Expanding Apprenticeship to New Sectors and Populations:

The Experiences and Outcomes of Apprentices in the American Apprenticeship Initiative

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PREPARED FOR:
U.S. Department of Labor
Employment and Training Administration
200 Constitution Avenue, NW
Washington, DC 20210

SUBMITTED BY:
Douglas Walton
Karen N. Gardiner
Burt Barnow (George Washington University)

Abt Associates
6130 Executive Boulevard
Rockville, MD 20852

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Abt ASSOCIATES

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

About this Report

Funded by the H-1B visa program, the U.S. Department of Labor's (DOL) American Apprenticeship Initiative (AAI) supported 46 grantees across the country to expand registered apprenticeship into new sectors, such as healthcare, and to populations historically underrepresented in apprenticeships. DOL commissioned an evaluation of the AAI grants to build evidence about the effectiveness of registered apprenticeship for apprentices and employers. This report presents findings from the outcomes study of that evaluation. It examines the characteristics, reasons for enrollment, program experiences, and post-program outcomes of AAI apprentices and pre-apprentices. The data sources include an AAI Apprentice Survey administered to a sample of approximately 2,600 registered apprentices, program records from grantees, and administrative earnings data from the National Directory of New Hires.

Authors

Douglas Walton
Karen N. Gardiner
Burt Barnow

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Glossary of Terms

Apprenticeship agreement: A written agreement between an apprentice and the apprentice's program sponsor, or sometimes an apprenticeship committee acting as agent for the program sponsor, that contains the terms and conditions of the employment and training of the apprentice.

Cancellation: The termination of a registered apprenticeship at the request of the sponsor or employer.

Employer: Business or organization that hires the apprentice, pays their wages, and commits to developing their technical skills through on-the-job learning.

Grantee: Organization that received American Apprenticeship Initiative funds to expand registered apprenticeship.

Incumbent worker: An apprentice who was already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship.

Instructor: Person who provides the related technical instruction (RTI) in the classroom for an apprenticeship program. The RTI provider might be a community college instructor, but it could also be an instructor associated with other types of RTI partners.

Mentor: Person who provides on-the-job learning opportunities for apprentices. Mentors are other employees of the hiring employer.

Occupation, occupational field: The specific job associated with an apprenticeship program. The DOL Office of Apprenticeship or a State Apprenticeship Agency, which assigns each job a distinct occupational code, must approve occupational fields. Grantees can operate multiple apprenticeship programs within an occupational field, and sponsors can operate multiple programs across different fields.

On-the-job learning (OJL): Hands-on training provided to the apprentice from an experienced mentor at the job site, typically for at least one year. Every apprenticeship program includes OJL. Structured OJL experiences are developed by mapping the skills and knowledge that the apprentice must learn over the course of the program in order to be fully proficient at the job.* Employers traditionally bear most training-related costs. American Apprenticeship Initiative grant funds could be used to support the OJL to reimburse employers for mentor time.

Partner organization: Any entity, besides an employer or a union, that provides support for grant activities. Partner organizations can include public agencies, community colleges, non-profits, and industry associations.

Pre-apprenticeship program: Preparation for individuals to enter and succeed in an apprenticeship program from an approved training curriculum based on industry standards. A program can include educational and pre-occupational services (e.g., career and industry awareness workshops, job readiness courses), hands-on training in a simulated lab experience or through volunteer opportunities, and

* For information on components of registered apprenticeship, including OJL, see DOL's *Quick-Start Toolkit* at https://www.doleta.gov/oa/employers/apprenticeship_toolkit.pdf.

assistance in applying to apprenticeship programs. Pre-apprenticeship programs involve formal partnerships with at least one apprenticeship program sponsor.

Registration agency: The DOL Office of Apprenticeship or a federally recognized State Apprenticeship Agency act as a Registration Agency, responsible for evaluating an apprenticeship program's Standards of Apprenticeship and for ongoing evaluation of the apprenticeship program to determine whether it complies with federal regulations related to program design, worker protections, and other criteria. Programs in compliance are "registered." Registered programs can access federal resources, state tax credits where available, and technical assistance.

Registered apprenticeship program: A structured program of work-based learning of technical skills under mentors (OJL) and classroom instruction (RTI), providing value to both employers and workers and culminating in an industry-recognized credential, that meets standards for registration by a Registration Agency. An apprenticeship sponsor for a specific occupation runs the program. Sponsors are responsible for registering individual apprentices and determining whether they have successfully completed the apprenticeship program.

Related technical instruction (RTI): Classroom instruction that complements the apprentice's on-the-job learning, delivering the technical concepts and workforce and academic competencies needed to succeed on the job. A community college, a technical school, an apprenticeship training school, or the employer itself can provide the instruction. Education partners collaborate with employers to design the curriculum to deliver the skills and knowledge needed by apprentices. All partners work together to identify how to pay for the RTI.

Sponsor: Entity responsible for the overall operation of the registered apprenticeship program, working in collaboration with the partners. Sponsors can be a single employer or a consortium of employers. Alternatively, the sponsor can be any of a range of workforce intermediaries including an industry association or a joint labor-management organization. Community colleges and community-based organizations can also serve as sponsors.

Standards of Apprenticeship: Document describing apprenticeship components for a specific job role. Its individual standards include the purpose of the proposed apprenticeship program, the term of the apprenticeship, the provision of related technical instruction and on-the-job learning, wage progression for the apprenticeship, supervision of apprentices, safety, registration of apprentices, work process schedule, probation period, periodic evaluation of apprentices' performance, completion requirements, and apprentice/mentor ratio.

Executive Summary

Apprenticeships are structured work-based training programs that combine classroom instruction ("related technical instruction," or RTI) with on-the-job learning (OJL) provided by a mentor at the employer's worksite (Box ES-1). Apprenticeships provide training in a specific occupation and deliver occupational skills that are recognized and transferable across employers. Apprentices are employed during their training, contribute to production, and earn progressively higher wages. Commonly used as a workforce development strategy in other countries, apprenticeships in the United States have typically been used as a training model for occupations in the building trades (e.g., electrician, carpenter) (Lerman 2016). Reflecting this history of apprenticeship programs in the United States, most apprentices have been non-Hispanic White men.[1]

Box ES-1: Elements of Registered Apprenticeship

- **Approval** by DOL's Office of Apprenticeship or a State Apprenticeship Agency, or sometimes both
- **Related technical instruction** (RTI) of at least 144 hours in a physical or virtual classroom
- **On-the-job learning** (OJL) of at least 2,000 hours overseen by a mentor at the employer's job site
- **Wage increases** over the course of the apprenticeship (wage progression), which can be tied to time in the program or to demonstration of skill competency
- An **industry-recognized credential** upon completion of the apprenticeship
- A ***Standards of Apprenticeship*** document that describes the work process schedule (skill standards) and specifies the RTI, OJL, and wage progression for the registered apprenticeship program
- A **sponsor** to oversee the program and maintain fidelity to the Standards of Apprenticeship and collect basic data on apprentices; sponsors can be employers, consortia of employers, unions, community colleges, state or local workforce agencies, or non-profits
- A **written apprenticeship agreement** between an apprentice and either the program sponsor or an apprenticeship committee acting as an agent for the sponsor

Source: Gardiner et al. (2021)

Initiated in 2015, the U.S. Department of Labor (DOL)'s American Apprenticeship Initiative (AAI) focused on expanding apprenticeships, specifically those that DOL (or state) "registers" as meeting specific standards (box right).[2] Funded by the H-1B visa program,[3] AAI awarded $175 million in five-year grants to 46 grantees to expand apprenticeship into sectors with few apprenticeships, such as healthcare and information technology (IT), and to populations historically underrepresented in

[1] According to 2020 data from the Registered Apprenticeship Partners Information Data System (RAPIDS), about 90 percent of all U.S. apprentices registered in states reporting to RAPIDS are men, and more than 60 percent are non-Hispanic White. About 65 percent of apprenticeships are in construction occupations. https://www.dol.gov/agencies/eta/apprenticeship/about/statistics/2020.

[2] For more information on the registered apprenticeship system, please see https://www.apprenticeship.gov/about-us/apprenticeship-system.

[3] The H-1B visa program allows qualified nonimmigrant foreign workers to temporarily work in the United States when U.S. employers cannot otherwise obtain needed skills and abilities from the U.S. workforce (https://www.dol.gov/whd/immigration/h1b.htm). The Funding Opportunity Announcement (FOA) for AAI indicated that industries and occupations proposed by grantees should be those where H-1B visas were being used by employers or that were otherwise high-growth industries (DOL/ETA 2014).

apprenticeship, including women, racial and ethnic minorities, and veterans.[4,5] AAI also supported pre-apprenticeship programs that aimed to help future apprentices enroll and succeed in apprenticeship programs by providing career-specific training and job readiness skills.

Box ES-2: AAI Evaluation Sub-studies

- An **implementation** study of the grantee apprenticeship programs
- An **outcomes** study that examines the characteristics, program experiences, and post-program outcomes of apprentices and pre-apprentices
- A study measuring the **return on investment** to employers
- An **employer engagement demonstration** that explores the impacts of training grantee staff to market apprenticeships to employers

In 2016, DOL commissioned an evaluation of AAI to build evidence about the effectiveness of registered apprenticeship for apprentices and employers and generate lessons for developing and operating apprenticeship programs, particularly in nontraditional occupations (occupations not related to construction). Conducted by Abt Associates and its partners, the AAI evaluation includes four sub-studies (see Box ES-2).[6] This is the final report for the outcomes sub-study. It describes the characteristics, program experiences (e.g., occupation, wage progression), and post-program employment and earnings outcomes of participants in an AAI-supported apprenticeship or pre-apprenticeship program.[7]

AAI Outcomes Study

The AAI outcomes study addresses the following research questions:

1. What are the characteristics of AAI apprentices and why did they enroll in an apprenticeship program?
2. What were the experiences of AAI apprentices during the apprenticeship program?
3. What were the completion rates and post-program labor market outcomes of AAI apprentices?
4. How did the experiences and outcomes of AAI apprentices differ between subgroups (see Box ES-3)?
   - Underrepresented[8] versus historically represented populations in registered apprenticeship?
   - Nontraditional versus traditional occupations?
   - New workers versus incumbent workers?
5. What were the characteristics, program experiences, and post-program outcomes of AAI pre-apprentices?

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4 One AAI grant ended prior to the start of data collection for the evaluation. This report presents findings for 45 grantees.

5 In 2020, DOL announced that grantees could apply for an extension of up to 12 months to their five-year grants, through September 30, 2021. Thirty-six of 45 grantees requested and received an extension.

6 The findings from these sub-studies are reported in a series of reports and briefs, including Copson et al. (2021), Fumia et al. (2022), Gardiner et al. (2021), Kuehn et al. (2022), Trutko et al. (2022), and Walton and Gardiner (2022).

7 All AAI apprentices are registered apprentices participating in registered apprenticeship programs whether denoted as such or not in the text.

8 The AAI Funding Opportunity Announcement describes underrepresented populations as women, young men and women of color, people with disabilities, and veterans, including transitioning service members (see https://www.dol.gov/sites/dolgov/files/ETA/grants/pdfs/FOA-ETA-15-02.pdf). Due to data availability, analyses of underrepresented populations in this report does not include people with disabilities.

This AAI outcomes study is the first to examine the in-program experiences of a large number of registered apprentices (2,600) in mostly non-construction occupations, linked with their prior- and post-apprenticeship employment and earnings. This report focuses on apprentices who registered and pre-apprentices who enrolled in their programs between October 1, 2015, and December 31, 2018, so that apprentices had been in their programs long enough to provide a meaningful assessment of their experiences (at least 15 months) and had at least five quarters of post-program earnings data available for analysis. The analysis uses the following data sources:

- An AAI **Apprentice Survey** administered to a subset of AAI apprentices between March and October 2020, on average about 2.7 years after starting their programs. The survey collected information about apprentices' background, program experiences, and post-program outcomes.
- **Apprenticeship Quarterly Performance Report (Apprenticeship QPR)** program data that AAI grantees collected and submitted to DOL. These data describe the pre-program characteristics and in-program occupations of AAI apprentices and pre-apprentices.
- Quarterly earnings from the **National Directory of New Hires (NDNH)**, a database of Unemployment Insurance (UI) payments and quarterly earnings data maintained by the Office of Child Support Enforcement within the Administration for Children and Families, U.S. Department of Health and Human Services. NDNH data are available for both apprentices and pre-apprentices through December 2020. The study team uses this data to construct measures of employment and earnings from a year prior to program start through the fifth quarter after expected program completion (on average about 9.5 quarters, or 2.5 years, after starting the apprenticeship program).
- Data from DOL's **Registered Apprenticeship Partners Information Data System (RAPIDS)** through 2020, which contains data on registered apprentices in 25 states with federally administered

Box ES-3: Defining AAI Outcomes Study Subgroups

Populations

- "**Underrepresented**" populations are defined as women, veterans, and people of color—that is, self-identifying as Black, Hispanic, or Other Race (specifically Asian, Native Hawaiian or Pacific Islander, Native American, or multiple races)
- "**Historically represented**" populations in registered apprenticeship are defined as White men

Occupations

- "**Nontraditional**" occupations are manufacturing, healthcare, computer/IT, and "other" (including banking, insurance, logistics, and transportation)
- "**Traditional**" occupations are those related to construction

Race/Ethnicity

Race and ethnicity are reported separately; apprentices could select more than one race in the AAI Apprentice Survey

- "**White**" describes non-Hispanic apprentices who reported themselves as White and no other race
- "**Black**" describes non-Hispanic apprentices who reported themselves as Black and no other race
- "**Hispanic**" describes apprentices who reported themselves of Hispanic ethnicity, regardless of reported race
- "**Other Race**" describes non-Hispanic apprentices who reported themselves as Asian, Native Hawaiian or Pacific Islander, Native American, or multiple races

Worker Status

- **"New worker"** describes an apprentice hired for the apprenticeship program
- **"Incumbent worker"** describes an apprentice who was already employed by the employer who operated the apprenticeship program

registered apprenticeship programs and 18 states with federally recognized State Apprenticeship Agencies.[9]

Several factors affect the interpretation of findings in this report. First, the outcomes study measures participant-level outcomes, not AAI apprenticeship programs' causal impacts. Thus, changes in employment and earnings cannot be attributed solely to the apprenticeship program. Additionally, the study reports outcomes for several subgroups of participants, and many subgroup characteristics are correlated. For example, if a larger share of women apprentices than men enroll in an occupation associated with lower post-apprenticeship earnings, such as healthcare, women might have lower post-apprenticeship earnings, on average, than men not because of their gender but because of their occupation selection. Since the non-experimental design of the outcomes study did not allow us to disentangle these various associations, the differences between subgroups were not formally tested for statistical significance.

Finally, in order to report post-program earnings in the fifth quarter after expected program completion, the earnings analysis is restricted to apprentices whose programs were expected to end by September 2019. As such, it excludes certain longer-term programs in which apprentices were still enrolled. Moreover, some of the post-program earnings outcomes may have been influenced by the economic shock associated with the onset of the COVID-19 pandemic (about 23 percent of AAI apprentices' fifth post-program quarter occurred during the period affected by the COVID-19 pandemic).

Summary of Key Findings

This summary first describes the characteristics of AAI apprentices, the importance of various factors in their decision to enroll in an apprenticeship program, their in-program experiences, and their post-apprenticeship outcomes. Next, it describes AAI pre-apprentice experiences and outcomes, including their earnings. It concludes with a brief discussion of implications of the outcome study findings.

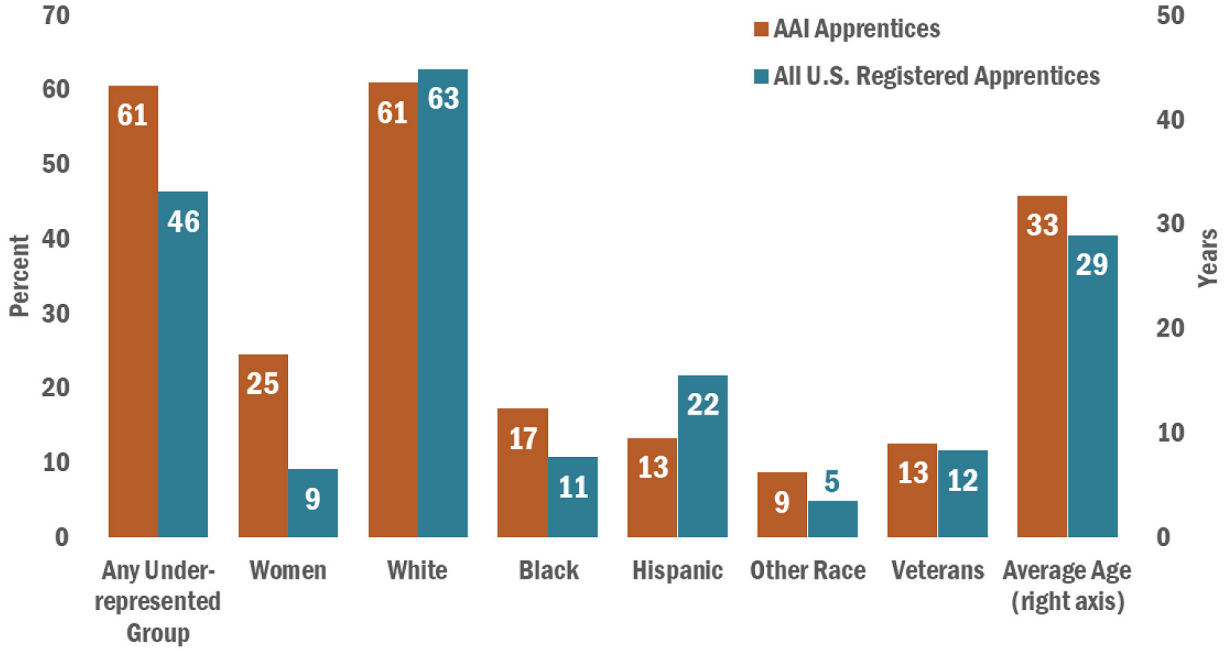
AAI Apprentice Characteristics and Factors Considered when Enrolling

Most AAI apprentices were from an underrepresented population. Whether AAI grantees succeeded in recruiting from historically underrepresented populations for apprenticeships is a primary topic of the AAI outcomes study. Sixty-one (61) percent of AAI apprentices were from an underrepresented population. In contrast, 46 percent of all U.S. registered apprentices in RAPIDS are from an underrepresented population, a difference of 15 percentage points (Exhibit ES-1).

Additionally, AAI apprentices were four years older, on average, than all registered apprentices (33 years compared to 29 years).

[9] This study uses RAPIDS data through 2020 to align with the timing of the AAI Apprentice Survey. Additional states began transferring data to RAPIDS in 2021 (see https://www.dol.gov/agencies/eta/apprenticeship/about/statistics/2021).

Exhibit ES-1. Characteristics of AAI Apprentices at Enrollment versus All Registered Apprentices



Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601); DOL Registered Apprenticeship Partners Information Data System (RAPIDS) (*N*=220,556). RAPIDS sample comprises U.S. apprentices registered between 2015 and 2018 who were still enrolled in 2020.

Notes: Survey means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. "Any underrepresented group" includes women, people of color, and veterans. Race and ethnicity were reported separately, and apprentices could select more than one race. "White" describes non-Hispanic apprentices who self-reported as White and no other race; "Black" describes non-Hispanic apprentices who self-reported as Black and no other race; "Hispanic" includes all apprentices who self-reported as of Hispanic ethnicity, regardless of reported race; and "Other Race" describes non-Hispanic apprentices who self-reported as Asian (4.5 percent), Native Hawaiian or Pacific Islander (0.7 percent), Native American (1.7 percent), or multiple races (1.7 percent). Average age reflects age at enrollment.

One-third of AAI apprentices had a postsecondary credential prior to starting their apprenticeships. Two-thirds of AAI apprentices had postsecondary experience (similar data is not available for all apprentices). More than one-quarter (27 percent) had a college degree (associate, bachelor's, or higher) and another 10 percent had a trade or vocational credential from a college or other source. Another 29 percent had some postsecondary education but no certificate or degree. Educational status varied by subgroup; a larger share of women and Other Race AAI apprentices had a college degree than did other subgroups.

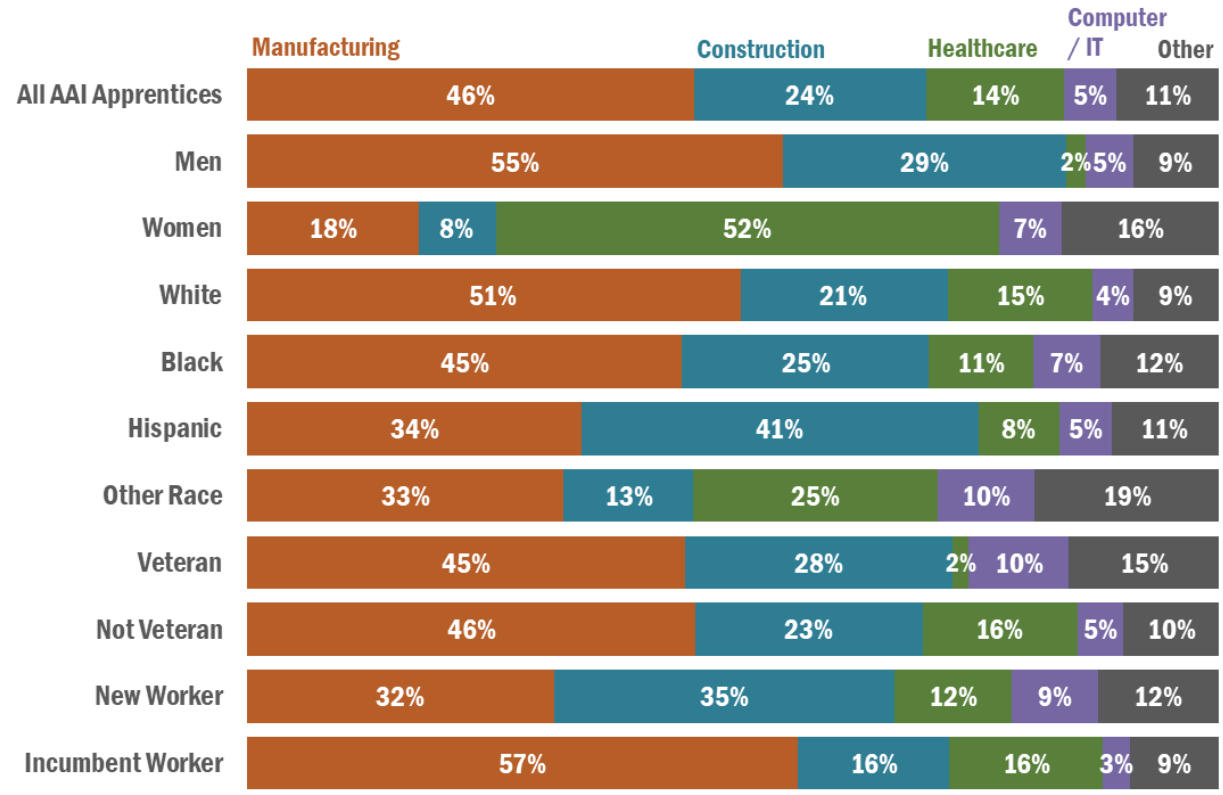
The vast majority of AAI apprentices were working at the time they enrolled in their apprenticeship. Most AAI apprentices (89 percent) were employed immediately prior to entering their apprenticeship, typically working full-time at a wage of about $18 per hour. More than half (57 percent) of AAI apprentices were incumbent workers; that is, already working for the employer that operated their apprenticeship.

AAI apprentices rated "train for a career" and gain "skills and credentials valued by employers" as the two most important factors in their decision to enroll in an apprenticeship program. Across all AAI apprentices, 79 percent reported the two most important factors in their decision making were training for a career and gaining skills and credentials valued by employers.

Apprentice In-program Experiences

Most AAI apprentices enrolled in nontraditional occupations, most commonly manufacturing. Consistent with the goals of AAI to expand into new industries and occupations, three-quarters of AAI apprentices enrolled in nontraditional occupations, including manufacturing (46 percent), healthcare (14 percent), computer/IT (5 percent), and other occupations such as finance, transportation, and logistics (11 percent) (Exhibit ES-2). Occupations varied by gender and race/ethnicity: a much larger share of women participated in healthcare apprenticeships, whereas a larger share of men participated in manufacturing ones. Manufacturing was also the most common occupation for all racial/ethnic subgroups except Hispanic apprentices, who most commonly enrolled in construction occupations. Manufacturing was the most common occupation of incumbent workers, whereas the largest share of new workers enrolled in construction apprenticeships.

Exhibit ES-2. Apprenticeship Training Occupation, by Gender, Race/Ethnicity, Veteran Status, and Worker Incumbency



Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).
Note: Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Most AAI apprentices reported that their program "prepared them well" for aspects of their occupation. The survey asked apprentices how well their apprenticeship RTI and OJL prepared them with the skills needed to operate at a high level in their occupation. More than three-quarters of AAI apprentices reported their training prepared them well or very well to use tools, equipment, or specialized skills, and to work and communicate effectively with others (76 percent each). Apprentices also reported

their training prepared them to use critical-thinking and problem-solving skills (74 percent), manage time effectively (72 percent), and apply reading and math skills relevant to the occupation (71 percent).

AAI apprentices cited RTI as contributing most to development of reading and math skills, but that OJL was most important to developing skills in the use of specialized tools or equipment required for the apprentice occupation, time management skills, communication skills, and critical-thinking and problem-solving skills.

Most AAI apprentices (86 percent) also reported they would recommend their program to a friend or family member who was interested in the field. All subgroups reported a strong willingness to recommend their apprenticeship program, including more than 90 percent of Hispanic, Other Race, and veteran apprentices.

Apprentice Post-program Experiences

Most AAI apprentices had completed their programs or were still enrolled at the time of the AAI Apprentice Survey. At the time they responded to the survey (on average 2.7 years after enrolling), about 80 percent of apprentices reported that they had completed (47 percent) or were still enrolled (33 percent) in their programs. Of those still enrolled, most (76 percent) reported they were on track to complete on time. Relative to all other subgroups, a larger share of women apprentices reported that they completed their programs (61 percent). This reflected the predominance of women in healthcare apprenticeships, which were shorter, on average, than other apprenticeships. Among other subgroups of AAI apprentices, the percentage who completed ranged from 43 percent (men) to 52 percent (Other Race).

Fifteen (15) percent of AAI apprentices left their programs before completing, and there was little variation by subgroup. The most often cited reason for leaving was personal or family problems (39 percent). This was the most often reported reason for all subgroups except those who identified as Other Race, who by a small margin reported finding a better-paying job as the top reason. Relative to all AAI apprentices, a larger proportion of women, Hispanic, and Black apprentices reported personal or family problems as the reason for leaving the apprenticeship prior to completion.

About two-thirds of AAI apprentices who completed their apprenticeship continued to work at the same employer that sponsored their apprenticeship program. Among all AAI apprentices who completed their programs, 65 percent were working for the same employer that sponsored their program. However, there was substantial variation by occupation and incumbency—far fewer apprentices in computer/IT (38 percent) and construction occupations (52 percent) remained with the same employer than did apprentices in healthcare (71 percent), manufacturing (71 percent), and other occupations (66 percent). More apprentices who were incumbent workers remained with the same employer after program completion than did new workers (74 percent versus 54 percent), possibly reflecting the relationship that these workers had established with their employers prior to their program, as well as occupation type.

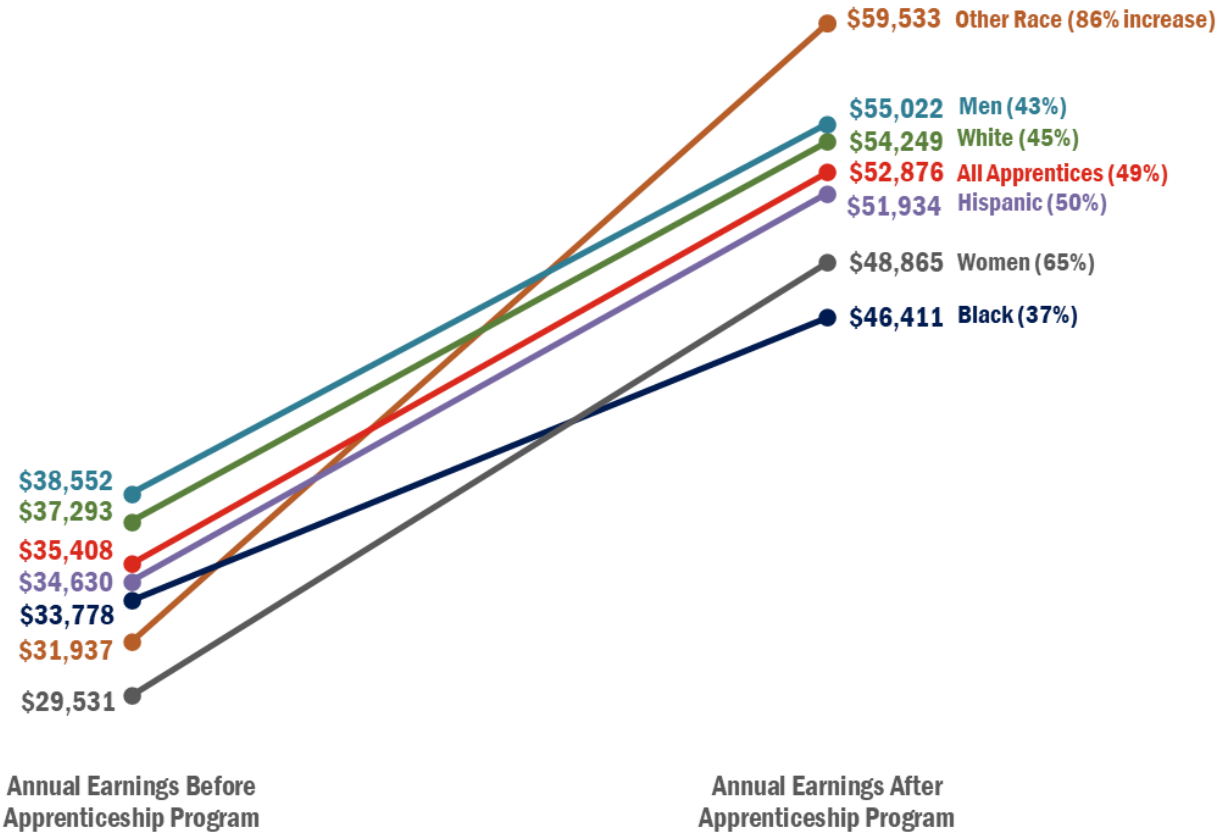
AAI apprentices experienced substantial earnings growth between the year before starting the apprenticeship and the year after program exit, but the magnitude of the increase varied by subgroup. Exhibit ES-3 shows annual earnings for apprentices in the year prior to starting their program and in the fifth quarter after expected program completion (which occurs on average about 9.5 quarters, or 2.5 years, after starting the program). On average, annual earnings across all AAI apprentices (red line) grew by 49

percent over this period, rising from $35,408 in the year before the program to about $52,876 one year after program exit.

Women AAI apprentices had higher earnings growth than men. Both the absolute and percentage gains for women exceeded those for men (Exhibit ES-3). Annual earnings for women grew by 65 percent from pre-program levels (grey line). Earnings for men grew by 43 percent (teal line). Although women's post-program earnings lagged those of men, the gap between women's and men's earnings decreased from 23 percent prior to the apprenticeship to 11 percent after (not shown).

Earnings increased for AAI apprentices in all racial and ethnic groups. The amount and percentage increase in earnings varied across racial and ethnic groups (Exhibit ES-3). Other Race apprentices had the highest earnings growth (86 percent; orange line). Earnings growth was lower for Hispanic apprentices (50 percent; purple line), White apprentices (45 percent; green line), and Black apprentices (37 percent; dark blue line).

Exhibit ES-3. Earnings Outcomes Overall, and by Gender and Race/Ethnicity

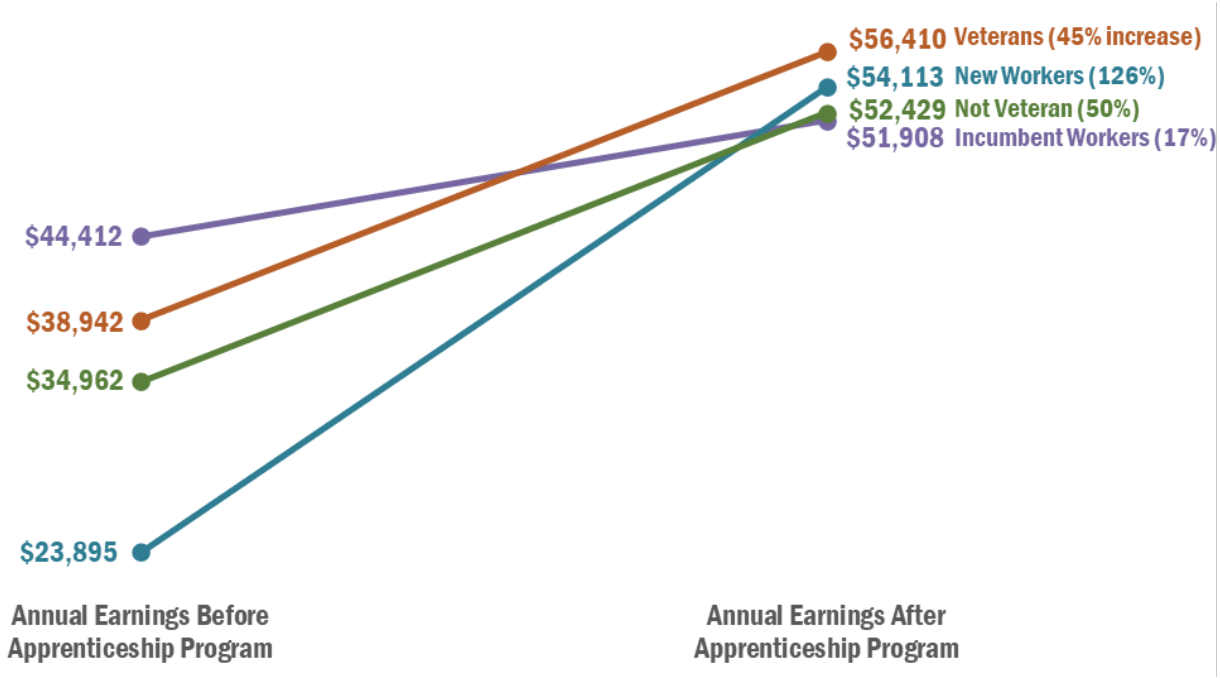


Source: National Directory of New Hires (*N*=3,871).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship QPR and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. "Annual earnings before apprenticeship program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after apprenticeship program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

Earnings grew much more for new workers than incumbent workers. Among incumbent workers—those already working with the employer that operated the apprenticeship—earnings grew by 17 percent (Exhibit ES-4, purple line). Among new workers hired by the employer that operated the apprenticeship, earnings grew by 126 percent (teal line).

There was little difference in earnings growth by veteran AAI apprentices. Veterans' earnings grew by 45 percent (orange line) compared to 50 percent for non-veterans (purple line; Exhibit ES-4).

Exhibit ES-4. Earnings Outcomes, by Incumbency and Veteran Status

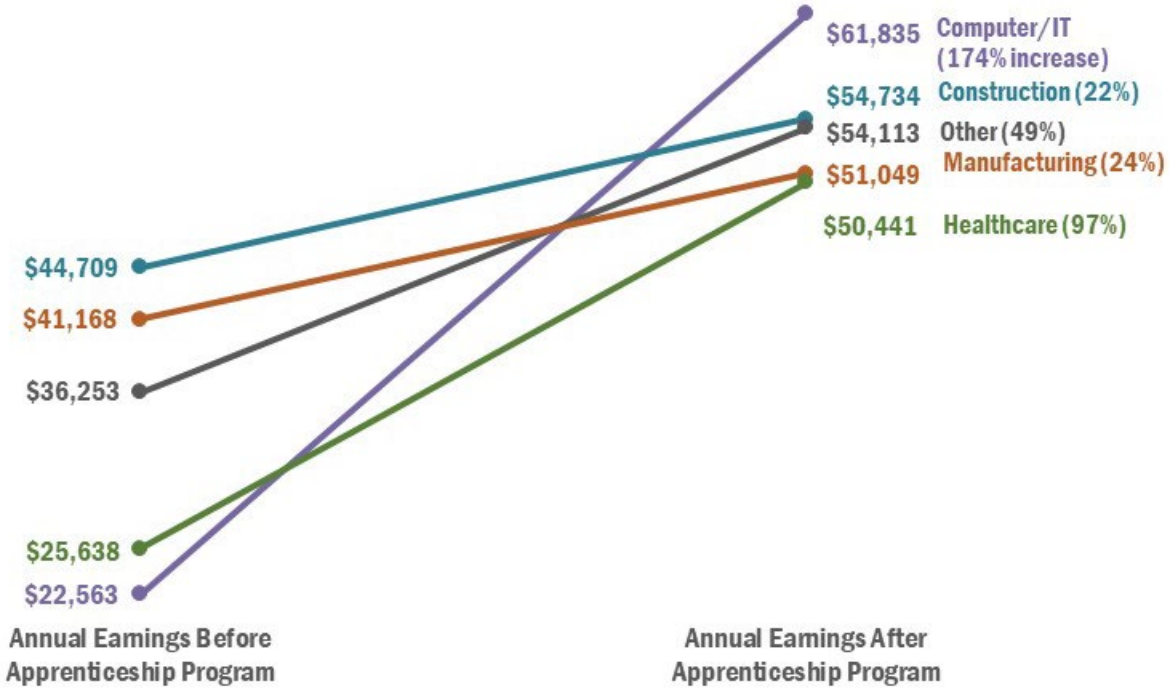


Source: National Directory of New Hires (*N*=3,871).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship QPR and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. "Annual earnings before apprenticeship program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after apprenticeship program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

Earnings growth was highest for AAI apprentices in computer/IT and healthcare occupations and lowest for apprentices in construction and manufacturing. Earnings growth varied by apprenticeship occupation (Exhibit ES-5). Apprentices in computer/IT occupations (purple line) experienced the greatest increase, with earnings growing 174 percent. This may reflect that computer/IT apprentices had the largest share of new workers among occupations (71 percent). Apprentices in healthcare occupations (green line) experienced the second-highest level, with earnings growing 97 percent. Apprentices in these two occupations had the lowest levels of pre-program earnings. Among healthcare apprentices, earnings growth was higher for White women apprentices than Black women apprentices, due in part to their differences in choice of healthcare occupation. A much higher share of White women healthcare apprentices participated in Registered Nurse apprenticeships, an occupation that had among the highest earnings growth of any occupation, whereas more Black women apprentices trained for lower-paying occupations, such as Pharmacy Technician (not shown).

Earnings growth was lowest for AAI apprentices in the manufacturing (24 percent) and construction (22 percent) occupations. Apprentices in these two occupations had the highest pre-program earnings.

Exhibit ES-5. AAI Apprentices' Earnings Outcomes, by Occupation



Source: National Directory of New Hires (*N*=3,871).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship QPR and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. "Annual earnings before apprenticeship program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after apprenticeship program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

Pre-apprentice Characteristics and Program Outcomes

Pre-apprenticeship programs aim to prepare workers to enter and succeed in a registered apprenticeship program. With a formal partnership with at least one apprenticeship program sponsor, the pre-apprenticeship is a strategy for preparing historically underrepresented populations for apprenticeship.

Relative to AAI apprentices, a larger share of AAI pre-apprentices was from underrepresented populations. Ninety (90) percent of AAI pre-apprentices were women, people of color, or veterans, compared to 61 percent of AAI apprentices. Also relative to apprentices, pre-apprentices had less postsecondary education experience and lower earnings in the 12 months before enrolling in their pre-apprenticeship program.

Most AAI pre-apprentices completed their programs and experienced earnings growth. Construction was the most common occupation, followed by computer/IT, manufacturing, healthcare, and other occupations. The typical AAI pre-apprenticeship program lasted about three months. Eighty-one (81) percent of pre-apprentices completed their programs. Almost two-thirds of pre-apprenticeship completers (63 percent) continued to a registered apprenticeship program. Registered apprenticeship was the most common next step for pre-apprentice completers in all occupations except for computer/IT pre-

apprentices, who most commonly entered related employment directly. Finally, the typical pre-apprentice's earnings nearly doubled between the year prior to starting the pre-apprenticeship and the year after expected program completion, although their earnings remained lower than those of apprentices.

Discussion and Areas for Further Inquiry

AAI aimed to expand registered apprenticeship to nontraditional occupations and underrepresented populations. The outcomes study finds that it did both. Most AAI apprentices and pre-apprentices completed their programs and experienced substantial earnings gains. Most apprentices reported positive experiences with their programs and that their programs prepared them well for their occupations.

Suggestions to Address Differential Earnings Growth across Subgroups

Although these positive findings occurred across all subgroups, the magnitude of earnings growth varied by apprentice training occupation, gender, race/ethnicity, and incumbency. The outcomes study findings suggest potentially promising actions that registered apprenticeship programs or future grantees could take to address differential earnings growth across subgroups.

- **Strategies to promote entry into higher-paying occupations for underrepresented populations.** Earnings growth was highest for occupations in the computer/IT and healthcare sectors. However, the potential earnings growth varied within these sectors, with the difference between Registered Nurse and Pharmacy Technician being one such example. Future programs might consider ways to promote entry into and completion of apprenticeships in higher-growth occupations by underrepresented populations. Future research might explore underlying reasons for this difference.
- **Approaches to encouraging employers to hire new workers in apprenticeship programs**. More than half of apprentices were already working at the employer who operated the apprenticeship program. Although incumbent workers experienced earnings gains of 17 percent, on average, new workers' earnings increased 126 percent. New workers earned about $20,000 per year less than incumbent workers in the year prior to starting their apprenticeship program, but about $2,000 more after their program. Apprenticeship programs or future grantees could explore ways to focus apprenticeship programs on new workers rather than incumbent workers.
- **Additional supportive services might help apprentices to persist and complete their programs.** A larger share of women, Black apprentices, and Hispanic apprentices than other subgroups left their apprenticeships before completing them due to personal or family problems. Programs might consider whether additional supportive services might help apprentices—particularly those from underrepresented populations—persist and complete their programs.
- **Strengthening collaboration with pre-apprenticeship programs.** AAI pre-apprenticeship programs appear to be an onramp to registered apprenticeship programs for underrepresented populations. Most pre-apprentices completed their programs, and the majority subsequently enrolled in a registered apprenticeship program. However, nearly 40 percent of pre-apprentice completers did not subsequently enter registered apprenticeships. Over half of AAI grantees reported there were not enough registered apprenticeship positions available to accommodate all pre-apprentices (Gardiner et al. 2021). Programs might consider whether additional collaboration between pre-apprenticeship and registered apprenticeship programs might increase the share of pre-apprentices interested in a registered apprenticeship who continue to one. However, grantees also reported that not all pre-

apprentices are interested in continuing to a registered apprenticeship for reasons including pursuit of a different occupation, finding other work, disengagement from the program, and pursuing other postsecondary education options (Gardiner et al. 2021).

