

As Apprenticeships Expand, Breaking Down Occupational Segregation Is Key to Women's Economic Success

Gender, Race, and the Wage Gap in Apprenticeship



ABOUT THIS REPORT

Apprenticeships are structured training programs that combine paid on-the-job learning with classroom instruction and provide a pathway to industry-recognized qualifications in in-demand occupations. The apprenticeship route can offer an alternative to traditional college (and college debt), yet traditionally, women have been much less likely to be apprentices than men. Since 2015, the US government has invested over \$1 billion to expand apprenticeships.

This report assesses whether apprenticeship expansion has improved gender diversity in apprenticeships and whether apprenticeships deliver the same earnings to women and men who completed an apprenticeship. It analyzes data by gender, race, and ethnicity from the US Bureau of Labor Statistics' Registered Apprenticeship Partners Information Database System (RAPIDS) database.

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Contents

Executive Summary	5
Introduction	8
Women's Numbers Are Growing across Race and Ethnicity but Continue to Be Underrepresented in Apprenticeships	11
Completing an Apprenticeship Leads to Good Earnings for Women, Though the Gender Wage Gap Remains	14
Black and Multiracial Women Completers Had the Lowest Earnings Compared to White Men.....	16
Women Apprentices Are Much More Likely than Men to Be in Lower-Paying Fields.....	17
Black Women Were Most Likely to Be in Female-Dominated Apprenticeship Fields and Had the Lowest Exit Wage.....	18
Women's Earnings for Completed Apprenticeships Are Highest in Male-Dominated Industries	20
The Military Had the Highest Number of Women in Apprenticeships.....	20
Health Care and Social Assistance Does Not Deliver High Earnings for Women.....	21
Educational Services Produced a Particularly Large Gender Wage Gap.....	21
Apprenticeships in Construction Led to High Earnings for Women.....	21
Women's Share of Apprenticeships Has Increased in Low-Paying Industries and Decreased in High-Paying Industries.....	25
Men Outnumber Women Apprentices in Every State	26
Construction Apprenticeships: Leaders and Laggards	28
The Large Majority of Construction Apprenticeships Are Male-Only.....	29
Union Apprenticeship Programs Made More Progress with Including Women.....	30
Cancellation Rates Are High for Men and Even Higher for Women.....	31
Women Electrician Apprentices in Union Programs Were Almost Three Times as Likely to Complete Their Apprenticeships as Those in Non-Union Programs.....	31
Conclusions	34
Appendix A: Methodology	35
Appendix Table B: Women Apprenticeships by State, 2023	36
References	38

List of Figures and Tables

Figure 1. Registered Apprentices, 2014 to 2023.....	11
Table 1. Change in the Number of Apprentices by Gender, 2014 to 2023.....	12
Table 2. Change in the Number of Women Apprentices by Race and Ethnicity, 2014 to 2023.....	13
Figure 2. Women Who Completed an Apprenticeship Had Much Lower Earnings than Men.....	16
Table 3a. The 20 Apprentice Occupations with the Highest Number of Women in 2023.....	18
Table 3b. The 20 Apprentice Occupations with the Highest Number of Men in 2023.....	19
Table 4. The Distribution of Women and Men Apprentices Across Industry, 2023.....	23
Table 5. The Median Hourly Wage for Those Who Completed an Apprenticeship in 2023, by Industry and Gender.....	24
Table 6. The Distribution of Women Apprentices across the Largest Apprenticeship Industries for Women by Race and Ethnicity, 2023.....	25
Figure 3. Women’s Share of Apprenticeship Programs Varies Widely Among States, 2023.....	27
Figure 4. The Population of Women Construction Apprentices Is Very Diverse.....	29
Figure 5. Union Construction Programs Are Much More Likely to Include Women Apprentices than Non-Union Programs.....	30
Figure 6. Electrician Apprentices in Union Programs Have Much Higher Completion Rates than in Non-Union Programs.....	32

As Apprenticeships Expand, Breaking Down Occupational Segregation Is Key to Women's Economic Success

Gender, Race, and the Wage Gap in Apprenticeship

Executive Summary

Apprenticeships are structured training programs that combine paid on-the-job learning with classroom instruction and provide a pathway to industry-recognized qualifications in in-demand occupations. For workers, the apprenticeship route can offer an alternative to traditional college (and college debt), yet traditionally, women have been much less likely to be apprentices than men. Since 2015, the US government has invested over \$1 billion to expand apprenticeships to new occupations and sectors, modernize the apprenticeship system, and improve the gender and racial diversity of apprentices.

Apprenticeships are also at the heart of the federal infrastructure and clean economy investments. The Biden Administration has communicated a clear expectation that these investments should lead to good-paying jobs with family-sustaining wages that are accessible to workers of all backgrounds, including women and workers from underserved communities. Apprenticeships are central to ensuring that a skilled workforce is available to fulfill these commitments.

This report analyzes whether the commitments to greater gender and racial equity in apprenticeship pathways are being realized and whether women and men are equally likely to achieve jobs with family-sustaining wages following apprenticeships. Drawing on data from the US Bureau of Labor Statistics' Registered Apprenticeship Partners Information Database System (RAPIDS), the report provides data by gender, race, and ethnicity for occupations with the largest number of apprentices; analyzes differences in earnings by gender, race, and ethnicity of those who have completed, or exited, an apprenticeship; and provides state-level data on the share of women in apprenticeships. Because of the substantial role of construction trade apprenticeships for infrastructure and clean energy investments, the report pays particular attention to trends in gender and racial equity in that sector, including among electrical apprenticeships, which have the largest number of apprentices.

The report highlights that, when it comes to ensuring high wages for women, not all apprenticeships are the same. Apprenticeships in high-earning fields lead to high earnings for women. Expanding apprenticeships for women in lower-earning fields, as often occurs, leads to large wage gaps between women and men completing apprenticeships. While there are newly developed apprenticeships with high earnings for women (and men), these are still a small minority of all apprenticeships. The report concludes that a gender and racially equitable apprenticeship strategy must first and foremost focus on earning potential in an occupation. Improving women's access to long-established apprenticeships—such as in construction—remains one of the most promising strategies for ensuring equitable benefits from apprenticeship investments.

Key Takeaways

The number of women apprentices has grown strongly during the last decade, though women remain a minority of apprentices.

- As a result of recent US Department of Labor investments, apprenticeships have grown significantly over the past decade. In 2023, there were 108,140 women apprentices (including both active apprentices and those who completed within the year), more than three times as many as in 2014 (32,766). The share of women apprentices increased from 9.2 to 14.4 percent among all 638,978 registered apprentices.¹
- The number of apprentices has increased for women of all racial and ethnic groups. Between 2014 and 2023, the number of women apprentices increased by 230 percent, with the highest growth for Asian (302 percent) and Latina (349 percent) women. The number of Black women apprentices increased by 222 percent, White women by 204 percent, Native Hawaiian or Pacific Islander women by 162 percent, and American Indian or Alaska Native women by 81 percent.

Women were underrepresented in apprenticeships in every state, but the extent of underrepresentation varied substantially.

- The states with the highest share of women apprentices were West Virginia (36.5 percent) and South Carolina (35.4 percent); the states with the lowest share were Delaware (3.1 percent) and Oklahoma (3.5 percent).
- In the 44 states with construction industry data by gender, women's share of construction industry apprentices ranged from 1.6 percent in South Dakota to 10.7 percent in Massachusetts.

Apprenticeships can deliver good earnings for women, but because women's apprenticeships are expanding in lower-paying fields, there is a large wage gap between women and men who completed an apprenticeship.

- In 2023, the median hourly earnings for women who entered employment after completing an apprenticeship were \$22.00, substantially higher than the rate for all employed women ages 25 and older with some college or a completed Associate's degree (\$18.80). However, that figure is substantially lower than the median hourly earnings for men completers—\$32.20—a gender earnings ratio of just 64.3 percent (a gender wage gap of 35.7 percent).
- Black and multiracial women faced the largest wage gaps compared to White non-Hispanic men. Women of all racial/ethnic backgrounds have substantially lower earnings than White non-Hispanic men after completing apprenticeships, with Black and multiracial women facing the lowest earnings ratio (59.1 and 60.2 percent, respectively).

¹ Apprenticeship numbers are for FY 2023, covering October 2022 to September 2023. Totals include 7,154 apprentices with missing gender information; percent female was calculated only based on apprentices with gender information. Unless otherwise indicated, all apprentice data in this report are IWPR analyses of data from the U.S. Department of Labor Office of Apprenticeship Registered Apprenticeship Partners Information Database System (RAPIDS); for a discussion of the database and analysis, see Methodology section.

Behind the apprenticeship gender wage gap lies stark occupational gender segregation.

- In 2023, women comprised 84.7 percent of apprentices in the Health and Social Services industry (median hourly exit wage of \$20.67 for women and \$20.02 for men) but just 4.5 percent of apprentices in the Construction industry (median exit wage of \$34.00 for women and \$34.25 for men). The largest apprentice occupation for women in 2023 was Nurse Assistant (81.4 percent women), with an exit wage of \$17.32 for women, and \$17.00 for men). The largest apprentice occupation for men was Electrician (4.2 percent women), with a median hourly exit wage for women of \$34.64 and \$31.68 for men.
- Efforts to expand apprenticeship opportunities for women have succeeded in lower-paying fields. Since 2016, the share of all women apprentices in lower-paying Health and Social Services apprenticeships has increased from 5.6 to 16.0 percent. By contrast, the share of women in higher-paying Construction apprenticeships has actually decreased from 14.3 to 10.3 percent. Expanding apprenticeships for women thus has intensified occupational segregation and consigned more women to lower-paying positions.

The construction industry accounts for the largest number of apprentices overall, and for over 10,000 women apprentices; progress with integrating women into construction apprenticeships is very uneven but is higher in union programs.

- Nearly eight in ten (78.5 percent) of over 6,700 registered construction apprenticeship programs had no female apprentices. Where women did participate, a small fraction reported they were the only members of their sex in the program (543, constituting 5.2 percent of all women construction industry apprentices). However, at least 492 programs (7.1 percent) had at least 10 percent women. These more diverse programs accounted for 30 percent of all women construction apprentices.
- Union-sponsored construction programs have recruited and retained women significantly more than non-union programs. A quarter (25.3 percent) of union compared with 88.6 percent of non-union programs include no women; twice as many union as non-union programs had at least 10 percent women (13.1 and 5.9 percent, respectively). The completion rate for women electricians was nearly three times as high in union (58.3 percent) as in non-union (20.2 percent) programs.

Introduction

Apprenticeships are a powerful tool for creating a skilled workforce. The earn-as-you-learn apprenticeship model combines paid on-the-job training with off-the-job classroom instruction and provides a pathway to industry-recognized qualifications in in-demand occupations. For workers, the apprenticeship route can offer an alternative to traditional college (and college debt). Apprenticeships typically do not require educational credentials beyond a high school diploma, and some are also open to workers who have not completed high school. They can provide pathways out of the low-wage labor market into careers with family-sustaining wages and can deliver both short-term and lifetime earnings goals.² For employers, apprenticeships can help train and retain skilled workers, build loyalty to the company or industry, and respond to the need to replenish skills arising from the retirement of older workers.³ Yet apprenticeships in the United States are much less common than in many other countries and are more concentrated in a limited number of occupational groups, such as in the construction trades and other typically male-dominated fields like utilities and heavy truck driving (Lerman 2021). Women are much less likely to be apprentices than men (Butrica, Keuhn, and Sirois 2023).



