

# **Postsecondary Credential Workforce Gap Analysis Commonwealth of Pennsylvania**

March 2024

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# Executive Summary

In October of 2023, the Pennsylvania Department of Education (PDE) retained Baker Tilly to study the gap between postsecondary credentials (certificates and degrees from colleges and universities) and workforce demand from employers across all sectors and regions in the statewide economy in 2023 and through 2032. All analyses detailed below are based on the current structure and funding of Pennsylvania's postsecondary sector and do not include an analysis of how any potential reform measures would address postsecondary workforce credential gaps. **The analyses indicate that Pennsylvania's demand for workers with postsecondary-level skills and credentials is greater than the current supply and greater than the future supply that postsecondary institutions are positioned to produce. Further, the analyses provide additional detail regarding workforce credential gaps in of each of five regions of the Commonwealth.**

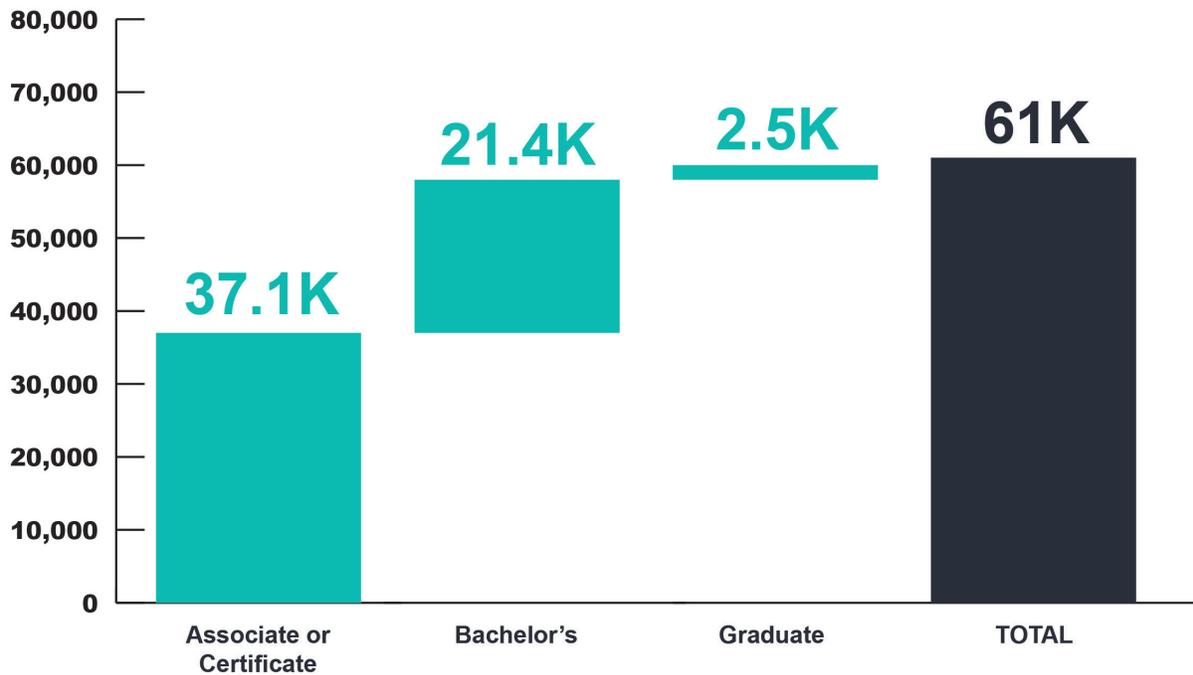
## Key Findings

- In 2023, demand for postsecondary-level skilled Pennsylvanians exceeded the credential workers supplied by Pennsylvania postsecondary institutions, resulting in a workforce credential gap of approximately 61,000. The largest workforce credential gaps are for jobs that typically require associate and certificate credentials and for jobs that typically require bachelor's degrees.
- Workforce credential gaps exist in all regions of Pennsylvania and are most acute in the Southeast, Southwest, and Northeast regions of the Commonwealth. The parameters of the workforce credential gap in each region varies due to substantial differences in terms of population and demographics, the employment sector, and the particular configuration of postsecondary institutions present.
- By 2032, there will be a projected workforce shortage of 218,000 workers with postsecondary-level skills and credentials, driven by projected job growth and a shrinking workforce in the Commonwealth.
- To eliminate the projected postsecondary workforce shortage of 218,00 by 2032, Pennsylvania will need to increase its postsecondary attainment rate by 4.4%

## 61,000 WORKFORCE CREDENTIAL GAP STATEWIDE IN 2023

As a result of the supply and demand mismatch, Pennsylvania colleges and universities produced an estimated 61,000 fewer postsecondary credentials than the economy required in 2023 – a workforce credential gap. When examining this gap by credential and degree type, the workforce credential gap totaled approximately 37,000 associate degrees and certificates (61%), 21,400 bachelor's degrees (35%), and 2,500 graduate degrees (4%) (See Figure 0.1).