Suggestions for Further Research

Further research would also help strengthen the evidence on registered apprenticeship programs. In particular:

- **Additional follow-up to understand the long-term earnings growth of AAI apprentices and pre-apprentices.** The earnings analysis in this report covers a period one year after the apprenticeship ended and excluded longer-term programs. Thus, the earnings results reflect the experiences of AAI apprentices who completed short- and medium-term apprenticeship programs. Longer-term follow-up would answer some important questions. Did apprentices in longer-term programs experience earnings growth of a similar magnitude to apprentices in shorter-term programs? Did earnings increases persist for apprentices who enrolled in shorter-term programs? Did earnings gaps further narrow between subgroups (e.g., men and women)? What are the apprenticeship outcomes for AAI pre-apprentices who subsequently enroll in an apprenticeship program?
- **Rigorously assess the impacts of registered apprenticeship on employment and earnings.** Descriptive statistics such as those reported here provide important details about apprentices' in-program experiences and their employment and earnings outcomes. Such statistics cannot, however, make causal attributions of outcomes to apprenticeship programs. A future study that randomizes apprentices to either a group that can enroll in the apprenticeship program or one that cannot, but can access other workforce training programs, could help build evidence on the causal impact of registered apprenticeship programs.

1. Introduction

Apprenticeship is an "earn and learn" training model. Apprenticeships are structured work-based training programs that combine classroom instruction ("related technical instruction," or RTI) with on-the-job learning (OJL) provided by a mentor at the employer's worksite. Apprenticeships provide training in a specific occupation and deliver occupational skills that are recognized and transferable across employers. Apprentices are employed and contribute to production during their training and earn progressively higher wages. Commonly used as a workforce development strategy in other countries, apprenticeships in the United States have traditionally been used as a training model for occupations in the building trades (e.g., electrician, carpenter) (Lerman 2016).[1] However, apprenticeship is growing in nontraditional occupations.[2]

The U.S. Department of Labor (DOL)'s American Apprenticeship Initiative (AAI) aimed to expand apprenticeship into sectors with few apprenticeships (such as healthcare, manufacturing, and information technology) and to populations historically underrepresented in apprenticeship, including women and people of color.[3] AAI focused specifically on apprenticeships that DOL or a State Apprenticeship Agency registers as meeting specific standards. Funded by the H-1B visa program,[4] AAI awarded $175 million in five-year grants to 46 grantees in 2015.[5,6]

Box 1: AAI Evaluation Sub-studies

- An **implementation** study of the grantee apprenticeship programs
- An **outcomes** study that explores the characteristics, program experiences, and post-program outcomes of apprentices and pre-apprentices
- A study measuring the **return on investment** to employers
- An **employer engagement demonstration** that explores the impacts of training grantee staff to market apprenticeships to employers

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1 When the U.S. Department of Labor awarded the American Apprenticeship Initiative (AAI) grants in fiscal year 2016, the most common registered apprenticeship occupations were electrician (41,490 active apprentices), plumber/pipefitter/steamfitter (23,000), carpenter (20,000), and construction laborer (14,000). "Registered Apprenticeship National Results, Fiscal Year 2016 (10/01/2015 to 9/30/2016)," https://www.dol.gov/agencies/eta/apprenticeship/about/statistics/2016.

2 In fiscal year 2020, pharmacy support staff (1,667 active apprentices) and nurse assistants (1,994) were amongst the top 25 occupations. "Registered Apprenticeship National Results Fiscal Year 2020 (10/01/2019 to 9/30/2020)," https://www.dol.gov/agencies/eta/apprenticeship/about/statistics/2020.

3 See the AAI Funding Opportunity Announcement (DOL/ETA 2014) at https://www.doleta.gov/Grants/pdf/FOA-ETA-15-02.pdf.

4 The H-1B visa program allows qualified nonimmigrant aliens to temporarily work in the United States when employers cannot otherwise obtain needed business skills and abilities from the U.S. workforce (https://www.dol.gov/whd/immigration/h1b.htm). The Funding Opportunity Announcement for AAI indicated grantees should propose apprenticeships in industries and occupations where H-1B visas were used or that were otherwise high-growth (see DOL/ETA 2014).

5 One of the 46 grants ended before data collection for the evaluation started. This report presents findings for 45 grantees.

6 In 2020, DOL announced that grantees could apply for an extension of up to 12 months to their five-year grants, through September 30, 2021. Of the 36 grantees that requested an extension, 27 extended their grants through September 30, 2021. One extended through January 1, 2021; four extended to March 31, 2021; and four extended to June 30, 2021.

In 2016, DOL commissioned an evaluation of AAI to build evidence about the effectiveness of registered apprenticeship for apprentices and employers and generate lessons for developing and operating apprenticeship programs, particularly in nontraditional occupations. The evaluation comprises four sub-studies (Box 1).[7]

This report of the outcomes study describes the characteristics, program experiences, and post-program outcomes of participants in an AAI-supported apprenticeship or pre-apprenticeship program.

The remainder of this chapter provides background on registered apprenticeships, describes the goals and objectives of the AAI outcomes study, lists the outcomes study research questions and data sources, and provides a guide to the remainder of the report.

Box 2: Elements of Registered Apprenticeship

- **Approval** by DOL's Office of Apprenticeship or a State Apprenticeship Agency, or sometimes both
- **Related technical instruction** (RTI) of at least 144 hours in a physical or virtual classroom
- **On-the-job learning** (OJL) of at least 2,000 hours overseen by a mentor at the employer site
- **Wage increases** over the course of the apprenticeship (wage progression), which can be tied to time in the program or to demonstration of skill competency
- An **industry-recognized credential** upon completion of the apprenticeship
- A ***Standards of Apprenticeship*** document the work process schedule (skill standards) and specifies the RTI, OJL, and wage structure for the registered apprenticeship program
- A **sponsor** to oversee the program and maintain the standards of apprenticeship and basic data on apprentices; sponsors can be employers, consortia of employers, unions, community colleges, State or local workforce agencies, or non-profits
- A **written apprenticeship agreement** between an apprentice and either the program sponsor or an apprenticeship committee acting as an agent for the sponsor

Source: Gardiner et al. (2021)

1.1 Registered Apprenticeship Programs and Apprentices

AAI supports apprenticeship programs that are registered either with DOL's Office of Apprenticeship (OA) or with a federally recognized State Apprenticeship Agency (SAA). Registered apprenticeship programs must be at least one year long to meet regulatory requirements but are typically two to five years long. A sponsor is responsible for the program and maintains the Standards of Apprenticeship, which documents the RTI, OJL, and other aspects of the apprenticeship. Apprenticeship completers receive an industry-recognized credential.[8] Box 2 summarizes elements of registered apprenticeships.[9]

Apprentices participating in a registered apprenticeship program are also registered by the same entity as the apprenticeship program (OA or an SAA). Registered apprentices sign an apprenticeship agreement that commits them to abiding by the standards of apprenticeship associated with their program.

Some apprentices might first participate in a pre-apprenticeship program. These programs aim to help future apprentices enroll and succeed in apprenticeship programs by providing instruction in basic skills

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7 The findings from these sub-studies are reported in a series of reports and briefs, including Copson et al. (2021), Fumia et al. (2022), Gardiner et al. (2021), Kuehn et al. (2022), Trutko et al. (2022), and Walton and Gardiner (2022).

8 More information on policies and other guidance on registered apprenticeship is available on DOL's site at https://www.dol.gov/agencies/eta/apprenticeship/policy.

9 For DOL advisories related to registered apprenticeship, see https://wdr.doleta.gov/directives.

(e.g., Adult Basic Education) and career-specific training. Pre-apprenticeship programs are typically short (12 weeks on average for programs operated by AAI grantees; see Gardiner et al. [2021]) and involve less OJL than apprenticeships do. Per the Funding Opportunity Announcement (FOA), pre-apprenticeship programs funded by AAI must demonstrate clear pathways for underrepresented populations to enter a registered apprenticeship program (DOL/ETA 2014).[10]

1.2 Outcomes Study Research Questions and Data Sources

Using survey and administrative data, the outcomes study breaks new ground by examining the experiences of 2,600 apprentices during their apprenticeship, along with their employment and earnings before, during, and after their apprenticeship. The study captures the experiences of AAI apprentices, who are primarily in fields outside of the building trades, and thus are not necessarily representative of all apprentices in the United States. It also describes participation of underrepresented populations in apprenticeships and how their experiences and outcomes compared to historically represented apprentices. Box 3 defines key subgroups used throughout the report: underrepresented[11] versus historically represented populations; nontraditional versus traditional occupations; and race/ethnicity.

The outcomes study addresses the following research questions:

Box 3: Subgroups in the AAI Outcomes Study

Populations

- "**Underrepresented**" populations are defined as women, veterans, and people of color—that is, self-identifying as Black, Hispanic, or Other Race (specifically Asian, Native Hawaiian or Pacific Islander, Native American, or multiple races)
- "**Historically represented**" populations in registered apprenticeship are defined as White men

Occupations

- **"Nontraditional"** occupations are manufacturing, healthcare, computer/IT, and "other" (including banking, insurance, logistics, and transportation)
- **"Traditional"** occupations are those related to construction

Race/Ethnicity

Race and ethnicity were reported separately, and apprentices could select more than one race in the AAI Apprentice Survey.

- **"White"** describes non-Hispanic apprentices who reported themselves as White and no other race
- **"Black"** describes non-Hispanic apprentices who reported themselves as Black and no other race
- **"Hispanic"** describes apprentices who reported themselves of Hispanic ethnicity, regardless of reported race
- **"Other Race"** describes non-Hispanic apprentices who reported themselves as Asian, Native Hawaiian or Pacific Islander, Native American, or multiple races

Worker Status

- **"New worker"** describes an apprentice hired for the apprenticeship program
- **"Incumbent worker"** describes an apprentice who was already employed by the employer who operated the apprenticeship program

[10] Pre-apprenticeship programs can include educational (e.g., GED instruction) and pre-occupational services (e.g., career and industry awareness workshops, job readiness courses), hands-on training in a lab simulation or in volunteer work opportunities, and assistance in applying to apprenticeship programs. More information on pre-apprenticeship is available at https://www.apprenticeship.gov/employers/explore-pre-apprenticeship.

[11] The AAI Funding Opportunity Announcement describes underrepresented populations as women, young men and women of color, people with disabilities, and veterans, including transitioning service members (see https://www.dol.gov/sites/dolgov/files/ETA/grants/pdfs/FOA-ETA-15-02.pdf). Due to data availability, analyses of underrepresented populations in this report include women, people of color, and veterans.

1. What are the characteristics of AAI apprentices and why did they enroll in an apprenticeship program?
2. What were the experiences of AAI apprentices during the apprenticeship program?
3. What were the completion rates and post-program labor market outcomes of AAI apprentices?
4. How did the experiences and outcomes of AAI apprentices differ between subgroups?
   - Underrepresented versus historically represented populations?
   - Nontraditional versus traditional occupations?
   - New workers versus incumbent workers?
5. What were the characteristics, program experiences, and post-program outcomes of AAI pre-apprentices?

The outcomes study combines data from a rich set of sources (see full detail in Appendix B):

- The **Apprenticeship Quarterly Performance Report (Apprenticeship QPR)** program data that AAI grantees collected and reported to DOL. The Apprenticeship QPR contains information on apprentice and pre-apprentice characteristics, occupation, and incumbent worker status, as well as limited data on program experiences and post-program outcomes. Data are available for *16,398 AAI apprentices* and *6,282 AAI pre-apprentices*, although some items are not reported by all grantees.
- An **AAI Apprentice Survey** administered to a subset of AAI apprentices.[12] (See Appendix B for details about sampling methodology.) The survey collected detailed information on apprentices' characteristics (including prior labor market experience and factors considered in the decision to become an apprentice); apprenticeship experiences (including the timing and content of RTI, prior skills and knowledge and apprenticeship-related gains, experience with the mentor, and receipt of supportive services); and apprenticeship outcomes (including program completion, reason for non-completion, receipt of credentials, and employment with the same employer or in the same occupation after completion). A total of *2,601 AAI apprentices* responded to the survey. The survey was administered between March and October 2020, and respondents completed the survey on average about 2.7 years after starting their programs.
- Quarterly administrative earnings and employment data from the **National Directory of New Hires (NDNH)**, a database of Unemployment Insurance (UI) payments and quarterly earnings data maintained by the Office of Child Support Enforcement within the Administration for Children and Families, U.S. Department of Health and Human Services.[13] The NDNH sample includes participants with a valid Social Security number in the Apprenticeship QPR. NDNH data are available for both apprentices and pre-apprentices through December 2020. The study team uses these data to construct measures of employment and earnings from a year prior to the program through the fifth quarter after program exit (or about 9.5 quarters, on average, after starting the apprenticeship program). Thus, the analysis includes apprentices whose programs were expected to end by September 30, 2019. The

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[12] The Paperwork Reduction Act requires that agency information collections minimize duplication and burden on the public, have practical utility, and support the proper performance of the agency's mission. The Information Collection Review for the AAI Apprentice Survey is available at: https://www.reginfo.gov/public/do/PRAViewICR?ref_nbr=201903-1290-003. The OMB Control Number is 1290-0028.

[13] See https://www.acf.hhs.gov/css/training-technical-assistance/overview-national-directory-new-hires.

analysis measures the outcomes of all AAI apprentices, regardless of completion status. NDNH outcomes are available for *3,871 AAI apprentices* and *2,161 AAI pre-apprentices*.

- Data from DOL's **Registered Apprenticeship Partners Information Data System (RAPIDS)**, which contains data on registered apprentices in 25 states with federally administered registered apprenticeship programs through the DOL Office of Apprenticeship and 18 states with federally recognized State Apprenticeship Agencies. RAPIDS data cover about three-quarters of registered apprenticeships (Kuehn 2019). National data from RAPIDS are used to compare the characteristics of AAI apprentices to all registered apprentices in the United States. RAPIDS data are available for *220,556 registered apprentices*.[14]

This report focuses on apprentices registered and pre-apprentices who enrolled in their programs between October 1, 2015, and December 31, 2018. Though registration of AAI apprentices continued until September 2021, the outcomes study focuses on apprentices registered by the end of 2018, for several reasons. First, this timing ensures that apprentices were surveyed at least 15 months after the start of their programs, so that participants had been in their programs long enough to provide a meaningful assessment of their experiences. Second, this timing ensures that a larger share of apprentices with at least five quarters of post-program earnings data is available for analysis.

Several factors should be considered in interpreting these results. First, the outcomes study measures participant-level outcomes, not AAI apprenticeship programs' causal impacts. That is, changes in employment and earnings cannot be attributed solely to the apprenticeship program. To do so would require a different study methodology—such as a randomized controlled trial—which is outside the scope of this study. Additionally, the study reports outcomes for several subgroups of participants, and many subgroup characteristics are correlated. For example, if a larger share of women apprentices than men enroll in an occupation associated with lower post-apprenticeship earnings, such as healthcare, women might have lower post-apprenticeship earnings, on average, than men not because of their gender, but because of their occupation selection. Differences between subgroups were not formally tested for statistical significance.

Finally, because the earnings analysis reported includes only apprentices whose programs ended by September 2019, it excludes certain longer-term programs in which apprentices were still enrolled.[15]

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[14] The RAPIDS data sample is based on data from 2020 and is comprised of apprentices registered between 2015 and 2018 who were still enrolled in 2020. More information on RAPIDS is available at https://www.apprenticeship.gov/help/what-rapids.

[15] As noted earlier, apprentice enrollment began in October 2015. Because the earnings analysis only includes apprentices in programs that were expected to end by September 2019, the sample excludes all apprentices enrolled in programs with an expected length of four years or longer (as these apprentices were still enrolled in their programs by September 2019). In addition, some apprentices enrolled in shorter programs are also excluded from the earnings analysis, depending on whether their program was expected to end by September 2019. For example, an apprentice who enrolled in a three-year program in June 2016 would be included in the analysis (because their program was expected to end by June 2019); but an apprentice who enrolled in a three-year program in June 2017 would not be included in the earnings analysis (because their program was expected to end by June 2020).

Moreover, some of the post-program earnings outcomes may have been influenced by the economic shock associated with the onset of the COVID-19 pandemic.[16]

1.3 Structure of the Report

The remainder of the report describes the characteristics of AAI apprentices and why they enrolled in an apprenticeship program (Chapter 2); AAI apprentices' in-program experiences (Chapter 3); AAI apprentices' program completion and post-program labor market outcomes (Chapter 4); AAI pre-apprentice characteristics, program experiences, and post-program outcomes (Chapter 5); and summary of key findings and areas for future research (Chapter 6).

The report includes the following appendices: Appendix A (snapshots of apprentice characteristics and outcomes by subgroup), Appendix B (data collection and analytic methods); and Appendices C-F (expanded results for Chapters 2-5, respectively).

[16] Across all AAI apprentices included in the analysis, earnings declined by about 10 percent (or $5,400 annualized) in the second quarter of 2020, before recovering by the fourth quarter of 2020. For about 23 percent of AAI apprentices, the fifth post-program quarter occurred during the period affected by the COVID-19 pandemic. Thus, average post-program earnings may have been about 2 to 3 percent higher in the absence of COVID-19.

2. What are the Characteristics of AAI Apprentices and Why Did They Enroll in an Apprenticeship Program?

Whether AAI grantees succeeded in recruiting historically underrepresented populations for apprenticeships is a primary topic of this outcomes study. This chapter first describes the characteristics of AAI apprentices and how they differ from all U.S. registered apprentices. It then summarizes reasons AAI apprentices reported for enrolling in an apprenticeship and any concerns they had prior to starting.

2.1 Do AAI Apprentices Differ from All Registered Apprentices?

To assess whether AAI apprentices differ from all registered apprentices, the study compared the age, race/ethnicity, and gender of AAI apprentices to all registered apprentices in RAPIDS data.

- ***Relative to all registered apprentices, AAI apprentices are more diverse.***

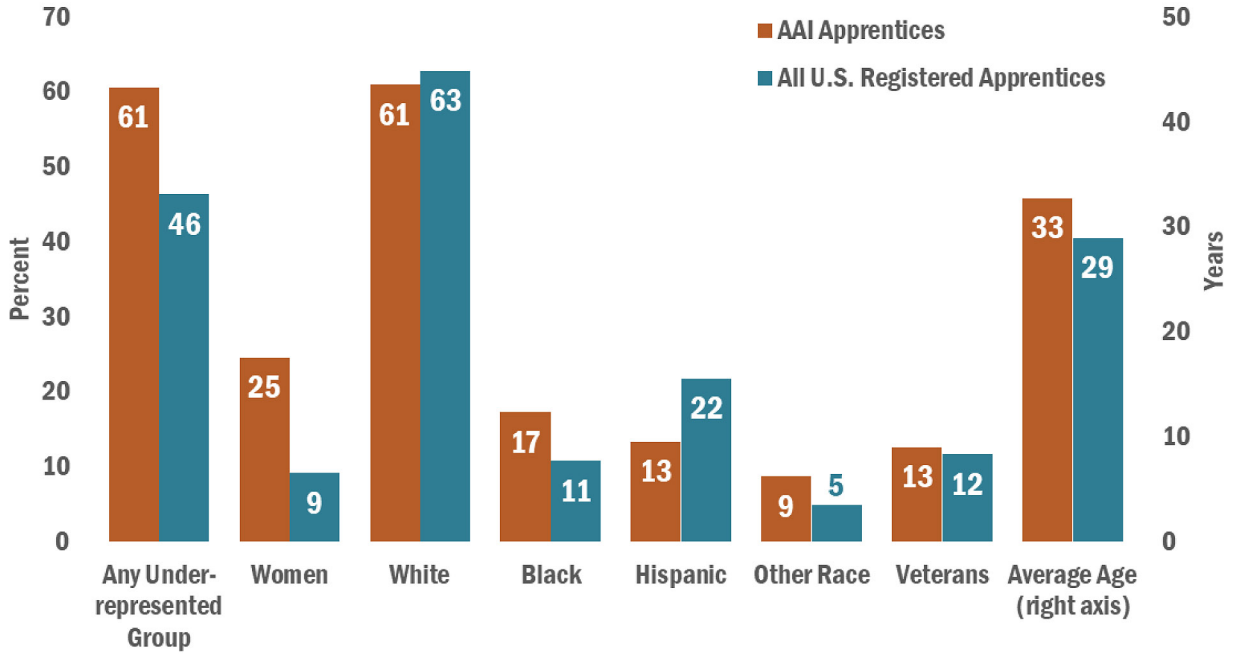
More AAI apprentices were from underrepresented populations (61 percent) than were all registered apprentices (46 percent) (Exhibit 2-1 and Appendix Exhibit C-1). Although most AAI apprentices were men (75 percent), almost one-quarter of apprentices were women, a proportion more than twice as large as that of all registered apprentices (9 percent). AAI apprentices also were more racially diverse than all registered apprentices. Specifically, a greater proportion of AAI apprentices self-identified as Black (17 percent versus 11 percent) or as Other Race (9 percent versus 5 percent).

The only population with a lower proportion of apprentices in AAI compared to all apprentices was Hispanic (13 percent of AAI apprentices versus 22 percent of all registered apprentices). As discussed in Chapter 4, a larger share of Hispanic apprentices relative to other subgroups enrolled in construction-related apprenticeship programs; that is, occupations not targeted by AAI. Veterans were similarly represented in both groups (13 percent and 12 percent), as were White apprentices (61 percent and 63 percent).

- ***Relative to all registered apprentices, AAI apprentices are older.***

The average AAI apprentice was four years older than the average registered apprentice at the time of program entry (age 33 versus age 29) (Exhibit 2-1). Fewer AAI apprentices were 24 or younger—that is, traditional college age—and more were 45 or older when they entered their apprenticeship program. Potential reasons for the age difference, as described in the next section, are that 57 percent of AAI apprentices were incumbent workers—that is, they were already working for the employer that provided the apprenticeship opportunity—and 65 percent had prior postsecondary education experience before enrolling.

Exhibit 2-1. Characteristics of AAI Apprentices at Enrollment versus All Registered Apprentices



Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601); RAPIDS (*N*=220,556). RAPIDS sample comprises apprentices registered between 2015 and 2018 who were still enrolled in 2020.
Notes: Survey means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. "Any underrepresented group" includes women, people of color, and veterans. Race and ethnicity were reported separately, and apprentices could select more than one race. "White" describes non-Hispanic apprentices who self-reported as White and no other race; "Black" describes non-Hispanic apprentices who self-reported as Black and no other race; "Hispanic" includes all apprentices who self-reported as of Hispanic ethnicity, regardless of reported race; "Other Race" describes non-Hispanic apprentices who reported themselves as Asian (4.5 percent), Native Hawaiian or Pacific Islander (0.7 percent), Native American (1.7 percent), or multiple races (1.7 percent).

2.2 What Were the Educational Status and Family Structure of AAI Apprentices?

The AAI Apprentice Survey provided additional details about AAI apprentices' characteristics at the time they entered their apprenticeship programs. RAPIDS data do not include educational attainment prior to apprenticeship, marital status, or presence of children in the family; thus, AAI apprentices and registered apprentices cannot be compared on these measures.

- ***Two-thirds of AAI apprentices had at least some college experience prior to starting their programs.***

Most AAI apprentices had some postsecondary education prior to enrollment (Exhibit 2-2). More than one in four had a college degree (associate, bachelor's, or higher). Ten (10) percent had a trade or vocational credential from a college or other source. Twenty-nine (29) percent had some college education but no certificate or degree. Thirty-three (33) percent entered with a high school diploma or equivalent. Among AAI apprentices with a credential, the largest share had a bachelor's degree or higher.

Educational status varied by subgroups. Forty-two (42) percent of women AAI apprentices had a college degree, as did 36 percent of Other Race apprentices. The proportion of apprentices with a college degree was lower among men (22 percent) and among Hispanic apprentices (16 percent) (Appendix Exhibit C-3).

- ***Most AAI apprentices were not currently married, and about a quarter had children.***

When they enrolled in their apprenticeship programs, 38 percent of apprentices were currently married, and almost half (48 percent) were never married (Exhibit 2-2). The proportion married was higher than average among veterans (49 percent), apprentices of Other Race (42 percent), and White apprentices (41 percent). When they enrolled, 26 percent of AAI apprentices were living with children. The proportion living with children was higher than average for women (36 percent) and apprentices of Other Race (33 percent) (Appendix Exhibit C-2).

Exhibit 2-2. Characteristics of AAI Apprentices at Enrollment versus All Registered Apprentices

Characteristic	AAI Apprentices	All U.S. Registered Apprentices
Highest Education (%)		
Less than high school	1.2	N/A
High school diploma or equivalent	33.3	N/A
Some college, no credential	28.5	N/A
Technical, trade, or vocational credential	9.8	N/A
Associate degree	11.7	N/A
Bachelor's degree or higher	15.5	N/A
Marital Status (%)		
Married	38.3	N/A
Separated/divorced/widowed	13.3	N/A
Never married	48.4	N/A
Living with children	25.9	N/A

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601); RAPIDS (*N*=220,556). RAPIDS sample comprises apprentices registered between 2015 and 2018 who were still enrolled in 2020.
Note: N/A = Not Applicable. Survey means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

2.3 What Were AAI Apprentices' Employment and Earnings Patterns prior to Apprenticeship?

AAI Apprentice Survey and Apprenticeship QPR data provide a wealth of information about the employment status of apprentices, characteristics of jobs prior to enrollment, and mean hourly wages and annual earnings prior to enrolling in their apprenticeships. RAPIDS data do not include information on prior labor market experience; thus, AAI apprentices and registered apprentices cannot be compared on these measures.

- ***Most AAI apprentices were working when they entered their apprenticeships.***

Exhibit 2-3 shows that 89 percent of apprentices reported they were working immediately prior to starting their apprenticeships, and almost three-quarters had one job. Among employed apprentices, about 90 percent worked full-time, for an average of 44 hours per week. Fifty-seven (57) percent of apprentices (representing 64 percent of employed apprentices, not shown) were incumbent workers. Of the 12 percent not employed immediately prior to starting their apprenticeships, only 3 percent were not actively searching for work. Apprentices not employed at enrollment reported last working almost seven months prior, on average.

Most AAI apprentices (61 percent) had not worked in a job in a field similar to their apprenticeship occupation. This indicates that even among incumbent workers, the apprenticeship trained many participants for new occupations (Exhibit 2-3 and Appendix Exhibit C-4).

- ***AAI apprentices earned, on average, about $18 per hour in their most recent job.***

On average, apprentices earned $18.37 per hour at their most recent job prior to entering their apprenticeships. To provide some context, the average wage was 150 percent higher than the federal minimum wage ($7.25 per hour in 2020), but almost $10 lower than the mean hourly wage for all U.S. workers in 2020 ($27.07).[17] Wages varied, with similar proportions of apprentices earning more than $20 per hour (35 percent) and $15 per hour or less (33 percent).

Average annual earnings of AAI apprentices in the 12 months prior to enrolling their programs (including the 11 percent who did not work with $0 earnings) were $31,016. Average earnings were highest for White apprentices ($34,124) and lowest for Hispanic apprentices ($24,826). Men, on average, earned more than women ($32,479 versus $26,503). Incumbent workers earned $35,453 in the year prior to starting their apprenticeship versus $25,099 for new workers (Appendix Exhibit C-3).

Exhibit 2-3. AAI Apprentices' Labor Market Experience Prior to Apprenticeship

Characteristic	Mean
Employment Status Immediately before Starting Apprenticeship (%)	
Employed	88.5
Not Employed	11.5
Incumbent worker (i.e., enrolled in apprenticeship program at current employer) (%)	57.1
Detailed Employment Status Immediately before Starting Apprenticeship (%)	
Employed: military	3.6
Employed: one job	72.8
Employed: multiple jobs	12.0
Not employed: looking for a job	8.4
Not employed: not looking for a job	3.2
Months since last worked for pay (among those not employed immediately before starting apprenticeship, *N*=289)	6.8
Weekly Hours Worked in Most Recent Job prior to Apprenticeship (among those working, *N*=2,225) (%)	
0 to 19 hours	1.3
20 to 34 hours	6.1
35 to 39 hours	3.0
40 to 44 hours	53.3
45 to 49 hours	10.9
50 or more hours	25.4
Weekly hours worked (mean)	43.7

[17] May 2020 National Occupational Employment and Wage Estimates. https://www.bls.gov/oes/current/oes_nat.htm#00-0000.

Exhibit 2-3. AAI Apprentices' Labor Market Experience Prior to Apprenticeship (continued)

Characteristic	Mean
Hourly Wage in Most Recent Job prior to Starting Apprenticeship (among those ever employed, *N*=2,531) (%)	
Less than $10/hour	4.8
$10 to $14.99/hour	28.3
$15 to $19.99/hour	32.3
$20 to $24.99/hour	17.8
$25/hour or more	16.8
Hourly wage (mean) ($)	18.37
Annual Earnings prior to Apprenticeship (%)	
$0	5.0
$1 to $9,999	17.8
$10,000 to $19,999	8.9
$20,000 to $29,999	16.1
$30,000 to $39,999	20.9
$40,000 to $49,999	11.1
$50,000 or more	20.2
Annual Earnings (mean) ($)	31,016
Ever worked in a job in a similar field to apprenticeship occupation (%)	39.4

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (N=2,601).
Note: Survey means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

2.4 How Did AAI Apprentices Learn about Their Apprenticeship Opportunity?

As noted in Chapter 1, apprenticeship is an uncommon workforce training model outside of the building trades in the United States. Thus, it is not surprising that more than half (60 percent) of AAI apprentices reported they knew "very little" (33 percent) or "nothing" (27 percent) about apprenticeship, and only 16 percent reported they knew "quite a bit" prior to enrolling in their programs (Exhibit 2-4).

- ***AAI apprentices most often learned about the apprenticeship opportunity through employers or friends.***

AAI grantees reported that employers were the most common recruitment partner, participating in recruitment, screening, and intake activities for 83 percent of apprenticeship programs (Gardiner et al. 2021). Reflecting this collaboration, according to the AAI Apprentice Survey, the largest share of apprentices (46 percent) reported learning of the apprenticeship opportunity through an employer (Exhibit 2-4 and Appendix Exhibit C-5). This figure also reflects the predominance of incumbent workers among AAI apprentices (57 percent; Exhibit 2-3), most of whom learned about the opportunity through an employer. Nearly all subgroups reported that an employer was the most common source of their knowledge of the apprenticeship opportunity; one exception is Hispanic apprentices, for whom a friend or acquaintance was the most common source (Appendix Exhibit C-6).

The next most common source of apprenticeship information was friends or acquaintances (21 percent) (Exhibit 2-4). This was the most common method reported by Hispanic apprentices, new worker apprentices (defined in Chapter 1, Box 3), and apprentices in construction (Appendix Exhibit C-6).

Exhibit 2-4. AAI Apprentices' Prior Knowledge of Apprenticeship

Characteristic	Mean (%)
How Much Did You Know about Apprenticeship before You Heard about This Apprenticeship?	
Quite a bit	15.8
Some	24.6
Very little	32.8
None	26.8
How Did You Learn about This Apprenticeship Opportunity (among those who knew something about apprenticeship before, *N*=1,834)	
Employer at the time	46.4
Friend or acquaintance	20.8
Job posting (online or printed)	11.6
School/college	8.5
Other	4.7
Recruiter	3.2
Employment service office	2.5
Military job	1.2
Union	1.1
Ever Part of Pre-Apprenticeship	
Yes, with the same employer	12.2
Yes, with a different employer	4.9
No	82.8

Source: AAI Apprentice Survey (*N*=2,601).
Note: Survey means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Less common sources of apprenticeship information were a job posting (12 percent of apprentices) and school or college (9 percent) (Exhibit 2-4). Eight (8) percent of veterans learned about the opportunity through their military job (Appendix Exhibit C-6). Very few apprentices learned of the opportunity through a union (1 percent), perhaps reflecting AAI's focus on nontraditional occupations, such as healthcare and IT, that are typically non-unionized.

- ***Few AAI apprentices participated in a pre-apprenticeship program.***

Pre-apprenticeship was not common among AAI apprentices. Seventeen (17) percent of apprentices participated in a pre-apprenticeship program through their apprenticeship employer or a different one (Exhibit 2-4). Among those who did participate in pre-apprenticeship, most reported it was with the same employer as their apprenticeship. Chapter 5 contains additional detail on the post-program outcomes of AAI pre-apprentices, including enrollment in registered apprenticeship.

Pre-apprenticeship participation did not vary by gender. More Black apprentices (24 percent) and Hispanic apprentices (23 percent) participated in a pre-apprenticeship program than any other subgroup, suggesting that pre-apprenticeship programs might improve access to registered apprenticeship for underrepresented groups (Appendix Exhibit C-6). Pre-apprenticeship was also relatively more common for apprentices in construction (28 percent) and computer/IT occupations (23 percent) than in other occupations.

2.5 Why Did AAI Apprentices Enter an Apprenticeship?

Apprenticeship Survey respondents rated the importance of six factors in their decision to become an apprentice rather than pursuing another employment, training, or education option. The survey also asked about their concerns prior to entering their apprenticeship programs.

- ***AAI apprentices rated "train for a career" and gain "skills and credentials valued by employers" as the two most important factors in their decision to enroll in an apprenticeship program.***

As shown in Exhibit 2-5, across all AAI apprentices, 79 percent reported the two most important factors in their decision making were training for a career, not just a job; and gaining skills and credentials valued by employers. Overall, AAI apprentices rated avoidance of student debt as the least important factor (60 percent); unlike the other five factors, however, there was more of a range of responses by subgroup. Seventy-one (71) percent of Hispanic apprentices rated avoiding student debt as most important, compared to 50 percent of Other Race apprentices. The importance of each factor also differed by training occupation and incumbency (Appendix Exhibit C-8).

Exhibit 2-5. Percentage of AAI Apprentices Reporting Most Important Factors in Decision to Become an Apprentice

Factor	All AAI Apprentices (%)	Men (%)	Women(%)	White(%)	Black (%)	Hispanic (%)	Other Race (%)	Veteran (%)
I could train for a career, not just a job	**79**	79	79	75	88	89	78	79
I was confident that the skills and credentials I gained would be valued by employers	**79**	78	82	77	82	85	78	76
I would have a concrete job opportunity after completing training	**77**	78	76	74	84	83	77	79
I could train for an occupation with high earning potential	**77**	79	72	73	83	88	77	79
I could earn while I learned	**76**	76	76	74	78	85	74	74
I could avoid student debt	**60**	59	62	57	67	71	50	54

Source: AAI Apprentice Survey (*N*=2,601).
Note: Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. The factor with the highest rating in each column is highlighted in blue.

- ***Few AAI apprentices reported "strong concerns" about apprenticeship before entering their program.***

Survey respondents rated each of six factors regarding their decision to enroll in an apprentice program as strong concern, moderate concern, or not a concern (Exhibit 2-6 and Appendix Exhibit C-7). On average, apprentices did not express strong concerns; no more than a quarter of any subgroup rated any factor as a strong concern. Taking time for training rather than going straight to work was the factor rated as a strong concern most often, reported by 18 percent of apprentices overall. This also was true for all subgroups except Other Race apprentices, for whom committing to a single career path was more often rated as a strong concern (23 percent).

Exhibit 2-6. Percentage of AAI Apprentices Reporting Factors as a Strong Concern about Becoming an Apprentice

Factor	All AAI Apprentices	Men	Women	White	Black	Hispanic	Other Race	Veteran
Having to take time for training, rather than getting right to work	**18**	17	22	14	24	25	22	18
Committing so strongly to a single career path	**16**	17	14	13	21	19	23	16
Unsure what the experience would be like	**12**	12	12	11	17	13	13	13
Unsure if I would like the work	**12**	11	13	11	13	12	15	12
The difficulty of the classroom training	**11**	10	11	10	12	11	13	11
The difficulty of the on-the-job training	**10**	10	11	8	17	11	12	11

Source: AAI Apprentice Survey (*N*=2,601).
Note: Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. The factor with the highest rating in each column is highlighted in blue.

Concerns also varied by apprentice occupation and incumbency (Appendix Exhibit C-8). A larger proportion of healthcare apprentices reported strong concerns about having to take time off for training (22 percent) than did apprentices in construction (18 percent) or manufacturing (16 percent). More new workers reported a strong concern about taking time off for training compared to incumbent workers (22 percent and 16 percent, respectively).

2.6 Summary of Research Question 1 Findings

This chapter reported the characteristics of AAI apprentices, the importance of various factors in their decision to enroll in an apprenticeship program, and their concerns about apprenticeship. Compared to all U.S. registered apprentices, AAI apprentices were more diverse in gender and race/ethnicity, and they were older. More than one-third had a postsecondary education credential when they entered their apprenticeship, most commonly a bachelor's degree. Almost 90 percent were working when they entered their apprenticeship, generally full-time; a majority were incumbent workers, although a substantial share were new workers. Among those with work experience, the average hourly wage at their most recent job before apprenticeship was lower than the national average ($18.37 versus $27.07). So, too, were apprentices' annual earnings in the 12 months prior to enrolling.

AAI apprentices most often learned about their apprenticeship opportunity through an employer or a friend. Few (17 percent) participated in a pre-apprenticeship program. AAI apprentices overall reported the opportunity to train for a career not just a job and that the skills and credentials gained would be valued by employers as the two most important factors in their decision to become an apprentice. Few reported having strong concerns about becoming an apprentice prior to starting.

3. What Were the Experiences of AAI Apprentices during the Apprenticeship Program?

The AAI outcomes study also reports the experiences of apprentices while they participated in their programs. This chapter examines the occupations in which AAI apprentices enrolled, both overall and by subgroup. Next, it examines how AAI apprentices viewed aspects of their apprenticeship, including their RTI, OJL, work with mentors, and wage progression. It also describes reported challenges to successful completion. Findings in this chapter are based on responses to the AAI Apprentice Survey.

3.1 In Which Occupations Did AAI Apprentices Enroll?

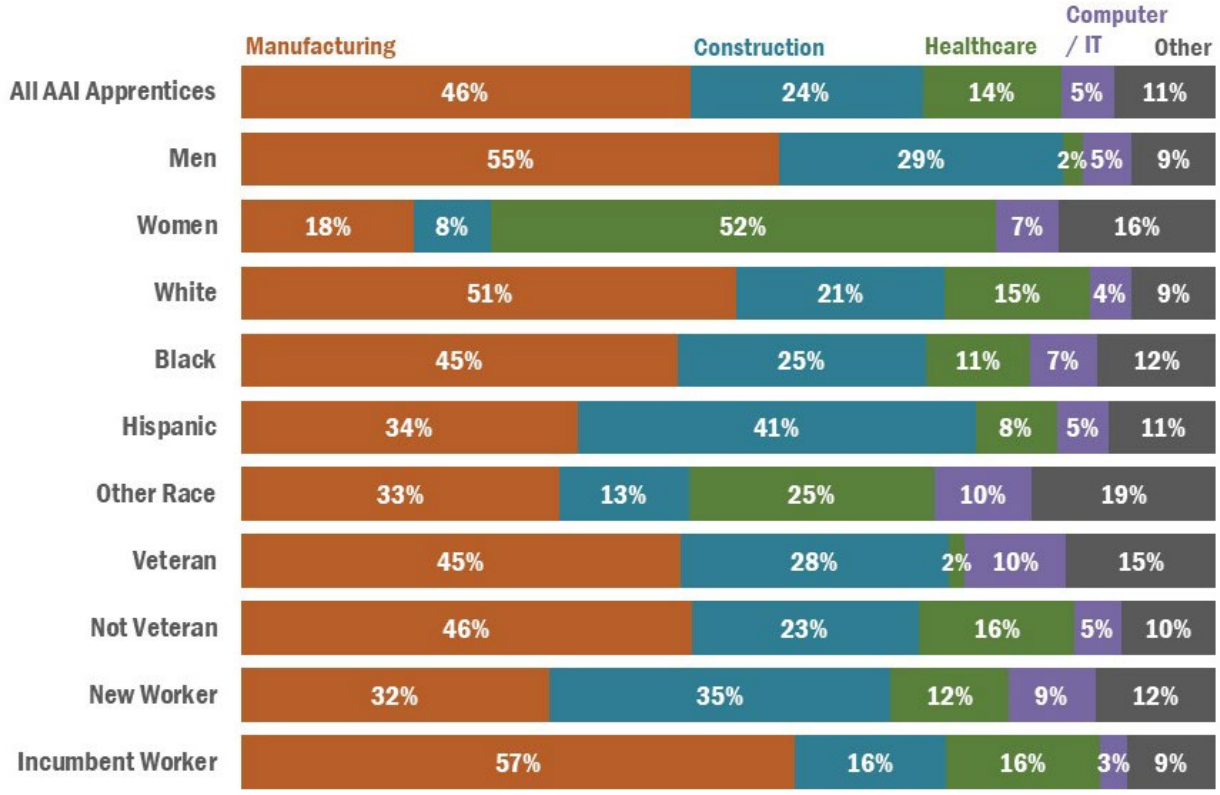
In addition to increasing apprenticeship opportunities, AAI sought to increase use of apprenticeships in nontraditional occupations not affiliated with construction. The extent to which apprentices enrolled in nontraditional occupations was a primary topic of the outcomes study.

- ***Most AAI apprentices enrolled in nontraditional occupations, most commonly manufacturing.***

AAI grantees expanded registration of apprentices in nontraditional occupations, with most grantees focusing on occupations in multiple industries (Gardiner et al. 2021). According to the AAI Apprentice Survey, the most common occupation was manufacturing, accounting for almost half of all apprentices (46 percent). Healthcare (14 percent) and computer/IT (5 percent) accounted for another 20 percent of apprentices. Less than one-quarter of apprentices were in a construction-related occupation (24 percent).

Exhibit 3-1 shows occupation by gender, race, ethnicity, incumbency, and veteran status. More than half of men apprentices enrolled in manufacturing occupations, compared to 18 percent of women, although manufacturing was the second most common occupation for women (18 percent) after healthcare (52 percent). Manufacturing was the most common occupation for White apprentices (51 percent), Black apprentices and veterans (45 percent each), and apprentices who identified as Other Race (33 percent). It was the second most common occupation for Hispanic apprentices, behind construction (41 percent). Additionally, manufacturing was the most common occupation of incumbent workers (57 percent), whereas the largest share of new workers enrolled in construction apprenticeships (35 percent).

Exhibit 3-1. AAI Apprentice Occupations, by Subgroup



Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).
Notes: Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Components may not add to 100 percent due to rounding Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

- ***The required time to complete AAI apprenticeships varied, with an average of 2.7 years.***

As required by the Standards of Apprenticeship (which are described in Chapter 1), registered apprenticeship programs must take at least one year to complete. According to data from RAPIDS, the average registered apprenticeship takes about three years to complete.[18] On average, AAI apprenticeship programs were 2.7 years on average (Appendix Exhibit D-1). Construction programs were, on average, longest (4.2 years), followed by manufacturing (2.8 years). Computer/IT (1.4 years) and healthcare (1.2 years) apprenticeships were the shortest. The average program length for men (3.1 years) was longer than for women (1.5 years), reflecting their focus on manufacturing and healthcare occupations, respectively. Average apprenticeship length also varied by race/ethnicity, with the average length for Hispanic apprentices (2.9 years) and White apprentices (2.8 years) exceeding that of Black apprentices

[18] Specifically, the average registered apprenticeship length was 5,940 hours, or 2.97 years. The RAPIDS sample comprises apprentices registered between 2015 and 2018 who were still enrolled in 2020 (*N*=220,556).

