



# Workplace Basics

**The Competencies Employers Want**

**2020**

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# Workplace Basics

## The Competencies Employers Want 2020

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# INTRODUCTION



Recent high school and college graduates launching their careers in the latter half of 2020 found themselves entering the worst job market in generations as COVID-19 decimated entire sectors of the economy. With businesses shuttered, job fairs canceled, and unemployment reaching a record high, these new workers faced stiffer competition than ever for existing jobs. As they set foot into the labor market, they may have asked: Do I really have what it takes to succeed in the American workforce?

In good job markets and in bad ones, a person's qualifications for employment are generally defined by a combination of their education, their experience, and their competencies: the skills, knowledge, and abilities that are essential to success on the job. Some job postings name a minimum level of education or a minimum number of years of experience that applicants need in order to be considered for a post, but while education and experience may be crucial to securing a job, these factors by themselves don't guarantee success in the workforce. Whether employees thrive in the specific work activities associated with their jobs depends on other crucial factors, including whether they have the mix of competencies that are most demanded within the specific contexts of their jobs.

In this report, we examine the competencies workers need in their occupations and how those competencies interact with their educational attainment to determine their earnings. While it is impossible to assign value to competencies in a vacuum, some clear patterns emerge as to which competencies have the biggest payoff, which are most needed in general, and which have the most value in specific occupational groups. This report shows which competencies are in high demand both across the workforce and in specific occupations, and details how the intensity with which workers use in-demand competencies can affect their earnings.<sup>1</sup>

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1 Throughout this report, we evaluate "demand" based on the competencies that incumbents and analysts report are required for workers to succeed in their jobs. We determine demand values according to the perceived importance of the competency in the job and the level of the competency required to perform the job. To measure relative demand across the labor market, we account for the number of workers employed in each job. We find that the competencies that incumbents and analysts report are in high demand are very similar to those demanded by employers in job ads. See Metsker, "The Top 10 Skills in Demand at the Top 10 US Companies in 2020," 2020, and Strack et al., *What's Trending in Jobs and Skills*, 2019.

We identify four trends that hold across the workforce:

- Over the past 50 years, structural changes in the economy have caused demand for cognitive competencies to rise and demand for physical competencies to fall.
- In the modern labor market, five cognitive competencies are in high demand across all occupational groups: (1) communication, (2) teamwork, (3) sales and customer service, (4) leadership, and (5) problem solving and complex thinking.
- Among the five competencies with generally high demand, communication is dominant: it has the highest demand across occupations, is in the top three most-demanded competencies within every occupational group, and is associated with the highest earnings boosts across the labor market.
- To succeed in their jobs and earn optimal compensation, workers need a balanced mix of competencies that are generally valued across the workforce and competencies that have high value within specific occupational contexts.

While knowing the combined value of occupation, education, and competencies can give workers the best chances of success, not all elements of workers' career trajectories are under their control. Fluctuations in supply and demand can be extremely unpredictable, and workers can't always choose to enter the labor market at a favorable time. In addition, not all workers receive the same payoff for acquiring education and in-demand skills. Labor-market discrimination continues to affect who is hired, who is promoted, and how much they are paid for their work, putting women at a disadvantage relative to men, and Black and Latino workers at a disadvantage relative to White workers.<sup>2</sup>

Thus, the economic value of competencies is complicated. Still, knowing the labor-market value of specific competencies can empower students and workers by helping them determine which knowledge, skills, and abilities to develop as they pursue career success—regardless of the economic climate. Likewise, educators can use this information to best prepare students for work, employers can use it to communicate about the competencies workers need, and policymakers can use it to develop a better understanding of the competencies that have the greatest demand and the highest rewards in today's workforce.



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2 In this report, we use the term Black to refer to people who identify as Black or African American and the term Latino to refer to people who identify as Hispanic or Latino. We use single terms for different racial and ethnic groups—White, Black, and Latino—to alleviate ambiguity and enhance clarity.

## A Brief Summary of this Report's Methodology

Our analysis in this report is based on the Occupational Information Network (O\*NET), a database created in the 1990s and updated regularly by the US Department of Labor to analyze the requirements associated with more than 1,000 occupations in the American labor market. O\*NET provides information about the use of specific **competencies**—including 120 different **knowledge areas, skills, and abilities**—within these occupations. We organized these 120 specific competencies into 19 major categories based on their statistical similarities.

O\*NET draws on survey responses from workers within occupations and analysts familiar with these occupations to describe how important the specific knowledge, skills, and abilities are to jobs, and what level of each is necessary within jobs. We combined these measures of level and importance to calculate **demand** for each competency. To measure the overall demand across the labor market, we calculated a weighted average of the demand value for each competency, using the number of workers in each occupation as the weight.

Within each competency, we measured **intensity of use** according to demand value quartiles. We used this measurement to determine the occupations in which each competency is used most intensively relative to its use across the workforce. A particular competency is used most intensively when its average demand value within an occupation is within the top quartile (the top 25 percent) of demand values for that competency as measured across all occupations. Each competency has different quartile thresholds for intensity of use.

### What are **competencies**?

Competencies are the knowledge, skills, and abilities that workers use in their jobs:

**Knowledge** includes the principles and facts associated with certain content domains, from the subjects taught in formal education to applied disciplines learned through practice.

**Skills** are vehicles that allow workers to successfully complete job tasks, to apply their knowledge usefully, and to engage in further learning.

**Abilities** are the aptitudes that influence work performance; they are both innate and developed, in contrast to knowledge and skills, which are acquired over time.

Note: Definitions are adapted from the O\*NET Content Model.



## Determining Demand

### DEMAND

**Demand** for a competency is measured according to the average **level** of the competency needed in a job and the **importance** of the competency in a job.

#### Comparing Demand

To compare **demand across the labor market**, we calculated a weighted average of demand values for each competency using the number of workers employed in each occupation as the weight.

#### Communication

is the **most demanded** competency across the labor market.

### HIGH DEMAND

To look at **high demand over time**, we established a consistent cutoff for demand values across competencies.

#### All Competencies

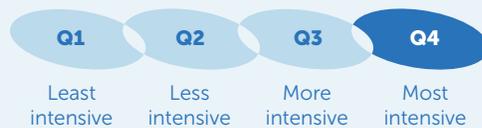


In 2019, 90 percent of workers were in jobs where **communication** was in **high demand**.

### INTENSITY OF USE

Within **individual competencies**, we measured **intensity of use** by demand value quartile.

#### Communication



Within jobs where **communication** competencies are used at their **most intensive**, 77% of workers have a bachelor's degree.

Note: For a detailed description of methodology, see Appendix A.



## PART 1. Competencies in the Modern Economy



What knowledge, skills, and abilities do workers need in the modern economy? Every generation asks similar questions, and the answers shift with the times. Within a half-century, advances in technology, changes in the way goods and services are produced and distributed, and periodic shocks to the supply and demand chains have transformed how work is done in the United States.<sup>3</sup> As a result, the American labor market now favors workers with higher-order cognitive competencies over those with physical skills and abilities.

Economic restructuring has increased the demand for cognitive competencies while reducing the demand for physical competencies.

The labor market demands a wide range of competencies that can generally be characterized as either physical or cognitive. **Physical competencies** include fine-motor abilities, mechanical skills, psychomotor and sensory abilities, spatial navigation, strength and coordination, and vision and hearing. **Cognitive competencies** include business and economics, communication, digital technology, engineering and physical sciences, health sciences, humanities, leadership, mathematics and computer science, perception and attentiveness, problem solving and complex thinking, sales and customer service, teaching and learning, and teamwork. By considering competencies in these broad groups, we can get a sense of how structural change in the economy has affected demand for certain types of competencies.

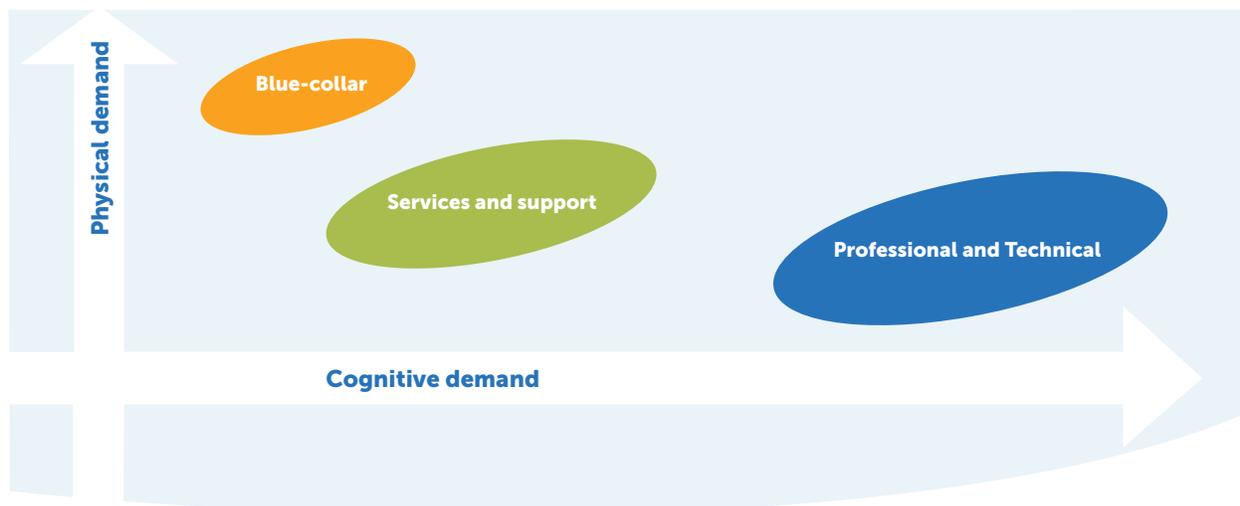
In general, blue-collar occupations involve higher levels of demand for physical competencies than other occupational groups, while professional and technical occupations<sup>4</sup> involve higher levels of demand for cognitive competencies. Services and support occupations<sup>5</sup> have slightly higher demand for cognitive competencies than blue-collar occupations, along with slightly higher demand for physical competencies than professional and technical occupations (Figure 1).

<sup>3</sup> Carnevale and Rose, *The Economy Goes to College* (Executive Summary), 2015.

<sup>4</sup> Professional and technical occupations include community services and arts occupations, education occupations, healthcare professional and technical occupations, managerial and professional office occupations, and STEM (science, technology, engineering, and mathematics) occupations.

<sup>5</sup> Services and support occupations include healthcare support, food and personal services, and sales and office support occupations.

**Figure 1.** The demand for physical competencies is highest in blue-collar occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: The size of the bubbles represents the number of workers employed in each occupation.

Because the competencies that workers need vary by occupation, the overall demand for specific competencies has changed over the past 50 years in connection with changes in the distribution of workers across occupations.<sup>6</sup> The collective effects of automation, globalization, and the networked economy (where professional services that were once provided in-house are now supplied by outside firms) have been felt strongly across the American workforce, especially within blue-collar occupations that were once reliable sources of employment.<sup>7</sup>

Blue-collar occupations employed 40 percent of American workers in 1970, but provided only 21 percent of national employment in 2019. In contrast, employment in professional and technical occupations, in which cognitive competencies are in high demand, increased over the same period, from 27 percent to 44 percent of employment. The share of employment in services and support occupations remained fairly stable; these occupations provided 32 percent of employment in 1970 and 35 percent in 2019.<sup>8</sup>

Thus, as professional and technical occupations have grown to replace blue-collar occupations as the leading suppliers of American jobs, demand for cognitive competencies such as leadership, teaching and learning, and problem solving and complex thinking has risen. Meanwhile, demand for physical competencies like mechanical skills, fine-motor abilities, and vision and hearing has fallen (Figure 2).<sup>9</sup>

6 As discussed elsewhere in this report, changes in the competencies that are in high demand within occupations also play a role in changes in overall demand; however, our data set does not allow us to measure changes in demand within occupations over time.

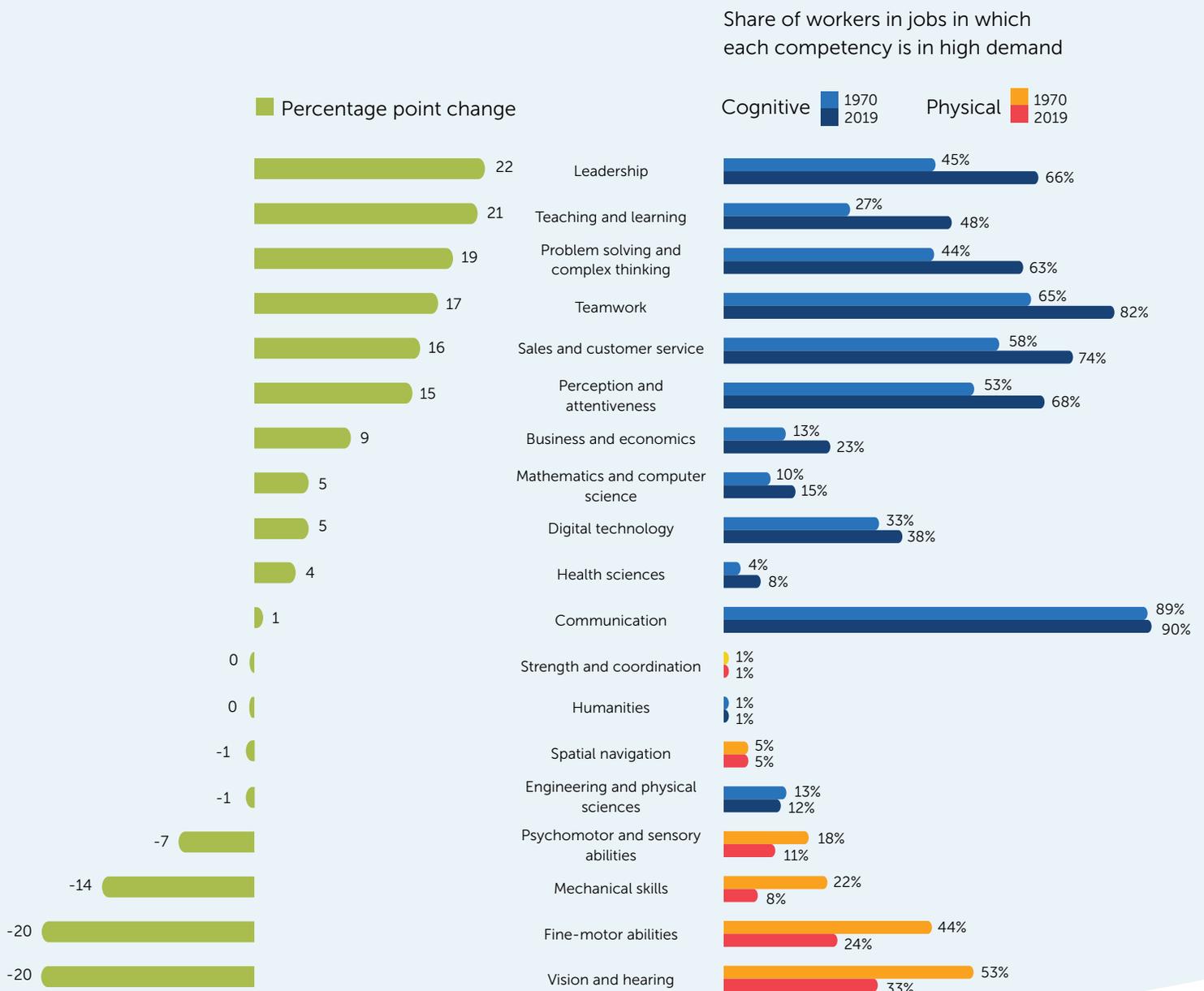
7 Carnevale et al., *Upskilling and Downsizing in American Manufacturing*, 2019.

8 Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS), 1970, 2019.

9 These 19 major competencies reflect 120 knowledge areas, skills, and abilities measured in our data set. For more information about our methodology for defining these groups, see Appendix A.

Among the structural changes that have weakened the blue-collar economy in the United States, automation may play a particularly strong role in affecting not just the existence of jobs, but the competencies that workers

**Figure 2. The demand for cognitive competencies has increased since 1970, while the demand for physical competencies has decreased.**



Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS), 1970, 2019, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: A competency is in high demand if the demand value for that competency (the average level and importance) is in the top third of all demand values across occupations and competencies. For more information on methodology, see Appendix A. The difference in shares might not match the percentage point change due to rounding.

need within those jobs. Physical and low-level cognitive tasks are particularly susceptible to automation,<sup>10</sup> while tasks that require “flexibility, judgment, and common sense”—including “abstract” tasks and those involving “adaptability”—are difficult to automate.<sup>11</sup> Researchers estimate that somewhere between 9 percent<sup>12</sup> and 47 percent<sup>13</sup> of jobs in the United States are “at risk” of some degree of automation. But fears that human workers will be replaced by robots are probably overblown: as technology advances, it is more likely to replace certain tasks within occupations than to substitute for entire occupations.<sup>14</sup> We estimate that on average, 28 percent of tasks within all occupations are at risk of automation.<sup>15</sup>

While it is unlikely that entire occupations will completely disappear in the near future, it is probable that job tasks will change and new kinds of jobs will emerge. While we can’t know exactly which competencies will be demanded years from now, historical trends suggest that general competencies that are transferable across all occupations are a good bet for workers, especially in these unknown and uncertain times. Moreover, research on new and emerging occupations suggests that, while overall demand for analytical skills has remained fairly steady for several decades, these types of skills are in high demand in new and emerging jobs.<sup>16</sup>

## Workers have acquired cognitive competencies with rising demand in part by attaining higher levels of education.

Many workers have found some success in meeting the changing demands of the modern economy by acquiring new competencies, often via educational attainment. In 1970, 15 percent of the workforce had a bachelor’s degree or higher, 12 percent had some college or an associate’s degree, and 73 percent had a high school diploma or less.<sup>17</sup> By 2019, educational attainment had increased dramatically: 43 percent of the workforce had a bachelor’s degree or higher, 26 percent had some college or an associate’s degree, and 31 percent had a high school diploma or less.<sup>18</sup> Educational attainment has been such an effective way for workers to adapt to skill-biased technological change that researchers have attributed the rising college earnings premium to an undersupply of college-educated workers arising from “the race between education and technology.”<sup>19</sup>

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10 Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2017, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 23.2 Database, 2019.