Expanding apprenticeship has been an important component of federal workforce development policy.⁴ Since 2015, the US government has invested over \$1 billion to modernize and improve the administration and delivery of apprenticeships, expand apprenticeships to new occupations and sectors, and diversify access to women, minorities, and underserved communities beyond the traditional predominantly male and White apprentice population (Buttrica, Kuehn, and Sirois, 2023). The US Department of Labor's American Apprenticeship Initiative (AAI) works with states and employers to increase the uptake of existing apprenticeship pathways as well as the development of new programs in high-demand fields such as information technology, public administration, and health care (Krishan 2022; Elliott, Marotta, Henandez-Lepez, and Rayfield 2022; Walton, Gardiner, and Barnow 2022). While apprenticeships are more typical in middle-skill occupations (that is, occupations that require

² See, for example, Reed et al. (2012) on lifetime earnings gains, and Katz, Lerman, Kuehn, and Shakesprere (2022) on short-term gains for women.

³ For a recent review of research on the benefits of apprenticeships, see Butrica et al. (2023).

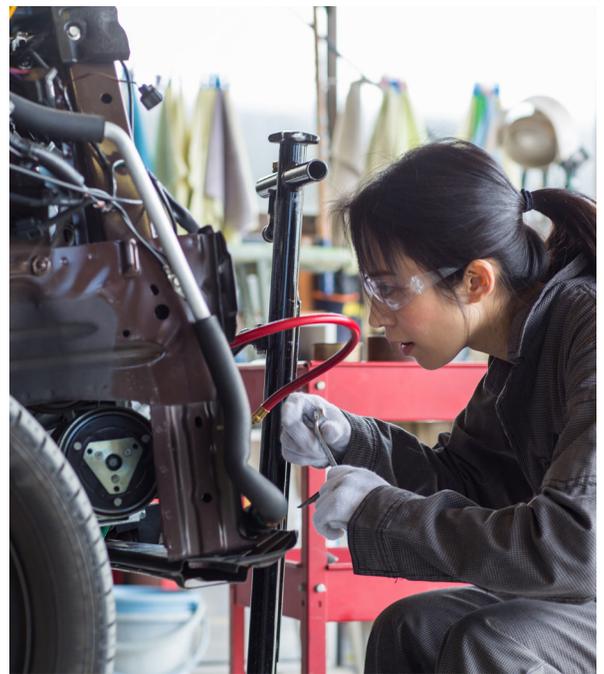
⁴ See, for example, Goger and Sinclair (2021).

some qualifications beyond high school completion but not a four-year college degree), some of these new pathways lead to occupations that typically require a four-year college degree (Love and McCarthy 2018; US Department of Education 2024).

Apprenticeships are also at the heart of federal infrastructure and clean economy investments. The Bipartisan Infrastructure Law (BIL), Inflation Reduction Act (IRA), and Creating Helpful Incentives to Produce Semiconductors and Science Act (CHIPS and Science Act) have committed close to \$2 trillion to rebuilding the nation's physical infrastructure, supporting a clean energy transition, and strengthening the domestic manufacturing sector (The White House 2022, 2023). The Biden Administration has communicated a clear expectation that these investments should lead to well-paying jobs with family-sustaining wages that are accessible to workers of all backgrounds, including women and workers from underserved communities.

Apprenticeships are vital to ensure that a skilled workforce is available to fulfill these commitments. Importantly, apprenticeships create pathways for underrepresented workers, such as women of all racial and ethnic backgrounds, to access the good jobs created by such investments (Walters 2023; Williams, Zhavoronkova, and Madland 2022).

The purpose of this report is to analyze whether the commitments to greater gender and racial equity in apprenticeship pathways are being realized and whether women and men are equally likely to achieve jobs with family-sustaining wages following apprenticeships. The report draws on data from the RAPIDS database, which collects data on apprentices in registered apprenticeship programs. Registered apprenticeships typically require annual minimums of 2,000 hours of on-the-job training or employment and 144 hours of classroom instruction (US Department of Labor Office of Apprenticeship n.d.) The report provides data by gender, race, and ethnicity for the occupations with the largest number of apprentices, analyzes differences in earnings by gender, race, and ethnicity of those who have completed or exited an apprenticeship, and provides state-level data on the share of women in apprenticeships. (A more detailed methodological note appears at the end of the report.) Because of the substantial role of construction trade apprenticeships for infrastructure and clean energy investments, the report pays particular attention to trends in gender and racial equity in that sector, including among electrical apprenticeships, the occupation with the largest number of apprentices.



The report highlights that not every apprenticeship guarantees high earnings for women; instead, completing apprenticeships in high-earning fields produces higher wages for women. Much of the expansion of apprenticeships for women has been in lower-earning fields, leading to high wage gaps between women and men completing apprenticeships. While there are newly developed apprenticeships with high earnings for women (and men), these are still a small minority of all apprenticeships. Moreover, they primarily provide alternative pathways to careers that typically

require a four-year college degree, such as Registered Nurses, K-12 Teachers, or Computer Programmers. While apprenticeship does offer economic advantages to women in every industry, the addition of an apprenticeship training model by itself does not raise the wages in lower-wage industries.

The report argues that focusing on women’s access to ‘traditional’ long-established apprenticeships—such as in construction—remains one of the most promising strategies for ensuring equitable benefits from apprenticeship investments. While overall, women remain starkly underrepresented in construction apprenticeships, such low performance is not uniform across programs. Some programs, particularly in the union sector, have made much more progress in attracting and retaining women. They show that change is possible. The report concludes that a gender and racially equitable apprenticeship strategy must first and foremost focus on earning potential in an occupation. While some new apprenticeships lead to high earnings for women, including in female-dominated fields, these remain a minority among the growing apprenticeships. Focusing on improving women’s access and retention in ‘traditional’ construction apprenticeships will be more beneficial to women’s economic security than expanding apprenticeships in female-dominated, lower-paid fields. Building careers with family-sustaining wages in low-paying women-dominated fields such as early education and health care requires different strategies for raising wages, such as collective bargaining and higher levels of public funding.

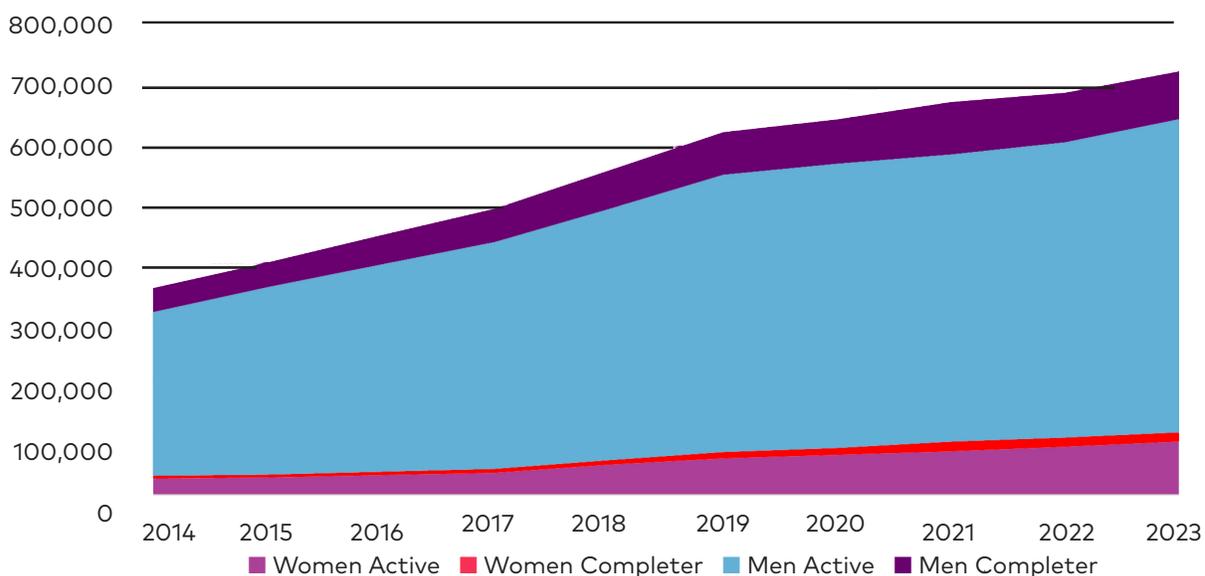


Women's Numbers Are Growing across Race and Ethnicity but Continue to Be Underrepresented in Apprenticeships

There was strong growth in the number of women and men apprentices between 2014 and 2023 for active apprentices and for completers of apprenticeships. Figure 1 illustrates the growing number of women among apprentices but also shows that women continue to be far from having an equal share of apprenticeships. In 2023, there were 108,140 women apprentices, including 92,250 active apprentices as well as 15,890 who completed a registered apprenticeship during that year.⁵ In the same year, there were 621,153 men apprentices (539,574 active apprentices and 81,579 completers).

Figure 1. Registered Apprentices, 2014 to 2023

Active Apprentices and Completers, by Gender



Source: IWPR analysis of RAPIDS data from FY 2014 to FY 2023 (October–September).

Notes: Completers are apprentices who successfully completed the requirements of their apprenticeship within the reference year; the RAPIDS database refers to the fiscal year (October to September of the following year), not the calendar year. Data are only included for active apprentices and completers identified as male or female in the database; in 2023, RAPIDS data included 7,154 active apprentices and 1,052 completers without a gender ID (see also Appendix A: Methodology).

While women were only one in seven (14.8 percent) of all apprentices in FY 2023, this was substantially higher than a decade earlier when they were fewer than one in ten (9.2 percent) of apprentices (Table 1). Further, although apprentice numbers grew strongly between 2014 and 2023 among both women and men, over a fifth of additional apprenticeships went to women and women's numbers grew at more than twice the rate of men's (230 compared to 97 percent higher; see Table 1).⁶

⁵ IWPR analysis of RAPIDS data; see also Notes in Figure 1. Unless otherwise indicated, in this report the number of apprentices in any year combines those who are active and those who have completed in a given year, counting all apprentices who were registered and not cancelled or suspended.

⁶ Between 2014 and 2023, women apprentices (active and completers) made up 20.2 percent of the 373,777 additional apprentices with a gender ID in the RAPIDS database.

Table 1. Change in the Number of Apprentices by Gender, 2014 to 2023

Active Apprentices and Completers, by Gender

	2014	2023	Growth (%) 2014-2023	Share of all (%)* 2024	Share of all (%)* 2023
Women	32,766	108,140	230%	9.2%	14.8%
Active apprentices	27,829	92,250	231%	9.0%	14.6%
Completers	4,937	15,890	222%	10.7%	16.3%
Men	323,750	621,153	92%	90.8%	85.2%
Active apprentices	282,736	539,574	91%	91.0%	85.4%
Completers	41,014	81,579	99%	89.3%	83.7%
No gender information	115	8,206	7036%	0.03%	1.1%
Active apprentices	101	7,154	6983%	0.03%	1.1%
Completers	14	1,052	7414%	0.03%	1.1%
All apprentices	356,631	737,499	107%	100%	100%
Active apprentices	310,666	638,978	106%	100%	100%
Completers	45,965	98,521	114%	100%	100%

Source: IWPR analysis of RAPIDS data from FY 2014 to FY 2023 (October–September).

Notes: Completers are apprentices who successfully completed the requirements of their apprenticeship within the reference year; the RAPIDS database refers to the fiscal year (October to September of the following year), not the calendar year.