(2.4 years), reflecting in part the large share of Hispanic apprentices in construction-related occupations (Appendix Exhibit D-2).

3.2 What Were Apprentices' Experiences with Related Technical Instruction and On-the-Job Learning?

RTI and OJL are the key components of a registered apprenticeship program. They work in tandem to facilitate mastery of skills required to complete the apprenticeship and to work after apprenticeship in the specific occupation. The AAI Apprentice Survey asked apprentices to report their experiences and assessment of RTI and OJL received during their programs.

- ***Most AAI apprentices reported they used most of what they learned in RTI in their apprenticeship.***

A key question is whether apprentices find RTI relevant to their occupational training. Most AAI apprentices did so; almost two-thirds reported using most (35 percent) or everything (27 percent) they learned in the classroom on the job (Exhibit 3-2). The most common RTI topics covered were use of tools, equipment, or specialized skills needed for the program (86 percent), followed by reading and math skills relevant to the program (68 percent) and critical thinking and problem solving (62 percent). The least common topic reported was business management skills (22 percent). Among those who completed their apprenticeships, 90 percent reported that RTI was very relevant to their current position (53 percent) or somewhat relevant (37 percent). More than half (59 percent) reported doing better in their classroom work because they were an apprentice (Appendix Exhibit D-3).

- ***Most RTI occurred alongside OJL; colleges were the most common provider.***

The most common RTI structure, reported by 46 percent of apprentices, was RTI concurrent with OJL throughout the apprenticeship (Exhibit 3-2). One in five apprentices reported RTI occurred at various times over the course of the apprenticeship.

Almost half of apprentices received RTI at a two-year college (46 percent). One-quarter of apprentices reported their employer provided RTI in addition to OJL. Although colleges commonly provided RTI, most apprentices (61 percent) earned no credits during their apprenticeship. A small proportion (16 percent), however, earned 30 or more credits, or the equivalent of two semesters of college.

Exhibit 3-2. Structure and Content of AAI Related Technical Instruction

Related Technical Instruction (RTI) Characteristic	Share (%)
Topics Covered in Classroom Instruction (respondents could select multiple options)	
Use of tools, equipment, or specialized skills required for the apprenticeship occupation	85.6
Reading and math skills relevant to the apprenticeship occupation	68.1
Computer science or information technology	34.9
Engineering or engineering technology	29.9
Business management skills	22.2
Critical thinking and problem solving	61.7
Managing time effectively	46.8
Professional skills (e.g., appropriate dress, punctuality, interaction with supervisors and colleagues)	45.8
Other	4.5

Exhibit 3-2. Structure and Content of AAI Related Technical Instruction (continued)

Related Technical Instruction (RTI) Characteristic	Share (%)
Structure of Classroom Instruction	
Completed before on-the-job training starts	14.5
Occurs at the same time as on-the-job training, but is completed before on-the-job training finishes	14.2
Occurs at the same time as on-the-job training and is ongoing throughout the apprenticeship program	46.2
Occurs at various times over the course of the apprenticeship program (e.g., block scheduling)	20.0
Other	5.1
Who Provided Classroom Instruction (respondents could select multiple options)	
Four-year college	4.3
Two-year college	46.4
Union	16.2
Employer	25.2
Non-profit organization	8.6
Private, for-profit provider	7.0
Other	3.1
Number of College Credits Earned/Will Earn during Apprenticeship	
0	61.0
1 to 9	9.5
10 to 19	7.8
20 to 29	6.1
30 or more	15.6
To What Degree Do You Use What You Learned in the Classroom in Your Work on the Job in Your Apprenticeship Program?	
None	8.0
Some	29.5
Most	35.2
Everything	27.3
Relevance of Classroom Training to Work in Current/Most Recent Job (among those not currently registered, *N*=1,713)	
Very relevant	52.7
Somewhat relevant	37.3
Not relevant	10.0

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).
Note: Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

- ***About half of AAI apprentices reported their primary mentor was very important to their apprenticeship success.***

Apprentices receive instruction in technical skills on the job through being mentored by skilled employees. The survey asked apprentices several questions about their primary mentor—that is, the mentor they spent the most time within a typical week. Almost three-quarters of apprentices reported their primary mentor was "very important" (48 percent) or "important" (24 percent) to their success in the apprenticeship (Exhibit 3-3).

Apprentices spent, on average, 21 hours per week with their primary mentor. However, there was substantial variation in the intensity of mentorship—36 percent spent nine hours or less per week with

their primary mentor, while 34 percent spent 40 or more hours. The duration of mentorship varied substantially by occupation—apprentices in construction occupations spent nearly 30 hours per week with their primary mentor, compared to 20 hours per week for apprentices in manufacturing; 16 hours per week for those in computer/IT and healthcare; and 14 hours for those in other occupations (Appendix Exhibit D-9).

- ***Most AAI apprentices reported high levels of satisfaction with their primary mentor.***

Seventy-three (73) percent of AAI apprentices reported being satisfied or very satisfied with their primary mentor (Exhibit 3-3). Only 12 percent said they were not satisfied. The level of satisfaction was similar for all subgroups (Appendix Exhibit D-9).

Exhibit 3-3. Value of AAI On-the-Job Learning Mentorship

Characteristic	Share (%)
Number of Hours Spent with Primary Mentor per Week	
0	15.5
1 to 9	20.9
10 to 19	9.3
20 to 29	12.7
30 to 39	7.9
40 or more	33.7
Hours (mean)	20.8
Importance of Primary Mentor for Helping You Succeed in Your Apprenticeship	
Very important	48.2
Important	23.9
Somewhat important	14.6
Not important	13.3
Satisfaction with Primary Mentor	
Very satisfied	46.0
Satisfied	26.7
Somewhat satisfied	15.3
Not satisfied	12.0

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).
Notes: "Primary mentor" is the mentor who the apprentice spent the most time with in a typical week. Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

- ***More than 70 percent of AAI apprentices reported that the combination of RTI and OJL in their program prepared them well for aspects of their occupation.***

The survey asked apprentices how well their apprenticeship RTI and OJL prepared them with the skills needed to operate at a high level in their occupation. More than seven in 10 apprentices reported that the program prepared them "very well" or "well" in five of eight areas (Exhibit 3-4 and Appendix Exhibit D-5). More than three-quarters of apprentices reported their training prepared them well or very well to use tools, equipment, or specialized skills; and to work and communicate effectively with others (76 percent each). Apprentices also reported their training prepared them to use critical-thinking and problem-solving skills (74 percent), manage time effectively (72 percent), and apply reading and math skills relevant to the

occupation (71 percent). Additionally, apprentices reported that these skills are very important for their current jobs (Appendix Exhibit D-7). Eighty-one (81) percent of completers reported that their apprenticeship program accomplishments gave them a high level of expertise in their occupation (Appendix Exhibit D-3).

Exhibit 3-4. How Well Apprenticeship Training Prepared AAI Apprentices in Select Skill Areas

Skill Area	Share (%)
Use of Tools, Equipment, or Specialized Skills Required for the Apprentice Occupation	
Very well prepared	42.9
Well prepared	33.2
Reading and Math Skills Relevant to the Apprenticeship Occupation	
Very well prepared	34.3
Well prepared	36.9
Computer Science or Information Technology Skills	
Very well prepared	16.3
Well prepared	25.4
Engineering or Engineering Technology Skills	
Very well prepared	12.8
Well prepared	24.2
Business Management Skills	
Very well prepared	15.8
Well prepared	22.9
Critical-Thinking and Problem-Solving Skills	
Very well prepared	39.5
Well prepared	34.3
Working and Communicating Effectively with Others	
Very well prepared	42.1
Well prepared	33.5
Managing Time Effectively	
Very well prepared	36.7
Well prepared	35.1

Sources: AAI Apprentice Survey (*N*=2,601).
Notes: Outcomes are based on responses to the following question: "How well has the classroom and on-the-job training you received through the apprenticeship prepared you with the skills needed to operate at a high level in your occupation?" Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

- ***Apprentices reported that on-the-job learning contributed most to developing their skills.***

Apprentices cited RTI as contributing the most to development of reading and math skills but cited OJL work experience as most important to developing skills in the use of specialized tools or equipment required for the apprentice occupation, time management skills, communication skills, and critical-thinking and problem-solving skills (Exhibit 3-5 and Appendix Exhibit D-6). Thus, OJL appeared to promote both general employment skills and occupation-specific skills.

Exhibit 3-5. Training Components that Contributed Most to Developing AAI Apprentices' Select Skill Areas

Skill Area	Share (%)
Use of Tools, Equipment, or Specialized Skills Required for the Apprentice Occupation	
Classroom learning (RTI)	13.9
Mentor guidance (OJL)	38.6
Work experience (OJL)	39.5
Not applicable	8.1
Reading and Math Skills Relevant to the Apprenticeship Occupation	
Classroom learning (RTI)	47.4
Mentor guidance (OJL)	14.2
Work experience (OJL)	24.0
Not applicable	14.4
Computer Science or Information Technology Skills	
Classroom learning (RTI)	29.8
Mentor guidance (OJL)	15.6
Work experience (OJL)	21.4
Not applicable	33.1
Engineering or Engineering Technology Skills	
Classroom learning (RTI)	22.6
Mentor guidance (OJL)	17.6
Work experience (OJL)	19.2
Not applicable	40.5
Business Management Skills	
Classroom learning (RTI)	20.8
Mentor guidance (OJL)	16.9
Work experience (OJL)	25.1
Not applicable	37.1
Critical Thinking and Problem Solving	
Classroom learning (RTI)	15.9
Mentor guidance (OJL)	32.1
Work experience (OJL)	44.5
Not applicable	7.5
Working and Communicating Effectively with Others	
Classroom learning (RTI)	12.7
Mentor guidance (OJL)	26.8
Work experience (OJL)	52.4
Not applicable	8.1
Managing Time Effectively	
Classroom learning (RTI)	12.4
Mentor guidance (OJL)	27.9
Work experience (OJL)	51.6
Not applicable	8.1

Sources: AAI Apprentice Survey (*N*=2,601).
Notes: Outcomes are based on responses to the following question: "Which aspects of the apprenticeship – either classroom learning, guidance from an on-the-job mentor, OR work experience (learning by doing) – contributed the most to helping you develop the following skills?" Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

- ***Most AAI apprentices reported they received at least one type of academic or financial support during their apprenticeship.***

AAI apprentices reported they received a variety of support services from grantees or employers to help them enter and persist in training. Such services included financial support (e.g., paying the costs of training-related materials such as uniforms, tools, equipment, and textbooks; providing transportation assistance; and providing dependent care assistance for apprentices with children) and academic support (e.g., academic counseling, tutoring, basic skills instruction). Fifty-seven (57) percent of apprentices reported receipt of at least one supportive service during their apprenticeship (Appendix Exhibit D-8). This is consistent with Gardiner et al. (2021), which found that 69 percent of grantees reported that supportive services are available to apprentices. A larger proportion received academic-related supports such as tutoring or skills remediation (46 percent) than received financial supports such as assistance with costs for tools, equipment, books, and supplies (35 percent). Few apprentices received assistance for transportation (6 percent) or childcare (1 percent).

Receipt of services differed somewhat among subgroups (Appendix Exhibit D-9). More men received financial support than did women (37 percent versus 30 percent). Fewer White apprentices (55 percent) received either financial or academic supports than did other racial/ethnic subgroups, while more apprentices who identified as Other Race received support (67 percent).

- ***Most AAI apprentices would recommend their programs to a family member or friend.***

Eighty-six (86) percent of apprentices would recommend their programs to a friend or family member interested in the field (Appendix Exhibit D-8). All subgroups reported a strong willingness to make such a recommendation, including more than 90 percent of Hispanic, Other Race, and veteran apprentices (Appendix Exhibit D-9). These results suggest high levels of satisfaction with their apprenticeship.

3.3 How Did Apprentice Wages Progress during Apprenticeship?

A key goal of registered apprenticeship is to promote wage progression.[19] Based on the apprenticeship model, wage increases over the course of the apprenticeship are tied to demonstration of a skill competency or time in the program (e.g., every six months). The AAI Apprentice Survey asked apprentices to report their wage from the start of their apprenticeship through the end of their program (or, if they were still enrolled at the time of the survey, their current apprenticeship wage).

- ***AAI apprentices' wages increased 27 percent, on average, between the start of the apprenticeship and the survey.***

Apprentices reported earning, on average, about $18 per hour when they started their apprenticeship (Exhibit 3-6). Starting wages ranged from under $15 per hour (33 percent) to $20 per hour or more (27 percent). Only 3 percent of apprentices earned less than $10 per hour; that is, a wage close to the federal minimum wage of $7.25 per hour.

[19] See DOL apprenticeship factsheet: https://www.apprenticeship.gov/sites/default/files/Apprenticeship_Fact_Sheet.pdf.

Exhibit 3-5 shows that wages increased $5 on average, to about $23 per hour, between the start and end of their apprenticeship (or, if they were still enrolled at the time of the survey, their current apprenticeship wage).[20] The proportion earning $25 per hour or more grew from 12 percent to 35 percent. Only 1 percent of apprentices earned less than $10 per hour at the time of the survey.

Exhibit 3-6. Wage Progression of AAI Apprentices during Apprenticeship

Characteristic	Starting Wage	Ending Wage
Wage (%)		
Less than $10/hour	2.5	1.3
$10-14.99/hour	30.6	11.5
$15 to $19.99/hour	39.6	27.1
$20 to $24.99/hour	15.3	25.3
$25/hour or more	12.0	34.8
Hourly Wage (mean) ($)	17.77	22.54

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601)
Notes: For apprentices who were not longer enrolled in their apprenticeship, the ending wage reflects their hourly wage at the end of their apprenticeship; for those still enrolled, this reflects their current hourly wage. Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Most apprentices reported multiple wage increases during their apprenticeship (Exhibit 3-7). On average, apprentices had between two and three wage increases. Thirty (30) percent had four or more wage increases, and a similar proportion (27 percent) reported no wage increases. Not surprisingly, apprentices in longer programs—including construction and manufacturing—had more wage increases during their programs than those in shorter programs (3.9 wage increases for construction and 2.4 for manufacturing, on average). More than half of apprentices in computer/IT and healthcare reported no wage increases during their programs (Appendix Exhibit D-11).[21]

- ***Nearly all AAI apprentices reported that they worked full-time.***

On average, apprentices worked 41 hours per week during their apprenticeship (Exhibit 3-7).[22] Women and apprentices who identified as Other Race worked fewer hours, on average (38 hours and 37 hours, respectively), while veterans reported the most hours of any subgroup (43 hours) (Appendix Exhibit D-11).

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[20] For apprentices who were no longer enrolled in their apprenticeship, the ending wage reflects their hourly wage at the end of their apprenticeship; for those still enrolled, this reflects their current hourly wage.

[21] This outcome is based on responses to the following survey question: "How many wage increases have you received in the apprenticeship program since you started as an apprentice?" It is unclear why some apprentices reported no wage increases during their program, since registered apprenticeship programs are required to pay higher wages as skills increase (see https://www.doleta.gov/oa/employers/apprenticeship_toolkit.pdf). This may be related to program length, as apprentices in shorter programs were less likely to report wage increases than apprentices in longer programs.

[22] For apprentices who were no longer enrolled in their apprenticeship, this reflects hours worked per week at the end of their apprenticeship; for those still enrolled, this reflects hours worked per week at the time of the survey.

Exhibit 3-7. Wage Increases and Hours Worked during Apprenticeship

Characteristic	Share
Number of wage increases received during apprenticeship (%)	
0	27.3
1	17.8
2	13.6
3	11.5
4 or more	29.8
Number of wage increases (mean)	2.4
Current/ending hours worked per week (%)	
1 to 19	3.7
20 to 34	4.7
35 to 39	3.9
40 to 44	62.7
45 to 49	9.2
50 or more	15.9
Hours (mean)	41.1

Sources: AAI Apprentice Survey (*N*=2,601)
Notes: For apprentices who were no longer enrolled in their apprenticeship, the ending hours worked reflects their hours worked at the end of their apprenticeship; for those still enrolled, this reflects their current hours worked. Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

3.4 Summary of Research Question 2 Findings

This chapter reported the experiences of AAI apprentices while they participated in their apprenticeship. AAI grantees expanded apprenticeship to nontraditional occupations—that is, occupations other than construction. Most apprentices enrolled in nontraditional occupations, with some variation by gender, race, and ethnicity. Men, White, Black, Other Race, and veteran apprentices most commonly enrolled in manufacturing occupations, whereas women apprentices generally enrolled in healthcare occupations, and Hispanic apprentices in construction ones.

Overall, AAI apprentices reported mostly positive experiences with the training, mentorship, and services received during their apprenticeship program. Apprentices expressed strong satisfaction with their RTI and with their primary mentors. Apprentices largely reported success in learning occupational and employability skills. A substantial majority reported that their training, including their RTI, was relevant and prepared them well for their current job. Asked about specific skills learned during the apprenticeship, apprentices generally reported that OJL work experiences contributed more to developing their skills than classroom training did. On average, apprentices in construction and manufacturing spent more time with their primary mentor than did apprentices in healthcare, computer/IT, or other occupations.

Apprentices' reported wages increased more than 25 percent, on average between the start of their apprenticeship and the time of the survey, with the typical apprentice reporting two or three wage increases during their apprenticeship. Another indicator of satisfaction with their apprenticeship, most apprentices reported they would recommend their programs to a family member or friend who wants to work in their field.

4. What Are the Post-Program Outcomes of AAI Apprentices?

AAI aimed to expand apprenticeship to nontraditional occupations and enroll apprentices from historically underrepresented populations. The broader goal, however, is to prepare apprentices for high-demand careers and increase their employment and earnings. This chapter first examines apprenticeship completion and current enrollment rates using AAI Apprentice Survey data. It then documents several post-program outcomes of AAI apprentices, including employment rates and earnings levels in the fifth quarter after their program using administrative earnings records from the NDNH.

As noted in Chapter 1, several caveats are appropriate in considering the analysis of employment and earnings. First, the outcomes study measures participant-level outcomes, not AAI apprenticeship programs' causal impacts. Second, the study reports outcomes for several subgroups of participants, and many subgroup characteristics are correlated. Third, because the earnings analysis reported includes only apprentices whose programs ended by September 2019, it excludes longer-term programs in which apprentices were still enrolled.[23] Thus, the earnings results presented largely reflect apprentices who completed short- and medium-term apprenticeship programs. Finally, some of the post-program earnings outcomes may have been influenced by the economic shock associated with the onset of the COVID-19 pandemic.[24]

4.1 Did AAI Apprentices Complete Their Programs?

As noted in Chapter 3, apprentices responded to the AAI Apprentice Survey an average of 2.7 years after enrolling in their programs. Apprentices reported their program status (completion, still enrolled, left the program prior to completion), reason for non-completion (if applicable), and receipt of credentials.

- ***Most AAI apprentices reported they had completed their programs or were still enrolled.***

About 80 percent of apprentices reported that they had completed (47 percent) or were still enrolled (33 percent) in their programs (Exhibit 4-1 and Appendix Exhibit E-1). Of those still enrolled, most (76 percent) reported they were on track to complete on time. Among those who did not expect to complete on time, the most common reason was due to delays in their progress through classroom instruction. By comparison, less than half of all registered apprentices successfully completed their programs.[25]

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[23] NDNH data is available through December 2020. In order to report earnings in the fifth quarter after program exit, the earnings analysis only includes apprentices whose programs were expected to end by September 30, 2019, so that earnings can be observed in the fifth quarter after their programs ended.

[24] Across all AAI apprentices included in the analysis, earnings declined by about 10 percent (or $5,400 annualized) in the second quarter of 2020, before recovering by the fourth quarter of 2020. For about 23 percent of AAI apprentices, the fifth post-program quarter occurred during the period affected by the COVID-19 pandemic. Thus, average post-program earnings may have been about 2 to 3 percent higher in the absence of COVID-19.

[25] According to data from RAPIDS, 47 percent of apprentices who registered in 2015 successfully completed their programs.

Relative to all other subgroups, a larger share of women apprentices reported that they completed their programs (61 percent), reflecting the predominance of women in healthcare apprenticeships, which were shorter, on average, than other apprenticeships. Among other subgroups of AAI apprentices, the percentage who completed ranged from 43 percent (men) to 52 percent (Other Race) (Appendix Exhibit E-3).

Exhibit 4-1. AAI Apprentice Enrollment and Completion Status

Characteristic	Share (%)
Current Status	
Currently enrolled	32.9
Completed	47.3
Program cancelled/suspended	5.2
Left before completing	14.6
Current Status (among those still enrolled, *N*=888)	
Will complete on time	76.2
Will not complete on time	23.8
Due to delays in my progress through classroom instruction	*7.2*
Due to shortage of work from employer	*3.4*
Due to other reasons	*3.4*
Due to delays in my progress through on-the-job learning	*3.3*
Due to delays related to COVID-19 pandemic	*3.3*
Due to personal or family reasons	*1.7*
Due to delays by the apprenticeship program/employer	*1.6*
Reason for Cancellation/Suspension (among those cancelled/suspended, *N*=156)	
For reasons not aware of	22.9
Other	16.0
Temporarily closed or reduced staff	15.9
My poor performance	15.3
Reasons related to COVID-19 pandemic	12.5
Fired or laid off, unknown cause	8.2
Lack of work	7.4
Went out of business	1.9
Received Any Degrees, Certificates, or Professional Licenses (among those not currently enrolled, *N*=1,713):	
Yes, portable to other employers	39.9
Yes, not portable to other employers	7.8
No	52.3

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Apprentices not currently enrolled included those who completed and those who left without completing their programs. Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

- ***One in five AAI apprentices reported that they left without completing or their apprenticeship was cancelled.***

About 15 percent of apprentices reported that they left their programs without completing, while another 5 percent had their programs cancelled—that is, ended by the employer or program sponsor (Exhibit 4-1). The largest share of apprentices who had their apprenticeship cancelled reported they did not know the reason (23 percent).[26] About 16 percent reported the employer temporarily closed or reduced staff, 15 percent reported that the cancelation was due to their poor performance, and 13 percent reported that their program was cancelled due to COVID-19.[27] A higher than average share of women (6 percent), Black (7 percent), and incumbent worker apprentices (6 percent) had their apprenticeships cancelled. There was little difference in cancellation rates by occupation (Appendix Exhibit E-3).

- ***Personal or family problems was the most cited reason for leaving an apprenticeship before completing it for almost all AAI apprentices.***

Almost 40 percent of apprentices who left their programs before completing reported personal or family problems as the reason (Exhibit 4-2). This was the most often cited reason for all subgroups except those who identified as Other Race, who by a small margin reported finding a better-paying job as the top reason. For all other subgroups, the second and third most common reasons reported were found a better-paying job and disliked the employer or program. Less than 1 percent of apprentices cited the COVID-19 pandemic as their primary reason for leaving their programs (Appendix Exhibit E-3).

Exhibit 4-2 also shows a larger proportion of women apprentices than men apprentices left their programs for personal or family reasons (54 percent versus 33 percent). About one in five apprentices who left reported they did so because they disliked the employer or program; almost a third of Black apprentices cited this reason.

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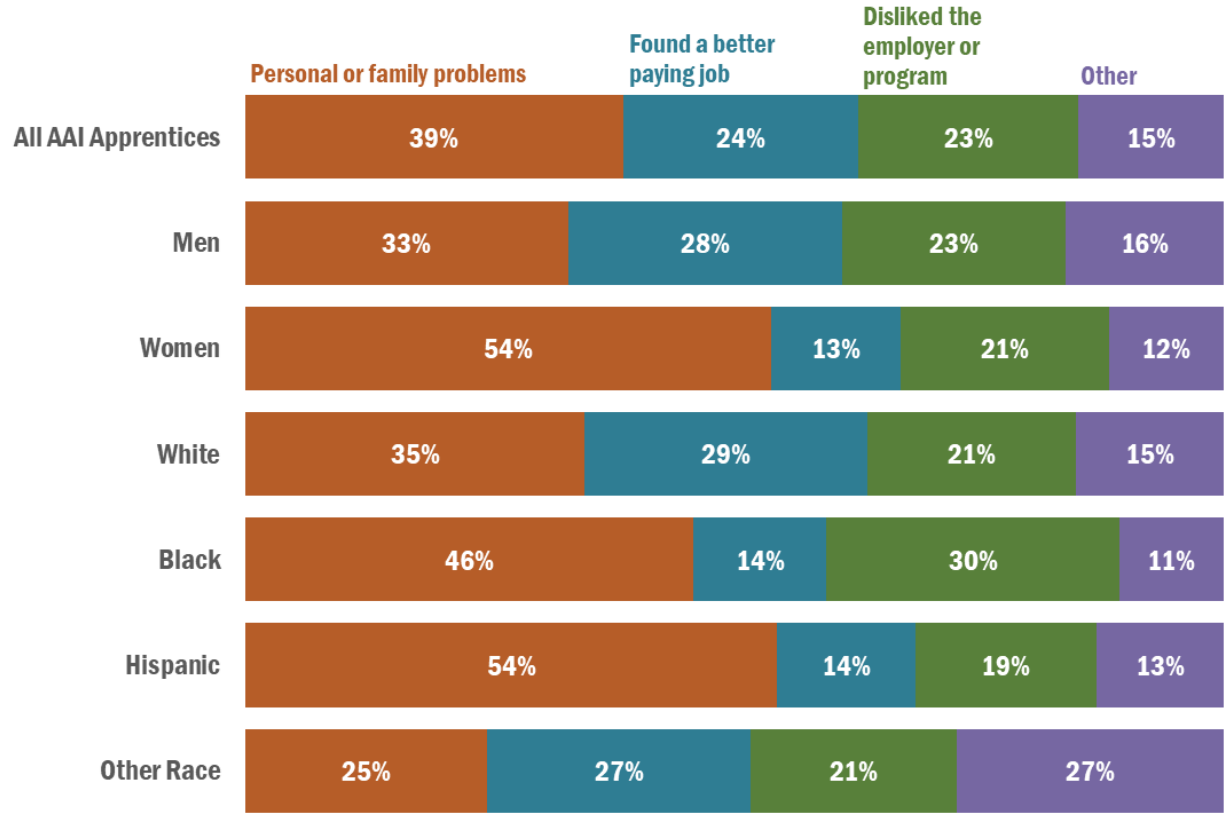
[26] The apprentices who reported that they did not know the reason for program cancellation were spread across multiple grantees and occupations.

[27] The AAI Apprentice Survey was conducted between March and October 2020, during the initial months of the COVID-19 pandemic. Thus, it is possible that employer closures and the economic disruption caused by the pandemic are related.

Exhibit 4-2. Reason for Leaving AAI Apprenticeship before Completing, by Gender and Race/Ethnicity



Source: AAI Apprentice Survey (*N*=366). Sample is limited to apprentices who left their programs without completing.
Note: Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Components may not add to 100 percent due to rounding.

4.2 What Were AAI Apprentices' Employment Outcomes?

The AAI Apprentice Survey asked apprentices not currently enrolled to describe their employment status. Apprentices not currently enrolled included those who completed and those who left without completing their programs.

- ***Most AAI apprentices reported they were employed after their apprenticeship, and the majority remained with the same employer.***

Exhibit 4-3 (and Appendix Exhibit E-2) shows employment outcomes for all apprentices not currently enrolled (top panel), among apprentices who completed (second panel), and apprentices who left without completing (third panel). Overall, 86 percent of apprentices not currently enrolled were employed, most often with the employer that operated the apprenticeship program. Not surprisingly, employment status varied by reason for apprenticeship exit. Ninety (90) percent of apprentices who completed were

employed, most often with the same employer (65 percent).[28] By way of comparison, fewer apprentices who left without completing were employed (75 percent), and more were employed by a different employer (49 percent) than the same employer who operated the apprenticeship (26 percent).

Apprentices who were no longer working for the employer that operated the apprenticeship program cited several reasons (fourth panel of Exhibit 4-3). The most common reasons were found a better-paying job (34 percent) and personal or family reasons (24 percent). Few reported they did not receive a job offer due to performance issues (3 percent).

Exhibit 4-3. Employment Outcomes for AAI Apprentices Not Currently Enrolled

Characteristic	Share (%)
Employment Status of All Apprentices Not Currently Enrolled (*N*=1,713)	
Employed	85.5
Same employer that operated apprenticeship program	53.3
Different employer	32.2
Not employed	14.5
Employment Status of Apprentices Who Completed Their Programs (*N*=1,191)	
Employed	89.9
Same employer that operated apprenticeship program	64.8
Different employer	25.0
Not employed	10.1
Employment Status of Apprentices Who Left without Completing (*N*=522)	
Employed	75.0
Same employer that operated apprenticeship program	25.8
Different employer	49.2
Not employed	25.0
Among Those Not Still Employed with Same Employer, Reason Why (*N*=694, respondents could select multiple reasons)	
Found better-paying job	34.1
Personal or family reasons	23.9
Other	12.2
Found job with better hours	11.4
Found job with better schedule	10.7
Employer did not make a job offer due to lack of work	10.7
Fired or laid off, unknown cause	7.4
Employer no longer in business	6.6
Quit	5.7
Reasons related to COVID-19 pandemic	4.3
Employer did not make a job offer due to apprentice's performance	3.0

Source: AAI Apprentice Survey (*N ranges by topic*). Sample is limited to apprentices who were not currently enrolled in their programs.
Note: Apprentices not currently enrolled included those who completed and those who left without completing their programs. Means are weighted for survey non-response and imputed for item non-response (see analytic details in Appendix B). On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

[28] This is generally consistent with employment rates for all registered apprentices who complete their programs. According to DOL, 92 percent of all registered apprentices are employed after completing their programs (see https://blog.dol.gov/2021/11/03/equity-snapshot-apprenticeships-in-america). This measure of employment is defined as the number of adult participants who are employed in both the second and third quarters after the exit quarter, divided by the number of adult participants who exit during the quarter.

- ***The employment status of apprentices who completed their programs varied by race/ethnicity and occupation.***

The proportion of apprenticeship completers who reported they were employed after their apprenticeship was highest for apprentices who identified as Other Race (97 percent) and lowest for Black apprentices (85 percent) (Appendix Exhibit E-3). Additionally, relative to the average among all completers, more Other Race apprentices (71 percent) and fewer Black apprentices (54 percent) were employed by the employer that operated the apprenticeship program.

Completers' employment rates did not vary much by gender, ethnicity, or veteran status (generally about 90 percent). About two-thirds of each group remained employed with the same employer that operated the apprenticeship program. Incumbent and new worker apprentices had similar employment rates after completion of their apprenticeship, but the proportion who remained with the same employer was higher for incumbent workers than for new workers (74 percent versus 54 percent) (Appendix Exhibit E-3).

Employment rates did, however, vary by occupation, ranging from 85 percent of construction apprentices to 93 percent of healthcare apprentices (Appendix Exhibit E-3). The proportion who remained with the employer who operated the apprenticeship program was lowest for apprentices in computer/IT occupations (38 percent); these occupations tend to have higher rates of worker turnover. Retention was also lower than average for apprentices in construction occupations (52 percent), in which apprenticeships are typically operated by joint labor-management organizations among groups of employers. Retention was highest for apprentices in healthcare and manufacturing occupations (71 percent each).

4.3 What Were Apprentice Earnings Outcomes?

The study analyzed NDNH quarterly earnings data for apprentices who completed their programs or who left without completing. The results include measures of employment and earnings in the year prior to starting the program through the fifth quarter after expected program completion (which is about 9.5 quarters, on average, after starting the apprenticeship program). Box 4 summarizes the NDNH outcomes, data availability, and analysis sample.[29]

Box 4: NDNH Outcomes, Data Availability, and Analysis Sample

Outcomes

- "**Annual earnings before program**" is calculated as total earnings in the four calendar quarters prior to the quarter in which the apprentice (or pre-apprentice) started their program.
- "**Annual earnings after program**" is calculated as earnings in the fifth quarter after the expected program completion date, multiplied by four. For AAI apprentices, the fifth quarter after expected program completion occurs about 9.5 quarters (or about 2.4 years), on average, after starting the program.

Data Availability and Analysis Sample

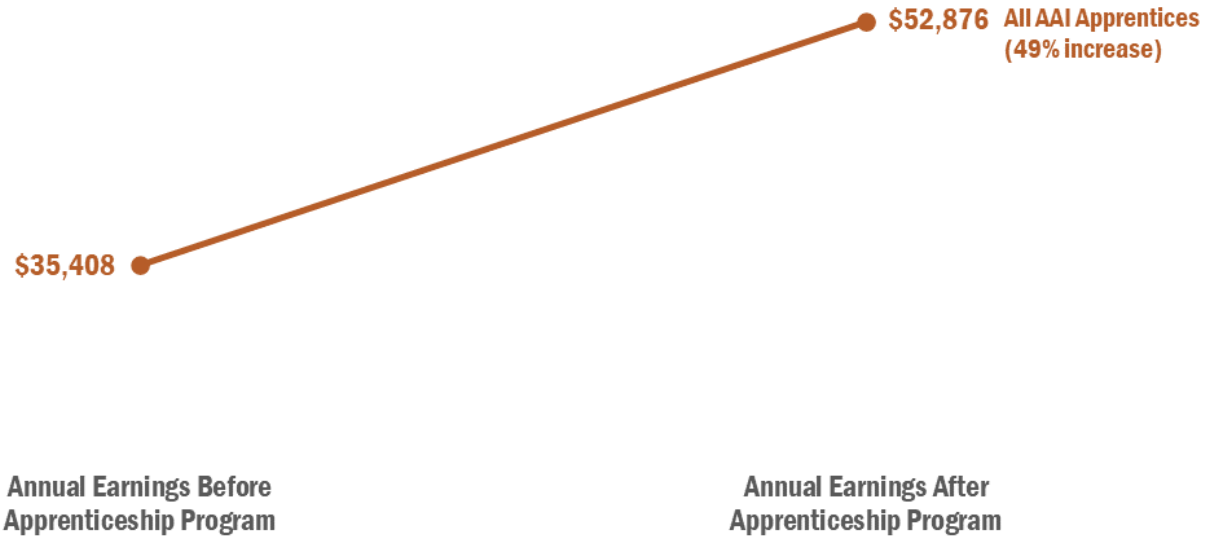
- NDNH data for this study is available through December 2020.
- The NDNH analysis sample consists of all apprentices and pre-apprentices with a valid SSN in the Apprenticeship QPR with an expected completion date of September 30, 2019, so that earnings in the fifth quarter after expected program completion are available.
- The analysis sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete.

[29] The NDNH sample consists of 3,871 apprentices with a valid Social Security number in DOL's Apprenticeship QPR system whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth quarter after their programs ended. Averages include apprentices with $0 earnings.

- ***AAI apprentice earnings grew by 49 percent between the year before starting the apprenticeship and the year after expected program completion.***

Based on the NDNH data, AAI apprentices, on average, earned $35,408 in the year before their apprenticeship started.[30] In the year after the program ended, apprentices earned on average $52,876, an increase in earnings of 49 percent (Exhibit 4-4).[31] The increase in earnings is associated with an increase in employment—89 percent of apprentices were employed in the year after their program ended, compared to 84 percent employed in the year prior to their apprenticeship (Appendix E-4). All apprentices are included in the calculation of average earnings, including those with no earnings, so the increase in the employment rate also increased average earnings.

Exhibit 4-4. Earnings Outcomes for All Apprentices



Source: National Directory of New Hires (*N*=3,871).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

- ***Women AAI apprentices had higher earnings growth than men.***

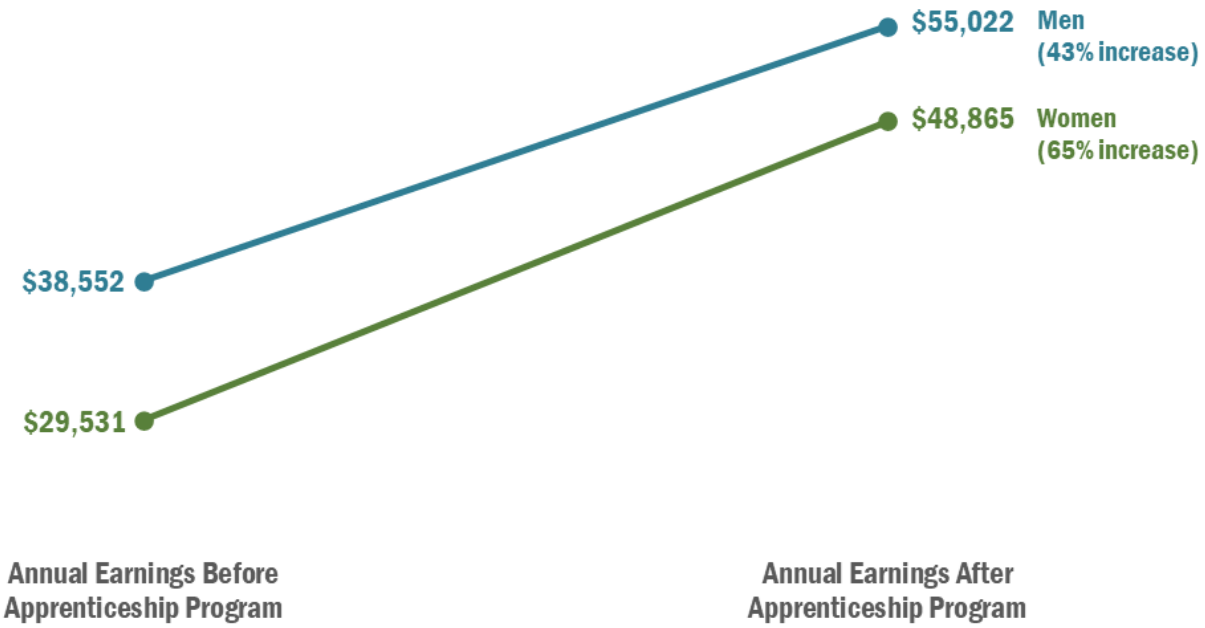
Both the absolute and percentage gains for women exceeded those for men (Exhibit 4-5 and Appendix Exhibit E-4). Annual earnings for women grew by $19,334, a 65 percent increase from pre-program levels. Earnings for men grew by $16,469, an increase of 43 percent. Still, at both points in time, women

[30] This value is different from annual earnings in the year prior to the apprenticeship reported in Chapter 2 ($31,016), which is based on data from the Apprenticeship QPR.

[31] Annual pre-program earnings were equal to the sum of earnings in the four quarters prior to the quarter of enrollment. Annual post-program earnings were equal to earnings in the fifth quarter after the expected program completion date multiplied by four.

earned less than men, although the difference decreased over time, from 23 percent prior to the apprenticeship to 11 percent following apprenticeship completion.

Exhibit 4-5. AAI Apprentices' Earnings Outcomes, by Gender



Source: National Directory of New Hires (*N*=3,871).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

- ***Earnings increased for AAI apprentices regardless of race/ethnicity, although the magnitude of increase varied considerably.***

As Exhibit 4-6 shows, earnings increased for apprentices in all racial and ethnic groups. The amount and percentage increase varied, however, with earnings growth for apprentices who identified as Other Race outpacing growth for White, Black, and Hispanic apprentices. Other Race apprentices had the lowest pre-apprenticeship earnings ($31,937) and highest post-apprenticeship earnings ($59,533), an increase of 86 percent. Hispanic apprentices experienced a 50 percent growth in earnings ($17,304). Earnings growth was similar for White apprentices ($16,956, a 45 percent increase) and lower for Black apprentices ($12,633, a 37 percent increase).

Along with the increase in earnings, employment rates also increased for all racial and ethnic groups. The employment rate for apprentices who identified as Other Race increased by 14 percentage points—79 percent were employed in the year prior to the apprenticeship, compared to 93 percent employed in the year after the apprenticeship. Employment growth was lower for White apprentices (5 percentage points) and Black apprentices (3 percentage points), while there was no change in the average employment rate for Hispanic apprentices (Appendix Exhibit E-4).

Exhibit 4-6. AAI Apprentices' Earnings Outcomes, by Race/Ethnicity

Source: National Directory of New Hires (*N*=3,871).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

- ***Earnings growth was higher for White women AAI apprentices than for Black women apprentices, due in part to the type of occupation.***

Earnings for White women apprentices grew by nearly $22,000 (a 74 percent program increase), whereas earnings for Black women apprentices grew by about $13,000 (a 48 percent increase) (Appendix Exhibit E-4). This difference in earnings growth appears to be related to the occupations chosen by each group (Exhibit 4-7). A much higher share of White women apprentices in healthcare than Black women apprentices in healthcare participated in registered nurse apprenticeships (37 percent versus 10 percent), an occupation, as reported below, that had among the highest earnings growth of any occupation. More Black women apprentices than White women apprentices trained for lower-paying and lower-growth occupations, such as pharmacy technician (43 percent versus 7 percent) and nursing assistant (22 percent versus 8 percent).[32]

[32] In May 2020, the mean hourly wage for registered nurses was $38.45. The mean hourly wage for pharmacy technicians was $17.52 and for nursing assistants $15.41. Source: Bureau of Labor Statistics. https://www.bls.gov/oes/current/oes_stru.htm#29-0000.

