Bridging the Middle-Skills Gap

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Connecting a Diverse Workforce to Economic Opportunity Through Certificates and Associate's Degrees

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GEORGETOWN UNIVERSITY
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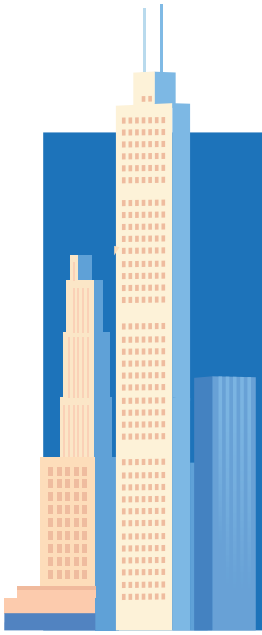


Introduction

There is a wide gap in America's middle-skills economy. On one side are people searching for economic opportunity, striving to make a good living with hard work, on-the-job experience, and a few years of formal postsecondary education or training. On the other side are employers, who are willing to pay high wages for skilled workers who can fill jobs in high-demand middle-skills occupations. Education and training programs serve as the bridge between these potential workers and employers, but this bridge is in need of repair. Despite an ample number of both aspiring workers and projected job openings, there are not enough middle-skills credentials (certificates and associate's degrees) awarded to meet the substantial expected employer demand for workers with these credentials in many occupations.

Credential shortages are particularly troubling because the United States is in dire need of qualified workers to fill projected job openings in occupations that are crucial to keeping our infrastructure intact, our communities safe, and our industries at the forefront of innovation. In some of these occupations (referred to in this report as "high-paying middle-skills occupations"), early-career middle-skills workers (ages 18–35) have median annual earnings of more than $55,000 (in 2023 dollars). These earnings exceed the median earnings of most young workers with a bachelor's degree.[1,2]

There are substantial annual shortages of credentials that provide a pathway to these high-paying middle-skills occupations. To fill these shortages, credential providers would need to produce 712,000 additional middle-skills credentials annually through 2032 in programs with pathways to high-paying blue-collar; management and professional office; science, technology, engineering, and mathematics (STEM); and protective services occupations.[3] Based on the demand for workers in both the high-paying and lower-paying occupations that align with these credentials, we expect that about 50 percent of

1 High-paying middle-skills jobs for early-career workers (ages 18–35) pay more than $55,000 per year (in 2023 dollars), approximately $500 more per year than the median annual earnings of young workers (ages 21–30) with a bachelor's degree ($54,500 in 2023 dollars). We use an age range that skews slightly older for early-career middle-skills workers because these workers often need more time in the workforce to earn as much as younger workers with a bachelor's degree. This difference is driven by two primary factors: (1) The earnings returns to work experience tend to accrue more gradually than the returns to a bachelor's degree, and (2) the earnings returns to work experience typically accrue faster for more-educated workers. Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2010–22. For a complete discussion of methodology, see Appendix A.

2 We define a high-paying middle-skills occupation as an occupation in which more than half of early-career middle-skills workers are in high-paying jobs. Fifteen percent of middle-skills occupations are considered high-paying for early-career middle-skills workers, and these occupations employ 10 percent of early-career middle-skills workers and 13 percent of middle-skills workers overall.

3 The number of additional credentials required annually assumes that each aligned credential granted represents one worker available to fill a job opening. Our analysis of labor-market alignment takes into account total labor-market demand for credentials that align with high-paying occupations, which includes a portion of demand in lower-paying occupations that also align with these credentials. For more detail on how these shortages were calculated, see Appendix A.

individuals who earn these credentials would find jobs in lower-paying occupations, although workers in these aligned lower-paying occupations still outearn workers in occupations that don't align with these credentials.[4]

Filling jobs in both high-paying and lower-paying occupations is critical for ensuring the country's continued economic strength—and it is also critical for providing economic opportunity to workers. Just as American employers are eager for young workers to fill in-demand middle-skills jobs, young workers are eager for the economic opportunity these jobs represent. However, as desirable as high-paying jobs for middle-skills workers may be, these jobs are relatively rare.[5] Across all occupations, only one-quarter of early-career middle-skills workers hold a high-paying middle-skills job.[6] While the share of middle-skills workers with a high-paying job rises above 50 percent in the occupations we identify as high-paying for middle-skills workers, these high-paying middle-skills occupations are also relatively rare. Even in STEM, the occupational group with the highest share of high-paying middle-skills occupations, only 39 percent of occupations are high-paying for middle-skills workers.[7] Nevertheless, good opportunities exist for those able to seek them out. When considering which middle-skills credentials to pursue, prospective students must have ample data-informed guidance from skilled career counselors so they are able to choose wisely.

In closing the gap between workers and high-paying middle-skills jobs, educators and employers can also help address opportunity gaps by gender and race/ethnicity. Closing these gaps would be beneficial on many levels. First, it would allow employers to draw on the full breadth of talent within our nation's workforce to fill critical roles in their companies and firms. Second, it would present a chance to connect workers from all backgrounds with economic opportunity and would reduce economic polarization along many different axes: among men and women, among workers from different racial/ethnic backgrounds, and among workers with differing levels of educational attainment.

As this report shows, however, we have a long way to go to close equity gaps in high-paying middle-skills occupations. At present, all four of the occupational groups aligned with high-paying middle-skills occupations in which we expect a shortage of credentials are dominated by men, with particularly high representation among white men. White men are among the most likely of all race/ethnicity-by-gender groups to earn credentials aligned with high-paying middle-skills occupations across all four occupational groups. White men are also the only group that is overrepresented in all four occupational groups with shortages relative to the credentials they earn. This overrepresentation relative to earned credentials suggests that factors such as varying career interests among workers within the same occupational group, along with racial/ethnic and gender discrimination in the labor market, may contribute to unequal economic opportunities, even among workers with the training to secure high-paying middle-skills work. Better career counseling could address disparities in career goals that contribute to the gaps, but labor-market discrimination is a much thornier problem.

There is one high-paying middle-skills occupational group for which we do not expect credential shortages: healthcare. While alarms are sounding over pending shortages of healthcare workers, these shortages are unlikely to be concentrated in high-paying middle-skills jobs. In part, this is because high-paying middle-skills healthcare jobs have steadily shifted away from middle-skills workers and toward workers with bachelor's degrees.[8] Take registered nurses (RNs): While not all RN jobs require a bachelor's degrees, 72 percent of RNs held one in 2022, and 72 percent of RN employers say they prefer new RN hires to have a bachelor's degree.[9] Other middle-skills healthcare occupations, like licensed practical nurses and dental hygienists, are expected to face shortages but are not high-paying occupations for early-career middle-skills workers.[10]

Healthcare also stands out as the only high-paying middle-skills occupational group dominated by women. Healthcare occupations arguably reflect a pattern that is evident across the workforce—namely,

4 Median earnings for early-career middle-skills workers in aligned lower-paying occupations ($43,600) are substantially higher than median earnings for early-career middle-skills workers in occupations that don't align with these credentials ($31,800). Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

5 Workers with bachelor's degrees increasingly have an edge in the labor market over workers with lower levels of educational attainment. Carnevale et al., *How Limits to Educational Affordability, Work-Based Learning, and Career Counseling Impede Progress Toward Good Jobs*, 2022; Strohl et al., *The Future of Good Jobs*, 2024.

6 Mabel et al., *Missed Opportunities*, 2024.

7 Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

8 The share of workers in healthcare occupations who hold a middle-skills credential fell from 46 percent in 2010 to 25 percent in 2022. This share is projected to fall further by 2032, to 10 percent. Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2010–22.

9 American Association of Colleges of Nursing, "Nursing Workforce Fact Sheet," 2024.

10 Health Resources and Services Administration, "Health Workforce Projections," 2024.

that women generally need one degree higher than men to receive comparable pay in the labor market.[11] Because opportunity in high-paying middle-skills healthcare occupations is shifting toward workers with bachelor's degrees, women who enter middle-skills healthcare credential programs should do so with an eye toward transferring to a four-year program; likewise, institutions need to ensure stronger pathways for transfer to and completion of four-year healthcare degrees. For women who want to enter the workforce with a middle-skills credential rather than a four-year degree, credential shortages in other occupations present stronger opportunities to gain ground.

In this report, we take a close look at the gaps between the potential middle-skills workforce and high-paying middle-skills jobs. We discuss the following **key findings**:

- Nationwide, there is an **annual shortage of nearly 712,000 certificates and associate's degrees** aligned with high-paying middle-skills occupations in **four occupational groups: blue-collar (360,800), management and professional office (253,000), STEM (87,500), and protective services (10,600) occupations**. These shortages are projected to persist at least through 2032.

- **Healthcare** is the only occupational group that is **not expected to experience shortages of certificates and associate's degrees aligned with high-paying middle-skills occupations**, although credential shortages are expected in other areas (for example, lower-paying healthcare occupations and healthcare occupations requiring a bachelor's degree or higher).[12]

- Among those who earn a middle-skills credential, **men across all racial/ethnic groups are more likely than women to earn their credential in a program aligned with a high-paying middle-skills occupation**.

- **White men, multiracial men,[13] and Hispanic/Latino men are overrepresented in high-paying middle-skills occupations** relative to what we would expect based on the credentials they earn. American Indian/Alaska Native and Native Hawaiian/Pacific Islander, Asian/Asian American, and Black/African American men and women—as well as Hispanic/Latina, multiracial, and white women—are underrepresented in high-paying middle-skills occupations.

- **Even with equitable representation by gender and race/ethnicity in high-paying middle-skills occupations, pay equity gaps would likely persist**. Among workers in high-paying middle-skills occupations—and across the span of their careers—men have higher median earnings than women. In addition, white, multiracial, and Asian/Asian American workers generally have higher median earnings than Black/African American, Hispanic/Latino, and American Indian/Alaska Native and Native Hawaiian/Pacific Islander workers.

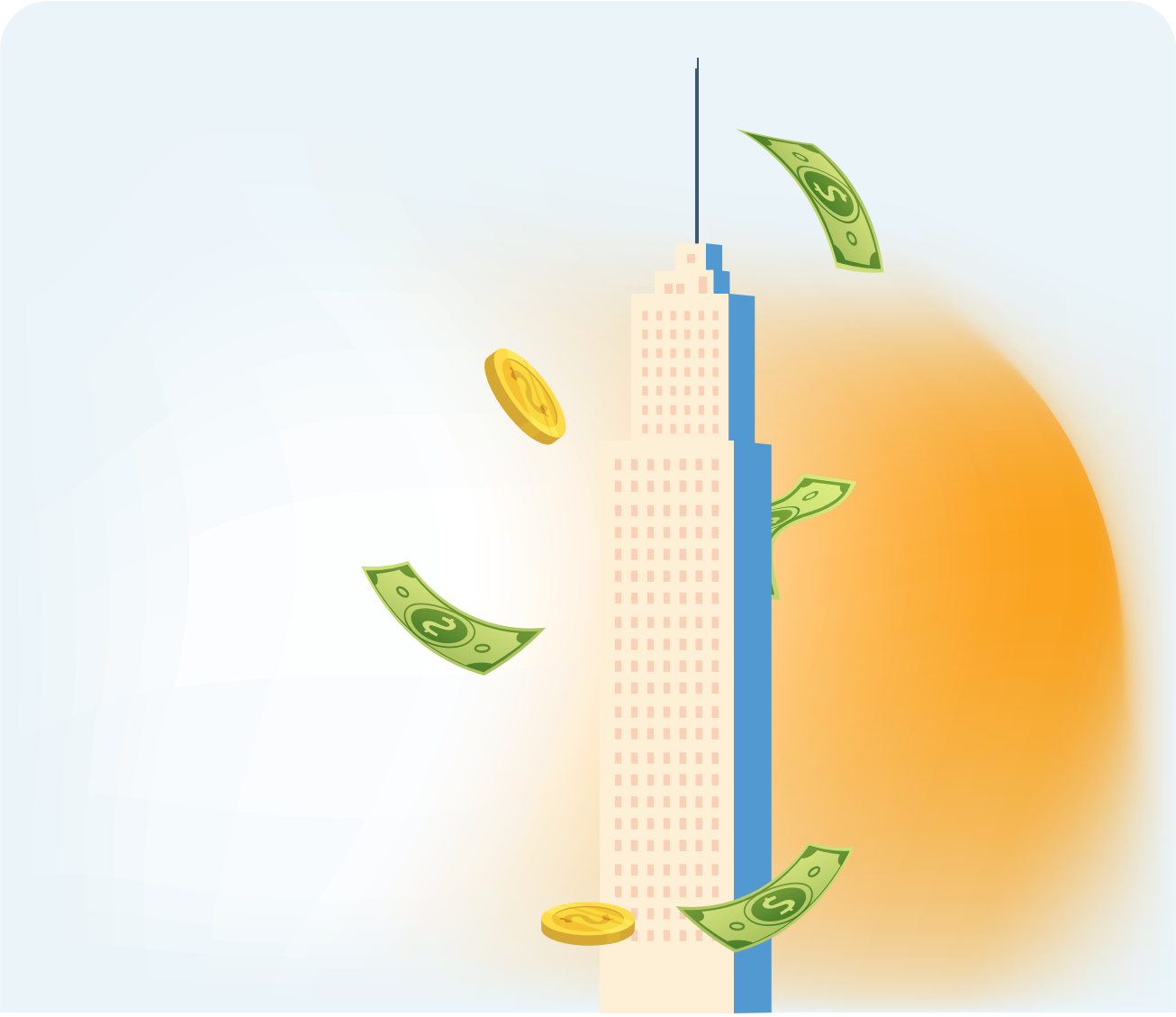
- **Projected shortages present substantial opportunities for men and women of all races/ethnicities to earn credentials that align with high-paying middle-skills jobs**. For example, filling credential shortages equitably would require **an increase of more than 500 percent annually through 2032 in the number of credentials aligned with high-paying blue-collar middle-skills occupations** that are awarded to men and women of all racial/ethnic backgrounds. It would also require substantial increases in the number of credentials awarded that are aligned with STEM, management and professional office, and protective services occupations.

These projected shortfalls present a serious challenge. Bridging the gaps between workers and opportunities will be critical to sustaining a strong American economy and building communities where everyone can thrive. By addressing multiple challenges at once—including credential shortages and unequal access to opportunity based on a person's race/ethnicity and gender—we can create mutually beneficial gains for workers, employers, and the nation. Doing so is imperative if we want to reduce economic inequality, continue to lead the world in innovation, and maintain high standards of living and access to opportunity for all.

11 Carnevale et al., *Women Can't Win*, 2018.

12 Health Resources and Services Administration, "Health Workforce Projections," 2024.

13 Multiracial men are very likely to have white heritage. Among multiracial men ages 18–35 with a middle-skills credential, 80 percent are white and one other race; an additional 10 percent are white and more than one other race. Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.



Part 1.

Opportunity for Early-Career Workers on the Middle-Skills Pathway

Although attainment of a bachelor's degree or higher is the most reliable pathway to economic opportunity,[14] some middle-skills credentials (certificates and associate's degrees) offer similar or greater earnings potential for early-career workers (ages 18–35). In fact, in some occupations—which we refer to as "high-paying middle-skills occupations"—most early-career workers with such credentials earn more than the median for young workers with a bachelor's degree ($55,000 in 2023 dollars).[15] In this section of the report, we describe these high-paying middle-skills occupations and the educational pathways that lead to them, and we explore the racial/ethnic and gender diversity of workers in these occupations.

14 Workers with a bachelor's degree or higher held 59 percent of good jobs in 2021 and are projected to hold 66 percent of good jobs by 2031. Good jobs are those that pay a minimum of approximately $45,000 (in 2023 dollars) for workers ages 25–44 and a minimum of approximately $57,000 for workers ages 45–64. Strohl et al., *The Future of Good Jobs*, 2024.

15 One-quarter of early-career middle-skills workers (ages 18–35) are in high-paying middle-skills jobs, meaning that they earn more than $55,000 per year (in 2023 dollars). The median annual earnings of young workers (ages 21–30) with a bachelor's degree are $54,500 (also in 2023 dollars). We use an age range that skews slightly older for early-career middle-skills workers because these workers often need more time in the workforce to earn as much as younger workers with a bachelor's degree. This difference is driven by two primary factors: (1) The earnings returns to work experience tend to accrue more gradually than the returns to a bachelor's degree, and (2) the earnings returns to work experience typically accrue faster for more-educated workers. Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2010–22.

Five high-paying middle-skills occupational groups are sources of opportunity for workers with middle-skills credentials.

An associate's degree or a certificate can be a stepping stone to a job in a high-paying middle-skills occupation. These occupations present workers with the opportunity to earn relatively high pay in return for a comparatively modest upfront investment in postsecondary education and training. A credential program of two years or less that offers a pathway to one of these occupations can yield earnings that are comparable to or better than those associated with the typical four-year degree.[16,17]

Individuals seeking to improve their earnings potential with a middle-skills credential must choose their educational program wisely, however. Relatively few of the middle-skills credentials awarded (29 percent) offer a pathway to high-paying middle-skills occupations (Figure 1).[18] Meanwhile, a similar share (28 percent) of the middle-skills credentials awarded have no direct occupational match.[19] While these credentials may facilitate transfer to a four-year institution or provide general enrichment, they do not prepare students for direct entry into the workforce.[20] The remaining proportion of middle-skills credentials (just above 42 percent) are those that lead solely to lower-paying occupations.

What is a high-paying middle-skills job?

In this report, a high-paying middle-skills job has annual earnings above $55,000 (in 2023 dollars) for early-career middle-skills workers (ages 18–35). In these jobs, workers earn more than the median for young workers with bachelor's degrees (ages 21–30), and workers have median annual earnings of $83,300 by mid-career (ages 36–49).

What is a high-paying middle-skills occupation?

In this report, a high-paying middle-skills occupation is an occupation in which more than half of early-career middle-skills workers are in high-paying jobs. Fifteen percent of middle-skills occupations are considered high-paying, and 10 percent of early-career middle-skills workers are employed in these occupations.

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2018, 2019, and 2021.

16 Obtaining a credential that aligns with high-paying middle-skills occupations does not guarantee employment in these occupations, as these credentials align with both high-paying and lower-paying occupations. Additionally, the 107 occupations identified as high-paying for middle-skills workers also employ workers with other levels of educational attainment. Twenty-four percent of early-career workers employed in these occupations have middle-skills credentials, 15 percent have a high school degree or less, and 61 percent have a bachelor's degree or higher. See Appendix A for a demonstration of the pathways between credentials and high-paying occupations and a comparison of the educational attainment distribution by occupational group.

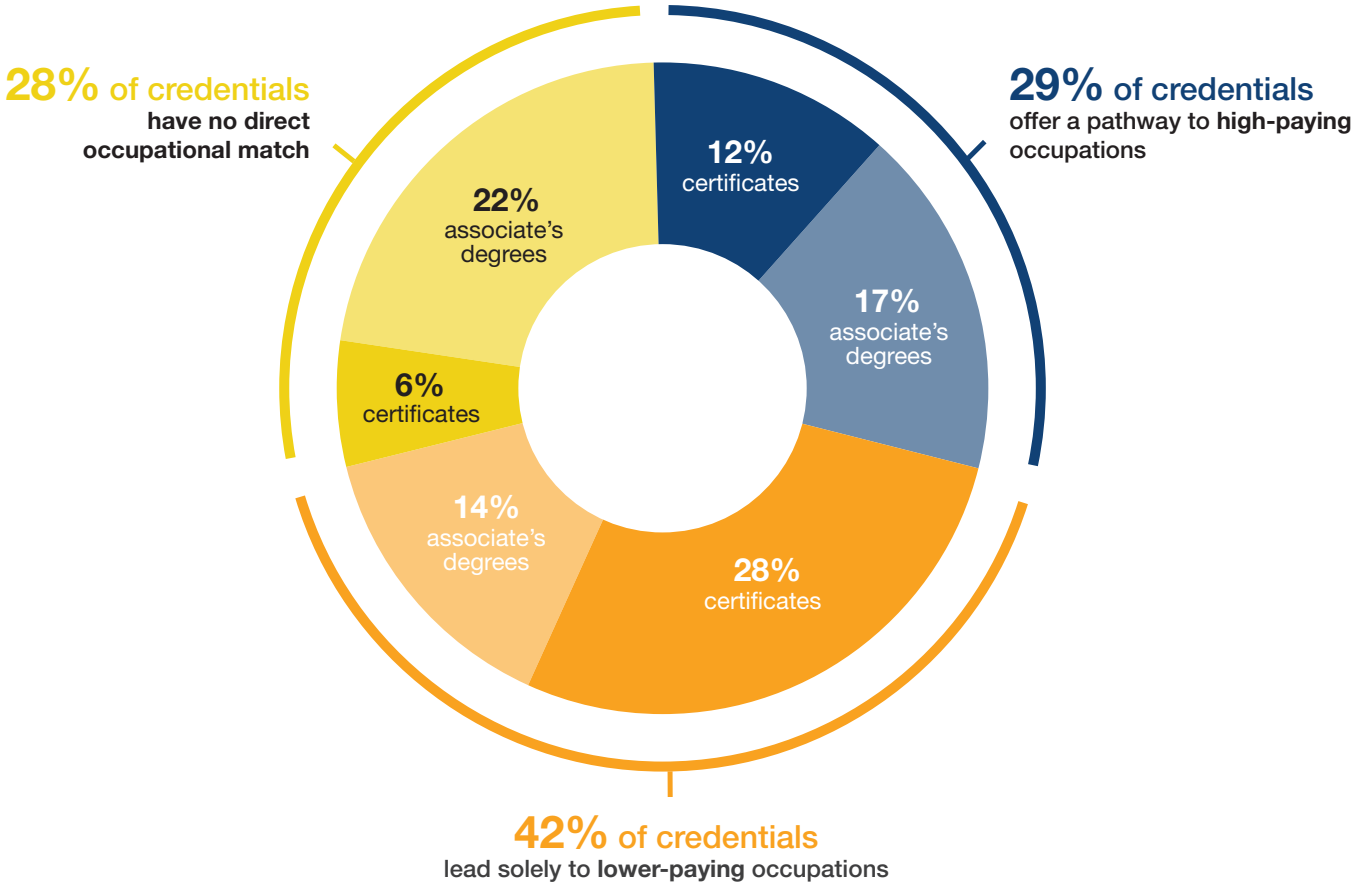
17 These credentials also offer pathways to lower-paying occupations. Median earnings for early-career middle-skills workers in aligned lower-paying occupations ($43,600) are substantially higher than median earnings for early-career middle-skills workers in occupations that don't align with these credentials ($31,800). Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

18 An even smaller share of early-career middle-skills workers (10 percent) are employed in these high-paying occupations. Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

19 This group of credentials includes degrees and certificates in the liberal arts, general studies, and humanities.

20 Fewer than half of students in these no-match programs transfer to four-year programs within six years. However, students in these programs are still more than twice as likely as all students enrolled in two-year programs to successfully transfer to a four-year program over that time frame. Strohl et al., *The Great Misalignment*, 2024. Education and employment data collected by states such as Virginia and South Carolina suggest that students who graduate from these no-match programs have median earnings that are approximately $5,000 less than the median earnings of all associate's degree holders both five years and 10 years after completing their degrees. Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, Longitudinal Employer-Household Dynamics: Post-Secondary Employment Outcomes, 2024.

Figure 1. Only 29 percent of middle-skills credentials granted offer a pathway to occupations that are high-paying for middle-skills workers.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19, 2021, and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: Values may not sum to 100 percent due to rounding.

In other words, certificates and associate's degrees that offer a pathway to high-paying occupations are the exception rather than the rule. Furthermore, these credentials are not a guarantee that graduates will find high-paying work, because they also offer pathways to lower-paying occupations alongside higher-paying ones (see Figure A1 in Appendix A for an illustration of these pathways).[21] For these reasons, it is critical that prospective students receive guidance on which middle-skills credentials are most likely to lead to economic opportunity, as the choice of postsecondary credential can have significant implications for an individual's long-term financial well-being.

21 For credentials that align with high-paying occupations, one-third of aligned occupations are high-paying, while the remainder are lower-paying. Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

There are 107 high-paying middle-skills occupations, falling into five occupational groups.

Workers seeking to maximize their chances of strong earnings outcomes with a certificate or an associate's degree should aim to obtain a credential aligned with one of the 107 high-paying middle-skills occupations identified in our analysis, with a special focus on the occupations that are likely to experience shortages in the short term.[22] These occupations include such jobs as first-line construction supervisors, project management specialists, firefighters, and network administrators, falling into four occupational groups: blue-collar; management and professional office; science, technology, engineering, and mathematics (STEM); and protective services (Figure 2). Healthcare, the fifth occupational group that is high-paying for early-career middle-skills workers, includes several high-paying middle-skills occupations but is not expected to experience shortages overall.

Figure 2. Software developers, police officers, and registered nurses are among the 107 high-paying middle-skills occupations.

EXAMPLE OCCUPATIONS WITHIN EACH GROUP

BLUE-COLLAR

- First-line supervisors of construction trades and extraction workers and of production and operating workers
- Mechanics (including farm equipment mechanics and service technicians, industrial machinery mechanics, and mobile heavy equipment mechanics)
- Operating engineers and other construction equipment operators
- Rail car repairers

MANAGEMENT

- Construction managers
- General and operations managers
- Project management specialists
- Computer and information systems managers
- Sales managers

PROTECTIVE SERVICES

- Police and sheriff's patrol officers
- Firefighters
- First-line supervisors of police and detectives
- Detectives and criminal investigators
- Transit and railroad police

SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM)

- Computer network architects
- Engineering technologists and technicians (including civil, electrical, environmental, industrial, and mechanical)
- Information security analysts
- Network and computer systems administrators
- Software and web developers

HEALTHCARE

- Registered nurses
- Radiologic technologists and technicians
- Respiratory therapists
- Diagnostic medical sonographers
- Paramedics

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023.

Note: This figure includes representative examples of high-paying occupations within each occupational group. For a complete list of high-paying middle-skills occupations, see Appendix B.