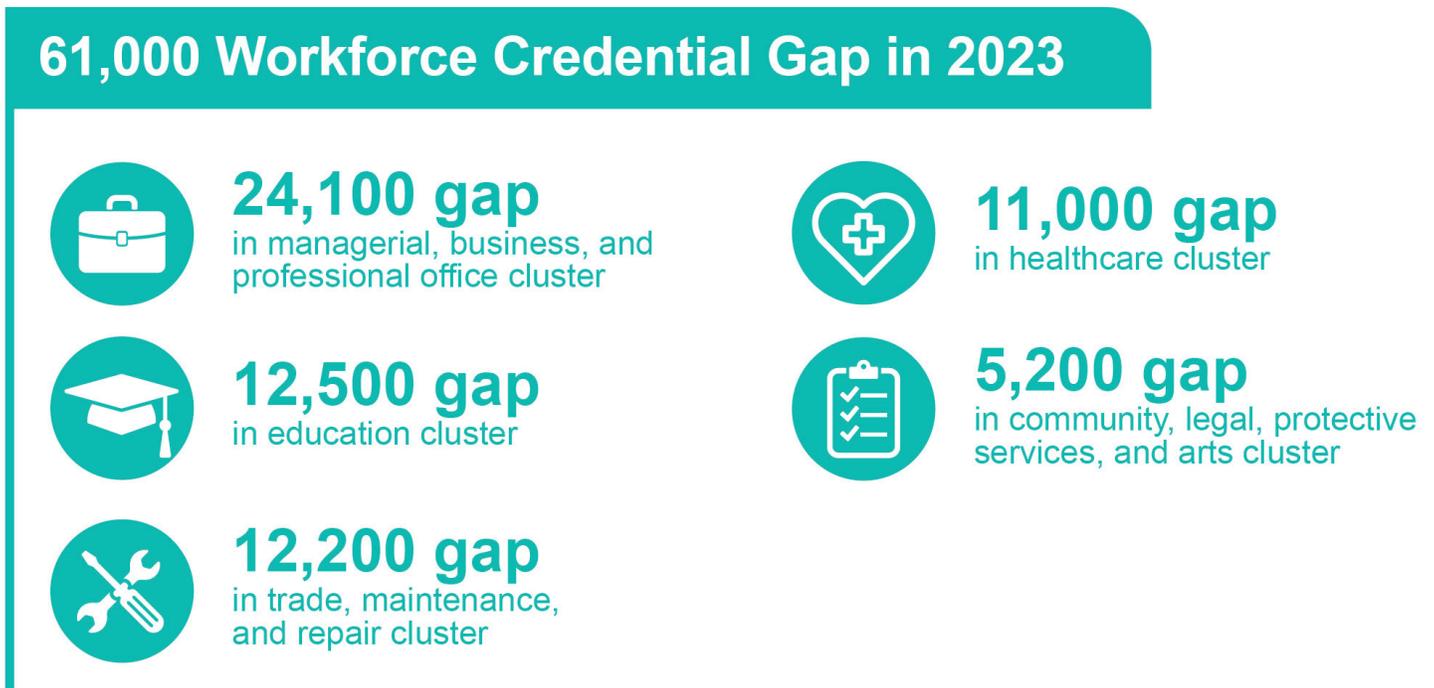
Figure 0.1 2023 Statewide Workforce Credential Gap by Postsecondary Credential Type



Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Baker Tilly Analysis

Occupational clusters facing the largest workforce credential gaps for postsecondary-level workers include managerial, business, and professional office; education; trades, maintenance, and repair; healthcare; and community, legal, protective services, and arts (Figure 0.2).