The growth in the number of apprentices shown in Figure 1 and Table 1 partly reflects the inclusion of additional states in the RAPIDS database.⁷ A decade ago, the database mainly included data for states that were part of the federal apprenticeship system, while state-level apprenticeship systems maintained their own databases. Since then, the RAPIDS database was expanded to include data from almost all states. By 2023, the only state data still missing are from Minnesota, Wisconsin, and Washington, DC (see Appendix A: Methodology). Thus, the growth in apprentice numbers in the RAPIDS database may at least partly reflect the inclusion of data from additional states. Nonetheless, calculating women’s share of apprenticeships only among those states with data for 2014 and 2023 yields almost identical growth estimates for women’s share of all apprenticeships, from 9.3 and 15.2 percent.⁸

The number of women apprentices has grown among all racial and ethnic groups but at varying rates. Between 2014 and 2023, Latina apprentice and Asian women apprentice numbers grew most strongly, by 349 and 302 percent, respectively, while American Indian or Alaska Native (AIAN) and multiracial women apprentice numbers grew less strongly, by 81 and 82 percent, respectively (Table 2). Latinas account for over a quarter of all women apprentices (26.7 percent), much higher than their share of all employed women (17.1 percent in 2022⁹). Black women are also overrepresented among women apprentices (20.2 percent of women apprentices in 2023 compared with 13.0 percent¹⁰ of all employed women), while White women are comparatively underrepresented (43.4 percent compared with 60.6 percent¹¹ of all employed women; see Table 2).

⁷ The following states were not included in the database in earlier years: CT, DC, DE, KS, MA, MN, NY, NM, NV, OR, RI, WA, WI, VA, VT.

⁸ IWPR analysis of RAPIDS data.

⁹ IWPR calculation based on U.S. Bureau of Labor Statistics 2022.

¹⁰ IWPR calculation based on U.S. Bureau of Labor Statistics 2022.

¹¹ IWPR calculation based on U.S. Bureau of Labor Statistics 2022.

Table 2. Change in the Number of Women Apprentices by Race and Ethnicity, 2014 to 2023

	2014	2023	Growth (%) 2014–2023	Share of all (%)* 2014	Share of all (%)* 2023
American Indian or Alaska Native	578	1,048	81%	2.3%	1.2%
Asian	1,030	4,137	302%	4.0%	4.9%
Black or African American	5,318	17,139	222%	20.8%	20.2%
Hispanic or Latina	5,027	22,588	349%	19.7%	26.7%
Multiracial	1,129	2,050	82%	4.4%	2.4%
Native Hawaiian or Pacific Islanders	374	981	162%	1.5%	1.2%
White	12,109	36,792	204%	47.4%	43.4%
Participant did not self-identify	7,201	23,405	225%	22.0%	21.6%
Total	32,766	108,140	230%	-	-

Source: IWPR analysis of RAPIDS data from FY 2014 to FY 2023 (October–September).

Notes: Racial groups are non-Hispanic; Hispanic and Latinas can be of any race; racial and ethnic categories from RAPIDS database. Calculated based only on apprentice records with gender and racial ID. Apprentices are active apprentices plus completers; completers are defined as apprentices who completed their apprenticeships within the reference year.



Completing an Apprenticeship Leads to Good Earnings for Women, Though the Gender Wage Gap Remains



The earnings of women who completed an apprenticeship in 2023 and entered employment were substantially higher than the hourly earnings for all women. Across all different apprenticeship fields, the median hourly earnings for women who completed an apprenticeship in 2023 were \$22.00.¹² This is substantially higher than the median hourly earnings of all hourly-paid women (\$17.76) and also higher than the rate for all employed women ages 25 and older with some college or a completed Associate's degree (\$18.80).¹³ Unlike these national averages, which reflect women at all ages and levels of experience, the apprentice exit wage captures earnings at the beginning of a woman's professional qualification and, hence, likely underestimates the level of earnings of all women who completed an apprenticeship.

Yet, women who completed apprenticeships had much lower median hourly earnings than men. The median hourly exit wage for men was \$34.20. This difference in earnings translates into a gender earnings ratio of 64.3 percent (a wage gap of 35.7 percent; see Figure 2). This gender wage gap is much worse than the gender earnings ratio between all women and men of 83.7 cents on the dollar in 2022 (a wage gap of 16.3 percent).¹⁴ Someone working full-time year-round at the women's median hourly exit wage of \$22.00 would leave a family of three earning less than 200 percent of the federal poverty threshold of \$23.90.¹⁵ This level of earnings is suggested by the US Department of Labor as an indication of the quality of an apprenticeship program (US Department of Labor, Employment and Training Administration 2024). The full-time year-round annual earnings at women's median exit wage are

¹² The median is the midpoint of the earnings distribution at which half of all earners have higher and half have lower earnings. In FY 2023, 15,890 women completed their apprenticeship, and 62,515 men; earnings data are available for 69 percent of women completers, and for 77 percent of men; IWPR analysis of RAPIDS data.

¹³ Median hourly earnings for all women 25 years and older in 2022 who had completed an Associate's degree or some college based on U.S. Bureau of Labor Statistics (2024a), adjusted for annual inflation in 2023 of 3.4 percent (BLS "Consumer Price Index: 2023 in Review" The Economics Daily, January 19, 2024), <https://www.bls.gov/opub/ted/2024/consumer-price-index-2023-in-review.htm#:~:text=Consumer%20prices%20for%20all%20items,for%20food%20away%20from%20home>.

¹⁴ In 2023, the median weekly earnings ratio for women and men who worked at least 35 hours per week was 83.6 percent (Hegewisch and Gartner 2024).

¹⁵ Federal poverty levels are set annually for different sizes of households by the U.S. Department of Health and Human Services and inform access to federal benefits; households earning more than the 100 percent level but less than 200 percent are often still classified as working poor, earning too little to be fully self-sufficient. In 2023, for a family of three, 200 percent of the poverty level was \$49,720; see "Historical Poverty Guidelines through 2024: Poverty Guidelines for 48 Contiguous States," (Nonfarm) <https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines>; at the median hourly wage for women completers of \$22.00, full-time year-round earnings would be \$45,760.

also less than the median annual earnings of all full-time year-round women workers.¹⁶ This is not the case for men's median hourly exit wages. The equivalent full-time year-round earnings at the median hourly wage for men at \$34.20 per hour would be well above the poverty level and higher than the median annual earnings for all full-time year-round working men.¹⁷

While the overall number of women who have benefited from apprenticeships has increased since the large federal and state investment in apprenticeship, the expansion has failed to improve the relative earnings of women completers compared with men completers. The gender earnings ratio for completers of apprenticeships in 2023 (64.3 percent) was substantially lower than it was at the outset of the apprenticeship expansion and modernization initiative in 2016 (72.0 percent), 2017 (77.1 percent), and 2018 (75.9 percent).¹⁸



¹⁶ In 2022, the most recently available data, median earnings for full-time year-round working women were \$52,360 (Hegewisch and Mendoza 2023).

¹⁷ Working full-time year-round at the median exit wage for men would lead to earnings of \$66,976, higher median earnings for full-time year-round working men were \$62,350 in 2022 (Hegewisch and Mendoza).

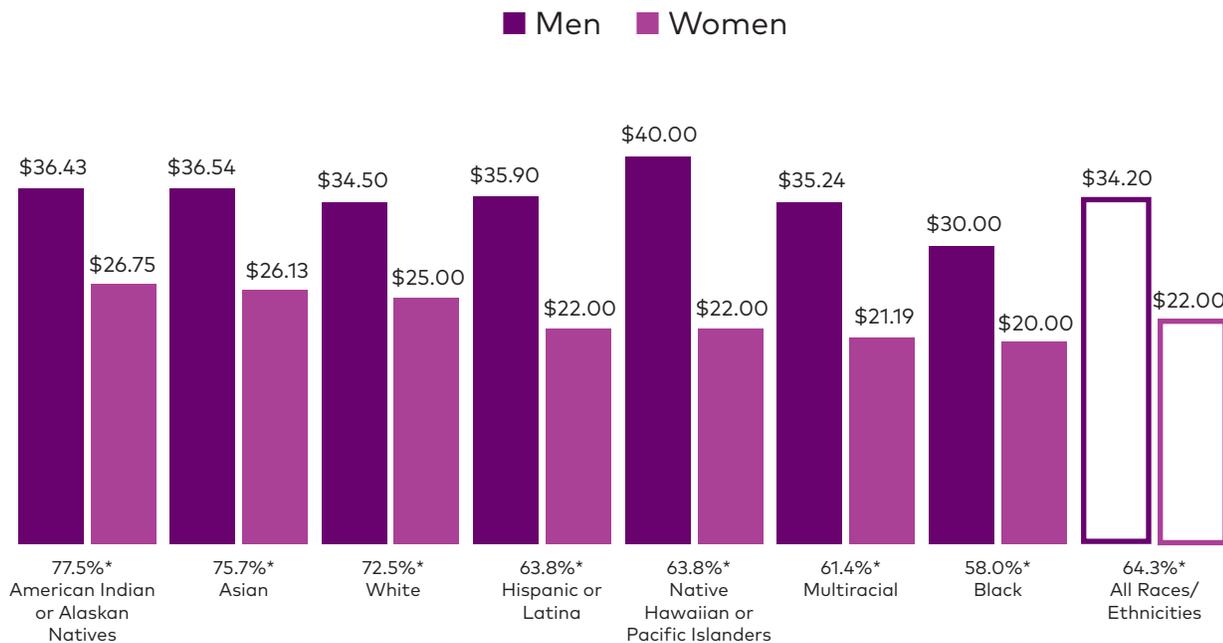
¹⁸ IWPR analysis of RAPIDS data.

Black and Multiracial Women Completers Had the Lowest Earnings Compared to White Men

Analyzing median hourly earnings by gender and race/ethnicity shows substantial earnings gaps for women of all racial and ethnic groups, whether compared with the earnings of White men or of men with the same racial or ethnic background (Figure 2). Black and multiracial women who completed an apprenticeship faced the largest gap in earnings compared to White men, with a median hourly earnings ratio of just 59.1 and 60.2 percent, respectively. While the earnings of Asian, White, and AIAN women are slightly higher, they have much lower earnings than White men, with earnings ratios of 72.9, 72.4, and 70.2 percent, respectively.¹⁹

Figure 2. Women Who Completed an Apprenticeship Had Much Lower Earnings than Men

Median Hourly Earnings and Gender Earnings Ratio for Completers of Apprenticeships by Gender, Race, and Ethnicity, 2023



Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

Notes: Racial and ethnic categories from RAPIDS database; racial categories are non-Hispanic; Hispanics can be of any race. Median hourly wage for people completing apprenticeships in FY 2023; the median is the midpoint in the earnings distribution at which half are paid more and half less per hour.

*Ratio of women’s median hourly wage to White Non-Hispanic men’s.

Particularly notable are the size of earnings differences compared to men of the same racial/ethnic group. Indeed, the median hourly earnings of men completers for all but Black completers were higher than White men’s (Figure 2). Apprenticeship expansion is delivering better results and earnings for men of color than for women of color.

¹⁹ IWPR analysis of RAPIDS database

Women Apprentices Are Much More Likely than Men to Be in Lower-Paying Fields

Lower hourly earnings for women who completed apprenticeships are due to women's overrepresentation in lower-paying occupations, not due to women's lower hourly earnings within each occupation. Tables 3a and 3b show the most common apprentice occupations for women and men, together with median hourly earnings for those who completed apprenticeships. In the majority of these occupations, the median exit wages for women are as high as or higher than those for men, and in just four of these occupations, women's median hourly earnings are less than 90 percent of men's. Differences in earnings within occupations likely reflect a number of factors, such as differences in the regional distribution of women and men apprentices or differences in union coverage. Yet they do not explain the large wage gap observed between all women and men who completed apprenticeships. These differences are due to women's greater likelihood to be in low-paying apprenticeship fields.