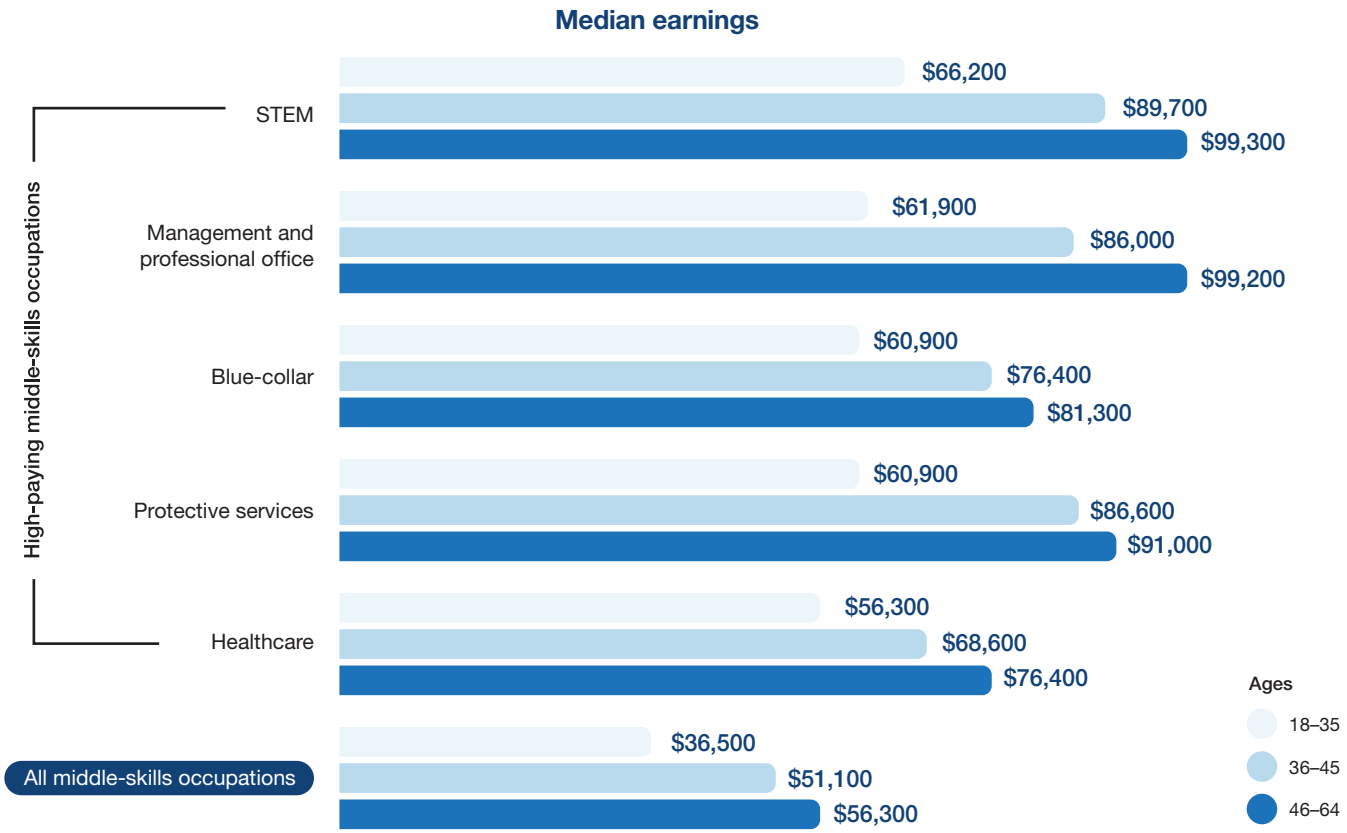
22 For a complete list of high-paying middle-skills occupations, see Appendix B. View a complete list of high-paying middle-skills occupations and aligned programs (sorted by occupation) on our website. View a complete list of aligned programs and all high-paying and lower-paying occupations available to workers with those credentials (sorted by field of study) on our website.

Workers who hold middle-skills credentials and workers who have bachelor's degrees are often in competition for high-paying middle-skills jobs, which in some cases might reflect a growing employer preference for workers with bachelor's degrees. Healthcare occupations are a key example. In 2010, 46 percent of workers in high-paying middle-skills healthcare jobs held a middle-skills credential; in 2022, that proportion had fallen to 25 percent.[23] Our analysis of projected credential shortages accounts for these trends in employer preferences for higher levels of education—and even after accounting for these trends, we project that there will be substantial shortages of middle-skills credentials that offer a pathway to high-paying middle-skills occupations through 2032. Thus, the four high-paying middle-skills occupational groups in which we project shortages are likely to remain strong sources of opportunity.

Occupations that are high-paying for early-career middle-skills workers pay even more for middle-skills workers in mid to late career.

In high-paying occupations within the five occupational groups, median earnings exceed $55,000 for early-career middle-skills workers and are even higher for mid- and late-career workers (Figure 3). This suggests that these occupations remain strong sources of economic opportunity for workers as they progress through their careers.

Figure 3. By late career (ages 46–64), middle-skills workers in high-paying STEM and management and professional office occupations have median earnings above $99,000.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19, 2021.

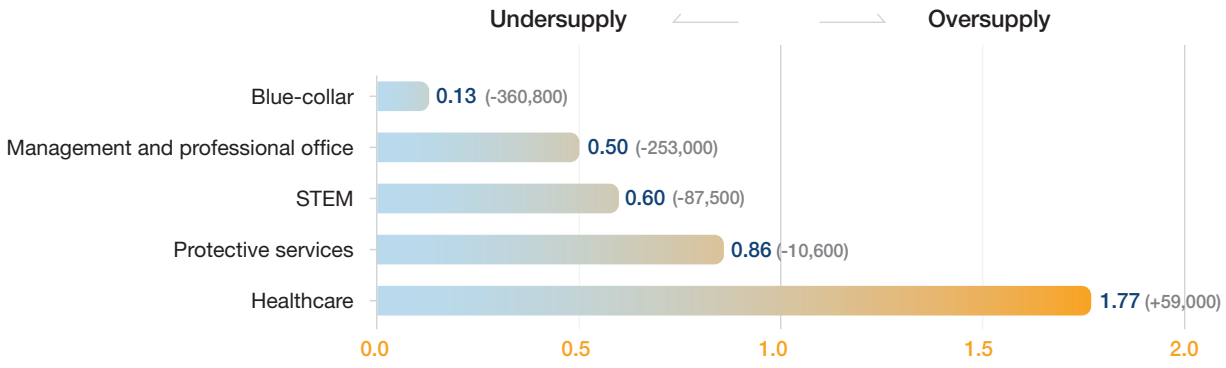
Note: Analysis is limited to middle-skills workers who reported working more than 10 hours per week and at least 14 weeks in the previous year.

23 Mabel et al., *Missed Opportunities*, 2024. For more information on the education distribution within these occupations, see Appendix A.

Demand for workers with aligned credentials will outpace current supply in four of the five occupational groups.

After accounting for the demand for middle-skills credentials in each occupational group,[24] we calculated a credential-to-jobs ratio by which values below one indicate a shortage in credential production, values above one indicate a surplus in credential production, and values equal to one indicate perfect alignment between credential production and future occupational demand. Using this metric, we find substantial shortages in the number of associate's degrees and certificates leading to high-paying middle-skills occupations compared with the projected demand for workers with these credentials. More specifically, in order to fill projected credential shortages in all occupations aligned with these credentials (both high paying and lower paying), we would need to produce 712,000 additional credentials annually through 2032.[25] These projected middle-skills credential shortages exist for credentials offering a pathway to four of the five occupational groups (blue-collar, management and professional office, STEM, and protective services). Healthcare is the only occupational group for which we anticipate an oversupply of middle-skills credentials that offer a pathway to high-paying middle-skills occupations (Figure 4).

Figure 4. The most severe shortages in credentials that offer a pathway to high-paying middle-skills occupations will be found in blue-collar occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: STEM = science, technology, engineering, and mathematics. The credentials-to-jobs ratio compares the number of credentials produced that align with high-paying middle-skills occupations against the projected annual number of job openings available in all occupations for workers with those credentials through 2032. Ratio values below one indicate a shortage in credential production, values above one indicate a surplus in credential production, and values equal to one indicate perfect alignment between credential production and future occupational demand. Values in parentheses indicate the number of credentials oversupplied or undersupplied on an annual basis through 2032.

24 We accounted for demand by multiplying the total number of projected job openings in each occupational group (from the Bureau of Labor Statistics) by the average forecasted share of early-career jobs held by middle-skills workers in high-paying occupations in each occupational group from 2022 to 2032. For more detail, see Appendix A.

25 The number of additional credentials required annually assumes that each aligned credential granted represents one worker available to fill a job opening. Our analysis of labor-market alignment takes into account total labor-market demand for credentials that align with high-paying occupations, which includes a portion of demand in lower-paying occupations that also align with these credentials. Based on the demand for workers in both the high-paying and lower-paying occupations that align with these credentials, we expect that about 50 percent of individuals who earn these credentials would find jobs in high-paying occupations. For more detail on how these shortages were calculated, see Appendix A.

The trends for high-paying middle-skills jobs are not surprising, as they align with overall trends in the four occupational groups with projected shortages. Economists and human resources professionals have been sounding the alarm about blue-collar worker shortages for years.[26] The needs of an increasingly complex business sector are expected to drive up employment in management and professional office occupations, from 19.5 million in 2021 to 22 million in 2031, with 18 percent of workers in this sector as of 2031 holding a middle-skills credential or having attended some college but not earning a degree.[27] Rapid technological change, including the proliferation of artificial intelligence (AI) and robotics, is shoring up the demand for STEM workers;[28] although this demand will predominantly be for workers with a bachelor's degree or higher, we expect that 12 percent of STEM jobs in 2031 will be held by workers with a middle-skills credential or some college but no degree.[29] In the protective services occupations, severe police staffing shortages exist in many local areas and have even led to police department closures in some small municipalities;[30] firefighter shortages have generated concern as well.[31]

The oversupply of middle-skills credentials leading to high-paying jobs in healthcare is a different story, running counter to the common understanding that the healthcare sector is facing a steep labor shortage. In fact, demand in many healthcare occupations is expected to be quite high—but that demand will likely be for workers with a bachelor's degree or higher or for middle-skills workers in lower-paying roles. For example, nurse practitioners are expected to be among the fastest-growing occupations over the next decade in terms of their percentage growth, but most workers in these roles will likely have graduate degrees.[32] Home health and personal care aides are also expected to be in high demand, but this occupation is not high-paying.[33] Overall, more than 80 percent of the job openings in middle-skills healthcare occupations are expected to be in lower-paying occupations rather than high-paying ones.[34]

In other cases, the surplus of middle-skills credentials could reflect increasing demand for higher levels of education in some healthcare occupations rather than low overall demand for workers in those occupations. At present, in healthcare professions that are high-paying for middle-skills workers, 25 percent of workers hold middle-skills credentials and 70 percent hold a bachelor's degree or higher. If current trends continue, by 2032, the share of workers in these occupations who hold middle-skills credentials will be 10 percent.[35]

Thus, middle-skills credentials aligned with healthcare professions are increasingly unlikely to lead directly to high-paying middle-skills jobs. The oversupply of middle-skills credentials that provide a pathway to high-paying healthcare occupations—paired with the growing demand for workers with bachelor's degrees—suggests a need for stronger transfer pathways to bachelor's degree programs for students interested in these fields.

26 Wilkie, "Navigating the Blue-Collar Worker Shortage in America's Economy," 2019.

27 Carnevale et al., *After Everything*, 2023.

28 West, *Improving Workforce Development and STEM Education to Preserve America's Innovative Edge*, 2023.

29 Carnevale et al., *After Everything*, 2023.

30 Young et al., "'We Need Them Desperately,'" 2022; Associated Press, "The U.S. Is Experiencing a Police Hiring Crisis," 2023.

31 Hyman and Deal, "Alarming Shortage," 2024.

32 US Bureau of Labor Statistics, "Nurse Anesthetists, Nurse Midwives, and Nurse Practitioners," 2024. Analysis of the fastest-growing occupations is from Table 1.3 of the US Bureau of Labor Statistics, Employment Projections, 2024.

33 Analysis of the fastest-growing occupations is from Table 1.3 of the US Bureau of Labor Statistics, Employment Projections, 2024. Home health and personal care aides had median earnings of approximately $33,500 in 2023.

34 Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023, and the US Census Bureau, American Community Survey (ACS), 2010–22.

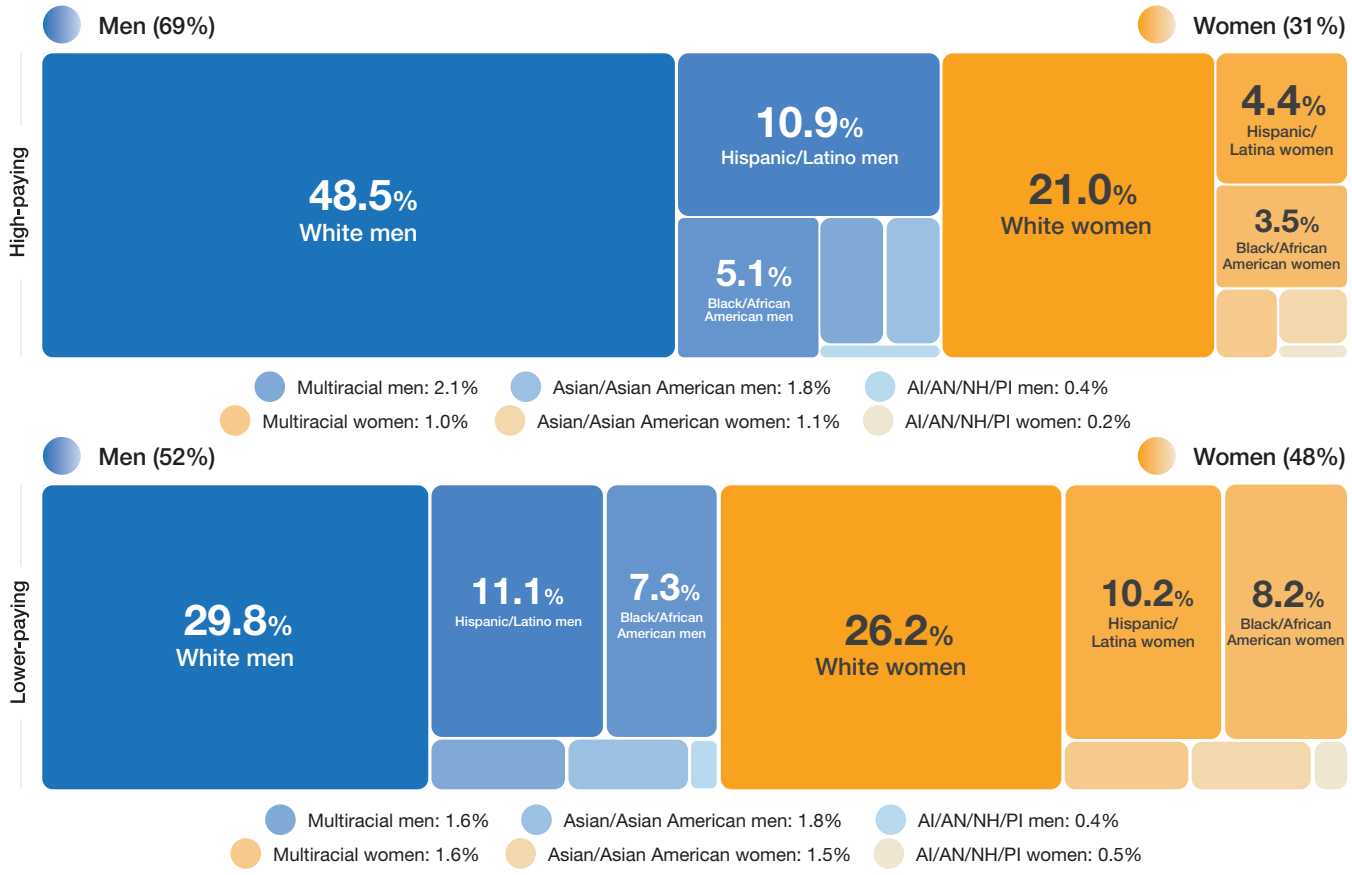
35 Mabel et al., *Missed Opportunities*, 2024. Although overall employment in healthcare occupations that are high-paying for middle-skills workers is expected to increase through 2032, if current trends continue, this increase will not be large enough to offset the decrease in demand for middle-skills workers in these occupations. Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2010–19, and US Department of Labor, Employment Projections, 2023.

Shortages represent opportunities for workers and could lead to greater racial/ethnic and gender equity in education and employment.

To fill the projected credential shortages and ensure a healthy economy, providers of postsecondary education and training would need to substantially increase the number of credentials they award that lead to high-paying middle-skills occupations. Through 2032, they would need to increase the number of such credentials with a pathway to blue-collar occupations by 360,800 annually; the number with a pathway to management and professional office occupations by 253,000 annually; the number with a pathway to STEM occupations by 87,500 annually; and the number with a pathway to protective services occupations by 10,600 annually. These credential shortages are a challenge for society, but they also present important opportunities for upskilling among workers seeking avenues to improve their earning potential.

In addition to creating an opening for more workers to access economic opportunity, projected credential shortages can allow for improved racial/ethnic and gender equity in high-paying middle-skills occupations. At present, almost half (48.5 percent) of middle-skills workers in these high-paying occupations are white men. In contrast, workers in lower-paying middle-skills occupations are much more likely to be women and/or from marginalized racial/ethnic groups (70.3 percent; Figure 5). These disparities result from two primary factors on the pathway from education to work: (1) differences by race/ethnicity and gender in who earns what kind of middle-skills credential, and (2) differences by race/ethnicity and gender in the transition from completing an aligned credential to obtaining a job in a high-paying middle-skills occupation. In the next sections, we discuss both factors.

Figure 5. White men account for nearly half of those employed in high-paying middle-skills occupations but less than one-third of those employed in lower-paying middle-skills occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19, 2021.

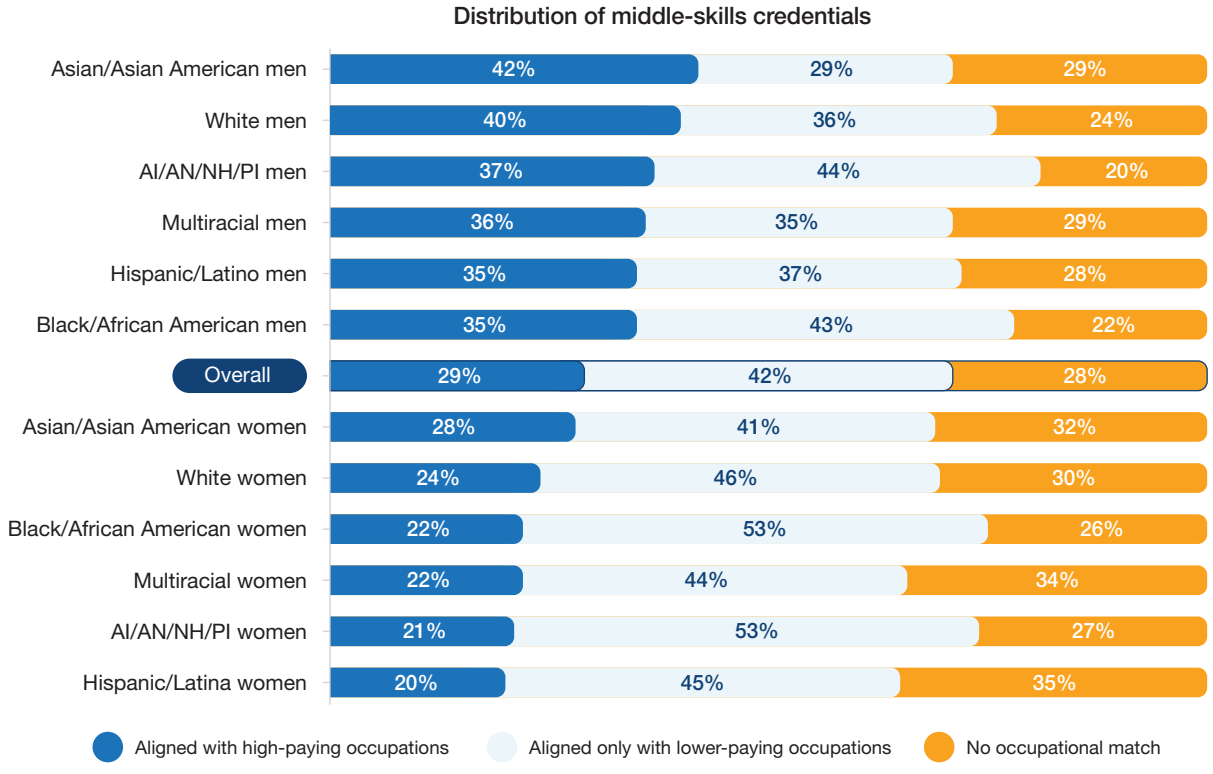
Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Values may not sum to 100 percent due to rounding. Analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

Men are more likely than women to earn a middle-skills credential in a program aligned with a high-paying occupation, with additional disparities between different racial/ethnic groups.

Racial/ethnic and gender disparities in the middle-skills workforce partially stem from differences in the likelihood that individuals from each group will earn a credential that leads to a high-paying occupation. Among those who earn a middle-skills credential, across racial/ethnic groups, men are more likely than women to earn their certificate or associate's degree in a program aligned with a high-paying middle-skills occupation. At one end of the distribution, 42 percent of the middle-skills credentials awarded to Asian/Asian American men and 40 percent of those awarded to white men are in programs aligned with high-paying occupations. On the other end of the distribution, 20 percent of the middle-skills credentials awarded to Hispanic/Latina women and 21 percent of those awarded to American Indian/Alaska Native/Native Hawaiian/Pacific Islander (AI/AN/NH/PI) women are in programs aligned with high-paying middle-skills occupations (Figure 6).

Thus, one potential lever for change would be to recruit more women into education and training programs that lead to high-paying middle-skills jobs—a strategy we discuss in more detail in Part 3 of this report. This strategy would involve addressing the many factors that discourage women from earning credentials in these fields, including lack of exposure to high-paying fields, cultural biases that make some of these fields unfriendly or unappealing to women, and personal preference for other occupational pathways.[36]

Figure 6. Asian/Asian American men are the most likely to earn a middle-skills credential that aligns with a high-paying occupation, while Hispanic/Latina women are the least likely to earn such a credential.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

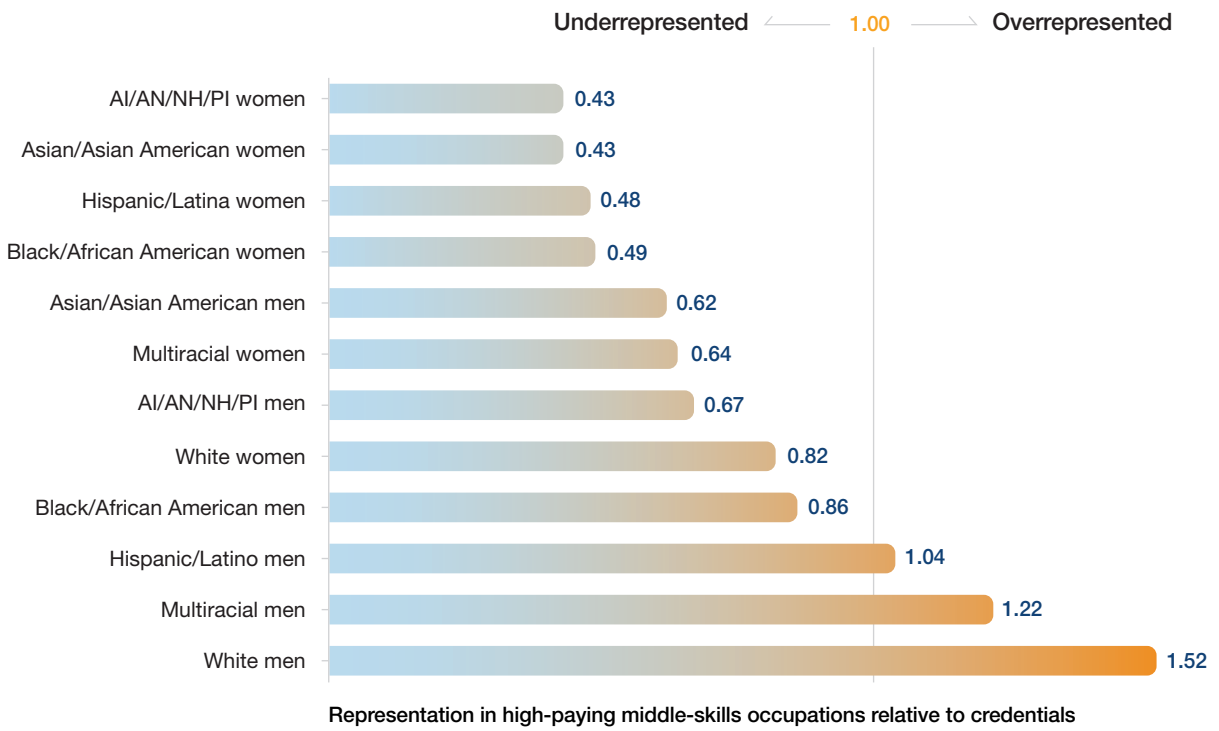
Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Values may not sum to 100 percent due to rounding.

36 Corbett and Hill, *Solving the Equation*, 2015; Hill et al., *Why So Few?*, 2010.

After completing their middle-skills programs, graduates are further divided into high-paying and lower-paying occupations along racial/ethnic and gender lines.

Credentials alone don't explain the disparities in high-paying middle-skills occupations. After accounting for the distribution of credentials by race/ethnicity and gender, we find that white men, multiracial men,[37] and Hispanic/Latino men are overrepresented in high-paying middle-skills occupations relative to what we would expect based on the credentials they hold. Conversely, women of all races/ethnicities—as well as Asian/Asian American men, AI/AN/NH/PI men, and Black/African American men—are underrepresented in high-paying middle-skills occupations relative to their credentials (Figure 7). As with disparities in credential choice, the factors driving these disparities in employment outcomes are multifaceted, involving gender and racial/ethnic biases and discrimination in hiring, as well as differences in personal career interests for those of different races/ethnicities and genders.

Figure 7. White, multiracial, and Hispanic/Latino men are overrepresented in high-paying middle-skills occupations relative to their credentials.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Representation ratios are calculated by dividing each race/ethnicity-by-gender group's share of the actual workforce distribution by their share of the expected distribution. The expected distribution is an estimate of what the race/ethnicity-by-gender distribution in high-paying occupations would be based on (1) the race/ethnicity-by-gender distribution among those who earn credentials that align with these occupations, and (2) the relative demand in high-paying versus lower-paying occupations for the aligned credentials that each race/ethnicity-by-gender group completes. See Appendix A for a more detailed description of this calculation. Actual workforce distribution analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

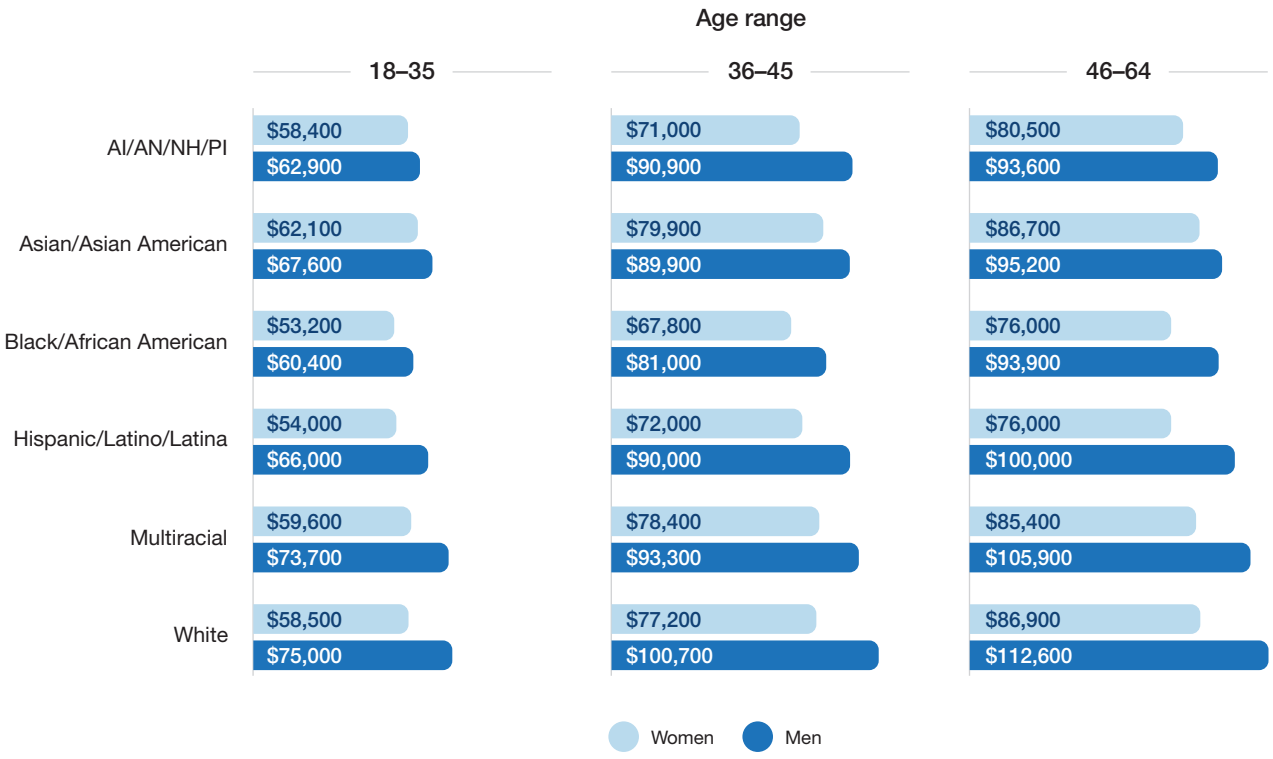
37 Multiracial men are very likely to have white heritage. Among multiracial men ages 18–35 with a middle-skills credential, 80 percent are white and one other race; an additional 10 percent are white and more than one other race. Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

In the next section of this report, we explore racial/ethnic and gender disparities within each of the five high-paying middle-skills occupational groups. For each occupational group, we examine the distribution by race/ethnicity of workers within high-paying occupations. We also examine the likelihood that workers' credentials align with high-paying occupations and the over- and underrepresentation of workers in the labor market relative to the credentials they hold.

