	19	24	31	19
Netherlands	34	23	36	25
Norway	18	27	30	24
Poland	10	39	28	26
Republic of Korea	28	19	64	‡
Slovak Republic	28	19	46	20
Spain	34	20	33	16
Sweden	32	26	32	26
<b>United States</b>	<b>31</b>	<b>36</b>	<b>45</b>	<b>34</b>
Flanders (Belgium)	27	34	34	31
England/Northern Ireland (United Kingdom)	34	21	45	21
OECD average	26	25	37	22

! Interpret data with caution; the coefficient of variation is greater than or equal to 30 percent.

‡ Reporting standards not met. The coefficient of variation for this estimate is 50 percent or greater or the cell size is less than 3.

NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC literacy items include continuous texts (e.g., text in sentences and paragraphs), non-continuous texts (e.g., schedules, graphs, and maps), and electronic texts (including hypertext or text in interactive environments, such as forms and blogs). PIAAC average scores in literacy are reported on a scale from 0 to 500. All gaps are based on unrounded estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.



**Table A-8. PIAAC numeracy score gaps between levels of highest education attainment, by age group and participating country and region: 2012**

Participating country and region	Age			
	16–65		20–29	
	Gap between those who did not finish high school and high school graduates	Gap between those who finished high school and those who have at least an associate's degree	Gap between those who did not finish high school and high school graduates	Gap between those who finished high school and those who have at least an associate's degree
Australia	33	22	32	15 !
Austria	33	28	48	31
Canada	37	26	47	20
Czech Republic	24	37	33	31
Denmark	30	24	40	10 !
Estonia	21	21	37	16
Finland	21	30	39	21
France	37	42	52	39
Germany	30	34	39	20
Ireland	31	30	32	31
Italy	35	16	38	24
Japan	28	25	40	17
Netherlands	35	24	38	23
Norway	25	29	40	21
Poland	18	37	31	24
Republic of Korea	33	23	67	8 !
Slovak Republic	37	27	59	22
Spain	37	21	34	14
Sweden	35	28	39	29
<b>United States</b>	<b>40</b>	<b>43</b>	<b>54</b>	<b>39</b>
Flanders (Belgium)	30	36	34	34
England/Northern Ireland (United Kingdom)	37	24	50	24
OECD average	31	28	42	23

! Interpret data with caution; the coefficient of variation is greater than or equal to 30 percent.

NOTE: The highest level of education attainment categories correspond to the following International Standard Classification of Education (ISCED:97) levels: ISCED:97 2 and lower (Less than high school); ISCED:97 3 and 4a-b (High school, no associate's degree); ISCED:97 5a-b and 6 (Associate's degree or above). PIAAC numeracy tasks involve objects or pictures, text, numbers, graphs, and technology-based displays. They also require basic mathematical skills in computation, proportions and percentages, an understanding of measurement concepts and procedures, and working with simple formulas. Respondents also encounter more complex items that require using models to predict future needs, and an understanding of basic statistical concepts and displays. PIAAC average scores in numeracy are reported on a scale from 0 to 500. All gaps are based on unrounded estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

## APPENDIX B: STANDARD ERROR TABLES

**Table B-1. Standard errors for table A-1: Average PIAAC literacy scores of 16- to 65-year-olds and 20- to 29-year-olds, by participating country and region: 2012**

Participating country and region	Age	
	16–65	20–29
Australia	0.9	1.9
Austria	0.7	1.5
Canada	0.6	1.1
Czech Republic	1.0	1.9
Denmark	0.6	1.8
Estonia	0.7	1.3
Finland	0.7	2.0
France	0.6	1.4
Germany	0.9	1.9
Ireland	0.9	1.9
Italy	1.1	2.4
Japan	0.7	1.7
Netherlands	0.7	1.6
Norway	0.6	1.6
Poland	0.6	1.1
Republic of Korea	0.6	1.4
Slovak Republic	0.6	1.5
Spain	0.7	1.6
Sweden	0.7	1.8
<b>United States</b>	<b>1.0</b>	<b>2.2</b>
Flanders (Belgium)	0.8	1.8
England/Northern Ireland (United Kingdom)	1.0	2.5
OECD average	0.2	0.4

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table B-2. Standard errors for table A-2: Average PIAAC numeracy scores of 16- to 65-year-olds and 20- to 29-year-olds, by participating country and region: 2012**

Participating country and region	Age	
	16–65	20–29
Australia	1.0	2.0
Austria	0.9	1.9
Canada	0.7	1.6
Czech Republic	0.9	1.9
Denmark	0.7	2.2
Estonia	0.5	1.4
Finland	0.7	1.8
France	0.6	1.6
Germany	1.0	1.8
Ireland	1.0	2.3
Italy	1.1	2.5
Japan	0.7	1.7
Netherlands	0.7	1.6
Norway	0.8	1.8
Poland	0.8	1.2
Republic of Korea	0.7	1.6
Slovak Republic	0.8	1.7
Spain	0.6	1.4
Sweden	0.8	2.0
<b>United States</b>	<b>1.2</b>	<b>2.5</b>
Flanders (Belgium)	0.8	1.8
England/Northern Ireland (United Kingdom)	1.1	2.6
OECD average	0.2	0.4