11 Autor, “Why Are There Still So Many Jobs?,” 2015.

12 Arntz et al., “The Risk of Automation for Jobs in OECD Countries,” 2016.

13 Manyika, “Technology, Jobs, and the Future of Work,” 2017.

14 Frey and Osborne, “The Future of Employment,” 2013.

15 Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2017, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 23.2 Database, 2019.

16 Kochhar, *Women Make Gains in the Workplace amid a Rising Demand for Skilled Workers*, 2020.

17 “Some college” includes individuals who have taken college coursework without earning a credential, which could include those who have received a certificate.

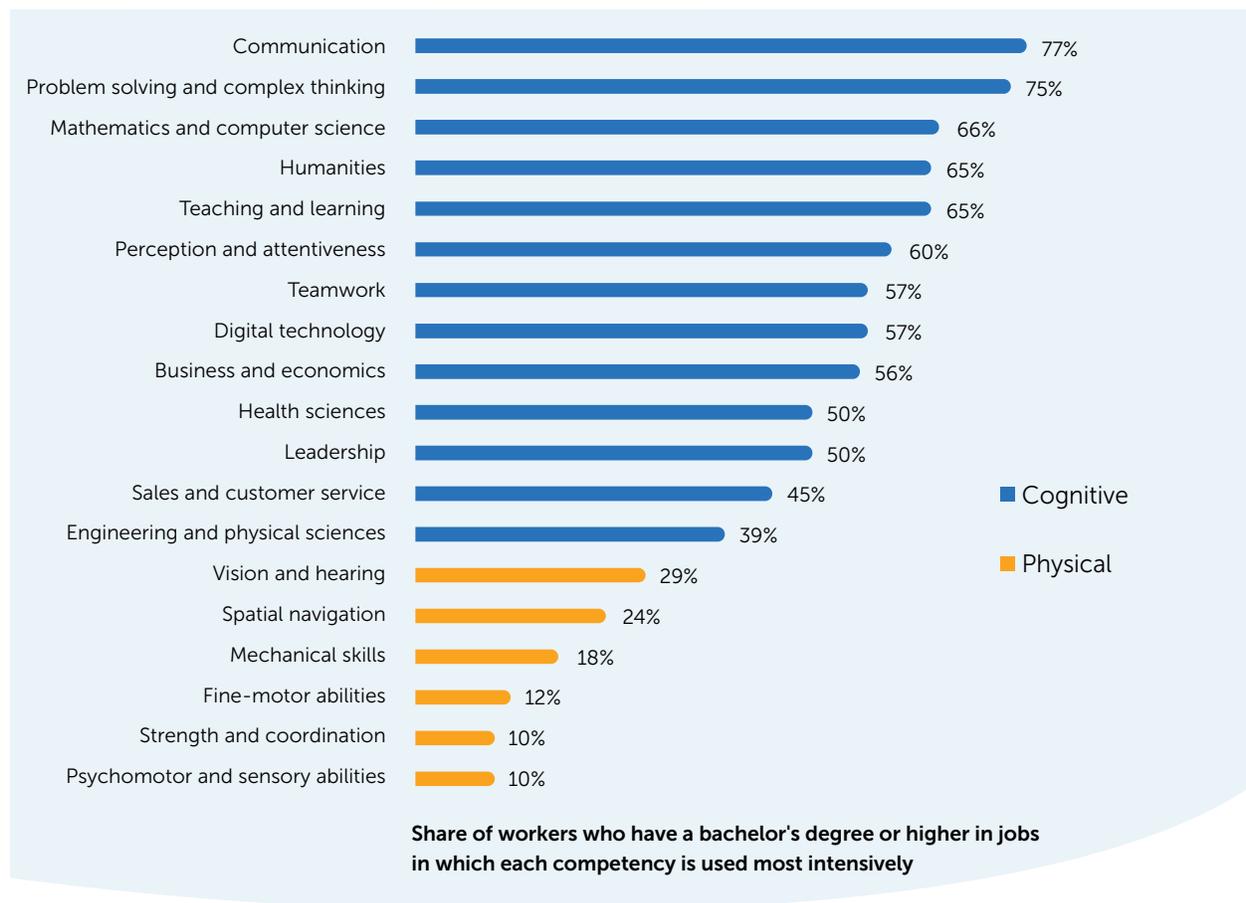
18 Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS), 1970, 2019.

19 Autor et al., “Extending the Race between Education and Technology,” 2020, and Goldin and Katz, *The Race between Education and Technology*, 2008.

The evidence suggests that workers' investments in education are also investments in the cognitive competencies they increasingly need in the labor market: the jobs in which cognitive competencies are used most intensively tend to be held by workers with higher levels of education. For example, 77 percent of workers who use communication most intensively have a bachelor's degree or higher, compared to 10 percent of workers who use psychomotor and sensory abilities—such as depth perception, sound localization, and reaction time—most intensively (Figure 3). This indicates that postsecondary degrees are a way for workers to provide information about their probable cognitive competencies to potential employers.

While there is a strong association between educational attainment and being employed in a job requiring intensive use of in-demand competencies, it is important to acknowledge that educational attainment

**Figure 3. More than three-quarters of workers in jobs in which communication competencies are used most intensively have a bachelor's degree or higher.**



Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Intensity of use is measured according to demand value quartiles for each specific competency, with the top quartile within each competency corresponding to the most intensive use of that competency. Intensity of use has different quartile thresholds for each competency. For more information on methodology, see Appendix A.

does not always mean that workers acquire the competencies they need in the workforce. Employer surveys have revealed that less than half of employers think that recent college graduates are proficient in key competencies such as oral and written communication.<sup>20</sup> In addition, formal education is not the only way for workers to acquire in-demand competencies: workers can also acquire and demonstrate their competencies through work experience, especially if they do not have a college degree.<sup>21</sup>

That being said, education still gives workers an edge in the labor market. Our previous research on the supply-and-demand gap in education showed that the supply of college-educated workers grew at roughly the same rate as demand for those workers until the late 1980s. But beginning in 1990, the demand for college-educated workers grew more quickly than the supply of those workers (2.0 percent growth per year in demand, versus 1.5 percent growth per year in supply). One important consequence of this gap is that workers with higher levels of education and related competencies are in ever-higher demand in the labor market.<sup>22</sup>

This supply-and-demand gap may help explain growing pay inequality between those who have gone to college and those who have not. The earnings premium for a college degree over a high school diploma began to rise in 1983,<sup>23</sup> launching an upward trend that continued through the 1980s before slowing in the 1990s, leveling off in the 2000s, and rising again in recent years. Today, the college earnings premium is 85 percent for workers with a bachelor's degree or higher compared to those with only a high school diploma, up from 59 percent in 1970.<sup>24</sup> For workers with an associate's degree, the current earnings premium is 40 percent over workers with no more than a high school diploma.<sup>25</sup>

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20 National Association of Colleges and Employers (NACE) Staff, "Are College Graduates 'Career Ready?'," 2018. NACE names eight competencies that it associates with "career readiness": professionalism/work ethic (in which 42.5 percent of employers rate recent graduates as proficient), oral/written communications (41.6 percent), critical thinking/problem solving (55.8 percent), teamwork/collaboration (77 percent), leadership (33 percent), digital technology (65.8 percent), career management (17.3 percent), and global/intercultural fluency (20.7 percent). Notably, students are more likely to rate themselves as proficient than are employers in all areas except for digital technology.

21 Blair et al., "Searching for STARS," 2020, and Demaria et al., *Exploring a Skills-Based Approach to Occupational Mobility*, 2020.

22 Carnevale and Rose, *The Undereducated American*, 2011.

23 Carnevale and Rose, *The Economy Goes to College* (Executive Summary), 2015.

24 Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS), 1970–2019.

25 Prior to 1992, data on educational attainment were collected by years of schooling, so the earnings premium for an associate's degree cannot be calculated for 1970.

## The right mix of occupation, education, and competencies can result in high rewards.

While much is known about the earnings premium associated with higher levels of education, less has been written about the earnings premium associated with different knowledge, skills, and abilities. In the following sections, we dive deeper into the question of how workers are compensated according to these specific competencies and how that compensation varies by educational attainment.

We find that the competencies used in any particular job interact with the education level of the worker to yield an overall earnings premium. While some competencies are in high demand—and generate high rewards—across occupations, different occupations reward different mixes of competencies and education.

## How will COVID-19 affect the competencies workers need?

In the COVID-19 labor market, competencies are particularly crucial for workers to set themselves apart from the competition. The virus has caused simultaneous supply and demand shocks to the global and US economies, with devastating effects on employment. The week after the World Health Organization declared COVID-19 a global pandemic, an unprecedented 3.3 million individuals filed for unemployment benefits in the United States, an increase of more than 3 million from the previous week.<sup>26</sup> Within six weeks, American workers had filed 30.3 million unemployment claims.<sup>27</sup> With unemployment peaking at a staggering 14.7 percent,<sup>28</sup> workers continued to face fierce competition for jobs throughout 2020 as the economy struggled to recover.

Even as the COVID-19 recession is heightening the need for workers to have in-demand competencies, it may be transforming the mix of competencies that the labor market requires of workers. While it is too early to predict how COVID-19 will affect the competencies workers need in the labor market, historical analysis shows that recessions tend to accelerate labor-market change.<sup>29</sup> Thus, while the COVID-19 recession is bound to be temporary, it may have a permanent impact on the structure of the economy.

Across occupational groups, the largest initial drop in employment from the COVID-19 recession occurred in services and support occupations, reducing demand for these workers' competencies in the labor market. Between February 2020 and April 2020, the number of workers in services and support occupations declined 20 percent, and the unemployment rate for workers in these occupations increased from 4 percent to 18 percent.<sup>30</sup> Even as the economy reopens, the fact that some businesses will permanently close due to coronavirus-related setbacks continues to threaten these workers' jobs.

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26 US Department of Labor, "Unemployment Insurance Weekly Claims," 2020.

27 Horsley, "A Staggering Toll," 2020.

28 Schwartz et al., "How Bad Is Unemployment?," 2020.

29 For example, the Great Recession permanently increased the level of skill required for jobs in the hardest-hit metropolitan areas; see Hershbein and Kahn, "Do Recessions Accelerate Routine-Biased Technological Change?," 2018, and Carnevale et al., *America's Divided Recovery*, 2016.

30 Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS), February 2020 and April 2020.

In contrast, workers in professional and technical occupations—who have the highest need for cognitive competencies in their jobs—have been more protected from the initial waves of COVID-related unemployment. The number of workers in professional and technical occupations decreased by only 6 percent between February 2020 and April 2020, and the unemployment rate for workers in these occupations increased from 2 percent to 7 percent,<sup>31</sup> far lower than the unemployment rate for the entire labor force. In part, this is because the roles of workers in professional and technical occupations are better suited to working from home.<sup>32</sup> If widespread telework continues, it is reasonable to expect that the relative demand for the cognitive competencies associated with these jobs will continue to rise. Moreover, as workers adjust to new working conditions requiring greater physical distance, competencies like communication are likely to become even more important.

Shocks to the economy can change the demand for competencies not only by changing the number of workers within each occupational group, but also by changing the work tasks associated with their occupations. Occupations that maintain high levels of employment by adapting to new economic conditions may begin demanding different competencies of their workers. It is difficult to predict which competencies will be required in newly reimagined occupations, but the doctors, teachers, and social workers of today are likely to perform different work tasks than their counterparts in the future.<sup>33</sup>

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31 Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau and Bureau of Labor Statistics, Current Population Survey (CPS), February 2020 and April 2020.

32 Carnevale and Fasules, "Who's Working from Home," 2020.

33 Manyika, "Technology, Jobs, and the Future of Work," 2017.

## PART 2. The Labor-Market Value of Competencies



The 21st-century labor market has put a premium on intellectual knowledge, skills, and abilities. Occupations requiring cognitive competencies yield the highest economic rewards, while those requiring physical strength and coordination are less valuable in the labor market.

In addition, some competencies (which we refer to as “general competencies”) are in high demand across the labor market, while others (“specific competencies”) are in high demand only in a few occupations and jobs. Workers in job assignments that once primarily involved specific competencies now depend upon their general competencies to provide the range of knowledge, skills, and abilities they need for job success.<sup>34</sup> This is partly because modern jobs are subject to rapid change, causing employers to prioritize a workforce that adapts easily and develops new competencies quickly.<sup>35</sup>

Importantly, the competencies that are in the highest demand across the labor market are not necessarily the ones associated with the highest earnings premiums. Just as commonly demanded commodities may not command high prices in the consumer market, commonly demanded competencies may not generate high pay. Consider the example of fuel prices: when oil is plentiful, gasoline prices are relatively low, even when demand is high; when trade restrictions limit supply, prices spike, even though demand remains unchanged.

Economic opportunity is significant for those who possess not just the competencies that are in high demand, but also those that are highly valued and therefore generously rewarded. Research has also shown that workers with high levels of general competencies tend to have higher rates of job satisfaction, advance more quickly in their professions, and have higher earnings than workers with low levels of general competencies.<sup>36</sup> That is why it is critical for workers to know which competencies are demanded in high-earning jobs, and which ones are required at high intensities.

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34 Hershbein and Kahn, “Do Recessions Accelerate Routine-Biased Technological Change?,” 2018.

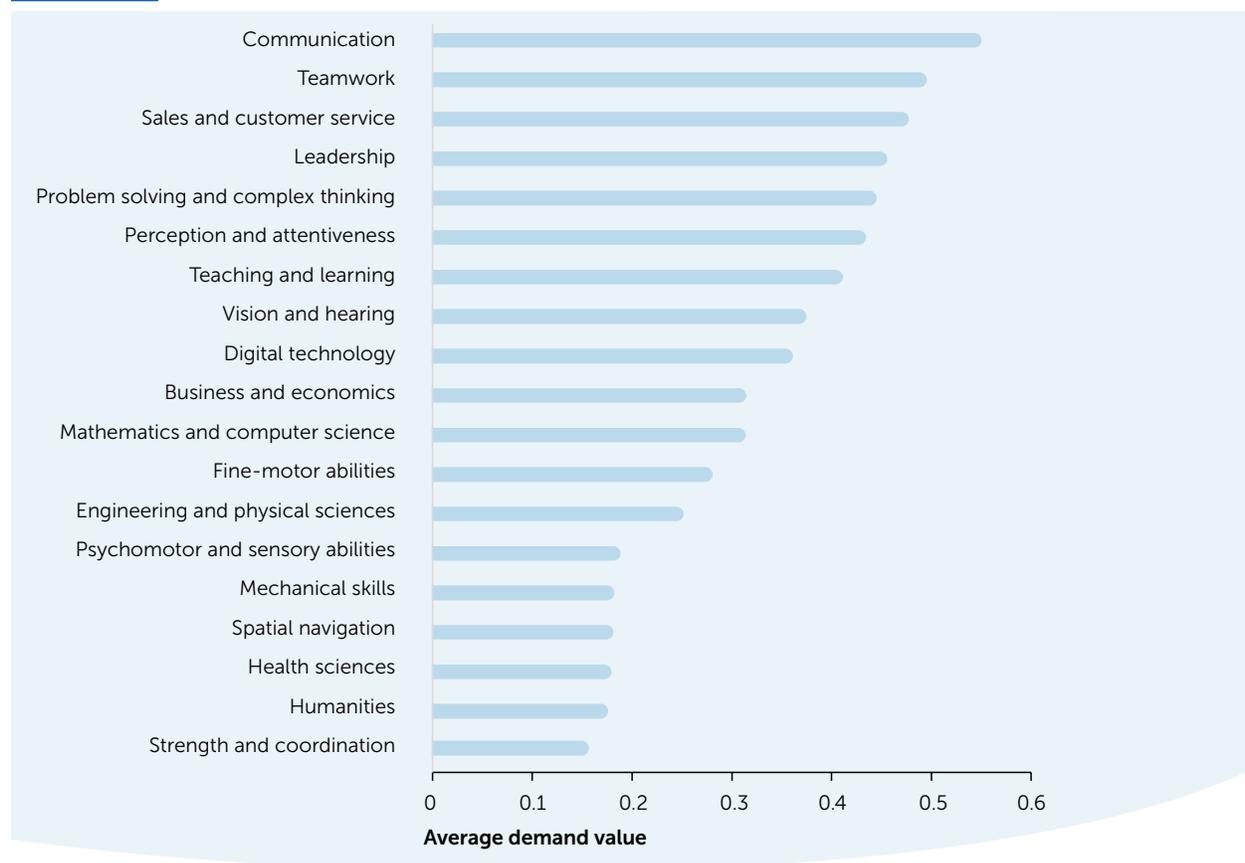
35 Rodriguez et al., “Developing Competency Models to Promote Integrated Human Resources Models,” 2002.

36 Akkermans et al., “The Role of Career Competencies in the Job Demand—Resources Model,” 2013, and Heijke et al., “An Investigation into the Role of Human Capital Competences and Their Pay-Off,” 2003.

## Five competencies are in high demand across the labor market.

To measure demand for a competency, we use survey data gathered by researchers who ask workers and job analysts how important specific knowledge, skills, and abilities are in their work, and what level of each of these is necessary to their job tasks. Across occupations, the key competencies reported as the most demanded based on importance and level are communication, teamwork, sales and customer service, leadership, and problem solving and complex thinking. In contrast, strength and coordination are the least demanded competencies across the economy (Figure 4).