Pay disparities persist even among those working in high-paying middle-skills occupations.

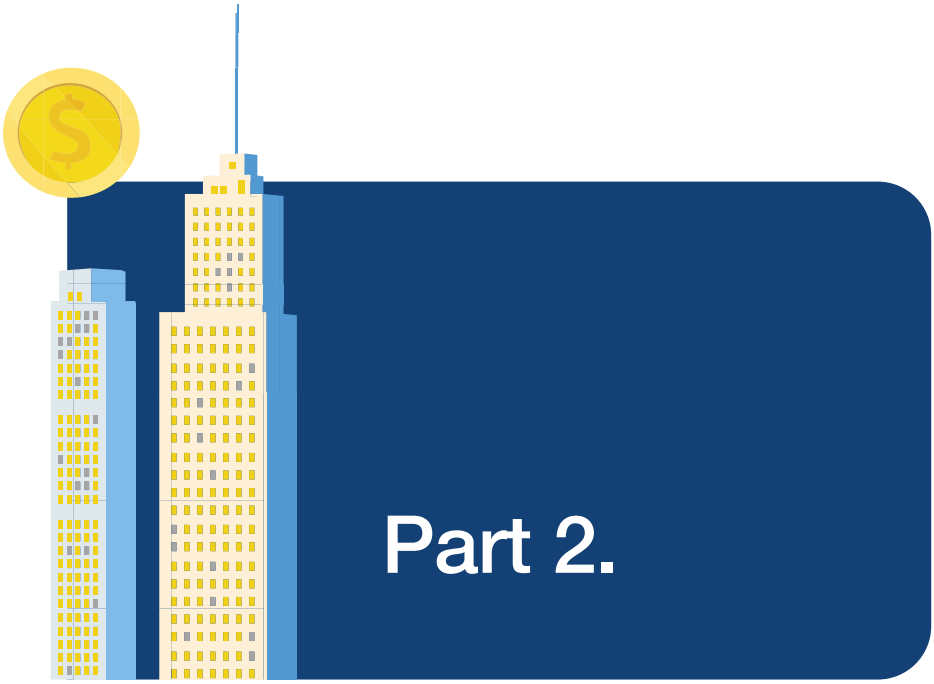
Workers in high-paying middle-skills occupations face pay disparities by race/ethnicity and gender, reflecting inequities seen in all segments of the labor market. Throughout their careers, white men in high-paying middle-skills jobs have higher earnings than men and women of all other races/ethnicities (Figure 8). While we focus our analysis and policy discussion in this report on equitable participation in high-paying middle-skills occupations, pay inequality among workers who hold high-paying middle-skills jobs is another sign of, and contributor to, economic inequality. Equalizing participation in high-paying middle-skills occupations won't be enough to create equal access to economic opportunity if the pay gaps within these occupations are not addressed as well.

Figure 8. Throughout their careers, white men earn more in high-paying middle-skills occupations than all other groups.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19, 2021.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Analysis is limited to middle-skills workers who reported working more than 10 hours per week and at least 14 weeks in the previous year.



Part 2.

Racial/Ethnic and Gender Disparities in High-Paying Middle-Skills Occupations

High-paying middle-skills occupations should offer gateways to economic opportunity for workers of all demographic backgrounds. Currently, however, more than two-thirds of jobs in high-paying middle-skills occupations are held by men, compared with just 52 percent of jobs in lower-paying middle-skills occupations. White men alone hold nearly half of the jobs in high-paying middle-skills occupations, compared with just under 30 percent of the jobs in lower-paying middle-skills occupations (see Figure 5 on page 12).

In this section, we examine the demographics of the high-paying middle-skills workforce in each of the five high-paying middle-skills occupational groups, as well as the disparities that occur on the pathways to these occupations. We find that projected credential shortages in four of the five occupational groups present opportunities for educators and policymakers to address inequitable representation within high-paying middle-skills occupations without negatively affecting individuals currently in those occupations. A more diverse workforce will be necessary to fill occupational shortages in many of these occupations.

Men dominate employment in high-paying blue-collar occupations.

While the effects of automation and globalization have prompted concern about the future of certain types of blue-collar work, such as manufacturing, blue-collar occupations still offer plenty of opportunities for workers, particularly on the middle-skills pathway. In fact, based on current credential production, the blue-collar sector is expected to face annual shortages (through 2032) of 360,800 credentials that align with high-paying middle-skills occupations. Based on the demand for both the high-paying and lower-paying occupations that align with these credentials, we expect that 37 percent of those who earn these credentials will find work in high-paying blue-collar occupations.

Blue-collar occupations are typically male dominated, and this is especially true of high-paying blue-collar occupations. Men hold 85 percent of lower-paying middle-skills blue-collar jobs, but they hold 93 percent of high-paying middle-skills blue-collar jobs (Figure 9). Disparities also exist by race/ethnicity. White men are heavily overrepresented in high-paying middle-skills blue-collar occupations relative to their representation in lower-paying middle-skills blue-collar occupations; they hold about two-thirds of the jobs in these occupations (compared with holding half of the jobs in lower-paying middle-skills blue-collar occupations). Within this occupational group, white men are the only group that holds a larger share of high-paying jobs than lower-paying ones.

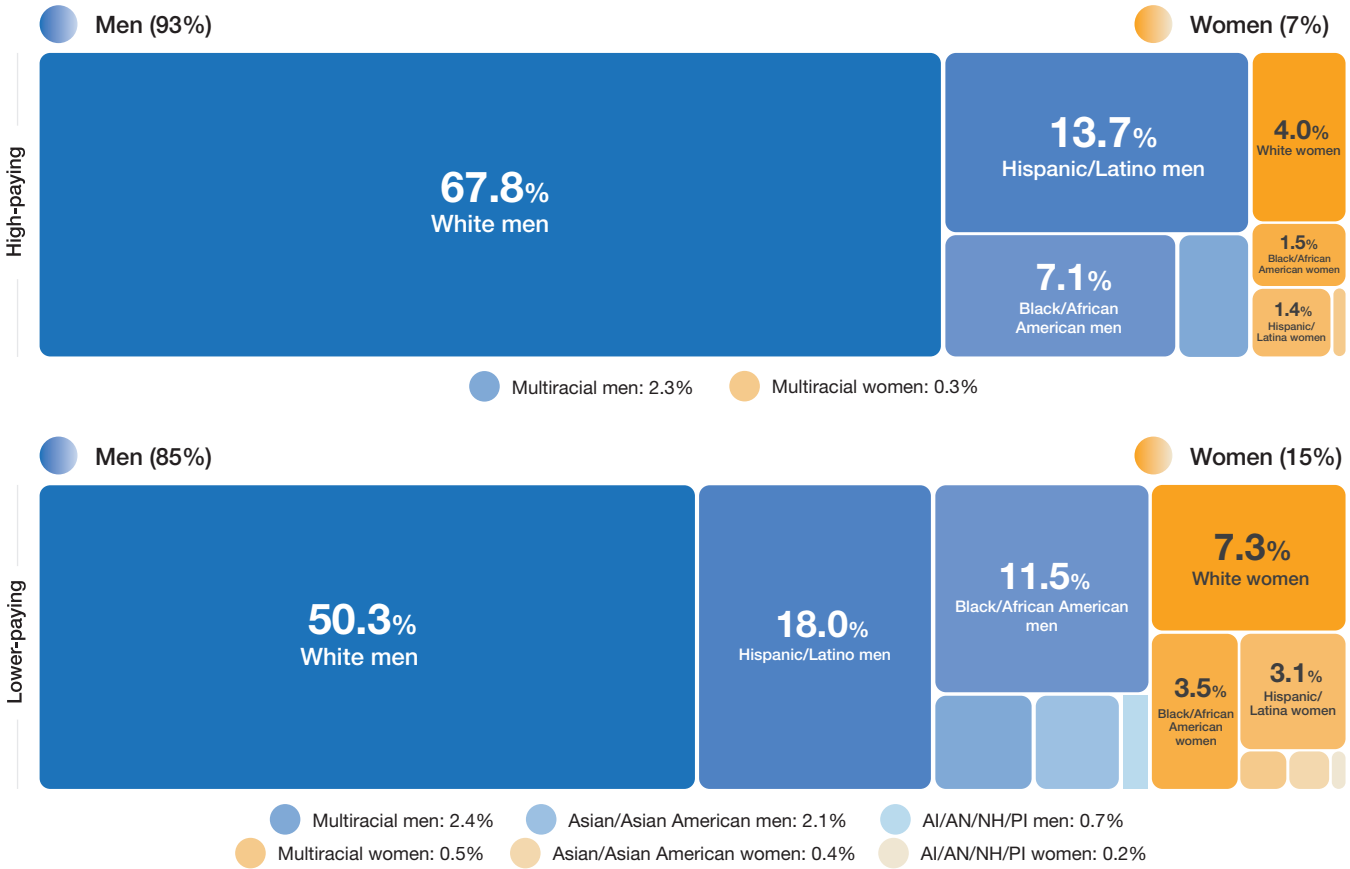
Examples of blue-collar occupations that are high-paying for early-career middle-skills workers

High-paying middle-skills blue-collar occupations include jobs in multiple categories, such as the following:

- First-line supervisors of construction trades and extraction workers and of production and operating workers
- Mechanics (including farm equipment mechanics and service technicians, industrial machinery mechanics, and mobile heavy equipment mechanics)
- Operating engineers and other construction equipment operators
- Rail car repairers

For a complete list, see Appendix B.

Figure 9. White men hold more than two-thirds of jobs in high-paying middle-skills blue-collar occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

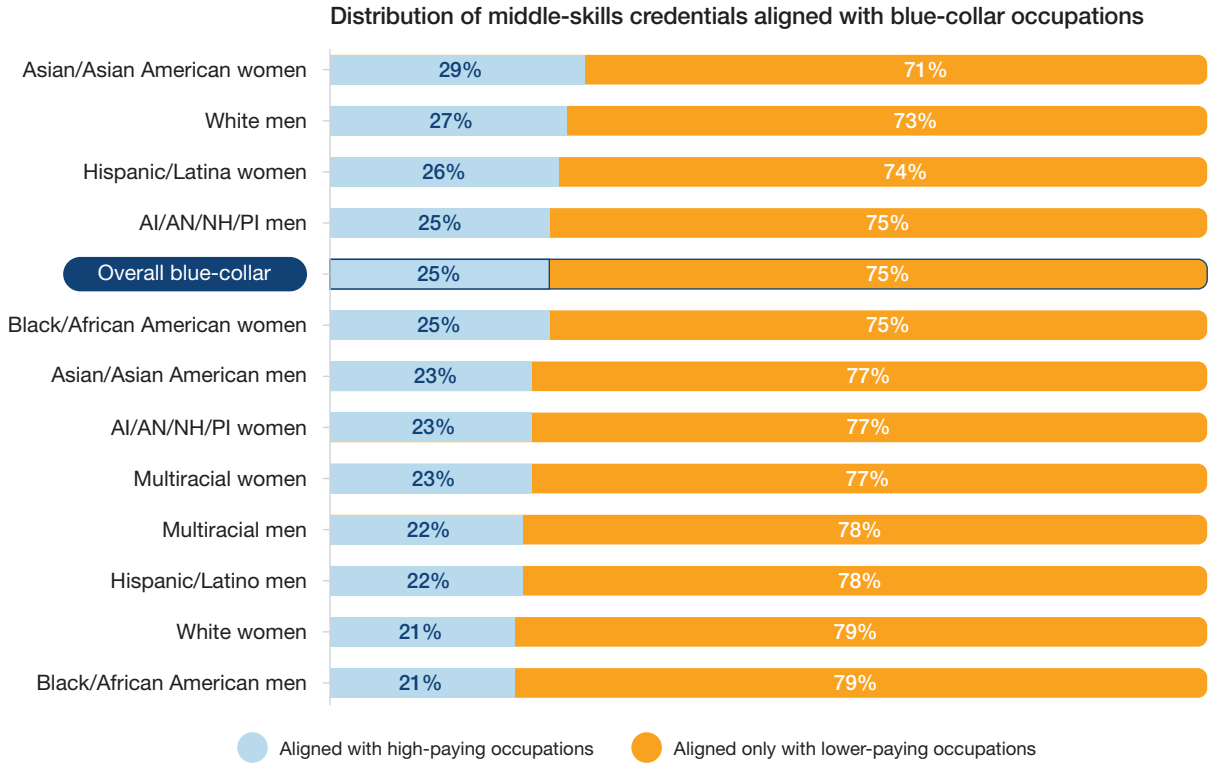
Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Due to sample size limitations, we do not report values by gender for AI/AN/NH/PI and Asian/Asian American workers in the high-paying workforce. AI/AN/NH/PI workers account for 0.7 percent of the high-paying middle-skills blue-collar workforce, and Asian/Asian American workers account for 1.5 percent. Values may not sum to 100 percent due to rounding. Analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

White men are among the groups most likely to earn a blue-collar credential and to earn it in a program that aligns with high-paying blue-collar occupations.

Men are far more likely than women to earn a middle-skills credential aligned with blue-collar occupations, which partially explains the disparities in the gender composition of employment in these occupations. One in four men who earn any middle-skills credential earn it in a blue-collar-aligned field, compared with just 2 percent of women who earn middle-skills credentials in these fields. As a result, 89 percent of blue-collar middle-skills credentials are held by men, with white men accounting for 50 percent of all blue-collar middle-skills credentials.[38]

Of the credentials awarded in programs aligned with blue-collar occupations, just one in four are awarded through programs that align with high-paying middle-skills occupations (Figure 10). This outcome is in part due to the fact that only one-third of middle-skills programs that align with blue-collar occupations offer pathways to high-paying blue-collar occupations.[39] Differing likelihoods of obtaining a credential that aligns with high-paying blue-collar occupations contribute to the racial/ethnic and gender imbalances in high-paying and lower-paying blue-collar employment. Among those who earn a middle-skills credential that aligns with any blue-collar occupation, white men are surpassed only by Asian/Asian American women as the most likely to obtain a credential aligned with a high-paying blue-collar occupation. By contrast, white women and Black/African American men are the least likely to obtain credentials aligned with a high-paying middle-skills blue-collar occupation.

Figure 10. Asian/Asian American women and white men are the groups most likely to obtain a middle-skills credential aligned with high-paying blue-collar occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Values may not sum to 100 percent due to rounding. See Appendix C for the share of each race/ethnicity-by-gender group earning a middle-skills credential aligned with blue-collar occupations and the distribution of middle-skills credentials aligned with high-paying blue-collar occupations by race/ethnicity and gender.

38 Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

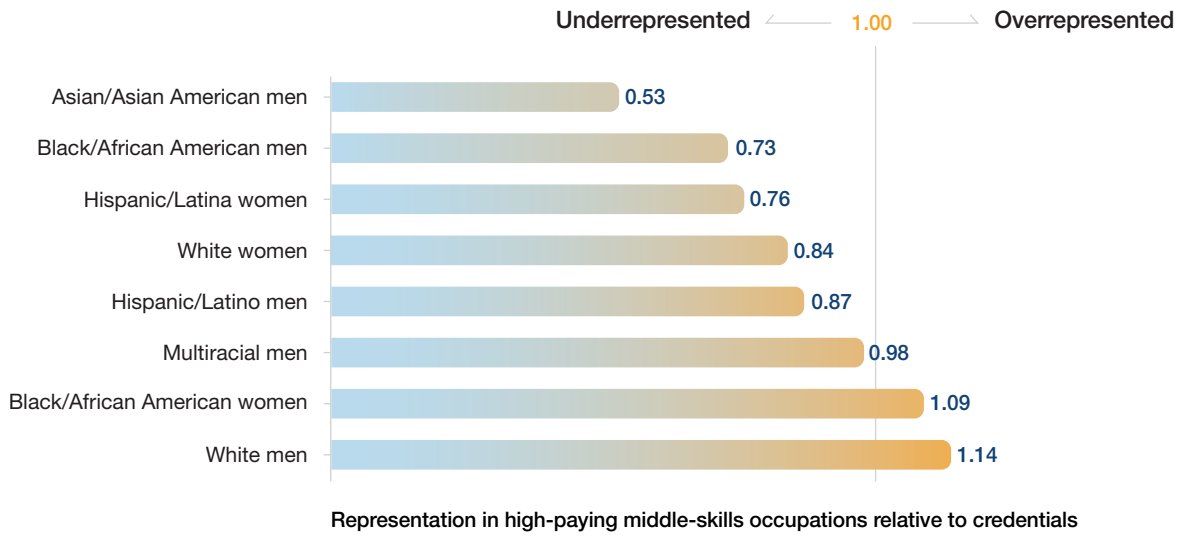
39 The three most popular programs in this group do not offer pathways to high-paying occupations. These programs are welding technology/welder (19 percent); automobile/automotive mechanics technology/technician (14 percent); and heating, air conditioning, ventilation, and refrigeration maintenance technology/technician (9 percent). Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

White men and Black/African American women are the only groups overrepresented in high-paying middle-skills blue-collar occupations relative to the credentials they hold.

While differences in credential attainment partially explain the disparities in high-paying blue-collar employment, the distribution of workers in these occupations suggests that other factors are at play. White men are overrepresented in high-paying blue-collar occupations even after taking into account their overrepresentation among those who earned aligned credentials (Figure 11). In other words, white men make up a larger share of actual high-paying blue-collar employment than would be expected based on their share of credentials earned in programs that align with these occupations.

Although Black/African American women account for only 1.5 percent of high-paying blue-collar workers, they are also slightly overrepresented in these occupations relative to their credentials. Other groups, most notably Asian/Asian American men, are underrepresented, meaning they represent a smaller share of high-paying blue-collar workers than would be expected based on their share of awarded credentials that align with these occupations. More specifically, Asian/Asian American men's share of high-paying middle-skills blue-collar employment is only 53 percent of what we would expect based on the credentials they hold.

Figure 11. White men and Black/African American women are the only groups overrepresented in high-paying middle-skills blue-collar occupations relative to the credentials they earn.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: Representation ratios are calculated by dividing each race/ethnicity-by-gender group's share of the actual workforce distribution by their share of the expected distribution. The expected distribution is an estimate of what the race/ethnicity-by-gender distribution in high-paying occupations would be based on (1) the race/ethnicity-by-gender distribution among those who earn credentials that align with these occupations, and (2) the relative demand in high-paying versus lower-paying occupations for the aligned credentials that each race/ethnicity-by-gender group completes. See Appendix A for a more detailed description of this calculation. Results for American Indian/Alaska Native/Native Hawaiian/Pacific Islander men and women, Asian/Asian American women, and multiracial women are suppressed due to sample size limitations. Actual workforce distribution analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

Asian/Asian American, Black/African American, and Hispanic/Latino men are underrepresented in both the high-paying and lower-paying middle-skills blue-collar occupations that align with these credentials, which suggests that they are less likely to work in any blue-collar occupation aligned with the credentials they hold, whether high-paying or lower-paying. By contrast, white and Hispanic/Latina women are underrepresented in high-paying middle-skills blue-collar occupations but overrepresented in lower-paying blue-collar occupations.[40]

Women account for less than one-third of workers in high-paying middle-skills management and professional office occupations.

While workforce experience can help workers get hired and promoted into management occupations, the field-specific knowledge that comes with a credential plays a part in such opportunities as well. Credentials in fields such as public administration, business, management, and entrepreneurship can help workers acquire the skills and knowledge they need to succeed in management occupations. To meet the expected demand for workers who have these credentials, the production of middle-skills credentials aligned with these high-paying management and professional office occupations will need to increase by 253,000 annually through 2032. Based on the demand for both the high-paying and lower-paying occupations that align with these credentials, we expect that 47 percent of those who earn these credentials will find work in high-paying management and professional office occupations.

Gender disparities in middle-skills management and professional office occupations are stark. Women account for more than half of lower-paying middle-skills management and professional office employment but less than one-third of high-paying middle-skills management and professional office employment (Figure 12). Black/African American men are the only group of men who are less represented in high-paying middle-skills management and professional office occupations than they are in lower-paying middle-skills management and professional office occupations. Women of all races/ethnicities hold larger shares of lower-paying middle-skills management and professional office jobs than of high-paying middle-skills management and professional office jobs.

Examples of management and professional office occupations that are high-paying for early-career middle-skills workers

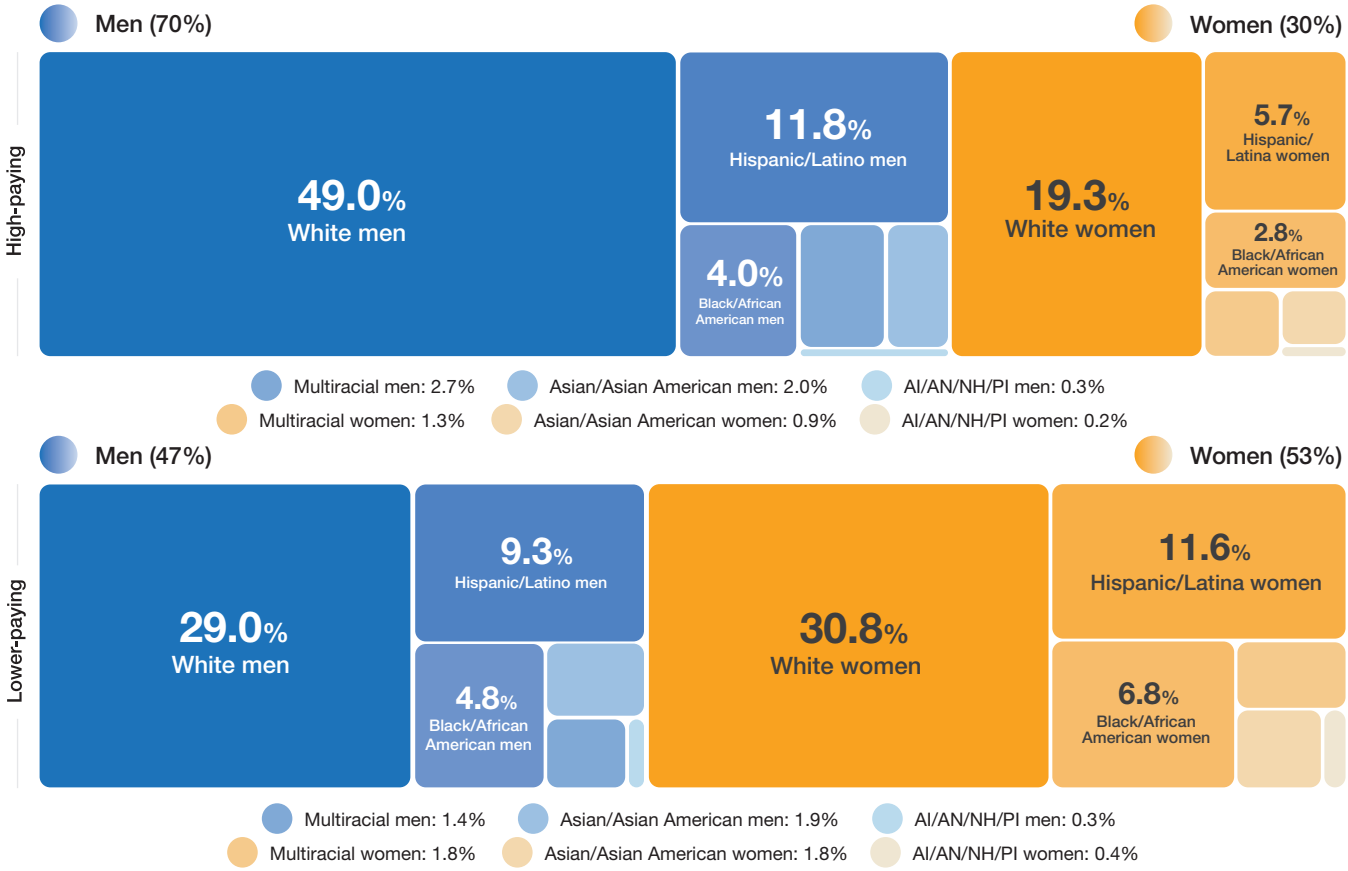
High-paying middle-skills management and professional office occupations include jobs in multiple categories, such as the following:

- Construction managers
- General and operations managers
- Project management specialists
- Computer and information systems managers
- Sales managers

For a complete list, see Appendix B.

40 See Appendix D for a comparison of expected versus actual representation of workers in high-paying and lower-paying blue-collar occupations relative to credential attainment.

Figure 12. White men account for nearly half of the high-paying middle-skills management and professional office workforce but less than one-third of the lower-paying middle-skills management and professional office workforce.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Values may not sum to 100 percent due to rounding. Analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

While women earn the majority of credentials aligned with management and professional office occupations, they are far less likely than men to earn these credentials in programs that align with high-paying occupations.