Exhibit 4-7. Earnings for Women AAI Apprentices in Healthcare Occupations, by Occupation and Race/Ethnicity

Occupation	Annual Earnings ($)			Share of Healthcare Apprentices (%)	
	Before Program	After Program	Change	White Women (*N*=367)	Black Women (*N*=103)
Registered Nurse	15,056	82,745	67,688	37	10
Medical Records and Health Information Technician	44,825	59,499	14,674	28	12
Pharmacy Technician	9,624	23,709	14,085	7	43
Nursing Assistant	18,438	30,232	11,794	8	22
All other healthcare occupations	27,507	36,926	9,418	20	14

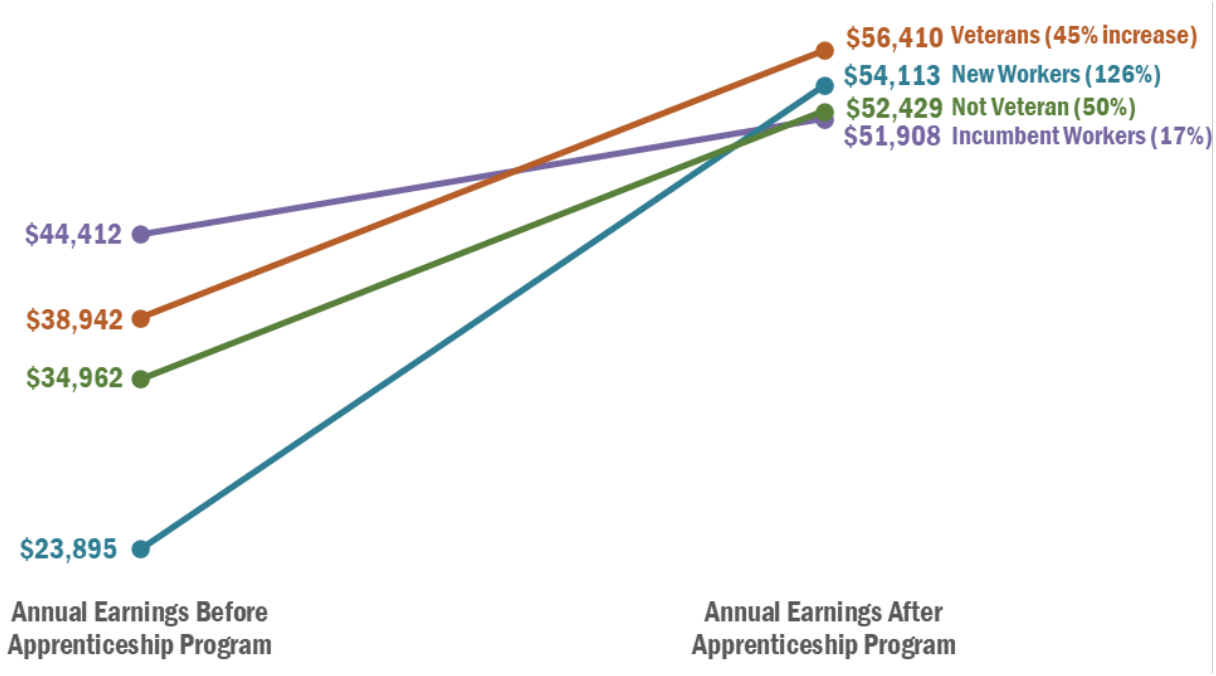
Source: National Directory of New Hires (*N*=470).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

In contrast, earnings growth for White men and Black men were similar (Appendix Exhibit E-4). Earnings for White men grew by $14,599 (a 36 percent increase) whereas earnings for Black men grew by $12,437 (a 33 percent increase). Both White men and Black men earned more than $50,000 per year after the apprenticeship program. Thus, most of the overall difference in earnings levels and growth between White and Black apprentices occurs among women.

- ***Earnings growth of AAI apprentices was greater for new workers than for incumbent workers.***

Exhibit 4-8 shows the substantial difference in earnings growth between new workers and incumbent workers. Among workers who were already working with the employer that operated the apprenticeship, earnings grew by $7,496, or 17 percent. Among new workers who were not already working with the employer when they started their apprenticeship, earnings grew by $30,217, or 126 percent. The difference in growth in part reflects a difference in pre-program earnings, which were higher for incumbent workers than for new workers. Interestingly, although new workers earned substantially less than incumbent workers prior to starting the apprenticeship ($23,895 versus $44,412), earnings were higher after the apprenticeship ended ($54,113 versus $51,908).

Exhibit 4-8. AAI Apprentices' Earnings Outcomes, by Incumbency

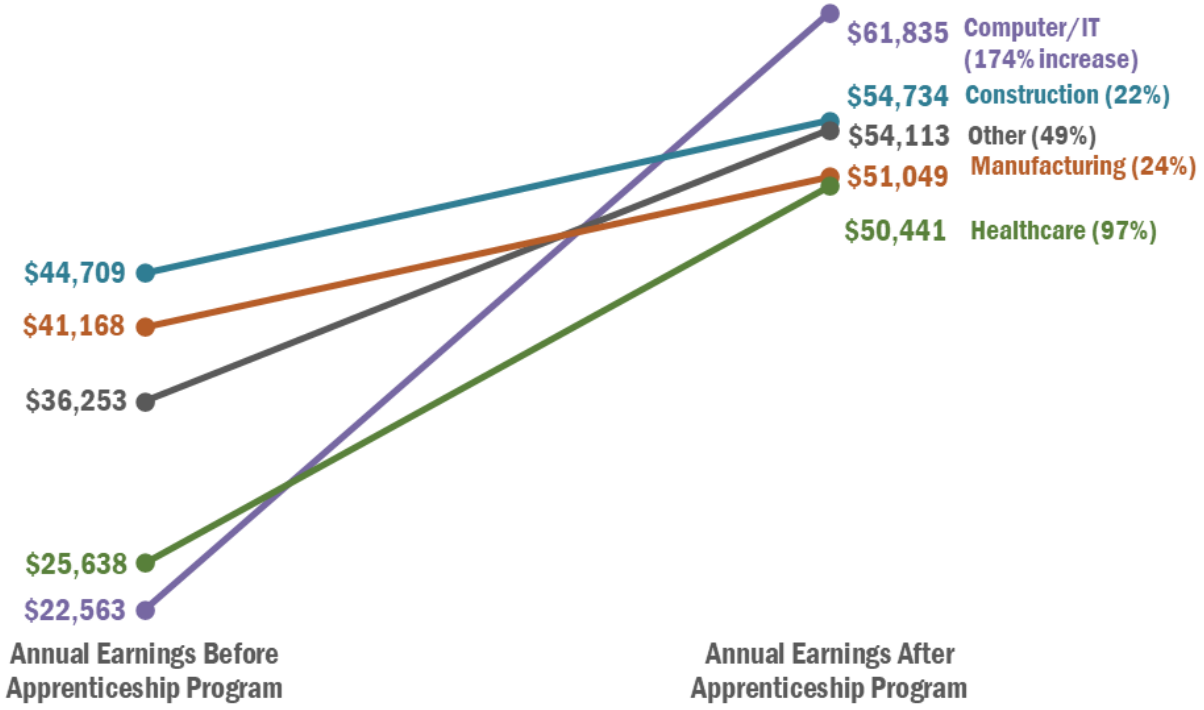


Source: National Directory of New Hires (*N*=3,871).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

- ***Earnings growth was greatest for AAI apprentices in computer/IT and healthcare occupations and lowest for apprentices in construction and manufacturing.***

Earnings growth varied by apprenticeship occupation (Exhibit 4-9). Apprentices in computer/IT occupations experienced the highest level, with earnings growing from $22,563 to $61,835 (an increase of $39,272, or 174 percent). Apprentices in healthcare occupations experienced the second-highest level, with earnings growing from $25,638 to $50,441 (an increase of $24,803, or 97 percent). Apprentices in these two occupations had the lowest levels of pre-program earnings, which partly explains the high levels of earnings growth. Earnings growth was lowest for apprentices in the manufacturing ($9,881, or 24 percent) and construction ($10,025, or 22 percent). Apprentices in these two occupations had the highest pre-program earnings.

Exhibit 4-9. AAI Apprentices' Earnings Outcomes, by Occupation



Source: National Directory of New Hires (*N*=3,871).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

- ***Among the most common AAI post-apprenticeship occupations, registered nurses and computer network specialists achieved the highest growth in earnings.***

Earnings growth varied across apprenticeship occupations. Exhibit 4-10 shows earnings levels and growth for the 10 most common occupations of apprentices, which together accounted for nearly two-thirds of all apprenticeships.[33] Occupations with the largest earnings growth included registered nurses (a $67,688 earnings increase) and computer network specialists (a $39,258 increase), followed by bus drivers (a $40,785 increase). One manufacturing program, Industrial Machinery Installation, Repair, and Maintenance, had earnings growth of $26,111.

[33] These are the 10 most common occupations in the earnings analysis; as described above, this is limited to apprentices who completed their programs by September 30, 2019.

- ***The two most common AAI apprenticeship occupations, both in the manufacturing industry, had low earnings growth relative to other apprenticeship occupations.***

Earnings growth was 9 percent for the most common occupation, industrial manufacturing technician, and 16 percent for the second most common one, machine operators (Exhibit 4-10). The two manufacturing occupations together accounted for about one-quarter of apprentices.

Exhibit 4-10. Earnings Growth for AAI Apprentices for Most Common Occupations in the Earnings Analysis

Occupation and Standard Occupational Classification (SOC) Code	Share of Apprentices (%)	Annual Earnings Before Program ($)	Annual Earnings After Program ($)	Earnings Growth ($)	Earnings Growth (%)
Registered Nurses (29-1141)	5	15,056	82,745	67,688	450
Bus Drivers (53-3021)	3	28,419	69,204	40,785	144
Computer Network Specialists (15-1151)	4	25,011	64,269	39,258	157
Industrial Machinery Installation, Repair, and Maintenance (49-9041)	4	24,810	50,921	26,111	105
All other occupations	37	28,503	47,716	19,213	67
Heavy and Tractor-Trailer Truck Drivers (53-3032)	5	33,417	50,506	17,089	51
Medical Records and Health Information Technicians (29-2071)	5	44,825	59,499	14,674	33
Machine Operators (51-4081)	12	46,627	54,237	7,610	16
Plumbers and Pipefitters (47-2152)	4	51,702	58,568	6,866	13
Industrial Manufacturing Technicians (17-3029)	14	42,520	46,278	3,758	9
Training and Development Specialists (13-1151)	5	54,283	55,973	1,690	3

Source: National Directory of New Hires (*N*=3,871).
Notes: Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four. Standard Occupation Classification (SOC) codes are a federal statistical standard used to classify workers into occupational categories. Occupations in this table are ordered by earnings growth.

- ***Earnings differences narrowed between the AAI pre-program and post-program periods.***

The relative earnings gap between apprentices with high earnings and apprentices with low earnings narrowed during the program. Specifically, there was a decline in the ratio in the earnings level at the 75th percentile of earners (i.e., those earning more than what 75 percent of all study participants did) relative to the earnings level at the 25th percentile of earners (i.e., those earning more than what 25 percent of all study participants did).[34] In the pre-program year, apprentices in the 75th percentile earned 3.5 times

[34] The 25th percentile is the level at which 25 percent of apprentices earn at or below the 25th percentile and 75 percent earn above the 25th percentile. Similarly, the 75th percentile is the level at which 75 percent of apprentices earn at or below the 75th percentile and 25 percent earn above the 75th percentile.

more than those in the 25th percentile. In the post-program year, the ratio between the 75th and 25th percentiles declined to 2.4 (Appendix Exhibit E-5).

Earnings at the 75th percent of the earnings distribution before the apprenticeship was about $50,000; at the post-apprenticeship period, earnings for the 75th percentile reached $74,000, a 48 percent increase. In contrast, apprentices at the 25th percentile of the earnings distribution before the program earned about $14,000, while those at the 25th percentile in the post-program period earned nearly $31,000, an increase of 114 percent.

4.4 Summary of Research Questions 3 and 4 Findings

Most AAI apprentices had favorable program completion outcomes. At the time of the AAI Apprentice Survey almost three years after program enrollment, about 80 percent of apprentices had completed or were still enrolled in their programs. Among those who left without completing, the largest share of each subgroup except Other Race apprentices cited personal or family problems for leaving their programs.

Employment rates were higher for completers than for apprentices who left their programs. Among completers, employment status varied by race/ethnicity and occupation. The proportion of completers employed was highest for apprentices who identified as Other Race and lowest for Black apprentices. Employment rates were highest for healthcare apprenticeship completers and lowest for construction apprenticeship completers.

Apprentice earnings grew, on average, by 50 percent between the year prior to starting the apprenticeship and the year after expected program completion. Earnings growth was much higher for new workers than for incumbent workers. Women had higher earnings growth than men did. However, earnings growth was higher for White women apprentices than for Black women apprentices, due in part to differences in their choice of healthcare occupations.

Earnings increased for apprentices regardless of race/ethnicity, although the magnitude of increase differed. Apprentices who identified as Other Race had the highest earnings growth; White and Black apprentices had the lowest earnings growth.

Earnings growth varied by apprenticeship occupation. Apprentices in computer/IT and healthcare occupations had the highest earnings gains. Apprentices in construction and manufacturing had the lowest gains, in part because their earnings before their apprenticeships started were among the highest, on average. Registered nurses and computer network specialists achieved the highest growth in earnings; industrial manufacturing technicians and training and development specialists had the lowest growth.

Finally, apprentices with the lowest initial earnings achieved the highest percentage gains in earnings, narrowing the earnings differences between high earners (those in the 75th percentile) and low earners (those in the 25th percentile).

5. What Were the Characteristics, Program Experiences, and Post-Program Outcomes of Pre-Apprentices?

Pre-apprenticeship programs aim to prepare workers to enter and succeed in a registered apprenticeship program. With a formal partnership with at least one apprenticeship program sponsor, the pre-apprenticeship is a strategy for preparing historically underrepresented populations for apprenticeship.[35] Almost three-quarters (73 percent) of AAI grantees supported a pre-apprenticeship program (Gardiner et al. 2021). This chapter reports the characteristics, program experiences, and post-program outcomes of AAI pre-apprentices, using data from the Apprenticeship QPR and the NDNH.

5.1 What Are the Characteristics of AAI Pre-Apprentices at Enrollment and How Do They Compare to Apprentices?

The Apprenticeship QPR records the demographic, educational, and economic characteristics of AAI pre-apprentices, often in more detail than for AAI apprentices. This section summarizes the characteristics of pre-apprentices at enrollment and, when possible, compares them to the characteristics of AAI apprentices.

- ***A larger share of AAI pre-apprentices were from underrepresented populations than were AAI apprentices, but they were similar in age.***

Ninety (90) percent of AAI pre-apprentices were from populations underrepresented in apprenticeship, compared to 61 percent of apprentices (Exhibit 5-1 and Appendix Exhibit F-1). The share of each underrepresented subgroup was higher among pre-apprentices than apprentices. More than one-third of pre-apprentices were women (38 percent) or Black (37 percent). Seventeen (17) percent were Hispanic or veterans. Ten (10) percent reported a disability.[36]

The average pre-apprentice age was 32 years old, about one year younger than the average apprentice. A larger share of pre-apprentices (35 percent) than apprentices (28 percent), however, were traditional college age (i.e., 24 and younger). Interestingly, more pre-apprentices than apprentices were never married (64 percent versus 48 percent), but a larger share of pre-apprentices had children (46 percent versus 26 percent).

[35] Although pre-apprenticeships are not regulated in the same way that registered apprenticeships are, DOL provided guidance and definitions for quality pre-apprenticeship programs in Training and Employment Notice 13-12, https://wdr.doleta.gov/directives/attach/TEN/TEN_13-12.pdf.

[36] The Apprenticeship QPR did not collect this information for apprentices.

Exhibit 5-1. Characteristics of AAI Pre-Apprentices versus AAI Apprentices at Enrollment

Characteristic	AAI Pre-Apprentices	AAI Registered Apprentices
Gender (%)		
Men	62.5	75.5
Women	37.5	24.5
Race/Ethnicity (%)		
White	32.6	60.9
Black	36.7	17.2
Hispanic	17.2	13.3
Other Race	13.5	8.6
Disability (%)	10.0	N/A
Veteran (%)	17.4	12.5
Any underrepresented population (women, people of color, veteran, or disability) (%)	89.9	60.5
Age (%)		
24 or younger	34.5	27.8
25 to 34	30.3	35.0
35 to 44	17.7	20.1
45 to 54	11.1	12.8
55 to 64	5.6	4.1
65 or older	0.7	0.3
Age (mean)	32.0	32.7
Highest Education (%)		
Less than high school	4.4	1.2
High school diploma or GED	54.2	33.3
Postsecondary or technical training	41.4	65.5
Marital Status (%)		
Married	25.1	38.3
Separated/divorced/widowed	10.5	13.3
Never married	64.4	48.4
Has one or more children (%)	45.7	25.9
Limited English language proficiency	5.1	N/A
Basic literacy skills deficiency (%)	11.2	N/A
Annual earnings prior to pre-apprenticeship		
$0	22.5	5.0
$1 to $9,999	25.5	17.8
$10,000 to $19,999	17.4	8.9
$20,000 to $29,999	15.5	16.1
$30,000 to $39,999	9.6	20.9
$40,000 to $49,999	4.7	11.1
$50,000 or more	4.8	20.2

Source: Apprenticeship Quarterly Performance Report (QPR) (*N*=6,282).
Notes: N/A = Not Applicable. GED = General Education Development high school equivalent. "Basic literacy skills deficiency" is defined as having math or English skills at or below the 8th grade level. "Limited English language proficiency" is defined as having a limited ability to speak, read, or write in the English language, and (a) having a native language other than English, or (b) living in a family or community environment where a language other than English is the dominant language.

- ***At enrollment, AAI pre-apprentices had lower levels of education than AAI apprentices.***

As expected, given the focus of the pre-apprenticeship programs, education levels were low. More than half of pre-apprentices (59 percent) did not have any education beyond a high school diploma or General Education Development (GED) high school equivalent, compared to 35 percent of apprentices (Exhibit 5-1). About one in 10 pre-apprentices had low basic skills at enrollment; fewer (5 percent) had limited English language proficiency. (The Apprenticeship QPR does not record this information for apprentices, thus no comparison is possible).

- ***At enrollment, AAI pre-apprentices had lower earnings than AAI apprentices.***

As also expected, given lower rates of educational attainment, AAI pre-apprentices had lower earnings than AAI apprentices. About half of pre-apprentices had no earnings (23 percent) or less than $10,000 in earnings (26 percent) in the 12 months prior to enrolling, compared to 23 percent of apprentices (Exhibit 5-1).

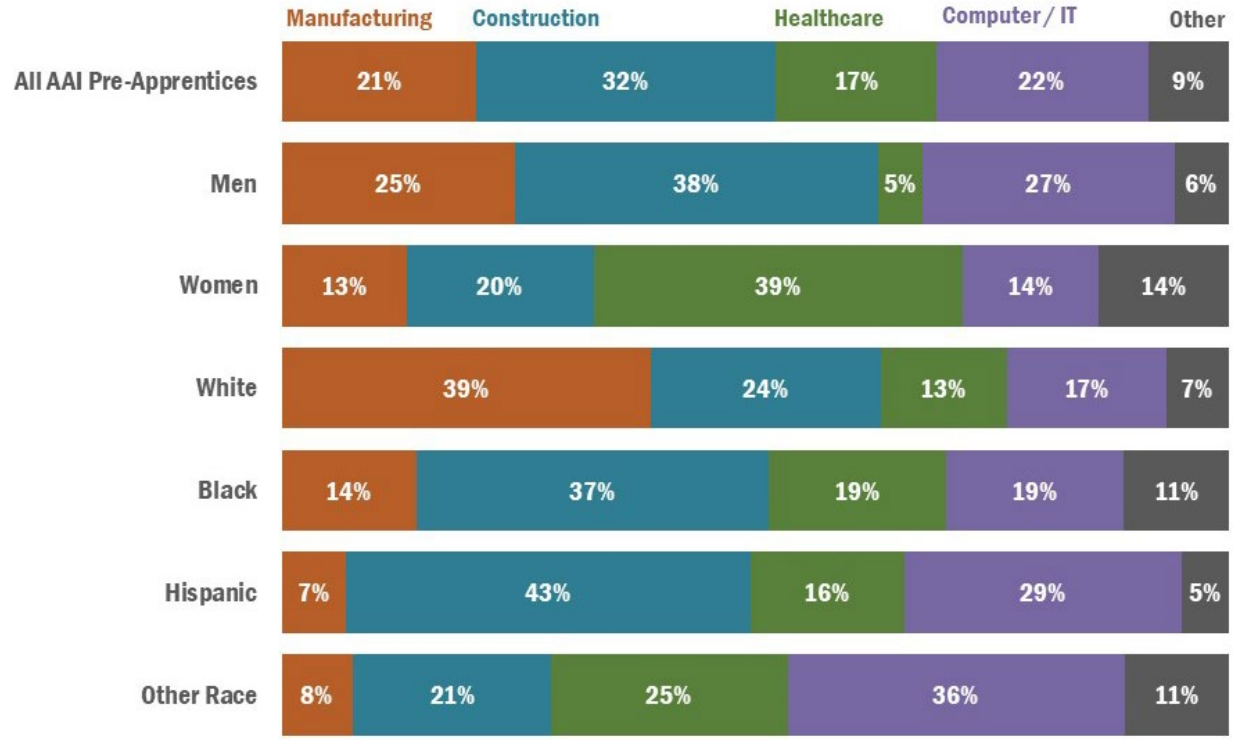
5.2 What Were AAI Pre-Apprentices' Program Experiences?

Pre-apprenticeship programs can include educational (e.g., GED instruction) and pre-occupational services (e.g., career and industry awareness workshops, job readiness courses), hands-on training in a lab simulation or in volunteer work opportunities, and assistance in applying to apprenticeship programs (Gardiner et al., 2021). The Apprenticeship QPR records information about occupational and work readiness instruction received, financial supports, and support services.

- ***The most common occupation for AAI pre-apprenticeships was construction.***

Whereas most AAI apprentices enrolled in manufacturing (46 percent) or healthcare (24 percent) apprenticeship programs, AAI pre-apprentices enrolled in preparation for a wider variety of occupations. Construction was the most common occupation, accounting for one-third of pre-apprentices (Exhibit 5-2). The remainder of pre-apprentices enrolled in other occupations in similar proportions.

Exhibit 5-2. AAI Pre-Apprenticeship Training Occupation, by Gender and Race/Ethnicity



Source: Apprenticeship Quarterly Performance Report (QPR) (*N*=6,282). Components may not add to 100 percent due to rounding.

- ***AAI pre-apprenticeship training occupation varied by gender and race/ethnicity.***

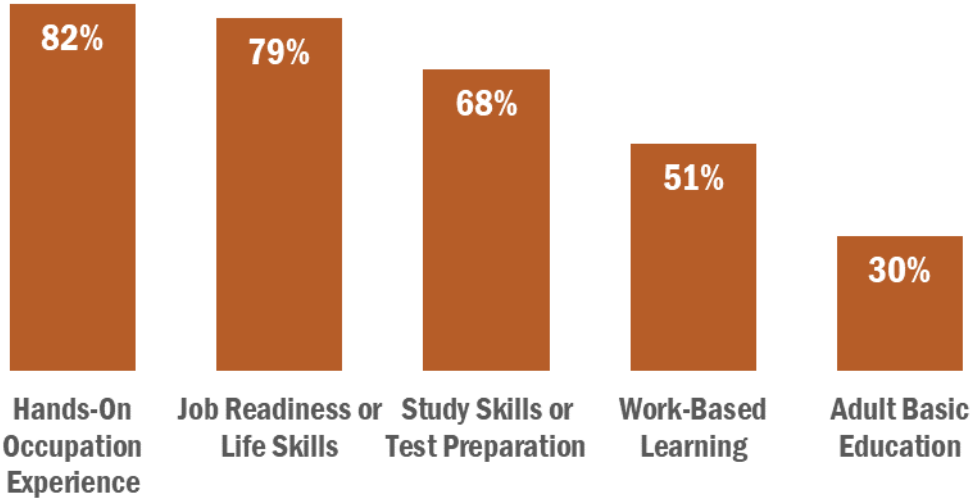
As with AAI apprentices, AAI pre-apprentices' choice of occupation varied by gender and race/ethnicity, but in different ways. The largest share of men pre-apprentices enrolled in construction (38 percent) and computer/IT (27 percent) programs (Exhibit 5-2). Women pre-apprentices most often enrolled in healthcare programs (39 percent). More AAI women pre-apprentices enrolled in construction programs than AAI women apprentices (20 percent versus 8 percent).

Like White apprentices, the largest share of White pre-apprentices enrolled in manufacturing programs (39 percent). Black and Hispanic pre-apprentices most often enrolled in construction programs (37 percent and 43 percent, respectively), exceeding the proportion of Black apprentices (25 percent) and Hispanic apprentices (41 percent).

- ***AAI pre-apprentices received an array of occupational and work readiness skill training.***

Most AAI pre-apprentices received hands-on occupation experience (82 percent), job readiness or life skills training (79 percent), study skills or test preparation training (68 percent), and work-based learning such as an internship, work experience, or job shadowing (51 percent) (Exhibit 5-3). Thirty percent participated in Adult Basic Education. Few participated in GED instruction (1 percent) or English as a Second Language classes (less than 1 percent) (not shown).

Exhibit 5-3. Types of Training Received by AAI Pre-Apprentices



Source: Apprenticeship Quarterly Performance Report (QPR) (*N*=6,282).

The typical pre-apprenticeship program lasted about three months (91 days) and provided about 180 hours of work-based training, or about four and a half weeks (Appendix Exhibit F-2).

- ***Two-thirds of AAI pre-apprentices received financial support, with smaller shares receiving career or academic supports.***

About three-quarters of pre-apprentices received at least one type of supportive service. Two-thirds received financial support such as a stipend, by far the most common type of service. A quarter of pre-apprentices received career supports; a fifth received academic supports (Exhibit 5-4).[37]

Exhibit 5-4. AAI Pre-Apprentice Receipt of Supportive Services

Characteristic	Share (%)
Received any Supportive Service	67.9
Supportive Services Received (respondents could select multiple options)	
Financial support	65.7
Career supports	24.5
Academic supports	20.6
Social support services	5.2
Veteran's assistance	3.2
Other	3.0

Source: Apprenticeship Quarterly Performance Report (QPR) (*N*=6,282).

[37] Receipt of supportive services among AAI pre-apprentices, as reported by grantees in the Apprentice QPR, is higher than the rate of survey-reported receipt of supportive services among AAI apprentices (see Section 5.2). This difference may be due to differences in data sources.

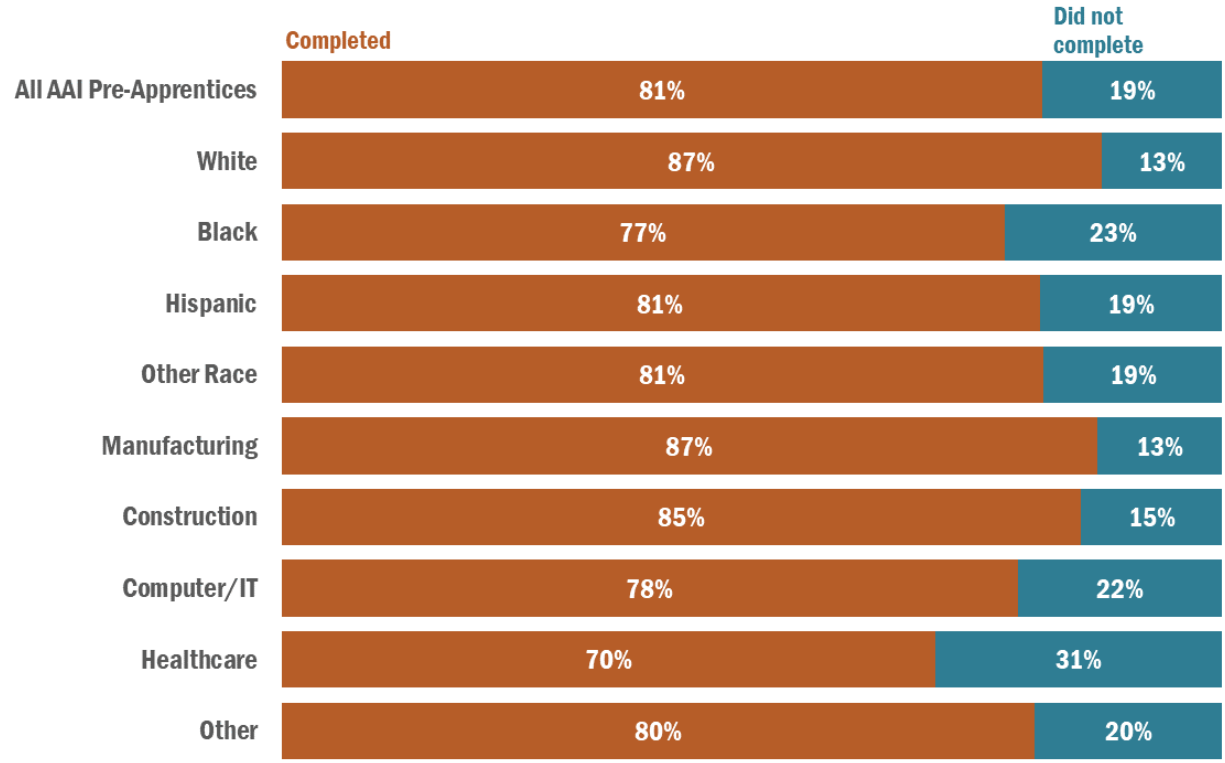
5.3 Pre-Apprentice Post-Program Outcomes

The Apprenticeship QPR records information about AAI pre-apprenticeship program completion, as well as whether pre-apprentices transitioned to a registered apprenticeship. This section also uses NDNH data to describe pre-apprentices' employment and earnings outcomes.

- ***Most AAI pre-apprentices completed their programs and earned a credential.***

Eighty-one (81) percent of pre-apprentices completed their programs (Exhibit 5-5). The completion rate was highest for White pre-apprentices (87 percent) and lowest for Black pre-apprentices (77 percent). The completion rate also varied by choice of occupation; 87 percent of pre-apprentices in manufacturing programs completed, compared to 70 percent of pre-apprentices in healthcare. Completion rates were higher for men (82 percent) than women (79 percent) and differed little by age group (Appendix Exhibit F-4).

Exhibit 5-5. Completion Status of AAI Pre-Apprentices



Source: Apprenticeship Quarterly Performance Report (QPR). Sample includes apprentices with valid completion data (*N*=4,079).

Seventy-two (72) percent of pre-apprentices earned a credential through their programs (Appendix Exhibit F-3). The most common credential was an occupational skills certificate (43 percent).

- ***Most AAI pre-apprentices who completed their programs continued to a registered apprenticeship program.***

Almost two-thirds of pre-apprenticeship completers (63 percent) continued to a registered apprenticeship program. Another 23 percent took a job in an occupation related to their training; seven (7) percent

pursued another educational opportunity, and six (6) percent took a job in an unrelated occupation (Exhibit 5-6).

Whether the pre-apprentice continued to a registered apprenticeship varied by occupation. For pre-apprentices in computer/IT and manufacturing, employment in a related occupation was the most common destination (49 percent and 38 percent, respectively). In contrast, much larger shares of apprentices in healthcare (94 percent), construction (84 percent), and other occupations (76 percent) continued to a registered apprenticeship program (Appendix Exhibit F-4).

These differences by occupation are reflected in the varying proportions of men and women who continued to an apprenticeship program (Appendix Exhibit F-4). A larger share of women than men entered a registered apprenticeship program (73 percent versus 58 percent). A contributing factor is that more women than men were in healthcare pre-apprenticeships, and the share of pre-apprentices who continued to a registered apprenticeship was very high in healthcare (94 percent).

Exhibit 5-6. AAI Pre-Apprentice Post-Program Outcomes, by Gender and Occupation

Source: Apprenticeship Quarterly Performance Report. Sample includes apprentices who completed their programs (*N=3,301*). Components may not add to 100 percent due to rounding.

- ***AAI pre-apprentice earnings nearly doubled between the year prior to starting the pre-apprenticeship and the year after their pre-apprenticeship program ended.***

AAI pre-apprentices earned $14,699 on average in the year prior to starting their pre-apprenticeship, approximately half of what apprentices earned prior to program enrollment (see Chapter 3). After their

pre-apprenticeship program ended, pre-apprentices earned on average $28,150, an increase of 92 percent (Exhibit 5-7 and Appendix Exhibit F-5).[38] The increase in earnings is associated with an increase in employment—83 percent of pre-apprentices were after they completed their pre-apprenticeships, compared to 63 percent employed before the pre-apprenticeship. All pre-apprentices are included in the average earnings calculations, including those with no earnings, so the increase in the employment rate contributed to the increase in average earnings.

Exhibit 5-7. Employment and Earnings Outcomes for AAI Pre-Apprentices

	N	Annual Earnings ($)				Employment (%)		
		Before Program	After Program	Change	Percent Change	Before Program	After Program	PP Change
Overall	2,161	14,699	28,150	13,451	92%	63	83	20
Gender								
Men	1,384	15,250	28,758	13,508	89%	63	84	21
Women	777	13,717	27,069	13,351	97%	63	81	18
Race/Ethnicity								
White	649	15,594	29,081	13,487	86%	62	82	19
Black	902	12,969	25,038	12,069	93%	62	82	19
Hispanic	401	14,358	27,974	13,616	95%	64	83	19
Other Race	209	20,039	39,033	18,994	95%	66	88	22
Age								
24 or younger	863	8,960	23,886	14,926	167%	57	84	26
25 to 34	697	18,039	30,606	12,567	70%	70	83	13
35 or older	601	19,066	31,425	12,359	65%	63	80	18
Occupation								
Computer/IT	331	17,483	33,312	15,829	91%	56	79	23
Construction	776	16,385	29,023	12,638	77%	69	85	15
Healthcare	383	11,874	25,157	13,283	112%	58	81	24
Manufacturing	476	13,547	26,073	12,526	92%	62	83	21
Other	195	11,621	26,866	15,245	131%	62	82	19

Source: National Directory of New Hires (N=2,161).
Notes: PP=percentage point. Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to pre-apprentices whose programs ended by September 30, 2019, so that earnings are observed in the fifth post-program quarter. The sample includes those who completed the program and those who did not complete. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

- ***On average, all AAI pre-apprentice subgroups experienced large earnings growth.***

Men and women pre-apprentices had similar earnings growth (about $13,500); however, this represented a larger increase for women (97 percent) than men (89 percent) (Exhibit 5-7). Earnings growth among pre-apprentices of all races/ethnicities was similar, although as a percentage change, it was highest for Hispanic and those who identified as Other Race (both 95 percent) and lowest for White pre-apprentices (86 percent). Other Race pre-apprentices had the highest earnings prior to starting ($20,039) and experienced the largest increase in earnings ($18,994).

[38] Annual post-program earnings are calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.

Pre-apprentices aged 24 or younger had lower pre-program earnings ($8,960) than older pre-apprentices but experienced the largest earnings increase ($14,926, or 167 percent). Finally, pre-apprentices in computer/IT had the largest increase in earnings ($15,829, or 91 percent); pre-apprentices in healthcare occupations and those categorized as other (such as finance, transportation, or logistics) had the largest changes in earnings (112 percent and 131 percent, respectively).

Despite growth in earnings, pre-apprentices still earned less, on average, than did apprentices before starting their apprenticeships. Pre-apprentices earned about $28,000 in the year after their program (Exhibit 5-7), while apprentices earned more than $34,000 before starting their apprenticeships (Exhibit 4-4).

- ***On average, eight in 10 AAI pre-apprentices were employed after their pre-apprenticeship program ended.***

Overall, 83 percent of pre-apprentices were employed after their programs ended, an increase of 20 percentage points from pre-program employment levels. The proportion employed was highest for pre-apprentices who identified as Other Race (88 percent) and lowest for pre-apprentices in computer/IT programs (79 percent) (Exhibit 5-7). The increase in employment rates was highest for the youngest pre-apprentices (26 percentage points) and lowest for pre-apprentices ages 25 to 34 (13 percentage points) and pre-apprentices in construction programs (15 percentage points).

5.4 Summary of Research Question 5 Findings

Relative to AAI apprentices, a larger share of AAI pre-apprentices were from underrepresented populations. When they enrolled in their pre-apprenticeship programs, pre-apprentices had lower levels of education than AAI apprentices, as well as lower earnings.

The largest share of AAI pre-apprentices enrolled in a construction-related occupational program, although, as with apprenticeships, pre-apprenticeship training occupation varied by gender and race/ethnicity. Construction was the most common occupational program for men, Black, and Hispanic pre-apprentices, healthcare was the most common occupation for women, computer/IT was the most common occupation for Other Race pre-apprentices, and manufacturing was the most common occupation for White pre-apprentices.

Most AAI pre-apprentices completed their programs and earned a credential. Among those who completed their programs, the majority continued to a registered apprenticeship program, although there was variation by occupation. The most common destination for pre-apprentices in computer/IT and manufacturing was employment in a related occupation.

AAI pre-apprentice earnings nearly doubled between the year prior to starting the pre-apprenticeship and the year after their pre-apprenticeship program ended. On average, all AAI pre-apprentice subgroups experienced large earnings growth. However, even with strong growth, pre-apprentices' post-program earnings were low relative to those of apprentices.

6. Summary of Findings and Implications

Through the American Apprenticeship Initiative (AAI), the U.S. Department of Labor sought to increase the number of registered apprenticeship programs and apprentices in the United States, with a focus on expanding registered apprenticeship to nontraditional occupations and increasing participation by underrepresented populations. Nontraditional occupations are those outside of the construction industry, including manufacturing, healthcare, and computer/IT. Underrepresented populations are women, veterans, individuals with disabilities, and people of color—that is, self-identifying as Black, Hispanic, or Other Race (including Asian, Native Hawaiian or Pacific Islander, Native American, or multiple races).[39] As documented in this AAI outcomes study, most AAI apprentices did enroll in nontraditional occupations, and a larger share of AAI apprentices are from underrepresented populations as compared to all registered apprentices. In addition, relative to AAI apprentices, a larger share of AAI pre-apprentices were from underrepresented populations.

This final chapter summarizes key outcomes study findings, starting with the characteristics of AAI apprentices and the importance of various factors in the decision to enroll in an apprenticeship program, followed by the in-program experiences, and concluding with post-apprenticeship outcomes. This chapter then summarizes AAI pre-apprentice experiences and outcomes. The chapter concludes with a brief discussion of implications of the outcome study findings.

6.1 Key Findings

Most AAI apprentices and pre-apprentices were from an underrepresented population. In line with AAI objectives, AAI apprentices were diverse. Sixty-one (61) percent were from underrepresented groups, compared to 46 percent of all registered apprentices. Specifically, the share of AAI apprentices who were women, Black, or Other Race was larger than the shares among all registered apprentices. An even larger share of AAI pre-apprentices were from underrepresented populations (90 percent).

Most AAI apprentices were attached to the labor market prior to enrolling. Most (89 percent) had been working immediately prior to their apprenticeship; most apprentices (57 percent) were incumbent workers—that is, they worked for the same employer that operated the apprenticeship program. Their earnings were relatively low: including apprentices who had not been working, mean earnings in the 12 months prior to apprenticeship were $31,016, according to the Apprenticeship QPR. Earnings varied by subgroup; mean earnings were highest for White apprentices and lowest for Hispanic apprentices. More than one-third of apprentices had a postsecondary credential, most commonly a bachelor's degree.

As reported on the AAI Apprenticeship Survey, AAI apprentices most often enrolled in a program to train for a career to gain skills and credentials valued by employers. Across all AAI apprentices, 79 percent reported the two most important factors in their decision making were training for a career and gaining skills and credentials valued by employers. The reason for enrolling differed little by gender, race/ethnicity, veteran status, or incumbency. Most commonly, apprentices learned about the

[39] Due to data availability, analyses of underrepresented populations in this report does not include people with disabilities.

apprenticeship opportunity from an employer (46 percent) or a family member or friend (21 percent). Few participated in a pre-apprenticeship program (17 percent).

Most AAI apprentices reported that their program "prepared them well" for aspects of their occupation. More than three-quarters of apprentices (76 percent) reported that the combination of related technical instruction (RTI) and on-the-job learning (OJL) "prepared them well" in the use of tools, equipment, or specialized skills required for the apprenticeship occupation. Apprentices cited RTI as contributing most to development of their reading and math skills (47 percent), and OJL as most important in developing time management (52 percent), communication (52 percent), and critical-thinking and problem-solving skills (45 percent). Almost three-quarters of apprentices (73 percent) reported high levels of satisfaction with their OJL mentor. Most AAI apprentices (86 percent) would recommend their programs to a family member or friend.

Most AAI apprentices enrolled in nontraditional occupations, most commonly manufacturing. Consistent with the goals of AAI to expand into new industries and occupations, three-quarters of apprentices enrolled in nontraditional occupations, including manufacturing (46 percent), healthcare (14 percent), computer/IT (5 percent), and other occupations such as finance, transportation, and logistics (11 percent). Training occupations varied notably by subgroup. Men, White, Black, Other Race, veteran, and incumbent worker apprentices most commonly participated in manufacturing occupations; women apprentices most commonly participated in healthcare occupations; and Hispanic and new worker apprentices most commonly participated in construction occupations. The average AAI apprenticeship was 2.7 years, reflecting the predominance of manufacturing programs. Nearly all apprentices worked full-time during their programs.

Most AAI apprentices had completed their programs or were still enrolled at the time of the AAI Apprentice Survey. At the time they responded to the AAI Apprentice Survey (on average 2.7 years after enrolling), about 80 percent of apprentices reported that they had completed (47 percent) or were still enrolled (33 percent) in their programs. Of those still enrolled, most (76 percent) reported they were on track to complete on time. Of the 20 percent who were not enrolled at follow-up, the majority (15 percent) had left before finishing, rather than having their apprenticeship cancelled.

Apprentices who left their programs prior to completion most often cited personal or family problems as the reason (39 percent). This was the most common reason cited for all subgroups except Other Race apprentices, who by a small margin reported finding a better job as the top reason (27 percent found a better job, compared to 25 percent who cited personal or family problems). The proportion of women and Hispanic apprentices reporting personal or family problems as the reason for leaving was higher than average (54 percent versus 39 percent).

About two-thirds of AAI apprentices who completed their apprenticeship continued to work at the same employer who had sponsored their apprenticeship program. Ninety (90) percent of apprentices who completed were employed after their program and 65 percent were working for the same employer who had sponsored their program. However, retention with the same employer varied substantially by occupation and incumbency—far fewer apprentices in computer/IT (38 percent) and construction occupations (52 percent) remained with the same employer after completing their programs than did apprentices in healthcare (71 percent), manufacturing (71 percent), or other occupations (66 percent). More apprentices who were incumbent workers (i.e., apprentices who were already working at the

employer who operated the apprenticeship program prior to beginning their apprenticeship) remained with the same employer than did new workers (74 percent versus 54 percent), possibly reflecting the relationship that these workers had established with their employers prior to their program as well as occupation type.

AAI apprentice earnings grew by 49 percent on average between the year before starting the apprenticeship and the year after expected completion. Earnings growth varied substantially by subgroup. Women had higher earnings growth than men, in both dollar amount ($19,334 versus $16,469) and percentage gain (65 percent versus 43 percent). Earnings increased for all apprentices regardless of race/ethnicity, but the rate of increase varied by race/ethnicity. Other Race apprentices (86 percent) experienced greater earnings growth than did White (45 percent), Black (37 percent), or Hispanic (50 percent) apprentices. Earnings growth was higher for White women apprentices (74 percent) than Black women apprentices (48 percent), due in part to differences in the healthcare occupation in which they enrolled.

Earnings growth was much higher for new workers than incumbent workers, in both dollar amount ($30,217 versus $7,496) and percentage change (126 percent versus 17 percent). While earning far less than incumbent workers before the apprenticeship, new workers averaged higher earnings after the program ($54,113 versus $51,908). Finally, earnings growth was highest for apprentices in two nontraditional occupations: computer/IT (174 percent) and healthcare (97 percent). It was lowest for apprentices in construction (22 percent) and manufacturing (24 percent).