**Figure 4.** Across the labor market, communication is the most in-demand competency.



Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

The top five competencies mentioned above are consistently in high demand across the labor market. Each is key to workers' ability to contribute to almost any workplace.<sup>37</sup> These competencies are especially critical for workers in a competitive job market: job posting data have shown that these general competencies are universal and timeless, while other more specific competencies (for example, proficiency in the latest computer programming language) are continually falling in and out of favor.<sup>38</sup>

37 For a list of the specific knowledge, skills, and abilities that constitute each broad competency, see Appendix B.

38 Metsker, "The Top 10 Skills in Demand at the Top 10 US Companies in 2020," 2020; and Metsker, "The Top 10 Skills in Demand at the Top 10 U.S. Companies in 2018," 2018.



**Communication** is a critical competency in any job. Whether working at home or onsite, workers need to be able to communicate with clients and colleagues in order to complete collaborative tasks, fulfill clients' needs, and adapt to changing demands and priorities. While different jobs involve different mixes of written and oral communication and different balances between expression (speaking and writing) and interpretation (listening and reading), communication is in high demand in every occupation.



**Teamwork** is the glue that holds the workplace together. Involving skills like persuasion, social perceptiveness, and service orientation, it allows workers to collaborate with others in the interest of completing shared tasks and meeting mutual goals. The collaborative demands of many occupations and the overlapping nature of workplace roles has increased the importance of teamwork as an essential competency.



**Sales and customer service** are valued competencies in today's economy. Businesses depend on their workers to promote their goods and services, whether they are selling manufactured goods like cars and clothing or business and professional services like accounting or financial advice. Even in occupations not traditionally associated with sales, such as education and healthcare, knowledge of how to evaluate clients' needs and meet their expectations are essential to the success of both workers and firms.



**Leadership** is crucial to the efficiency and effectiveness of any business. Encompassing key skills like coordination, negotiation, and management of time and personnel, it allows workers to use resources appropriately to get the job done.



**Problem solving and complex thinking** are more critical than ever for the success of both workers and employers. As a larger percentage of rote and manual tasks are handled by robots and computers, workers are spending more time on higher-order tasks requiring interpretation, creativity, and flexibility. Problem solving and complex thinking allow workers to identify challenges, create solutions, and measure results.<sup>39</sup>

## The earnings associated with different competencies vary.

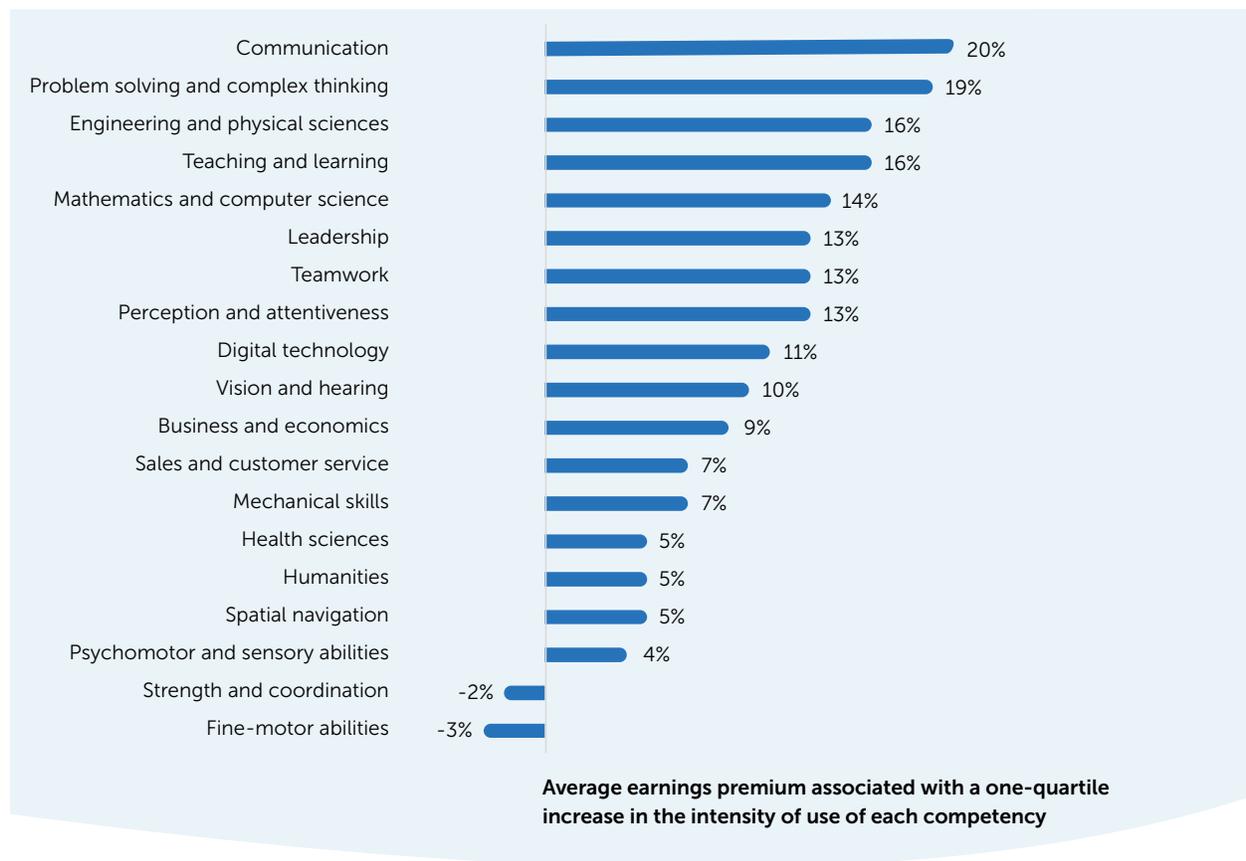
The competencies that are in the highest demand throughout the labor market are not always the ones that produce the highest annual earnings. Controlling for both education and major occupational group, in-demand competencies like communication and problem solving are associated with higher earnings in jobs where they also are used most intensively. At the same time, competencies that are in lower demand across the labor market—such as engineering and mathematics—can also yield high earnings. In short, few workers may need to use engineering and mathematics competencies in their jobs, but those who do may be rewarded handsomely.

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39 Carnevale and Smith, "Workplace Basics," 2013.

Across occupations, higher-intensity use of a competency is generally associated with higher earnings. An increase from one quartile to the next in how intensively workers use communication competencies within a job is associated with an average earnings premium of 20 percent, while a similar increase in how intensively workers use problem solving and complex thinking competencies corresponds with an average earnings premium of 19 percent.<sup>40</sup> In contrast, two competencies are associated with lower earnings when they are used more intensively: a one-quartile increase in how intensively workers use fine-motor abilities is associated with an earnings penalty of 3 percent; for strength and coordination, the associated earnings penalty is 2 percent (Figure 5).

**Figure 5. Communication has the highest earnings premium associated with higher intensity of use.**



Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: We control for educational attainment and major occupational group when calculating the average earnings premium associated with each competency. Within each specific competency, intensity of use is measured according to quartiles defined by the demand values for each occupation, with the top quartile within each competency corresponding to the most intensive use of that competency. Intensity of use has different quartile thresholds for each competency. For more information on methodology, see Appendix A.

40 To determine the average earnings premium associated with each competency, we control for educational attainment and major occupational group. For more details on the methodology, see Appendix A.

The gaps between the demand for certain competencies and the rewards associated with those competencies can be explained in part by differences in the occupations that make up the labor market, along with differences in the educational attainment of the workers in those occupations. Some competencies are in high demand—and generate high rewards—across all occupations; other competencies are in low demand across occupations, but nonetheless generate high rewards in the occupations where workers use them most intensively.

As we describe in the next section, the labor market rewards different mixes of competencies and education depending on what workers need within different occupations. While there are many factors affecting their careers that workers cannot control, such as discrimination or whether they enter the labor market during a recession, workers are able to control which competencies they acquire either through formal education and training or on-the-job experiences. By acquiring the optimal mix of education and competencies for their chosen occupation, workers can improve their chances of success in the labor market.



## PART 3. The Competencies Associated with Occupational Success



The mix and strength of workers' competencies may give them the edge they need in a competitive labor market. Knowing how competencies vary from occupation to occupation can help students and workers prioritize which competencies to acquire, whether through education or experience. Workers should also recognize that the most useful and relevant set of competencies within each occupation is bound to change as different occupations evolve, so they will need to continuously broaden the variety of competencies they have.<sup>41</sup> The summaries below show which competencies are currently valued at various levels of education within nine major occupational groups.

### Every occupation requires a different mix of competencies.

While many jobs require workers to flexibly apply sets of competencies that overlap across occupations, the exact competencies needed within each job vary widely. A doctor likely needs health sciences knowledge more than an engineer or a CEO does to succeed. In contrast, a CEO generally needs sales and customer service knowledge more than an engineer or a doctor does, while an engineer needs a depth of expertise in digital technology that the other two do not. Workers in all three of these high-earning occupations need communication competencies, as well as problem solving and complex thinking (Figure 6).

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<sup>41</sup> Accenture, *It's Learning*, 2018.

**Figure 6.** While some competencies, such as communication, are demanded across occupations, the ranking based on demand varies from occupation to occupation.



Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Height of boxes represents the relative demand for each competency. STEM stands for science, technology, engineering, and mathematics.

The earnings associated with any given occupation, and whether a worker earns more or less than the median for that occupation, depend to some degree on the combination of competencies that a worker uses and the value of those competencies within the labor market. Some competencies are associated with higher pay, while others are associated with lower compensation: for example, communication generally commands high wages, while strength and coordination do not. A job that relies on combinations of high-paying competencies will command higher earnings than one that requires both high- and low-paying competencies.<sup>42</sup>

The specific combination of knowledge, skills, and abilities that a worker possesses interacts with a range of other factors—including educational attainment and how intensively a worker uses specific competencies on the job—to determine the worker’s earnings. Some of these factors are generally under a worker’s control; others are not. While a worker can choose to pursue a degree or other credential to increase his or her employability, compensation for certain credentials and competencies is based on external supply and demand factors that are always in flux.

In addition, a worker can do everything “right” and still experience race- or gender-based labor-market discrimination, which prevents equally qualified individuals from receiving equal rewards for their competencies and their work.<sup>43</sup> In previous studies, researchers have determined that 41 percent (about 8 cents out of 20 cents on every dollar) of the overall earnings gap between men and women is “unexplained,” meaning that it has “no obvious measurable rationale” and is most likely attributable to discrimination resulting from conscious or unconscious bias.<sup>44</sup> Between 11 cents and 18 cents of Black–White and Latino–White earnings gaps are similarly “unexplained.”<sup>45</sup>

While our research does not attempt to estimate the amount of the earnings gap that is attributable to bias, it does confirm that the earnings gaps persist, even among workers with similar educational attainment who are employed in the same major occupational group. Our data show that on average, after controlling for educational attainment and occupational group, White women earn 74 cents on the dollar compared to White men’s earnings. Black women earn 68 cents, Latina women earn 67 cents, Black men earn 79 cents, and Latino men earn 85 cents for every dollar earned by White men.<sup>46</sup>

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42 Other research has shown that social, analytical, and managerial skills generally command high wages, while mechanical skills do not. Kochhar, *Women Make Gains in the Workforce amid a Rising Demand for Skilled Workers*, 2020.

43 Carnevale et al., *Women Can’t Win*, 2018; Carnevale et al., *The Unequal Race for Good Jobs*, 2019.

44 Carnevale et al., *Women Can’t Win*, 2018.

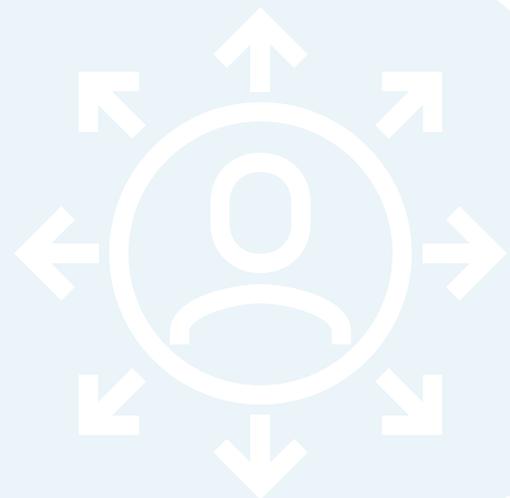
45 Carnevale et al., *The Unequal Race for Good Jobs*, 2019.

46 Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18.

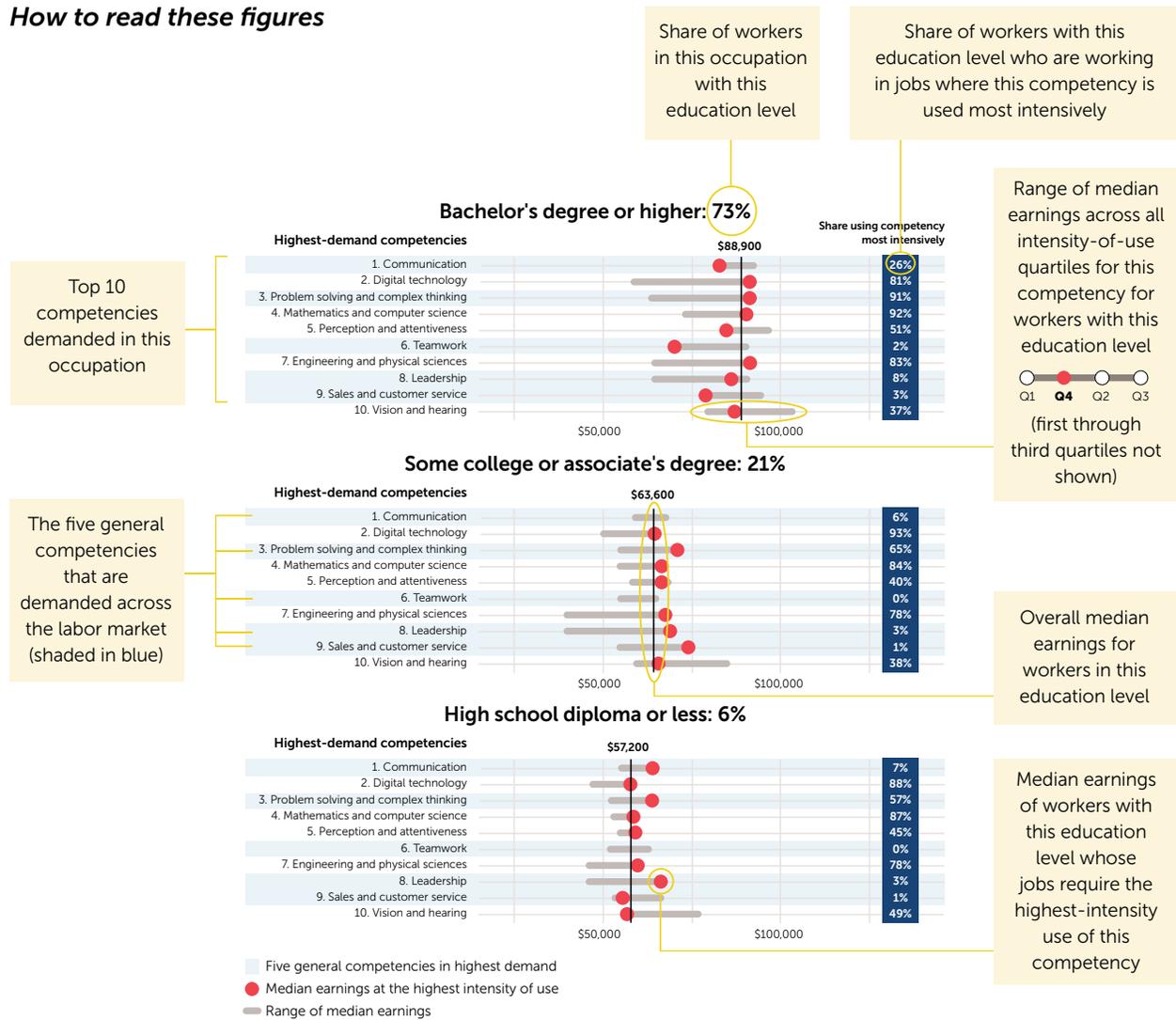
Nonetheless, workers are empowered by knowing the value of different competencies in the labor market. Some competencies have high value for workers at all levels of education within all major occupational groups, while others have high value only within specific occupations. A student or worker interested in an occupation would benefit from knowing the value of general and specific competencies at various educational attainment levels within that occupation or occupational group. Being able to demonstrate that they have these competencies will make them stand out in the crowd and help them secure success within their professions.

## Different combinations of competencies pay off in different occupations.

In the discussion below, we examine how occupation, education, and competencies interact to determine workers' earnings. For each of nine major occupational groups, we explore (1) how important educational attainment is to the occupation; (2) which 10 competencies are in the highest demand within that occupation; and (3) how the intensity with which workers use these in-demand competencies affects their earnings. We find that each occupational group requires a different mix of general and specific competencies, and occupations that require workers to use their general competencies most intensively yield higher earnings.