The most common apprentice occupation for women in 2023 was Nurse Assistant; the median hourly exit wage for women who completed an apprenticeship during 2023 was just \$17.32 (Table 3a). Five other apprentice occupations in the top 20 for women—Early Childhood Education and Care worker (\$14.00), Medical Assistant (\$15.51), Teacher Aide I (\$13.00), Cosmetologist (\$15.00), and Home Health Aide (\$16.75)—paid less than \$20.00 per hour, and in eight of them the exit wages are below the wage of \$23.90 per hour suggested as an indicator of a good apprenticeship by the US Department of Labor Employment and Training Administration (Table

3a).²⁰ Lower-paying apprentice occupations are much less common for men. Among the twenty most common apprentice occupations for men, only two—Automotive Technician Specialist (\$19.63) and Heavy Truck Driver (\$20.08)—had a median exit wage below \$23.90 an hour (Table 3b).²¹

Yet, the top twenty occupations for women also point to the potential of apprenticeships to lead to good-paying jobs. Nine of these fields had median hourly exit wages for women higher than \$30.00. With two exceptions, Registered Nurse (\$31.50) and Correction Officer (\$31.12), these higher-paying fields are in the construction trades. Men's apprenticeships are much less occupationally diverse than women's. Notably, at least to date, for both women and men, almost all the highest-paying common apprenticeship occupations were in the construction trades. While many women apprentices are choosing these fields, these 'traditional' apprenticeship pathways remain 'nontraditional' for women, with women making up a minority of apprentices. The section on the construction trades below examines in greater detail the progress in including women in these fields.

²⁰ An hourly wage in 2023 of \$23.90, see U.S. Department of Labor Employment and Training Administration 2024.

²¹ While the RAPIDS database groups apprenticeship programs by broad industrial sector, it does not do so for occupations and instead lists apprenticeship schemes by their individual titles (such as electrician (interior) electrician (maintenance), electrician (substation)); occupations in Tables 3a and 3b group apprenticeships under the most analogous occupational title; see also Appendix A: Methodology.

Black Women Were Most Likely to Be in Female-Dominated Apprenticeship Fields and Had the Lowest Exit Wage

The proportion of women apprentices in predominantly female occupations helps explain differences in exit wages between women of different races/ethnicities. Black women had the lowest median hourly exit wage in 2023 (\$20.00; see Figure 2); they were substantially more likely than other groups of women to be in predominantly female apprenticeship fields (29.1 percent of all Black women apprentices).²² AIAN and Asian women had the highest median hourly exit wages in 2023 (\$26.75 and \$26.13, respectively; see Figure 2); women of these groups were least likely to be in predominantly female apprenticeship fields (17.2 and 18.9 percent, respectively, of all women apprentices in 2023).²³

Table 3a. The 20 Apprentice Occupations with the Highest Number of Women in 2023

	Apprentices (active and completers)			Median hourly earnings of completers		
	Women (#)	Men (#)	Percent female	Women	Men	Female as % of male earnings
Nurse Assistant	7,733	1,772	81.4%	\$17.32	\$17.00	101.9%
Registered Nurse	5,559	797	87.5%	\$31.50	\$33.00	95.5%
Electrician	4,051	92,312	4.2%	\$34.64	\$31.68	109.3%
Early Childhood Education and Care	3,620	97	97.4%	\$14.00	\$13.00	107.7%
Medical Assistant	2,132	177	92.3%	\$18.51	\$19.98	92.6%
Carpenter	2,004	36,205	5.2%	\$35.61	\$42.28	84.2%
Laborer	1,687	24,681	6.4%	\$34.00	\$35.00	97.1%
K-12 Teacher	1,487	244	85.9%	\$27.42	\$27.42	100.0%
Heavy Truck Driver	1,371	11,234	10.9%	\$21.23	\$20.08	105.7%
Correction Officer	1,325	3,670	26.5%	\$31.12	\$31.12	100.0%
Teacher Aide I	1,227	232	84.1%	\$13.00	n/a	n/a
Medical Secretary	1,195	1,060	53.0%	\$26.00	\$18.00	144.4%
Nurse, Licensed Practical	918	64	93.5%	\$26.00	\$24.85	104.6%
Pharmacist Assistant	886	171	83.8%	\$21.00	\$21.00	100.0%
Cosmetologist	796	67	92.2%	\$15.00	n/a	n/a
Pipefitter (Construction)	743	20,727	3.5%	\$39.89	\$41.50	96.1%
Plumber	724	28,105	2.5%	\$38.75	\$32.00	121.1%
Operating Engineers	678	6,161	9.9%	\$39.33	\$38.65	101.8%
Structural Steel Worker	544	9,170	5.6%	\$33.53	\$35.50	94.5%
Home Health Aide	539	38	93.4%	\$16.75	n/a	n/a
Occupation not provided	45,124	203,539	18.1%	\$22.00	\$34.90	63.0%
All	108,140	621,153	14.8%	\$22.00	\$34.00	63.4%

Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

Notes: Apprentices are active apprentices plus completers. Completers are defined as apprentices who completed their apprenticeship in FY 2023; the exit wage is the hourly wage of completers who reported their earnings; n/a means earnings data not available or fewer than 10 exiters with earnings data. The median is the midpoint in the earnings distribution at which half earn more and half earn less.

²² IWPR analysis of RAPIDS data.

²³ IWPR analysis of RAPIDS data.

Table 3b. The 20 Apprentice Occupations with the Highest Number of Men in 2023

	Apprentices (active and completers)			Median hourly exit wages of completers		
	Men (#)	Women (#)	Percent female	Women	Men	Female as % of male earnings
Electrician	92,312	4,051	4.2%	\$34.64	\$31.68	109.3%
Carpenter	36,205	2,004	5.2%	\$35.61	\$42.28	84.2%
Plumber	28,105	724	2.5%	\$38.75	\$32.00	121.1%
Laborer	24,681	1,687	6.4%	\$34.00	\$35.00	97.1%
Lineworker	21,357	152	0.7%	\$40.51	\$40.87	99.1%
Pipe Fitter (Construction)	20,727	743	3.5%	\$39.89	\$41.50	96.1%
Sheet Metal Worker	12,829	536	4.0%	\$37.82	\$39.26	96.3%
Heavy Truck Driver	11,234	1,371	10.9%	\$21.23	\$20.08	105.7%
Structural Steel Worker	9,170	544	5.6%	\$33.53	\$35.50	94.5%
Heating & Air Conditioning	8,459	163	1.9%	\$25.00	\$28.48	87.8%
Roofer	7,886	209	2.6%	\$33.04	\$37.00	89.3%
Millwright	7,261	403	5.3%	\$33.16	\$33.95	97.7%
Operating Engineer	6,161	678	9.9%	\$39.33	\$38.65	101.8%
Telecommunications Technician	6,090	271	4.3%	\$32.50	\$27.35	118.8%
Elevator Constructor	5,866	99	1.7%	\$48.15	\$49.07	98.1%
Drywall Applicator	4,942	99	2.0%	\$43.76	\$47.24	92.6%
Painter (Construction)	3,945	436	10.0%	\$30.77	\$36.39	84.6%
Correction Officer	3,670	1,325	26.5%	\$31.12	\$31.12	100.0%
Automotive Technician Specialist	3,494	170	4.6%	\$18.01	\$19.63	91.7%
Cement Mason	3,439	108	3.0%	\$35.98	\$42.00	85.7%
Occupation not provided	203,539	45,124	18.1%	\$22.00	\$34.90	63.0%
All	621,153	108,140	14.8%	\$22.00	\$34.00	63.4%

Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

Notes: Apprentices are active apprentices plus completers. Completers are defined as apprentices who completed their apprenticeship in FY 2023; the exit wage is the hourly wage of completers who reported their earnings; n/a means earnings data not available or fewer than 10 exiters with earnings data. The median is the midpoint in the earnings distribution at which half earn more and half earn less.

Women's Earnings for Completed Apprenticeships Are Highest in Male-Dominated Industries

Another way of analyzing apprenticeship outcomes by gender is to focus on industries. The industrial sector classification is not occupation-specific and includes a mix of occupations, such as, for example, administrative as well as maintenance occupations, and thus might be expected to be more gender-integrated than individual apprentice occupations. Yet, even at the industry level, apprenticeships are highly segregated by gender. Out of 20 industrial sectors identified in the RAPIDS database, the top five—Public Administration, including Military (not covered in the economic census); Health Care and Social Assistance; Educational Services; Construction; and Other Services (except Public Administration)—account for the large majority of both women and men apprentices (85.6 and 86.9 percent, respectively; see Table 4).

Four of the largest sectors for women apprentices are nontraditional for women (women are fewer than 25 percent of apprentices), and one is nontraditional for men (men are fewer than 25 percent of apprentices). While this partly reflects gender differences in employment more broadly, gender differences among apprentices tend to be much starker than gender differences among all employed in each sector.²⁴

The Military Had the Highest Number of Women in Apprenticeships

Almost four in ten (38.2 percent) women apprentices in 2023 were in Public Administration (not included in the economic census) compared with less than a quarter (24.1 percent) of men (Table 4). This sector primarily captures military apprentices.²⁵ Women's share of military apprenticeships is substantially higher than their share of all apprenticeships (22.2 and 14.8 percent, respectively; see Table 4). While women's share of apprentice occupations within the military also varies, women's share tends to be substantially higher than in non-military apprenticeships in the same occupation. For example, women's share of electrician apprentices in the military is more than three times as high as their share of all electrician apprentices (12.4 and 4.2 percent, respectively).²⁶ The military has made more progress in attracting women than many other nontraditional fields.²⁷

²⁴ For example, in 2022, women's share of all employed compared with their share of apprentices in FY 2023, respectively, were 78.6 and 84.7 percent in Health Care and Social Assistance; 68.9 and 11.5 percent in Educational Services and Health Services; 10.9 and 4.4 percent in Construction; 52.2 and 20.9 percent in Other Services (except Public Administration); and 29.3 and 11.4 percent in Manufacturing; see HOUSEHOLD DATA ANNUAL AVERAGES 18. Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity, Labor Force Statistics from the Current Population Survey. Washington DC: U.S. Bureau of Labor Statistics. <https://www.bls.gov/cps/cpsaat18.htm>

²⁵ In FY 2023, 83.5 percent of active women apprentices in this sector were in military apprenticeships (USMAP); women were 23.4 percent of active military apprentices; IWPR analysis of Registered Apprenticeship Partners Information Data System (RAPIDS) data.

²⁶ IWPR analysis of Registered Apprenticeship Partners Information Data System (RAPIDS) data. <https://www.apprenticeship.gov/data-and-statistics>.

²⁷ While there is no recent research on the performance of military apprenticeships, a 2015 evaluation pointed to substantial problems with the quality, completion, and transferability to civilian contexts of such apprenticeships, Hanson and Lerman 2016.

Health Care and Social Assistance Does Not Deliver High Earnings for Women

The second most common sector for women, Health Care and Social Assistance accounted for 19.2 percent of all women apprentices in 2023 but less than one percent (0.6 percent) of male apprentices. This sector includes many of the lowest-paid apprenticeship fields shown in Table 3a, and the large majority of apprentices in the sector (84.5 percent) are women (Table 4). Apprenticeships in Health Care and Social Assistance have grown particularly strongly during the last decade, by over 800 percent since 2014.²⁸ The expansion of this sector has primarily been in lower-paying careers. Women's median exit wage was just \$20.67, and men's median hourly exit wage was just as low (\$20.02; see Table 5). While apprenticeships can deliver benefits in terms of the quality of training and job quality and can help reduce job turnover and recruitment difficulties in the sector, apprenticeships in these careers are not leading to a career with family-sustaining wages and thus fail to fulfill one of the fundamental promises of apprenticeship.

Educational Services Produced a Particularly Large Gender Wage Gap

Educational Services is the third most common sector for women apprentices, accounting for 11.1 percent of women apprentices (Table 4), and is characterized by very high earnings differences between women and men completing apprenticeships. At the median, women made just half of what men made. Women's median exit wage in 2023 was just \$20.43 compared with \$40.93 for men, a gender earnings ratio of just 49.9 percent (Table 5). Women are still a small minority of all apprentices in Educational Services (11.5 percent; see Table 4), but this reflects a doubling of their share of apprentices in the sector since 2014.²⁹

Apprenticeships in Education Services include a high number of construction trade occupations in the building and maintenance of schools, colleges, and related institutions, as well as newly emerging apprenticeships in fields such as teaching and early childhood education. Approximately as many women apprentice as carpenters, electricians, and laborers as they do as K-12 teachers.³⁰ Women also gained apprenticeships in high-paying, traditionally male fields in the sector, such as electricians employed by educational institutions. However, their growing numbers in newer, often lower-paid apprenticeships in women-dominated fields, such as Early Childhood and Teachers' Aides,³¹ result in women's comparatively low exit wages and the large gender wage gap.