Figure 0.2 Statewide Workforce Credential Gap in 2023

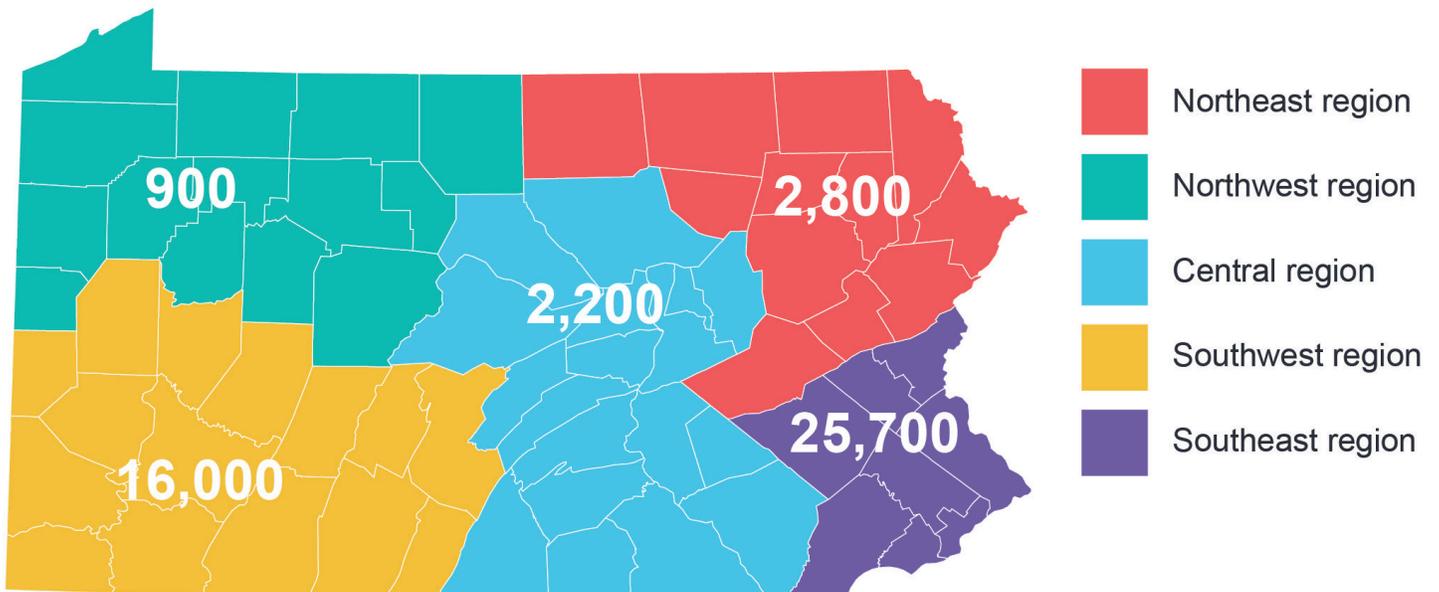


Note: Does not include the surplus in the STEM occupational cluster of approximately 4,000.  
Source: Baker Tilly Analysis

## WORKFORCE CREDENTIAL GAPS EXIST IN ALL PENNSYLVANIA REGIONS IN 2023

In all regions in the Commonwealth, 2023 demand for workers with postsecondary-level skills and credentials exceeded the postsecondary credential supply from postsecondary institutions within the region. Across the five Pennsylvania regions, the largest workforce credential gaps were identified in the Southeast (25,700) and Southwest (16,000) (Figure 0.3). In terms of viewing the gap (or unfilled demand) as a percentage of total demand for postsecondary-level skilled and credentialed workers, three regions (Northeast, Southeast, and Southwest) only had approximately 50% of their demand met by their regional 2023 credential supply.