## How to read these figures



## Science, Technology, Engineering, and Mathematics (STEM) Occupations

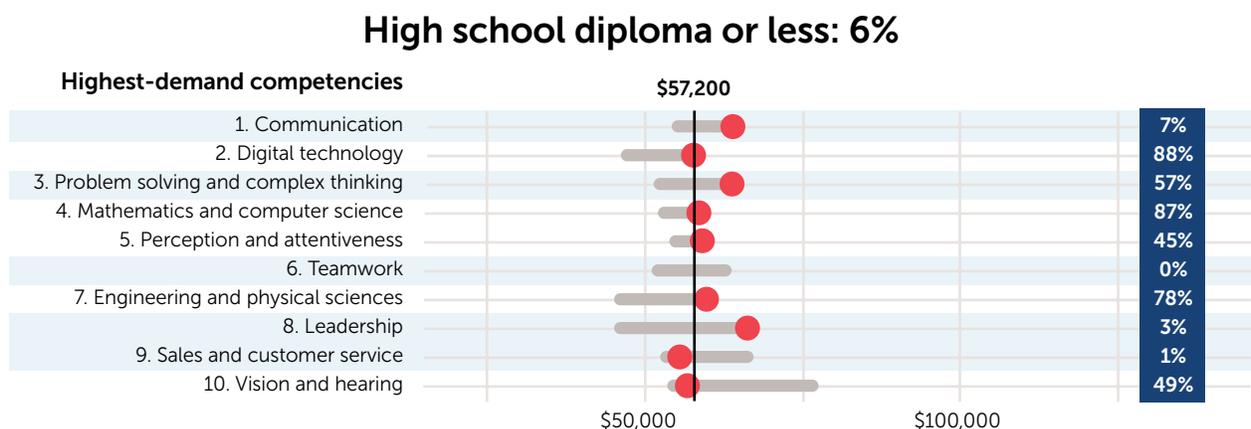
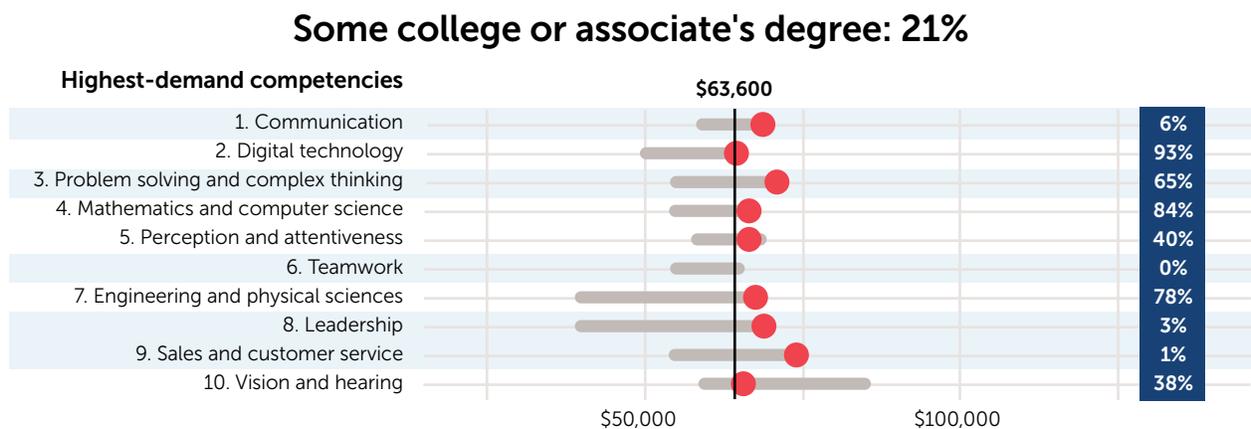
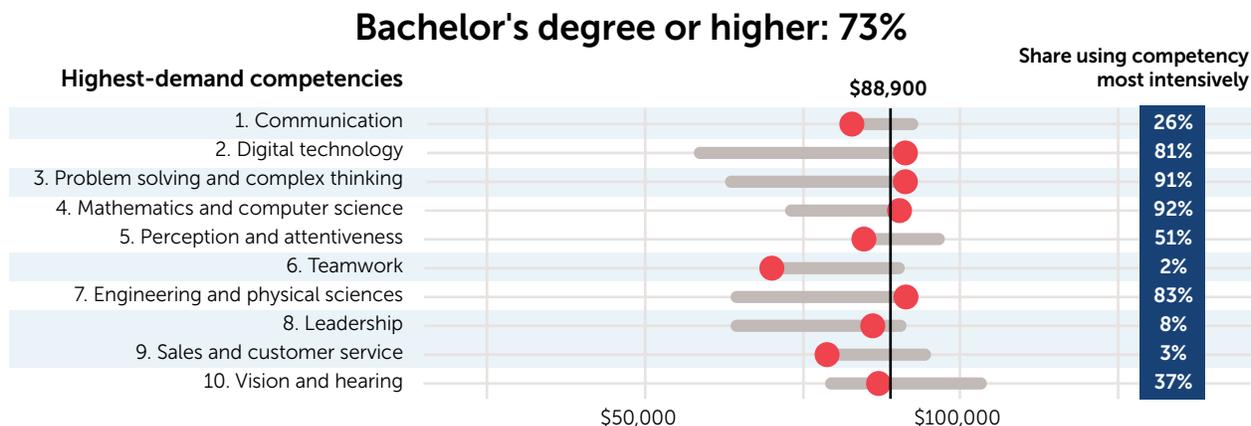
STEM occupations have the highest median earnings of all occupational groups, at \$81,600. This high pay may compensate workers not only for high levels of education (as 73 percent of STEM workers have a bachelor's degree or higher), but also for mastery of specialized skills that are required at a high intensity within these occupations, such as digital technology, mathematics and computer science, and engineering and physical sciences.

Most STEM workers use these specific competencies, along with the general competency of problem solving and complex thinking, at their most intensive levels. For example, at all three levels of educational attainment, more than 80 percent of STEM workers use digital technology at the most intensive level compared to this competency's use in the overall economy, while more than 75 percent use engineering and physical sciences at its most intensive level (Figure 7).

The earnings premium associated with both general and specific competencies varies across education levels: for workers with a bachelor's degree or higher, the most intensive use of a competency isn't always associated with the highest median earnings. Communication, for example, yields below-median earnings at the highest intensity for workers with a bachelor's degree or higher within STEM occupations, in contrast to its generally high earnings premium across the labor market. Meanwhile, for workers with some college or an associate's degree and those with a high school diploma or less, those who use the top 10 competencies at their highest intensities generally receive an earnings boost over the median for their education level.

Thus in-demand competencies acquired through experience could be a way for workers with lower levels of education to maximize their earning potential.

**Figure 7.** The top 10 competencies needed by STEM workers are a balanced mix of general and specific competencies.



- Five general competencies in highest demand
- Median earnings at the highest intensity of use
- ▬ Range of median earnings

Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Competencies are ranked in the order demanded by the major occupational group.

## Managerial and Professional Office Occupations

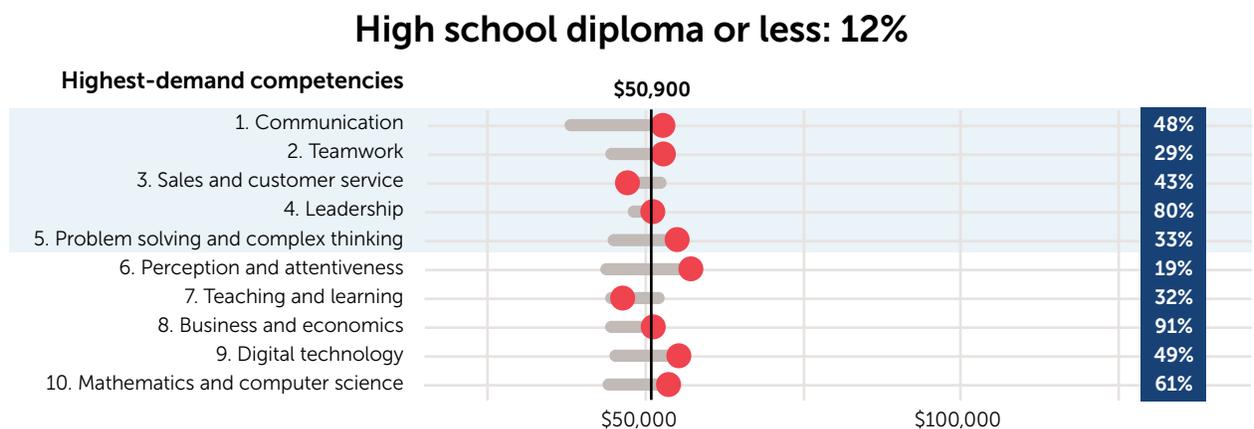
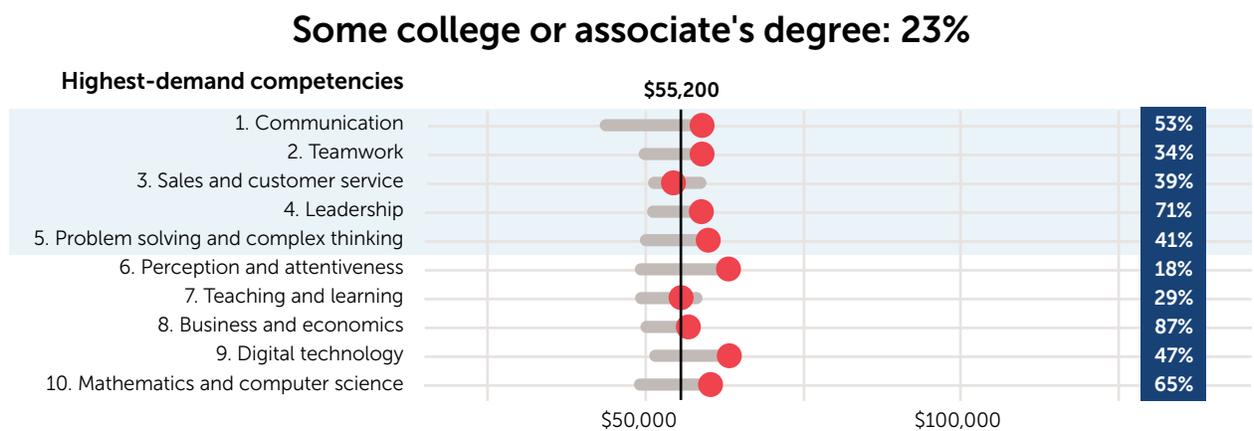
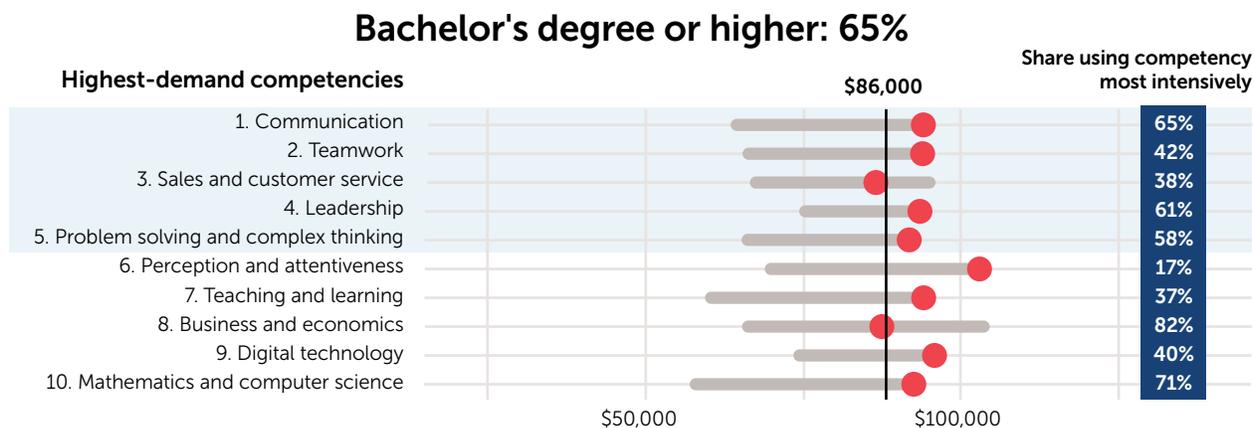
Workers in managerial and professional office occupations have median earnings of \$73,200. Among these workers, 65 percent have a bachelor's degree or higher. The bachelor's degree is particularly important for workers in this group, who generally cannot compensate for lower levels of education with in-demand competencies gained through experience. Even with high-intensity use of competencies, workers in managerial and professional office occupations who have some college or an associate's degree don't earn much more than workers with a high school diploma or less (Figure 8). In fact, workers with some college or an associate's degree or those with a high school diploma or less whose jobs require high-intensity use of competencies still earn at least \$20,000 less than the bachelor's degree median.

General competencies are in high demand for managerial and professional office workers: communication is the top competency for this occupational group, followed by teamwork and sales and customer service. Leadership along with problem solving and complex thinking round out the top five most-demanded competencies for this occupational group.

On average, for workers in managerial and professional office occupations, higher-intensity use of in-demand competencies is associated with higher median earnings. Within this occupational group, the highest earnings premiums are attached to perception and attentiveness (a 16-percent premium over the median at the most intensive use) and digital technology (a 10-percent premium).

The intensity of high-demand competencies matters more for managerial and professional office workers with a bachelor's degree than for those with lower levels of formal education. Within this occupational group, workers with a bachelor's degree or higher can experience a significant earnings penalty when their job does not require intensive use of in-demand competencies, nearly canceling out the earnings premium associated with having a bachelor's degree. For example, workers with a bachelor's degree in managerial and professional office jobs requiring the least-intensive use of mathematics and computer science make \$55,300, compared to the overall median of \$55,200 for workers with some college or an associate's degree.

**Figure 8.** The top five competencies needed in managerial and professional office occupations are all general competencies.



■ Five general competencies in highest demand  
● Median earnings at the highest intensity of use  
▬ Range of median earnings

Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Competencies are ranked in the order demanded by the major occupational group.

## Healthcare Professional and Technical Occupations

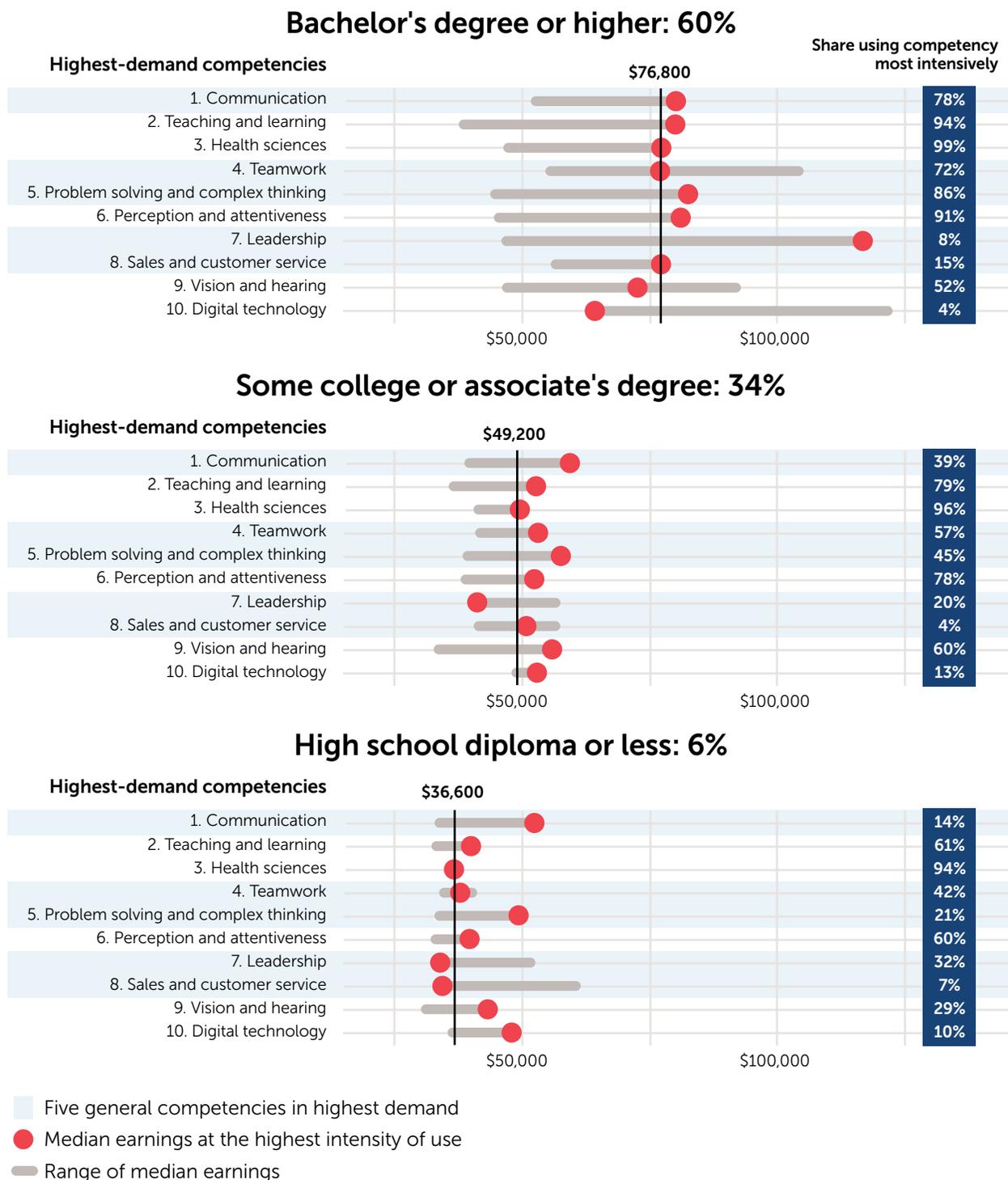
Healthcare professional and technical workers—a diverse occupational group that includes physicians, nurses, pharmacists, paramedics, and nutritionists—have median earnings of \$63,500. For these workers, a bachelor's degree or higher is associated with a significant earnings premium, with the workers who hold such a degree making more than twice as much at the median as workers with a high school diploma or less (Figure 9).

Communication is the most demanded competency for workers in this occupational group, followed by teaching and learning and then health sciences. Certain jobs within this occupational group have specific requirements that affect trends for the entire group: for example, pharmacists, dieticians, and licensed practical nurses use leadership at the most intensive level.