Most AAI pre-apprentices completed their programs and experienced substantial earnings growth. More than two-thirds (81 percent) completed their programs; most completers (63 percent) continued to a registered apprenticeship program. Post-program placement differed substantially by occupation: for pre-apprentices in healthcare (93 percent), construction (84 percent), and other occupations (76 percent), most pre-apprentice completers entered a registered apprenticeship program. For pre-apprentices in computer/IT and manufacturing occupations, the most common destination was employment in an occupation related to their training (49 percent and 38 percent, respectively). The typical pre-apprentice experienced substantial earnings growth: average earnings grew by 92 percent between the year prior to starting the pre-apprenticeship and the year after expected program completion.

6.2 Discussion and Areas for Further Inquiry

The AAI outcomes study is the first to examine the in-program experiences of a large number of registered apprentices (2,600) in mostly non-construction occupations, linked with their pre- and post-apprenticeship employment and earnings. It provides data on the importance of various factors for entering apprenticeships, learning in apprenticeships, the role of mentors, and early post-apprenticeship employment and earnings. A few other studies (e.g., Reed et al. 2012; Dula 2021) estimated post-apprenticeship earnings using administrative earnings records matched to apprentices, but they have mainly covered individuals in traditional construction apprenticeships.

Suggestions to Address Differential Outcomes across Subgroups

Overall, consistent with the goals of the initiative, AAI expanded apprenticeship into nontraditional occupations and to underrepresented populations. Most AAI apprentices and pre-apprentices completed

their programs and experienced substantial earnings gains. However, there were differences in completion rates, employment, and earnings by occupation, gender, race/ethnicity, and incumbency.

To address differential earnings growth across subgroups in particular, these outcomes study findings suggest potentially promising actions that registered apprenticeship programs or future grantees could take:

- **Strategies to promote entry into higher-paying occupations for underrepresented populations.** The earnings results demonstrated that certain occupations—such as Computer Network Specialist; Registered Nurse; and Industrial Machinery Installation, Repair, and Maintenance—offer greater potential for earnings growth than other occupations do. However, these three occupations collectively represented just 13 percent of AAI apprentices. As a specific case, this study found that a larger share of Black women apprentices participated in shorter-term, lower-paying healthcare apprenticeships, such as Pharmacy Technician, whereas a larger share of White women apprentices participated in longer-term, higher-paying healthcare apprenticeships, such as Registered Nurse. Future programs might consider ways to promote entry into and completion of apprenticeships in higher-growth occupations by all underrepresented populations.
- **Approaches to encouraging employers to hire new workers in apprenticeship programs**. More than half of apprentices were already working at the employer who operated the apprenticeship. Although incumbent workers experienced earnings gains of 17 percent, on average, new workers' earnings increased 126 percent. New workers earnings were about $20,000 per year less than incumbent workers in the year prior to starting their apprenticeship program, but about $2,000 more after their program. Apprenticeship programs or future grantees could explore ways to encourage or incentivize employers to focus apprenticeship programs on new workers in addition to incumbent workers.
- **Additional supportive services or mentorship to help apprentices to persist and complete their programs.** Fifteen (15) percent of apprentices left their programs without completing. Of these apprentices, the largest share (39 percent) cited personal or family problems as the reason for leaving. A larger share of women (54 percent), Black apprentices (46 percent), and Hispanic apprentices (54 percent) who left their programs cited personal or family problems. Programs might consider whether additional supportive services might help apprentices—particularly those from underrepresented populations—persist and complete their programs. Additional research might explore which specific services are associated with program persistence and completion. Programs might also develop additional mentorship opportunities in nontraditional occupations to help apprentices persist and complete their programs; AAI apprentices in healthcare and computer/IT occupations spent less time with their primary mentor than did apprentices in construction and manufacturing.
- **Strengthening collaboration with pre-apprenticeship programs.** AAI pre-apprenticeship programs appear to be an onramp to registered apprenticeship programs for underrepresented populations. Most pre-apprentices completed their programs, and the majority subsequently enrolled in a registered apprenticeship program. However, nearly 40 percent of pre-apprentice completers did not subsequently enter registered apprenticeships. Programs might consider whether additional collaboration between pre-apprenticeship and registered apprenticeship programs might increase the share of pre-apprentices who continue on to a registered apprenticeship, as well as exploring the underlying reasons why some pre-apprentices do not enter registered apprenticeship.

Suggestions for Further Research

Further research would also help strengthen the evidence on registered apprenticeship programs. In particular:

- **Additional follow-up to understand the long-term earnings growth of AAI apprentices and pre-apprentices.** The earnings analysis in this report covers a period one year after the apprenticeship ended and excluded longer-term programs. Thus, the earnings results reflect the experiences of AAI apprentices who completed short- and medium-term apprenticeship programs. Longer-term follow-up would answer some important questions, such as: Did apprentices in longer-term programs experience earnings growth of a similar magnitude to apprentices in shorter-term programs? Did earnings increases persist for apprentices who enrolled in shorter-term programs? Did earnings gaps further narrow between subgroups (e.g., men and women)? What are the apprenticeship outcomes for AAI pre-apprentices who subsequently enroll in an apprenticeship program? How does earnings growth for AAI apprentices compare to earnings growth for similar workers?
- **Rigorously assess the impacts of registered apprenticeship on employment and earnings.** Descriptive statistics such as those reported here provide important details about apprentices' in-program experiences and their employment and earnings outcomes. Such statistics cannot, however, make causal attributions of outcomes to apprenticeship programs. A future study that randomizes apprentices to either a group that can enroll in the apprenticeship program or one that cannot, but can access other workforce training programs, could help build evidence on the causal impact of registered apprenticeship programs.

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Appendix A: Snapshots of AAI Apprentice Characteristics and Outcomes by Subgroup

Exhibit A-1. Snapshot of AAI Apprentice Characteristics and Outcomes, by Gender

	Men	Women
Share of sample (%)	76	25
Race/Ethnicity (%)		
White	62	59
Black	17	18
Hispanic	14	12
Other Race	8	11
Average age (years)	31	37
Incumbent Worker (%)	56	60
Occupation (%)		
Manufacturing	55	18
Construction	29	8
Computer/IT	5	7
Healthcare	2	52
Other	9	16
Current status (%)		
Currently registered	38	17
Completed	43	61
Canceled/suspended	5	6
Left before completing	14	16
Reason for leaving apprenticeship (among those who left before completing) (%)		
Personal or family problems	33	54
Found a better paying job	28	13
Disliked the employer or apprentice program	23	21
Other	16	12
Employed after completing program (%)	90	90
Same employer that operated apprenticeship program	64	67
Different employer	26	24
Earnings		
Annual earnings before program ($)	38,552	29,531
Annual earnings after program ($)	55,022	48,865
Change in earnings ($)	16,469	19,334
Change in earnings (%)	43	65

Highlights

- Most apprentices are men.
- Men and women came from similar racial and ethnic backgrounds.
- Women were older than men and a larger share were incumbent workers.
- Most men participated in manufacturing apprenticeships, while most women participated in healthcare apprenticeships.
- A larger share of women had completed their programs, reflecting the shorter duration of healthcare apprenticeships.
- A similar share of men and women left their apprenticeships without completing. More than half of women cited personal or family problems as the reason for leaving, compared to just a third of men.
- A larger share of women remained with the same employer after the program than men.
- Women experienced greater earnings growth than men between the year before the program and the year after program exit.

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601); National Directory of New Hires (*N=3,871)*.
Notes: Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program. Components may not add to 100 percent due to rounding.

Exhibit A-2. Snapshot of AAI Apprentice Characteristics and Outcomes, by Race and Ethnicity

	White	Black	Hispanic	Other Race
Share of sample (%)	61	17	13	9
Gender (%)				
Men	76	75	78	68
Women	24	25	22	32
Average age (years)	33	35	29	33
Incumbent Worker (%)	63	48	46	49
Occupation (%)				
Manufacturing	51	45	34	33
Construction	21	25	41	13
Computer/IT	4	7	5	10
Healthcare	15	11	8	25
Other	9	12	11	19
Current status (%)				
Currently registered	34	28	36	31
Completed	47	49	45	52
Canceled/suspended	5	7	5	5
Left before completing	15	15	14	12
Reason for leaving apprenticeship (among those who left before completing) (%)				
Personal or family problems	35	46	54	25
Found a better paying job	29	14	14	27
Disliked the employer or apprentice program	21	30	19	21
Other	15	11	13	27
Employed after completing program (%)	90	85	89	97
Same employer that operated apprenticeship	67	54	65	71
Different employer	23	31	24	26
Earnings				
Annual earnings before program ($)	37,293	33,778	34,630	31,937
Annual earnings after program ($)	54,249	46,411	51,934	59,533
Change in earnings ($)	16,956	12,633	17,304	27,596
Change in earnings (%)	45	37	50	86

Highlights

- Most apprentices are White.
- Black apprentices were older than average, and Hispanic apprentices were younger than average.
- A larger share of White apprentices are incumbent workers than other racial and ethnic groups.
- Manufacturing was the most common occupation for White, Black, and Other Race apprentices; construction was most common for Hispanic apprentices.
- A larger share of Black apprentices had their programs cancelled or left without completing; Other Race apprentices had the smallest share.
- Among those who left without completing, a larger share of Black and Hispanic apprentices cited personal or family problems.
- A smaller share of Black apprentices remained with the same employer after the program, while a larger share of Other Race apprentices remained with the same employer.
- Earnings grew for apprentices in all groups. Other Race apprentices experienced the greatest earnings growth, while Black apprentices experienced the lowest growth.

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601); National Directory of New Hires (*N=3,871)*.
Notes: Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program. Components may not add to 100 percent due to rounding.

Exhibit A-3. Snapshot of AAI Apprentice Characteristics and Outcomes, by Age at Enrollment

	Age 24 or Less	Age 25 to 34	Age 35 or Older
Share of sample (%)	28	35	37
Gender (%)			
Men	83	78	67
Women	17	22	33
Race/Ethnicity (%)			
White	64	58	62
Black	10	18	22
Hispanic	18	16	8
Other Race	8	8	9
Incumbent Worker (%)	46	54	68
Occupation (%)			
Manufacturing	45	44	48
Construction	30	29	15
Computer/IT	7	6	4
Healthcare	10	12	19
Other	8	9	14
Current status (%)			
Currently registered	37	37	26
Completed	44	45	53
Canceled/suspended	3	4	8
Left before completing	17	14	13
Reason for leaving apprenticeship before completing (among those who left without completing) (%)			
Personal or family problems	33	29	53
Found a better paying job	29	29	15
Disliked the employer or apprentice program	22	23	22
Other	15	19	10
Employed after completing program (%)	90	89	91
Same employer that operated apprenticeship	60	61	71
Different employer	30	28	20
Earnings			
Annual earnings before program ($)	17,867	36,235	44,882
Annual earnings after program ($)	49,947	53,804	53,792
Change in earnings ($)	32,080	17,568	8,910
Change in earnings (%)	180	48	20

Highlights

- The typical apprentice was in their early 30s when they started the program.
- A larger share of younger apprentices were men, while a larger share of older apprentices are women.
- A larger share of younger apprentices were Hispanic, and a larger share of older apprentices are Black.
- A larger share of older apprentices are incumbent workers than younger apprentices.
- Manufacturing was the most common occupation for all age groups. Construction was second-most common for younger apprentices, while healthcare was second-most common for older apprentices.
- A similar share of each age group had their programs cancelled or left without completing. More than half of older apprentices cited personal or family problems as the reason for leaving, compared to just a third of younger workers.
- A larger share of older apprentices remained with the same employer after the program.
- Earnings grew for apprentices in all age groups. Younger workers experienced the highest growth in earnings, while older workers experienced the lowest growth.

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601); National Directory of New Hires (*N=3,871)*.
Notes: Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program. Components may not add to 100 percent due to rounding.

Exhibit A-4. Snapshot of AAI Apprentice Characteristics and Outcomes, by Education

	High School	Some College	College Degree (Associate or Higher)
Share of sample (%)	35	38	27
Gender (%)			
Men	86	75	62
Women	14	25	38
Race/Ethnicity (%)			
White	59	62	63
Black	15	19	18
Hispanic	19	12	8
Other Race	8	7	11
Average age (years)	30	33	35
Incumbent Worker (%)	58	57	57
Occupation (%)			
Manufacturing	54	49	32
Construction	32	25	13
Computer/IT	1	5	11
Healthcare	6	14	26
Other	8	7	19
Current status (%)			
Currently registered	36	36	25
Completed	44	45	55
Canceled/suspended	5	5	5
Left before completing	15	14	16
Reason for leaving apprenticeship before completing (among those who left without completing) (%)			
Personal or family problems	36	41	37
Found a better paying job	18	23	32
Disliked the employer or apprentice program	26	23	19
Other	19	13	12
Employed after completing program (%)	89	89	92
Same employer that operated program	66	63	66
Different employer	23	26	26

Highlights

- Nearly two-thirds of apprentices had some college education at the start of their apprenticeship.
- A larger share of apprentices with a college degree are women compared to the share of women among apprentices with a high school diploma.
- A larger share of apprentices with a high school diploma are Hispanic compared to the Hispanic share of apprentices with a college degree.
- About three-quarters of apprentices without a college degree participated in manufacturing and construction occupations, while most apprentices with a college degree participated in Computer/IT, healthcare, or other occupations.
- A similar share of each age group had their programs cancelled or left without completing. A larger share of apprentices with a college degree cited they found a better paying job as the primary reason for leaving their apprenticeship.
- Across all education groups, most apprentices remained with the same employer after the program.

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601)
Notes: Earnings data from the National Directory of New Hires is not available for education subgroups. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program. Components may not add to 100 percent due to rounding.

Exhibit A-5. Snapshot of AAI Apprentice Characteristics and Outcomes, by Veteran Status

	Veteran	Not Veteran
Share of sample (%)	13	88
Gender (%)		
Men	93	73
Women	7	27
Race/Ethnicity (%)		
White	58	61
Black	25	16
Hispanic	10	14
Other Race	7	9
Average age (years)	37	32
Incumbent Worker (%)	55	58
Occupation (%)		
Manufacturing	45	46
Construction	28	23
Computer/IT	10	5
Healthcare	2	16
Other	15	10
Current status (%)		
Currently registered	26	34
Completed	51	47
Canceled/suspended	5	5
Left before completing	19	14
Reason for leaving apprenticeship before completing (among those who left without completing) (%)		
Personal or family problems	36	39
Found a better paying job	28	23
Disliked the employer or apprentice program	19	23
Other	17	14
Employed after completing program (%)	88	90
Same employer that operated apprenticeship program	65	65
Different employer	23	25
Earnings		
Annual earnings before program ($)	38,942	34,962
Annual earnings after program ($)	56,410	52,429
Change in earnings ($)	17,469	17,468
Change in earnings (%)	45	50

Highlights

- About 13 percent of apprentices were veterans.
- A larger share of veterans were men than non-veterans.
- A larger share of veterans were Black than non-veterans.
- On average, veterans were older than non-Veterans
- Manufacturing was the most common occupation for both veterans and non-veterans. A smaller share of veterans participated in healthcare apprenticeships than non-veterans.
- A larger share of veterans left their programs without completing than non-veterans; the reasons for leaving were similar for both groups.
- A majority of both veterans and non-veterans remained with the same employer after the program.
- Both veterans and non-veterans experienced similar levels of earnings growth.

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601); National Directory of New Hires (*N=3,871)*.
Notes: Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program. Components may not add to 100 percent due to rounding.

Exhibit A-6. Snapshot of AAI Apprentice Characteristics and Outcomes, by Occupation

	Manufacturing	Construction	Computer/IT	Healthcare	Other
Share of sample (%)	46	24	5	14	11
Gender (%)					
Men	91	92	70	11	62
Women	9	8	30	89	38
Race/Ethnicity (%)					
White	67	54	49	64	51
Black	17	18	22	13	20
Hispanic	10	23	13	8	14
Other Race	6	5	16	15	15
Average age (years)	33	29	31	37	35
Incumbent Worker (%)	71	37	29	64	49
Current status (%)					
Currently registered	37	51	11	11	18
Completed	44	29	70	69	64
Canceled/suspended	6	4	5	5	6
Left before completing	14	16	15	15	13
Reason for leaving apprenticeship before completing (among those who left without completing) (%)					
Personal or family problems	33	39	26	53	49
Disliked the employer or apprentice program	21	28	6	22	28
Found a better paying job	29	21	46	14	13
Other	18	12	22	12	11
Employed after completing program (%)	91	85	89	93	89
Same employer that operated program	71	52	38	71	66
Different employer	20	33	51	22	23
Earnings					
Annual earnings before program ($)	41,168	44,709	22,563	25,638	36,253
Annual earnings after program ($)	51,049	54,734	61,835	50,441	54,113
Change in earnings ($)	9,881	10,025	39,272	24,803	17,860
Change in earnings (%)	24	22	174	97	49

Highlights

- Three-quarters of apprentices participated in a non-construction occupation.
- Most apprentices in manufacturing and construction were men; most apprentices in healthcare were women.
- Most apprentices in manufacturing and healthcare were incumbent workers; less than a third of apprentices in computer/IT were incumbent workers.
- Most apprentices in construction were still enrolled, while most in computer/IT, healthcare, and other occupations had completed.
- A larger share of apprentices in healthcare left their programs due to personal or family problems, while many in computer/IT left for better paying jobs.
- Most apprentices who completed their programs in manufacturing, healthcare, and other occupations remained with the same employer after the program, while most in computer/IT changed to a different employer.
- Earnings growth was highest for apprentices in computer/IT and healthcare occupations, and lowest for apprentices in manufacturing and construction occupations.

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601); National Directory of New Hires (*N=3,871)*.
Notes: Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program. Components may not add to 100 percent due to rounding.

Exhibit A-7. Snapshot of AAI Apprentice Characteristics and Outcomes, by Incumbency

	New worker	Incumbent Worker
Share of sample (%)	43	57
Gender (%)		
Men	77	74
Women	23	26
Race/Ethnicity (%)		
White	52	68
Black	21	14
Hispanic	17	11
Other Race	10	7
Average age (years)	30	35
Occupation (%)		
Manufacturing	32	57
Construction	35	16
Computer/IT	9	3
Healthcare	12	16
Other	12	9
Current status (%)		
Currently registered	32	33
Completed	51	45
Canceled/suspended	4	6
Left before completing	13	16
Reason for leaving apprenticeship before completing (among those who left without completing) (%)		
Personal or family problems	35	41
Disliked the employer or apprentice program	29	19
Found a better paying job	22	26
Other	14	15
Employed after completing program (%)	89	91
Same employer that operated program	54	74
Different employer	35	16
Earnings		
Annual earnings before program ($)	23,895	44,412
Annual earnings after program ($)	54,113	51,908
Change in earnings ($)	30,217	7,496
Change in earnings (%)	126	17

Incumbent Worker

- Most apprentices are incumbent workers.
- A larger share of incumbent workers than new workers are White.
- On average, incumbent workers are older than new workers.
- Manufacturing is the most common occupation for incumbent workers, while construction is most common for new workers.
- A larger share of incumbent workers than new workers had their programs cancelled or left without completion.
- Both groups cited personal or family problems as the primary reason for leaving without completing. New workers also cited dislike of the employer or program as a common reason for not completing.
- Nearly two-thirds of incumbent workers remained with the same employer after exiting the program; about half of new workers remained with the same employer.
- New workers experienced a substantially larger increase in average earnings than incumbent workers.

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601); National Directory of New Hires (*N=3,871)*.
Notes: Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program. Components may not add to 100 percent due to rounding.

Appendix B: Data Collection and Analytic Methods

This appendix provides additional detail on the data collection, study sample, operationalization of measures, and approach to missing data.

Data Collection

The outcomes study combines data from a variety of sources, including the **Apprenticeship Quarterly Performance Report (QPR)** data; an **AAI Apprentice Survey** administered to a subset of AAI apprentices between March and October 2020; and quarterly administrative earnings and employment data from the **National Directory of New Hires (NDNH).** This section describes how these data were collected.

AAI Apprentice Survey

The AAI Apprentice Survey collected information on participants' background prior to starting their apprenticeship; their apprenticeship experiences, including training and service receipt and skill development; completion status and receipt of credentials; and employment outcomes. The study team fielded the survey between March and October 2020 to 8,000 participants across two waves. The survey had a 33 percent response rate (2,601 completes).

AAI Apprentice Survey Eligibility and Sample Selection

The initial sampling frame for the AAI Apprentice Survey started with 16,398 AAI apprentices registered between October 1, 2015, and December 31, 2018, in the Apprenticeship QPR. From this initial frame, certain groups of apprentices were removed. First, in order to match survey respondents to administrative earnings records, the study team limited the eligible sample to those with a valid Social Security Number (SSN), which reduced the sample to 11,404 eligible participants. Second, the survey design necessitated that apprentices could be contacted by mail (for the advance letter), email (for the web link) and phone (for those who did not complete the survey via web). This reduced the preliminary eligible sample to 7,800 apprentices. To increase the number of eligible participants, the study used a third-party vender, LexisNexis, to identify updated contact information for all apprentices with an SSN. This effort increased the final eligible sample to 9,900 (Exhibit B-1)

Exhibit B-1. Eligible Apprentices for the AAI Apprentice Survey

Sample and description	Sample Size
Initial Sampling Frame (all apprentices registered between 10/1/15 and 12/31/18)	16,398
Valid SSN Sample (all apprentices with valid Social Security Number (SSN)	11,404
Preliminary Eligible Sample – Before Updated Contact Information (valid SSN and complete contact info)	7,800
Final Eligible Sample – After Updated Contact Information (valid SSN and complete contact info)	9,900
Sample Selected for Survey	3,200 (wave 1) 4,800 (wave 2) 8,000 (both waves)

Source: Apprenticeship Quarterly Performance Report (QPR).

From the final eligible sample, the study team selected a subset of apprentices to receive the survey. The initial sampling plan called for a sample of 3,200 apprentices to produce 2,000 completed surveys (assuming a response rate of 62.5 percent). This initial sample of 3,200 apprentices was selected using a stratified sampling design to provide useful sample sizes for several policy-relevant subgroups that are underrepresented among AAI apprentices. Specifically, the sample selection for the first wave produced the following target representation in the unweighted survey sample:

- **Occupation type.** 15 percent from construction; 35 percent from other manual occupations, including manufacturing and installation, repair, and maintenance; and 50 percent from all other occupations.
- **Gender.** 35 percent women and 65 percent men.
- **Race/ethnicity.** 30 percent Hispanic, 30 percent white non-Hispanic, 30 percent Black non-Hispanic, 10 percent other.

Due to a lower-than-expected response rate (which is discussed in more detail below), the study team, in consultation with DOL, selected a second wave of 4,800 apprentices to complete the follow-up survey. For this second wave, the study team modified the stratification strategy from the first wave, as the target sample counts for certain groups exceeded the actual number of available sample members. The second wave sample included all eligible apprentices who were women, people of color, or in non-manual occupations. The study team then randomly selected from the remaining set of apprentices (i.e., men in construction or manufacturing occupations) to reach the sample of 4,800 apprentices.

AAI Apprentice Survey Administration

The study team fielded the first survey wave between March 31, 2020, and June 30, 2020, and the second survey wave between July 20, 2020, and October 19, 2020. The field period for each wave was 13 weeks. The study team administered the survey using computer-assisted web interviewing (CAWI) for the first four weeks of each wave, followed by computer-assisted telephone interviewing (CATI) along with CAWI for the remaining weeks. Participants could complete the survey in either English or Spanish. In total, AAI participants selected for the survey received two mailed letters, eight emails in Wave 1 and 10 emails in Wave 2, and up to 15 phone calls from the interviewers in an effort to obtain a response. All communications included a toll-free phone number and email address that participants could contact to update their contact information, ask questions, or set an appointment to complete the survey with a research interviewer.

The average time to complete the survey was 25 minutes by web and 36 minutes by phone, which averages to the planned length of 30 minutes.

Changes in Wave 2 Survey Administration

Fielding a second wave provided the opportunity to use the experience gained in the first wave to implement improvements to survey procedures. The study team implemented the following changes to procedures in the second wave:

- *Program sponsor name in email and physical mail communication*. In the first wave, communication material did not mention the participant's program sponsor or grantee name. The

study team added sponsor name to the communications materials to increase the perceived legitimacy of the survey and encourage participation.

- *Program sponsor name in the phone survey introduction*. Similar to the email communication, in the first wave, the introduction to the phone survey did not mention the participant's program sponsor name. In the second wave, the study team updated the introduction to include the program sponsor name at the beginning of the call. Anecdotal feedback from telephone interviewers who worked both waves of the phone survey indicated that this change helped build an immediate connection with the respondent and helped improve response rates. Indeed, the phone response rate for the second wave (8.9 percent) was nearly twice as high as the response rate for the first wave (4.5 percent) (Exhibit B-2 below).
- *Local phone numbers*. Staff based in Abt Associate's Florida call center conducted the phone interviews. For the first wave, a Florida phone number was displayed in the caller ID for outbound calls. In the second wave, the interviewers used phone numbers with the area code of each participant's grantee city and state. For grantees that did not have a city listed in their records, the largest city in their state was selected. Updating the outbound phone number to a local phone number was implemented for the purposes of encouraging participants to answer incoming calls.
- *Additional email reminders*. In the first wave, the study team observed that email reminders tended to increase responses. Based on this observation, the study team sent two additional email reminders to participants in the second wave, for a total of ten emails, compared to eight in the first wave.

As shown in Exhibit B-2 below, the response rate in the second wave was nearly six percentage points higher than the rate in the first wave, with a particular improvement in the phone completion rate. Because of sample differences, we cannot definitively say that the changes in survey administration caused the higher response rate. However, anecdotal evidence suggests that the program sponsor name may have alleviated concerns about the legitimacy of the survey.

AAI Apprentice Survey Response

The first survey wave of 3,200 produced 929 completions (or a 29 percent response rate). The second survey wave of 4,800 participants produced 1,672 completions (a 35 percent response rate). Overall, the survey achieved 2,601 responses across the two waves.

Exhibit B-2. AAI Apprentice Survey Sample and Completion, by Wave and Mode

	Wave 1	Wave 2	Total
Survey Sample	3,200	4,800	8,000
Survey Completions	929	1,672	2,601
Completion Rate	29.0%	34.8%	32.5%
Web Completion Rate	24.5%	25.9%	25.4%
Phone Completion Rate	4.5%	8.9%	7.1%

Source: AAI Apprentice Survey.

As discussed above, the study team undertook a number of efforts to locate respondents, establish communication, and encourage them to complete the survey. However, the final response rate was lower than expected. The research team believes that several important challenges likely affected the response rate:

- *Participants did not know that they would be asked to complete a survey***.** A major challenge was that participants did not know that they would be asked to complete a survey about their apprenticeship. With no uniform intake process across grantees, apprentices were likely unaware that they would be asked to participate in a data collection effort. Moreover, participants very likely had never heard of Abt Associates before, which may have made them question the legitimacy of the survey. While DOL did inform grantees that Abt Associates would be conducting this survey, this information likely did not reach participants, in part because grantees varied in the extent to which their staff interacted with participants.
- *Missing contact information and lack of alternate contacts***.** Another challenge was the lack of complete and updated contact information. About 30 percent of participants did not have complete contact information in the Apprenticeship QPR. Moreover, data in the Apprenticeship QPR was not updated over time, so even complete information may have been out of date. As noted above, the study team used LexisNexis to obtain contact information for participants that had missing data in the Apprenticeship QPR, as well as to find updated information for participants in the Apprenticeship QPR. However, this information was likely of lower quality than if participants had provided it themselves. Moreover, the study team did not have access to alternate contacts (e.g., family or friends) to help locate participants, which is typically collect when Abt administers baseline information forms directly to participants.
- *Lack of in-person field efforts or alternate contacts***.** Per the study design—which included apprentices from all 45 AAI grantees—the survey did not include an in-person survey component, generally employed by other studies to increase the response rate. The dispersion of apprentices across the country made in-person survey efforts extremely difficult and costly.
- *Long follow-up period***.** In general, a longer follow-up period is typically associated with lower response rates. For the AAI participant survey, the sample included participants entered into the Apprenticeship QPR between October 2015 and December 2018. The study team selected this range in order to obtain responses from both apprentices who completed and those still enrolled. This means that some participants were interviewed more than four years after the start of their apprenticeship. This long follow-up was necessary because many apprenticeship programs are long—up to four years. However, the long follow-up may have reduced the salience of their apprenticeship experience and made them less likely to want to respond to a survey.

Incentive Payment Experiment

In response to DOL interest in examining how alternative incentive structures might produce higher response rates, we incorporated a test into administration of the survey. Because phone follow-up is so expensive relative to web survey completes, the experiment focuses in particular on inducing greater response rates to the web-based survey.

Previous evidence suggests that a two-tiered payment with a larger "early bird" payment may increase the number of responses received during the period in which the larger payment in in effect (see De Santis et al. 2016). However, the evidence is limited. Moreover, that work did not clearly disentangle the size of the payment from the payment structure (flat payment versus graduated/two-tiered), because the two-tiered option has also offered higher overall payments to early respondents.

To test whether a two-tiered payment can increase the response rate over a fixed one, we implemented the following experiment. Each sample member was randomly assigned to one of three options:

- Option 1 (8 percent of sample): Constant $25 payment regardless of timing or mode of completion.
- Option 2 (46 percent of sample): Constant $40 payment regardless of timing or mode.
- Option 3 (46 percent of sample): Two-tier payment: $40 if the respondent completes the survey during first four weeks (web administration); $20 if the respondent completes after 4 weeks, regardless of mode.

The primary outcome of interest is response rates during the first four weeks—the period before phone follow-up begins. Increasing the number of responses obtained by web, rather than phone, can substantially reduce the cost of fielding a survey. The secondary outcome of interest is the overall response rate. Increasing the overall response rate can help achieve a more representative sample and more precise estimates of parameters.

Exhibit B-3 shows the sample size and completion rate for each of the three groups. There was little difference in either the overall completion rate or in the share responding during the first four weeks of survey administration. In particular, the two-tiered payment structure did not increase response during the first four weeks relative to the flat $40 or $25 payment. It is possible that the monetary differences between the payment options were too small to produce a behavioral response, given that participants were earning about $50,000 per year after their programs (see Chapter 4).

Exhibit B-3. AAI Apprentice Survey Completion Rate by Incentive Group

	Sample Size	Overall Completion Rate	Completed in first 4 weeks	Completed in weeks 5 to 13
Group 1 (flat $25)	640	29.8%	17.7%	12.2%
Group 2 (flat $40)	3,680	33.1%	19.2%	13.9%
Group 3 ($40 / $20)	3,680	32.4%	16.4%	16.0%
Total	8,000	32.5%	17.8%	14.7%

Sources: AAI Apprentice Survey.

National Directory of New Hires (NDNH)

The federal Office of Child Support Enforcement (OCSE) in the U.S. Department of Health and Human Services' Administration for Children and Families (ACF) operates the NDNH. It contains new hire, quarterly wage, and Unemployment Insurance (UI) information submitted by State Directories of New Hires, employers, and state workforce agencies. OCSE also supplements the state reports with records about earnings from federal civilian and military jobs (which are otherwise not covered by state UI data).

OCSE may disclose certain information contained in the NDNH to local, state, or federal agencies for research likely to contribute to achieving the purposes of part A or part D of title IV of the Social Security Act.[40] DOL and OCSE negotiated a memorandum of understanding (MOU) allowing access to NDNH data for the AAI evaluation. Beginning in December 2017, the study team transmitted quarterly match request files to OCSE. These match request files contain the names and SSNs of AAI apprentices and pre-apprentices. OCSE verifies with the Social Security Administration that the reported SSNs belong to the

[40] See "A Guide to the National Directory of New Hires" here: https://www.acf.hhs.gov/sites/default/files/documents/ocse/a_guide_to_the_national_directory_of_new_hires.pdf.

named persons, then copies NDNH records that had been received during the previous two years to a secure DOL folder. These copied records contain a pseudo-SSN; the records are stripped of all personal identifiers.

Once the study team was ready to analyze the collected data, the team submitted a "passthrough" file to OCSE containing a variety of additional variables from the QPR and AAI Apprentice Survey. OCSE again strips the personal identifiers out of the passthrough file and replaces the actual SSNs with the same pseudo-SSNs previously assigned to the archived wage records. The study then uses these pseudo-SSNs to merge QPR and survey data with NDNH quarterly wage data on DOL's secure server in order to estimate earnings and employment outcomes for various subgroups.

For this report, NDNH quarterly earnings and employment data are available from January 2015 through December 2020.

Because of the timing of the analysis, some of the earnings changes may have been affected by the onset of the COVID-19 pandemic and its impact on the economy. Across all AAI apprentices included in the analysis, earnings declined by about 10 percent (or $5,400 annualized) in the second quarter of 2020, before recovering by the fourth quarter of 2020. For about 23 percent of AAI apprentices, the fifth post-program quarter occurred during the period affected by the COVID-19 pandemic. Thus, average post-program earnings may have been about 2 to 3 percent higher in the absence of COVID-19.

Apprenticeship QPR

The study team obtained quarterly extracts of QPR data from DOL for apprentices and pre-apprentices. The Apprenticeship QPR contains information reported by grantees on apprentice and pre-apprentice characteristics, occupation, incumbent worker status, as well as limited data on program experiences and post-program outcomes. Many variables in the QPR have some level of missing data, which is addressed through imputation (see below). This report uses data from the December 2020 extract.

Study Sample

The full study sample consists of 16,398 apprentices and 6,282 pre-apprentices pulled from the set of valid records in the Apprenticeship QPR (i.e., records associated with a valid grantee and not marked for deletion). The sample only includes apprentices with an apprenticeship start date between 10/1/2015 and 12/31/2018, and pre-apprentices with a pre-apprenticeship start date of 12/31/2018 or earlier. The study team checked for individuals who were potentially entered multiple times into the QPR system by looking at various combinations of full name, social security number, and date of birth. Duplicate individuals are excluded from the sample.

The survey sample is a subset of the full apprentice sample and consists of 2,601 apprentices who responded to the AAI Apprentice Survey.

The NDNH apprentice sample is a subset of the full apprentice sample and consists of apprentices with a valid SSN in the QPR and an expected completion date of September 30, 2019, or earlier. The NDNH apprentice sample consists of 3,871 apprentices. The NDNH pre-apprentice sample is a subset of the full pre-apprentice sample and consists of pre-apprentices with a valid SSN in the QPR and an exit date of September 30, 2019, or earlier. The NDNH pre-apprentice sample consists of 2,161 pre-apprentices.

Operationalization of Outcomes

Exhibit B-4 contains the detailed operationalization of measures based on data from the QPR.

Exhibit B-4. Description of Apprenticeship QPR Measures

Measure	Definition	Apprenticeship QPR Variable
Participant Characteristics		
Gender	Binary indicators for whether participant was man or woman.	GenderInd
Race/ethnicity	Categorical indicator of participant race and ethnicity. Based on responses to series of race and ethnicity variables. Responses were grouped into five categories: 1) Hispanic (any race) 2) White (Non-Hispanic) 3) Black (Non-Hispanic) 4) Asian (Non-Hispanic) 5) Other, including multi-race (Non-Hispanic)	HispLatInd WInd AfricaAmerInd AsianInd NatIndianInd NatHawaiInd
Age	Continuous measure and categorical indicator of age. Calculated at the time when the participant started the apprenticeship.	DOB StartDt
Veteran	Binary indicator for participant veteran status.	VetStatInd
Disability	Binary indicator for participant disability status.	DisabiltyInd
Educational Attainment	Categorical indicator of participant highest level of educational attainment.	EducatStatCode
Program Type	Categorical indicator of program type.	ProgType
Occupation	Categorical indicator of occupational grouping of apprenticeship program. SOC categorizations were grouped into seven categories: 1) Manufacturing 2) Construction 3) Installation 4) Transportation 5) Computer/IT 6) Healthcare 7) Other	OnetSocCode
Expected Program Length	Continuous measure of expected time in apprenticeship program.	StartDt ExpCompDate
Prior Earnings	Categorical indicator of annual earnings prior to starting the apprenticeship.	AnnualEarningsPrior
Incumbent Worker Status	Binary indicator for whether participant is a new employee or existing employee	EmpStatus
Starting Wage	Continuous measure and categorical indicator of wages at the time of starting the apprenticeship.	StartWage
Current Apprenticeship Status	Categorical indicator of current status in apprenticeship program (registered, completed, canceled, or other).	LastEventCode
Time in Program	Continuous measure and categorical indicator of time in apprenticeship program in years. Applicable for completers and cancelers only.	StartDt ExitDt
Employed with Same Employed	Binary indicator for whether participant current employer was the same as the apprenticeship employer. Applicable for currently employed completers only.	EmpOutcome

Exhibit B-5 contains the detailed operationalization of measures based on data from the AAI Apprentice Survey.

Exhibit B-5. Description of Survey Measures

Survey Measure (Survey Question Number)	Definition	Survey Variable
Participant Characteristics		
Current Status (0.a.2)	Categorical measure of current status in apprenticeship program (currently registered, completed, canceled/suspended, left before completing).	currentstatus
Completion Status (derived from currenstatus)	Binary indicator of whether participant has completed the apprenticeship program	completed
Currently Registered (derived from currenstatus)	Binary indicator of whether participant is currently registered as an apprentice	currentlyregistered
Training Occupation* (0.a.5)	Categorical measure of occupation covered by apprenticeship (computer/IT, construction, healthcare, manufacturing, other)	trainingocc
Length of apprenticeship thus far (0.a.6)	Continuous measure of time spent in apprenticeship program	lengthapp
Length of apprenticeship remaining (0.a.7)	Continuous measure of time left in apprenticeship program	lengthleft
Nature and timing of apprenticeship cancellation (0.a.19)	Categorical measure of apprenticeship cancellation nature and timing (for those whose apprenticeships were canceled) (permanent cancelation before March 2020, permanent cancelation March 2020 or later, temporary suspension March 2020 or later)	timingcancel
Prior knowledge of apprenticeship (1.a.1)	Categorical measure of knowledge about apprenticeship prior to learning about their apprenticeship opportunity (quite a bit, some, very little, none)	pknowapp
Source of knowledge about their apprenticeship* (1.a.2)	Categorical measure of where participant learned about apprenticeship opportunity (recruiter, job posting (online), job posting (printed), friend or acquaintance, school/college, military job, employer at the time, employment service office, union**, other)	learnapp
Inumbent Worker Status (1.a.3)	Binary indicator for whether participant is a new employee or existing employee	incumbent
Importance of ability to earn while I learn (1.b.1.a)	Categorical measure of how important being able to earn while they learned was as consideration in decision to become an apprentice (most important, of secondary importance, least important or not important)	imp_earnwhilelearn
Importance of ability to train for occupation with high earnings potential (1.b.1.b)	Categorical measure of how important being able to train for an occupation with high earnings potential was as consideration in decision to become an apprentice (most important, of secondary importance, least important or not important)	imp_highearnings

*Open-text responses to the "Other" option for this question were used to re-code some responses to existing response options.
**This response category was created based on review of open-text responses to the "Other" option which did not correspond to existing response options.

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Importance of being confident that skills and credentials gained would be valued by employers (1.b.1.c)	Categorical measure of how important being confident that the skills and credentials gained would be valued by employers was as consideration in decision to become an apprentice (most important, of secondary importance, least important or not important)	imp_valuedskills
Importance of avoiding student debt (1.b.1.d)	Categorical measure of how important avoiding student debt was as consideration in decision to become an apprentice (most important, of secondary importance, least important or not important)	imp_avoiddebt
Importance of having a concrete job opportunity after completing training (1.b.1.e)	Categorical measure of how important having a concrete job opportunity after completing training was as consideration in decision to become an apprentice (most important, of secondary importance, least important or not important)	imp_concretejobopp
Importance of training for a career rather than just a job (1.b.1.f)	Categorical measure of how important training for a career rather than just a job was as consideration in decision to become an apprentice (most important, of secondary importance, least important or not important)	imp_career
Degree of concern about having to take time for training (1.b.2.a)	Categorical measure of how concerned participant was about having to take time for training, rather than getting right to work (strong concern, moderate concern, not a concern)	conc_timefortraining
Degree of concern about difficulty of classroom training (1.b.2.b)	Categorical measure of how concerned participant was about the difficulty of classroom training (strong concern, moderate concern, not a concern)	conc_classroom
Degree of concern about difficulty of on-the-job training (1.b.2.c)	Categorical measure of how concerned participant was about the difficulty of on-the-job training (strong concern, moderate concern, not a concern)	conc_ojt
Degree of concern about committing so strongly to a single career path (1.b.2.d)	Categorical measure of how concerned participant was about committing so strongly to a single career path (strong concern, moderate concern, not a concern)	conc_singlecareer
Degree of concern about being unsure whether they would like the work (1.b.2.e)	Categorical measure of how concerned participant was about being unsure whether they would like the work (strong concern, moderate concern, not a concern)	conc_unsurelikework
Degree of concern about being unsure what the experience would be like (1.b.2.f)	Categorical measure of how concerned participant was about being unsure what the experience would be like (strong concern, moderate concern, not a concern)	conc_unsureexper
Employment status prior to apprenticeship (1.c.1)	Categorical measure of employment status immediately before apprenticeship (employed with the military, employed as a civilian with one job, employed as a civilian with multiple jobs, not employed and looking for a job, not employed and not looking for a job)	empstatus

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Weekly hours worked in job held immediately before apprenticeship (1.c.2)	Continuous measure of weekly hours worked in job held immediately before apprenticeship	hrsworked_immed
Has ever worked (1.c.3)	Binary indicator for whether participant has ever worked for pay	everworked_yes
Weekly hours worked in most recent job before apprenticeship (1.c.4)	Continuous measure of weekly hours worked in most recent job before apprenticeship	hrsworked_recent
Number of months since last worked before apprenticeship (1.c.5)	Continuous measure of number of months since the participant last worked before apprenticeship	monthssincelastworked
Hourly wage in most recent job before apprenticeship (1.c.6)	Continuous measure of hourly earnings in most recent job before apprenticeship	hourlywage
Length of employment in most recent job before apprenticeship (1.c.8)	Continuous measure of length of employment at most recent job before apprenticeship	monthsemployed
Total earnings from all jobs in 12 months before apprenticeship (1.c.9)	Continuous measure of total earnings in 12 months prior to apprenticeship	earnings12moprior
Number of jobs held in 3 years before apprenticeship (1.c.10)	Continuous measure of number of jobs held in the 3 years prior to apprenticeship	numjobs
Total length of unemployment in 3 years before apprenticeship (1.c.11)	Continuous measure of total unemployment duration in the 3 years prior to apprenticeship	monthsunemployed
Worked similar job to apprenticeship in the past (1.c.12)	Binary indicator for whether participant had ever worked in a similar field to their apprenticeship	workedsimilarjob_yes
Veteran Status (1.c.13)	Binary indicator for whether participant is a veteran	veteran_yes
Pre-apprentice Status (1.d.1)	Binary indicator for whether participant participated in a pre-apprentice program	preapprentice
Pre-apprenticeship employer (1.d.2)	Binary indicator for whether participant apprenticed with the same employer with whom they participated in the pre-apprenticeship program	preappemployer

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Pre-apprenticeship Details (derived from preapprentice and preappemployer)	Categorical indicator of pre-apprentice details. Based on responses to 1.d.1 and 1.d.2 Responses were grouped into three categories: 1) Participant did not participate in a pre-apprenticeship program 2) Participant was a pre-apprentice and apprenticed with a different employer than the one with whom they participated in the pre-apprenticeship program 3) Participant was a pre-apprentice and apprenticed with the same employer with whom they participated in the pre-apprenticeship program	everpreapp_no everpreapp_same everpreapp_diff
Marital status (1.e.1)	Categorical measure of participant marital status (married, widowed, divorced, separated, never married)	marital
Family Status* (1.e.2)	Binary indicators for whether participant lives with different types of individuals Binary indicators were constructed for whether participant lived with each of the following: 1) Spouse 2) Unmarried partner 3) Child/children 4) Father 5) Mother 6) Other 7) None of the above	family_spouse family_partner family_child family_father family_mother family_otheradult family_none
Family living situation (derived from family series of variables)	Categorical indicator of participant's living situation. Based on responses to Family Status (1.e.2) questions. Responses were grouped into six categories: 1) Living with spouse or partner, no children 2) Living with spouse or partner and child 3) Living with at least one other adult, no spouse/partner or children 4) Living with at least one other non-spouse/partner adult and children 5) Living with children, no other adults 6) Living alone, no children or other adults	famliv_alone famliv_childnoadults famliv_childother famliv_childspouse famliv_nochildspouse famliv_other
Number of children (1.e.3)	Continuous measure of number of children that participant lives with and supports	children
Educational Attainment (1.e.4)	Categorical measure of participant highest level of educational attainment (bachelor's degree or higher, associate's degree, technical/trade/vocational credential, some college without credential, high school diploma, GED or other high school equivalent, 12th grade or less without diploma)	highested
Type of apprenticeship (2.a.1)	Categorical measure for type of apprenticeship program (time-based, competency-based, hybrid)	apprenticeshiptype

*Open-text responses to the "Other" option for this question were used to re-code some responses to existing response options.