Apprenticeships in Construction Led to High Earnings for Women

As of 2023, over ten thousand (10,397) women apprentices were in the Construction industry, 11.0 percent of all women apprentices. Women who completed construction apprenticeships in 2023 had a median hourly exit wage of \$34.00 (compared to \$34.25 for men; see Table 5), substantially higher

²⁸ IWPR analysis of RAPIDS data <https://www.apprenticeship.gov/data-and-statistics>.

²⁹ In 2014, women's share of Active Apprentices was 4.0 percent; IWPR download from RAPIDS database <https://www.apprenticeship.gov/data-and-statistics>.

³⁰ For example, in FY 2023, of 32,380 active carpenter apprentices in the RAPIDS database, 28.2 percent worked in the Educational Services; IWPR download from RAPIDS database <https://www.apprenticeship.gov/data-and-statistics>.

³¹ See Smith, Mercado, and Williams (2023) on state-level efforts to grow child care apprenticeships.

than apprenticeships completed in almost all other industries and by far the highest among the large apprenticeship sectors. Despite the large number of women pursuing construction apprenticeships, they are still just a small minority of all apprentices, only 4.4 percent (Table 4). The section on the construction industry will discuss progress in increasing women's share of apprenticeships in the building trades.

Five additional sectors—Manufacturing; Administrative and Support and Waste Management and Remediation Services; Professional, Scientific, and Technical Services; Transportation and Warehousing; and Retail Trade—had at least one thousand women apprentices each; exit wages ranged from \$21.00 in retail to \$30.00 in Professional, Scientific, and Technical Services (Tables 4 and 5). The American Apprenticeship Initiative (AAI) successfully targeted manufacturing for its programs: nearly half (46 percent) of all AAI apprentices³² were in that industry, including almost



4,000 women apprentices in 2023. The median hourly exit wage for women who completed manufacturing apprenticeships was \$23.25³³, substantially higher than that earned by all women production workers at \$18.55.³⁴ This suggests that apprenticeships are offering pathways to better-paying jobs for women in manufacturing. But women's exit wages were also substantially lower than those of men, at \$28.87 (an earnings ratio of 80.5 percent; see Table 5). Thus, women apprentices may not work in the highest-paid fields or sectors in manufacturing and are not benefitting as much as men. Women comprised only 11.4 percent of all apprentices in manufacturing (Table 4), a substantially lower share than their share of all workers in manufacturing (29.5 percent; US Bureau of Labor Statistics 2024c). Outreach to women about career opportunities in higher-paying sectors such as aircraft manufacturing continues to be woefully lacking (Hegewisch 2023).

³² Manufacturing apprentices were 46.0% of AAI apprentices (Walton, Gardiner, and Barnow, 2022).

³³ IWPR analysis of RAPIDS database.

³⁴ The median weekly earnings for full-time work of women production workers in 2023 were \$742; assuming a 40-hour week, this translates to \$18.55 per hour; for men production workers, earnings were \$966, or \$24.15 per hour; IWPR calculations based on U.S. Bureau of Labor Statistics (2024b).

Table 4. The Distribution of Women and Men Apprentices Across Industry, 2023

Rank by number of women	Industry	Women apprentices (#)	Women's share of apprentices in sector (%)	Women apprentices in sector as share of all women apprentices (%)	Men apprentices in sector as share of all men apprentices (%)
1	Public Administration, including Military (not covered in the economic census)	36,173	22.2%	38.2%	24.1%
2	Health Care and Social Assistance	18,157	84.7%	19.2%	0.6%
3	Educational Services	10,539	11.5%	11.1%	15.4%
4	Construction	10,397	4.4%	11.0%	42.6%
5	Other Services (except Public Administration)	5,779	20.9%	6.1%	4.1%
6	Manufacturing	3,866	11.4%	4.1%	5.7%
7	Administrative and Support and Waste Management	2,980	51.6%	3.1%	0.5%
8	Professional, Scientific, and Technical	2,076	39.9%	2.2%	0.6%
9	Transportation and Warehousing	1,214	14.8%	1.3%	1.3%
10	Retail Trade	1,111	54.3%	1.2%	0.2%
11	Accommodation and Food Services	805	48.7%	0.9%	0.2%
12	Utilities	423	2.2%	0.4%	3.6%
13	Finance and Insurance	392	51.9%	0.4%	0.1%
14	Agriculture, Forestry, Fishing, and Hunting	245	21.1%	0.3%	0.2%
15	Wholesale Trade	228	9.1%	0.2%	0.4%
16	Arts, Entertainment, and Recreation	161	47.4%	0.2%	0.0%
17	Information	52	13.4%	0.1%	0.1%
18	Mining, Quarrying, and Oil and Gas Extraction	37	6.5%	n/a	0.1%
19	Management of Companies and Enterprises	37	68.5%	0.0%	0.0%
20	Real Estate and Rental and Leasing	30	8.0%	0.0%	0.1%
	Industry ID not provided	13,438	12.4%	14.2%	18.0%
	All	108,140	14.8%	-	-

Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

Notes: Apprentices are active apprentices plus completers. Completers are defined as apprentices who completed their apprenticeship in FY 2023; the exit wage is the hourly wage of completers who reported their earnings; n/a means earnings data not available or fewer than 10 exiters with earnings data. The median is the midpoint in the earnings distribution at which half earn more and half earn less.

Table 5. The Median Hourly Wage for Those Who Completed an Apprenticeship in 2023, by Industry and Gender

Industry	Rank by number of women	Women's median hourly exit wage	Men's median hourly exit wage	Female/male median hourly earnings ratio
Accommodation and Food Services	11	\$20.50	\$19.00	107.9%
Administrative and Support and Waste Management and Remediation Services	7	\$21.03	\$21.03	100.0%
Agriculture, Forestry, Fishing, and Hunting	14	\$17.31	\$17.31	100.0%
Arts, Entertainment, and Recreation	16	\$18.25	\$19.24	94.9%
Construction	4	\$34.00	\$34.25	99.3%
Educational Services	3	\$20.43	\$40.93	49.9%
Finance and Insurance	13	\$20.26	\$28.85	70.2%
Health Care and Social Assistance	2	\$20.67	\$20.02	103.2%
Information	17	\$27.26	\$23.00	118.5%
Management of Companies and Enterprises	19	n/a-	\$23.52	n/a-
Manufacturing	6	\$23.25	\$28.87	80.5%
Mining, Quarrying, and Oil and Gas Extra	18	\$38.95	\$38.95	100.0%
Other Services (except Public Admin)	5	\$20.00	\$24.00	83.3%
Professional, Scientific, and Technical	8	\$30.00	\$27.60	108.7%
Public Administration, including Military, not covered in the economic census	1	\$22.00	\$22.00	100.0%
Real Estate and Rental and Leasing	20	\$17.00	\$22.00	77.3%
Retail Trade	10	\$21.00	\$22.00	95.5%
Transportation and Warehousing	9	\$22.00	\$21.73	101.2%
Utilities	12	\$31.19	\$38.87	80.2%
Wholesale Trade	15	\$34.00	\$28.76	118.2%
Industry ID not provided		\$29.17	\$36.80	79.3%
All		\$22.00	\$34.20	64.3%

Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

Notes: Apprentices are active apprentices plus completers. Completers are defined as apprentices who completed their apprenticeship in FY 2023; the exit wage is the hourly wage of completers who reported their earnings; n/a means earnings data not available or fewer than 10 exiters with earnings data. The median is the midpoint in the earnings distribution at which half have higher and half have lower earnings.

Table 6 shows the distribution of women apprentices by race and ethnicity across the largest apprentice sectors. The military is the most common apprentice sector for women of all backgrounds, although White women are substantially less likely to be in military apprenticeships than others, just slightly above a quarter (26.5 percent) compared with at least a third for women of other backgrounds. More than a quarter (25.8 percent) of AIAN women apprentices were in construction; they were also the group with the highest median exit earnings among women (\$26.75; see Figure 2). Asian women apprentices, on the other hand, were least likely to be in construction—just 3.3 percent; their median hourly exit earnings, at \$26.13, were almost as high as those of AIAN women, reflecting apprenticeships completed in higher-paying occupations that typically required a college degree, such as Registered Nurses or Computing and IT Specialists.

Table 6. The Distribution of Women Apprentices across the Largest Apprenticeship Industries for Women by Race and Ethnicity, 2023

	American Indian or Alaska Natives	Asian	Black or African American	Hispanic/Latina	Native Hawaiian or Pacific Islanders	White	Multiracial
All with industry ID*	100% (850)	100% (3,688)	100% (14,942)	100% (20,194)	100% (893)	100% (31,020)	100% (1,903)
Military and Public Administration (not covered in the economic census)	35.4%	54.3%	37.2%	39.9%	57.2%	26.5%	62.8%
Health Care and Social Assistance	11.5%	16.4%	20.9%	13.9%	7.4%	26.2%	8.9%
Educational Services	12.8%	10.2%	13.3%	11.8%	5.8%	12.5%	7.5%
Construction	25.8%	3.3%	8.1%	10.2%	10.8%	16.7%	5.7%
Other Services (except Public Administration)	5.1%	4.3%	2.8%	13.2%	6.9%	4.0%	3.0%
Manufacturing	2.7%	2.4%	3.4%	4.3%	3.0%	4.7%	6.1%
Share of top 6	93.3%	91.0%	85.6%	93.3%	91.2%	90.6%	94.0%

Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

Notes: The RAPIDS database included industry information for 81.1 percent of American Indian or Alaska Natives women apprentices, 89.1 percent of Asian women apprentices, 87.2 percent of Hispanic or Latina women apprentices, 91 percent of Native Hawaiian or Pacific Islander women apprentices, and 92.8 percent of multiracial women apprentices.

Women’s Share of Apprenticeships Has Increased in Low-Paying Industries and Decreased in High-Paying Industries

Women apprentice numbers have grown in all major industries since the beginning of the American Apprenticeship Initiative (AAI), both absolutely and as a proportion of all apprentices. But that growth has been uneven. The share of all women apprentices increased in the lowest-paying industries and fell in the highest-paying industries. In 2016, 5.6 percent of women active apprentices were in Health Care and Social Assistance industry apprenticeships and 5.5 percent in the Educational Services industry; by 2023, these industries accounted for 16.0 and 9.2 percent of women apprentices, respectively. During the same period, the share of women active apprentices in the Construction industry fell from 14.3 to 10.3 percent.³⁵ In the future, Health Care and Social Assistance and Educational Services apprenticeships may increase the number of women holding more male-dominated and highly paid occupations in those sectors. To date, however, apprenticeships have increased women’s participation in these sectors’ lower-paying fields. This shift from higher- to lower-paying apprenticeship fields contributed to the increase in the gender wage gap between women and men completers.

³⁵ IWPR calculation based on RAPIDS data for Active Apprentices <https://www.apprenticeship.gov/data-and-statistics>.

Men Outnumber Women Apprentices in Every State

The AAI worked with states to encourage expansion and modernization of apprenticeship programs, including the development of apprenticeships in new fields with high demands for workers (Moran and Oberg 2023; US Department of Labor Office of Apprenticeship 2024). State-based differences remain, however, particularly as to gender. While men are more likely to be apprentices than women in every state, women's share of apprenticeships varies widely.