For workers with a bachelor's degree or higher, the rewards associated with leadership are high: workers who use leadership at the highest intensity (for example, pharmacists) are also in the highest-paying occupations. In fact, using leadership at its most intensive levels is associated with an earnings premium of 52 percent above the median for workers with a bachelor's degree or higher. In contrast, the most intensive use of leadership is associated with a wage penalty at other education levels, because workers who use this competency at the highest intensity are in the lowest-paying occupations (for example, licensed practical and vocational nurses). When using leadership at its most intensive levels, workers with a high school diploma or less earn 7 percent below the median and workers with some college or an associate's degree earn 16 percent below the median. Overall, the 10 most-demanded competencies are generally associated with earnings above the median.

While higher education typically results in higher earnings for healthcare professional and technical occupations, intensive use of high-demand competencies can provide an earnings boost. Workers with a high school diploma or less in jobs that demand the highest intensity of communication or problem solving and complex thinking, for example, have earnings similar to those of some workers with some college or an associate's degree. In fact, high school-educated workers who use communication most intensively have higher earnings (\$52,300), on average, than the median for workers with some college or an associate's degree (\$49,200). Moreover, workers with some college or an associate's degree who use high-demand competencies most intensively typically have higher median earnings than workers with a bachelor's degree or higher whose jobs require the lowest intensity of high-demand competencies.

**Figure 9.** Healthcare professional and technical workers with a bachelor's degree or higher enjoy a high earnings premium for leadership skills.



Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Competencies are ranked in the order demanded by the major occupational group.

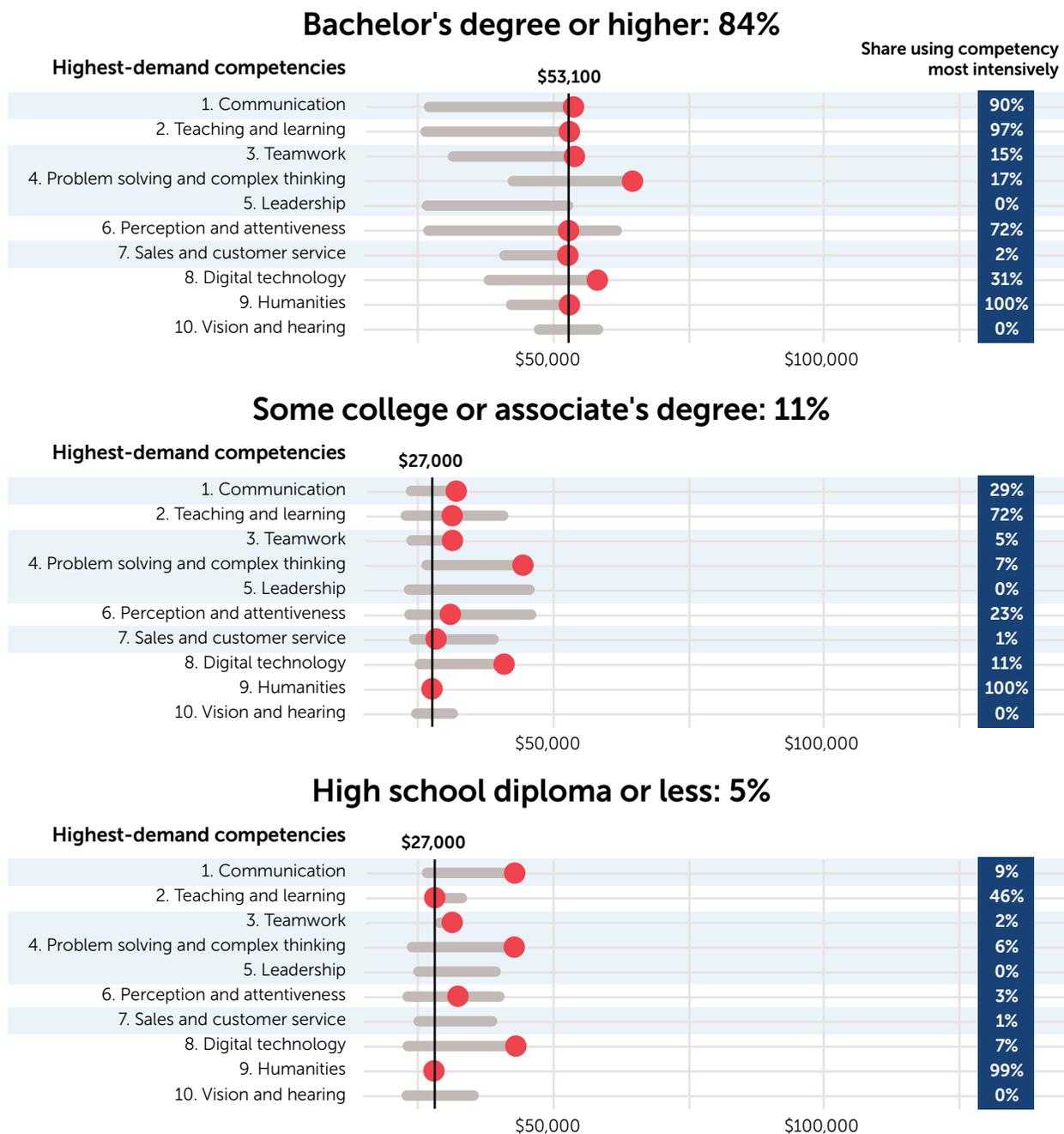
## Education

Workers in education occupations have a median wage of \$50,900. Within this occupational group, 84 percent of workers have a bachelor's degree or higher, and these workers enjoy a significant earnings premium over workers with less education. In contrast, in education occupations, workers with some college or an associate's degree enjoy no earnings premium above those with a high school diploma or less: both groups earn a median of \$27,000 annually (Figure 10).

The top competencies demanded of education workers are communication, teaching and learning, and teamwork. Specific competencies required of workers in these occupations include perception and attentiveness, digital technology, and humanities. While humanities is the competency with the ninth-highest level of demand for this occupational group, it is required at exceptionally high intensity compared to its use across the workforce: almost 100 percent of workers in education occupations use humanities knowledge at its highest intensity, with library technicians being the exception.

The most intensive use of problem solving and complex thinking, communication, and digital technology is generally associated with an earnings premium over the median for educators, regardless of education level. For the other competencies that are in high demand for this occupation group, the earnings associated with intensive use are more in line with the median for each education level.

**Figure 10.** High-intensity use of communication, problem solving and complex thinking, and digital technology can boost earnings for educators at all education levels.



- Five general competencies in highest demand
- Median earnings at the highest intensity of use
- ▬ Range of median earnings

Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Competencies are ranked in the order demanded by the major occupational group.

## Community Services and Arts

Workers in community services and arts occupations have median earnings of \$50,200, an average that is biased downward by the low economic value typically assigned to community services occupations like clergy, counselors, and social workers. These community services occupations make up 53 percent of all community services and arts occupations, compared to 47 percent that are in the arts. While community services occupations may require higher intensities of high-demand competencies—such as teamwork, teaching and learning, and problem solving and complex thinking—than arts occupations do, they do not necessarily result in higher earnings.<sup>47</sup>

The concentration of workers in community services occupations may help explain another unusual pattern for this occupational group: those who use the most in-demand competencies most intensively seem to suffer an earnings penalty. For example, 67 percent of workers with a bachelor's degree or higher use communication at its highest level of intensity, but those workers earn slightly less than the median wage for all workers with bachelor's degree or higher in the occupational group. In fact, only two of the most-demanded competencies are associated with an earnings premium when used most intensively: digital technology (with an average premium of 14 percent across education levels) and vision and hearing (with a 13 percent premium) (Figure 11). Within this occupational group, the most intensive use of these competencies predominantly occurs within arts occupations.

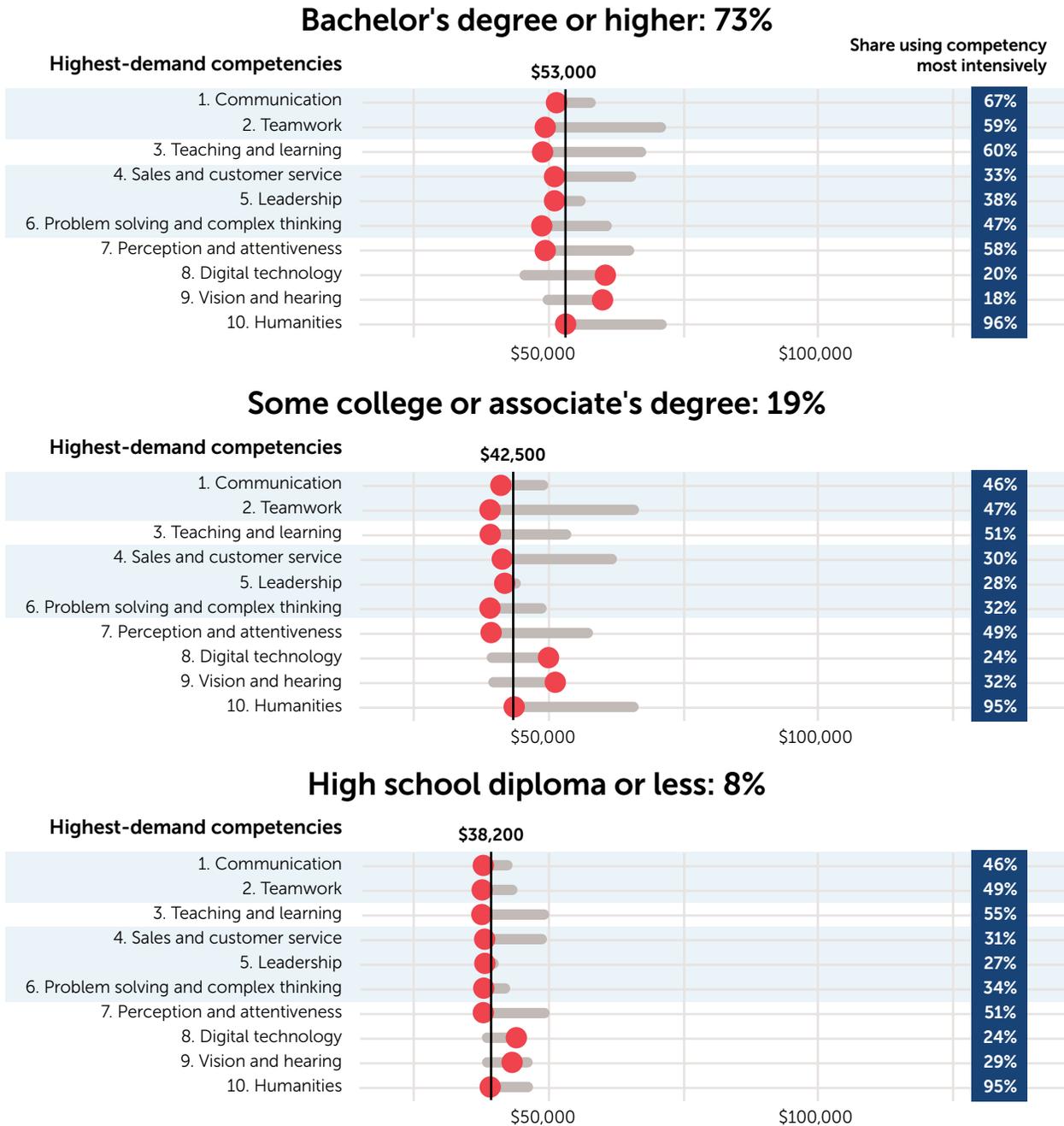
Other patterns can also be partially explained by specific occupations within the broader group. For example, high intensity of problem solving and complex thinking results in earnings that are 8 percent below the median at the bachelor's degree or higher level; this competency is required at the highest intensity by clergy, counselors, and social workers, which are all professions with below-median pay. Meanwhile, technical writers have the highest median earnings of this group, and this profession requires low-intensity teamwork, sales and customer service, and perception and attentiveness.

Some competencies within each occupational group are used with particularly high intensity relative to their use in the rest of the workforce. In community services and arts occupations, more than 95 percent of workers require humanities knowledge at its most intensive level, compared to 25 percent of the entire workforce. Even so, humanities competencies do not crack the top five in-demand competencies for this occupational group.

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47 The full-time, full-year median earnings for arts occupations, analyzed here, are more than \$10,000 higher than the full-time, full-year median earnings for community services occupations. If we were to analyze all positive earnings instead, arts occupations would have median earnings that are about \$5,000 more than the median earnings for community services occupations. Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18.

**Figure 11.** In community services and the arts, using high-demand competencies at the highest intensity is associated with an earnings penalty.



- Five general competencies in highest demand
- Median earnings at the highest intensity of use
- Range of median earnings

Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Competencies are ranked in the order demanded by the major occupational group.

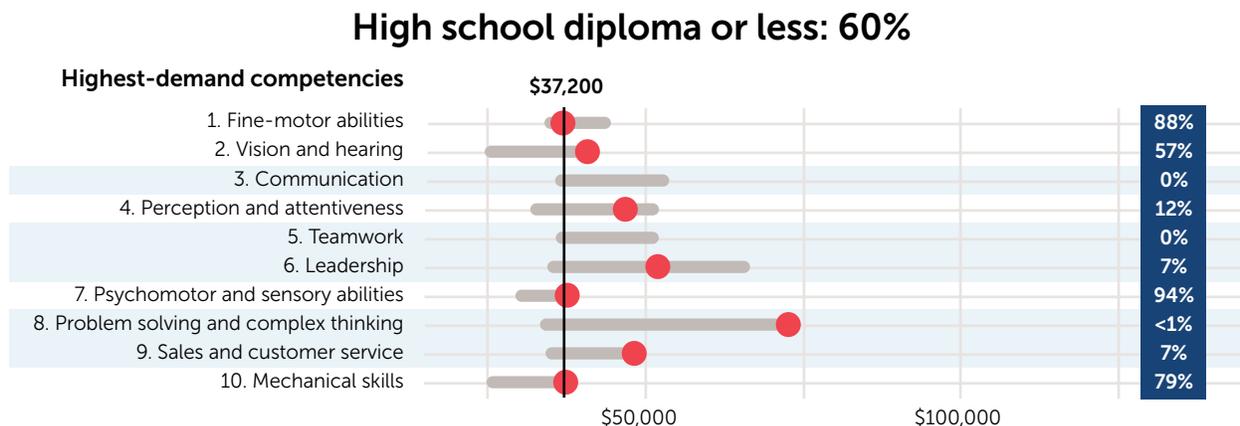
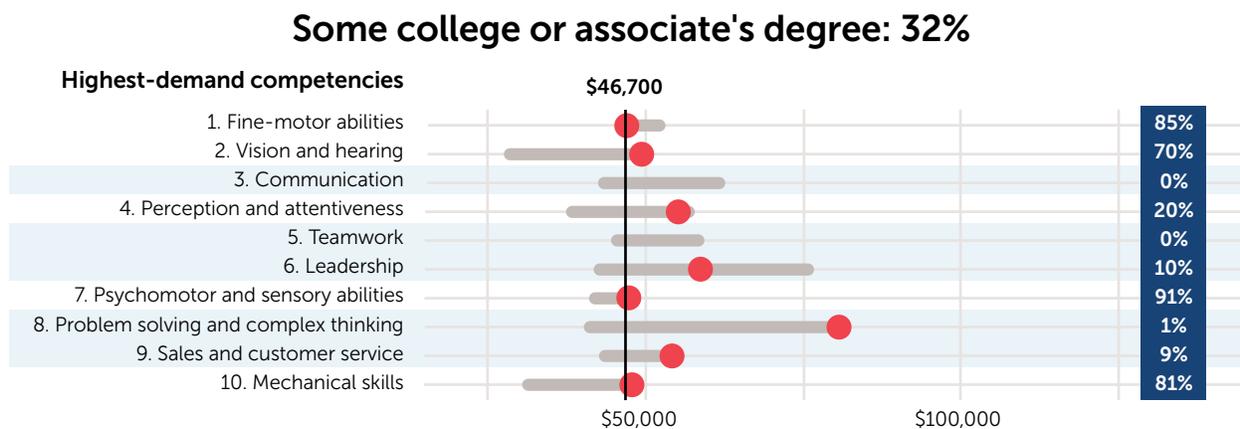
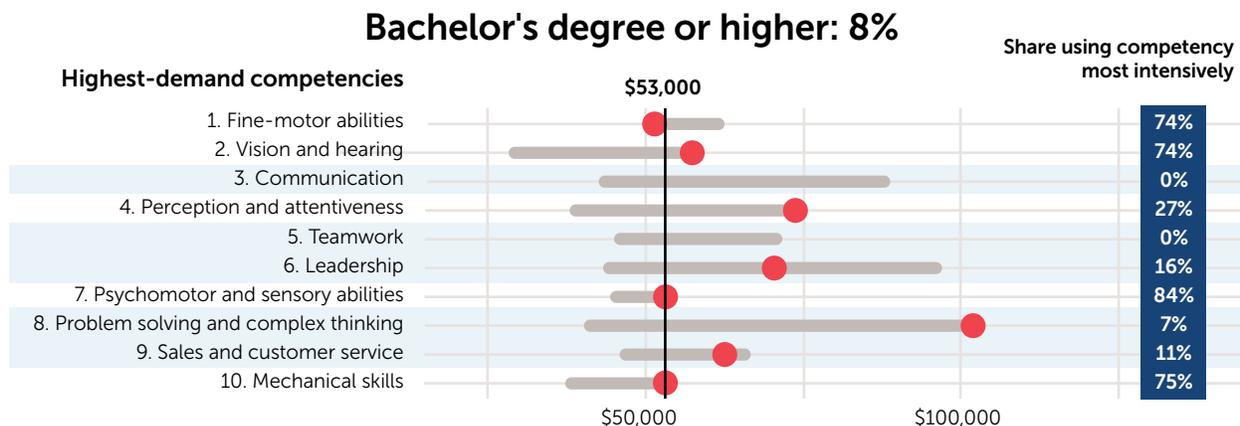
## Blue-Collar Occupations

Blue-collar occupations have median earnings of \$41,400, with a far less dramatic college earnings premium for workers with a bachelor's degree or higher than other occupational groups. Few blue-collar workers—only 8 percent—have a bachelor's degree or higher. A full 60 percent of the blue-collar workforce has a high school diploma or less, and 32 percent have some college or an associate's degree (Figure 12). While blue-collar workers with higher levels of formal education enjoy a slight earnings premium overall, workers with lower formal education levels can earn more than workers with higher education levels if they use their competencies at the highest intensity.