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table B-3. Standard errors for table A-3: Average PIAAC literacy scores of 16- to 65-year-olds and 20- to 29-year-olds, by highest level of education attainment and participating country and region: 2012**

Participating country and region	Ages 16–65			Ages 20–29		
	Less than high school	High school, no associate's degree	Associate's degree or above	Less than high school	High school, no associate's degree	Associate's degree or above
Australia	1.6	1.5	1.2	5.7	2.6	3.3
Austria	1.7	0.9	1.3	4.9	1.6	2.7
Canada	1.6	0.9	0.7	4.4	1.7	2.1
Czech Republic	2.5	1.0	2.3	6.4	2.3	3.4
Denmark	1.5	1.0	1.0	4.4	2.2	3.0
Estonia	1.6	0.9	1.0	3.5	1.7	2.0
Finland	1.9	1.2	1.1	6.8	2.2	3.5
France	1.1	0.8	0.9	4.0	1.8	1.6
Germany	2.3	1.0	1.3	5.8	2.3	3.2
Ireland	1.6	1.4	1.2	6.2	2.7	2.3
Italy	1.6	1.3	1.6	5.3	2.4	4.0
Japan	2.0	1.0	0.9	5.6	2.2	2.0
Netherlands	1.4	1.2	1.2	3.7	2.0	2.9
Norway	1.3	1.2	0.9	4.4	2.2	3.0
Poland	1.8	0.8	1.2	4.2	1.4	1.9
Republic of Korea	1.6	0.9	0.9	9.8	2.1	1.8
Slovak Republic	1.5	0.8	1.3	4.2	1.8	2.4
Spain	1.2	1.2	1.1	2.7	2.4	2.4
Sweden	1.6	1.0	1.2	7.1	1.8	3.1
<b>United States</b>	<b>2.1</b>	<b>1.2</b>	<b>1.5</b>	<b>5.2</b>	<b>2.4</b>	<b>2.8</b>
Flanders (Belgium)	1.7	1.1	1.2	5.8	2.0	2.5
England/Northern Ireland (United Kingdom)	1.4	1.4	1.4	4.5	3.3	3.1
OECD average	0.4	0.2	0.3	1.2	0.5	0.6

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table B-4. Standard errors for table A-4: Average PIAAC numeracy scores of 16- to 65-year-olds and 20- to 29-year-olds, by highest level of education attainment and participating country and region: 2012**

Participating country and region	Ages 16–65			Ages 20–29		
	Less than high school	High school, no associate's degree	Associate's degree or above	Less than high school	High school, no associate's degree	Associate's degree or above
Australia	1.7	1.6	1.3	6.3	3.0	3.7
Austria	2.0	1.1	1.5	5.7	2.1	3.2
Canada	2.0	1.2	0.9	4.6	2.3	2.5
Czech Republic	2.4	1.0	2.4	5.8	1.9	5.3
Denmark	1.7	1.2	1.1	4.9	2.7	3.2
Estonia	1.5	0.9	0.9	3.4	1.9	2.3
Finland	1.9	1.0	1.2	7.5	1.9	3.8
France	1.1	0.9	1.0	4.2	2.0	1.8
Germany	2.6	1.2	1.5	5.6	2.2	3.6
Ireland	1.9	1.5	1.4	7.1	3.1	3.0
Italy	1.5	1.4	2.1	5.3	2.7	4.5
Japan	2.2	1.3	0.9	6.6	2.7	2.2
Netherlands	1.5	1.1	1.2	4.0	2.1	2.7
Norway	1.7	1.3	1.2	5.2	2.8	3.0
Poland	2.2	1.1	1.4	4.2	1.5	2.0
Republic of Korea	1.6	0.9	1.2	10.7	2.1	2.1
Slovak Republic	2.0	0.9	1.4	4.3	1.9	3.2
Spain	1.2	1.3	1.1	2.5	2.2	2.5
Sweden	1.8	1.1	1.3	6.8	2.0	3.1
<b>United States</b>	<b>2.3</b>	<b>1.4</b>	<b>1.6</b>	<b>5.8</b>	<b>2.4</b>	<b>3.4</b>
Flanders (Belgium)	1.6	1.1	1.1	6.5	2.3	2.2
England/Northern Ireland (United Kingdom)	1.7	1.5	1.6	5.1	3.4	3.6
OECD average	0.4	0.3	0.3	1.2	0.5	0.7

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table B-5. Standard errors for table A-5: PIAAC literacy score gaps between those who did not have a high school degree and those who had at least an associate's degree, by age group and participating country and region: 2012**

Participating country and region	Age	
	16–65	20–29
Australia	1.9	6.9
Austria	1.9	5.8
Canada	1.8	4.7
Czech Republic	3.1	7.3
Denmark	1.8	5.7
Estonia	1.7	3.5
Finland	2.2	7.8
France	1.4	4.4
Germany	2.3	6.2
Ireland	1.9	6.8
Italy	2.1	6.7
Japan	2.2	6.0
Netherlands	1.9	4.8
Norway	1.6	5.3
Poland	2.3	4.6
Republic of Korea	1.8	10.1
Slovak Republic	2.2	4.7
Spain	1.6	3.4
Sweden	2.1	7.7
<b>United States</b>	<b>2.4</b>	<b>6.1</b>
Flanders (Belgium)	2.0	5.6
England/Northern Ireland (United Kingdom)	1.9	5.0
OECD average	0.4	1.3