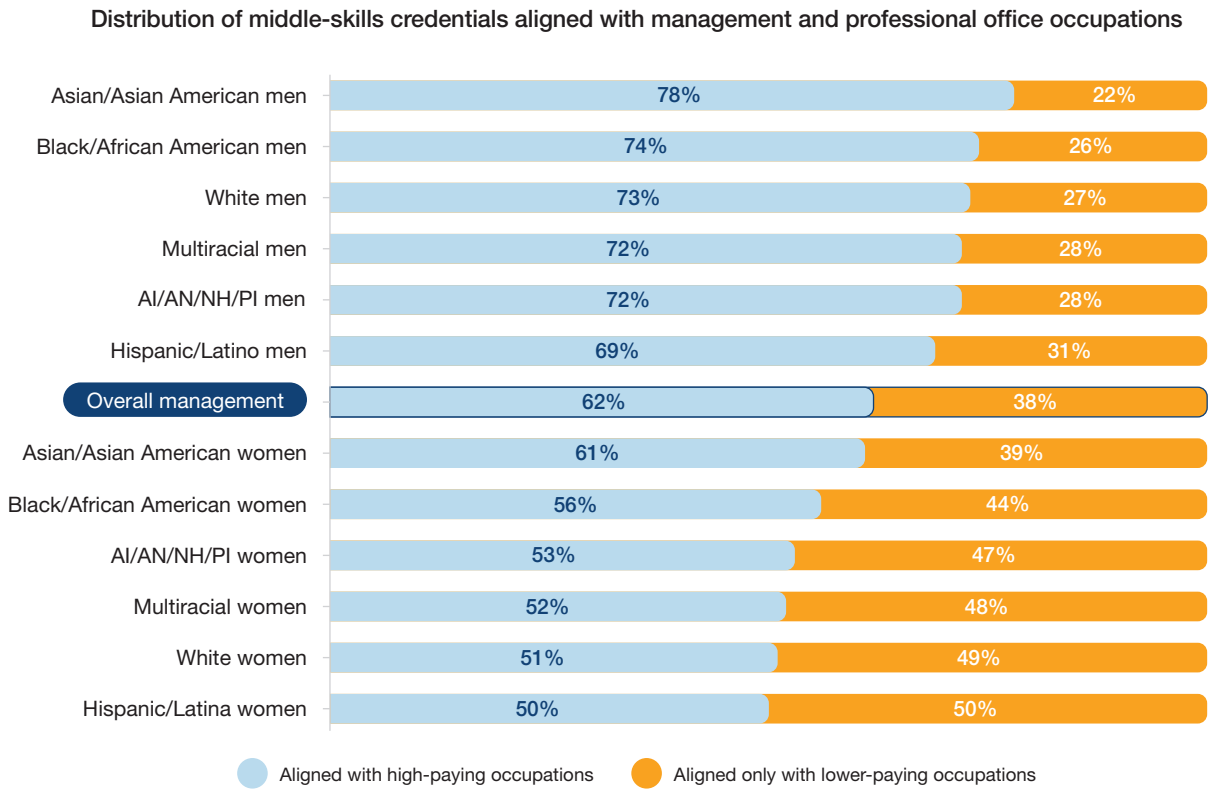
Unlike in blue-collar occupations, the majority of middle-skills credentials granted in programs that align with management and professional office occupations are awarded in programs that align with *high-paying* management and professional office occupations (62 percent). This is in part because nearly half (46 percent) of programs that align with management and professional office occupations align with high-paying occupations.[41]

Although the share of credentials granted in programs that align with high-paying occupations is higher for

41 Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

management and professional office occupations than it is for blue-collar occupations, the distribution of those credentials also varies more by race/ethnicity and gender. Women earn more than half (54 percent) of all middle-skills credentials in programs that align with management and professional office occupations.[42] However, across all races/ethnicities, among those who earn these credentials, men are more likely than women to earn credentials that lead to high-paying management and professional office occupations (Figure 13). Relative to other men, Asian/Asian American men are the most likely to earn a credential that leads to high-paying management and professional office occupations (78 percent of the credentials for this group align with high-paying occupations), while Hispanic/Latino men are the least likely (69 percent) to earn a credential aligned with high-paying occupations. This pattern holds among women as well: Asian/Asian American women are the most likely to earn a credential that leads to a high-paying management and professional office occupation (61 percent), while Hispanic/Latina women are the least likely to earn such a credential (50 percent).

Figure 13. Asian/Asian American men are the most likely to earn a middle-skills credential that aligns with a high-paying management and professional office occupation, and Hispanic/Latina women are the least likely to earn such a credential.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

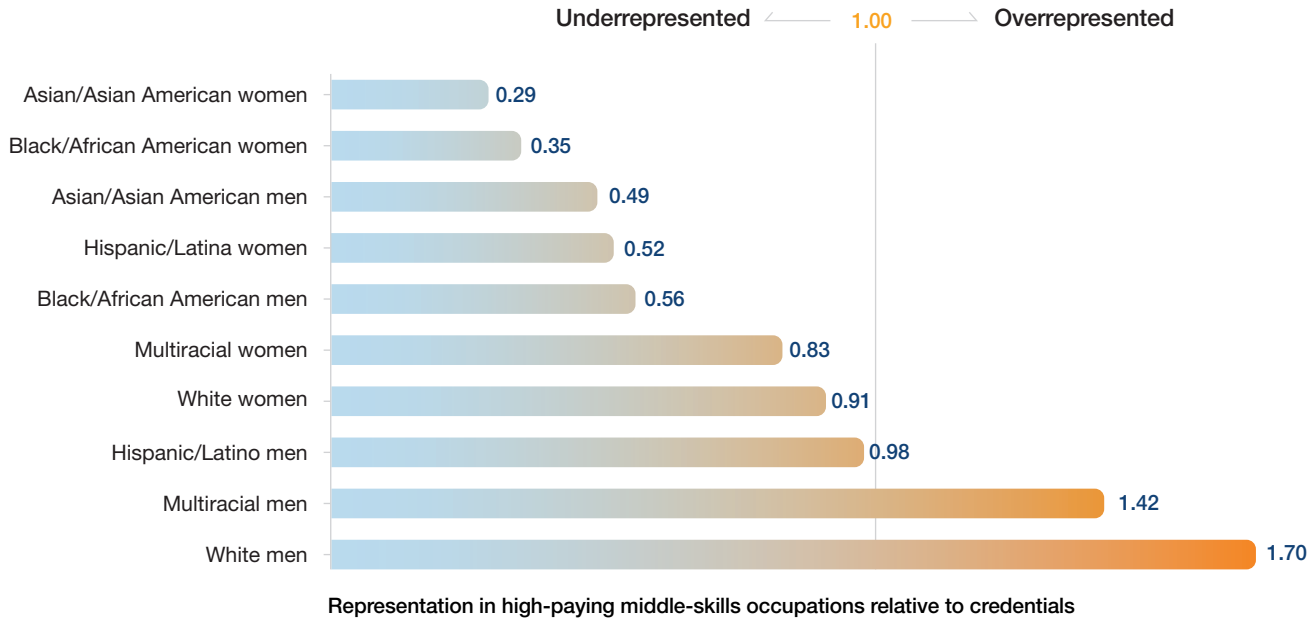
Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Values may not sum to 100 percent due to rounding. See Appendix C for the share of each race/ethnicity-by-gender group earning a middle-skills credential aligned with management and professional office occupations and the distribution of middle-skills credentials aligned with high-paying management and professional office occupations by race/ethnicity and gender.

42 Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

White men and multiracial men are overrepresented in high-paying middle-skills management and professional office occupations relative to the distribution of credentials in programs that align with these occupations.

The extent of overrepresentation and underrepresentation in high-paying middle-skills occupations is even greater in the management and professional office workforce than in the blue-collar workforce. White men's share of the high-paying management and professional office workforce is 1.7 times higher than what would be expected based on the distribution of middle-skills credentials aligned with high-paying management and professional office occupations (Figure 14). By contrast, Asian/Asian American women's share of high-paying middle-skills management and professional office employment is only 29 percent of what would be expected based on the credentials earned.

Figure 14. White and multiracial men are vastly overrepresented in high-paying management and professional office occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: Representation ratios are calculated by dividing each race/ethnicity-by-gender group's share of the actual workforce distribution by their share of the expected distribution. The expected distribution is an estimate of what the race/ethnicity-by-gender distribution in high-paying occupations would be based on (1) the race/ethnicity-by-gender distribution among those who earn credentials that align with these occupations, and (2) the relative demand in high-paying versus lower-paying occupations for the aligned credentials that each race/ethnicity-by-gender group completes. See Appendix A for a more detailed description of this calculation. Results for American Indian/Alaska Native/Native Hawaiian/Pacific Islander men and women are suppressed due to sample size limitations. Actual workforce distribution analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

Asian/Asian American men and women, Black/African American women, Hispanic/Latino men, Hispanic/Latina women, and multiracial women don't work in middle-skills management and professional occupations to the degree their attainment of relevant credentials would suggest. These groups are underrepresented in both low- and high-paying middle-skills management and professional office occupations. Black/African American men and white women are the exception to this pattern of underrepresentation. Both groups are underrepresented in high-paying middle-skills management and professional office occupations but overrepresented in lower-paying middle-skills management and professional office occupations.[43]

43 See Appendix D for a comparison of expected versus actual representation of workers in high-paying and lower-paying management and professional office occupations relative to credential attainment.

Women account for less than 15 percent of workers in high-paying middle-skills STEM occupations.

Science, technology, engineering, and mathematics (STEM) occupations are expected to provide ample opportunity to middle-skills workers as the nation strives to keep up with rapid developments in areas such as artificial intelligence, telecommunications, and new energy technologies. While demand in STEM occupations skews toward workers with a bachelor's degree or higher, these occupations are among the fastest growing in the American economy, with job openings expected for workers at all levels of education.[44] Production of aligned credentials will need to increase by 87,500 annually through 2032 in order to meet the demand for workers holding middle-skills credentials aligned specifically with high-paying middle-skills STEM occupations. Based on the demand for both the high-paying and lower-paying occupations that align with these credentials, we expect that 73 percent of those who earn these credentials will find work in high-paying STEM occupations.

Addressing this shortage provides an opportunity to increase women's participation in STEM occupations, which remain male dominated despite long-standing efforts to recruit and retain more women for STEM fields. At present, men account for 80 percent of lower-paying middle-skills STEM workers and 86 percent of high-paying middle-skills STEM workers (Figure 15). Among men, Asian/Asian American men are the only group that has equal representation in lower-paying STEM occupations and high-paying STEM occupations. White, Hispanic/Latino, Black/African American, and multiracial men are all more strongly represented in high-paying STEM occupations than in lower-paying STEM occupations. With the exception of Asian/Asian American women, women in all racial/ethnic groups account for a smaller proportion of workers in high-paying STEM occupations than in lower-paying STEM occupations.

Examples of STEM occupations that are high-paying for early-career middle-skills workers

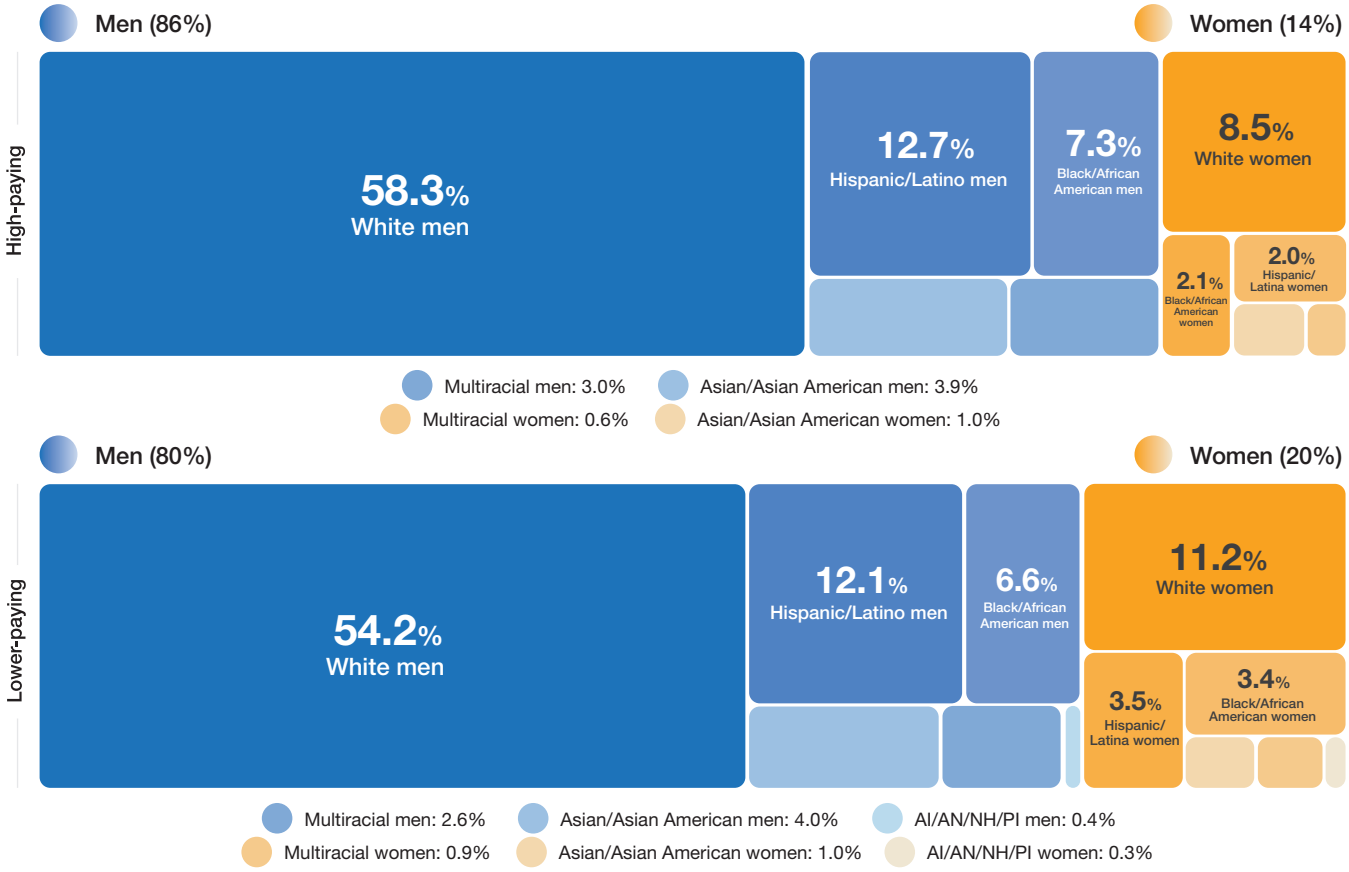
High-paying middle-skills STEM occupations include jobs in multiple categories, such as the following:

- Computer network architects
- Engineering technologists and technicians (including civil, electrical, environmental, industrial, and mechanical)
- Information security analysts
- Network and computer systems administrators
- Software and web developers

For a complete list, see Appendix B.

44 Carnevale et al., *After Everything*, 2023.

Figure 15. Men account for the majority of both the high-paying and lower-paying middle-skills STEM workforces.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

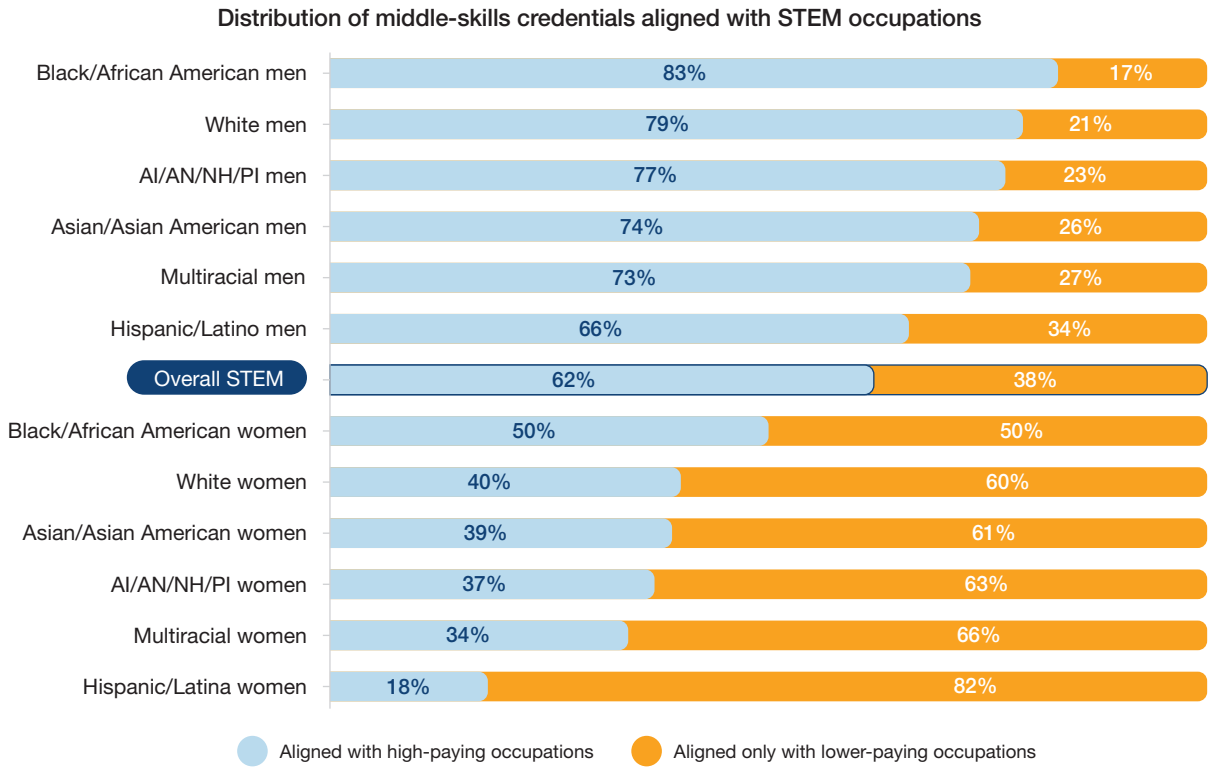
Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Due to sample size limitations, we do not report values by gender for AI/AN/NH/PI workers in the high-paying workforce. AI/AN/NH/PI workers account for 0.6 percent of the high-paying middle-skills STEM workforce. Values may not sum to 100 percent due to rounding. Analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

Men earn the majority of middle-skills credentials that align with high-paying STEM occupations.

Similar to middle-skills programs aligned with management and professional office occupations, about half of programs that align with STEM occupations align with high-paying STEM occupations. Completions of middle-skills STEM credentials are concentrated in programs that offer a pathway to high-paying STEM occupations (62 percent).[45] Thus, an individual who earns a middle-skills STEM credential is more likely than not to earn that credential in a program that provides pathways to high-paying occupations.

However, STEM occupations have the greatest disparities by race/ethnicity and gender in the share of credentials earned in programs that align with high-paying occupations. Men earn nearly two-thirds of all middle-skills STEM credentials, and they are much more likely than women to earn them in programs that align with high-paying STEM occupations.[46] Among those who earn middle-skills credentials aligned with STEM occupations, about four in five Black/African American men and white men earn a credential in a program that is aligned with a high-paying STEM occupation, compared with fewer than one in five Hispanic/Latina women (Figure 16).

Figure 16. Black/African American men are the most likely to obtain a middle-skills credential that aligns with high-paying STEM occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Values may not sum to 100 percent due to rounding. See Appendix C for the share of each race/ethnicity-by-gender group earning a middle-skills credential aligned with STEM occupations and the distribution of middle-skills credentials aligned with high-paying STEM occupations by race/ethnicity and gender.

45 Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

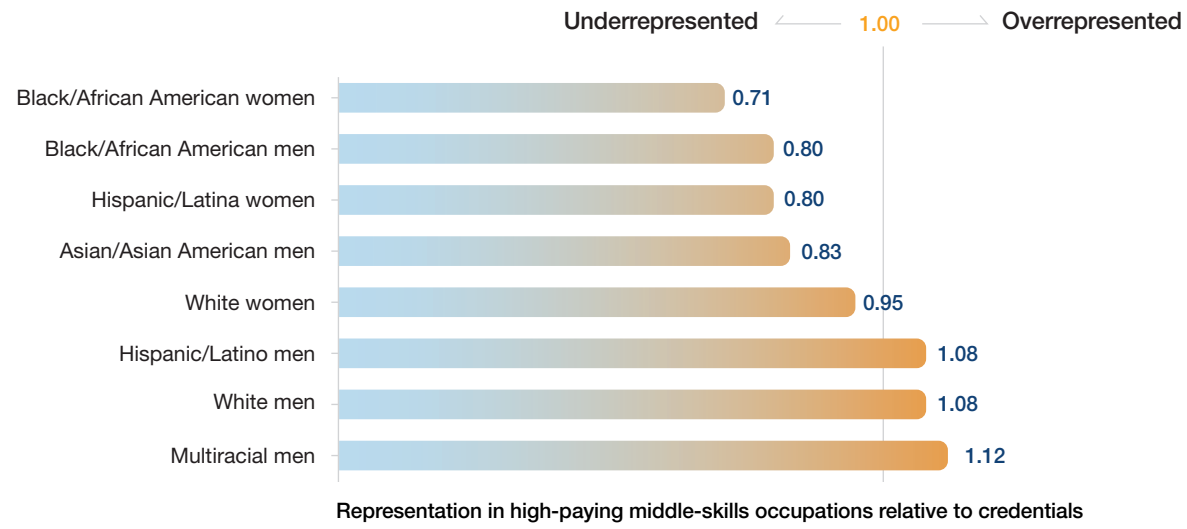
46 Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Black/African American women, Black/African American men, and Hispanic/Latina women are the most underrepresented groups in the high-paying STEM workforce relative to their credentials.

Based on the distribution of credentials aligned with high-paying STEM occupations, Hispanic/Latino men, white men, and multiracial men are overrepresented in the high-paying STEM workforce, while Black/African American men are the most underrepresented among men (Figure 17). Black/African American, Hispanic/Latina, and white women are all underrepresented in high-paying STEM occupations relative to the credentials they earn. The extent of this over- and underrepresentation is less severe than in other occupational groups, though, suggesting that credential attainment gaps may play a larger role in influencing the demographics of the STEM workforce. For example, factors such as high attrition rates among underrepresented groups early in the STEM curriculum may reduce these groups' representation in these middle-skills occupations long before graduates enter the labor market.[47]

Most groups that are underrepresented in high-paying middle-skills STEM occupations are also underrepresented in lower-paying middle-skills STEM occupations relative to the aligned credentials they earn. However, Black/African American men are slightly overrepresented in lower-paying middle-skills STEM occupations.[48]

Figure 17. Multiracial men, white men, and Hispanic/Latino men are overrepresented in the high-paying STEM workforce relative to the distribution of credentials in programs that align with these occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: Representation ratios are calculated by dividing each race/ethnicity-by-gender group's share of the actual workforce distribution by their share of the expected distribution. The expected distribution is an estimate of what the race/ethnicity-by-gender distribution in high-paying occupations would be based on (1) the race/ethnicity-by-gender distribution among those who earn credentials that align with these occupations, and (2) the relative demand in high-paying versus lower-paying occupations for the aligned credentials that each race/ethnicity-by-gender group completes. See Appendix A for a more detailed description of this calculation. Results for American Indian/Alaska Native/Native Hawaiian/Pacific Islander men and women, Asian/Asian American women, and multiracial women are suppressed due to sample size limitations. Actual workforce distribution analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

47 Bahr and colleagues found that female students were more likely than male students to begin their college STEM studies in a lower-level course, which was also the case for Black/African American, Hispanic/Latino/Latina, and Native American students compared with historically advantaged students. They also found that beginning studies in a lower-level course made it less likely that these students would advance in the STEM program. Bahr et al., "Unrealized Potential," 2017.

48 See Appendix D for a comparison of expected versus actual representation of workers in high-paying and lower-paying STEM occupations relative to credential attainment.

White men account for nearly two-thirds of workers in high-paying middle-skills protective services occupations.

To meet the demand for workers in high-paying protective services occupations, the production of middle-skills credentials that align with these occupations will need to increase by 10,600 annually through 2032. Based on the demand for both the high-paying and lower-paying occupations that align with these credentials, we expect that 58 percent of those who earn these credentials will find work in high-paying protective services occupations. While these shortages are smaller than the shortages expected in blue-collar, management and professional office, and STEM occupations, they nonetheless reflect the critical challenges facing protective services workers across the United States. Take policing as one example: The Police Executive Research Forum has identified a "staffing crisis" in policing and has pointed to the need to diversify the workforce by race/ethnicity and gender in order to address staffing shortages.[49]

At present, high-paying protective services occupations generally lack diversity. The majority of the protective services workforce overall is male, and this trend is even more pronounced in high-paying protective services occupations, where men account for 90 percent of workers (Figure 18). Notably, the gender disparity between high-paying and lower-paying protective service occupations is driven entirely by white men, who hold nearly twice the share of jobs in high-paying middle-skills protective services occupations as they do in lower-paying middle-skills protective services occupations. By contrast, men of all other races/ethnicities hold a larger share of lower-paying protective services jobs than of high-paying jobs, a pattern that also holds for women of all races/ethnicities. This disparity is particularly stark for Black/African American women, who account for 11.5 percent of lower-paying protective services workers but only 2.1 percent of high-paying protective services workers (Figure 18).

Examples of protective services occupations that are high-paying for early-career middle-skills workers

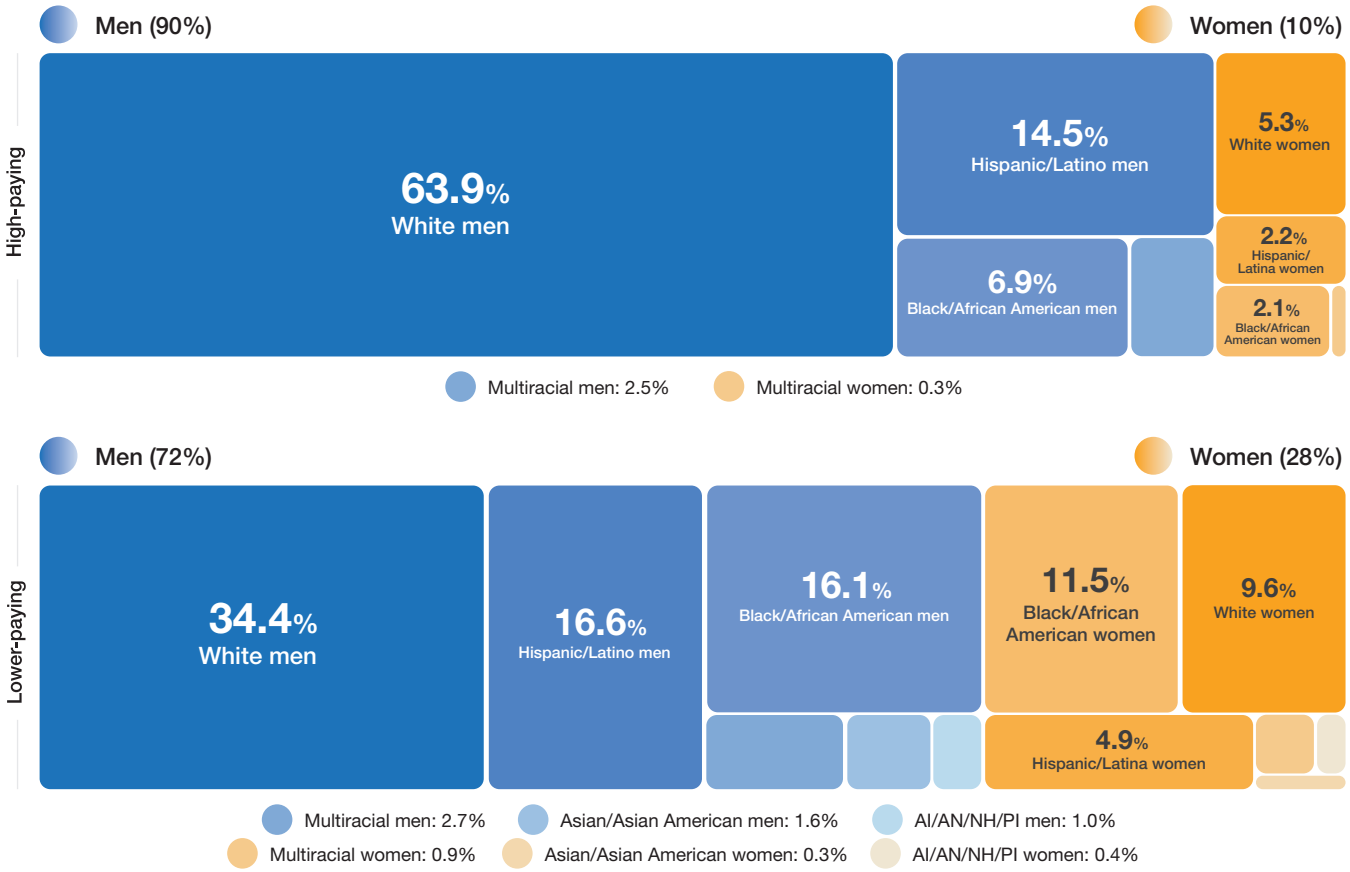
High-paying middle-skills protective services occupations include jobs in multiple categories, such as the following:

- Police and sheriff's patrol officers
- Firefighters
- First-line supervisors of police and detectives
- Detectives and criminal investigators
- Transit and railroad police

For a complete list, see Appendix B.