The top five highest-demand competencies for blue-collar workers include three with specific value in these occupations: fine-motor abilities, vision and hearing, and perception and attentiveness. Among the top five competencies with the highest demand, communication and teamwork are the only competencies that are generally in high demand across the workforce, and virtually no workers need these competencies at their most intensive levels. Overall, very few blue-collar workers require generally demanded competencies at their highest intensity.

Although few blue-collar workers need generally demanded competencies at their highest intensity, those whose jobs require high-intensity use of general competencies may see substantial earnings boosts. The most intensive use of problem solving and complex thinking is associated with an earnings boost of 89 percent above the median on average across all education levels, and the highest level of intensity for leadership is associated with an average earnings premium of 35 percent. In comparison, fine-motor abilities, psychomotor and sensory abilities, and mechanical skills are all associated with just a 1 percent earnings boost above the median. Problem solving and complex thinking is particularly important for some of the highest-paying occupations within this occupational group, including aircraft pilots and flight engineers as well as air traffic controllers.

**Figure 12.** Blue-collar workers who use high-demand competencies at high intensities can experience an earnings boost similar to the boost from educational attainment.



- Five general competencies in highest demand
- Median earnings at the highest intensity of use
- ▬ Range of median earnings

Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Competencies are ranked in the order demanded by the major occupational group.

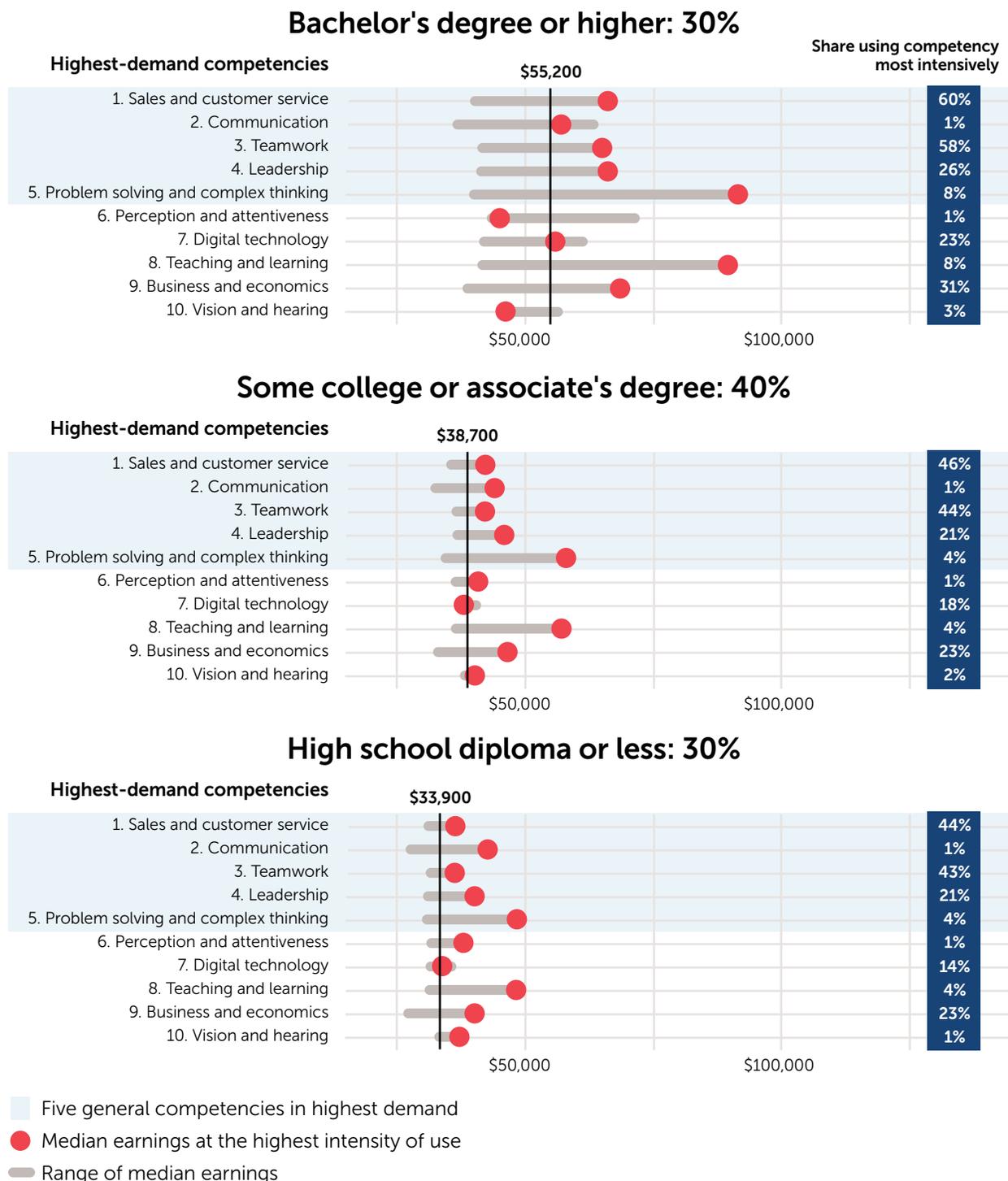
## Sales and Office Support

Jobs in sales and office support occupations, which have median earnings of \$41,000, are fairly evenly split between workers with a bachelor's degree or higher (30 percent), workers with some college or an associate's degree (40 percent), and workers with a high school diploma or less (30 percent). There is a substantial college earnings premium for workers in this occupational group, with workers with a bachelor's degree or higher earning \$16,500 more at the median than workers with some college or an associate's degree, and \$21,300 more than workers with a high school diploma or less (Figure 13).

The general competencies that are in high demand across the economy are also the most-demanded competencies for workers in sales and office support occupations. Fittingly, sales and customer service is in the highest demand, with more than 40 percent of workers at every education level using this competency at its highest intensity compared to the rest of the workforce. Communication is the competency in second-highest demand for this occupational group, although only 1 percent of workers in sales and office support use this competency at its highest intensity.

While problem solving and complex thinking is used at lower intensities overall, workers who use this competency most intensively can gain a significant earnings boost. First-line supervisors of non-retail sales workers and sales engineers are the only occupations within this group that use this competency at its highest intensity, and they also have some of the highest median earnings. In general, workers in sales and office support occupations who use competencies at their most intensive levels can expect earnings above the median.

**Figure 13.** Few sales and office support workers use problem solving and complex thinking at its highest intensity, but those who do can expect higher earnings.



Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Competencies are ranked in the order demanded by the major occupational group.

## Food and Personal Services

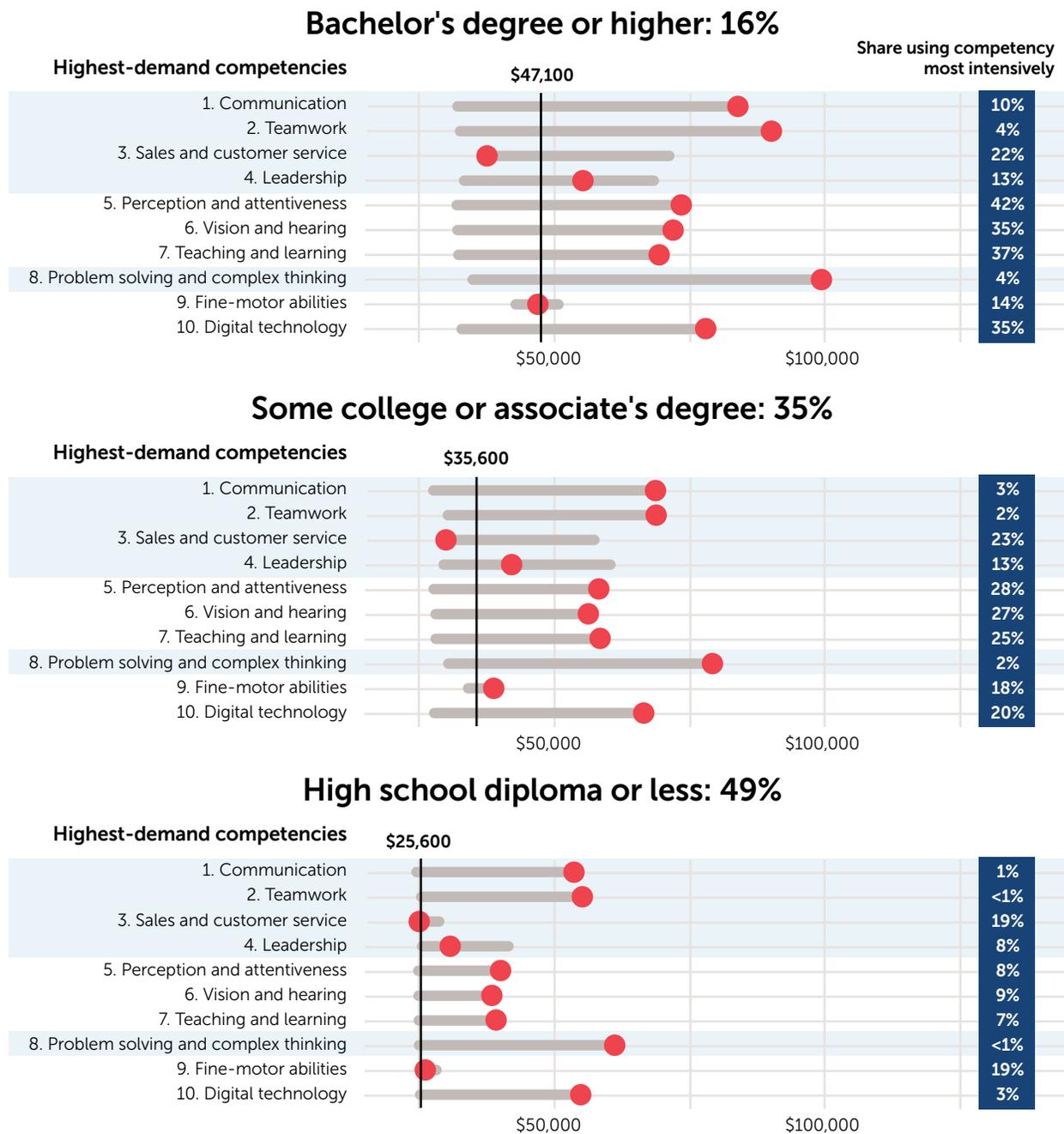
Food and personal services workers have median earnings of \$30,800. While there is an earnings premium attached to higher levels of educational attainment for workers in these occupations, nearly 50 percent of these workers have a high school diploma or less (Figure 14).

Communication and teamwork stand out for the low shares of workers using these competencies at their highest intensity levels. While these are the top two in-demand competencies for this occupational group, no more than 10 percent of workers at any education level use either of these competencies at their most intensive levels.

While this occupational group has some of the lowest median earnings of the nine major occupational groups, these jobs also have some of the highest earnings premiums associated with intensive use of competencies. For example, the most intensive use of problem solving and complex thinking is associated with an average earnings premium of 130 percent above the median across all education levels, and the most intensive use of teamwork is associated with an average earnings premium of 104 percent.

For food and personal services workers, the earnings premium associated with competencies can compensate for the earnings penalty associated with lower levels of formal education. Across education levels, workers using competencies at higher intensities are likely to have higher wages. In fact, workers with lower levels of education using in-demand competencies at higher intensities can earn higher wages than their peers with more education who use in-demand competencies at lower intensities.

**Figure 14.** Food and personal services workers can realize a substantial earnings premium by working in jobs where in-demand competencies are used at high intensities.



■ Five general competencies in highest demand  
 ● Median earnings at the highest intensity of use  
 — Range of median earnings

Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Competencies are ranked in the order demanded by the major occupational group.

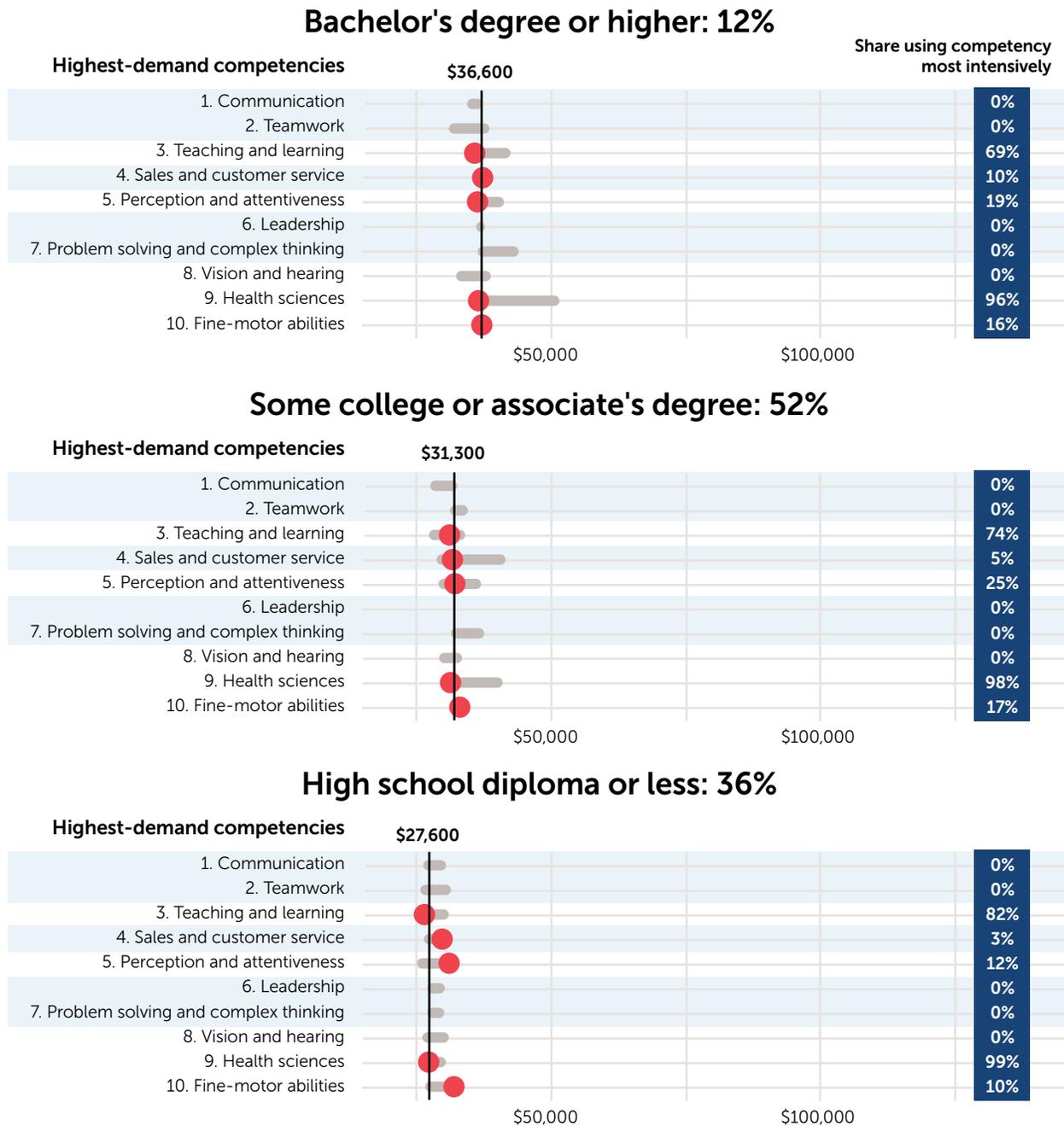
## Healthcare Support

Sadly, in the era of COVID-19, one of the most-needed and highest-risk occupational groups—healthcare support—is also the lowest-paid. Healthcare support workers have median wages of \$30,700, slightly lower than those of food and personal services workers. These workers primarily have some college or an associate’s degree: 52 percent of these workers hold more than a high school diploma but less than a bachelor’s degree (Figure 15).

Like workers in other occupations, healthcare support workers need a mix of general and specific competencies. Although health sciences is their ninth most in-demand competency overall, more than 95 percent of workers in this occupation use this competency at its greatest intensity compared to the rest of the workforce. In contrast, healthcare support workers do not use most generally demanded competencies at the highest intensities: virtually no healthcare support workers report the highest-intensity use of communication, teamwork, leadership, problem solving and complex thinking, or vision and hearing, even though all five of these competencies are necessary to their work.

Neither higher levels of education nor more intensive use of in-demand competencies result in much of an earnings premium for healthcare support workers. For this occupational group, the in-demand competencies that have positive earnings premiums compared to the median are perception and attentiveness (with an average premium of 6 percent across education levels) and fine-motor abilities (with an 8 percent premium). Meanwhile, the highest-intensity use of teaching and learning, while required of the majority of healthcare support workers, is associated with a 3 percent earnings penalty compared to the median.

**Figure 15.** For healthcare support workers, intensive use of in-demand competencies does not necessarily yield higher earnings.