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table B-6. Standard errors for table A-6: PIAAC numeracy score gaps between those who did not have a high school degree and those who had at least an associate's degree, by age group and participating country and region: 2012**

Participating country and region	Age	
	16–65	20–29
Australia	2.2	8.0
Austria	2.3	6.1
Canada	2.1	5.0
Czech Republic	3.1	8.1
Denmark	2.0	6.1
Estonia	1.7	3.6
Finland	2.3	8.6
France	1.5	4.6
Germany	2.9	6.3
Ireland	2.4	8.0
Italy	2.5	6.7
Japan	2.5	7.0
Netherlands	1.9	5.0
Norway	2.1	6.2
Poland	2.7	4.8
Republic of Korea	2.0	11.0
Slovak Republic	2.6	5.1
Spain	1.7	3.6
Sweden	2.1	7.5
<b>United States</b>	<b>2.6</b>	<b>6.9</b>
Flanders (Belgium)	1.9	6.5
England/Northern Ireland (United Kingdom)	2.4	6.0
OECD average	0.5	1.4

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.

**Table B-7. Standard errors for table A-7: PIAAC literacy score gaps between levels of highest education attainment, by age group and participating country and region: 2012**

Participating country and region	Age			
	16–65		20–29	
	Gap between those who did not finish high school and high school graduates	Gap between those who finished high school and those who have at least an associate's degree	Gap between those who did not finish high school and high school graduates	Gap between those who finished high school and those who have at least an associate's degree
Australia	2.1	1.9	6.1	4.2
Austria	1.9	1.5	5.3	3.0
Canada	1.8	1.2	4.7	2.9
Czech Republic	2.5	2.3	6.6	4.1
Denmark	1.9	1.5	4.8	3.6
Estonia	1.7	1.2	3.9	2.8
Finland	2.4	1.7	7.0	4.1
France	1.3	1.2	4.1	2.3
Germany	2.4	1.7	6.4	3.7
Ireland	2.0	1.7	6.9	3.3
Italy	1.8	1.8	5.3	4.9
Japan	2.1	1.2	6.0	2.6
Netherlands	2.0	1.7	4.3	3.8
Norway	1.9	1.6	5.1	3.8
Poland	2.2	1.5	4.3	2.5
Republic of Korea	1.9	1.4	10.5	†
Slovak Republic	1.8	1.6	4.4	3.1
Spain	1.7	1.7	3.6	3.6
Sweden	2.0	1.7	7.3	3.6
<b>United States</b>	<b>1.9</b>	<b>1.7</b>	<b>5.7</b>	<b>3.0</b>
Flanders (Belgium)	2.1	1.6	6.1	2.9
England/Northern Ireland (United Kingdom)	1.9	1.8	5.4	4.2
OECD average	0.4	0.3	1.2	0.7

† Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.



**Table B-8. Standard errors for table A-8: PIAAC numeracy score gaps between levels of highest education attainment, by age group and participating country and region: 2012**

Participating country and region	Age			
	16–65		20–29	
	Gap between those who did not finish high school and high school graduates	Gap between those who finished high school and those who have at least an associate's degree	Gap between those who did not finish high school and high school graduates	Gap between those who finished high school and those who have at least an associate's degree
Australia	2.2	2.1	6.8	5.1
Austria	2.2	1.8	6.0	3.9
Canada	2.2	1.5	5.0	3.5
Czech Republic	2.6	2.6	6.3	5.3
Denmark	2.2	1.7	5.4	3.8
Estonia	1.9	1.3	4.1	2.9
Finland	2.2	1.7	7.6	4.6
France	1.4	1.2	4.3	2.5
Germany	2.9	1.9	6.2	4.2
Ireland	2.2	1.9	7.8	3.9
Italy	1.9	2.4	5.5	5.3
Japan	2.5	1.6	7.0	3.6
Netherlands	2.1	1.7	4.9	3.5
Norway	2.2	1.8	6.3	4.2
Poland	2.5	1.8	4.4	2.6
Republic of Korea	2.0	1.5	11.0	2.9
Slovak Republic	2.2	1.6	4.6	3.8
Spain	1.8	1.7	3.4	3.5
Sweden	2.1	1.7	6.9	3.5
<b>United States</b>	<b>2.0</b>	<b>1.8</b>	<b>6.0</b>	<b>3.3</b>
Flanders (Belgium)	2.0	1.6	7.0	2.9
England/Northern Ireland (United Kingdom)	2.0	2.0	5.8	5.1
OECD average	0.5	0.4	1.3	0.8

SOURCE: U.S. Department of Education, National Center for Education Statistics, Organization for Economic Cooperation and Development (OECD), Program for the International Assessment of Adult Competencies (PIAAC), 2012.