The two states with the highest share of women apprentices were West Virginia and South Carolina, at 36.5 and 35.4 percent, respectively (Figure 3). But the focus of apprenticeship expansion in the two states has created very different outcomes for women. In West Virginia, women who completed apprenticeships in 2023 had a median hourly exit wage of \$28.97, compared to just \$21.00 per hour in South Carolina.³⁶ Over 80 percent of women apprentices in West Virginia are in the Health Care and Social Assistance sector but exit wages, at \$28.97, are substantially

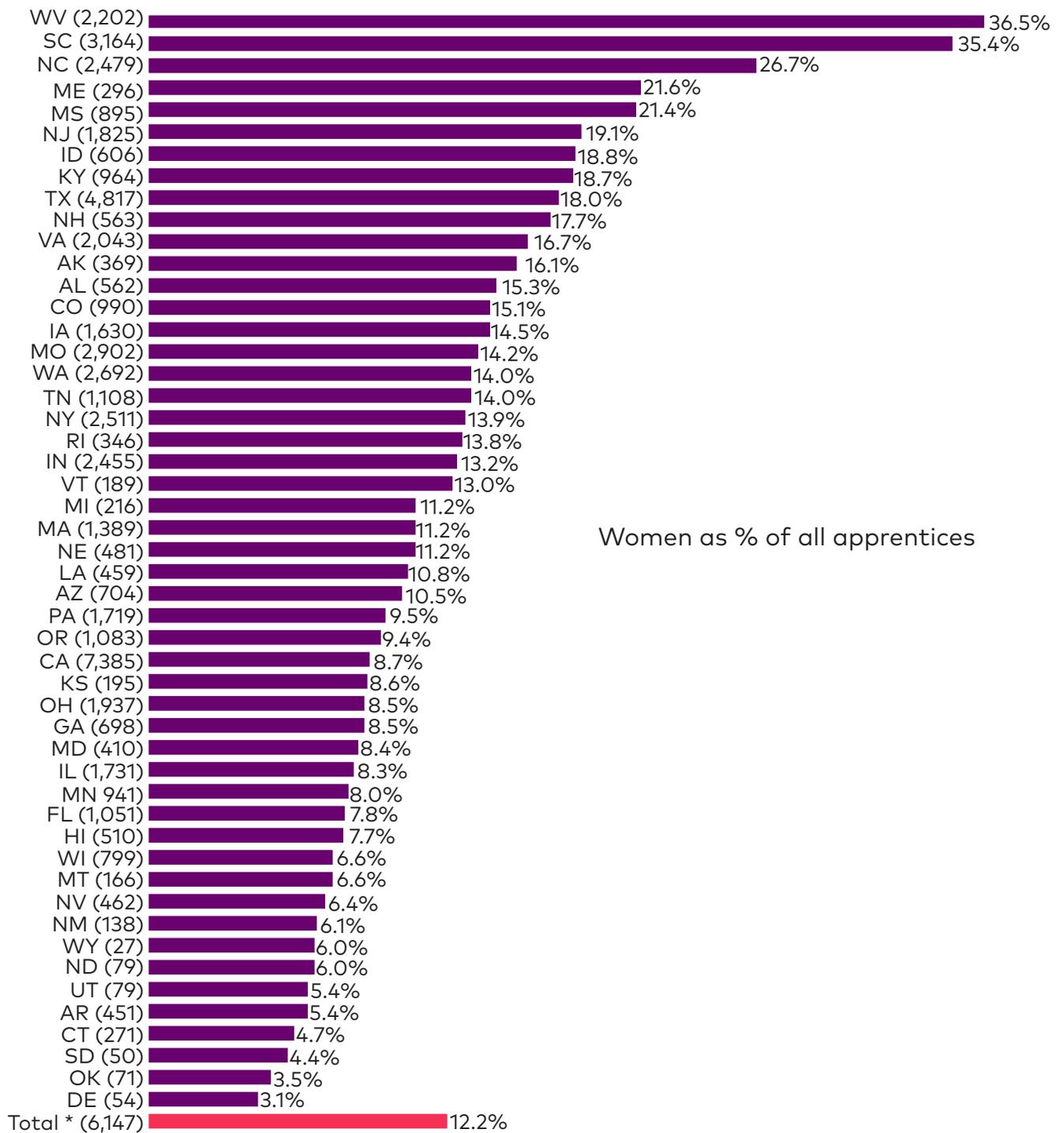
higher than in this sector in other states. While the South Carolina apprenticeship system is considerably more diversified across sectors and occupations than West Virginia's, Health Care and Social Assistance is also the largest single apprenticeship sector for women (accounting for 29.6 percent of women apprentices); yet the median hourly exit wage for women in this sector was only \$17.08. West Virginia shows that, by focusing on better-paying occupations in Health Care and Social Assistance, apprenticeships can be a pathway to careers with family-sustaining wages in the sector.

At the other end of the spectrum are three states where women are fewer than 5 percent of all apprentices—Delaware (3.1 percent women), Oklahoma (3.5 percent women), and South Dakota (4.4 percent women; see Figure 3). In each of these states, fewer than 100 women served as apprentices in 2023. Construction is the largest apprenticeship sector in all three states, and the fraction of women apprentices is below the national average for the construction sector (2.2 percent in Delaware, 3.7 percent in Oklahoma, and 1.6 percent in South Dakota, see Appendix Table B). Massachusetts, with women's share of construction apprenticeships at 10.7 percent, shows that such low performance is not inevitable (Appendix Table B).

³⁶ IWPR analysis of RAPIDS data <https://www.apprenticeship.gov/data-and-statistics>.

Figure 3. Women's Share of Apprenticeships Varies Widely Among States

The Number of Women Apprentices and Women's Share (%) of All Apprentices by State, 2023



Women as % of all apprentices

Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

Notes: Data for Washington, DC, are not included in the RAPIDS database. Number in brackets after state abbreviation provides total number of women apprentices (active and completers) in FY 2023. *Total is for all women apprentices with state and gender ID.

Construction Apprenticeships: Leaders and Laggards



Construction is the most common single sector for apprenticeships overall, with close to a quarter of a million (237,000) apprentices and over a third (37.8 percent) of all apprentices in 2023. As discussed in the introduction, construction apprenticeships, moreover, play an integral role in the implementation of federal investments to rebuild the nation's infrastructure, support the transition to clean energy, and strengthen and rebuild manufacturing capacity as part of safeguarding national security (Mehta 2023; The White House 2022; 2023). Construction trade apprenticeships also consistently had exit wages of at least \$30 per hour, providing the prototype for apprenticeships leading to careers with family-sustaining wages.

Since the AAI began in 2016, the number of women construction industry apprentices has more than doubled.³⁷ As a reflection of a very low starting point, however, and amid substantial growth of the industry overall, women's share of construction industry apprenticeships only increased from 2.8 to 4.4 percent. Women's numbers in electrician apprenticeships—the largest apprenticeship occupation across sectors—grew at a similar rate, but still, only 4.2 percent of all electrician apprentices in 2023 were women (Table 3a).³⁸

Figure 4 shows the composition of the women construction industry apprentice population by race and ethnicity. It highlights the diversity of women apprentices in the industry as much as their stark underrepresentation compared to their share of the total workforce, whatever their race or ethnicity. Women's low share of construction industry apprentices means that, statistically, a woman apprentice has less than a one-in-twenty chance to be in a construction industry apprenticeship program with another woman, and a Latina (0.9 percent of all construction apprentices, compared with 8.0 percent of all employed³⁹) or Black non-Hispanic woman (0.5 percent of all construction apprentices compared with 6.2 percent of all employed⁴⁰) a less than one-in-a hundred chance to work with another woman apprentice of the same race or ethnicity. Yet, some apprenticeship programs have made substantially more progress in recruiting and retaining women than others, and the number of women who are isolated in their programs is lower than statistically expected.

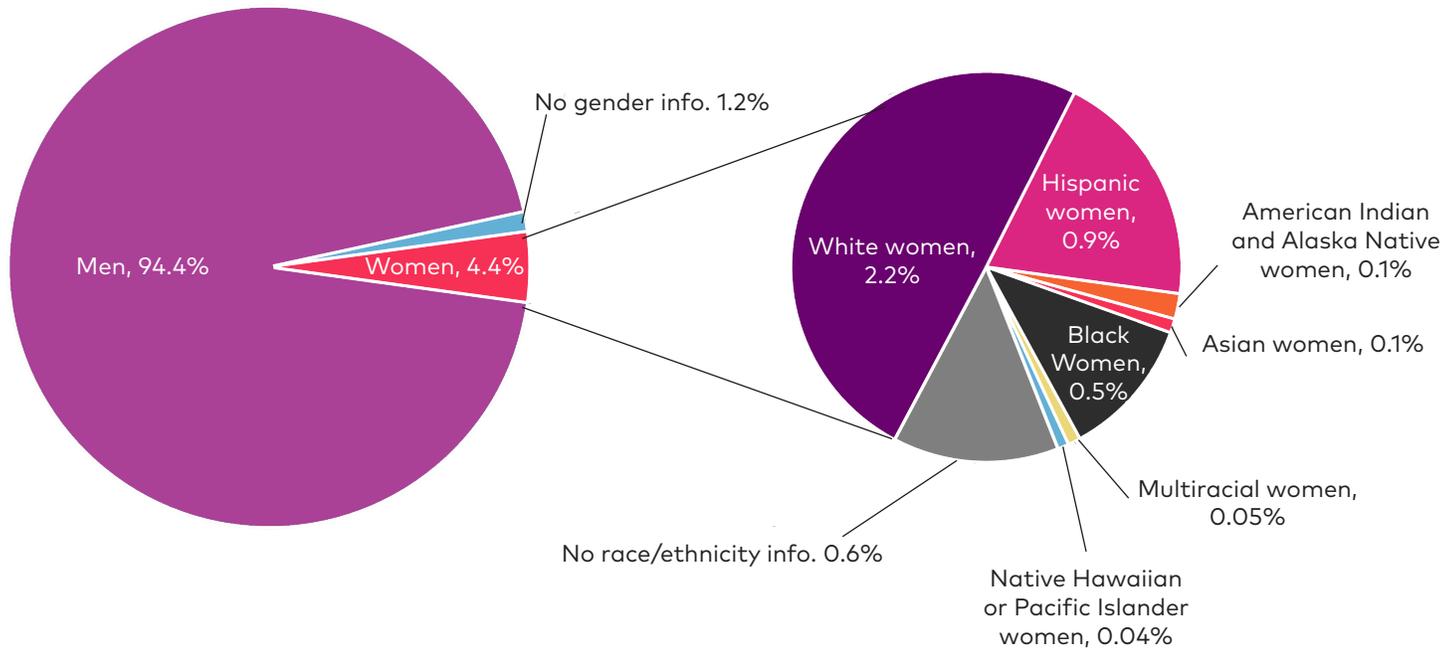
³⁷ As discussed above, the 2023 RAPIDS data includes a substantially larger number of states than it did previously. By including data only from the 37 states with data in 2016, the number of women apprentices in construction grew from 4,431 to 9,650, an increase of 118 percent; the number of all apprentices (including those without gender ID) increased from 157,770 to 217,450, an increase of 37.8 percent.

³⁸ In the 37 states with RAPIDS data for both 2016 and 2023, the number of women electrician apprentices grew from 1,652 to 3,539, an increase of 114 percent; women's share of apprentices with gender IDs grew from 2.8 to 4.1 percent (IWPR analysis of RAPIDS data).

³⁹ IWPR calculation based on U.S. Bureau of Labor Statistics 2023.

⁴⁰ IWPR calculation based on U.S. Bureau of Labor Statistics 2023.