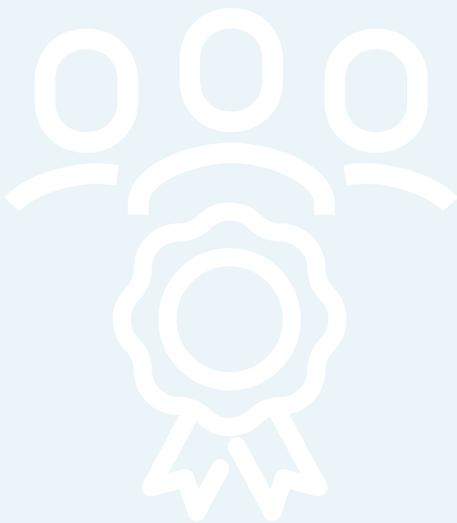
- Five general competencies in highest demand
- Median earnings at the highest intensity of use
- ▬ Range of median earnings

Source: Georgetown University Center on Education and the Workforce analysis of data from US Census Bureau, American Community Survey (ACS), 2014–18, and US Department of Labor, Employment and Training Administration, Occupational Information Network (O\*NET) 24.3 Database, 2020.

Note: Competencies are ranked in the order demanded by the major occupational group.

## General competencies have high value across occupations.

In general, occupations in which workers use general competencies at higher intensities have higher median earnings. This is especially true of two of the top five general competencies: (1) communication and (2) problem solving and complex thinking. The relatively intensive use of these two competencies in top-earning occupational groups could help explain the higher earnings attached to these occupations. It could also explain the earnings premium attached to education, assuming that formal education after high school leads to stronger communication and problem solving and complex thinking competencies and thus better preparation to work in jobs where these competencies are applied most intensively.



# CONCLUSION AND RECOMMENDATIONS

The economic value of competencies is complicated. Workers' median earnings depend on a mix of general competencies that are valued across the labor market, as well as specific competencies tied to particular occupations and education levels. Our research shows that higher levels of educational attainment are generally associated with more intensive use of the cognitive knowledge, skills, and abilities that are also typically used in higher-paying jobs.

Importantly, averages mask differences in earnings by gender, race, and ethnicity. Earnings gaps between groups are partially explained by group members' different levels of educational attainment and occupational choices, but research has shown that labor-market discrimination also plays an important role.<sup>48</sup>

Some knowledge, skills, and abilities are in high demand across all jobs: communication, teamwork, sales and customer service, leadership, and problem solving and complex thinking are among the top 10 high-demand competencies for all occupational groups. These are the general competencies that all workers need to participate in the modern economy. Workers also need specific competencies that have high value within their occupations and at their level of education. For example, STEM occupations require mathematics and computer science, while blue-collar occupations require fine-motor abilities and mechanical skills.

The competencies that are in high demand across the labor market may not be the ones that yield high earnings premiums. For example, most workers need to provide some kind of sales and customer service, but few are likely to see high earnings as a result of having these competencies.

Different groups should take a variety of lessons from our research:

## **Students and Workers**

When making decisions that will affect their future employment, students and workers should take into account how occupation, education, and competencies intersect. This information may be most useful to students when they are early in their education-to-career journeys. Workers can also use this information to help guide their decisions about upskilling or reskilling later in their careers, whether through formal education or on-the-job professional development. A few helpful guidelines can set the stage for career satisfaction and economic stability.

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<sup>48</sup> Carnevale et al., *Women Can't Win*, 2018; and Carnevale et al., *The Unequal Race for Good Jobs*, 2019.

- **Choose an occupation wisely.** When selecting an occupation, it's important to understand the monetary and nonmonetary consequences of the decision. Some occupations carry an earnings premium relative to others—for example, workers with similar levels of educational attainment are likely to earn more in STEM occupations than in blue-collar occupations. Of course, the decision is not as simple as choosing the occupation with the highest earnings: people's career satisfaction also depends on whether the competencies associated with success in an occupation align with their interests and values.
- **Get the education you need to meet your goals.** People with higher levels of education generally earn higher wages, but the earnings premium associated with education varies by occupation. Many jobs require a minimum level of education for entry. At the same time, with the right competencies, some workers may be able to earn the salary they want—and, just as important, do work they enjoy—with an associate's degree or a high school diploma rather than a bachelor's or graduate degree. Certificates and shorter-term credentials, such as licenses and certifications, can also be associated with an earnings bump. Knowing what an investment in education will cost in time and money and how it can benefit one's career trajectory is crucial to making informed decisions about one's future.
- **Develop the competencies rewarded within your chosen occupation alongside those in high demand across the workforce.** Whatever their chosen field, workers are likely to benefit from honing high-demand competencies: communication, teamwork, sales and customer service, leadership, and problem solving and complex thinking. They will also need a set of occupationally specific knowledge, skills, and abilities. Students and workers should seek to develop the competencies that will give them an edge in their chosen career, whether through informal on-the-job or co-curricular experiences, formal education and training opportunities designed to develop these competencies, or a combination of both.

## Educators

Faculty, counselors, and educational administrators should ensure that all students have the opportunity to gain both the specific competencies rewarded in their fields and the broadly applicable competencies demanded across the workforce.

- **Provide a curriculum that conveys both general and specific competencies.** The highest economic rewards go to those who have occupation-specific knowledge, skills, and abilities alongside the broadly applicable competencies often associated with a general education in the liberal arts and sciences.<sup>49</sup> The best way to ensure that students have what they need when they enter the workforce is to provide an education that strikes the ideal balance. Despite common complaints about a "skills gap" between the competencies college graduates have and the competencies they need in the workplace, the American

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49 General education in particular has been shown to provide workers with the flexibility they need to adapt to changing workforce conditions. This greater flexibility not only improves workers' outcomes later in their careers, but also strengthens the US economy. See Hanushek et al., "General Education, Vocational Education, and Labor-Market Outcomes over the Lifecycle," 2017; and Krueger and Kumar, "US–Europe Differences in Technology Adoption and the Role of Education and Other Policies," 2003. For more on the value of general education, see Krueger and Kumar, "Skill-Specific Rather Than General Education," 2004; Gould, "Rising Wage Inequality, Comparative Advantage, and the Growing Importance of General Skills in the United States," 2002; and Bailey and Belfield, "Community College Occupational Degrees," 2012.

bachelor's degree, with its mix of general and specific curricular requirements, is still the best model available for conveying the ideal mix of general and specific competencies.<sup>50</sup> Associate's degree programs, certificates, and high school diplomas can also provide a balanced curriculum tailored to students' needs.

- **Offer comprehensive career counseling and structured opportunities to explore potential careers.** Students need information about the competencies they will practice in a career in order to decide whether that career is right for them. Educators can help give students the information they need through career counseling focused on the school-to-work transition alongside career exploration and exposure, beginning in middle school and extending throughout their formal education. Career fairs, site visits, internships, externships, and career-focused projects tied to the curriculum can all provide opportunities for students to identify work they might enjoy. These activities can also help them begin acquiring the knowledge, skills, and abilities necessary to do that work.
- **Offer all students access to opportunity and the support they need to succeed.** At all levels, the educational system needs to steadfastly avoid tracking students toward certain occupations, levels of attainment, or competencies based on their race, ethnicity, gender, socioeconomic status, or other group characteristics. Educators should ensure that all students can make informed choices about their own journeys from school to careers, and they should provide support services associated with higher rates of educational and career success to any students who might benefit from them. For example, research has indicated that low-income and first-generation students benefit from such practices as peer tutoring, workshops, and counseling.<sup>51</sup>

## Employers

Our findings confirm what employers have long said about the competencies they want to see in workers. The National Association of Colleges and Employers has consistently ranked critical thinking and problem solving, teamwork and collaboration, and oral and written communication among the top competencies for employees;<sup>52</sup> our research confirms that these competencies are key. In addition to rewarding workers who excel in these areas, employers can take steps to help ensure that the competencies they want are the competencies they'll get from the current and future workforce.

- **Make the case for education and workforce preparation that conveys the competencies that are in high demand.** As the national debate rages over the relative benefits of general liberal learning versus narrow occupational training, the voices of employers are particularly resonant. Our analysis suggests that employers reward workers who have a mix of both general and specific education. Employers should make their voices heard in public discourse and policy arenas.

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50 Newton, "Colleges Don't Need to Change to Close Skills Gap," 2018.

51 Based on a study of student support services provided through Federal TRIO Programs; see Chaney, *National Evaluation of Student Support Services: Examination of Student Outcomes After Six Years*, 2010.

52 National Association of Colleges and Employers (NACE) Staff, "The Four Career Competencies Employers Value Most," 2019.

- **Partner with high schools, colleges, universities, and communities to give students and job seekers opportunities to develop high-demand, high-reward competencies.** Employers can play a larger role than simply advocating for the job preparation they want their workers to have: they can offer relevant opportunities. By forging connections with education and training providers, employers can give future workers the on-the-job experiences they need to develop usable competencies, widening the pool of potential skilled employees.
- **Be proactive about providing upskilling opportunities to incumbent workers.** In addition to building pipelines from education to work for future workers, employers can benefit from providing upskilling opportunities to their existing workforce. Employers can create in-house programs or partner with local higher education institutions to help employees build new competencies for the twenty-first century workforce.

## Policymakers

For years, policymakers have debated how much and what kind of formal preparation people need for work. Our research shows that people can succeed at all levels of education and with a variety of competencies, but a combination of broad high-demand competencies and specific high-reward competencies is generally the most valuable in the workplace. In addition, most workers need communication, teamwork, sales and customer service, leadership, and problem solving and complex thinking. Policymakers can put our findings to work by supporting programs that allow for the development of these competencies.

- **Increase transparency about educational outcomes.** Many programs claim to provide the broad and specific competencies described in this report, but not all deliver on their promises. Within a single institution, program quality can vary widely. The recent addition of program-level data to the federal College Scorecard is a step forward in increasing transparency, but the data set is currently too limited, including only large programs and students with federal loans. Greater transparency about whether programs really deliver on their promises related to earnings and learning outcomes can help hold these programs accountable by allowing students to make informed decisions about where they enroll and providing opportunities for low-performing programs to improve.
- **Support programs that allow students and workers to develop high-demand, high-reward competencies, particularly when they improve opportunity for underserved populations.** More transparency about the workforce outcomes of higher education—including at the level of learning outcomes when possible—will allow policymakers to reward high performers. But in judging whether a program is successful, it's important to take into account the student population it serves. Programs that move the needle for underserved populations should be given the resources they need to expand effective work.
- **Guard against tracking throughout the education and workforce systems.** Our findings reinforce the idea that workers benefit most from having broad knowledge and abilities alongside specific skills. It is critical that education and workforce policy ensure that current and future workers have the opportunity to benefit from education that develops these broad and specific competencies commonly associated with the American bachelor's degree but also available to some extent at the associate's degree level. People should have a range of educational options at their disposal, and no one should be tracked based on their race, ethnicity, family income, or gender toward narrow vocational training that primarily conveys specific skills.

Ultimately, workers need a combination of general and specific competencies to succeed in the workforce, and the exact combination they need varies by occupation and education level. This report provides information that students, workers, educators, employers, and policymakers need to make more informed decisions about the education and workforce preparation programs they enroll in or provide.



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## Appendix A. Data Sources and Methodology

Our analysis in this report relies primarily on two sources: the Occupational Information Network (O\*NET) and the American Community Survey (ACS).

O\*NET is a database built from surveys of occupational incumbents and analysts. Operated by the National O\*NET Consortium and funded by the US Department of Labor, the database includes information about competencies (occupational knowledge, skills, and abilities), work values, work interests, and key performances (tasks and activities) for workers in almost 1,000 different occupations. For each competency, O\*NET provides average ratings of importance and level within specific occupations.

To determine the labor-market value of each competency, we connected data from the O\*NET 24.3 Database to a five-year pooled sample of the ACS for the years 2014–18. A nationally representative survey conducted by the US Census Bureau that reaches more than 3 million households each year, the ACS contains information about respondents' education, work, income, occupational standing, family relationships, demographic characteristics, health insurance, migration history, disability status, and veteran status.

### Defining Competencies

For each knowledge area, skill, or ability (KSA) in the O\*NET database, analysts and job incumbents assign numerical ratings to the KSA's importance within a job (with ratings ranging from one to five) and the level at which it is used in the job (with ratings ranging from zero to seven). For each O\*NET occupation, we standardized these ratings on a scale of zero to one and averaged the data values.

We then used exploratory factor analysis to categorize all KSAs as broad competencies for discussion.<sup>1</sup> Exploratory factor analysis provides a means of grouping factors according to their statistical similarities, where factors "load on" (or attach) to aggregate categories based on patterns in the data (see Figure A1). While each KSA loaded on to every broad competency, we considered each KSA to have loaded on to only the broad competency with which it had the strongest statistical relationship.<sup>2</sup> For example, in Figure A1, we considered Knowledge 1, Skills 1 and 2, and Ability 1 as having loaded on to Competency 1, and Knowledge 2 and Ability 2 as having loaded on to Competency 2. Using this method, we defined 19 broad competencies (see Appendix B).

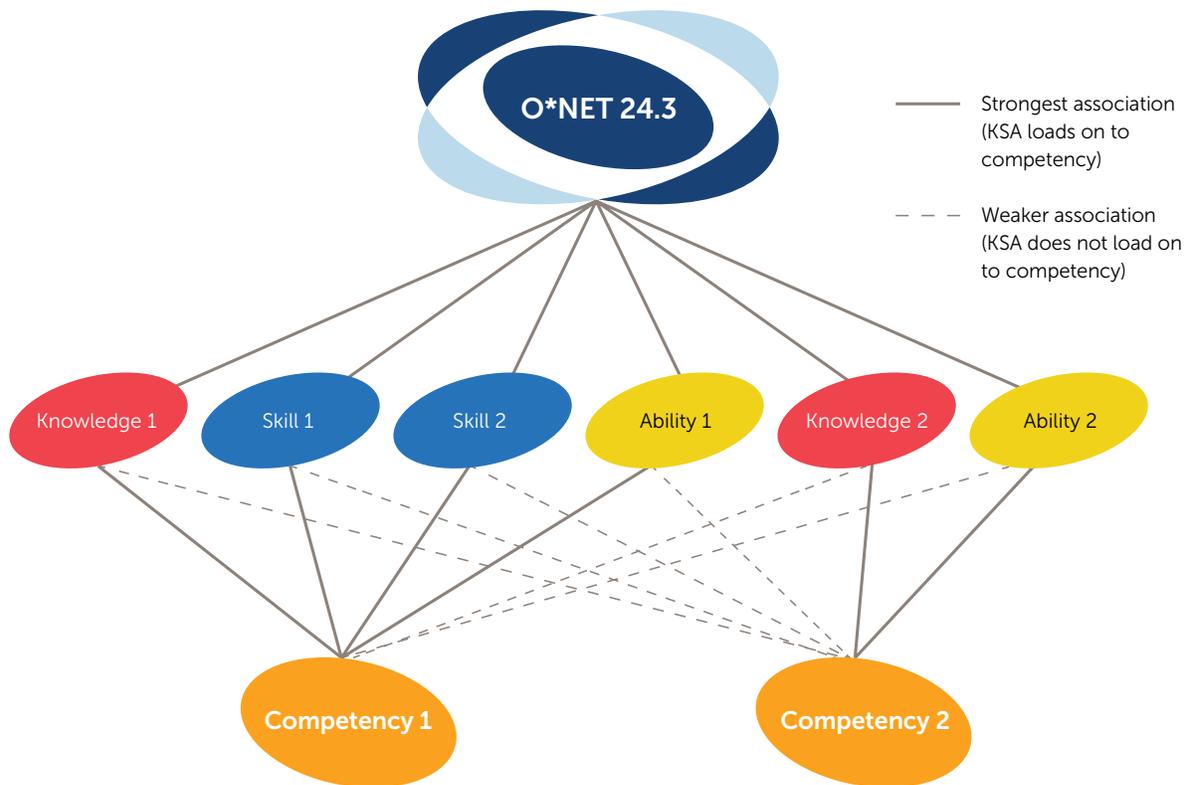
For the purposes of comparison, we categorized the competencies as either "physical" or "cognitive." In this analysis, physical competencies include fine-motor abilities, mechanical skills, psychomotor and sensory abilities, spatial navigation, strength and coordination, and vision and hearing abilities. Cognitive competencies include business and economics, communication, digital technology, engineering and physical sciences, health sciences, humanities, leadership, mathematics and computer science, perception and attentiveness, problem solving and complex thinking, sales and customer service, teaching and learning, and teamwork.

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1 Based on the Kaiser criterion, we retained factors with eigenvalues greater than one; we obtained factor loadings using a varimax rotation with Horst normalization.

2 In other words, we retained only the highest factor loading for each competency.

**Figure A1.** Using exploratory factor analysis to categorize competencies from O\*NET



## Measuring Demand

### Demand

We defined demand according to what incumbents and job analysts report is required for workers to succeed in their jobs. For each competency, we averaged the standardized importance and level for all KSAs associated with that competency to determine the demand value. For example, the demand value for teamwork is the average of importance and level ratings for persuasion, service orientation, social perceptiveness, and speech recognition. Within each occupation, competencies with higher average demand values have higher levels of demand. For example, for computer and information systems managers, communication (0.61) is in higher demand than sales and customer service (0.48).

To determine overall demand across the labor market, we connected O\*NET data with ACS data for prime-age, full-time, full-year workers.<sup>3</sup> To do this, we first converted O\*NET Standard Occupation Classification (SOC) codes to Census occupation codes, aggregating the number of occupations from 968 to 455. We then calculated weighted averages using as the weight the number of workers employed in each occupation according to the ACS. We ranked the competencies from highest to lowest demand based on these weighted averages, where larger weighted averages correspond to higher demand.