Figure 0.3 **2023 Workforce Credential Gap by Region**



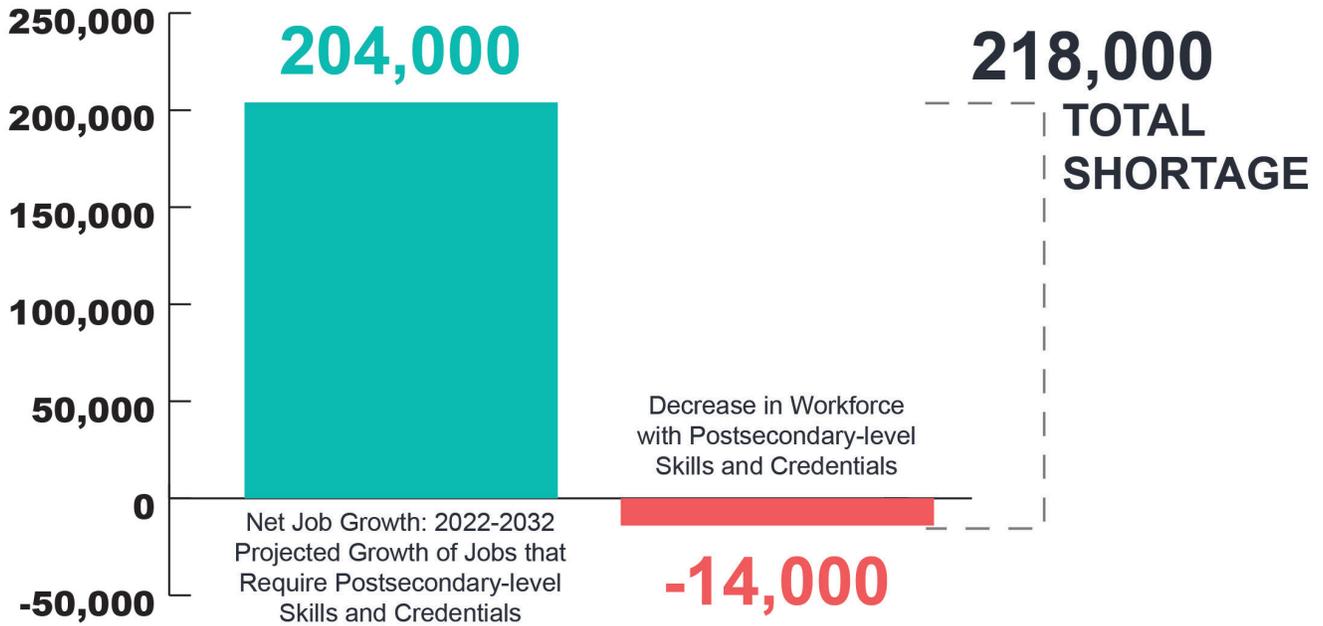
*Note: Regional workforce credential gap utilizes a different metric for workforce demand than the statewide workforce credential gap.*

*Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Baker Tilly Analysis*

## LONG-TERM POSTSECONDARY-LEVEL SKILLED WORKFORCE SHORTAGE OF 218,000

While Pennsylvania's workforce is projected to age and shrink, the demand for a workforce with postsecondary-level training continues to grow, resulting in an even more acute need for workers with postsecondary-level skills in the next 10 years. By 2032, Pennsylvania is expected to add approximately 204,000 new jobs that require some postsecondary education – a nearly 7% increase over current levels. However, the size of the Pennsylvania workforce with postsecondary-level skills and credentials is projected to shrink approximately 14,000 over the same period, primarily driven by an aging population and declining postsecondary enrollment of recent high school graduates. Due to the projected job growth and shrinking workforce, there is a projected shortage of about 218,000 workers with postsecondary-level skills and credentials in 2032 (Figure 0.4).

Figure 0.4 Pennsylvania Projected 2032 Postsecondary-level Skilled Workforce Shortage



Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, Center for Rural Pennsylvania, U.S. Census Bureau, U.S. Bureau of Labor Statistics, Baker Tilly Analysis

Figure 0.5

**WHAT IS A WORKFORCE CREDENTIAL GAP?** The workforce credential gap represents the difference between demand for workers with postsecondary-level skills and credentials from Pennsylvania’s postsecondary institutions adjusted for reenrollment and out-migration assumptions. The gap does not include assumptions for in-migration of credentialed workers into Pennsylvania. Without increases to degree production, employers will need to find employees from the current workforce or recruit employees from outside of the state.

Source: Baker Tilly Analysis

# 1.0 Background of Workforce Credential Gap Analysis

The research and analysis presented in this report is part of a larger project conducted by the Pennsylvania Department of Education that explores the extent to which Pennsylvania’s postsecondary sector meets current demands for a workforce with postsecondary credentials and degrees within the Commonwealth and whether it is positioned to meet these needs in the future. All analyses detailed below are based on the current structure and funding of Pennsylvania’s postsecondary sector and do not include an analysis of how any potential reform measures would address postsecondary workforce credential gaps.