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Expected length of apprenticeship (2.a.2)	Continuous measures of how long apprenticeship was expected to be	monthsexplength yearsexplength
Expected end date (derived from monthsexplength and StartDt)	Date apprenticeship expected to end based on start date and expected length	expenddate
Informed about competency areas (2.a.3)	Binary indicator for whether participant was informed about the specific competency elements they needed to learn to complete their apprenticeship	informed_competency
Apprenticeship/ mentor logged hours for occupational competency areas (2.a.4)	Binary indicator for whether participant or their mentor logged hours for each occupational competency area	loggedcompetency
Apprenticeship structure* (2.b.1)	Categorical measure for structure of apprenticeship program (classroom instruction completed before on-the-job training starts, classroom instruction occurs at the same as on-the-job training but is completed before on-the-job training finishes, classroom instruction occurs at the same time as on-the-job training and is ongoing throughout the apprenticeship program, classroom instruction occurs at different times over the course of the apprenticeship program (e.g., block scheduling), Other, classroom instruction begins after on-the-job training has been completed**, N/A or no classroom component**)	structure
Classroom instruction provider* (2.b.2)	Binary indicators for sources of classroom instruction Binary indicators were constructed for whether each of the following provided classroom instruction to participant through the apprenticeship program: 1) Four-year college 2) Community college, two-year college, or technical college 3) Union 4) Employer 5) Non-profit organization 6) Private, for-profit training provider 7) Other 8) None of the above**	provider_employer provider_fouryrcollege provider_none provider_nonprofit provider_other provider_privateprofit provider_twoyrcollege provider_union
Number of credits earned (2.b.3)	Continuous measure of number of college credits participant earned or will earn as part of the apprenticeship	creditsearned

*Open-text responses to the "Other" option for this question were used to re-code some responses to existing response options.
**This response category was created based on review of open-text responses to the "Other" option which did not correspond to existing response options.

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Subjects covered by classroom instruction* (2.b.4)	Binary indicators for topics covered by classroom instruction Binary indicators were constructed for whether each of the following were covered under classroom instruction: 1) Use of tools, equipment, or specialized skills 2) Relevant reading and math skills 3) Computer science or IT 4) Engineering or engineering technology 5) Business management skills 6) Critical thinking and problem solving skills 7) Managing time effectively 8) Professional skills (e.g., appropriate dress, punctuality, interaction with supervisors and colleagues) 9) Other 10) None of the above**	classroomtopics_specialized classroomtopics_readingmath classroomtopics_compsci classroomtopics_engineering classroomtopics_business classroomtopics_critical classroomtopics_timemgmt classroomtopics_professional classroomtopics_other classroomtopics_none
Degree to which uses classroom knowledge on the job (2.b.5)	Categorical measure of degree to which classroom instruction was used during work on the job as apprentice (none, some, most, everything)	usingclassroom
Amount paid for tuition, fees, and books (2.c.1)	Continuous measure of amount participant personally spent or will spend on tuition, fees, and books as part of the apprenticeship	personallypaided
Amount paid for tools or equipment (2.c.2)	Continuous measure of amount participant personally spent or will spend on tools or equipment as part of the apprenticeship	personallypaideq
Total paid towards apprenticeship (derived from personallypaided and personallypaideq)	Continuous measure of total amount participant personally spent as part of the apprenticeship	totalpaid
Amount covered by grants (2.c.3)	Continuous measure of how much of tuition, fees, and books was or will be paid for through grants	amountgrants
Weekly hours spent with mentor (2.d.1)	Continuous measure of weekly hours participant worked with their primary on-the-job mentor	hourswithmentor
Importance of mentor (2.d.2)	Categorical measure of degree of importance of primary mentor for helping participant succeed (very important, important, somewhat important, not important)	mentorimportance
Satisfaction with mentor (2.d.3)	Categorical measure of participant's degree of satisfaction with their primary mentor (very satisfied, satisfied, somewhat satisfied, not satisfied)	mentorsatisfaction
Current/ending wage as apprentice (2.e.1)	Continuous measure of current or ending wage as apprentice	currentwage

*Open-text responses to the "Other" option for this question were used to re-code some responses to existing response options.
**This response category was created based on review of open-text responses to the "Other" option which did not correspond to existing response options.

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Current/ending weekly hours worked as apprentice (2.e.2)	Continuous measure of current or ending weekly hours worked as apprentice	weeklyhours
Number of wage increases during apprenticeship (2.e.3)	Continuous measure of number of wage increases participant has received or did receive as an apprentice	wageincreases
Support received* (2.f.1)	Binary indicators for types of support received by the participant during the apprenticeship program Binary indicators were constructed for whether each of the following types of support were received 1) Academic/career counseling 2) Tutoring 3) Basic skills or remedial/developmental training in math and/or English (as opposed to occupation-specific math or English training) 4) Introductory information technology training 5) Tuition assistance 6) Assistance with costs for tools, equipment, books, supplies, and/or other materials 7) Child care 8) Flexible scheduling 9) Transportation assistance 10) Other 11) None 12) Assistance with certification costs 13) In-kind or other substantive support	support_academic support_tutoring support_skillsinstruction support_ITtraining support_tuition support_suppliescost support_childcare support_scheduling support_transportation support_other support_none support_certification support_inkind
Financial support received	Binary indicator for whether participant received any type of financial/monetarily-valued support (Tuition assistance; Assistance with costs for tools, equipment, books, supplies and/or other materials; Child care; Transportation assistance; Assistance with certification costs; In-kind or other substantive support)	support_fin
Academic support received	Binary indicator for whether participant received any type of academic support (Academic/career counseling; Tutoring; Basic skills or remedial/developmental training in math and/or English; Introductory information technology training; flexible scheduling)	support_acads
Willingness to recommend (2.g.1)	Binary indicator for whether participant would recommend apprenticeship program to a family member or friend	recommend
Level of specialized skills before apprenticeship (3.a.1)	Categorical measure of participant's level of specialized skills before apprenticeship (highly skilled, somewhat skilled, not very skilled, not applicable)	beforespecialized

*Open-text responses to the "Other" option for this question were used to re-code some responses to existing response options.

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Level of reading and math skills before apprenticeship (3.a.2)	Categorical measure of participant's level of reading and math skills before apprenticeship (highly skilled, somewhat skilled, not very skilled, not applicable)	beforereadingmath
Level of computer science skills before apprenticeship (3.a.3)	Categorical measure of participant's level of computer science skills before apprenticeship (highly skilled, somewhat skilled, not very skilled, not applicable)	beforecompsci
Level of engineering skills before apprenticeship (3.a.4)	Categorical measure of participant's level of engineering skills before apprenticeship (highly skilled, somewhat skilled, not very skilled, not applicable)	beforeengineering
Level of business management skills before apprenticeship (3.a.5)	Categorical measure of participant's level of business management skills before apprenticeship (highly skilled, somewhat skilled, not very skilled, not applicable)	beforebusinessmgmt
Level of critical thinking skills before apprenticeship (3.a.6)	Categorical measure of participant's level of critical thinking skills before apprenticeship (highly skilled, somewhat skilled, not very skilled, not applicable)	beforecritical
Level of communication skills before apprenticeship (3.a.7)	Categorical measure of participant's level of communication skills before apprenticeship (highly skilled, somewhat skilled, not very skilled, not applicable)	beforecommunicating
Level of time management skills before apprenticeship (3.a.8)	Categorical measure of participant's level of time management skills before apprenticeship (highly skilled, somewhat skilled, not very skilled, not applicable)	beforetimemgmt
Level of specialized skills preparation from apprenticeship (3.b.1)	Categorical measure of how well apprenticeship program prepared them in terms of specialized skills (very well prepared, well prepared, somewhat prepared, not well prepared, not applicable)	trainspecialized
Level of reading and math skills preparation from apprenticeship (3.b.2)	Categorical measure of how well apprenticeship program prepared them in terms of reading and math skills (very well prepared, well prepared, somewhat prepared, not well prepared, not applicable)	trainreadingmath
Level of computer science skills preparation from apprenticeship (3.b.3)	Categorical measure of how well apprenticeship program prepared them in terms of computer science skills (very well prepared, well prepared, somewhat prepared, not well prepared, not applicable)	traincompsci
Level of engineering skills preparation from apprenticeship (3.b.4)	Categorical measure of how well apprenticeship program prepared them in terms of engineering skills (very well prepared, well prepared, somewhat prepared, not well prepared, not applicable)	trainengineering
Level of business management skills preparation from apprenticeship (3.b.5)	Categorical measure of how well apprenticeship program prepared them in terms of business management skills (very well prepared, well prepared, somewhat prepared, not well prepared, not applicable)	trainbusinessmgmt

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Level of critical thinking skills preparation from apprenticeship (3.b.6)	Categorical measure of how well apprenticeship program prepared them in terms of critical thinking skills (very well prepared, well prepared, somewhat prepared, not well prepared, not applicable)	traincritical
Level of communication skills preparation from apprenticeship (3.b.7)	Categorical measure of how well apprenticeship program prepared them in terms of communication skills (very well prepared, well prepared, somewhat prepared, not well prepared, not applicable)	traincommunicating
Level of time management skills preparation from apprenticeship (3.b.8)	Categorical measure of how well apprenticeship program prepared them in terms of time management skills (very well prepared, well prepared, somewhat prepared, not well prepared, not applicable)	traintimemgmt
Apprenticeship aspect that contributed most to specialized skills development (3.c.1)	Categorical measure of which apprenticeship aspect contributed most to their development of specialized skills (classroom learning, on-the-job mentor guidance, work experience, not applicable)	compspecialized
Apprenticeship aspect that contributed most to reading and math skills development (3.c.2)	Categorical measure of which apprenticeship aspect contributed most to their development of reading and math skills (classroom learning, on-the-job mentor guidance, work experience, not applicable)	compreadingmath
Apprenticeship aspect that contributed most to computer science skills development (3.c.3)	Categorical measure of which apprenticeship aspect contributed most to their development of computer science skills (classroom learning, on-the-job mentor guidance, work experience, not applicable)	compcompsci
Apprenticeship aspect that contributed most to engineering skills development (3.c.4)	Categorical measure of which apprenticeship aspect contributed most to their development of engineering skills (classroom learning, on-the-job mentor guidance, work experience, not applicable)	compengineering
Apprenticeship aspect that contributed most to business management skills development (3.c.5)	Categorical measure of which apprenticeship aspect contributed most to their development of business management skills (classroom learning, on-the-job mentor guidance, work experience, not applicable)	compbusinessmgmt
Apprenticeship aspect that contributed most to critical thinking skills development (3.c.6)	Categorical measure of which apprenticeship aspect contributed most to their development of critical thinking skills (classroom learning, on-the-job mentor guidance, work experience, not applicable)	compcritical
Apprenticeship aspect that contributed most to communication skills development (3.c.7)	Categorical measure of which apprenticeship aspect contributed most to their development of communication skills (classroom learning, on-the-job mentor guidance, work experience, not applicable)	compcommunicating

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Apprenticeship aspect that contributed most to time management skills development (3.c.8)	Categorical measure of which apprenticeship aspect contributed most to their development of time management skills (classroom learning, on-the-job mentor guidance, work experience, not applicable)	comptimemgmt
Believes skills could be developed through classroom instruction alone (3.d.1)	Binary indicator for whether participant believes they could have developed relevant skills through classroom instruction alone	classroomalone
Relevance of classroom training (3.d.2)	Categorical measure of level of relevance of classroom training to work performed in current or most recent job (very relevant, somewhat relevant, not relevant)	classroomrelevance
Importance of specialized skills for apprenticeship (3.e.1)	Categorical measure of how important specialized skills are for success in participant's job or most recent job (very important, moderately important, slightly important, not at all important)	impspecialized
Importance of reading and math skills for apprenticeship (3.e.2)	Categorical measure of how important reading and math skills are for success in participant's job or most recent job (very important, moderately important, slightly important, not at all important)	impreadingmath
Importance of computer science skills for apprenticeship (3.e.3)	Categorical measure of how important computer science skills are for success in participant's job or most recent job (very important, moderately important, slightly important, not at all important)	impcompsci
Importance of engineering skills for apprenticeship (3.e.4)	Categorical measure of how important engineering skills are for success in participant's job or most recent job (very important, moderately important, slightly important, not at all important)	impengineering
Importance of business management skills for apprenticeship (3.e.5)	Categorical measure of how important business management skills are for success in participant's job or most recent job (very important, moderately important, slightly important, not at all important)	impbusinessmgmt
Importance of critical thinking skills for apprenticeship (3.e.6)	Categorical measure of how important critical thinking skills are for success in participant's job or most recent job (very important, moderately important, slightly important, not at all important)	impcritical
Importance of communication skills for apprenticeship (3.e.7)	Categorical measure of how important communication skills are for success in participant's job or most recent job (very important, moderately important, slightly important, not at all important)	impcommunicating
Importance of time management skills for apprenticeship (3.e.8)	Categorical measure of how important time management skills are for success in participant's job or most recent job (very important, moderately important, slightly important, not at all important)	imptimemgmt
Perceived class performance compared to in absence of apprenticeship (3.f)	Categorical measure of how participant believes they did on classroom work compared to how they would do if they were enrolled but were not an apprentice (did better, did worse, no difference)	classperform

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Current status (registered apprentices)* (4.a.1)	Categorical measure of participant's current status in the apprenticeship program, if currently registered as an apprentice (on track to complete the apprenticeship by the expected completion date, will not complete on time due to delays in progress through classroom instruction, will not complete on time due to delays in progress through on-the-job training, will not complete on time due to personal or family reasons, will not complete on time due to a shortage of available work from employer, other, will not complete on time due to delays related to the COVID-19 pandemic**, will not complete on time due to delays on the part of the apprenticeship program/employer**)	statusreg
Reason employer canceled apprenticeship* (4.a.2)	Categorical measure of reason why participant's employer canceled their registered apprenticeship, if apprenticeship was canceled (lack of work, employer went out business, employer temporarily closed or reduced staff, poor performance on the job, reasons that apprentice is not aware of, other, reasons related to the COVID-19 pandemic**, fired or laid off with unknown cause**)	reasoncanceled
Reason did not complete apprenticeship (4.a.3)	Categorical measure of reason why participant did not complete their registered apprenticeship, if participant left apprenticeship (lost interest in the occupation, found a better paying job, disliked the employer or the apprenticeship program, personal of family reasons, other, reasons related to the COVID-19 pandemic**)	reasonleft
Certificate receipt (4.b.1)	Binary indicators for whether and which types of certifications of apprenticeship the participant received Binary indicators were constructed for whether each of the following: 1) Participant did not receive a certificate of apprenticeship completion 2) Participant received a certificate of completion from the US Department of Labor, Office of Apprenticeship 3) Participant received a certificate of apprenticeship from a state apprenticeship	certificate_not certificate_DOL certificate_state
Receipt of any degrees, certificates, or licenses (4.b.2)	Binary indicator for whether the participant received any degrees, certificates, or professional licenses as a result of the apprenticeship program	anycerts
Credential portability (4.b.3)	Binary indicator for whether or not the credentials earned through apprenticeship are portable to other employers	credentialportable

*Open-text responses to the "Other" option for this question were used to re-code some responses to existing response options.
**This response category was created based on review of open-text responses to the "Other" option which did not correspond to existing response options.

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Credential Status (derived from anycerts and credentialportable)	Categorical indicator consolidating information about credentials earned. Based on responses to 4.b.2 and 4.b.3 questions. Responses were grouped into three categories: 1) Participant did not earn any degrees, certificates, or licenses 2) Participant earned a credential that is portable to other employers 3) Participant earned a credential that is not portable to other employers	earnedcred_no earnedcred_notport earnedcred_port
Occupation requires license (4.b.4)	Binary indicator for whether participant is employed in an occupation where a license is required	licenserequired
Have required license (4.b.5)	Binary indicator for whether participant has license required for their occupation	havereqdlicense
Earned required license through apprenticeship (4.b.6)	Binary indicator for whether participant earned the required license through apprenticeship	earnedreqdlicense
License Details (derived from licenserequired, havereqdlicense, and earnedreqlicense)	Categorical indicator consolidating information about licenses earned. Based on responses to 4.b.4, 4.b.5, and 4.b.6 questions. Responses were grouped into three categories: 1) License not required for participant's occupation 2) License is required for the participant's occupation but they do not have the license 3) License is required for the participant's occupation and they have the license, which they earned through the apprenticeship 4) License is required for the participant's occupation and they have the license, which they did not earn through the apprenticeship	license_no license_yesdonthave license_yeshaveapp license_yeshaveother
Certificate available in occupation (4.b.7)	Binary indicator for whether participant is employed in an occupation where a certification is available	certavailable
Have available certificate (4.b.8)	Binary indicator for whether participant has the certificate that is available in their occupation	haveavailablecert
Earned available certificate through apprenticeship (4.b.9)	Binary indicator for whether participant earned the available certificate through apprenticeship	earnedavailablecert

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Certificate Details (derived from certavailable, haveavailablecert, and earnedavailablecert)	Categorical indicator consolidating information about certificates earned. Based on responses to 4.b.7, 4.b.8, and 4.b.9 questions. Responses were grouped into three categories: 1) Certificate not available for participant's occupation 2) Certificate is available for the participant's occupation but they do not have the certificate 3) Certificate is available for the participant's occupation and they have the available certificate, which they earned through the apprenticeship 4) Certificate is available for the participant's occupation and they have the available certificate, which they did not earn through the apprenticeship	cert_no cert_yesdonthave cert_yeshaveapp cert_yeshaveother
Believes achieved high level of expertise (4.b.10)	Binary indicator for whether participant believes they achieved a high level of expertise in a profession or occupation in their apprenticeship	achievedexpertise_yes
Perceived expertise relative to experienced worker (4.b.11)	Categorical measure of level of expertise participant believes they have achieved relative to an experienced worker in their apprenticeship program (10%, 25%, 50%, 75%, 90%, 100%)	relativeexp
Current employment status (4.c.1)	Binary indicator for whether participant is currently employed	currentlyemployed
Employed with employer that operated apprenticeship (4.c.2)	Binary indicator for whether participant is employed with the same employer that operated their apprenticeship program	employedsame
Current Employment Details (derived from currentlyemployed and employedsame)	Categorical indicator consolidating information about current employment. Based on responses to 4.c.1 and 4.c.2 questions. Responses were grouped into three categories: 1) Participant is not currently employed 2) Participant is employed with the same employer that operated their apprenticeship program 3) Participant is employed with a different employer than the one that operated their apprenticeship program	currentemp_notemp currentemp_empsame currentemp_empdiff

Exhibit B-5. Description of Survey Measures (continued)

Survey Measure (Survey Question Number)	Definition	Survey Variable
Reason no longer employed by apprenticeship operator* (4.c.3)	Binary indicators for reasons why participant is no longer employed with the employer that operated your apprenticeship program Binary indicators were constructed for each of the following reasons: 1) Found a better paying job 2) Found a job that offered better hours 3) Found a job that offered better scheduling 4) Personal or family reasons 5) The employer that operated the apprenticeship program is no longer in business 6) The employer that operated the apprenticeship program did not have additional work for the participant and therefore did not make a job offer 7) The employer that operated the apprenticeship program did not make a job offer because of their performance 8) Other 9) Reasons of the COVID-19 pandemic 10) Fired or laid off, unknown cause 11) Quit	notemployedsame_betterpay notemployedsame_betterhours notemployedsame_betterscheduling notemployedsame_personal notemployedsame_outofbusiness notemployedsame_lackofwork notemployedsame_performance notemployedsame_other notemployedsame_covid notemployedsame_layoff notemployedsame_quit
Employed in same occupation/job title as beginning of apprenticeship (4.c.4)	Binary indicator for whether the participant has the same job title or occupation that they started with at the beginning of the apprenticeship	employedsametitle
Current Occupation/Job Title Details (derived from currentlyemployed and employedsametitle)	Categorical indicator consolidating information about current employment. Based on responses to 4.c.1 and 4.c.4 questions. Responses were grouped into three categories: 1) Participant is not currently employed 2) Participant is employed and has the same job title or occupation as the one they started with at the beginning of their apprenticeship 3) Participant is employed and has a different job title or occupation than the one they started with at the beginning of their apprenticeship	currentempl_notemp currentempl_occdiff currentempl_occsame

*Open-text responses to the "Other" option for this question were used to re-code some responses to existing response options.

Approach to Missing Data

This section describes the approach to two different types of missing data: **non-response weighting** to address survey non-response; and **imputation** to address item non-response.

Survey Non-response Analysis and Weighting

The study team developed non-response weights to generalize the sample of the survey respondents to the original population. These weights account for the loss of sample due to four stages of selection, which are shown in Exhibit B-6:

1. SSN Sample (subset of Full Sample): Baseline participants who have non-missing SSN. Note this is not random, as SSN reporting varied by grantee.
2. Survey Sample Frame (subset of SSN Sample): Have non-missing SSN and complete contact information (email, phone, and address) after lookup. Note that this is also not random, as contact information reporting varied by grantee.
3. Selected Survey Sample (subset of Survey Sample Frame): Sample selected for survey.
4. Survey Respondent Sample (subset of Selected Survey Sample): Respondents to the participant survey.

Exhibit B-6: Stages of Sample Formation

Sample and description	Sample Size
Full Sample: All Apprentices enrolled between 10/1/15 and 12/31/18	16,398
1. SSN Sample (subset of Full Sample): Have non-missing SSN. Note this is NOT random—SSN reporting varies by grantee.	11,404
2. Survey Sample Frame (subset of SSN Sample): Have non-missing SSN and complete contact information (email, phone, and address) after lookup. Note that this is also NOT random—SSN and contact info reporting varies by grantee.	9,900
3. Selected Survey Sample (subset of Survey Sample Frame): Sample selected for survey	8,000
4. Survey Respondent Sample (subset of Selected Survey Sample): Respondents to the survey	2,601

The non-response weights were constructed by:

1. Modeling response propensity for each stage,
2. Forming a product of inverse propensities / inverse sampling probabilities, and
3. Calibration to the population totals.

Exhibit B-7 assesses the performance of non-response weights on apprentice characteristics. The first column shows the characteristics of apprentices for the full sample. The second column shows characteristics for unweighted survey respondents, which differ somewhat from those of the full sample. The third column shows characteristics for survey respondents after applying non-response weights, which closely resemble the characteristics of the full sample.

Exhibit B-7. Effect of Non-response Weights on Apprentice Characteristics

Characteristic	Full Sample	Unweighted Survey Respondents	Weighted Survey Respondents
Gender (%)			
Men	75.5	65.4	75.5
Women	24.5	34.6	24.5
Race/Ethnicity (%)			
Hispanic	12.5	16.0	12.5
White	56.6	50.2	56.6
Black	16.0	18.3	16.0
Other Race	7.5	8.9	7.9
Missing	7.5	6.6	7.1
Training Occupation (%)			
Construction	21.5	22.2	21.5
Manufacturing	44.5	33.6	44.5
Healthcare	11.7	16.7	14.0
Computer/IT	6.0	7.8	5.3
Other	11.4	14.8	10.3
Missing	4.9	4.9	4.4
Annual Earnings before Program ($)	27,167	28,482	27,167
Starting Wage ($)	18.02	17.14	17.66
Sample	16,398	2,601	2,601

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=16,398)
Note: Responses are not imputed for unit non-response and therefore differ from those reported in Chapter 2.

Imputation of Missing Data

The study team incorporated a series of imputation steps to address item non-response. The most straight-forward imputation involved filling in missing data with existing QPR data where QPR fields map to survey questions. These imputations include fields such as veteran status, highest level of educational attainment, incumbent worker status, training occupation, and expected program length. The QPR field for highest level of educational attainment contained only a single option for post-secondary and technical training, while the survey had three associated options. For apprentices missing this survey data and with QPR data indicating post-secondary or technical training, we randomly assigned them to one of the three survey response options with a probability of 58 percent for a bachelor's degree or higher, 27 percent for an associate degree, and 26 percent for technical/trade/vocational training.

Secondly, the study team incorporated logical imputations from a combination of other survey data and QPR data for the individual. These imputations included fields such as employment prior to apprenticeship, number of jobs prior to apprenticeship, pre-apprenticeship program participation, supportive services received during program participation, certifications received, portable credits earned, and employment with the same employer upon exit.

Lastly, the study team performed five iterations of chained multiple imputation on the remaining missing survey data required for analyses, then combine the results using the standard approach first developed by Rubin (1987). We used Stata to conduct the imputations with a combination of predictive mean matching (PMM) and maximum likelihood modeling. The imputation used auxiliary fields with no missing data, including apprenticeship program type, gender, age, prior knowledge of apprenticeship, incumbent status, prior work experience, prior work experience similar to the apprentice program, prior pre-apprentice program participation, current enrollment at the time of the survey, certifications received, and program

completion. Survey fields where responses are based on previous survey responses were imputed to also take into account those previous responses. Since race/ethnicity information was collected as binary indicators, if the imputations produced no indication of any race or ethnicity (i.e., all zeroes), then we set that individual's data to be non-Hispanic, other race. Exhibit B-8 provides details of multiple imputation for each variable.

Exhibit B-8. Details of Multiple Imputation

Variable Type	Variables Imputed
Predictive Mean Matching (using 5 nearest neighbors)	
Binary	Detailed race and ethnicity indicators Family living situation indicators (survey) Classroom topics covered in apprenticeship indicators (survey) Indicator whether participant would recommend the program (survey) Indicator whether participant could have developed apprenticeship skills through classroom instruction alone (survey) Indicator whether participant is employed with the same title they had during the apprenticeship (survey) Indicator whether participant is employed in an occupation where a license is required (survey) Indicator whether participant is employed in an occupation where a certification is available (survey) Indicator whether the participant is employed at the time of the survey among those not currently registered (survey) Indicator whether the participant is still employed with the apprenticeship employer among those not currently registered (survey)
Ordinal	Highest level of educational attainment (survey) Number of jobs held in three years prior to starting apprenticeship (survey) Importance of factors in deciding to become an apprentice (survey) Concern about apprenticeship factors (survey) Level of skills prior to apprenticeship (survey) Importance of apprenticeship mentor (survey) Satisfaction with apprenticeship mentor (survey) Degree to which apprenticeship training prepared participant in certain areas (survey) Degree to which participant uses/used classroom knowledge in on-the-job work in apprenticeship program (survey) Training components that contributed the most to developing skills (survey) Importance of skills (survey)
Continuous Numeric	Number of children (survey) Earnings in previous 12 months (survey) Wage in most recent job prior to apprenticeship for those who had worked for pay before (survey) Months employed in most recent job prior to apprenticeship for those who had worked for pay before (survey) Expected program length (survey) Credits earned in apprenticeship program (survey) Number of hours spent with apprenticeship mentor (survey) Wage at start of apprenticeship program (QPR) Wage at time of survey (survey) Weekly hours worked (survey) Weekly hours worked at the time of the survey for those currently working (survey) Number of wage increases (survey) Length of time in program (survey)
Multinomial logistic regression	
Categorical	Marital status (survey) Apprenticeship training occupation group (QPR) Apprenticeship type (survey)

Appendix C: Expanded Results for Chapter 2

Exhibit C-1. Characteristics of AAI Apprentices at Enrollment

Characteristic	Mean	Standard Deviation
Gender (%)		
Men	75.5	1.1
Women	24.5	1.1
Age (%)		
24 or younger	27.7	1.3
25 to 34	35.1	1.3
35 to 44	20.1	1.1
45 or older	17.1	0.9
Age (years)	32.7	0.3
Race/Ethnicity (%)		
White	60.9	1.4
Black	17.2	1.0
Hispanic	13.3	0.9
Other Race	8.6	0.8
Veteran (%)	12.5	1.0
Any underrepresented group (women, people of color, or veteran) (%)	60.5	1.4
Highest Education (%)		
Less than High School	1.2	0.3
High School or equivalent	33.3	1.3
Some college, no credential	28.5	1.3
Technical, trade, or vocational credential	9.8	0.9
Associate degree	11.7	0.9
Bachelor's degree or higher	15.5	1.0
Marital Status (%)		
Married	38.3	1.4
Separated/divorced/widowed	13.3	0.9
Never married	48.4	1.4
Living with Children (%)		
No children	74.1	1.2
1 child	8.4	0.8
2 children	11.1	0.9
3 children	4.2	0.6
4 or more children	2.2	0.4

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).

Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. "Any Underrepresented Group" includes women, people of color, and veterans. Race and ethnicity were reported separately, and apprentices could select more than one race. "White" describes non-Hispanic apprentices who reported themselves as White and no other race; "Black" describes non-Hispanic apprentices who reported themselves as Black and no other race; "Hispanic" includes all apprentices who reported themselves of Hispanic ethnicity, regardless of reported race. "Other Race" describes non-Hispanic apprentices who reported themselves as Asian (4.5 percent), Native Hawaiian or Pacific Islander (0.7 percent), Native American (1.7 percent), or multiple races (1.7 percent). The Other Race group has too few observations to disaggregate further.

Exhibit C-2. Characteristics of All AAI Apprentices versus Apprentices from Underrepresented Populations and Selected Subgroups

Characteristic	Share of Sample (%)	Average Age (yrs)	Currently Married (%)	Living with Children (%)	Any Prior College (%)	Incumbent Worker (%)	Average Earnings Prior to Apprenticeship ($)
All AAI apprentices	100.0	32.7	38.3	25.9	65.5	57.1	31,016
Any underrepresented group (women, people of color, or veterans)	60.5	34.3	39.4	28.8	68.1	52.5	28,416
Gender							
Men	75.5	31.4	37.8	22.7	60.6	56.3	32,479
Women	24.5	36.7	40.0	35.7	80.8	59.8	26,503
Race/Ethnicity							
White	60.9	32.8	41.0	25.2	66.8	63.4	34,124
Black	17.2	35.2	30.0	25.2	70.6	47.8	26,193
Hispanic	13.3	28.8	34.3	25.5	50.6	46.1	24,826
Other Race	8.6	33.5	42.3	33.2	69.3	48.8	28,203
Veteran	12.5	36.9	49.0	27.2	68.3	54.0	36,635

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).

Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. "Any Underrepresented Group" includes women, people of color, and veterans. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Exhibit C-3. Selected Characteristics of All AAI Apprentices, by Subgroup

	All AAI Apprentices	Gender		Race/Ethnicity				Age			Veteran Status	
		Men	Women	White	Black	Hispanic	Other	24 or Younger	25 to 34	35 or Older	Veteran	Non-Veteran
Age (%)												
24 or younger	27.7	30.6	18.9	29.0	16.1	37.8	26.8	N/A	N/A	N/A	15.3	29.5
25 to 34	35.1	36.3	31.4	33.3	37.0	41.1	34.1	N/A	N/A	N/A	30.4	35.7
35 to 44	20.1	20.1	20.1	19.6	27.8	13.1	19.1	N/A	N/A	N/A	27.0	19.1
45 or older	17.1	13.1	29.5	18.1	19.0	8.0	20.1	N/A	N/A	N/A	27.4	15.7
Age (years)	32.7	31.4	36.7	32.8	35.2	28.8	33.5	N/A	N/A	N/A	36.9	32.1
Education (%)												
High School	31.9	36.5	17.7	31.0	27.8	42.8	28.9	45.3	27.2	26.2	31.8	34.9
Some College	38.3	38.3	38.5	38.8	42.1	34.5	33.2	34.9	41.4	38.0	40.3	38.1
College degree (Associate or higher)	27.2	22.3	42.3	28.0	28.5	16.1	36.1	16.9	28.2	33.9	28.0	27.1
Race/Ethnicity (%)												
White	60.9	61.6	58.9	N/A	N/A	N/A	N/A	63.6	57.9	61.8	58.4	61.3
Black	17.2	17.0	17.9	N/A	N/A	N/A	N/A	10.0	18.2	21.7	24.8	16.1
Hispanic	13.3	13.7	11.8	N/A	N/A	N/A	N/A	18.1	15.6	7.5	10.1	13.7
Other Race	8.6	7.7	11.3	N/A	N/A	N/A	N/A	8.3	8.3	9.0	6.7	8.9
Annual earnings prior to apprenticeship (%)												
$0	5.0	4.7	6.0	3.8	7.6	5.7	7.0	8.9	4.2	2.8	1.9	5.4
$1 to $9,999	17.8	15.8	23.9	14.3	21.8	22.1	27.9	20.2	16.8	16.9	15.3	18.2
$10,000 to $19,999	8.9	9.3	7.7	8.0	11.3	11.5	6.7	16.5	6.4	5.7	5.4	9.4
$20,000 to $29,999	16.1	16.0	16.4	16.4	16.2	18.9	9.9	22.5	15.5	12.0	14.0	16.4
$30,000 to $39,999	20.9	19.8	24.0	22.7	15.7	21.5	16.9	18.7	25.3	18.2	22.1	20.7
$40,000 to $49,999	11.1	12.1	8.2	11.2	11.3	8.3	14.8	7.1	13.0	12.3	14.5	10.6
$50,000 or more	20.2	22.3	13.9	23.6	16.0	12.0	16.7	6.1	18.7	32.1	26.8	19.3
Annual Earnings ($)	31,016	32,479	26,503	34,124	26,193	24,826	28,203	21,191	31,499	37,883	36,635	30,210
Incumbent Worker (%)	57.1	56.3	59.8	63.4	47.8	46.1	48.8	46.1	54.0	68.4	54.8	57.5

Exhibit C-3. Selected Characteristics of All AAI Apprentices, by Subgroup (continued)

	Education			Occupation					Incumbency	
	High School	Some College	College Degree	Manufacturing	Construction	Computer/IT	Healthcare	Other	New Worker	Incumbent Worker
Age (%)										
24 or younger	38.7	25.3	17.3	27.2	34.8	33.3	20.3	21.1	34.9	22.3
25 to 34	31.0	37.8	36.3	33.7	42.0	38.6	29.4	31.1	37.7	33.1
35 to 44	16.5	20.7	23.8	21.5	16.5	18.4	19.5	23.8	16.9	22.4
45 or older	13.8	16.2	22.7	17.6	6.8	9.6	30.7	23.9	10.5	22.2
Age (years)	30.4	32.8	35.5	32.8	29.3	30.7	36.9	35.3	30.2	34.6
Education (%)										
High School	N/A	N/A	N/A	37.4	42.2	5.6	13.2	23.0	31.0	32.5
Some College	N/A	N/A	N/A	40.7	39.7	37.5	36.8	27.2	38.4	38.3
College degree (Associate or higher)	N/A	N/A	N/A	18.8	14.4	56.6	49.3	47.8	27.6	26.9
Race/Ethnicity (%)										
White	58.7	61.7	62.7	67.2	54.2	48.8	63.9	50.7	52.1	67.5
Black	14.7	18.9	18.1	16.8	18.3	22.1	13.0	20.0	21.0	14.4
Hispanic	19.1	11.9	7.9	9.9	22.7	13.2	7.9	13.8	16.7	10.7
Other Race	7.7	7.4	11.4	6.1	4.8	15.9	15.2	15.4	10.2	7.3
Annual earnings prior to apprenticeship (%)										
$0	7.1	3.2	4.7	4.1	4.6	9.6	5.7	6.5	8.9	2.0
$1 to $9,999	19.9	16.4	17.0	15.3	17.0	23.8	25.3	17.3	19.8	16.3
$10,000 to $19,999	9.5	10.0	6.8	7.4	12.6	12.0	8.8	5.9	12.3	6.4
$20,000 to $29,999	17.8	16.3	13.8	14.8	21.0	12.4	16.1	12.9	18.5	14.4
$30,000 to $39,999	18.6	23.7	19.6	21.2	19.5	23.1	23.3	18.1	20.2	21.3
$40,000 to $49,999	11.2	9.5	13.4	13.5	9.4	5.1	6.7	13.7	8.1	13.4
$50,000 or more	15.7	20.9	24.8	23.8	15.9	14.0	14.0	25.6	12.2	26.2
Annual Earnings ($)	27,218	31,386	35,313	33,423	28,967	24,675	26,705	34,213	25,099	35,453
Incumbent Worker (%)	57.7	57.1	56.5	70.5	37.3	29.3	63.5	49.3	N/A	N/A

Exhibit C-3. Selected Characteristics of All AAI Apprentices, by Subgroup (continued)

	Grantee Type			
	State Agency	College	Nonprofit	Sector-Based Organization
Age (%)				
24 or younger	28.6	34.8	15.6	19.3
25 to 34	32.9	39.6	36.4	26.2
35 to 44	18.1	16.4	29.5	25.4
45 or older	20.4	9.2	18.5	29.1
Age (years)	33.1	29.9	35.0	37.0
Education (%)				
High School	33.6	39.9	30.1	26.5
Some College	37.5	40.2	39.4	33.8
College degree (Associate or higher)	28.9	19.9	30.5	39.7
Race/Ethnicity (%)				
White	67.0	57.2	58.0	54.6
Black	17.9	15.4	15.4	23.7
Hispanic	7.4	20.2	13.9	11.4
Other Race	7.8	7.2	12.6	10.3
Annual earnings prior to apprenticeship (%)				
$0	5.0	6.0	3.2	4.4
$1 to $9,999	20.1	15.6	14.8	20.5
$10,000 to $19,999	9.6	10.3	4.3	8.9
$20,000 to $29,999	14.2	20.1	13.3	14.6
$30,000 to $39,999	21.8	20.7	19.0	20.8
$40,000 to $49,999	11.5	9.7	14.5	9.5
$50,000 or more	18.0	17.6	30.9	21.3
Annual Earnings ($)	29,183	29,921	37,319	32,036
Incumbent Worker (%)	62.1	47.4	67.3	55.0

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).
Notes: N/A = Not Applicable. Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Exhibit C-4. Prior Labor Market Experience of AAI Apprentices

Characteristic	Mean	Standard Deviation
Employment status immediately before starting apprenticeship (%)		
Employed	88.5	1.1
Not Employed	11.5	1.1
Detailed employment status immediately before starting apprenticeship (%)		
Employed: military	3.6	0.6
Employed: one job	72.8	1.2
Employed: multiple jobs	12.0	0.9
Not employed: looking for a job	8.4	0.7
Not employed: not looking for a job	3.2	0.5
Months since last worked for pay (among those not employed immediately before starting apprenticeship, N=289)	6.8	0.6
Weekly hours worked in most recent job prior to apprenticeship (among those working, N=2,225) (%)		
0 to 19 hours	1.3	0.3
20 to 34 hours	6.1	0.7
35 to 39 hours	3.0	0.4
40 to 44 hours	53.3	1.5
45 to 49 hours	10.9	1.0
50 or more hours	25.4	1.3
Weekly hours (mean)	43.7	0.3
Hourly wage in most recent job prior to starting apprenticeship (among those ever employed, N=2,531) (%)		
Less than $10/hour	4.8	0.6
$10 to $14.99/hour	28.3	1.3
$15 to $19.99/hour	32.3	1.3
$20 to $24.99/hour	17.8	1.1
$25/hour or more	16.8	1.0
Hourly wage (mean) ($)	18.37	0.21
Annual Earnings Prior to Apprenticeship (%)		
$0	5.0	0.6
$1 to $9,999	17.8	1.1
$10,000 to $19,999	8.9	0.9
$20,000 to $29,999	16.1	1.1
$30,000 to $39,999	20.9	1.3
$40,000 to $49,999	11.1	1.1
$50,000 or more	20.2	1.3
Annual Earnings (mean) ($)	31,016	739
Incumbent worker (i.e., enrolled in apprenticeship program at current employer) (%)	57.1	1.4
Ever worked in a job in a similar field to apprenticeship occupation (%)	39.4	1.4

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).

Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Exhibit C-5. Prior Knowledge of Apprenticeship

Characteristic	Mean	Standard Deviation
How much did you know about apprenticeship before you heard about this apprenticeship? (%)		
Quite a bit	15.8	1.1
Some	24.6	1.2
Very little	32.8	1.3
None	26.8	1.2
How did you learn about this apprenticeship opportunity (among those who knew something about apprenticeship before, N=1,834) (%)		
Employer at the time	46.4	1.7
Friend or acquaintance	20.8	1.3
Job posting (online or printed)	11.6	1.1
School/college	8.5	0.8
Other	4.7	0.7
Recruiter	3.2	0.5
Employment service office	2.5	0.5
Military job	1.2	0.3
Union	1.1	0.3
Ever part of pre-apprenticeship (%)		
Yes, with the same employer	12.2	0.9
Yes, with a different employer	4.9	0.6
No	82.8	1.0

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. "Other Race" describes non-Hispanic apprentices who reported themselves as Asian, Native Hawaiian or Pacific Islander, Native American, or multiple races.