<sup>3</sup> Prime-age, full-time, full-year workers are individuals between the ages 25 and 54 who work at least 35 hours a week and 50 weeks a year.

## **Historical Change in Demand**

To analyze the historical change in demand for competencies over time, we connected O\*NET data to Current Population Survey (CPS) data for the years 1970 to 2019. To determine the share of workers in occupations where each competency is in “high demand,” we assigned a cutoff demand value across all competencies corresponding to the threshold above which the average demand values were in the top third.

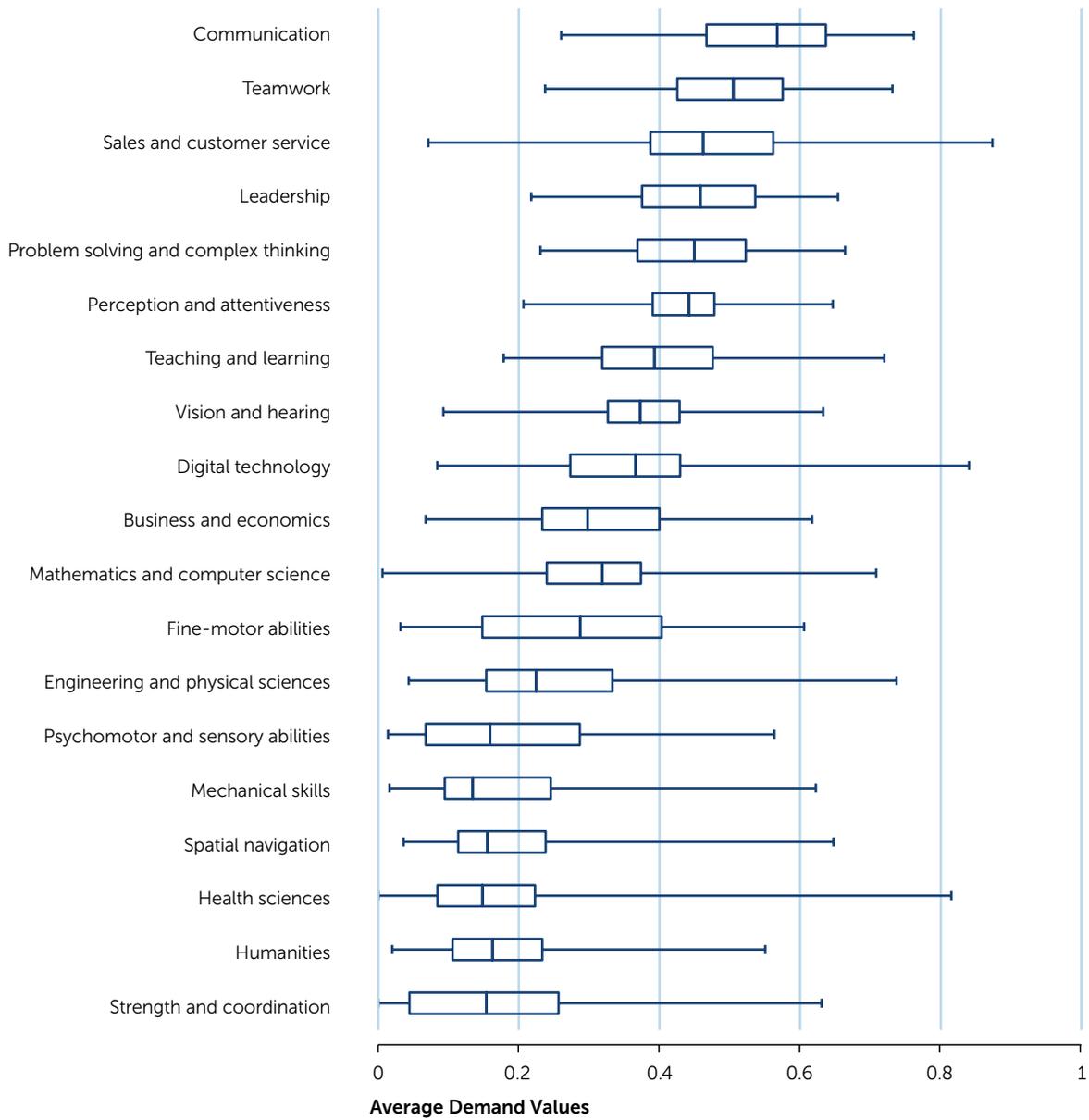
## **Intensity of Use**

Our measure of intensity of use of a competency is based on a cross-occupation comparison of the importance of a competency and the level at which it is used. Workers using a competency at its “most intensive” are those falling in the top quartile (top 25 percent) of combined importance and level across all occupations. Use of a competency is “more intensive” for workers in the third quartile, “less intensive” for workers in the second quartile, and “least intensive” for workers in the bottom quartile (bottom 25 percent). We calculated this distribution independently for each of the 19 competency groups, and each group therefore has a unique demand value cutoff point for each quartile (see Figure A2).

## **Average Earnings Premium**

To determine the labor-market value of competencies, we analyzed median annual earnings by workers’ major occupational group, their educational attainment, and the intensity of use they needed for a competency. We calculated the average earnings premium associated with increasing intensity of use by one quartile for each occupational group and education level. When calculating the economy-wide average earnings premium, we controlled for occupation and education.

**Figure A2. Intensity of use quartiles for each competency (based on importance and level)**



Source: Georgetown University Center on Education and the Workforce analysis of data from the Occupational Information Network (O\*NET) 24.3 Database, 2020, and US Census Bureau, American Community Survey (ACS), 2014–18.

## Appendix B. Competencies: Categories and Definitions

The following table lists the specific knowledge, skills, and abilities that constitute each of 19 broad competencies, ranked from highest to lowest in demand across the workforce.

Competency	Knowledge, Skill, or Ability	O*NET definition
<b>1. Communication</b>		
Active listening	Skill	Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
English language	Knowledge	Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.
Law and government	Knowledge	Knowledge of laws, legal codes, court procedures, precedents, government regulations, executive orders, agency rules, and the democratic political process.
Oral comprehension	Ability	The ability to listen to and understand information and ideas presented through spoken words and sentences.
Oral expression	Ability	The ability to communicate information and ideas in speaking so others will understand.
Reading comprehension	Skill	Understanding written sentences and paragraphs in work related documents.
Speaking	Skill	Talking to others to convey information effectively.
Speech clarity	Ability	The ability to speak clearly so others can understand you.
Writing	Skill	Communicating effectively in writing as appropriate for the needs of the audience.
Written comprehension	Ability	The ability to read and understand information and ideas presented in writing.
Written expression	Ability	The ability to communicate information and ideas in writing so others will understand.
<b>2. Teamwork</b>		
Persuasion	Skill	Persuading others to change their minds or behavior.
Service orientation	Skill	Actively looking for ways to help people.
Social perceptiveness	Skill	Being aware of others' reactions and understanding why they react as they do.
Speech recognition	Ability	The ability to identify and understand the speech of another person.

3. Sales and customer service		
Customer and personal service	Knowledge	Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
Sales and marketing	Knowledge	Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.
4. Leadership		
Coordination	Skill	Adjusting actions in relation to others' actions.
Management of personnel resources	Skill	Motivating, developing, and directing people as they work, identifying the best people for the job.
Negotiation	Skill	Bringing others together and trying to reconcile differences.
Time management	Skill	Managing one's own time and the time of others.
5. Problem solving and complex thinking		
Active learning	Skill	Understanding the implications of new information for both current and future problem-solving and decision-making.
Category flexibility	Ability	The ability to generate or use different sets of rules for combining or grouping things in different ways.
Complex problem solving	Skill	Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
Critical thinking	Skill	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
Deductive reasoning	Ability	The ability to apply general rules to specific problems to produce answers that make sense.
Fluency of ideas	Ability	The ability to come up with a number of ideas about a topic (the number of ideas is important, not their quality, correctness, or creativity).
Inductive reasoning	Ability	The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
Information ordering	Ability	The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, or mathematical operations).
Judgment and decision making	Skill	Considering the relative costs and benefits of potential actions to choose the most appropriate one.

Memorization	Ability	The ability to remember information such as words, numbers, pictures, and procedures.
Near vision	Ability	The ability to see details at close range (within a few feet of the observer).
Operations analysis	Skill	Analyzing needs and product requirements to create a design.
Originality	Ability	The ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.
Science	Skill	Using scientific rules and methods to solve problems.
Systems analysis	Skill	Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
Systems evaluation	Skill	Identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.

#### 6. Perception and attentiveness

Flexibility of closure	Ability	The ability to identify or detect a known pattern (a figure, object, word, or sound) that is hidden in other distracting material.
Problem sensitivity	Ability	The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
Speed of closure	Ability	The ability to quickly make sense of, combine, and organize information into meaningful patterns.
Time sharing	Ability	The ability to shift back and forth between two or more activities or sources of information (such as speech, sounds, touch, or other sources).

#### 7. Teaching and learning

Education and training	Knowledge	Knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and groups, and the measurement of training effects.
Instructing	Skill	Teaching others how to do something.
Learning strategies	Skill	Selecting and using training/instructional methods and procedures appropriate for the situation when learning or teaching new things.
Monitoring	Skill	Monitoring/assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.

Psychology	Knowledge	Knowledge of human behavior and performance; individual differences in ability, personality, and interests; learning and motivation; psychological research methods; and the assessment and treatment of behavioral and affective disorders.
Therapy and counseling	Knowledge	Knowledge of principles, methods, and procedures for diagnosis, treatment, and rehabilitation of physical and mental dysfunctions, and for career counseling and guidance.
<b>8. Vision and hearing</b>		
Far vision	Ability	The ability to see details at a distance.
Hearing sensitivity	Ability	The ability to detect or tell the differences between sounds that vary in pitch and loudness.
Operation monitoring	Skill	Watching gauges, dials, or other indicators to make sure a machine is working properly.
Perceptual speed	Ability	The ability to quickly and accurately compare similarities and differences among sets of letters, numbers, objects, pictures, or patterns. The things to be compared may be presented at the same time or one after the other. This ability also includes comparing a presented object with a remembered object.
Selective attention	Ability	The ability to concentrate on a task over a period of time without being distracted.
Visual color discrimination	Ability	The ability to match or detect differences between colors, including shades of color and brightness.
Visualization	Ability	The ability to imagine how something will look after it is moved around or when its parts are moved or rearranged.
<b>9. Digital technology</b>		
Computers and electronics	Knowledge	Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.
Telecommunications	Knowledge	Knowledge of transmission, broadcasting, switching, control, and operation of telecommunications systems.

10. Business and economics		
Administration and management	Knowledge	Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.
Clerical	Knowledge	Knowledge of administrative and clerical procedures and systems such as word processing, managing files and records, stenography and transcription, designing forms, and other office procedures and terminology.
Economics and accounting	Knowledge	Knowledge of economic and accounting principles and practices, the financial markets, banking and the analysis and reporting of financial data.
Food production	Knowledge	Knowledge of techniques and equipment for planting, growing, and harvesting food products (both plant and animal) for consumption, including storage/handling techniques.
Management of financial resources	Skill	Determining how money will be spent to get the work done, and accounting for these expenditures.
Management of material resources	Skill	Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.
Personnel and human resources	Knowledge	Knowledge of principles and procedures for personnel recruitment, selection, training, compensation and benefits, labor relations and negotiation, and personnel information systems.
11. Mathematics and computer science		
Mathematical reasoning	Ability	The ability to choose the right mathematical methods or formulas to solve a problem.
Mathematics skill	Skill	Using mathematics to solve problems.
Number facility	Ability	The ability to add, subtract, multiply, or divide quickly and correctly.
Programming	Skill	Writing computer programs for various purposes.
12. Fine-motor abilities		
Arm-hand steadiness	Ability	The ability to keep your hand and arm steady while moving your arm or while holding your arm and hand in one position.
Control precision	Ability	The ability to quickly and repeatedly adjust the controls of a machine or a vehicle to exact positions.
Finger dexterity	Ability	The ability to make precisely coordinated movements of the fingers of one or both hands to grasp, manipulate, or assemble very small objects.

Manual dexterity	Ability	The ability to quickly move your hand, your hand together with your arm, or your two hands to grasp, manipulate, or assemble objects.
Wrist-finger speed	Ability	The ability to make fast, simple, repeated movements of the fingers, hands, and wrists.
<b>13. Engineering and physical sciences</b>		
Building and construction	Knowledge	Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.
Design	Knowledge	Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
Engineering and technology	Knowledge	Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
Mathematics knowledge	Knowledge	Knowledge of arithmetic, algebra, geometry, calculus, and statistics, and their applications.
Physics	Knowledge	Knowledge and prediction of physical principles, laws, their interrelationships, and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic, and sub-atomic structures and processes.
Technology design	Skill	Generating or adapting equipment and technology to serve user needs.
<b>14. Psychomotor and sensory abilities</b>		
Auditory attention	Ability	The ability to focus on a single source of sound in the presence of other distracting sounds.
Depth perception	Ability	The ability to judge which of several objects is closer or farther away from you, or to judge the distance between you and an object.
Extent flexibility	Ability	The ability to bend, stretch, twist, or reach with your body, arms, and/or legs.
Glare sensitivity	Ability	The ability to see objects in the presence of glare or bright lighting.
Multilimb coordination	Ability	The ability to coordinate two or more limbs (for example, two arms, two legs, or one leg and one arm) while sitting, standing, or lying down. It does not involve performing the activities while the whole body is in motion.
Operation and control	Skill	Controlling operations of equipment and systems.

Rate control	Ability	The ability to time your movements or the movement of a piece of equipment in anticipation of changes in the speed and/or direction of a moving object or scene.
Reaction time	Ability	The ability to quickly respond (with the hand, finger, or foot) to a signal (sound, light, picture) when it appears.
Response orientation	Ability	The ability to choose quickly between two or more movements in response to two or more different signals (light, sounds, or pictures). It includes the speed with which the correct response is started with the hand, foot, or other body part.
Sound localization	Ability	The ability to tell the direction from which a sound originated.
Speed of limb movement	Ability	The ability to quickly move the arms and legs.
Static strength	Ability	The ability to exert maximum muscle force to lift, push, pull, or carry objects.
<b>15. Mechanical skills</b>		
Equipment maintenance	Skill	Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.
Equipment selection	Skill	Determining the kind of tools and equipment needed to do a job.
Installation	Skill	Installing equipment, machines, wiring, or programs to meet specifications.
Mechanical	Knowledge	Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
Production and processing	Knowledge	Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
Quality control analysis	Skill	Conducting tests and inspections of products, services, or processes to evaluate quality or performance.
Repairing	Skill	Repairing machines or systems using the needed tools.
Troubleshooting	Skill	Determining causes of operating errors and deciding what to do about it.
<b>16. Spatial navigation</b>		
Geography	Knowledge	Knowledge of principles and methods for describing the features of land, sea, and air masses, including their physical characteristics, locations, interrelationships, and distribution of plant, animal, and human life.
Night vision	Ability	The ability to see under low light conditions.

Peripheral vision	Ability	The ability to see objects or movement of objects to one's side when the eyes are looking ahead.
Public safety and security	Knowledge	Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.
Spatial orientation	Ability	The ability to know your location in relation to the environment or to know where other objects are in relation to you.
Transportation	Knowledge	Knowledge of principles and methods for moving people or goods by air, rail, sea, or road, including the relative costs and benefits.
<b>17. Health sciences</b>		
Biology	Knowledge	Knowledge of plant and animal organisms, their tissues, cells, functions, interdependencies, and interactions with each other and the environment.
Chemistry	Knowledge	Knowledge of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal methods.
Medicine and dentistry	Knowledge	Knowledge of the information and techniques needed to diagnose and treat human injuries, diseases, and deformities. This includes symptoms, treatment alternatives, drug properties and interactions, and preventive healthcare measures.
<b>18. Humanities</b>		
Communications and media	Knowledge	Knowledge of media production, communication, and dissemination techniques and methods. This includes alternative ways to inform and entertain via written, oral, and visual media.
Fine arts	Knowledge	Knowledge of the theory and techniques required to compose, produce, and perform works of music, dance, visual arts, drama, and sculpture.
Foreign language	Knowledge	Knowledge of the structure and content of a foreign (non-English) language including the meaning and spelling of words, rules of composition and grammar, and pronunciation.
History and archeology	Knowledge	Knowledge of historical events and their causes, indicators, and effects on civilizations and cultures.

Philosophy and theology	Knowledge	Knowledge of different philosophical systems and religions. This includes their basic principles, values, ethics, ways of thinking, customs, practices, and their impact on human culture.
Sociology and anthropology	Knowledge	Knowledge of group behavior and dynamics, societal trends and influences, human migrations, ethnicity, cultures and their history and origins.
<b>19. Strength and coordination</b>		
Dynamic flexibility	Ability	The ability to quickly and repeatedly bend, stretch, twist, or reach out with your body, arms, and/or legs.
Dynamic strength	Ability	The ability to exert muscle force repeatedly or continuously over time. This involves muscular endurance and resistance to muscle fatigue.
Explosive strength	Ability	The ability to use short bursts of muscle force to propel oneself (as in jumping or sprinting), or to throw an object.
Gross body coordination	Ability	The ability to coordinate the movement of your arms, legs, and torso together when the whole body is in motion.
Gross body equilibrium	Ability	The ability to keep or regain your body balance or stay upright when in an unstable position.
Stamina	Ability	The ability to exert yourself physically over long periods of time without getting winded or out of breath.
Trunk strength	Ability	The ability to use your abdominal and lower back muscles to support part of the body repeatedly or continuously over time without "giving out" or fatiguing.

Source: Georgetown University Center on Education and the Workforce analysis of O\*NET 24.3 Content Model.



*Workplace Basics: The Competencies Employers Want* can be accessed online at [cew.georgetown.edu/competencies](http://cew.georgetown.edu/competencies).

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