Figure 4: The Population of Women Construction Apprentices Is Very Diverse
 Construction Industry Apprentices by Gender, Race, and Ethnicity, 2023



Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

Notes: Includes all apprentices (active and completers). Racial categories are exclusive of Hispanic ethnicity; Hispanic or Latina/o workers may be of any race.

The Large Majority of Construction Industry Apprenticeships Are Male-Only

In 2023, nearly eight in ten construction apprenticeship programs—78.5 percent—included no women apprentices. By contrast, not a single construction apprenticeship program in the RAPIDS database included only women and no men apprentices. Typically, all-male programs are smaller than mixed programs, accounting for just 12 percent of all apprentices, but this is not universally true: the RAPIDS database includes 81 all-male programs with at least 50 apprentices and 18 all-male programs with 100 or more apprentices.⁴¹

Where women did participate, a small fraction report being the only woman in the program (543, constituting 5.2 percent of all female construction apprentices). More substantial progress in including women is concentrated in a small number of apprenticeship programs. Just 62 programs—fewer than 1 percent of all programs—had at least 10 women apprentices, but these programs together accounted for seven in ten (69.3 percent) of all women construction apprentices in 2023. These diverse programs, while only a minority, are having a significant impact on the overall number of women in construction. They point to the need for technical assistance and oversight to ensure that other programs make similar progress.

⁴¹ IWPR analysis of RAPIDS database.

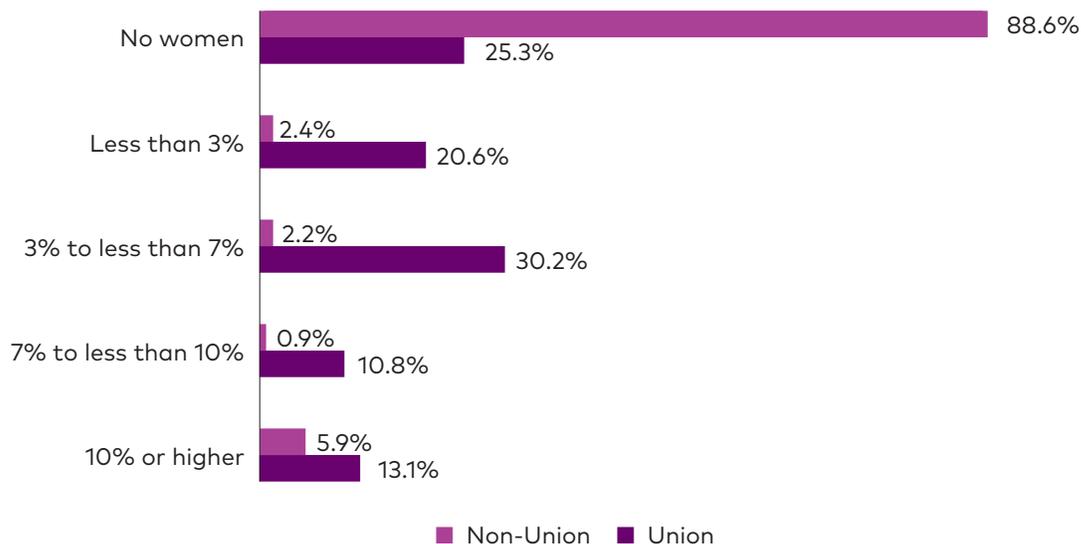
Union Apprenticeship Programs Made More Progress with Including Women

The large majority (82.4 percent) of women construction apprentices were in union programs, a slightly higher share than of men apprentices (70.4 percent).⁴² Union-affiliated construction apprenticeship programs were much less likely to be all-male than non-union programs (25.3 percent and 88.6 percent, respectively; see Figure 5). Women in union programs were also much less likely to be the only woman apprentice; only 1.5 percent of union but 22.9 percent of non-union women apprentices were in a program where they were the only woman.⁴³

Union construction programs overall are still far from gender equitable. Federal affirmative action rules for federal construction contractors set a target for women's hours of at least 6.9 percent of hours worked. This very low goal is partly set with reference to the existing number of skilled tradeswomen, not for apprenticeship programs, which can recruit from a much larger pool. But even among union programs, fewer than a quarter had a gender ratio of at least seven percent women (information on hours worked is not available), and only one in seven (13.1 percent) had a gender ratio of at least 10 percent (Figure 5).

Figure 5. Union Construction Programs Are Much More Likely to Include Women Apprentices than Non-Union Programs

Union and Non-Union Apprenticeship Programs by Proportion (%) of Women Apprentices, 2023



Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

⁴² IWPR analysis of RAPIDS database.

⁴³ IWPR analysis of RAPIDS database.

Cancellation Rates Are High for Men and Even Higher for Women

Construction apprenticeships have high rates of non-completion and cancellations,⁴⁴ and while they are high for both men and women, the rates are consistently higher for women.⁴⁵ In 2023, women's share of those who canceled a construction apprenticeship was a third (33.3 percent) higher than would be expected from their share of all construction apprenticeships.⁴⁶ Being the sole or one of a handful of women, especially a woman of color, on a worksite can be stressful and can be a contributing factor when apprentices drop out of their programs.⁴⁷ Other factors include a culture of harassment and disrespect, discrimination in access to opportunities to learn and develop skills, and discrimination in hiring and firing, making it more difficult for women to accumulate the work hours needed to complete their apprenticeship.⁴⁸

Women Electrician Apprentices in Union Programs Were Almost Three Times as Likely to Complete Their Apprenticeships as Those in Non-Union Programs

Apprenticeships involve substantial investments, investments that are lost when an apprentice cancels their program. Differences in cancellations in a single year are not the best indicator of gender differences in cancellation rates because they are not controlled for the time an apprentice already spent in their apprenticeship. Cancellation rates are typically higher in the early period of an apprenticeship when it becomes clearer to apprentices whether their chosen career path really works for them. Thus, higher cancellation rates in any one year for women may simply reflect a higher share of newer apprentices among women than men. A more accurate way of capturing cancellations is to follow a cohort of apprentices from the same starting year. For this analysis, the report focuses on the 2016 cohort of electrician apprentices.

Electricians are the largest single occupational group among apprentices. Successfully growing the number of skilled electricians is also particularly important in implementing the federal government's clean economy strategy. The Biden Administration has set an ambitious goal for half of new cars sold to be electric by 2030. Registered apprenticeships and additional certifications for licensed electricians through the Electric Vehicle Infrastructure Training Program (EVITP) play an important role in ensuring that such cars are supported by a reliable network of electric charging stations, as much as ensuring that "these historic investments in EV charging create good-paying jobs," (The White House 2023b). Unless the number of skilled women electricians grows substantially—in 2023, women were only 2.9 percent of all electricians in the United States⁴⁹ (US Bureau of Labor Statistics

⁴⁴ Cancellation is the term used if an apprentice leaves their program before completing all classroom and work requirements of the apprenticeship; this can be at their own volition or can be initiated by the program sponsor or employer in response to low performances or absences.

⁴⁵ See also Bilginsoy (2022).

⁴⁶ In 2023, women were 4.5% of construction apprentices, and 6.0% of apprentices who cancelled, IWPR analysis of RAPIDS database.

⁴⁷ For survey and interview data with women apprentices working in construction trades, see Hegewisch and Mefferd (2021) and Childers, Hegewisch, and Jackson (2021).

⁴⁸ In the national 2021 Tradeswomen's Retention and Advancement survey, of almost 600 women construction trade apprentices who responded, over 40 percent said they had considered/were seriously considering leaving their apprenticeships; of these, 51 percent cited lack of respect, and 40 percent lack of opportunity to build a full skill set as a very important reason for wanting to leave (Hegewisch and Mefferd, 2021).

⁴⁹ Anyone working as an electrician, irrespective of their qualifications.

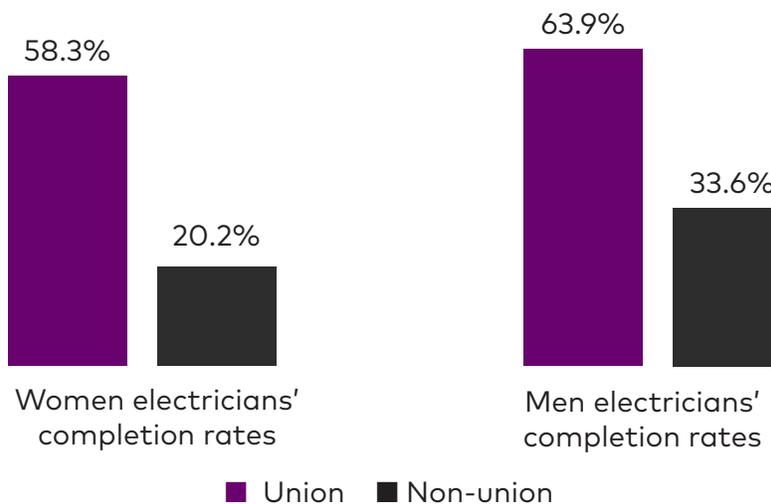
2024d)—few women will benefit from these highly paid jobs. The industry has made some progress since 2016, when women electrician apprentices accounted for only 2.8 percent; by 2023, the number of new women apprentices had doubled to 1,560, and women’s share of electrician apprentices was 4.2 percent (Table 3a).⁵⁰

The 2016 cohort of electrician apprentices suggests that progress in attracting new apprentices to become electricians needs to be matched by progress in helping them complete their apprenticeships. Fewer than half of the 719 women (38.9 percent) and 19,858 men (46.1 percent) in the RAPIDS database who started an electrician apprenticeship in 2016 successfully completed their program and became a journey-level electrician by 2023. The period under review covers the COVID-19 pandemic, yet the highest numbers of cancellations for both women and men occurred in the first and second years of the apprenticeships, before the pandemic started.⁵¹

Among the 2016 cohort, women in union-affiliated electrician programs were substantially more likely to complete an apprenticeship than those in non-union programs. Almost six in ten (58.3 percent) union women electrician apprentices completed their apprenticeship, nearly three times as many as in non-union apprenticeships (20.2 percent). Men also benefit from being in union programs, but the difference in completion rates between union and non-union programs was less (63.9 and 33.6 percent, respectively; see Figure 6). Women union apprentices had higher cancellation and non-completion rates than their male counterparts, but gender differences were much less stark than for apprentices in non-union programs.

Figure 6. Electrician Apprentices in Union Programs Have Much Higher Completion Rates than in Non-Union Programs

The Proportion (%) of Electrician Apprentices Who Started Their Program in 2016 and Had



Completed Their Apprenticeship by 2023, by Union Status or Program and Gender

Source: IWPR analysis of RAPIDS data FY2016–2023 (October 2022–September 2023).

⁵⁰ IWPR analysis of RAPIDS database.

⁵¹ See Bilginsoy (2022) for an analysis of construction trades cancellations and completion rates by gender, race, and ethnicity, including by state, from 1999 to 2019; see Brooks et al. (2023) for an analysis of construction trade trends from 2015 to 2021, including for individual construction occupations; see Polson and Herzenberg (2023) for an analysis of apprenticeships in Appalachia, with a particular focus on Pennsylvania.