Exhibit C-6. Prior Knowledge of Apprenticeship, by Subgroup

	All AAI Apprentices	Gender		Race/Ethnicity				Age			Veteran Status	
		Men	Women	White	Black	Hispanic	Other Race	24 or Younger	25 to 34	35 or Older	Veteran	Non-Veteran
How much did you know about apprenticeship before you heard about this apprenticeship? (%)												
Quite a bit	15.8	16.9	12.2	15.6	18.8	11.0	18.3	18.5	13.2	16.2	17.0	15.6
Some	24.6	25.2	23.0	26.4	19.8	28.0	16.9	25.5	22.1	26.4	23.7	24.8
Very little	32.8	33.8	29.7	32.8	34.2	30.0	34.2	30.8	36.8	30.4	36.1	32.3
None	26.8	24.1	35.2	25.2	27.3	31.0	30.6	25.2	27.9	27.0	23.2	27.3
How did you learn about this apprenticeship opportunity (among those who knew something about apprenticeship before) (%)												
Employer	46.4	44.9	51.7	52.4	40.1	27.5	42.8	33.2	44.0	58.7	38.8	47.6
Friend or acquaintance	20.8	23.3	12.1	17.9	18.9	42.4	14.4	29.3	27.8	7.9	16.6	21.5
Job posting (online or printed)	11.6	11.4	12.2	11.5	15.0	4.7	15.2	9.1	11.4	13.6	14.5	11.1
School/college	8.5	8.6	8.1	6.6	9.8	13.8	11.8	18.8	4.8	3.9	4.8	9.0
Other	4.7	3.9	7.8	5.0	5.9	1.0	6.0	2.8	5.2	5.8	6.7	4.4
Recruiter	3.2	3.0	4.0	2.8	3.1	3.4	6.2	4.2	2.0	3.5	2.9	3.3
Employment service office	2.5	2.4	3.0	2.3	3.7	3.1	1.3	1.0	2.2	4.1	6.1	2.0
Military job	1.2	1.3	0.7	0.7	2.3	2.1	0.7	1.0	1.4	1.0	8.4	0.1
Union	1.1	1.3	0.5	0.8	1.3	1.9	1.6	0.5	1.2	1.4	1.1	1.1
Ever part of pre-apprenticeship (%)												
Yes, with the same employer	12.2	12.8	10.5	9.6	16.4	17.9	14.0	15.9	9.6	11.9	11.7	12.3
Yes, with a different employer	4.9	4.8	5.2	4.0	7.4	4.8	6.4	6.0	5.0	4.0	5.1	4.9
No	82.8	82.4	84.2	86.4	76.1	77.2	79.5	78.1	85.3	84.0	83.1	82.8

Exhibit C-6. Prior Knowledge of Apprenticeship, by Subgroup (continued)

	Education			Occupation					Incumbency	
	High School	Some College	College Degree (Associate or higher)	Manufacturing	Construction	Computer/IT	Healthcare	Other	New worker	Incumbent Worker
How much did you know about apprenticeship before you heard about this apprenticeship? (%)										
Quite a bit	18.6	14.8	13.5	17.2	19.3	8.7	9.6	13.4	13.2	17.7
Some	27.4	25.0	20.7	27.2	24.2	20.6	20.9	21.6	22.5	26.3
Very little	29.4	34.7	34.4	30.6	36.9	41.9	30.6	31.4	34.9	31.2
None	24.7	25.5	31.3	25.1	19.5	28.8	39.0	33.5	29.4	24.9
How did you learn about this apprenticeship opportunity (among those who knew something about apprenticeship before) (%)										
Employer	42.7	48.9	47.9	57.5	25.5	19.6	60.8	46.1	18.3	66.2
Friend or acquaintance	28.0	16.5	17.4	12.0	43.6	17.9	9.7	17.2	34.6	11.1
Job posting (online or printed)	9.6	13.6	11.2	14.4	8.2	11.3	9.5	9.5	12.2	11.1
School/college	8.9	9.2	6.7	7.9	8.2	22.3	7.2	5.7	14.4	4.2
Other	2.9	5.0	6.9	3.3	5.0	14.1	6.1	4.4	4.9	4.6
Recruiter	3.5	1.9	4.9	3.1	1.7	9.6	4.0	3.4	7.8	0.0
Employment service office	2.1	2.8	2.7	1.1	4.0	3.7	2.4	5.3	3.8	1.6
Military job	1.1	1.4	1.0	0.1	1.1	1.6	0.2	7.8	2.4	0.3
Union	1.2	0.8	1.3	0.7	2.7	0.0	0.0	0.5	1.6	0.7
Ever part of pre-apprenticeship (%)										
Yes, with the same employer	15.3	12.2	8.4	10.1	19.6	14.9	8.8	7.7	13.8	11.0
Yes, with a different employer	4.5	5.7	4.5	4.6	7.9	7.6	1.3	3.2	9.2	1.7
No	80.2	82.1	87.1	85.3	72.4	77.4	89.9	89.1	77.0	87.2

Exhibit C-6. Prior Knowledge of Apprenticeship, by Subgroup (continued)

	Grantee Type			
	State Agency	College	Nonprofit	Sector-Based Organization
How much did you know about apprenticeship before you heard about this apprenticeship? (%)				
Quite a bit	14.8	16.8	16.6	14.9
Some	25.2	24.9	25.8	19.7
Very little	32.5	34.9	28.8	33.0
None	27.5	23.4	28.8	32.4
How did you learn about this apprenticeship opportunity (among those who knew something about apprenticeship before) (%)				
Employer	56.8	35.3	50.3	39.5
Friend or acquaintance	13.0	34.1	11.1	18.6
Job posting (online or printed)	12.6	8.7	18.9	6.2
School/college	7.3	9.7	5.8	12.9
Other	4.3	4.6	4.6	7.4
Recruiter	3.3	3.0	4.2	1.8
Employment service office	2.2	2.6	2.3	4.1
Military job	0.1	0.8	0.5	8.0
Union	0.5	1.1	2.3	1.4
Ever part of pre-apprenticeship (%)				
Yes, with the same employer				
Yes, with a different employer	9.7	11.6	13.3	22.3
No	4.4	3.8	6.0	9.3

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Exhibit C-7. Importance of Various Factors for Decision to Become an Apprentice and Concerns prior to Apprenticeship

	Mean	Standard Deviation
Importance of each factor in decision to become apprentice (%)		
I could train for a career, not just a job		
Most important	79.1	1.1
Of secondary importance	16.8	1.0
Least important or not important	4.1	0.5
I was confident that the skills and credentials I gained would be valued by employers		
Most important	78.8	1.2
Of secondary importance	18.7	1.1
Least important or not important	2.5	0.4
I would have a concrete job opportunity after completing training		
Most important	77.3	1.1
Of secondary importance	16.3	1.0
Least important or not important	6.4	0.7
I could train for an occupation with high earning potential		
Most important	77.1	1.1
Of secondary importance	18.7	1.0
Least important or not important	4.2	0.6
I could earn while I learned		
Most important	75.8	1.2
Of secondary importance	19.6	1.1
Least important or not important	4.6	0.6
I could avoid student debt		
Most important	60.0	1.4
Of secondary importance	20.1	1.1
Least important or not important	19.9	1.1
Importance of each factor in decision to become apprentice (%)		
Having to take time for training, rather than getting right to work		
Strong concern	18.1	1.1
Moderate concern	33.2	1.3
Not a concern	48.7	1.4
Committing so strongly to a single career path		
Strong concern	16.0	1.0
Moderate concern	33.5	1.3
Not a concern	50.4	1.4
Unsure what the experience would be like		
Strong concern	12.3	0.9
Moderate concern	41.0	1.4
Not a concern	46.8	1.4
Unsure if I would like the work		
Strong concern	11.6	0.9
Moderate concern	30.5	1.3
Not a concern	57.9	1.4
The difficulty of the classroom training		
Strong concern	10.5	0.8
Moderate concern	35.4	1.3
Not a concern	54.1	1.4
The difficulty of the on-the-job training		
Strong concern	10.2	0.9
Moderate concern	32.4	1.3
Not a concern	57.3	1.4

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit C-8. Importance of Various Factors for Decision to Become an Apprentice and Concerns prior to Apprenticeship, by Subgroup

	All AAI Apprentices	Gender		Race/Ethnicity				Age			Veteran Status	
		Men	Women	White	Black	Hispanic	Other Race	24 or Younger	25 to 34	35 or Older	Veteran	Non-Veteran
Importance of each factor in decision to become apprentice (%)												
I could train for a career, not just a job												
Most important	79.1	79.2	78.7	74.6	87.7	89.4	78.1	76.7	84.5	75.8	78.6	79.2
Of secondary importance	16.8	16.9	16.3	20.6	9.5	9.7	15.0	19.4	12.8	18.5	15.5	16.9
Least important or not important	4.1	3.8	5.0	4.8	2.8	0.9	6.8	3.9	2.7	5.7	5.9	3.9
I was confident that the skills and credentials I gained would be valued by employers												
Most important	78.8	77.9	81.6	76.5	82.4	85.2	78.1	75.0	82.6	78.0	77.5	79.0
Of secondary importance	18.7	19.7	15.7	20.7	16.2	13.1	18.2	23.4	14.6	19.1	20.2	18.5
Least important or not important	2.5	2.5	2.7	2.9	1.4	1.7	3.7	1.7	2.8	2.9	2.3	2.6
I would have a concrete job opportunity after completing training												
Most important	77.3	77.7	76.0	74.4	83.6	82.7	76.9	76.4	80.0	75.3	78.5	77.1
Of secondary importance	16.3	16.1	16.9	17.8	11.6	13.7	18.8	19.0	14.6	15.9	16.3	16.3
Least important or not important	6.4	6.2	7.1	7.8	4.8	3.6	4.3	4.6	5.4	8.8	5.2	6.6
I could train for an occupation with high earning potential												
Most important	77.1	78.9	71.5	73.1	82.9	88.0	76.9	74.8	82.2	74.0	79.0	76.8
Of secondary importance	18.7	17.2	23.1	21.5	14.8	11.2	18.1	21.7	15.7	19.2	16.7	19.0
Least important or not important	4.2	3.8	5.4	5.4	2.3	0.8	5.0	3.4	2.1	6.8	4.3	4.2
I could earn while I learned												
Most important	75.8	75.6	76.3	73.5	77.7	84.9	74.0	76.3	78.1	73.2	74.0	76.0
Of secondary importance	19.6	19.8	18.8	21.0	18.0	13.8	21.8	20.0	18.2	20.6	20.5	19.4
Least important or not important	4.6	4.5	4.9	5.5	4.2	1.2	4.3	3.7	3.8	6.2	5.5	4.5
I could avoid student debt												
Most important	60.0	59.4	61.9	57.0	66.9	71.3	50.2	67.6	64.6	50.1	53.9	60.9
Of secondary importance	20.1	20.7	18.0	22.4	14.8	12.9	25.0	20.8	18.3	21.1	21.5	19.8
Least important or not important	19.9	19.9	20.1	20.6	18.3	15.8	24.8	11.6	17.1	28.8	24.6	19.2

Exhibit C-8. Importance of Various Factors for Decision to Become an Apprentice and Concerns prior to Apprenticeship, by Subgroup (continued)

	All AAI Apprentices	Gender		Race/Ethnicity				Age			Veteran Status	
		Men	Women	White	Black	Hispanic	Other Race	24 or Younger	25 to 34	35 or Older	Veteran	Non-Veteran
Concerns about decision to become an apprentice (%)												
Having to take time for training, rather than getting right to work												
Strong concern	18.1	16.7	22.4	14.4	24.1	24.7	21.9	13.7	18.4	21.1	18.0	18.1
Moderate concern	33.2	33.4	32.6	33.0	29.7	39.2	32.8	34.2	33.7	32.0	28.5	33.9
Not a concern	48.7	49.8	45.0	52.6	46.3	36.0	45.3	52.1	47.8	46.9	53.5	48.0
Committing so strongly to a single career path												
Strong concern	16.0	16.6	14.3	13.0	21.0	18.7	23.0	15.7	15.9	16.4	14.5	16.2
Moderate concern	33.5	35.3	28.1	34.3	27.4	39.2	31.9	36.4	33.7	31.3	33.7	33.5
Not a concern	50.4	48.1	57.6	52.7	51.5	42.1	45.2	47.9	50.4	52.3	51.8	50.2
Unsure what the experience would be like												
Strong concern	12.3	12.3	12.3	10.8	16.9	12.5	13.1	12.4	13.7	10.8	9.6	12.7
Moderate concern	41.0	40.3	43.1	41.0	39.4	42.0	42.6	42.3	40.6	40.4	42.2	40.8
Not a concern	46.8	47.5	44.6	48.2	43.7	45.5	44.3	45.3	45.7	48.8	48.2	46.6
Unsure if I would like the work												
Strong concern	11.6	11.2	12.9	10.7	13.2	11.6	14.9	14.2	10.5	10.8	7.3	12.2
Moderate concern	30.5	31.6	26.9	29.2	30.2	36.5	31.0	33.7	32.7	26.0	37.5	29.5
Not a concern	57.9	57.2	60.2	60.1	56.6	51.9	54.1	52.1	56.8	63.3	55.3	58.3
The difficulty of the classroom training												
Strong concern	10.5	10.2	11.3	9.6	12.1	10.9	13.1	8.8	9.6	12.6	9.4	10.7
Moderate concern	35.4	35.9	33.8	32.5	35.9	44.5	40.5	36.7	34.6	35.1	30.2	36.1
Not a concern	54.1	53.9	54.9	57.9	52.0	44.5	46.4	54.4	55.8	52.3	60.4	53.2
The difficulty of the on-the-job training												
Strong concern	10.2	9.8	11.4	8.0	16.5	11.0	12.1	6.6	9.2	13.9	7.3	10.6
Moderate concern	32.4	31.6	34.8	29.6	33.0	38.4	42.3	33.5	30.2	33.7	35.6	32.0
Not a concern	57.3	58.5	53.8	62.4	50.5	50.6	45.6	59.9	60.6	52.4	57.0	57.4

Exhibit C-8. Importance of Various Factors for Decision to Become an Apprentice and Concerns prior to Apprenticeship, by Subgroup (continued)

	Education			Occupation					Incumbency	
	High School	Some College	College Degree (Associate or higher)	Manufacturing	Construction	Computer/IT	Healthcare	Other	New worker	Incumbent Worker
Importance of each factor in decision to become apprentice (%)										
I could train for a career, not just a job										
Most important	83.8	79.0	73.3	78.2	86.1	74.7	76.2	73.6	81.2	77.6
Of secondary importance	13.6	18.2	18.8	17.7	11.4	22.3	17.9	20.6	15.0	18.1
Least important or not important	2.6	2.8	7.9	4.2	2.6	3.0	5.8	5.8	3.8	4.3
I was confident that the skills and credentials I gained would be valued by employers										
Most important	81.2	76.4	79.1	77.9	76.2	84.0	83.4	79.3	77.6	79.7
Of secondary importance	16.9	21.4	17.2	20.0	20.6	13.8	14.1	17.5	19.4	18.2
Least important or not important	2.0	2.2	3.7	2.1	3.2	2.2	2.4	3.3	3.0	2.1
I would have a concrete job opportunity after completing training										
Most important	79.2	80.6	70.2	78.4	80.1	69.1	75.9	72.0	80.6	74.8
Of secondary importance	15.8	14.6	19.3	15.4	14.5	23.4	15.9	20.7	14.2	17.8
Least important or not important	5.0	4.8	10.5	6.2	5.3	7.5	8.2	7.3	5.2	7.4
I could train for an occupation with high earning potential										
Most important	79.4	78.0	73.0	78.3	82.4	80.8	68.4	69.4	78.5	76.1
Of secondary importance	17.6	18.2	20.8	16.3	16.1	16.4	26.5	25.6	18.0	19.2
Least important or not important	3.2	3.8	6.2	5.4	1.5	2.8	5.1	4.9	3.6	4.7
I could earn while I learned										
Most important	76.2	76.7	74.0	72.7	83.1	72.5	77.1	73.0	77.9	74.2
Of secondary importance	19.3	19.5	20.0	22.0	14.0	23.4	18.6	21.3	17.7	21.0
Least important or not important	4.5	3.8	6.0	5.4	3.0	4.1	4.4	5.7	4.4	4.8
I could avoid student debt										
Most important	65.2	63.4	48.7	58.7	67.0	48.9	63.1	51.2	60.9	59.4
Of secondary importance	18.2	19.3	23.5	21.2	16.7	27.3	18.6	21.0	18.6	21.2
Least important or not important	16.6	17.3	27.8	20.1	16.3	23.8	18.3	27.8	20.5	19.5

Exhibit C-8. Importance of Various Factors for Decision to Become an Apprentice and Concerns prior to Apprenticeship, by Subgroup (continued)

	Education			Occupation					Incumbency	
	High School	Some College	College Degree (Associate or higher)	Manufacturing	Construction	Computer/IT	Healthcare	Other	New worker	Incumbent Worker
Concerns about decision to become an apprentice (%)										
Having to take time for training, rather than getting right to work										
Strong concern	16.4	18.8	19.2	15.5	18.1	16.8	21.9	25.1	21.2	15.8
Moderate concern	35.0	31.4	33.5	33.6	32.3	31.6	33.9	33.7	34.4	32.3
Not a concern	48.6	49.8	47.2	50.9	49.5	51.6	44.2	41.2	44.4	51.9
Committing so strongly to a single career path										
Strong concern	17.4	15.5	15.0	15.7	17.0	12.2	14.2	19.4	17.6	14.9
Moderate concern	36.5	30.8	33.6	35.6	34.8	27.1	27.8	32.7	37.9	30.3
Not a concern	46.1	53.6	51.4	48.6	48.2	60.7	58.0	47.9	44.6	54.8
Unsure what the experience would be like										
Strong concern	12.4	12.5	11.8	12.0	12.9	9.0	10.0	16.7	15.7	9.7
Moderate concern	38.9	41.1	43.5	41.8	35.3	42.9	45.1	43.7	43.7	38.9
Not a concern	48.7	46.5	44.7	46.2	51.8	48.1	44.9	39.6	40.6	51.4
Unsure if I would like the work										
Strong concern	12.2	11.4	11.2	11.8	10.3	9.9	11.9	14.3	14.6	9.4
Moderate concern	33.0	29.7	28.4	29.2	33.9	31.4	26.0	33.9	34.2	27.7
Not a concern	54.8	58.9	60.5	59.0	55.8	58.8	62.2	51.8	51.2	62.9
The difficulty of the classroom training										
Strong concern	12.3	10.0	9.0	10.8	11.1	6.2	10.9	9.4	10.3	10.6
Moderate concern	39.5	37.7	26.9	36.2	35.9	27.7	36.3	33.1	33.7	36.6
Not a concern	48.2	52.3	64.1	53.0	52.9	66.1	52.8	57.5	55.9	52.8
The difficulty of the on-the-job training										
Strong concern	11.2	9.5	10.0	10.3	9.8	5.0	11.3	12.3	11.9	9.0
Moderate concern	29.6	33.6	34.3	30.9	32.3	29.4	37.1	34.5	33.0	31.9
Not a concern	59.1	57.0	55.6	58.8	57.9	65.7	51.6	53.2	55.1	59.0

Exhibit C-8. Importance of Various Factors for Decision to Become an Apprentice and Concerns prior to Apprenticeship, by Subgroup (continued)

	Grantee Type			
	State Agency	College	Nonprofit	Sector-Based Organization
Importance of each factor in decision to become apprentice (%)				
I could train for a career, not just a job				
Most important	75.6	83.8	79.5	76.4
Of secondary importance	19.8	13.9	16.0	16.0
Least important or not important	4.6	2.4	4.5	7.6
I was confident that the skills and credentials I gained would be valued by employers				
Most important	78.4	77.5	81.5	80.2
Of secondary importance	18.5	20.5	16.2	17.6
Least important or not important	3.1	2.1	2.3	2.2
I would have a concrete job opportunity after completing training				
Most important	76.2	77.6	79.9	76.1
Of secondary importance	15.7	17.8	13.7	17.2
Least important or not important	8.1	4.5	6.4	6.7
I could train for an occupation with high earning potential				
Most important	74.9	79.9	80.1	71.6
Of secondary importance	21.2	16.3	14.0	23.9
Least important or not important	3.9	3.8	5.8	4.4
I could earn while I learned				
Most important	73.7	78.6	72.5	79.3
Of secondary importance	22.0	16.9	21.5	16.5
Least important or not important	4.3	4.5	6.0	4.3
I could avoid student debt				
Most important	55.6	68.5	51.6	61.6
Of secondary importance	23.6	16.2	20.8	18.4
Least important or not important	20.8	15.3	27.6	20.0

Exhibit C-8. Importance of Various Factors for Decision to Become an Apprentice and Concerns prior to Apprenticeship, by Subgroup (continued)

	Grantee Type			
	State Agency	College	Nonprofit	Sector-Based Organization
Concerns about decision to become an apprentice (%)				
Having to take time for training, rather than getting right to work				
Strong concern	16.3	17.2	21.2	23.4
Moderate concern	34.1	32.3	32.3	34.6
Not a concern	49.6	50.5	46.6	42.0
Committing so strongly to a single career path				
Strong concern	15.7	17.9	14.6	13.3
Moderate concern	35.1	34.9	34.2	22.4
Not a concern	49.2	47.3	51.2	64.3
Unsure what the experience would be like				
Strong concern	12.2	12.2	13.4	11.1
Moderate concern	39.5	42.2	41.4	41.9
Not a concern	48.4	45.5	45.2	47.1
Unsure if I would like the work				
Strong concern	12.1	11.8	11.4	9.4
Moderate concern	27.4	33.0	32.9	30.3
Not a concern	60.5	55.2	55.7	60.3
The difficulty of the classroom training				
Strong concern	8.9	10.0	13.6	13.6
Moderate concern	36.0	35.6	31.1	38.7
Not a concern	55.1	54.4	55.3	47.7
The difficulty of the on-the-job training				
Strong concern	11.3	8.2	10.7	12.1
Moderate concern	29.7	32.8	36.0	36.0
Not a concern	59.0	59.0	53.3	51.8

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Appendix D: Expanded Results for Chapter 3

Exhibit D-1. Occupation, Program Type, and Program Length

Characteristic	Mean	Standard Deviation
Occupation (%)		
Manufacturing	46.0	1.4
Construction	23.9	1.2
Computer/IT	5.4	0.5
Healthcare	14.2	0.8
Other	10.5	0.7
Program Type (%)		
Independent, non-joint	57.3	1.4
Independent, joint	12.2	1.0
Group, joint	13.8	0.9
Group, non-joint	16.7	1.0
Type of apprenticeship (%)		
Time-based	35.7	1.4
Competency-based	10.3	0.9
Hybrid	54.1	1.4
Expected length of apprenticeship (%)		
Less than 12 months	12.9	0.8
12 to 23 months	21.9	1.1
24 to 35 months	15.9	1.0
36 to 47 months	9.2	0.9
48 to 59 months	24.0	1.2
60 or more months	16.0	1.0
Average length (years)	2.7	0.04

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).
Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. For "program type," registered apprenticeship programs that do not include unions are called "non-joint" programs; those that include unions are called "joint" programs. Apprenticeship programs can also be operated by or with a single employer ("independent") or multiple employers ("group"). The "type of apprenticeship" refers to whether the apprenticeship is structured such that apprentices advance through their program by achieving a certain set of competencies (competency-based), completing a specified number of training hours (time-based), or a combination (hybrid).

Exhibit D-2. Occupation, Program Type, and Program Length, by Subgroup

	All AAI Apprentices	Gender		Race/Ethnicity				Age			Veteran Status	
		Men	Women	White	Black	Hispanic	Other Race	24 or Younger	25 to 34	35 or Older	Veteran	Non-Veteran
Occupation (%)												
Manufacturing	46.0	55.2	17.7	50.8	44.8	34.4	32.6	45.1	44.2	48.4	45.1	46.2
Construction	23.9	29.1	7.9	21.3	25.4	40.8	13.3	30.0	28.6	14.9	27.6	23.4
Computer/IT	5.4	5.0	6.5	4.3	6.9	5.3	10.0	6.5	5.9	4.1	10.4	4.7
Healthcare	14.2	2.0	51.8	14.9	10.7	8.4	25.2	10.4	11.9	19.2	1.6	16.0
Other	10.5	8.7	16.1	8.7	12.2	11.0	18.9	8.0	9.3	13.5	15.4	9.8
Program Type (%)												
Independent, Non Joint	57.3	53.4	69.3	60.5	58.2	49.6	44.7	55.2	58.5	57.7	51.8	58.1
Independent, Joint	12.2	13.8	7.4	11.3	13.5	10.9	18.3	5.2	11.5	18.2	13.7	12.0
Group, Joint	13.8	15.9	7.3	11.5	19.1	18.7	11.5	16.2	16.6	9.4	21.7	12.7
Group, Non Joint	16.7	16.9	16.0	16.7	9.2	20.8	25.5	23.5	13.5	14.7	12.8	17.3
Program Length (Years)	2.7	3.1	1.5	2.8	2.4	2.9	2.2	2.9	3.0	2.2	2.7	2.7

[continued]

	Education			Occupation					Incumbency	
	High School	Some College	College Degree (Associate or higher)	Manufacturing	Construction	Computer/IT	Healthcare	Other	New worker	Incumbent Worker
Occupation (%)										
Manufacturing	54.0	48.9	31.9	N/A	N/A	N/A	N/A	N/A	31.6	56.8
Construction	31.8	24.8	12.7	N/A	N/A	N/A	N/A	N/A	35.0	15.6
Computer/IT	1.0	5.3	11.2	N/A	N/A	N/A	N/A	N/A	8.9	2.8
Healthcare	5.7	13.6	25.8	N/A	N/A	N/A	N/A	N/A	12.1	15.8
Other	7.7	7.4	18.5	N/A	N/A	N/A	N/A	N/A	12.4	9.1
Program Type (%)										
Independent, Non Joint	54.0	52.0	69.0	61.8	33.9	86.4	80.0	44.9	54.2	59.5
Independent, Joint	10.9	15.8	8.9	15.8	8.8	0.0	5.0	20.3	7.0	16.1
Group, Joint	15.6	15.8	8.7	1.5	47.2	2.5	0.0	16.1	23.2	6.7
Group, Non Joint	19.5	16.5	13.5	21.0	10.0	11.1	15.0	18.6	15.6	17.6
Program Length (Years)	3.0	2.8	2.2	2.8	4.2	1.4	1.2	1.5	2.8	2.6

[continued]

Exhibit D-2. Occupation, Program Type, and Program Length, by Subgroup (continued)

	Grantee Type			
	State Agency	College	Nonprofit	Sector-Based Organization
Occupation (%)				
Manufacturing	57.5	38.4	62.3	3.0
Construction	10.4	46.0	6.2	29.2
Computer/IT	5.7	4.0	10.8	0.5
Healthcare	15.8	7.0	3.5	48.3
Other	10.7	4.6	17.3	19.0
Program Type (%)				
Independent, Non Joint	75.2	40.0	54.1	51.1
Independent, Joint	11.4	8.3	30.7	0.0
Group, Joint	4.5	19.8	4.4	43.7
Group, Non Joint	8.9	31.8	10.9	5.1
Program Length (Years)	2.4	3.3	2.3	2.2

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).
Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program. For "program type," registered apprenticeship programs that do not include unions are called "non-joint" programs; those that include unions are called "joint" programs. Apprenticeship programs can also be operated by or with a single employer ("independent") or multiple employers ("group").

Exhibit D-3. Structure and Content of RTI and OJL

Characteristic	Mean	Standard Deviation
Structure of classroom instruction (%)		
Completed before on-the-job training starts	14.5	0.9
Occurs at the same time as on-the-job training, but is completed before on-the-job training finishes	14.2	1.0
Occurs at the same time as on-the-job training and is ongoing throughout the apprenticeship program	46.2	1.4
Occurs at different times over the course of the apprenticeship program (e.g., block scheduling)	20.0	1.1
Other	5.1	0.6
Who provided classroom instruction (respondents could select multiple options) (%)		
Four-year college	4.3	0.6
Two-year college	46.4	1.4
Union	16.2	1.0
Employer	25.2	1.2
Non-profit organization	8.6	0.7
Private, for-profit provider	7.0	0.7
Other	3.1	0.5
Topics covered in classroom instruction (respondents could select multiple options) (%)		
Use of tools, equipment, or specialized skills required for the apprenticeship occupation	85.6	0.9
Reading and math skills relevant to the apprenticeship occupation	68.1	1.3
Computer science or information technology	34.9	1.3
Engineering or engineering technology	29.9	1.3
Business management skills	22.2	1.1
Critical thinking and problem solving skills	61.7	1.4
Managing time effectively	46.8	1.4
Professional skills	45.8	1.4
Other	4.5	0.6
Number of college credits earned/will earn during apprenticeship (%)		
0	61.0	1.4
1 to 9	9.5	1.0
10 to 19	7.8	0.8
20 to 29	6.1	0.9
30 or more	15.6	1.2
Relevance of classroom training to work in current/most recent job (among those not currently enrolled, N=1,713) (%)		
Very relevant	52.7	1.7
Somewhat relevant	37.3	1.7
Not relevant	10.0	1.0
Did better or worse in classroom instruction than would have done without being an apprentice? (%)		
Did better	59.4	1.4
Did worse	34.1	1.3
No difference	6.4	0.7
Could have developed a high level of competence in skills gained during apprenticeship through classroom instruction alone (%)	41.4	1.4
To what degree do you use what you learned in the classroom in your work on the job in your apprenticeship program? (%)		
None	8.0	0.8
Some	29.5	1.3
Most	35.2	1.3
Everything	27.3	1.2
Apprentice believes that their program accomplishments gave them a high level of expertise in their profession or occupation (among completers, N=1,191) (%)	80.9	1.6

Source: AAI Apprentice Survey (*N*=2,601).

Notes: Apprentices not currently enrolled included those who completed and those who left without completing their programs. Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit D-4. Skill Level Prior to Apprenticeship

Skill Area	Mean	Standard Deviation
Use of tools, equipment, or specialized skills required for the apprentice occupation (%)		
Highly skilled	32.3	1.3
Somewhat skilled	42.2	1.4
Not very skilled	19.4	1.1
Not applicable	6.1	0.6
Reading and math skills relevant to the apprenticeship occupation (%)		
Highly skilled	41.0	1.4
Somewhat skilled	45.1	1.4
Not very skilled	7.0	0.7
Not applicable	6.8	0.7
Computer science or information technology skills (%)		
Highly skilled	16.3	1.0
Somewhat skilled	41.7	1.4
Not very skilled	24.4	1.2
Not applicable	17.5	1.1
Engineering or engineering technology skills (%)		
Highly skilled	8.7	0.8
Somewhat skilled	29.3	1.3
Not very skilled	32.9	1.3
Not applicable	29.1	1.2
Business management skills (%)		
Highly skilled	14.6	1.0
Somewhat skilled	31.9	1.3
Not very skilled	28.8	1.3
Not applicable	24.6	1.2
Critical thinking and problem-solving skills (%)		
Highly skilled	47.0	1.4
Somewhat skilled	44.3	1.4
Not very skilled	5.6	0.7
Not applicable	3.2	0.5
Working and communicating effectively with others (%)		
Highly skilled	51.5	1.4
Somewhat skilled	41.1	1.4
Not very skilled	4.9	0.6
Not applicable	2.6	0.4
Managing time effectively (%)		
Highly skilled	42.2	1.4
Somewhat skilled	45.6	1.4
Not very skilled	8.9	0.8
Not applicable	3.3	0.5

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Outcomes are based on responses to the following question: "Please rate how well-developed your skills were before you began your apprenticeship." Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit D-5. How Well Did Apprenticeship Training Prepare Apprentice in Each Skill

Skill Area	Mean	Standard Deviation
Use of tools, equipment, or specialized skills required for the apprentice occupation (%)		
Very well prepared	42.9	1.4
Well prepared	33.2	1.3
Somewhat prepared	14.4	1.0
Not well prepared	2.4	0.4
Not applicable	7.1	0.7
Reading and math skills relevant to the apprenticeship occupation (%)		
Very well prepared	34.3	1.3
Well prepared	36.9	1.4
Somewhat prepared	15.3	1.0
Not well prepared	3.6	0.5
Not applicable	9.9	0.8
Computer science or information technology skills (%)		
Very well prepared	16.3	1.0
Well prepared	25.4	1.2
Somewhat prepared	25.3	1.3
Not well prepared	10.1	0.8
Not applicable	23.0	1.2
Engineering or engineering technology skills (%)		
Very well prepared	12.8	1.0
Well prepared	24.2	1.2
Somewhat prepared	21.9	1.2
Not well prepared	9.8	0.8
Not applicable	31.3	1.2
Business management skills (%)		
Very well prepared	15.8	1.0
Well prepared	22.9	1.2
Somewhat prepared	22.3	1.2
Not well prepared	10.0	0.9
Not applicable	29.0	1.3
Critical thinking and problem-solving skills (%)		
Very well prepared	39.5	1.4
Well prepared	34.3	1.3
Somewhat prepared	16.7	1.1
Not well prepared	4.0	0.6
Not applicable	5.5	0.6
Working and communicating effectively with others (%)		
Very well prepared	42.1	1.4
Well prepared	33.5	1.3
Somewhat prepared	14.5	1.0
Not well prepared	4.2	0.6
Not applicable	5.7	0.7
Managing time effectively (%)		
Very well prepared	36.7	1.4
Well prepared	35.1	1.3
Somewhat prepared	17.3	1.1
Not well prepared	4.3	0.6
Not applicable	6.6	0.7

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Outcomes are based on responses to the following question: "How well has the classroom and on-the-job training you received through the apprenticeship prepared you with the skills needed to operate at a high level in your occupation?" Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit D-6. Which Training Component Contributed the Most to Developing Each Skill

Skill Area	Mean	Standard Deviation
Use of tools, equipment, or specialized skills required for the apprentice occupation (%)		
Classroom learning (RTI)	13.9	0.9
Mentor guidance (OJL)	38.6	1.4
Work experience (OJL)	39.5	1.4
Not applicable	8.1	0.7
Reading and math skills relevant to the apprenticeship occupation (%)		
Classroom learning (RTI)	47.4	1.4
Mentor guidance (OJL)	14.2	1.0
Work experience (OJL)	24.0	1.2
Not applicable	14.4	0.9
Computer science or information technology skills (%)		
Classroom learning (RTI)	29.8	1.3
Mentor guidance (OJL)	15.6	1.0
Work experience (OJL)	21.4	1.1
Not applicable	33.1	1.3
Engineering or engineering technology skills (%)		
Classroom learning (RTI)	22.6	1.2
Mentor guidance (OJL)	17.6	1.1
Work experience (OJL)	19.2	1.1
Not applicable	40.5	1.3
Business management skills (%)		
Classroom learning (RTI)	20.8	1.1
Mentor guidance (OJL)	16.9	1.1
Work experience (OJL)	25.1	1.2
Not applicable	37.1	1.4
Critical thinking and problem-solving skills (%)		
Classroom learning (RTI)	15.9	1.0
Mentor guidance (OJL)	32.1	1.3
Work experience (OJL)	44.5	1.4
Not applicable	7.5	0.7
Working and communicating effectively with others (%)		
Classroom learning (RTI)	12.7	0.9
Mentor guidance (OJL)	26.8	1.3
Work experience (OJL)	52.4	1.4
Not applicable	8.1	0.8
Managing time effectively (%)		
Classroom learning (RTI)	12.4	0.9
Mentor guidance (OJL)	27.9	1.3
Work experience (OJL)	51.6	1.4
Not applicable	8.1	0.7

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Outcomes are based on responses to the following question: "Which aspects of the apprenticeship – either classroom learning, guidance from an on-the-job mentor, OR work experience (learning by doing) – contributed the most to helping you develop the following skills?" Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit D-7. Importance of Each Skill to Succeed in Current or Most Recent Job

Skill Area	Mean	Standard Deviation
Use of tools, equipment, or specialized skills required for the apprentice occupation (%)		
Very important	75.2	1.2
Moderately important	15.2	1.0
Slightly important	5.1	0.6
Not at all important	4.6	0.5
Reading and math skills relevant to the apprenticeship occupation (%)		
Very important	55.5	1.4
Moderately important	28.2	1.3
Slightly important	11.3	0.9
Not at all important	5.0	0.5
Computer science or information technology skills (%)		
Very important	29.4	1.2
Moderately important	28.6	1.3
Slightly important	21.6	1.2
Not at all important	20.4	1.2
Engineering or engineering technology skills (%)		
Very important	28.2	1.3
Moderately important	25.1	1.2
Slightly important	18.0	1.1
Not at all important	28.8	1.2
Business management skills (%)		
Very important	30.3	1.3
Moderately important	24.2	1.2
Slightly important	18.9	1.1
Not at all important	26.6	1.2
Critical thinking and problem-solving skills (%)		
Very important	79.3	1.1
Moderately important	15.0	1.0
Slightly important	3.5	0.5
Not at all important	2.2	0.4
Working and communicating effectively with others (%)		
Very important	76.1	1.2
Moderately important	17.7	1.1
Slightly important	4.2	0.6
Not at all important	2.0	0.4
Managing time effectively (%)		
Very important	75.1	1.2
Moderately important	18.5	1.1
Slightly important	4.1	0.5
Not at all important	2.3	0.4

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Outcomes are based on responses to the following question: "How important are each of those skills to succeed in your job, or, if you are not currently employed, your most recent job?" Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit D-8. Mentorship and Supportive Services

	Mean	Standard Deviation
Number of hours spent with primary mentor per week (%)		
0	15.5	1.0
1 to 9	20.9	1.1
10 to 19	9.3	0.8
20 to 29	12.7	1.0
30 to 39	7.9	0.8
40 or more	33.7	1.4
Weekly hours (mean)	20.8	0.5
Importance of primary mentor for helping you succeed in your apprenticeship (%)		
Very important	48.3	1.4
Important	23.8	1.2
Somewhat important	14.6	1.0
Not important	13.3	1.0
Satisfaction with primary mentor (%)		
Very satisfied	46.0	1.4
Satisfied	26.7	1.3
Somewhat satisfied	15.3	1.0
Not satisfied	12.0	0.9
Receipt of support (detailed categories, select all that apply) (%)		
Academic/career counseling	16.6	1.0
Tutoring	14.9	1.0
Basic skills instruction	14.9	1.0
IT training	17.0	1.0
Tuition assistance	18.6	1.1
Assistance with costs for tools, equipment, books, supplies	25.7	1.2
Childcare	1.2	0.3
Flexible scheduling	22.8	1.2
Transportation assistance	5.9	0.7
Other	0.7	0.2
Receipt of support (aggregate categories) (%)		
None	42.8	1.1
Financial support	35.3	1.1
Academic support	45.7	1.1
Would recommend program to family member or friend who wants to work in this field (%)	86.4	0.9

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit D-9. Mentorship and Supportive Services, by Subgroup

	All AAI Apprentices	Gender		Race/Ethnicity				Age			Veteran Status	
		Men	Women	White	Black	Hispanic	Other Race	24 or Younger	25 to 34	35 or Older	Veteran	Non-Veteran
Number of hours spent with primary mentor per week (%)												
0	15.5	14.4	19.0	16.3	15.1	12.3	15.3	10.9	15.8	18.6	19.4	14.9
1 to 9	20.9	18.2	29.2	19.9	20.3	21.1	28.6	19.2	20.3	22.7	9.7	22.5
10 to 19	9.3	8.2	12.6	9.3	9.9	7.4	11.1	7.7	8.3	11.4	11.9	8.9
20 to 29	12.7	14.0	8.8	13.7	10.2	10.4	14.5	16.0	10.9	12.0	11.0	13.0
30 to 39	7.9	7.4	9.6	8.0	7.3	8.1	8.4	10.0	8.1	6.2	8.3	7.8
40 or more	33.7	37.9	20.8	32.8	37.2	40.7	22.1	36.3	36.5	29.2	39.8	32.9
Weekly Hours (mean)	20.8	22.3	16.1	20.6	21.5	23.0	17.1	22.9	21.4	18.6	23.0	20.5
Satisfaction with primary mentor (%)												
Very satisfied	46.0	45.2	48.2	43.0	50.7	50.4	50.6	45.3	45.9	46.5	56.4	44.5
Satisfied	26.7	27.8	23.4	28.1	25.5	22.5	25.6	27.8	27.9	24.8	17.3	28.0
Somewhat satisfied	15.3	15.8	13.9	15.0	13.1	18.5	17.4	18.8	12.7	15.2	12.9	15.7
Not satisfied	12.0	11.2	14.5	13.9	10.7	8.6	6.4	8.2	13.4	13.5	13.4	11.8
Receipt of support (general categories) (%)												
None	42.8	42.2	44.5	45.3	39.8	41.1	33.4	41.1	41.3	45.4	45.6	42.4
Financial support	35.3	37.0	30.0	33.8	37.2	36.9	39.5	39.0	37.9	30.0	31.4	35.8
Academic support	45.7	46.0	44.9	42.2	51.6	48.6	55.0	49.0	44.5	44.4	43.3	46.1
Receipt of support (detailed categories) (select all that apply) (%)												
Academic/career counseling	16.6	16.5	17.0	13.7	17.8	20.3	29.3	21.6	14.8	14.6	12.7	17.2
Tutoring	14.9	15.3	13.6	11.8	19.8	17.7	22.5	17.3	14.6	13.4	13.1	15.1
Basic skills instruction	14.9	16.3	10.7	12.3	19.9	14.8	23.1	14.9	15.7	14.2	14.4	15.0
IT training	17.0	18.2	13.0	14.0	19.2	20.8	27.3	18.8	13.4	18.9	17.0	16.9
Tuition assistance	18.6	19.2	16.7	19.0	14.2	19.8	22.1	21.7	21.4	13.5	13.0	19.4
Assistance with costs for tools, equipment, books, supplies	25.7	26.1	24.5	24.6	27.2	28.3	26.5	28.6	25.8	23.4	22.0	26.2
Childcare	1.2	1.2	1.3	0.7	3.1	1.2	1.2	1.7	1.4	0.7	0.6	1.3
Flexible scheduling	22.8	23.0	22.1	23.2	20.7	22.7	24.3	27.1	21.4	21.0	19.5	23.3
Transportation assistance	5.9	6.3	4.6	5.3	6.6	5.3	10.1	7.8	5.7	4.7	5.7	5.9
Would recommend program to family member or friend who wants to work in this field (%)	86.4	86.9	85.0	85.1	84.4	92.6	90.5	86.6	86.1	86.6	91.4	85.7

Exhibit D-9. Mentorship and Supportive Services, by Subgroup (continued)

	Education			Occupation					Incumbency	
	High School	Some College	College Degree (Associate or higher)	Manufacturing	Construction	Computer/IT	Healthcare	Other	New worker	Incumbent Worker
Number of hours spent with primary mentor per week (%)										
0	12.6	16.8	16.6	17.6	10.6	12.7	16.4	17.5	12.3	17.9
1 to 9	16.6	17.1	30.6	19.4	8.3	32.3	31.6	35.3	18.7	22.5
10 to 19	9.3	8.4	10.8	9.7	3.8	15.1	13.3	11.4	8.1	10.2
20 to 29	13.9	13.2	10.7	16.3	7.2	11.0	9.8	14.2	13.9	11.8
30 to 39	7.4	8.7	7.3	6.0	9.5	8.7	13.4	4.8	9.2	6.9
40 or more	40.1	35.8	24.0	30.9	60.5	20.2	15.4	16.8	37.7	30.7
Hours (mean)	23.2	21.7	16.9	19.7	29.7	16.4	15.9	14.2	22.9	19.2
Satisfaction with primary mentor (%)										
Very satisfied	47.0	45.4	45.3	39.8	49.8	63.7	49.9	49.9	47.0	45.2
Satisfied	29.1	25.9	24.8	30.0	24.9	17.9	23.1	25.7	25.1	27.9
Somewhat satisfied	14.3	15.2	16.8	17.3	14.5	7.5	13.5	15.3	15.7	15.1
Not satisfied	9.5	13.5	13.0	13.0	10.8	10.9	13.5	9.1	12.3	11.8
Receipt of support (general categories) (%)										
None	44.4	39.1	46.1	42.3	46.0	26.5	46.0	41.5	42.3	43.2
Financial support	34.6	38.1	32.1	36.8	37.2	42.9	30.4	26.7	35.3	35.3
Academic support	45.7	47.0	44.0	46.5	40.4	65.8	40.4	51.7	47.1	44.7
Receipt of support (detailed categories) (select all that apply) (%)										
Academic/career counseling	15.4	18.2	16.0	13.8	16.2	39.8	15.5	19.7	21.8	12.7
Tutoring	14.9	13.5	16.7	14.3	16.4	28.9	11.9	10.7	16.1	13.9
Basic skills instruction	17.4	14.5	12.3	15.1	20.7	9.7	9.1	11.4	16.1	14.0
IT training	19.0	16.1	15.6	17.2	15.8	47.0	9.9	12.7	19.5	15.0
Tuition assistance	19.7	18.1	17.8	23.0	15.3	18.3	17.1	8.6	17.9	19.0
Assistance with costs for tools, equipment, books, supplies	23.8	28.1	24.7	26.4	28.5	26.5	25.1	16.6	25.0	26.2
Childcare	1.3	0.7	1.9	0.9	1.3	1.4	1.7	1.7	1.9	0.7
Flexible scheduling	23.5	23.1	21.4	25.1	15.2	27.0	22.2	28.6	21.2	24.0
Transportation assistance	6.0	5.9	5.8	5.2	6.1	15.1	2.2	8.9	7.2	5.0
Would recommend program to family member or friend who wants to work in this field (%)	88.9	84.9	85.3	84.7	90.0	89.5	84.3	87.1	85.0	87.5

Exhibit D-9. Mentorship and Supportive Services, by Subgroup (continued)

	Grantee Type			
	State Agency	College	Nonprofit	Sector-Based Organization
Number of hours spent with primary mentor per week (%)				
0	15.5	14.8	15.0	18.6
1 to 9	22.2	14.2	28.0	27.2
10 to 19	9.0	8.3	12.5	8.9
20 to 29	17.6	9.6	8.4	10.9
30 to 39	8.2	7.2	8.3	8.5
40 or more	27.5	46.0	27.9	25.9
Hours (mean)	19.6	24.4	18.0	17.5
Satisfaction with primary mentor (%)				
Very satisfied	43.8	45.7	48.7	51.1
Satisfied	29.3	26.0	24.3	22.7
Somewhat satisfied	15.3	16.5	14.5	12.9
Not satisfied	11.6	11.8	12.5	13.3
Receipt of support (general categories) (%)				
None	42.8	40.6	43.4	49.0
Financial support	34.7	39.9	30.3	29.5
Academic support	44.6	47.4	48.0	41.1
Receipt of support (detailed categories) (select all that apply) (%)				
Academic/career counseling	15.1	18.4	18.5	13.8
Tutoring	13.0	15.4	17.0	17.1
Basic skills instruction	12.6	17.6	17.6	10.7
IT training	15.8	16.7	21.1	15.6
Tuition assistance	17.9	22.2	15.5	13.3
Assistance with costs for tools, equipment, books, supplies	24.7	28.3	21.7	27.0
Childcare	1.4	1.6	0.7	0.1
Flexible scheduling	23.6	24.4	19.1	20.0
Transportation assistance	6.9	6.6	5.1	1.0
Would recommend program to family member or friend who wants to work in this field (%)	86.6	88.1	84.0	84.0

Source: AAI Apprentice Survey (N=2,601).