49 Police Executive Research Forum, *Responding to the Staffing Crisis*, 2023. Our own research underscores that protective services shortages are most severe in certain metro areas. Mabel et al., *Missed Opportunities*, 2024.

Figure 18. White men's proportion of the high-paying middle-skills protective services workforce is nearly twice as large as their proportion of the lower-paying middle-skills protective services workforce.



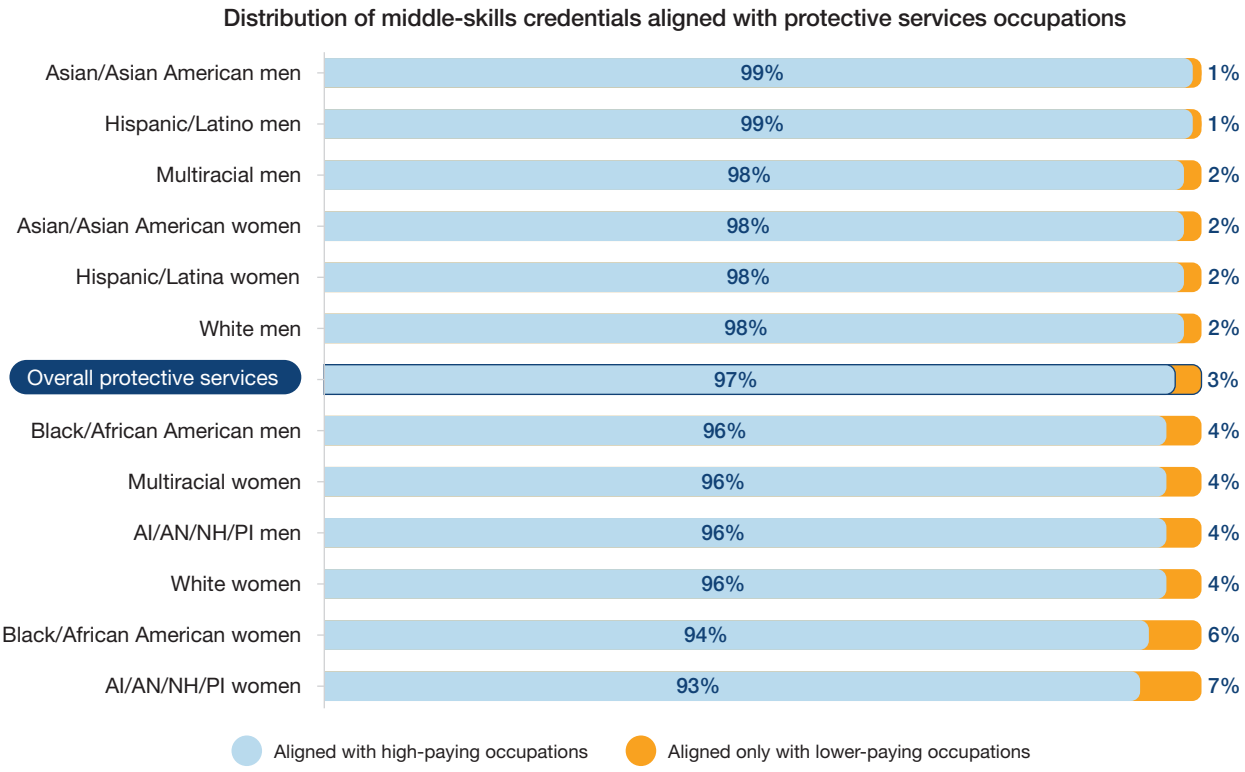
Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Due to sample size limitations, we do not report values by gender for AI/AN/NH/PI and Asian/Asian American workers in the high-paying workforce. AI/AN/NH/PI workers account for 0.8 percent of the high-paying middle-skills protective services workforce, and Asian/Asian American workers account for 1.6 percent. Values may not sum to 100 percent due to rounding. Analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

The vast majority of all graduates with middle-skills credentials that align with protective services occupations earn them in programs that align with high-paying occupations.

Almost all middle-skills credentials granted that align with protective services occupations offer pathways to high-paying occupations alongside pathways to lower-paying occupations. In fact, more than two-thirds of credentials granted in programs aligned with protective services occupations are in just three programs, all of which have pathways to high-paying protective services occupations.[50] Among those who earn a middle-skills credential aligned with protective services, there is relatively little variation across racial/ethnic and gender groups in the likelihood that their credential will align with high-paying occupations, with Asian/Asian American men and Hispanic/Latino men being the most likely (99 percent for both groups) and AI/AN/NH/PI women (93 percent) being the least likely to earn a credential that aligns with high-paying occupations (Figure 19).

Figure 19. **Middle-skills protective services credentials almost always align with high-paying occupations.**



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

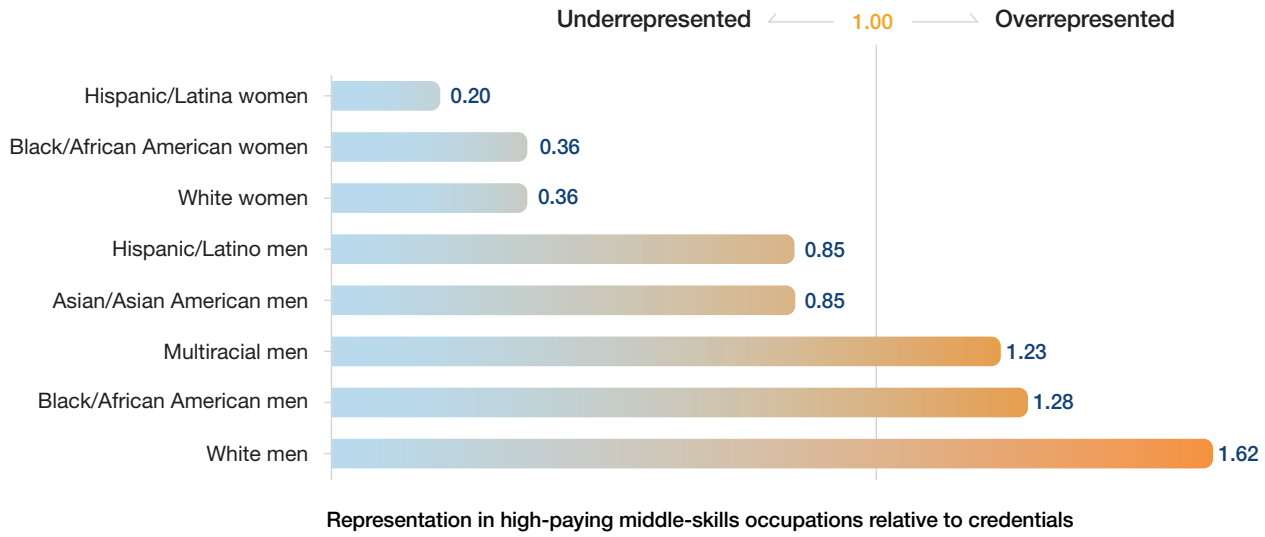
Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Values may not sum to 100 percent due to rounding. See Appendix C for the share of each race/ethnicity-by-gender group earning a middle-skills credential aligned with protective services occupations and the distribution of middle-skills credentials aligned with high-paying protective services occupations by race/ethnicity and gender.

50 The three programs awarding the largest numbers of credentials aligned with high-paying middle-skills protective services occupations include criminal justice/police science, criminal justice/law enforcement administration, and criminal justice/safety studies. Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

White, Black/African American, and multiracial men are overrepresented in high-paying middle-skills protective services occupations.

There is severe over- and underrepresentation of specific groups in high-paying middle-skills protective services occupations relative to the current distribution of credentials. Hispanic/Latina women, Black/African American women, and white women are particularly underrepresented in high-paying protective services occupations, as are Hispanic/Latino men and Asian/Asian American men. By contrast, white men, Black/African American men, and multiracial men are overrepresented in high-paying protective services occupations (Figure 20). Black/African American men and multiracial men are also overrepresented, and to an even greater extent, in lower-paying protective services occupations. Black/African American women and Asian/Asian American men are also overrepresented in lower-paying protective services occupations in addition to being underrepresented in high-paying protective services occupations.[51]

Figure 20. Hispanic/Latina women, Black/African American women, and white women are severely underrepresented in high-paying middle-skills protective services occupations relative to the distribution of credentials in programs that align with these occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: Representation ratios are calculated by dividing each race/ethnicity-by-gender group's share of the actual workforce distribution by their share of the expected distribution. The expected distribution is an estimate of what the race/ethnicity-by-gender distribution in high-paying occupations would be based on (1) the race/ethnicity-by-gender distribution among those who earn credentials that align with these occupations, and (2) the relative demand in high-paying versus lower-paying occupations for the aligned credentials that each race/ethnicity-by-gender group completes. See Appendix A for a more detailed description of this calculation. Results for American Indian/Alaska Native/Native Hawaiian/Pacific Islander men and women, Asian/Asian American women, and multiracial women are suppressed due to sample size limitations. Actual workforce distribution analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

51 See Appendix D for a comparison of expected versus actual representation of workers in high-paying and lower-paying protective services occupations relative to credential attainment.

Women account for more than 80 percent of high-paying middle-skills healthcare workers.

The middle-skills healthcare sector is unique in two primary ways. First, it is the only high-paying middle-skills occupational group for which there are not projected credential shortages, in part because of increasing demand for workers with bachelor's degrees. Second, women account for the majority of middle-skills healthcare workers, in both high-paying and lower-paying jobs.

However, there are significant differences by race/ethnicity in terms of representation in the high-paying and lower-paying occupations. White women account for 46 percent of lower-paying middle-skills healthcare workers and nearly 60 percent of high-paying middle-skills healthcare workers (Figure 21). Black/African American, Hispanic/Latina, and multiracial women hold a smaller proportion of jobs in high-paying healthcare occupations than in lower-paying healthcare occupations.

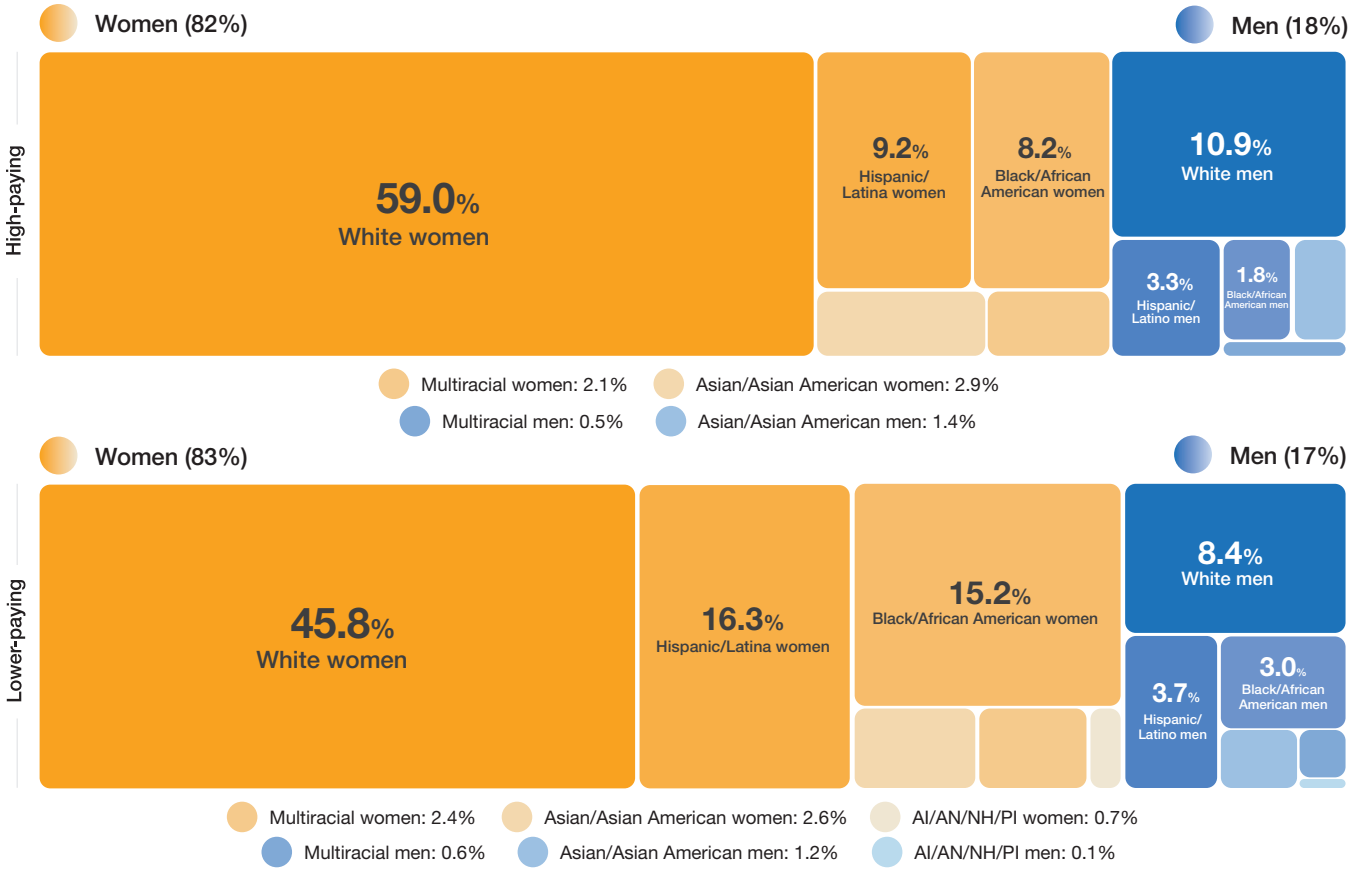
Examples of healthcare occupations that are high-paying for early-career middle-skills workers

High-paying middle-skills healthcare occupations include jobs in multiple categories, such as the following:

- Registered nurses
- Radiologic technologists and technicians
- Respiratory therapists
- Diagnostic medical sonographers
- Paramedics

For a complete list, see Appendix B.

Figure 21. Women account for the majority of both high-paying and lower-paying middle-skills healthcare workers, although white women account for a much larger share of high-paying workers than women from other racial/ethnic groups.



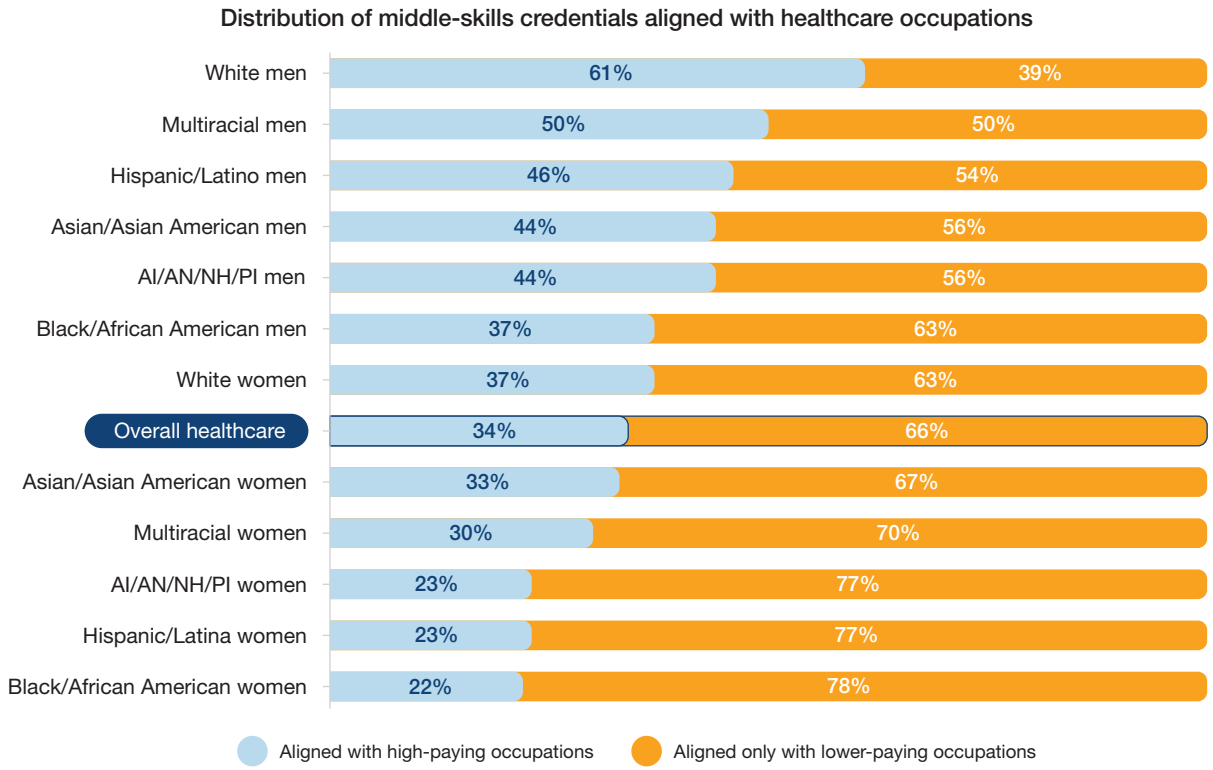
Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Due to sample size limitations, we do not report values by gender for AI/AN/NH/PI workers in the high-paying workforce. AI/AN/NH/PI workers account for 0.7 percent of the high-paying middle-skills healthcare workforce. Values may not sum to 100 percent due to rounding. Analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

Despite earning a small share of middle-skills healthcare credentials, men of all races/ethnicities are more likely than women to earn these credentials in programs that align with high-paying middle-skills occupations.

Slightly more than one-third of all middle-skills healthcare credentials granted are in programs that align with high-paying healthcare occupations (Figure 22). However, there is significant variation in this share by race/ethnicity and gender. Men earn only 16 percent of all middle-skills healthcare credentials, yet men of all race/ethnicities who do earn middle-skills healthcare credentials are more likely than women to earn them in programs that align with high-paying healthcare occupations. White men are the most likely to earn credentials that align with high-paying healthcare occupations (61 percent), while Black/African American women are the least likely to earn these credentials (22 percent).

Figure 22. White men are the most likely to obtain a middle-skills credential that aligns with high-paying healthcare occupations.



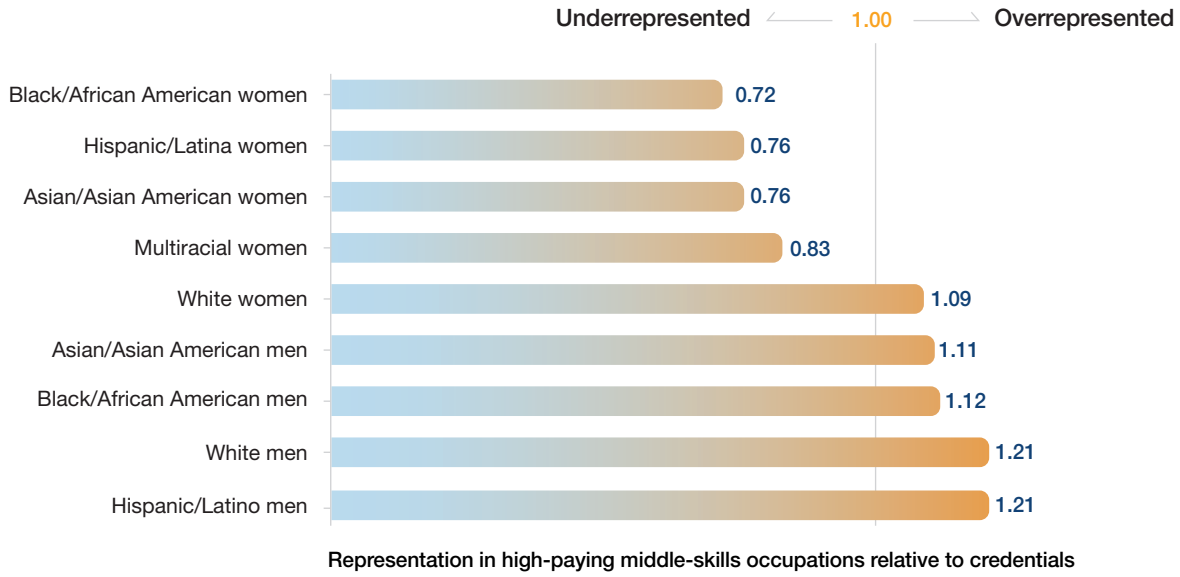
Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Values may not sum to 100 percent due to rounding. See Appendix C for the share of each race/ethnicity-by-gender group earning a middle-skills credential aligned with healthcare occupations and the distribution of middle-skills credentials aligned with high-paying healthcare occupations by race/ethnicity and gender.

White women are slightly overrepresented in high-paying middle-skills healthcare occupations relative to their credentials, while Black/African American, Hispanic/Latina, Asian/Asian American, and multiracial women are underrepresented in these occupations.

Despite accounting for a relatively small share of high-paying healthcare workers, men are overrepresented in high-paying middle-skills healthcare occupations relative to their share of credentials that align with these occupations. White women are also overrepresented relative to their share of these credentials, while Black/African American, Hispanic/Latina, Asian/Asian American, and multiracial women are all underrepresented (Figure 23).

Figure 23. Black/African American women are the most underrepresented group in high-paying middle-skills healthcare occupations relative to their credentials.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: Representation ratios are calculated by dividing each race/ethnicity-by-gender group's share of the actual workforce distribution by their share of the expected distribution. The expected distribution is an estimate of what the race/ethnicity-by-gender distribution in high-paying occupations would be based on (1) the race/ethnicity-by-gender distribution among those who earn credentials that align with these occupations, and (2) the relative demand in high-paying versus lower-paying occupations for the aligned credentials that each race/ethnicity-by-gender group completes. See Appendix A for a more detailed description of this calculation. Results for American Indian/Alaska Native/Native Hawaiian/Pacific Islander men and women and multiracial men are suppressed due to sample size limitations. Actual workforce distribution analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

Notably, Hispanic/Latina women and Black/African American women are overrepresented in lower-paying healthcare occupations relative to the credentials they hold, while they are underrepresented in high-paying healthcare occupations. This overrepresentation in lower-paying occupations is particularly severe for Black/African American women, whose share of lower-paying middle-skills healthcare jobs is more than double what would be expected based on the credentials they earn.[52] In other words, Black/African American women with middle-skills healthcare credentials may have particular difficulty finding jobs in high-paying healthcare occupations.

52 See Appendix D for a comparison of expected versus actual representation of workers in high-paying and lower-paying healthcare occupations relative to credential attainment.

Shortages represent an opportunity for men and women of all racial/ethnic backgrounds to obtain high-paying jobs.

Projected credential shortages provide educators and employers with the rare opportunity to strengthen the economy and broaden access to high-paying jobs for workers with middle-skills credentials in the process. Expanding access to high-paying jobs would yield positive economic outcomes for men and women of all races and ethnicities. However, making such a change is easier said than done, as broadening access to high-paying middle-skills occupations would require addressing disparities in field of study, among other measures.

The factors that lead students to choose one field of study over another are complex, rooted in their personal experiences and prior educational experiences. More specifically, the choice of what to study reflects broad differences in students' personal interests and goals and how their expectations are formed, along with the different educational barriers and constraints they encounter throughout the education system.

A thought experiment can help illuminate how shortages could be used to create more equitable access to opportunity. To conduct this thought experiment, we consider what a more equitable distribution of credentials leading to high-paying occupations might look like. We assume that students who are interested in a broad occupational group might choose to pursue a different credential within a broad field of study (for example, switching from a credential that aligns only with lower-paying occupations to one that aligns with high-paying occupations), but not that they might switch fields of study altogether. To account for the differences in students' interests, we use the distribution of all credentials aligned with each occupational group as our benchmark for a more equitable distribution of credentials that lead to high-paying occupations within that occupational group. In other words, we define a more equitable approach to addressing credential shortages as one in which the distribution of credentials that align with *high-paying* occupations in each occupational group matches the current distribution of credentials that align with both high-paying and lower-paying occupations in each occupational group.[53]

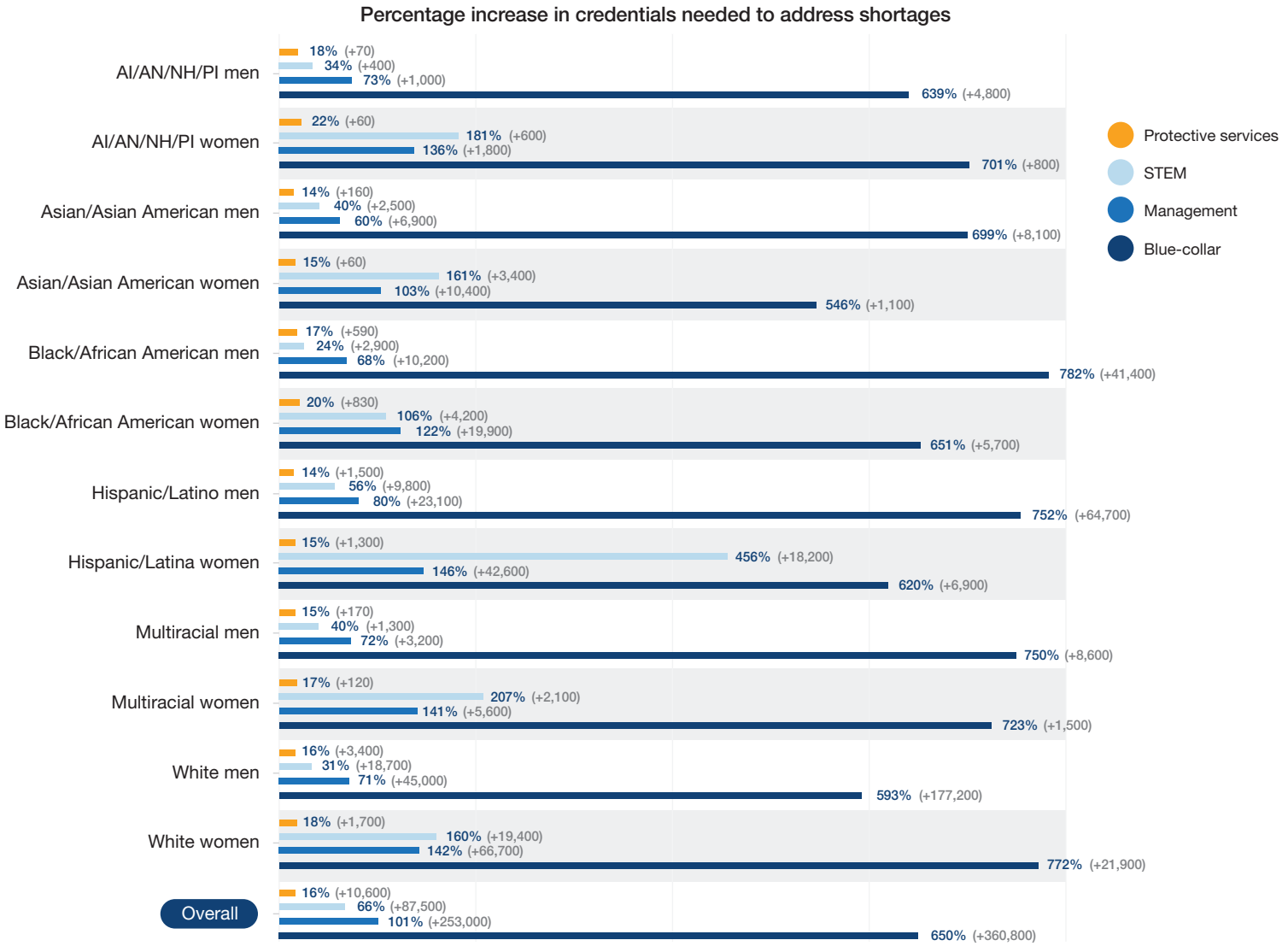
Across all four occupational groups in which there are shortages, every racial/ethnic and gender group would need to increase the number of credentials they earn in order to both address shortages across the economy and achieve a more equitable credential distribution. The increase would be greatest for credentials aligned with blue-collar occupations (with 360,800 more credentials needed annually through 2032), with the largest percentage increase needed for Black/African American men in credentials aligned with blue-collar occupations (782 percent).