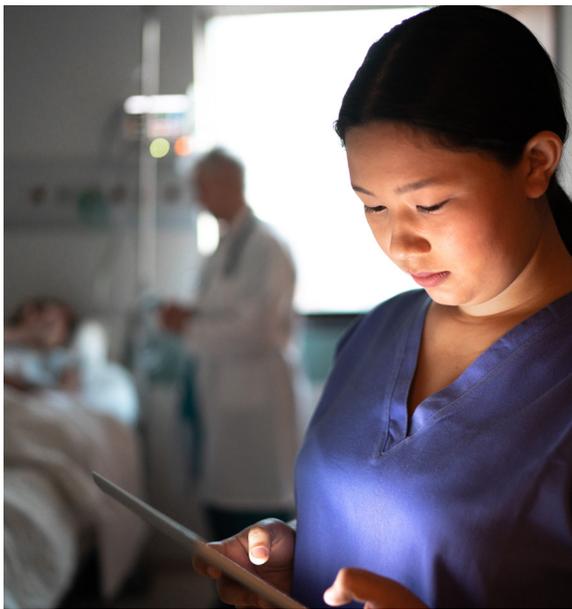
Different completion rates likely at least partly reflect differences in earnings during and after the apprenticeship program. In 2023, the median hourly exit wage for women union electricians was \$37.00 (\$38.08 for men), compared with \$24.49 for non-union women electricians (\$24.49 for men). As apprentices move through their apprenticeships, their hourly rates increase, slowly approaching the rate paid to journey-level workers; such increases are much less substantial for non-union workers, providing less incentive for completing their programs. Yet, higher completion rates likely also reflect the quality of the programs and the support provided for apprenticeships, as well as the greater likelihood that a program has made progress on achieving greater gender and racial diversity in apprenticeships.

Construction apprenticeships show both the need and the potential for progress in achieving greater gender diversity in well-paid, male-dominated fields. Substantial research is available on the type of interventions and practices that work to increase gender and racial diversity in these fields.⁵² Guidelines and examples of best practices are also available from the federal government as part of its commitment to increasing gender and racial equity in infrastructure jobs and the expressed expectation that contractors receiving public funds demonstrate tangible progress towards greater inclusion (see, for example, US Department of Transportation 2024). The high performance of some construction programs in the RAPIDS database suggests that if all programs systematically followed established best practices, women's integration into the construction industry could be much higher.

⁵² See, for example, U.S. Women's Bureau (2023); see best practice examples and resources from the Policy Group on Tradeswomen's Issues (PGTI) <https://policygroupontradeswomen.org/best-practices/> or The National Centre for Women's Equity in Apprenticeship and Employment at Chicago Women in the Trades <https://womensequitycenter.org/best-practices>; for case studies of project labor agreements and gender and racial diversity for large construction projects, see Johansson and Woods (2016); for qualitative research on the role of pre-apprenticeship programs for women's recruitment and retention in construction apprenticeships, see Wagner and Kulwicz (2020); for descriptions of gender-equity-focused pre-apprenticeship programs see Buttrica, Kuehn, and Sirois (2023) and Wells (2022).

Conclusions

Apprenticeship expansion during the last decade has successfully increased access to apprenticeships for women. Women's numbers have grown both in newly developed and in well-established apprenticeship fields. While women are still a minority of apprentices overall, expansion means that more women benefit from the earn-as-you-learn apprenticeship model and its structured



pathway to industry-recognized qualifications. Yet, increasing apprenticeships is much less likely to lead to family-sustaining wages for women than for men. While there are well-paid apprentice careers in newly developed sectors in health care, education, and other fields including a high number of women, many of the newer apprenticeships for women yield earnings that are not family-sustaining and fall below the guidance wage for a quality apprenticeship program suggested by the Department of Labor.⁵³ Adding an apprenticeship training model to a poorly paid occupation may help employers meet skills needs, but it will not by itself lead to higher wages for workers.

Expanding apprenticeships for women has not been an unqualified success. Significant gender and racial wage gaps persist among those who completed an apprenticeship in 2023. Further, the gender wage gap has grown since the start of the American Apprentice Initiative. A strategy of expansion targeting higher-paying careers will be more likely to deliver for women. This includes increasing efforts to build new, better-paid apprenticeships in female-dominated occupations such as teachers or registered nurses, but it also must continue the focus on well-paid traditional apprenticeships such as construction, where women are underrepresented. Although the number of women in building trades apprenticeships has grown, with additional funding and oversight, growth could be much more substantial.

With the RAPIDS database, excellent resources are available for benchmarking and monitoring progress on greater gender and racial equity in apprenticeship programs. Apprenticeship expansion and modernization are ongoing, and this report captures just one point in the journey toward a more comprehensive national apprenticeship system. This report suggests that earnings and gender and racial wage gaps should be key reference points in assessing progress and determining the allocation of efforts and resources to expand apprenticeships in the future.

⁵³ An hourly wage of \$23.90 in 2023 for full-time year-round work equivalent to the annual earnings that would be 200 percent of the federal poverty level for a family of three; see U.S. Department of Labor Employment and Training Administration (2024).

Appendix A: Methodology

This report draws on the 2023 Registered Apprenticeship Partners Information Database System (RAPIDS); data can be accessed at <https://www.apprenticeship.gov/data-and-statistics>. When providing annual data, the RAPIDS database uses the federal fiscal year, running from October to September of the following year, not the calendar year. The database includes only apprentices in registered apprenticeship programs.⁵⁴ Unless otherwise indicated, in this report, apprentice numbers for any one year include those classified as active as well as those classified as having completed (or 'journeyed out') of their apprenticeship in the given year; this provides a fuller count of apprenticeship numbers in any one year because most completers spend part of the year still as apprentices.

With the exception of the District of Columbia, RAPIDS includes at least partial data for all states, whether they are part of the federal registration system or follow their own state registration system.⁵⁵ The RAPIDS database includes apprentice data from Puerto Rico and smaller territories; these have been excluded from the analysis. Data for military apprentices are included. Changes in apprentice numbers in the RAPIDS database during the last decade partly reflect the addition of new state data rather than absolute growth in the number of apprentices nationally. Since 2014, data for Connecticut, Delaware, Kansas, New York, New Mexico, Nevada, Oregon, Wisconsin, Washington, Vermont, and Virginia were added; the availability of demographic data by industry or occupation continues to vary between states.

Gender, racial, and ethnic categories are those used in the RAPIDS database. Racial categories in the RAPIDS database are non-Hispanic. Demographic IDs should reflect the self-identification of the apprentice; however, anecdotal evidence suggests that, in some cases, such information may also be provided by program staff without consultation with the apprentice.

In 2023, gender information was missing for 1.1 percent of apprentices overall (Table 1). Occupational data by gender were missing for 18.1 percent of apprentices (Tables 3a and 3b) and industry data by gender for 12.1 percent of apprentices (Table 4), with missing data still particularly high for some of the more recently added states. Racial/ethnic data were missing for 21.6 percent of apprentices (Table 2). Because it is not possible to accurately impute demographic characteristics where such information is missing, gender or racial/ethnic ratios are calculated only for those apprentices with gender or racial/ethnic IDs.

While the RAPIDS database groups apprenticeship programs by broad sectors of industry, it does not provide groupings by occupation. Instead, the database lists apprenticeship programs by their title, requiring manual groupings into main occupations. Our groupings are available on request.

The 2014 to 2023 dataset was downloaded from the Apprenticeship USA 'Data and Statistics' website (<https://www.apprenticeship.gov/data-and-statistics>) and analyzed using STATA. Where indicated, the report also includes data generated directly through the Interactive Apprenticeship Data tool available on that website.

⁵⁴ Registered apprenticeships typically require a minimum of 2,000 hours of on-the-job training/paid work experience, and a minimum of 144 hours annually of structured off-the-job instruction. <https://www.apprenticeship.gov/sites/default/files/apprenticeship-requirements-reference-guide.pdf>.

⁵⁵ See Apprenticeship USA, "Apprenticeship System" for a list of states with federally administered apprenticeship systems and State Apprenticeship Agencies; (U.S. Department of Labor Office of Apprenticeship, n.d.) <https://www.apprenticeship.gov/about-us/apprenticeship-system>.

Appendix Table B: Women Apprentices by State, 2023

Women Apprentices, Percent Female for All and for Women Construction Industry Apprentices, Median Hourly Wage, and Median Hourly Gender Earnings Ratio, by State, 2023

	Women apprentices	Women as % of all apprentices*	Women as % of construction industry apprentices	Median hourly wage for all women completers	Women exiters' median hourly wage as % of men's
Alabama	562	15.3%	6.6%	\$22.50	78.9%
Alaska	369	16.1%	6.9%	\$22.69	56.5%
Arizona	704	10.5%	7.5%	\$21.80	67.0%
Arkansas	451	5.4%	2.5%	\$25.00	113.6%
California	7,385	8.7%	4.3%	\$33.17	76.3%
Colorado	990	15.1%	4.9%	\$20.50	62.8%
Connecticut	271	4.7%	*n/a	**n/a	**n/a
Delaware	54	3.1%	2.2%	**n/a	**n/a
Florida	1,051	7.8%	3.5%	\$24.20	93.1%
Georgia	698	8.5%	5.9%	\$26.20	88.4%
Hawaii	510	7.7%	3.1%	\$18.50	39.8%
Idaho	606	18.8%	4.5%	\$17.89	70.4%
Illinois	1,713	8.3%	5.1%	\$41.10	84.8%
Indiana	2,455	13.2%	4.9%	\$20.19	62.0%
Iowa	1,630	14.5%	2.9%	\$28.89	94.1%
Kansas	195	8.6%	3.9%	\$16.50	57.6%
Kentucky	964	18.7%	4.1%	\$24.00	87.3%
Louisiana	459	10.8%	3.9%	\$12.00	46.8%
Maine	296	21.6%	7.9%	\$24.00	89.6%
Maryland	410	8.4%	3.2%	\$27.00	79.4%
Massachusetts	1,389	11.2%	10.7%	\$45.03	100.0%
Michigan	2,165	11.2%	5.2%	\$18.69	57.5%
Minnesota	941	8.0%	*n/a	\$ 33.55	91.6%
Mississippi	895	21.4%	3.3%	\$21.23	84.2%
Missouri	2,902	14.2%	4.3%	\$19.45	56.3%
Montana	166	6.6%	4.4%	\$21.32	68.7%
Nebraska	481	11.2%	3.9%	\$16.50	75.7%
Nevada	462	6.4%	3.4%	\$21.55	49.1%
New Hampshire	563	17.7%	3.0%	\$20.00	71.4%
New Jersey	1,825	19.1%	4.1%	\$35.04	89.7%
New Mexico	138	6.1%	4.8%	**n/a	**n/a
New York	2,511	13.9%	*n/a	\$35.77	97.7%
North Carolina	2,479	26.7%	4.5%	**n/a	**n/a

	Women apprentices	Women as % of all apprentices*	Women as % of construction industry apprentices	Median hourly wage for all women completers	Women exiters' median hourly wage as % of men's
North Dakota	79	6.0%	3.3%	**n/a	**n/a
Ohio	1,937	8.5%	5.7%	\$29.72	90.1%
Oklahoma	71	3.5%	3.7%	**n/a	**n/a
Oregon	1,083	9.4%	*n/a	\$36.03	81.1%
Pennsylvania	1,719	9.5%	3.7%	\$20.00	53.1%
Rhode Island	346	13.8%	4.0%	\$25.00	78.1%
South Carolina	3,164	35.4%	3.7%	\$16.80	77.3%
South Dakota	50	4.4%	1.6%	**n/a	**n/a
Tennessee	1,108	14.0%	5.5%	\$22.05	73.4%
Texas	4,817	18.0%	3.8%	\$29.79	103.1%
Utah	245	5.4%	3.3%	\$24.53	77.4%
Vermont	189	13.0%	3.2%	\$22.11	88.4%
Virginia	2,043	16.7%	3.7%	\$15.00	60.0%
Washington	2,692	14.0%	*n/a	\$31.82	66.7%
West Virginia	2,202	36.5%	6.6%	\$28.97	124.9%
Wisconsin	799	6.6%	*n/a	\$27.71	75.3%
Wyoming	27	6.0%	4.2%	**n/a	**n/a

Source: IWPR analysis of RAPIDS data for FY 2023 (October 2022–September 2023).

Notes: Data for the District of Columbia are not included in the RAPIDS database. *n/a indicates that industry level data are not available for women apprentices. Exiters are those who completed an apprenticeship within the financial year; **n/a indicates fewer than 10 women exiters with wage data in FY 2023.

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