Notes: Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Exhibit D-10. Wage Progression during Apprenticeship

Characteristic	Mean	Standard Deviation
Starting wage (%)		
Less than $10/hour	2.5	0.5
$10-14.99/hour	30.6	1.2
$15 to $19.99/hour	39.6	1.4
$20 to $24.99/hour	15.3	1.0
$25/hour or more	12.0	1.0
Wage (mean)	17.77	0.18
Current/ending wage (%)		
Less than $10/hour	1.3	0.3
$10 to $14.99/hour	11.5	0.9
$15 to $19.99/hour	27.1	1.2
$20 to $24.99/hour	25.3	1.2
$25/hour or more	34.8	1.4
Wage (mean)	22.54	0.22
Number of wage increases received during apprenticeship (%)		
0	27.3	1.2
1	17.8	1.1
2	13.6	1.0
3	11.5	0.9
4 or more	29.8	1.4
Number of wage increases (mean)	2.4	0.1
Hours worked per week (%)		
1 to 19	3.7	0.5
20 to 34	4.7	0.6
35 to 39	3.9	0.5
40 to 44	62.7	1.4
45 to 49	9.2	0.9
50 or more	15.9	1.1
Hours (mean)	41.1	0.3

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).
Notes: For apprentices who were no longer enrolled in their apprenticeship, the current/ending wage reflects their hourly wage at the end of their apprenticeship; for those still enrolled, this reflects their current hourly wage. Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit D-11. Wage Progression during Apprenticeship, by Subgroup

	All AAI Apprentices	Gender		Race/Ethnicity				Age			Veteran Status	
		Men	Women	White	Black	Hispanic	Other Race	24 or Younger	25 to 34	35 or Older	Veteran	Non-Veteran
Starting wage (%)												
Less than $10/hour	2.5	2.7	2.0	2.9	2.1	2.9	0.3	4.8	2.3	1.0	1.9	2.6
$10-14.99/hour	30.6	28.6	36.7	28.9	37.7	34.6	22.5	46.4	24.8	24.3	18.1	32.4
$15 to $19.99/hour	39.6	40.7	36.1	41.0	37.7	29.9	48.3	34.5	46.1	37.3	47.7	38.4
$20 to $24.99/hour	15.3	16.8	10.5	14.7	12.6	23.5	12.5	8.2	16.6	19.4	18.9	14.8
$25/hour or more	12.0	11.1	14.7	12.6	9.9	9.1	16.4	6.1	10.3	18.0	13.4	11.8
Starting Wage (dollars)	17.77	17.75	17.85	17.96	16.97	17.29	18.86	15.47	17.74	19.53	18.78	17.63
Current/ending wage (%)												
Less than $10/hour	1.3	0.9	2.7	1.0	2.1	1.5	1.4	1.2	0.8	1.9	2.5	1.1
$10 to $14.99/hour	11.5	8.8	19.8	9.4	19.9	12.2	8.4	16.7	9.1	9.9	6.3	12.2
$15 to $19.99/hour	26.9	25.7	30.7	27.7	24.5	23.1	32.1	35.6	25.2	22.1	23.2	27.5
$20 to $24.99/hour	25.3	26.4	21.6	27.2	25.0	20.4	19.5	23.1	26.8	25.5	24.0	25.4
$25/hour or more	35.0	38.2	25.2	34.7	28.5	42.7	38.6	23.4	38.1	40.7	44.1	33.7
Ending Wage (dollars)	22.57	23.12	20.89	22.81	20.85	23.50	22.90	20.44	23.28	23.49	23.52	22.43
Average wage growth during apprenticeship (dollars)	4.80	5.37	3.04	4.85	3.88	6.21	4.05	4.98	5.55	3.96	4.75	4.81
Hours worked per week (%)												
1 to 19	3.5	2.6	6.4	2.3	4.9	5.2	7.4	3.1	3.4	4.0	3.0	3.6
20 to 34	4.7	3.5	8.5	4.2	6.0	3.9	7.3	7.5	3.9	3.3	0.7	5.3
35 to 39	4.1	2.0	10.6	3.9	2.9	6.0	4.9	5.7	4.4	2.5	1.7	4.4
40 to 44	62.6	62.5	63.1	58.8	67.2	68.0	72.4	60.9	64.2	62.4	65.4	62.2
45 to 49	9.2	10.8	4.6	11.0	5.2	9.7	3.9	10.4	9.3	8.4	9.4	9.2
50 or more	15.8	18.7	6.9	19.9	13.7	7.3	4.0	12.3	14.8	19.4	19.8	15.3
Hours (mean)	41.1	42.2	37.9	42.3	40.2	39.5	37.3	40.0	41.0	42.2	43.1	40.8
Number of wage increases received during apprenticeship (%)												
0	27.4	21.8	44.7	24.3	35.8	24.8	37.1	23.1	22.2	35.6	32.8	26.7
1	17.8	15.2	25.7	18.2	16.9	15.9	19.1	15.5	16.0	21.1	16.2	18.0
2	13.7	13.6	13.8	14.8	11.3	12.7	12.2	13.5	15.8	11.8	12.5	13.8
3	11.3	12.7	7.0	12.4	9.4	9.1	10.2	11.8	12.4	9.9	9.2	11.6
4 or more	29.9	36.7	8.8	30.3	26.5	37.6	21.5	36.1	33.7	21.6	29.3	29.9
Number of wage increases (mean)	2.4	2.8	1.2	2.5	2.1	2.6	1.9	2.7	2.6	1.9	2.3	2.4

Exhibit D-11. Wage Progression during Apprenticeship, by Subgroup (continued)

	Education			Occupation					Incumbency	
	High School	Some College	College Degree (Associate or higher)	Manufacturing	Construction	Computer/IT	Healthcare	Other	New worker	Incumbent Worker
Starting wage (%)										
Less than $10/hour	3.0	2.8	1.6	1.8	4.3	0.2	2.0	3.4	3.0	2.2
$10-14.99/hour	36.2	29.4	25.1	32.4	29.9	16.1	36.8	23.5	35.0	27.3
$15 to $19.99/hour	38.3	41.6	38.4	43.4	30.1	43.3	30.2	55.5	38.2	40.7
$20 to $24.99/hour	17.6	13.8	14.5	13.8	22.6	25.0	9.3	8.5	13.9	16.3
$25/hour or more	4.9	12.3	20.5	8.7	13.1	15.3	21.7	9.1	10.0	13.5
Starting Wage (dollars)	16.56	17.66	19.46	17.27	17.74	19.42	18.97	17.57	16.99	18.36
Current/ending wage (%)										
Less than $10/hour	1.2	1.1	1.8	1.0	0.2	2.8	2.6	2.9	2.1	0.7
$10 to $14.99/hour	11.1	12.5	10.5	9.5	8.4	11.7	24.4	9.7	14.3	9.4
$15 to $19.99/hour	28.9	27.6	23.5	26.9	21.9	29.7	31.7	30.7	28.4	25.9
$20 to $24.99/hour	28.5	24.5	22.2	31.4	21.2	19.7	15.3	24.2	22.9	27.1
$25/hour or more	30.1	34.3	42.1	31.3	48.3	36.2	26.0	32.5	32.4	37.0
Ending Wage (dollars)	21.81	22.21	24.04	21.81	25.26	22.27	20.90	22.18	21.99	23.01
Average wage growth during apprenticeship (dollars)	5.25	4.55	4.57	4.54	7.52	2.85	1.93	4.60	5.00	4.65
Hours worked per week (%)										
1 to 19	2.8	3.3	4.1	2.4	0.8	3.2	8.2	8.9	3.7	3.4
20 to 34	4.5	5.0	4.4	4.5	1.7	5.7	9.1	6.1	8.7	1.7
35 to 39	2.4	3.2	7.6	0.7	3.0	4.5	14.9	6.4	4.9	3.5
40 to 44	64.7	62.2	60.8	55.7	73.6	83.2	60.7	60.0	66.6	59.7
45 to 49	10.5	9.1	8.3	13.1	8.7	0.5	3.6	5.6	5.4	12.1
50 or more	15.1	17.3	14.9	23.6	12.3	2.9	3.5	12.9	10.7	19.7
Hours (mean)	41.6	41.3	40.6	42.9	42.2	38.5	36.5	38.6	39.4	42.4
Number of wage increases received during apprenticeship (%)										
0	21.9	25.5	36.4	24.8	6.6	58.7	51.1	38.4	26.1	28.4
1	15.9	16.6	21.4	20.0	5.6	19.0	26.5	23.2	14.9	19.9
2	15.0	13.2	12.9	14.4	13.1	13.4	12.2	14.2	14.8	12.9
3	11.1	10.4	12.8	12.3	13.6	6.4	6.1	11.1	10.0	12.2
4 or more	36.1	34.2	16.5	28.6	61.0	2.6	4.1	13.2	34.1	26.6
Number of wage increases (mean)	2.7	2.6	1.7	2.4	3.9	0.8	0.9	1.6	2.6	2.2

Exhibit D-11. Wage Progression during Apprenticeship, by Subgroup (continued)

	Grantee Type			
	State Agency	College	Nonprofit	Sector-Based Organization
Starting wage (%)				
Less than $10/hour	3.4	2.6	0.4	2.2
$10-14.99/hour	28.0	38.4	20.8	29.6
$15 to $19.99/hour	42.0	29.3	52.0	45.9
$20 to $24.99/hour	16.8	16.2	14.2	8.0
$25/hour or more	9.8	13.5	12.6	14.4
Starting Wage (dollars)	17.64	17.28	18.38	18.99
Current/ending wage (%)				
Less than $10/hour	1.7	0.7	1.5	1.5
$10 to $14.99/hour	12.1	11.7	7.9	14.0
$15 to $19.99/hour	29.4	25.8	21.8	28.9
$20 to $24.99/hour	27.1	22.0	28.2	25.0
$25/hour or more	29.7	39.8	40.6	30.6
Ending Wage (dollars)	21.40	23.51	23.02	23.21
Average wage growth during apprenticeship (dollars)	3.76	6.24	4.64	4.23
Hours worked per week (%)				
1 to 19	3.9	1.9	5.4	4.6
20 to 34	5.8	4.2	3.7	3.7
35 to 39	5.1	2.7	3.5	5.7
40 to 44	57.2	67.9	57.9	72.8
45 to 49	11.8	8.2	8.2	4.6
50 or more	16.2	15.1	21.2	8.7
Hours (mean)	40.8	41.8	41.4	39.5
Number of wage increases received during apprenticeship (%)				
0	30.7	18.0	29.8	42.8
1	20.8	12.8	18.3	21.8
2	15.5	14.5	10.7	8.6
3	10.6	12.5	11.9	8.9
4 or more	22.5	42.2	29.3	17.9
Number of wage increases (mean)	2.0	3.0	2.3	1.5

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (*N*=2,601).

Notes: For apprentices who were no longer enrolled in their apprenticeship, the current/ending wage reflects their hourly wage at the end of their apprenticeship; for those still enrolled, this reflects their current hourly wage. Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Appendix E: Expanded Results for Chapter 4

Exhibit E-1. Enrollment Status

Characteristic	Mean	Standard Deviation
Current status (%)		
Currently registered	32.9	1.3
Completed	47.3	1.4
Program cancelled/suspended	5.2	0.5
Left before completing	14.6	1.0
Current status (among those still registered, N=888) (%)		
On track to complete on time	76.2	2.1
Will not complete on time due to delays in my progress through classroom instruction	7.2	1.3
Will not complete on time due to shortage of work from employer	3.4	1.0
Other	3.4	0.9
Will not complete on time due to delays in my progress through on-the-job training	3.3	0.9
Will not complete on time due to delays related to COVID-19 pandemic	3.3	0.9
Will not complete on time due to personal or family reasons	1.7	0.5
Will not complete on time due to delays on the part of the apprenticeship program/employer	1.6	0.7
Reason for cancellation/suspension (among those cancelled/suspended, N=156) (%)		
Lack of work	7.4	2.1
Went out of business	1.9	1.0
Temporarily closed or reduced staff	15.9	3.6
My poor performance	15.3	3.7
For reasons I not aware of	22.9	4.5
Other	16.0	3.7
Reasons related to COVID-19 pandemic	12.5	4.4
Fired or laid off, unknown cause	8.2	2.9
Reason for leaving apprenticeship before completing (among those who left without completing, N=366) (%)		
Lost interest in the occupation	8.5	1.9
Found a better-paying job	24.1	3.3
Disliked the employer or apprentice program	22.5	3.1
Personal or family problems	38.6	3.6
Other	5.7	2.1
Reasons related to COVID-19 pandemic	0.7	0.6
Received any degrees, certificates, or professional licenses (among those not currently enrolled, N=1,713) (%)		
Yes, portable to other employers	39.9	1.4
Yes, not portable to other employers	7.8	0.7
No	52.3	1.4

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Apprentices not currently enrolled included those who completed and those who left without completing their programs. Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit E-2. Employment Outcomes

Characteristic	Mean	Standard Deviation
Employment status, by employer (all not currently enrolled, N=1,713) (%)		
Employed, same employer that operated apprenticeship program	53.3	1.7
Employed, different employer	32.2	1.6
Not employed	14.5	1.2
Employment status, by employer (among completers, N=1,191) (%)		
Employed, same employer that operated apprenticeship program	64.8	2.0
Employed, different employer	25.0	1.8
Not employed	10.1	1.3
Employment status, by employer (among those who left without completing, N=522) (%)		
Employed, same employer that operated apprenticeship program	25.8	2.7
Employed, different employer	49.2	3.2
Not employed	25.0	2.7
Reason not still employed with same employer (among all not employed with same employer, N=694, respondents could select multiple options) (%)		
Found better-paying job	34.1	2.6
Found job with better hours	11.4	1.6
Found job with better schedule	10.7	1.6
Personal or family reasons	23.9	2.2
Employer no longer in business	6.6	1.5
Did not make a job offer due to lack of work	10.7	1.6
Did not make a job offer due to performance	3.0	1.0
Other	12.2	1.8
Reasons related to COVID-19 pandemic	4.3	1.2
Quit	5.7	1.2
Fired or laid off, unknown cause	7.4	1.6
Employed in an occupation where a license is required (%)		
Yes, and earned license through apprentice program	13.8	1.0
Yes, and earned license outside the apprentice program	7.5	0.7
Yes, but do not have the license	8.3	0.8
No	70.4	1.3
Employed in an occupation where a certificate is available (%)		
Yes, and earned certificate through apprentice program	24.4	1.2
Yes, and earned certificate outside the apprentice program	9.2	0.7
Yes, but do not have the certificate	25.5	1.2
No	40.8	1.4

Source: AAI Apprentice Survey (*N*=2,601).
Notes: Apprentices not currently enrolled included those who completed and those who left without completing their programs. Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship.

Exhibit E-3. Enrollment and Employment Outcomes, by Subgroup

	All AAI Apprentices	Gender		Race/Ethnicity				Age			Veteran Status	
		Men	Women	White	Black	Hispanic	Other Race	24 or Younger	25 to 34	35 or Older	Veteran	Non-Veteran
Current status (%)												
Completed or still enrolled	80.2	80.9	78.1	80.4	77.6	80.8	83.2	80.2	81.7	78.8	76.6	80.7
Currently registered	32.9	38.1	16.8	33.9	28.2	35.5	31.3	36.7	37.1	26.1	25.6	33.9
Completed	47.3	42.8	61.3	46.5	49.4	45.3	51.9	43.5	44.6	52.7	51.0	46.8
Program cancelled/suspended	5.2	4.9	6.0	4.8	7.1	4.8	4.5	2.8	4.0	8.0	4.7	5.2
Left before completing	14.6	14.2	16.0	14.9	15.2	14.4	12.3	17.0	14.3	13.2	18.7	14.1
Reason for leaving apprenticeship before completing (among those who left without completing, N=366) (%)												
Lost interest in the occupation	8.5	9.4	5.9	7.9	3.6	12.8	17.8	13.5	8.6	3.5	3.6	9.4
Found a better-paying job	24.1	28.0	13.2	28.9	13.6	14.1	27.0	29.2	28.6	14.5	27.8	23.4
Disliked the employer or apprentice program	22.5	22.9	21.3	21.3	30.0	18.5	21.0	22.3	22.8	22.2	18.6	23.2
Personal or family problems	38.6	33.0	53.8	34.7	45.8	54.4	24.7	33.3	29.3	53.1	36.3	39.0
Other	5.7	5.7	5.8	6.1	6.9	0.3	9.5	1.7	8.8	6.5	13.7	4.2
Reasons related to COVID-19 pandemic	0.7	1.0	0.0	1.1	0.0	0.0	0.0	0.0	1.9	0.2	0.0	0.8
Received any degrees, certificates, or professional licenses (among those not currently enrolled, N=1,713) (%)	47.7	47.3	48.5	46.1	48.9	50.7	51.3	50.0	48.8	45.3	50.6	47.2
Employment status, by employer (among those not currently enrolled, N=1,713) (%)												
Employed, same employer that operated apprenticeship program	53.3	51.2	58.1	55.1	52.7	43.4	62.3	47.3	49.1	60.5	50.7	53.7
Employed, different employer	32.2	34.8	26.1	30.9	33.3	35.9	31.6	40.3	35.7	24.1	34.6	31.8
Not employed	14.5	14.0	15.8	14.0	14.0	20.7	6.1	12.4	15.2	15.4	14.7	14.5
Employment status, by employer (among completers, N=1,191) (%)												
Employed, same employer that operated apprenticeship program	64.8	63.8	66.9	67.1	53.9	65.0	71.1	59.8	60.5	71.3	64.9	64.8
Employed, different employer	25.0	25.8	23.5	23.2	31.4	24.2	26.0	29.9	28.3	19.5	22.9	25.4
Not employed	10.1	10.4	9.5	9.8	14.7	10.8	2.9	10.2	11.1	9.3	12.3	9.8

Exhibit E-3. Enrollment and Employment Outcomes, by Subgroup (continued)

	Education			Occupation				
	High School	Some College	College Degree (Associate or higher)	Manufacturing	Construction	Computer/IT	Healthcare	Other
Current status (%)								
Completed or still enrolled	80.4	80.8	79.0	80.3	79.6	80.2	79.7	81.6
Currently registered	36.0	36.0	24.5	36.5	50.6	10.6	10.9	18.1
Completed	44.3	44.8	54.5	43.8	29.0	69.6	68.8	63.5
Program cancelled/suspended	4.9	5.4	5.2	5.6	4.3	5.2	4.9	5.5
Left before completing	14.7	13.8	15.7	14.1	16.1	14.7	15.4	12.9
Reason for leaving apprenticeship before completing (among those who left without completing, N=366) (%)								
Lost interest in the occupation	15.2	4.4	5.9	11.3	6.5	9.0	5.3	5.2
Found a better-paying job	18.2	23.3	32.1	29.0	21.2	45.8	13.7	12.6
Disliked the employer or apprentice program	26.0	22.9	18.6	20.5	27.8	6.2	21.6	27.7
Personal or family problems	36.4	40.7	37.1	32.7	39.2	26.1	52.9	48.9
Other	2.4	8.7	6.1	5.1	5.3	12.9	6.5	4.8
Reasons related to COVID-19 pandemic	1.9	0.0	0.3	1.4	0.0	0.0	0.0	0.8
Received any degrees, certificates, or professional licenses (among those not currently enrolled, N=1,713) (%)	41.8	54.3	46.1	45.4	50.5	47.4	49.8	48.6
Employment status, by employer (among those not currently enrolled, N=1,713) (%)								
Employed, same employer that operated apprenticeship program	55.1	51.3	55.0	58.3	35.4	32.5	65.6	54.1
Employed, different employer	30.0	34.1	32.0	29.1	43.3	55.8	23.3	27.3
Not employed	14.9	14.6	13.0	12.6	21.3	11.7	11.1	18.6
Employment status, by employer (among completers, N=1,191) (%)								
Employed, same employer that operated apprenticeship program	65.8	62.7	65.7	70.8	52.1	38.0	70.9	66.0
Employed, different employer	23.1	26.1	26.3	20.0	33.0	50.6	21.7	22.5
Not employed	11.0	11.2	8.0	9.1	14.9	11.5	7.4	11.6

Exhibit E-3. Enrollment and Employment Outcomes, by Subgroup (continued)

	Incumbency		Grantee Type			
	New worker	Incumbent Worker	State Agency	College	Nonprofit	Sector-based Organization
Current status (%)						
Completed or still enrolled	83.2	77.8	81.4	80.4	82.9	70.7
Currently registered	32.4	33.2	26.8	39.7	33.0	33.3
Completed	50.8	44.6	54.6	40.7	49.9	37.4
Program cancelled/suspended	3.7	6.2	4.6	4.0	7.8	7.2
Left before completing	13.0	15.9	14.0	15.6	9.2	22.1
Reason for leaving apprenticeship before completing (among those who left without completing, N=366) (%)						
Lost interest in the occupation	6.0	10.0	14.8	5.6	3.9	2.8
Found a better-paying job	21.6	25.6	32.4	24.5	17.4	7.2
Disliked the employer or apprentice program	28.7	18.6	17.6	27.5	28.4	18.5
Personal or family problems	35.3	40.5	27.5	38.7	30.6	70.0
Other	8.1	4.3	5.8	3.7	19.7	1.5
Reasons related to COVID-19 pandemic	0.2	1.0	1.9	0.0	0.0	0.0
Received any degrees, certificates, or professional licenses (among those not currently enrolled, N=1,713) (%)	56.7	40.9	44.9	52.0	50.3	42.2
Employment status, by employer (among those not currently enrolled, N=1,713) (%)						
Employed, same employer that operated apprenticeship program	42.9	61.2	55.4	46.9	57.5	56.9
Employed, different employer	42.5	24.3	30.2	37.9	30.5	26.2
Not employed	14.6	14.5	14.4	15.2	12.0	16.9
Employment status, by employer (among completers, N=1,191) (%)						
Employed, same employer that operated apprenticeship program	53.8	74.2	67.0	57.8	67.4	72.6
Employed, different employer	35.3	16.3	23.6	29.3	23.2	21.7
Not employed	10.9	9.5	9.5	12.9	9.4	5.7

Sources: AAI Apprentice Survey and Apprenticeship Quarterly Performance Report (QPR) (N=2,601).
Notes: Apprentices not currently enrolled included those who completed and those who left without completing their programs. Survey means are weighted for survey non-response and imputed for item non-response. On average, respondents completed the survey about 2.7 years after enrolling in their apprenticeship. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Exhibit E-4. Earnings and Employment Outcomes, by Subgroup

	Sample	Length of follow-up (quarters)	Annual Earnings ($)				Employment Rate (%)		
			Before Program	After Program	Change	Percent Change	Before Program	After Program	PP Change
Overall	3,871	9.5	35,408	52,876	17,468	49%	84%	89%	5
Sex									
Men	2,505	9.7	38,552	55,022	16,469	43%	84%	88%	4
Women	1,366	9.2	29,531	48,865	19,334	65%	83%	90%	7
Race/Ethnicity									
White	1,941	9.6	37,293	54,249	16,956	45%	84%	89%	5
Black	829	9.2	33,778	46,411	12,633	37%	84%	87%	3
Hispanic	651	9.7	34,630	51,934	17,304	50%	85%	85%	0
Other Race	450	9.4	31,937	59,533	27,596	86%	79%	93%	14
Sex and Race/Ethnicity									
White Men	1,298	9.8	41,009	55,608	14,599	36%	84%	88%	4
Black Men	505	9.2	37,701	50,138	12,437	33%	86%	87%	1
Hispanic Men	462	9.9	37,142	54,672	17,530	47%	87%	85%	-2
Other Race Men	240	9.9	30,472	62,753	32,281	106%	75%	94%	19
White Women	643	9.2	29,614	51,441	21,827	74%	84%	91%	7
Black Women	324	9.2	27,053	40,022	12,969	48%	80%	88%	7
Hispanic Women	189	9.2	28,028	44,738	16,710	60%	82%	86%	5
Other Race Women	210	9.0	33,440	56,230	22,790	68%	84%	93%	9
Age									
24 or less	966	9.8	17,867	49,947	32,080	180%	73%	88%	15
25 to 34	1,366	9.6	36,235	53,804	17,568	48%	87%	89%	2
35 or older	1,539	9.3	44,882	53,792	8,910	20%	87%	89%	2
Veteran Status									
Veteran	495	9.4	38,942	56,410	17,469	45%	80%	88%	8
Not Veteran	3,376	9.5	34,962	52,429	17,468	50%	84%	89%	4
Occupation									
Computer/IT	389	9.4	22,563	61,835	39,272	174%	72%	90%	18
Construction	250	10.2	44,709	54,734	10,025	22%	93%	86%	-7
Healthcare	718	9.0	25,638	50,441	24,803	97%	79%	91%	12
Manufacturing	1,566	9.7	41,168	51,049	9,881	24%	89%	87%	-2
Other	948	9.5	36,253	54,113	17,860	49%	79%	90%	10
Incumbency									
Incumbent Worker	2,063	9.3	44,412	51,908	7,496	17%	93%	90%	-3
New Worker	1,808	9.8	23,895	54,113	30,217	126%	72%	87%	15

Source: National Directory of New Hires (N=3,871).

Notes: PP=percentage point. Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Exhibit E-5. Earnings Percentiles, by Subgroup

	Sample	Annual Earnings Before Program				Annual Earnings After Program			
		p25	p50	p75	p75/p25 ratio	p25	p50	p75	p75/p25 ratio
Overall	3,871	14,409	34,338	50,029	3.5	30,856	52,032	73,764	2.4
Sex									
Men	2,505	17,095	38,155	53,378	3.1	33,632	56,548	75,544	2.2
Women	1,366	11,296	26,820	40,833	3.6	27,152	43,744	67,052	2.5
Race/Ethnicity									
White	1,941	15,369	35,710	51,987	3.4	32,460	54,500	75,460	2.3
Black	829	13,106	34,160	47,054	3.6	25,656	44,904	63,972	2.5
Hispanic	651	16,784	34,836	50,156	3.0	27,368	52,376	74,404	2.7
Other Race	450	10,855	28,270	45,119	4.2	34,532	57,428	77,856	2.3
Sex and Race/Ethnicity									
White Men	1,298	17,438	40,629	57,553	3.3	33,820	56,996	76,484	2.3
Black Men	505	18,739	38,520	52,247	2.8	32,020	50,668	66,728	2.1
Hispanic Men	462	21,180	38,264	51,566	2.4	29,620	57,864	75,976	2.6
Other Race Men	240	4,721	27,094	45,648	9.7	39,956	62,904	80,920	2.0
White Women	643	11,698	27,347	41,898	3.6	31,576	45,876	71,836	2.3
Black Women	324	9,193	24,281	37,984	4.1	18,440	37,572	54,944	3.0
Hispanic Women	189	9,726	23,308	39,039	4.0	20,036	39,564	65,328	3.3
Other Race Women	210	15,673	29,084	42,665	2.7	31,048	45,928	72,188	2.3
Age									
24 or less	966	2,890	13,234	29,788	10.3	23,940	47,508	74,308	3.1
25 to 34	1,366	19,983	34,931	49,496	2.5	31,128	53,928	73,160	2.4
35 or older	1,539	28,161	42,770	60,317	2.1	33,312	52,844	73,600	2.2
Veteran Status									
Veteran	495	17,094	37,223	54,249	3.2	32,028	55,900	76,364	2.4
Not Veteran	3,376	14,033	33,758	49,609	3.5	30,856	51,512	73,116	2.4
Occupation									
Computer/IT	389	2,819	15,561	38,559	13.7	37,508	59,668	85,128	2.3
Construction	250	34,715	47,446	53,728	1.5	30,856	60,752	76,216	2.5
Healthcare	718	7,741	22,180	36,373	4.7	27,704	41,944	70,340	2.5
Manufacturing	1,566	24,652	39,780	54,716	2.2	31,828	52,584	71,224	2.2
Other	948	14,346	33,350	52,979	3.7	31,048	52,976	74,376	2.4
Incumbency									
Incumbent Worker	2,063	28,807	40,758	56,731	2.0	32,024	51,100	69,516	2.2
New Worker	1,808	3,949	17,186	41,120	10.4	27,104	54,600	77,848	2.9

Source: National Directory of New Hires (*N*=3,871).

Notes: p=percentile. Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to apprentices whose programs were expected to end by September 30, 2019, so that earnings are observed in the fifth post-program quarter. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four. Incumbent workers are apprentices who were already employed by the employer who operated the apprenticeship program prior to beginning their apprenticeship; new workers are apprentices who were not already employed by the employer who operated the apprenticeship program.

Appendix F: Expanded Results for Chapter 5

Exhibit F-1. Characteristics of AAI Pre-Apprentices

Characteristic	Mean	Standard Deviation	Sample	Number of Missing Values
Sex (%)				
Men	62.5	48.4	6,275	7
Women	37.5	48.4	6,275	7
Race/Ethnicity (%)				
White	32.6	46.9	5,884	398
Black	36.7	48.2	5,884	398
Hispanic	17.2	37.7	5,884	398
Other Race	13.5	34.2	5,884	398
Disability (%)	10.0	30.0	4,839	1,443
Veteran (%)	17.4	38.0	5,811	471
Any underrepresented population (women, people of color, veteran, or disability) (%)	87.1	33.6	4,565	1,717
Age (%)				
24 or younger	34.5	47.6	6,072	210
25 to 34	30.3	46.0	6,072	210
35 to 44	17.7	38.2	6,072	210
45 to 54	11.1	31.4	6,072	210
55 to 64	5.6	23.1	6,072	210
65 or older	0.7	8.3	6,072	210
Age (mean)	32.0	12.0	6,072	210
Highest Education (%)				
Less than High School	4.4	19.5	5,918	364
GED	8.8	27.6	5,919	364
High school diploma	45.4	49.5	5,920	364
Post-secondary or technical training	41.4	48.8	5,922	364
Marital Status (%)				
Married	25.1	43.4	4,380	1,902
Separated/divorced/widowed	10.5	30.6	4,380	1,902
Never married	64.4	47.9	4,380	1,902
Children (%)				
No children	54.3	49.8	2,591	3,691
1 child	16.8	37.4	2,591	3,691
2 children	14.1	34.8	2,591	3,691
3 children	8.8	28.3	2,591	3,691
4 or more children	6.1	23.9	2,591	3,691
Limited English language proficiency (%)	5.1	21.9	4,191	2,091
Basic literacy skills deficiency (%)	11.2	31.5	4,450	1,832
Annual earnings prior to pre-apprenticeship (%)				
$0	22.5	41.7	3,831	2,451
$1 to $9,999	25.5	43.6	3,831	2,451
$10,000 to $19,999	17.4	37.9	3,831	2,451
$20,000 to $29,999	15.5	36.2	3,831	2,451
$30,000 to $39,999	9.6	29.5	3,831	2,451
$40,000 to $49,999	4.7	21.2	3,831	2,451
$50,000 or more	4.8	21.3	3,831	2,451

Source: Apprenticeship Quarterly Performance Report (QPR) (*N*=6,282).

Exhibit F-2. Receipt of Training and Services for AAI Pre-Apprentices

Characteristic	Mean	Standard Deviation	Sample	Number of Missing Values
Training Occupation (%)				
Manufacturing	20.5	37.2	4,203	2,079
Construction	31.7	46.5	4,203	2,079
Computer/IT	22.3	41.6	4,203	2,079
Healthcare	17.0	37.6	4,203	2,079
Other	8.5	27.1	4,203	2,079
Instruction Received (respondents could select multiple options) (%)				
Hands-On Occupation Experience	82.4	38.1	4,007	2,275
Job Readiness or Life Skills	79.3	40.5	4,008	2,274
Study Skills or Test Preparation	67.7	46.8	3,751	2,531
Work-Based Learning	51.0	50.0	3,988	2,294
Adult Basic Education	30.3	46.0	3,870	2,412
GED Instruction	1.3	11.2	3,871	2,411
English as a Second Language	0.4	6.0	3,848	2,434
Hours of Hands-On Instruction (%)				
None	5.6	23.1	4,081	2,201
1 to 40 hours	7.7	26.7	4,081	2,201
41 to 80 hours	9.3	29.1	4,081	2,201
81 to 120 hours	5.9	23.6	4,081	2,201
121 to 160 hours	13.8	34.5	4,081	2,201
161 to 200 hours	16.9	37.5	4,081	2,201
201 to 240 hours	18.4	38.7	4,081	2,201
More than 240 hours	22.3	41.6	4,081	2,201
Hours (mean)	182	114	4,081	2,201
Support services received (respondents could select multiple options) (%)				
Financial support	65.7	47.5	6,282	0
Career supports	24.5	43.0	6,282	0
Academic supports	20.6	40.4	6,282	0
Social support services	5.2	22.2	6,282	0
Veteran's assistance	3.2	17.6	6,282	0
Other	3.0	17.2	6,282	0
Length of time in program (among completers, N=3,301) (%)				
Less than 30 days	9.6	29.4	3,244	57
30 to 59 days	18.8	39.1	3,244	57
60 to 89 days	21.1	40.8	3,244	57
90 to 119 days	10.0	29.9	3,244	57
120 to 149 days	10.7	30.9	3,244	57
150 to 179 days	12.3	32.8	3,244	57
180 to 209 days	4.4	20.5	3,244	57
210 days or more	13.2	33.8	3,244	57
Days in program (mean)	125	108	3,244	57
Days in program (median)	91	-	3,244	57

Source: Apprenticeship Quarterly Performance Report (QPR) (*N*=6,282).

Exhibit F-3. Completion Status, Credential Receipt, and Placement Outcomes for AAI Pre-Apprentices

Characteristic	Mean	Standard Deviation	Sample	Number of Missing Values
Completion Status (%)				
Completed	80.9	33.1	4,079	2,203
Cancelled	19.1	33.1	4,079	2,203
Credentials Received (%)				
No recognized credential	28.5	45.2	4,082	2,200
Earned credential	71.5	45.2	4,082	2,200
High school diploma or equivalent	2.3	14.9	4,082	2,200
Occupational skills licensure	8.3	27.6	4,082	2,200
Occupational skills certificate	42.7	49.5	4,082	2,200
Other recognized educational or occupational skills credential	18.3	38.6	4,082	2,200
Placement Outcome (among completers, N=3,301) (%)				
Registered apprenticeship program	63.4	49.9	2,446	855
Employment, related to training	22.9	37.6	2,446	855
Employment, not related to training	4.0	17.1	2,446	855
Employment, unknown relation to training	2.0	12.2	2,446	855
Further education	7.3	22.5	2,446	855
Military	0.3	4.3	2,446	855

Source: Apprenticeship Quarterly Performance Report (QPR) (*N*=6,282).
Note: Components may not sum to totals due to rounding.

Exhibit F-4. Training Occupation, Completion Status, and Placement Outcomes for AAI Pre-Apprentices, by Subgroup

	All Pre-Apprentices	Men	Women	White	Black	Hispanic	Other Race	24 or younger	25 to 34	35 or older
Training Occupation (N=4,203) (%)										
Manufacturing	20.5	24.6	13.3	38.9	14.3	6.9	7.6	27.7	14.3	17.4
Construction	31.7	38.4	19.7	24.4	37.1	42.7	20.9	29.3	40.3	26.0
Computer/IT	22.3	26.7	14.4	16.9	18.7	29.3	35.7	20.1	20.9	26.0
Healthcare	17.0	4.7	38.9	13.3	18.8	16.2	24.9	14.4	17.5	20.2
Other	8.5	5.7	13.7	6.5	11.1	5.0	10.9	8.6	6.9	10.4
Status (N=4,079) (%)										
Completed	80.9	82.2	78.6	87.2	76.9	80.6	81.0	83.9	81.9	77.6
Cancelled	19.1	17.8	21.4	12.8	23.1	19.4	19.0	16.1	18.1	22.4
Placement Outcome (among completers, N=3,301) (%)										
Registered apprenticeship program	63.4	57.7	73.2	61.3	63.0	67.9	66.8	58.5	73.2	59.5
Employment, related to training	22.9	27.2	15.7	23.3	22.6	21.8	21.1	22.8	17.7	27.7
Employment, not related to training	4.0	4.1	4.0	5.0	5.7	1.6	1.4	4.2	2.7	5.7
Employment, unknown relation to training	2.0	1.8	2.4	0.7	4.2	1.7	0.4	2.3	1.3	2.5
Further education	7.3	8.7	4.7	9.3	4.2	6.9	10.0	11.5	5.1	4.5
Military	0.3	0.3	0.1	0.4	0.1	0.0	0.4	0.6	0.1	0.0

(continued)

	Manufacturing	Construction	Computer/IT	Healthcare	Other
Status (N=4,079) (%)					
Completed	86.7	85.0	78.3	69.5	80.1
Cancelled	13.3	15.0	21.7	30.5	19.9
Program Outcome (among completers, N=3,301) (%)					
Registered apprenticeship program	33.7	84.1	29.2	93.5	75.6
Employment, related to training	38.3	11.0	49.0	2.3	11.0
Employment, not related to training	6.6	4.5	0.9	1.8	8.7
Employment, unknown relation to training	4.9	0.1	2.9	1.2	2.6
Further education	15.5	0.4	17.5	1.2	2.2
Military	0.8	0.0	0.4	0.0	0.0

Source: Apprenticeship Quarterly Performance Report (QPR) (sample size is noted for each outcome).

Exhibit F-5. Employment and Earnings Outcomes for AAI Pre-Apprentices

	Sample	Annual Earnings ($)				Employment (%)		
		Before Program	After Program	Change	Percent Change	Before Program	After Program	PP Change
Overall	2,161	14,699	28,150	13,451	92%	63%	83%	20
Sex								
Men	1,384	15,250	28,758	13,508	89%	63%	84%	21
Women	777	13,717	27,069	13,351	97%	63%	81%	18
Race/Ethnicity								
White	649	15,594	29,081	13,487	86%	62%	82%	19
Black	902	12,969	25,038	12,069	93%	62%	82%	19
Hispanic	401	14,358	27,974	13,616	95%	64%	83%	19
Other Race	209	20,039	39,033	18,994	95%	66%	88%	22
Age								
24 or less	863	8,960	23,886	14,926	167%	57%	84%	26
25 to 34	697	18,039	30,606	12,567	70%	70%	83%	13
35 or older	601	19,066	31,425	12,359	65%	63%	80%	18
Occupation								
Computer/IT	331	17,483	33,312	15,829	91%	56%	79%	23
Construction	776	16,385	29,023	12,638	77%	69%	85%	15
Healthcare	383	11,874	25,157	13,283	112%	58%	81%	24
Manufacturing	476	13,547	26,073	12,526	92%	62%	83%	21
Other	195	11,621	26,866	15,245	131%	62%	82%	19

Source: National Directory of New Hires (*N*=2,161).

Notes: PP=percentage point. Results include data through December 2020. Sample includes participants with a valid Social Security number in the Apprenticeship Quarterly Performance Report (QPR) and is restricted to pre-apprentices whose programs ended by September 30, 2019, so that earnings are observed in the fifth post-program quarter. The sample includes both survey respondents and nonrespondents, as well as those who completed the program and those who did not complete. "Annual earnings before program" is calculated as the sum of earnings in the four quarters before starting the program. "Annual earnings after program" is calculated as earnings in the fifth quarter after the expected program completion date multiplied by four.