The next largest increase annually through 2032 would be for credentials aligned with management and professional office occupations (253,000), followed by credentials for STEM occupations (87,500). With regard to credentials aligned with high-paying management and professional office occupations, Hispanic/Latina women would need the largest percentage increase (146 percent) in order to address the shortages in an equitable way. STEM fields have the largest variability among groups in terms of the likelihood of obtaining a credential aligned with high-paying occupations; thus, these fields have the largest variability in percentage increase required to address annual shortages in a more equitable way. Hispanic/Latina women would need to increase the number of credentials aligned with high-paying STEM occupations by 456 percent annually, while Black/African American men and white men would only need to increase their numbers of credentials by 24 percent and 31 percent, respectively.

Finally, credentials aligned with protective services occupations will require the smallest increases across all race/ethnicity and gender groups (10,600 credentials annually through 2032, an increase of 16 percent overall; Figure 24).

53 One limitation to this approach is that it does not account for how students' broad choice of field might be affected by factors such as their own and others' implicit biases and lack of representation in the field. The approach also does not attempt to remedy gaps in completion rates among groups. Thus, a truly equitable distribution would require more extensive changes beyond those accounted for in this analysis—involving not just changes within broad field of study, but increasing efforts to recruit and support more students in fields in which they are underrepresented, ideally as early as during their K–12 education.

Figure 24. Projected shortages present substantial opportunity for men and women of all races/ethnicities to earn credentials that align with high-paying middle-skills jobs.



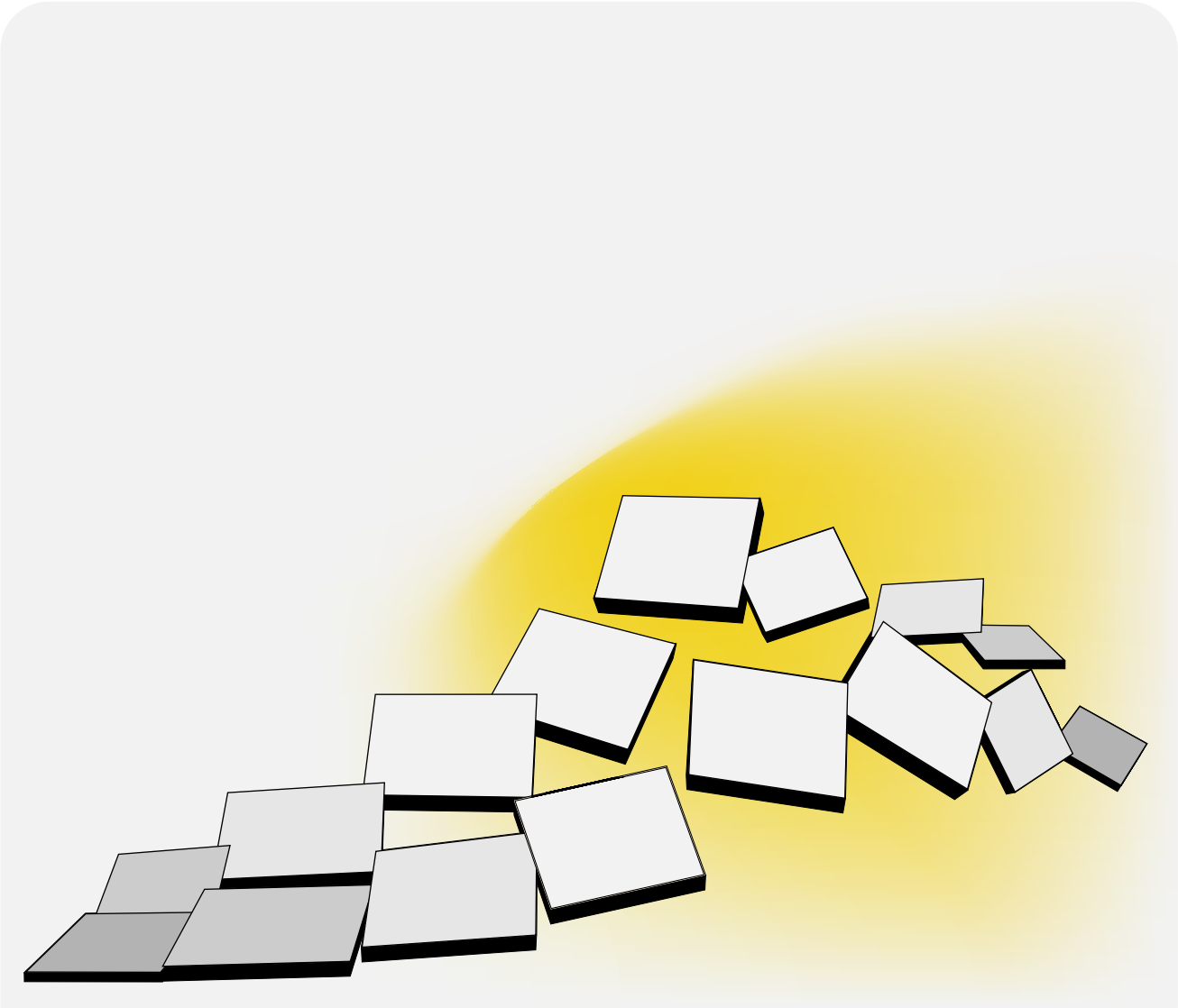
Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. STEM = science, technology, engineering, and mathematics. Values in parentheses indicate the number of additional credentials needed on an annual basis through 2032. Totals include estimates for nonresident men and women, as well as men and women of unknown racial/ethnic background. See Appendix E for tables.

Equitably meeting the demand for credentials that align with high-paying occupations will not, on its own, create equity in the high-paying middle-skills workforce. Unless high-paying middle-skills occupations also become more welcoming for historically underrepresented groups, these groups' representation in the high-paying middle-skills workforce will still fall short of what we would expect relative to their increased shares of credentials aligned with these occupations.[54] A change in credentials alone will not address all the sources of inequality in the workforce.

In the next section, we outline potential changes in policy and practice that could expand participation in programs leading to high-paying middle-skills jobs and break down barriers to high-paying middle-skills occupations for workers who hold the relevant credentials.

54 See Appendix F for a comparison of these distributions.



Part 3.

Policy and Practice Recommendations

Filling credential shortages and improving equity in the high-paying middle-skills workforce will require smoothing the pathways to credential attainment and work opportunities for students of all races/ethnicities and genders. Changes in policy and practice could help accomplish these goals by encouraging a broader group of potential workers to pursue pathways to high-paying middle-skills jobs and by lowering barriers for women and members of underrepresented racial/ethnic groups to enter and succeed in high-paying middle-skills occupations.

Better transfer pathways to the bachelor's degree would help healthcare workers move from high-paying middle-skills occupations without credential shortages to occupations with high need at the bachelor's-degree level.

The growing demand for healthcare workers with bachelor's degrees points to a need to improve the transition from two-year to four-year institutions. Better transfer pathways are particularly relevant for students interested in pursuing careers in nursing, as employers increasingly prefer to hire registered nurses (RNs) with educational attainment higher than an associate's degree.[55] In other healthcare occupations where large credential shortages are expected, such as physicians and healthcare educators,[56] workers are generally expected to have a bachelor's degree or higher.[57] With the right support to pursue further education, students with an interest in healthcare who start out on the middle-skills pathway could become candidates to fill these shortages.

Students starting out on the middle-skills pathway who are interested in earning a bachelor's or graduate degree in a healthcare field would benefit from clearer road maps to achieving this goal, starting with a more transparent and effective transfer system. While surveys indicate that the majority (80 percent) of community college students intend to transfer, slightly less than one-third of students do so.[58] Of those who do transfer, only about half actually complete a bachelor's degree.[59] These low success rates have major equity implications. Because students from historically underrepresented racial/ethnic groups and from low-income backgrounds are more likely than white students to be enrolled at two-year institutions,[60] the barriers to transfer from these institutions to four-year institutions perpetuate disparities in bachelor's degree attainment by race/ethnicity and socioeconomic class.

One substantial barrier to transfer is the lack of advising and support surrounding the transfer process. Students who intend to transfer are typically advised to enroll in general transfer programs and take general education courses,[61] but guidance doesn't go far beyond this advice unless students actively seek it out. One survey found that only 30 percent of students intending to transfer had spoken with someone at their college about the application process for transferring to a four-year college, and nearly 40 percent of those intending to transfer were unaware of information about transferring available to them on their college's website.[62]

This lack of support can lead students to waste time and money. Unclear articulation agreements specifying which course credits will transfer between institutions and unstructured, non-field-specific transfer programs can leave students unsure of which classes they need to take to successfully transfer to a four-year college and pursue a degree in their field of interest.[63] In fact, many students end up taking unnecessary credits, and those who transfer lose about 40 percent of their credits through the transfer process because the receiving institution does not accept these credits as counting toward students' credentials.[64]

55 American Association of Colleges of Nursing, "Nursing Workforce Fact Sheet," 2024.

56 GlobalData Plc., *The Complexities of Physician Supply and Demand*, 2024; American Association of Colleges of Nursing, "Fact Sheet: Nursing Faculty Shortage," 2024.

57 The typical entry-level education for physicians is a doctoral degree; for health educators, it is a bachelor's degree. US Bureau of Labor Statistics, "Physicians and Surgeons," 2024; US Bureau of Labor Statistics, "Health Education Specialists," 2024.

58 Center for Community College Student Engagement, *Helping Community College Students Climb the Transfer Ladder*, 2023. Among students at two-year institutions pursuing healthcare credentials, 74 percent report that they intend to continue on to a bachelor's degree program within five years. Of students with these intentions, only 25 percent had successfully transferred to a four-year institution within five years. Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Beginning Postsecondary Students Longitudinal Survey (BPS), 2012/2017.

59 National Student Clearinghouse Research Center, "Tracking Transfer," 2024.

60 Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Table 306.20 of the *Digest of Education Statistics*, 2023.

61 Fink et al., *Advancing Equity with Effective Community College Transfer Pathways*, 2023.

62 Center for Community College Student Engagement, *Helping Community College Students Climb the Transfer Ladder*, 2023.

63 Fink et al., *Advancing Equity with Effective Community College Transfer Pathways*, 2023.

64 US Government Accountability Office, *Higher Education*, 2017.

Easing the path to transfer will require major changes. With financing from state governments, institutions should fund and implement advising strategies that provide support and guidance throughout students' time at the institution. This support should connect students with an intended field of study and help them create a transfer plan as early as possible. Additionally, states can establish state- or system-wide articulation agreements that simplify the credit transfer process, ideally with major-specific pathways to ensure students are making steady progress toward their desired degree without wasting resources on unnecessary courses.[65]

Achieving equitable increases in high-paying middle-skills credentials will require new policies and practices to address long-standing disparities in credential attainment and field of study choice.

Improve the scope of and the capacity to collect labor-market data, and make these data more readily available to students.

Filling shortages of credentials that meet the needs of an area's labor market will require better data. Public two-year colleges, particularly those in rural areas, report that data accuracy and relevance are primary concerns, as data reported at the state level may be misleading at the local level.[66] Comprehensive, timely, and geographically specific labor-market data will allow institutions to identify which programs should be expanded and ensure they are teaching the skills graduates will need in the labor market.[67]

In addition to the need for higher-quality data, institutions also need to make better use of the data available to them—which may require both institutions and outside entities (such as state governments) to dedicate more resources to data support. A recent survey found that only 25 percent of respondents at public two-year institutions say they are capable of comprehensive data collection, analysis, and reporting.[68] Slightly more than half of respondents at public two-year institutions report that their institutions provide funding for products or services related to labor market information, and only 40 percent report having staff dedicated to using the data.[69]

Beyond using labor-market information to make decisions about programming, institutions should also share this information with students. While college major choice is complex and personal, exposure to labor-market information does appear to influence students' decisions.[70] Currently, though, only half of public two-year institutions that use labor-market data share this information with students.[71] Access to the most up-to-date and relevant data possible will allow students to make the most informed decisions regarding their education and careers. Federal efforts such as the Financial Value Transparency and Gainful Employment Act have instituted new reporting requirements intended to increase transparency about financial outcomes for students who received Title IV aid,[72] but institutions should do more than the minimum required by these regulations and communicate directly with students about likely program outcomes.

65 Fink et al., *Advancing Equity with Effective Community College Transfer Pathways*, 2023.
66 Van Noy et al., *How Colleges and Universities Are Using Labor-Market Information (LMI)*, 2023.
67 Aspen Institute College Excellence Program, *Using Labor Market Data to Improve Student Success*, 2014.
68 Van Noy et al., *How Colleges and Universities Are Using Labor-Market Information (LMI)*, 2023.
69 Van Noy et al., *How Colleges and Universities Are Using Labor-Market Information (LMI)*, 2023.
70 Baker et al., "The Effect of Labor Market Information on Community College Students' Major Choice," 2017.
71 Van Noy et al., *How Colleges and Universities Are Using Labor-Market Information (LMI)*, 2023.
72 US Department of Education, "Financial Value Transparency and Gainful Employment," 2023.

Expose students to a variety of subjects early, and foster a welcoming environment for historically underrepresented groups in high-paying middle-skills fields.

Societal norms and expectations likely play a strong role in students' educational and career interests, leading to disparities in major and occupation by gender and race/ethnicity. Many high-paying middle-skills occupations—particularly blue-collar, protective services, and STEM occupations—are historically male dominated. Women who are interested in these occupations may not see them as welcoming—or worse, they may be deterred by reports of harassment and discrimination.[73] Harassment and discrimination, as well as a lack of representation, may discourage members of racially/ethnically marginalized groups from entering these occupations as well.

In addition to fighting harassment and discrimination, combating disparities in field-of-study choice will require families, educators, and employers to introduce students to a diverse set of subjects and career options early and to create a welcoming environment in classrooms and workplaces. For example, research shows that exposing middle and high school girls to information about engineering increases their interest in pursuing these careers.[74] Similarly, evidence suggests that exposure to a field close to the time students choose a major can influence their decisions.[75]

Underlying beliefs about one's own intelligence or ability could also discourage some students from pursuing further education in certain fields. For example, research has found that children hold gender stereotypes about their own and others' abilities in math and science as early as first or second grade.[76] By high school, girls tend to assess their own math skills more harshly than boys assess their own, and girls are less likely to believe they will succeed in a STEM career—even though they generally earn the same number of math and science credits as boys and achieve higher grades in these courses.[77] The good news is that early exposure and intervention can mitigate the effects of these beliefs. Research has found that early exposure to positive role models in STEM careers can influence implicit biases about ability and increase retention of individuals from underrepresented groups in STEM fields.[78]

Finally, there is evidence that values play a part in field-of-study choice. In particular, research has shown that women are more likely than men to be interested in pursuing work that benefits their communities.[79] Research has also shown that students do not generally associate fields like engineering and computing with these communal goals.[80] However, evidence suggests that when women are encouraged to see a connection between scientific fields and communal goals, their interest in scientific careers increases.[81]

73 National Institute of Justice, *Women in Policing*, 2019; Hegewisch and Mefferd, *A Future Worth Building*, 2021; Funk and Parker, "Women and Men in STEM Often at Odds Over Workplace Equity," 2018.

74 Hill et al., *Why So Few?*, 2010.

75 Fricke et al., "Exposure to Academic Fields and College Major Choice," 2018; Patterson et al., "Timing Matters," 2021.

76 Cvencek et al., "Math-Gender Stereotypes in Elementary School Children," 2011.

77 Hill et al., *Why So Few?*, 2010.

78 Drury et al., "When Do Female Role Models Benefit Women?," 2011; Herrmann et al., "The Effects of a Female Role Model on Academic Performance and Persistence of Women in STEM Courses," 2016.

79 Hill et al., *Why So Few?*, 2010; Corbett and Hill, *Solving the Equation*, 2015.

80 Corbett and Hill, *Solving the Equation*, 2015.

81 Corbett and Hill, *Solving the Equation*, 2015.

Provide scaffolding to support college completion, including through investments in comprehensive counseling and support services.

At present, only 34 percent of first-time degree-seeking students at two-year institutions graduate within three years, with substantial disparities by race/ethnicity. Graduation rates at two-year postsecondary institutions are highest for Asian/Asian American and white students, at 44 percent and 38 percent, respectively. By contrast, graduation rates for Hispanic/Latino (31 percent), American Indian/Alaska Native (29 percent), multiracial (29 percent), Pacific Islander (28 percent), and Black/African American students (25 percent) are far lower.[82]

To achieve increased rates of credential attainment, students must receive comprehensive support from high school through early career, starting with counseling that introduces them to different career fields and connects them to the education and training they will require to pursue those fields. Dual enrollment can help students get a head start on earning college credits in high school, increasing the likelihood that they will earn a credential.[83]

This support should continue after students enter the postsecondary system. Students at community colleges are more likely to be from low-income backgrounds, work at least part-time, have children, and be from historically underrepresented racial/ethnic groups.[84] This student population faces unique barriers in their pursuit of a credential and thus requires targeted and comprehensive support services. Cohesive advising that integrates academic, career, and other nonacademic support services can contribute to students' success because students will not need to pursue each of these services in isolation.[85] Additionally, adults without a college degree frequently cite cost as a significant barrier to enrollment in and completion of a degree program.[86] Financial support services can alleviate this burden and encourage persistence. In fact, some of the most successful comprehensive support programs, such as Accelerated Study in Associate Programs (ASAP), include financial support in a variety of ways, such as through tuition waivers, transportation assistance, grocery gift cards, and free access to textbooks.[87]

82 Percentages are for the cohort that entered these institutions in 2019. US Department of Education, Table 326.20, *Digest of Education Statistics*, 2023.

83 Fink et al., *What Happens to Students Who Take Community College "Dual Enrollment" Courses in High School?*, 2017.

84 Community College Research Center, "An Introduction to Community Colleges and Their Students," 2021.

85 Brock and Slater, *Strategies for Improving Postsecondary Credential Attainment Among Black, Hispanic, and Native American Adults*, 2021.

86 Gallup and Lumina Foundation, *The State of Higher Education 2024*, 2024.

87 Miller and Weiss, *Increasing Community College Graduation Rates*, 2021.

Beyond improving equity in credential attainment, more action will be necessary to close gaps in the workforce.

Provide work-based learning opportunities, and build partnerships with employers.

To smooth the transition from education to work in high-paying middle-skills occupations, educators and employers must provide students with opportunities to connect with the workforce while they are still in school. Strong partnerships between educators and employers can help guide curriculum development and ensure that students learn in-demand skills while making connections in their industry. Several examples of these partnerships exist nationwide and show promising outcomes for both students and employers.[88] However, both community colleges and employers have indicated that there is much room for improvement.[89]

One key benefit of strong college–employer partnerships is more student access to work-based learning opportunities like internships, apprenticeships, and co-ops. Work-based learning opportunities can help students apply what they are learning in the classroom, clarify their career interests and goals, and practice using in-demand skills.[90] These experiences can translate to improved likelihood of employment and higher earnings.[91]

However, work-based learning opportunities are relatively rare, particularly for middle-skills workers—only 34 percent of young adults with an associate's degree and 15 percent of those with some college education have completed a work-based learning experience. By contrast, more than half (54 percent) of those with a bachelor's degree have work-based learning experience.[92] Disparities in work-based learning exist by gender and race/ethnicity as well. Women accounted for just 12 percent of active apprenticeships in 2021 and were more likely to hold these apprenticeships in lower-paying occupations like nursing assistants and pharmacy technicians.[93] Additionally, Black/African American men and women and Hispanic/Latina women are among the least likely to have had a paid internship experience.[94]

Paid work-based learning experiences will be key to increasing access to high-paying middle-skills occupations for students pursuing middle-skills credentials. Many of these students are already working, although they are employed in fields that do not align with their desired careers;[95] they may struggle to schedule classes around work[96] and to maintain good grades while working too many hours.[97] For most students, this work is financially motivated,[98] so abandoning their jobs or cutting down on hours to make time for an unpaid work-based learning experience is not a viable option. Paid work-based learning opportunities allow students to tend to their financial needs while gaining relevant experience that will help their careers in the long term.

88 For examples, see Dailey et al., *Engaging Employers in Community College Workforce Education Programs*, 2017.

89 Fuller and Raman, *The Partnership Imperative*, 2022; Leavitt and Leigh, *Employer and Community College Partnerships*, 2023.

90 Cahill, *Making Work-Based Learning Work*, 2016.

91 Carnevale et al., *How Limits to Educational Affordability, Work-Based Learning, and Career Counseling Impede Progress Toward Good Jobs*, 2022.

92 Carnevale et al., *How Limits to Educational Affordability, Work-Based Learning, and Career Counseling Impede Progress Toward Good Jobs*, 2022.

93 Butrica et al., *Women in Apprenticeships and Nontraditional Occupations in the United States*, 2023.

94 Torpey-Saboe et al., *The Power of Work-Based Learning*, 2022.

95 Beer and Bray, *The College-Work Balancing Act*, 2019; Center for Community College Student Engagement, *The Intersection of Work and Learning*, 2020; Love and Rush-Marlowe, "Making Work-Based Learning Work Better for Community College Students," 2024.

96 Center for Community College Student Engagement, *The Intersection of Work and Learning*, 2020; Love and Rush-Marlowe, "Making Work-Based Learning Work Better for Community College Students," 2024.

97 Carnevale and Smith, *Balancing Work and Learning*, 2018.

98 Beer and Bray, *The College-Work Balancing Act*, 2019; Love and Rush-Marlowe, "Making Work-Based Learning Work Better for Community College Students," 2024.

Integrate career guidance with academic advising and other student support services, and provide ample opportunities for students to connect with employers.

Community colleges typically offer career counseling to students, but they often treat such counseling as secondary to, and disjointed from, academic advising and other student supports. Career support should instead be integrated with other student support services and should go beyond simply helping students choose a major that aligns with their interests. Advisors should share labor-market data with students, including information about projected demand and earnings potential in occupations of interest. They should also ensure that students are aware of occupations that are in demand and pay well, such as the high-paying middle-skills occupations discussed in this report. Once students choose a major, they should regularly meet with advisors to ensure that they are on track to complete their credential and that their courses align with their professional interests and goals.

Another important function of an effective advising system is the facilitation of connections with employers to help students build their networks. Employer connections are particularly important for students from low-income backgrounds, as they might not have access to mentors and role models in their desired fields.[99] By inviting employers to lead workshops and participate in guidance and advising,[100] colleges can help facilitate these connections. When nearing graduation, students can then leverage these networks to jump-start their careers. Advisors should provide support to students throughout the application and hiring process, and the advisors themselves should receive more and better preparation to provide this career-focused support.[101] Career services should be available to students even after they graduate so they aren't on their own if they need assistance early or even later in their careers.

99 Ross et al., *Work-Based Learning Can Advance Equity and Opportunity for America's Young People*, 2020; Chetty et al., "Social Capital and Economic Mobility," 2022.

100 Leavitt and Leigh, *Employer and Community College Partnerships*, 2023.

101 Rey, "Career Advising from the Primary Role Academic Adviser's Viewpoint," 2022.

Address bias in hiring and promotion, and ensure a welcoming workplace for individuals from underrepresented groups.

Research shows strong evidence of racial/ethnic discrimination in the hiring process,[102] and such discrimination likely plays a role in the disparities seen in the transition from completing a credential to working in an aligned high-paying occupation. Women and marginalized racial/ethnic groups also are held to higher standards for promotion than white men, including the expectation for them to have more total work experience, more job-specific experience, and more years with an employer in order to be promoted.[103] Higher barriers to promotion may have a particularly negative effect on women and marginalized racial/ethnic groups in high-paying middle-skills management occupations, as these occupations are frequently filled through promotion. Eliminating bias in hiring and promotion will be critical to achieving equitable representation in high-paying middle-skills occupations.

Beyond outright discrimination in hiring and promotion, additional factors may discourage women and members of marginalized racial/ethnic groups from entering or persisting in high-paying middle-skills occupations. Once in these occupations, women and members of marginalized racial/ethnic groups may experience unsupportive or even hostile work environments. For example, about half of women in STEM jobs report having experienced gender-based discrimination at work, and about one-fifth report experiencing sexual harassment at work (a statistic that likely understates the full extent of the problem because sexual harassment is "chronically underreported").[104] Tradeswomen report similar experiences.[105]

Further, more than 60 percent of Black/African American STEM workers report that they have experienced discrimination at work due to their race.[106] These experiences may discourage women and workers from marginalized racial/ethnic groups from persisting in these occupations. In fact, among tradeswomen who have seriously considered leaving the profession, harassment and lack of respect are among the most commonly cited reasons.[107] Additionally, family responsibilities typically fall more heavily on women, and these responsibilities can also prevent women from persisting or being promoted in their field of interest.[108]

While many of these changes will require substantial investment, a number of institutions and organizations have implemented successful programs that demonstrate that change is possible. And given the demand for qualified workers in these fields, everyone stands to benefit by equalizing opportunity and access to high-paying middle-skills jobs for men and women of all races/ethnicities.

102 Bertrand and Duflo, "Field Experiments on Discrimination," 2017; Neumark, "Experimental Research on Labor Market Discrimination," 2018; Quillian et al., "Meta-Analysis of Field Experiments Shows No Change in Racial Discrimination in Hiring over Time," 2017.

103 Smith, "Do the Determinants of Promotion Differ for White Men Versus Women and Minorities?," 2005; Yap and Konrad, "Gender and Racial Differentials in Promotions," 2009; Huang et al., "Gender Bias in Promotions," 2023; Benson et al., "'Potential' and the Gender Promotion Gap," 2024.

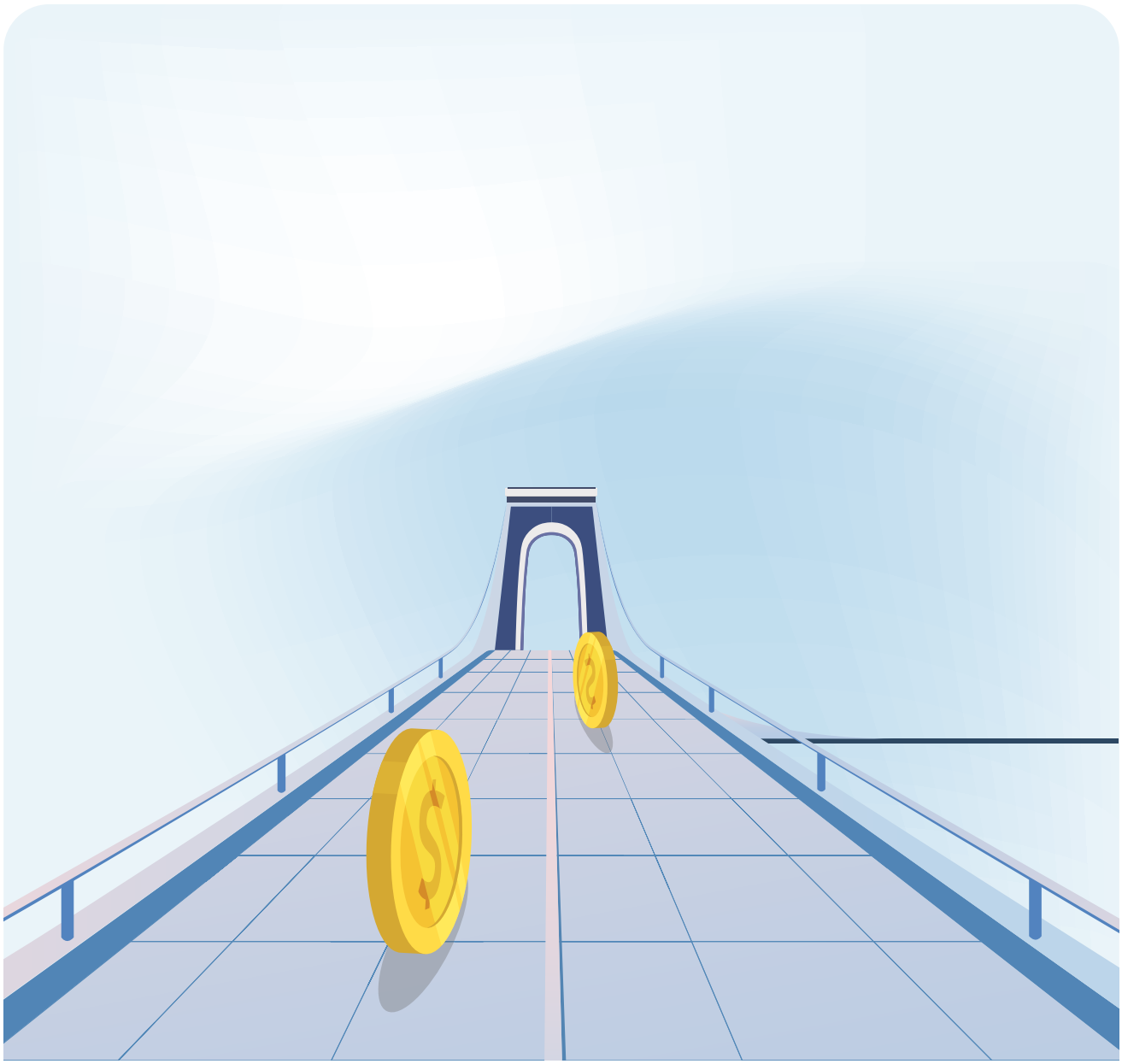
104 Funk and Parker, "Women and Men in STEM Often at Odds over Workplace Equity," 2018; Dahl and Knepper, "Why Is Workplace Sexual Harassment Underreported?," 2021.

105 Hegewisch and Mefferd, *A Future Worth Building*, 2021.

106 Funk and Parker, "Women and Men in STEM Often at Odds over Workplace Equity," 2018.

107 Hegewisch and Mefferd, *A Future Worth Building*, 2021.

108 Hill et al., *Why So Few?*, 2010; Hegewisch and Mefferd, *A Future Worth Building*, 2021.



Conclusion

Current and projected credential shortages in high-paying middle-skills occupations present a substantial opportunity for workers to earn a good living even if they don't complete a four-year degree. But to ensure that this opportunity is available to people of all genders and races/ethnicities, we need to widen the pathways to attainment of credentials that align with high-paying middle-skills jobs, as well as create more reliable transitions from those credentials to the labor market.

At present, the four high-paying middle-skills occupational groups with shortages of credentialed workers—blue-collar, management and professional office, STEM, and protective services—are male dominated. In part, this gender imbalance exists because among students who earn credentials aligned with these four occupational groups, men are more likely than women to do so in programs that align with high-paying occupations. Further, white men, multiracial men, and Hispanic/Latino men are overrepresented in high-paying middle-skills occupations relative to what we would expect based on the credentials they earn, while all other groups—including AI/AN/NH/PI men and women, Asian/Asian American men and women, Black/African American men and women, Hispanic/Latina women, multiracial women, and white women—are underrepresented. Creating equitable opportunity in these occupational groups will require better recruitment and retention in credential programs aligned with high-paying middle-skills occupations, along with changes in the workforce and in cultural norms to ensure that qualified individuals are able to use their skills in high-paying jobs.

Meanwhile, healthcare—the fifth high-paying occupational group, and the only one that is female dominated—has a surplus of aligned middle-skills credentials alongside a shortage of healthcare workers in jobs typically requiring a bachelor's degree or higher. For this occupational group, the challenge is not about how to attract more workers to relevant middle-skills credentials, but about how to ensure that workers with an interest in healthcare have strong pathways toward related four-year and graduate degrees, should they wish to pursue them.

Filling shortages in high-paying middle-skills occupations in a way that creates equitable access to opportunity for both men and women and people of all races/ethnicities—especially those in historically marginalized groups—is good for everyone: workers, employers, the American economy, and society at large. High-paying middle-skills jobs are relatively rare, and the ones that exist should reflect the country's rich diversity rather than opening yet another gap between the haves and the have-nots. This report and its recommendations are intended to shine a light on the opportunity that shortages represent and to prompt action to close opportunity gaps. By taking the steps outlined in this report, we can better connect skilled workers of all backgrounds to high-paying middle-skills employment.

References

American Association of Colleges of Nursing. "Fact Sheet: Nursing Faculty Shortage." Updated May 2024.

American Association of Colleges of Nursing. "Nursing Workforce Fact Sheet." Updated April 2024.

Aspen Institute College Excellence Program. *Using Labor Market Data to Improve Student Success*. Aspen Institute, 2014.

Associated Press. "The U.S. Is Experiencing a Police Hiring Crisis." NBC News, September 6, 2023.

Bahr, Peter Riley, Grant Jackson, Jon McNaughtan, Meghan Oster, and Jillian Gross. "Unrealized Potential: Community College Pathways to STEM Baccalaureate Degrees." *Journal of Higher Education* 88, no. 3 (2017): 430–78.

Baker, Rachel, Eric Bettinger, Brian Jacob, and Iona Marinescu. "The Effect of Labor Market Information on Community College Students' Major Choice." Education Policy Initiative Working Paper 02-2017. Gerald R. Ford School of Public Policy, University of Michigan, Ann Arbor, 2017.

Beer, Allison, and Jacob B. Bray. *The College-Work Balancing Act*. Association of Community College Trustees, 2019.

Benson, Alan, Danielle Li, and Kelly Shue. "'Potential' and the Gender Promotions Gap." SSRN, March 4, 2024.

Bertrand, Marianne, and Esther Duflo. "Field Experiments on Discrimination." In *Handbook of Economic Field Experiments*, Vol. 1, edited by Abhijit Vinayak Banerjee and Esther Duflo. Elsevier, 2017.

Brock, Thomas, and Doug Slater, eds. *Strategies for Improving Postsecondary Credential Attainment Among Black, Hispanic, and Native American Adults*. Community College Research Center at Teachers College, Columbia University, 2021.

Butrica, Barbara A., Daniel Kuehn, and Madeleine Sirois. *Women in Apprenticeships and Nontraditional Occupations in the United States: Apprenticeship Evidence-Building Portfolio*. Urban Institute, 2023.

Cahill, Charlotte. *Making Work-Based Learning Work.* Jobs for the Future, 2016.

Carnevale, Anthony P., Kathryn Peltier Campbell, Ban Cheah, Artem Gulish, Michael C. Quinn, and Jeff Strohl. *How Limits to Educational Affordability, Work-Based Learning, and Career Counseling Impede Progress Toward Good Jobs*. Georgetown University Center on Education and the Workforce, 2022.

Carnevale, Anthony P., and Nicole Smith. *Balancing Work and Learning: Implications for Low-Income Students*. Georgetown University Center on Education and the Workforce, 2018.

Carnevale, Anthony P., Nicole Smith, and Artem Gulish. *Women Can't Win: Despite Making Educational Gains and Pursuing High-Wage Majors, Women Still Earn Less than Men*. Georgetown University Center of Education and the Workforce, 2018.

Carnevale, Anthony, Nicole Smith, Martin Van Der Werf, and Michael C. Quinn. *After Everything: Projections of Jobs, Education, and Training Requirements Through 2031*. Georgetown University Center on Education and the Workforce, 2023.

Center for Community College Student Engagement. *The Intersection of Work and Learning: Findings from Entering Students in Community Colleges*. University of Texas at Austin, College of Education, Department of Educational Leadership and Policy, 2020.

Center for Community College Student Engagement. *Helping Community College Students Climb the Transfer Ladder*. University of Texas at Austin, College of Education, Department of Educational Leadership and Policy, 2023.

Chetty, Raj, Matthew O. Jackson, Theresa Kuchler, et al. "Social Capital and Economic Mobility." Non-Technical Research Summary. Opportunity Insights, August 2022.

Community College Research Center. "An Introduction to Community Colleges and Their Students." Policy Fact Sheet. Teachers College, Columbia University, 2021.

Corbett, Christianne, and Catherine Hill. *Solving the Equation: The Variables for Women's Success in Engineering and Computing*. American Association of University Women, 2015.

Cvencek, Dario, Andrew N. Meltzoff, and Anthony G. Greenwald. "Math-Gender Stereotypes in Elementary School Children." *Child Development* 82, no. 3 (2011): 766–79.

Dahl, Gordon B., and Matthew M. Knepper. *Why Is Workplace Sexual Harassment Underreported? The Value of Outside Options amid the Threat of Retaliation*. NBER Working Paper 29248. National Bureau of Economic Research, 2021.

Dailey, Caitlin Rose, Monica Mean, Ivan Charner, Kevin Jordan, and Steven Klein. *Engaging Employers in Community College Workforce Education Programs: Examples from the Field*. National Center for Innovation in Career and Technical Education, 2017.

Drury, Benjamin J., John Oliver Siy, and Sapna Cheryan. "When Do Female Role Models Benefit Women? The Importance of Differentiating Recruitment from Retention in STEM." *Psychological Inquiry* 22 (2011): 265–69.

Fink, John, Davis Jenkins, and Takeshi Yanagiura. *What Happens to Students Who Take Community College "Dual Enrollment" Courses in High School?* Community College Research Center, Teachers College, Columbia University, and National Student Clearinghouse Research Center, 2017.

Fink, John, Aurely Garcia Tulloch, Jessica Steiger, and Vikash Reddy. *Advancing Equity with Effective Community College Transfer Pathways*. Campaign for College Opportunity, 2023.

Fricke, Hans, Jeffrey Grogger, and Andreas Steinmayr. "Exposure to Academic Fields and College Major Choice." *Economics of Education Review* 64 (2018): 199–213.

Fuller, Joseph B., and Manjari Raman. *The Partnership Imperative: Community Colleges, Employers, and America's Chronic Skills Gap*. Harvard Business School, 2022.

Funk, Cary, and Kim Parker. "Women and Men in STEM Often at Odds over Workplace Equity." Pew Research Center, January 9, 2018.

Gallup and Lumina Foundation. *The State of Higher Education 2024*. Gallup, 2024.

GlobalData Plc. *The Complexities of Physician Supply and Demand: Projections from 2021 to 2036*. Association of American Medical Colleges, 2024.

Health Resources and Services Administration. "Health Workforce Projections." March 2024.

Hegewisch, Ariane, and Eve Mefferd. *A Future Worth Building: What Tradeswomen Say About the Change They Need in the Construction Industry*. Institute for Women's Policy Research, 2021.

Herrmann, Sarah D., Robert Mark Adelman, Jessica E. Bodford, Oliver Graudejus, Morris A. Okun, and Virginia S. Y. Kwan. "The Effects of a Female Role Model on Academic Performance and Persistence of Women in STEM Courses." *Basic and Applied Social Psychology* 38, no. 5 (2016): 258–68.

Hill, Catherine, Christianne Corbett, and Andresse St. Rose. *Why So Few? Women in Science, Technology, Engineering, and Mathematics*. American Association of University Women, 2010.

Huang, Ruidi, Erik J. Mayer, and Darius P. Miller. "Gender Bias in Promotions: Evidence from Financial Institutions." Southern Methodist University Cox School of Business Research Paper No. 21–18. SSRN, 2023.

Hyman, Mark, and Larry Deal. "Alarming Shortage: The Nation Is Facing a Critical Shortage of Firefighters." ABC News 33/40, March 7, 2024.

Leavitt, Melissa, and Elaine W. Leigh. *Employer and Community College Partnerships: Models and Practices for Supporting Students and Strengthening the Workforce*. Strada Education Foundation, 2023.

Love, Ivy, and Rachel Rush-Marlowe. "Making Work-Based Learning Work Better for Community College Students." New America, September 11, 2024.

Mabel, Zachary, Kathryn Peltier Campbell, Emma Nyhof, and Jeff Strohl. *Missed Opportunities: Credential Shortages in Programs Aligned with High-Paying Middle-Skills Jobs in 55 US Metro Areas*. Georgetown University Center on Education and the Workforce, 2024.

Miller, Cynthia, and Michael Weiss. *Increasing Community College Graduation Rates: A Synthesis of Findings on the ASAP Model from Six Colleges Across Two States*. MDRC, 2021.

National Institute of Justice. *Women in Policing: Breaking Barriers and Blazing a Path*. National Institute of Justice, 2019.

National Student Clearinghouse Research Center. "Tracking Transfer." Updated April 18, 2024.

Neumark, David. "Experimental Research on Labor Market Discrimination." *Journal of Economic Literature* 56, no. 3 (2018): 799–866.

Patterson, Richard W., Nolan G. Pope, and Aaron Feudo. "Timing Matters: Evidence from College Major Decisions." *Journal of Human Resources*, ahead of print, February 17, 2021.

Police Executive Research Forum. *Responding to the Staffing Crisis: Innovations in Recruitment and Retention*. Police Executive Research Forum, 2023.

Quillian, Lincoln, Devah Pager, Ole Hexel, and Arnfinn H. Midtbøen. "Meta-Analysis of Field Experiments Shows No Change in Racial Discrimination in Hiring over Time." *Proceedings of the National Academy of Sciences of the United States of America* 114, no. 41 (2017): 10870–5.

Rey, Beth. "Career Advising from the Primary Role Academic Adviser's Viewpoint: A Review of the Literature." National Association of Colleges and Employers, August 15, 2022.

Ross, Martha, Richard Kazis, Nicole Bateman, and Laura Stateler. *Work-Based Learning Can Advance Equity and Opportunity for America's Young People*. Metropolitan Policy Program at Brookings, 2020.

Smith, Ryan A. "Do the Determinants of Promotion Differ for White Men Versus Women and Minorities? An Exploration of Intersectionalism Through Sponsored and Contest Mobility Processes." *The American Behavioral Scientist* 48, no. 9 (2005): 1157–81.

Strohl, Jeff, Artem Gulish, and Catherine Morris. *The Future of Good Jobs: Projections Through 2031*. Georgetown University Center on Education and the Workforce, 2024.

Strohl, Jeff, Zachary Mabel, and Kathryn Peltier Campbell. *The Great Misalignment: Addressing the Mismatch Between the Supply of Certificates and Associate's Degrees and the Future Demand for Workers in 565 US Labor Markets*. Georgetown University Center on Education and the Workforce, 2024.

Torpey-Saboe, Nichole, Elaine W. Leigh, and Dave Clayton. *The Power of Work-Based Learning.* Strada Education Network, 2022.

US Bureau of Labor Statistics. "2018 Standard Occupational Classification System." Accessed May 22, 2025.

US Bureau of Labor Statistics. Table 1.3. Fastest Growing Occupations, 2023 and Projected 2033. In Employment Projections. 2024.

US Bureau of Labor Statistics. *Occupational Outlook Handbook*, Health Education Specialists. August 29, 2024.

US Bureau of Labor Statistics. "Nurse Anesthetists, Nurse Midwives, and Nurse Practitioners." *Occupational Outlook Handbook*. US Bureau of Labor Statistics, updated August 29, 2024.

US Bureau of Labor Statistics. "Physicians and Surgeons." *Occupational Outlook Handbook*. US Bureau of Labor Statistics, updated August 29, 2024.

US Census Bureau. American Community Survey (ACS), 2010–22. Ruggles, Steven, Sarah Flood, Matthew Sobek, Danika Brockman, Grace Cooper, Stephanie Richards, and Megan Schouweiler. IPUMS USA: Version 13.0 [data set]. IPUMS, 2023. https://doi.org/10.18128/D010.V13.0.

US Census Bureau. "Comparing 2020 American Community Survey Data." February 7, 2022.

US Census Bureau. Longitudinal Employer-Household Dynamics: Post-Secondary Employment Outcomes (PSEO). 2024.

US Department of Education, National Center for Education Statistics. Beginning Postsecondary Students Longitudinal Study (BPS). 2012–17.

US Department of Education, National Center for Education Statistics. Integrated Postsecondary Education Data System (IPEDS). 2019–21.

US Department of Education, National Center for Education Statistics (NCES). Table 306.20: Total Fall Enrollment in Degree-Granting Postsecondary Institutions, by Level and Control of Institution and Race/Ethnicity or Nonresident Status of Student: Selected Years, 1976 Through 2022. In *Digest of Education Statistics*. 2023.

US Department of Education, National Center for Education Statistics (NCES). Table 326.20: Graduate Rate from First Institution Attended Within 150 Percent of Normal Time for First-Time, Full-Time Degree/Certificate-Seeking Students at 2-Year Postsecondary Institutions, by Race/Ethnicity, Sex, and Control of Institution: Selected Cohort Entry Years, 2000 Through 2019. In *Digest of Education Statistics*. 2023.

US Department of Education, Office of Postsecondary Education. "Financial Value Transparency and Gainful Employment." *Federal Register* 88, no. 194 (October 10, 2023): 70004.

US Department of Labor, Bureau of Labor Statistics (BLS). Employment Projections: Employment by Detailed Occupation. 2023.

US Government Accountability Office. *Higher Education: Students Need More Information to Help Reduce Challenges in Transferring College Credits*. GAO-17-574. US Government Accountability Office, 2017.

Van Noy, Michelle, Monica Reid Kerrigan, Victoria Coty, Genevive Bjorn, and Jennifer Lenahan. *How Colleges and Universities Are Using Labor Market Information (LMI): A National Snapshot*. Rutgers University Education and Employment Research Center, May 2023.

West, Darrell M. *Improving Workforce Development and STEM Education to Preserve America's Innovative Edge*. Brookings Institution, 2023.

Wilkie, Dana. "Navigating the Blue-Collar Worker Shortage in America's Economy." SHRM, February 1, 2019.

Yap, Margaret, and Alison M. Konrad. "Gender and Racial Differentials in Promotions: Is There a Sticky Floor, a Mid-Level Bottleneck, or a Glass Ceiling?" *Industrial Relations/Relations Industrielles* 64, no. 4 (2009): 593–619.

Young, Ryan, Devon M. Sayers, and Ray Sanchez. "'We Need Them Desperately': US Police Departments Struggle with Critical Staffing Shortages." CNN, July 20, 2022.

Appendix A. Data Sources and Methodology

This appendix describes the data and analytical approach used to estimate misalignment between (1) the current supply of middle-skills credentials (certificates and associate's degrees) in programs aligned with high-paying middle-skills occupations and (2) the projected demand for workers with these credentials across the United States through 2032.

1. HIGH-PAYING MIDDLE-SKILLS OCCUPATIONS

We used five years of pooled American Community Survey (ACS) data (2016–19 and 2021) to identify the set of high-paying middle-skills occupations. We excluded the 2020 ACS sample due to the COVID-19 pandemic, which disrupted data collection and yielded a survey that is not appropriate for including in trend analyses.[1] We identified the set of high-paying middle-skills occupations using the following three steps:

- In Step 1, we estimated the distribution of earnings for early-career middle-skills workers ages 18–35[2] and defined workers with earnings in the top quartile (above $55,000 in 2023 dollars) as having a high-paying job.
- In Step 2, we estimated the distribution of earnings among 18-to-35-year-old middle-skills workers in each occupation and defined an occupation as high-paying when more than half of middle-skills workers in the occupation had a high-paying job.
- In Step 3, we estimated the proportion of 18-to-35-year-old workers in each occupation with middle-skills education or training (some college but no degree or an associate's degree) and restricted the set of high-paying occupations to those in which middle-skills workers accounted for more than 5 percent of the workforce.

Although this analysis focuses exclusively on middle-skills workers in these occupations, it is important to note that these occupations employ workers with various levels of educational attainment. In fact, only 24 percent of workers employed in these occupations have middle-skills levels of educational attainment, and this share varies significantly by occupational group (Table A1).

Table A1. Education distribution of early-career workers in occupations identified as high-paying for middle-skills workers, by occupational group

	High school diploma or less	Middle-skills	Bachelor's degree or higher	Total
Blue-collar	49%	36%	15%	100%
Healthcare	3%	30%	68%	100%
Management and professional office	13%	20%	67%	100%
Protective services	15%	48%	37%	100%
STEM	5%	11%	84%	100%
Overall	15%	24%	61%	100%

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

Note: Shares may not sum to 100 percent due to rounding.

1 For additional details, see US Census Bureau, "Comparing 2020 American Community Survey Data," 2022.

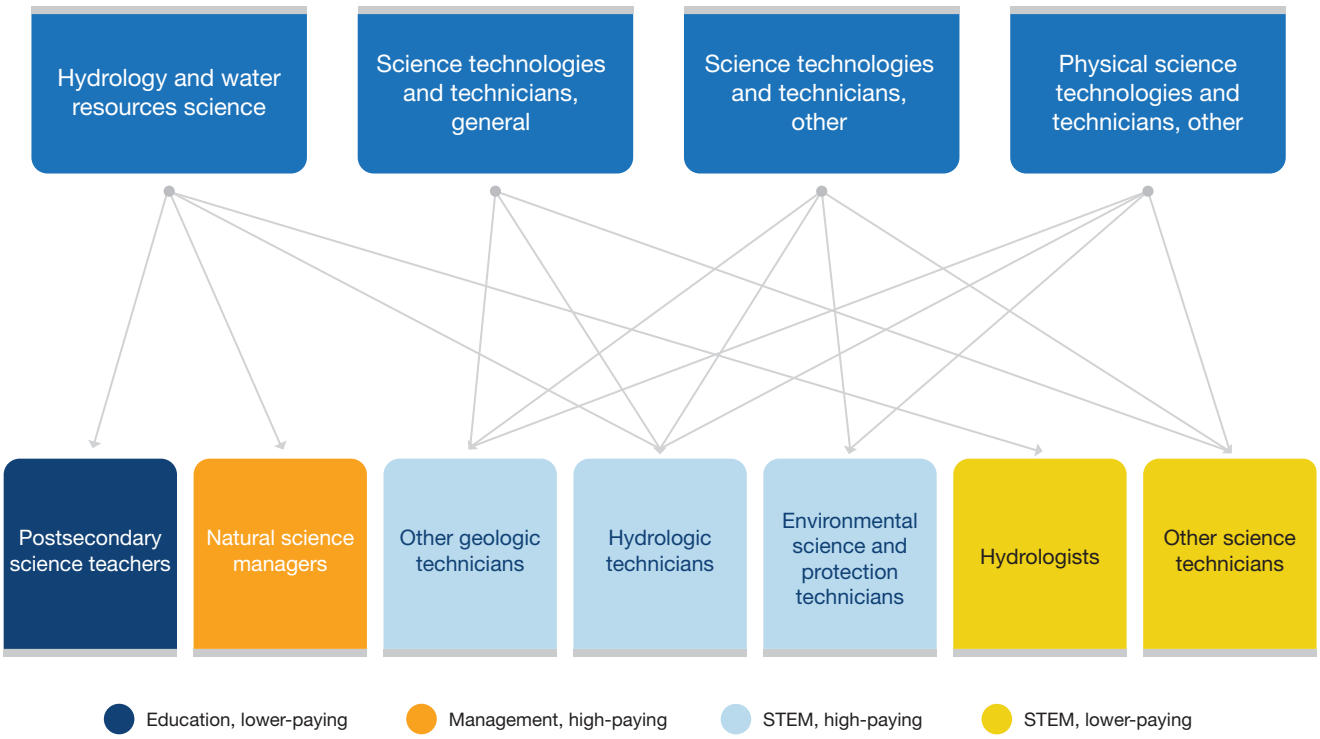
2 We limit this group to workers who reported that they usually work more than 10 hours per week and that they had worked at least 14 weeks in the previous year. We impose this sample restriction to remove workers whose attachment to the labor market is tenuous and whose realized earnings thus may not represent their true earning potential.

2. CURRENT SUPPLY OF MIDDLE-SKILLS CREDENTIALS ALIGNED WITH HIGH-PAYING OCCUPATIONS

To determine the current supply of certificates and associate's degrees awarded in programs aligned with high-paying middle-skills occupations, we relied on administrative data from the US Department of Education's National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS). Specifically, we used three years of pooled credentials data from the 2018–19 through 2020–21 academic years at the institution-by-field-of-study level.[3]

The credentials data in IPEDS are reported at the institution-by-field-of-study level using a six-digit Classification of Instructional Programs (CIP) code. To match the CIP codes from IPEDS with Standard Occupational Classification (SOC) codes for the set of high-paying middle-skills occupations, we used the 2020 CIP–SOC crosswalk developed by the US Bureau of Labor Statistics (BLS) and the US Department of Education's National Center for Education Statistics. Using the crosswalk to measure alignment is complicated by the fact that each program can align with multiple occupations and each occupation can align with multiple programs. Thus, in many instances, multiple programs lead to a specific occupation, and each program also offers pathways to a variety of high-paying and lower-paying occupations. In total, 349 middle-skills programs align with the 107 high-paying occupations. Another 486 middle-skills programs align with lower-paying occupations that also align with the 349 programs that provide a pathway to high-paying occupations.[4] Figure A1 provides an example of the various pathways between high-paying middle-skills occupations and credentials.

Figure A1. Credentials that offer pathways to high-paying occupations for middle-skills workers can also lead to lower-paying occupations.



Source: Georgetown University Center on Education and the Workforce analysis of data from the US Bureau of Labor Statistics (BLS) and the US Department of Education's National Center for Education Statistics Classification of Instructional Programs (CIP)–Standard Occupational Classification (SOC) crosswalk and data from the US Census Bureau, American Community Survey (ACS), 2016–19 and 2021.

3 Despite the COVID-19 pandemic's negative impact on college enrollments during this period, the annual number of certificates and associate's degrees conferred remained nearly unchanged between the pre-pandemic year of 2019 and the pandemic years of 2020 and 2021. Therefore, our use of IPEDS data covering middle-skills credentials conferred during the pandemic is unlikely to impact the findings in this report.

4 As we describe in the following section, we account for credential production in the other 486 programs to adjust for the projected overall demand in both high-paying and lower-paying occupations for workers educated in the 349 middle-skills programs aligned with the set of high-paying occupations.

3. PROJECTED DEMAND FOR MIDDLE-SKILLS WORKERS

To estimate the projected demand for high-paying middle-skills job openings, we relied on data from the BLS and the ACS. We started with the BLS national forecast of average annual occupational openings from 2022 through 2032. We used pooled ACS data from 2010 through 2022 to forecast the nationwide change in the share of 24-to-35-year-old workers with middle-skills credentials through 2032.[5,6] We estimated the change separately for high-paying and lower-paying occupations in each occupational group.

We used these forecasts to estimate the average annual number of projected middle-skills job openings nationwide in each occupation from 2022 through 2032. We obtained these estimates by multiplying the BLS overall national projections for each occupation by the average forecasted share of early-career jobs held by middle-skills workers from 2022 through 2032.

4. MEASURING MISALIGNMENT

Our analysis of labor-market alignment compares the number of credentials currently produced in programs aligned with high-paying middle-skills occupations with the projected number of total annual job openings (in both high-paying and lower-paying occupations) available to workers with those credentials.[7] We compare credential production against total job openings rather than openings only in high-paying occupations because many of the programs that align to these occupations also offer pathways to lower-paying occupations. Thus, it is necessary to account for the overall demand for workers with these credentials when determining if the credentials are being undersupplied or oversupplied.

The task of measuring labor-market alignment is made more difficult by the fact that the lower-paying occupations in this analysis draw workers not only from programs aligned with high-paying middle-skills occupations but also from hundreds of other programs that are not aligned with high-paying middle-skills occupations. We accounted for credential production in these other programs to obtain better estimates of the projected overall demand for workers educated in programs that align with high-paying middle-skills occupations.

After making this adjustment, we constructed two labor-market alignment metrics. First, we calculated the credentials-to-jobs ratio for each occupational group as follows:

$$\text{Credentials-to-jobs ratio} = \frac{\text{Annual number of credentials produced in programs aligned with high-paying occupations}}{\text{(Number of projected annual job openings in high-paying occupations + Adjusted number of projected annual job openings in lower-paying occupations)}}$$

This ratio estimates the extent to which the country will face a shortfall or surplus in the number of credentials aligned with high-paying middle-skills occupations. Ratio values below one indicate a shortage in credential production, values above one indicate a surplus in credential production, and values equal to one indicate perfect alignment between credential production and future occupational demand.

Second, we calculated the difference between the annual number of credentials produced that align with high-paying middle-skills occupations within the occupational group and the adjusted number of projected annual job openings available in all occupations for middle-skills workers with those credentials, assuming that each aligned credential granted represents one worker available to fill a job opening. When credential shortages exist, this metric provides an estimate of the annual number of additional middle-skills credentials in programs aligned with high-paying occupations that would need to be produced to meet projected demand for workers with those credentials through 2032. When credential surpluses exist, this metric provides an estimate of the annual number of credentials oversupplied relative to projected labor demand.

5 We restricted the data to workers ages 24–35 to forecast the change among early-career workers. Although some middle-skills workers begin their careers before age 24, most workers with a bachelor's degree do not. Thus, we excluded workers younger than age 24 to better estimate the evolution of employment opportunities for middle-skills workers.

6 As described earlier in this appendix with regard to high-paying middle-skills occupations, we excluded the 2020 ACS sample due to the COVID-19 pandemic.

7 One important limitation of the data used in this analysis is that while projected job openings are based on workers whose highest level of educational attainment is a middle-skills credential, the credential completion data do not differentiate by highest level of education. Thus, middle-skills credentials in programs aligned with high-paying occupations that are granted to those who already have a bachelor's degree or higher would still count toward the annual production of credentials in these programs.

5. EQUITABLY MEETING DEMAND FOR HIGH-PAYING MIDDLE-SKILLS CREDENTIALS

Based on the estimated shortage of middle-skills credentials in programs aligned with high-paying occupations, we calculated how the number and distribution of credentials would need to change to equitably meet the total demand for these credentials. In other words, we calculated how many credentials in programs aligned with high-paying occupations would need to be earned by individuals in each demographic group to both fill existing shortages and achieve representation in those programs on par with each group's overall representation in fields of study aligned with each occupational group. This calculation involved a three-step process:

- In Step 1, we calculated the total number of credentials that would need to be produced in each occupational group to meet total demand.
- In Step 2, we applied the race/ethnicity-by-gender distribution of credentials awarded in programs that align with any occupation (high-paying or lower-paying) in each occupational group to these totals to get the total number of credentials that would need to be awarded to each demographic group under a more equitable distribution that addresses these shortages.
- In Step 3, we took the difference between the number of credentials calculated in Step 2 and the current number of credentials to get the number of additional credentials each demographic group would need to meet total demand under a more equitable distribution.

6. EXPECTED VERSUS ACTUAL DISTRIBUTION OF THE HIGH-PAYING AND LOWER-PAYING WORKFORCE

As noted earlier in this appendix, the 349 programs that align with high-paying middle-skills occupations also align with lower-paying occupations. Consequently, we would expect workers with these credentials to be distributed across both the high-paying and lower-paying occupations with which these programs align. However, the extent to which workers sort into high-paying versus lower-paying occupations is likely to differ by demographic group for several reasons: (1) Programs aligned with high-paying occupations have different demographic compositions; (2) the relative demand for high-paying versus lower-paying occupations differs across programs; and (3) the overall likelihood of securing work in aligned fields may differ by demographic group for several reasons, including labor-market discrimination. We calculated the expected distribution of the high-paying and lower-paying workforce for each demographic group to account for the first two factors.[8] We followed a four-step process to calculate the expected distributions:

- In Step 1, we calculated the share of job openings associated with each occupation aligned with each field of study.
- In Step 2, we calculated the number of credential awardees expected to enter into each occupation by multiplying the number of credentials granted in a program in each demographic group by the share of job openings calculated in Step 1.
- In Step 3, we calculated the total number of awardees in each demographic group expected to enter high-paying and lower-paying occupations by taking the sum of the expected awardees in all high-paying and lower-paying occupations calculated in Step 2.
- In Step 4, we separately calculated the demographic distributions of the high-paying and lower-paying workforces by dividing the number of awardees expected to enter into high-paying and lower-paying occupations in each demographic group by the total number of awardees expected to enter into high-paying and lower-paying occupations across all groups.

We then compared the expected high-paying and lower-paying workforce distributions with the actual high-paying and lower-paying workforce distributions observed in the ages 18–35 middle-skills workforce in the ACS.

8 We followed the adjustment approach described in Part 4 of this appendix to better estimate the projected demand for lower-paying occupations to be filled by graduates in programs that align with high-paying middle-skills occupations.

Appendix B. High-Paying Middle-Skills Occupations by Occupational Group

Occupational group	Occupation code	Occupation title
Blue-collar	471011	First-line supervisors of construction trades and extraction workers
Blue-collar	472071	Paving, surfacing, and tamping equipment operators
Blue-collar	472072	Pile driver operators
Blue-collar	472073	Operating engineers and other construction equipment operators
Blue-collar	474021	Elevator and escalator installers and repairers
Blue-collar	475011	Derrick operators, oil and gas
Blue-collar	475012	Rotary drill operators, oil and gas
Blue-collar	475013	Service unit operators, oil and gas
Blue-collar	475022	Excavating and loading machine and dragline operators, surface mining
Blue-collar	475023	Earth drillers, except oil and gas
Blue-collar	475041	Continuous mining machine operators
Blue-collar	475049	Underground mining machine operators, all other
Blue-collar	475099	Extraction workers, all other
Blue-collar	491011	First-line supervisors of mechanics, installers, and repairers
Blue-collar	493041	Farm equipment mechanics and service technicians
Blue-collar	493042	Mobile heavy equipment mechanics, except engines
Blue-collar	493043	Rail car repairers
Blue-collar	499012	Control and valve installers and repairers, except mechanical door
Blue-collar	499041	Industrial machinery mechanics
Blue-collar	499044	Millwrights
Blue-collar	499045	Refractory materials repairers, except brickmasons
Blue-collar	499051	Electrical power-line installers and repairers
Blue-collar	511011	First-line supervisors of production and operating workers
Blue-collar	514111	Tool and die makers

Occupational group	Occupation code	Occupation title
Blue-collar	518011	Nuclear power reactor operators
Blue-collar	518013	Power plant operators
Blue-collar	518091	Chemical plant and system operators
Blue-collar	518092	Gas plant operators
Blue-collar	532011	Airline pilots, copilots, and flight engineers
Blue-collar	532012	Commercial pilots
Blue-collar	532021	Air traffic controllers
Blue-collar	532022	Airfield operations specialists
Blue-collar	534011	Locomotive engineers
Blue-collar	534013	Rail yard engineers, dinkey operators, and hostlers
Blue-collar	534031	Railroad conductors and yardmasters
Blue-collar	537021	Crane and tower operators
Healthcare	291126	Respiratory therapists
Healthcare	291141	Registered nurses
Healthcare	292031	Cardiovascular technologists and technicians
Healthcare	292032	Diagnostic medical sonographers
Healthcare	292033	Nuclear medicine technologists
Healthcare	292034	Radiologic technologists and technicians
Healthcare	292035	Magnetic resonance imaging technologists
Healthcare	292036	Medical dosimetrists
Healthcare	292043	Paramedics
Management	111011	Chief executives
Management	111021	General and operations managers
Management	111031	Legislators
Management	112021	Marketing managers
Management	112022	Sales managers
Management	113013	Facilities managers
Management	113021	Computer and information systems managers

Occupational group	Occupation code	Occupation title
Management	113051	Industrial production managers
Management	113061	Purchasing managers
Management	119021	Construction managers
Management	119041	Architectural and engineering managers
Management	119121	Natural sciences managers
Management	119161	Emergency management directors
Management	131051	Cost estimators
Management	131082	Project management specialists
Management	131111	Management analysts
Protective services	331012	First-line supervisors of police and detectives
Protective services	332011	Firefighters
Protective services	333021	Detectives and criminal investigators
Protective services	333051	Police and sheriff's patrol officers
Protective services	333052	Transit and railroad police
STEM	151211	Computer systems analysts
STEM	151212	Information security analysts
STEM	151241	Computer network architects
STEM	151242	Database administrators
STEM	151243	Database architects
STEM	151244	Network and computer systems administrators
STEM	151251	Computer programmers
STEM	151252	Software developers
STEM	151254	Web developers
STEM	152031	Operations research analysts
STEM	172011	Aerospace engineers
STEM	172021	Agricultural engineers
STEM	172031	Bioengineers and biomedical engineers
STEM	172041	Chemical engineers

Occupational group	Occupation code	Occupation title
STEM	172051	Civil engineers
STEM	172061	Computer hardware engineers
STEM	172071	Electrical engineers
STEM	172072	Electronics engineers, except computer
STEM	172081	Environmental engineers
STEM	172111	Health and safety engineers, except mining safety engineers and inspectors
STEM	172112	Industrial engineers
STEM	172121	Marine engineers and naval architects
STEM	172131	Materials engineers
STEM	172141	Mechanical engineers
STEM	172151	Mining and geological engineers, including mining safety engineers
STEM	172161	Nuclear engineers
STEM	172171	Petroleum engineers
STEM	172199	Engineers, all other
STEM	173021	Aerospace engineering and operations technologists and technicians
STEM	173022	Civil engineering technologists and technicians
STEM	173023	Electrical and electronic engineering technologists and technicians
STEM	173024	Electro-mechanical and mechatronics technologists and technicians
STEM	173025	Environmental engineering technologists and technicians
STEM	173026	Industrial engineering technologists and technicians
STEM	173027	Mechanical engineering technologists and technicians
STEM	173028	Calibration technologists and technicians
STEM	173029	Engineering technologists and technicians, except drafters, all other
STEM	194042	Environmental science and protection technicians, including health
STEM	194043	Geological technicians, except hydrologic technicians
STEM	194044	Hydrologic technicians
STEM	194051	Nuclear technicians

Source: US Bureau of Labor Statistics, "2018 Standard Occupational Classification System," accessed May 22, 2025.

Note: STEM = science, technology, engineering, and mathematics.

View a complete list of high-paying middle-skills occupations and aligned programs (sorted by occupation) on our website.

View a complete list of aligned programs and all high-paying and lower-paying occupations available to workers with those credentials (sorted by program of study) on our website.

Appendix C. Share of Each Race/Ethnicity-by-Gender Group Earning a Middle-Skills Credential Aligned with Each Occupational Group

Table C1. Share of middle-skills credentials by aligned occupational group, by race/ethnicity and gender

	Blue-collar	Healthcare	Management and professional office	Protective services	STEM	All other middle-skills credentials
AI/AN/NH/PI men	33%	9%	20%	5%	17%	27%
AI/AN/NH/PI women	3%	30%	19%	2%	7%	43%
Asian/Asian American men	12%	10%	34%	3%	20%	35%
Asian/Asian American women	1%	23%	29%	1%	9%	43%
Black/African American men	28%	8%	23%	4%	16%	31%
Black/African American women	2%	34%	18%	3%	5%	41%
Hispanic/Latino men	22%	8%	24%	6%	15%	34%
Hispanic/Latina women	2%	24%	21%	3%	8%	49%
Multiracial men	21%	8%	24%	5%	18%	36%
Multiracial women	2%	26%	20%	2%	8%	47%
White men	27%	8%	21%	5%	19%	29%
White women	3%	32%	18%	2%	6%	43%

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. STEM = science, technology, engineering, and mathematics. Values sum to greater than 100 percent because some credentials align with more than one occupational group.

Table C2. Distribution of middle-skills credentials aligned with high-paying occupations, by occupational group and by race/ethnicity and gender

	Blue-collar	Healthcare	Management and professional office	Protective services	STEM
AI/AN/NH/PI men	1.4%	0.3%	0.5%	0.6%	0.9%
AI/AN/NH/PI women	0.2%	0.7%	0.5%	0.4%	0.2%
Asian/Asian American men	2.1%	1.4%	4.6%	1.8%	4.7%
Asian/Asian American women	0.4%	3.2%	4.0%	0.7%	1.6%
Black/African American men	9.6%	1.9%	5.9%	5.3%	9.0%
Black/African American women	1.6%	8.7%	6.5%	6.6%	3.0%
Hispanic/Latino men	15.0%	5.0%	12.0%	16.0%	13.0%
Hispanic/Latina women	2.0%	11.0%	12.0%	13.0%	3.0%
Multiracial men	2.1%	0.8%	1.8%	1.8%	2.5%
Multiracial women	0.4%	2.2%	1.6%	1.1%	0.7%
Nonresident men	1.0%	0.1%	1.9%	0.3%	1.7%
Nonresident women	0.2%	0.5%	1.8%	0.2%	0.7%
Unknown men	4.1%	0.9%	2.1%	2.3%	3.1%
Unknown women	0.6%	2.4%	1.7%	1.2%	0.8%
White men	54.0%	15.0%	25.0%	34.0%	46.0%
White women	5.1%	46.0%	19.0%	15.0%	9.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. STEM = science, technology, engineering, and mathematics. Values may not sum to 100 percent due to rounding.

Appendix D. Expected-Versus-Actual Representation Ratios

Table D1. Expected-versus-actual representation ratios (based on credential attainment) in the high-paying and lower-paying workforce by occupational group, race/ethnicity, and gender

	Blue-collar		Healthcare		Management		Protective services		STEM		Overall	
	High-paying	Lower-paying	High-paying	Lower-paying	High-paying	Lower-paying	High-paying	Lower-paying	High-paying	Lower-paying	High-paying	Lower-paying
AI/AN/NH/PI men	*	0.50	*	*	*	*	*	0.94	*	*	0.67	1.01
AI/AN/NH/PI women	*	*	*	*	*	*	*	*	*	*	0.43	0.47
Asian/Asian American men	0.53	0.69	1.11	*	0.49	0.72	0.85	1.33	0.83	0.89	0.62	0.74
Asian/Asian American women	*	*	0.76	*	0.29	0.51	*	*	*	*	0.43	0.32
Black/African American men	0.73	0.66	1.12	1.14	0.56	1.15	1.28	2.34	0.80	1.04	0.86	1.48
Black/African American women	1.09	1.39	0.72	2.17	0.35	0.77	0.36	1.15	0.71	0.83	0.49	0.75
Hispanic/Latino men	0.87	0.89	1.21	0.89	0.98	0.91	0.85	0.99	1.08	1.02	1.04	1.20
Hispanic/Latina women	0.76	1.18	0.76	1.24	0.52	0.60	0.20	0.43	0.80	0.56	0.48	0.41
Multiracial men	0.98	0.83	*	*	1.42	1.21	1.23	1.52	1.12	1.32	1.22	1.24
Multiracial women	*	0.96	0.83	*	0.83	0.79	*	*	*	*	0.64	0.52
White men	1.14	1.14	1.21	0.78	1.70	1.54	1.62	1.03	1.08	1.22	1.52	1.75
White women	0.84	1.12	1.09	0.99	0.91	1.16	0.36	0.61	0.95	0.72	0.82	0.71

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: Asterisks indicate that data are excluded due to small sample sizes. AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. STEM = science, technology, engineering, and mathematics. Representation ratios are calculated by dividing each race/ethnicity-by-gender group's share of the actual workforce distribution by their share of the expected distribution. The expected distribution is an estimate of what the race/ethnicity-by-gender distribution of high-paying occupations would be based on (1) the race/ethnicity-by-gender distribution among those who earn credentials that align with these occupations, and (2) the relative demand for high-paying versus lower-paying occupations aligned with the set of high-paying programs that each race/ethnicity-by-gender group completes. See Appendix A for a more detailed description of this calculation. Actual workforce distribution analysis is limited to early-career workers (ages 18–35) who reported working more than 10 hours per week and at least 14 weeks in the previous year.

Appendix E. Equitably Filled Shortages by Occupational Group

Table E1. Credential changes needed to fill shortages equitably in high-paying middle-skills blue-collar occupations

	Current credentials leading to high-paying middle-skills blue-collar occupations (annual)	Total credentials needed to fill shortages in high-paying middle-skills blue-collar occupations under a more equitable distribution (annual)	Credential change needed (#)	Credential change needed (%)
AI/AN/NH/PI men	800	5,600	4,800	639%
AI/AN/NH/PI women	100	900	800	701%
Asian/Asian American men	1,200	9,300	8,100	699%
Asian/Asian American women	200	1,300	1,100	546%
Black/African American men	5,300	46,700	41,400	782%
Black/African American women	900	6,600	5,700	651%
Hispanic/Latino men	8,600	73,300	64,700	752%
Hispanic/Latina women	1,100	8,000	6,900	620%
Multiracial men	1,200	9,800	8,600	750%
Multiracial women	200	1,700	1,500	723%
Nonresident men	600	2,600	2,100	361%
Nonresident women	100	500	400	386%
Unknown men	2,300	16,200	13,900	607%
Unknown women	300	2,000	1,700	521%
White men	29,900	207,100	177,200	593%
White women	2,800	24,800	21,900	772%
Total	**55,500**	**416,300**	**360,800**	**650%**

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Credential changes needed (both number and percentage) are calculated using unrounded numbers. Values may not sum due to rounding.

Table E2. Credential changes needed to fill shortages equitably in high-paying middle-skills management and professional office occupations

	Current credentials leading to high-paying middle-skills management and professional office occupations (annual)	Total credentials needed to fill shortages in high-paying middle-skills management and professional office occupations under a more equitable distribution (annual)	Credential change needed (#)	Credential change needed (%)
AI/AN/NH/PI men	1,300	2,300	1,000	73%
AI/AN/NH/PI women	1,300	3,200	1,800	136%
Asian/Asian American men	11,500	18,400	6,900	60%
Asian/Asian American women	10,100	20,600	10,400	103%
Black/African American men	14,900	25,100	10,200	68%
Black/African American women	16,300	36,200	19,900	122%
Hispanic/Latino men	29,000	52,000	23,100	80%
Hispanic/Latina women	29,100	71,800	42,600	146%
Multiracial men	4,500	7,700	3,200	72%
Multiracial women	4,000	9,500	5,600	141%
Nonresident men	4,700	7,300	2,700	57%
Nonresident women	4,400	8,400	4,000	89%
Unknown men	5,200	9,500	4,300	82%
Unknown women	4,200	10,000	5,800	137%
White men	63,400	108,400	45,000	71%
White women	47,100	113,800	66,700	142%
Total	**251,000**	**504,100**	**253,000**	**101%**

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Credential changes needed (both number and percentage) are calculated using unrounded numbers. Values may not sum due to rounding.

Table E3. Credential changes needed to fill shortages equitably in high-paying middle-skills protective services occupations

	Current credentials leading to high-paying middle-skills protective services occupations (annual)	Total credentials needed to fill shortages in high-paying middle-skills protective services occupations under a more equitable distribution (annual)	Credential change needed (#)	Credential change needed (%)
AI/AN/NH/PI men	410	490	70	18%
AI/AN/NH/PI women	280	340	60	22%
Asian/Asian American men	1,100	1,300	160	14%
Asian/Asian American women	420	480	60	15%
Black/African American men	3,400	4,000	590	17%
Black/African American women	4,200	5,100	830	20%
Hispanic/Latino men	10,500	12,000	1,500	14%
Hispanic/Latina women	8,300	9,600	1,300	15%
Multiracial men	1,200	1,300	170	15%
Multiracial women	720	850	120	17%
Nonresident men	180	200	30	15%
Nonresident women	160	180	30	18%
Unknown men	1,500	1,800	330	22%
Unknown women	790	1,000	220	28%
White men	21,600	25,000	3,400	16%
White women	9,600	11,300	1,700	18%
Total	**64,400**	**75,000**	**10,600**	**16%**

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. Credential changes needed (both number and percentage) are calculated using unrounded numbers. Values may not sum due to rounding.

Table E4. Credential changes needed to fill shortages equitably in high-paying middle-skills STEM occupations

	Current credentials leading to high-paying middle-skills STEM occupations (annual)	Total credentials needed to fill shortages in high-paying middle-skills STEM occupations under a more equitable distribution (annual)	Credential change needed (#)	Credential change needed (%)
AI/AN/NH/PI men	1,200	1,600	400	34%
AI/AN/NH/PI women	300	900	600	181%
Asian/Asian American men	6,300	8,800	2,500	40%
Asian/Asian American women	2,100	5,400	3,400	161%
Black/African American men	12,000	15,000	2,900	24%
Black/African American women	4,000	8,200	4,200	106%
Hispanic/Latino men	17,400	27,200	9,800	56%
Hispanic/Latina women	4,000	22,200	18,200	456%
Multiracial men	3,300	4,700	1,300	40%
Multiracial women	1,000	3,100	2,100	207%
Nonresident men	2,200	3,000	800	34%
Nonresident women	1,000	2,000	1,000	98%
Unknown men	4,100	5,200	1,100	27%
Unknown women	1,000	2,200	1,200	114%
White men	60,900	79,500	18,700	31%
White women	12,100	31,500	19,400	160%
Total	**133,000**	**220,400**	**87,500**	**66%**

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. STEM = science, technology, engineering, and mathematics. Credential changes needed (both number and percentage) are calculated using unrounded numbers. Values may not sum due to rounding.

Appendix F. High-Paying Workforce Representation Under an Equitable Credential Distribution

As discussed in Part 3, an equitable distribution of credentials aligned with high-paying middle-skills occupations would not be enough to achieve equity in the workforce on its own. Under a more equitable distribution of credentials, representation of currently underrepresented groups would improve but would still fall short of what we could expect based on credentials earned if patterns of over- and underrepresentation in the transition from credential to the workforce remain the same.

Table F1. Increasing equity in attainment of credentials aligned with high-paying occupations

	Current workforce distribution	New workforce distribution assuming same patterns of over- and underrepresentation	New expected distribution if over- and underrepresentation in the workforce were eliminated
Blue-collar			
AI/AN/NH/PI men	*	*	*
AI/AN/NH/PI women	*	*	*
Asian/Asian American men	1.2%	1.3%	2.5%
Asian/Asian American women	*	*	*
Black/African American men	7.1%	8.3%	11.3%
Black/African American women	1.5%	1.5%	1.3%
Hispanic/Latino men	13.7%	15.5%	17.8%
Hispanic/Latina women	1.4%	1.3%	1.7%
Multiracial men	2.3%	2.6%	2.6%
Multiracial women	*	*	*
White men	67.8%	62.3%	54.9%
White women	4.0%	4.6%	5.5%

	Current workforce distribution	New workforce distribution assuming same patterns of over- and underrepresentation	New expected distribution if over- and underrepresentation in the workforce were eliminated
Management and professional office			
AI/AN/NH/PI men	*	*	*
AI/AN/NH/PI women	*	*	*
Asian/Asian American men	2.0%	1.6%	3.3%
Asian/Asian American women	0.9%	0.9%	3.3%
Black/African American men	4.0%	3.3%	5.9%
Black/African American women	2.8%	3.1%	8.8%
Hispanic/Latino men	11.8%	10.5%	10.7%
Hispanic/Latina women	5.7%	7.0%	13.4%
Multiracial men	2.7%	2.3%	1.6%
Multiracial women	1.3%	1.6%	1.9%
White men	49.0%	41.6%	24.5%
White women	19.3%	23.2%	25.4%
Protective Services			
AI/AN/NH/PI men	*	*	*
AI/AN/NH/PI women	*	*	*
Asian/Asian American men	1.5%	1.5%	1.7%
Asian/Asian American women	*	*	*
Black/African American men	6.9%	7.0%	5.5%
Black/African American women	2.1%	2.1%	5.9%
Hispanic/Latino men	14.5%	12.0%	14.1%
Hispanic/Latina women	2.2%	2.6%	13.5%
Multiracial men	2.5%	2.5%	2.0%
Multiracial women	*	*	*
White men	63.9%	64.0%	39.6%
White women	5.3%	5.4%	14.9%

	Current workforce distribution	New workforce distribution assuming same patterns of over- and underrepresentation	New expected distribution if over- and underrepresentation in the workforce were eliminated
STEM			
AI/AN/NH/PI men	*	*	*
AI/AN/NH/PI women	*	*	*
Asian/Asian American men	3.9%	3.4%	4.1%
Asian/Asian American women	*	*	*
Black/African American men	7.3%	5.6%	7.0%
Black/African American women	2.1%	2.7%	3.8%
Hispanic/Latino men	12.7%	12.3%	11.3%
Hispanic/Latina women	2.0%	6.9%	8.6%
Multiracial men	3.0%	2.6%	2.3%
Multiracial women	*	*	*
White men	58.3%	47.1%	43.6%
White women	8.5%	13.7%	14.4%

Source: Georgetown University Center on Education and the Workforce analysis of data from the US Department of Labor, Employment Projections, 2023; the US Census Bureau, American Community Survey (ACS), 2010–22; and the US Department of Education, Integrated Postsecondary Education Data System (IPEDS), 2019–21.

Note: Asterisks indicate that data are excluded due to small sample sizes. AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander. STEM = science, technology, engineering, and mathematics.

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