This analysis focused on three primary questions:

1. What is the alignment between the current demand for jobs that typically require postsecondary degrees and credentials in the Commonwealth and the supply of postsecondary credentials being produced currently by Pennsylvania postsecondary institutions?
2. How does the alignment of job demand and postsecondary credential supply differ by region given vastly different population bases and economic needs?
3. How well prepared will the Pennsylvania workforce be to meet the postsecondary credential and skill demands of the economy in 2032?

To best answer these questions, three separate analyses were conducted. All three analyses indicate that Pennsylvania’s demand for workers with postsecondary credentials is greater than the current supply and greater than the future supply that postsecondary institutions are positioned to produce absent any major reforms. The methodology used for each analysis is summarized below.

## Analysis One: Statewide 2023 Workforce Credential Gap

Figure 1.1 Statewide 2023 Credential Gap Calculation



Source: Baker Tilly Analysis

This analysis indicates statewide differences between 2023 annual demand for jobs that typically require postsecondary credentials and postsecondary credential supply by Pennsylvania postsecondary institutions. The analysis considers segmentation by both credential type (e.g., bachelor’s degree) and occupational clusters (e.g., education). It does not provide an analysis by specific job titles (e.g., elementary school teacher). Job demand and postsecondary credential supply are compared using National Center for Education Statistics’ (Classification of Instructional Programs – Standard Occupational Classification (NCES CIP-SOC) crosswalk<sup>1</sup> and methodology to compare postsecondary credential supply with six occupational clusters and three postsecondary credential types (leading to 18 total combinations of occupational clusters and postsecondary credential types). Occupational clusters were assigned to aggregate 867 occupations or job titles within the Bureau of Labor Statistics’ Standard Occupation Classification (SOC) to present an accessible analysis for the Commonwealth. These 18 total combinations include all jobs that typically require some postsecondary education, except for culinary (e.g. chef) or personal care (e.g. hair stylist) occupations.<sup>2</sup>

### Analysis Two: Regional 2023 Workforce Credential Gap

Figure 1.2 Regional 2023 Credential Gap Calculation



Source: Baker Tilly Analysis

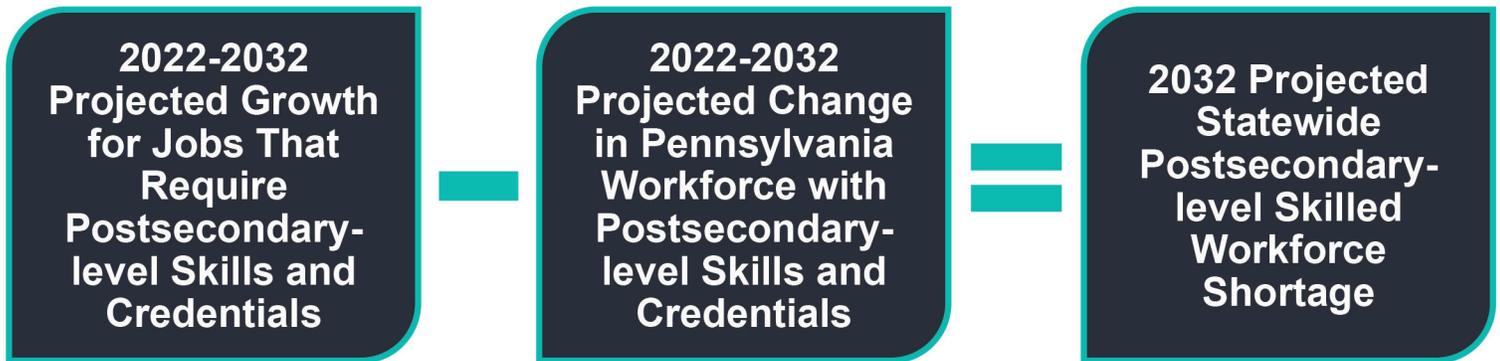
This analysis details regional differences between job openings as of October 2023 in specific regions as well as postsecondary credential supply in the same region by occupational clusters (e.g., healthcare) and postsecondary credential type (e.g., bachelor’s degrees), but not to specific job titles (e.g., registered nurse). Job opening data was utilized because the statewide demand data used in this report’s section 2.0 (Statewide 2023 Workforce Credential Gap) was not available at the regional level.

<sup>1</sup> Additional information on the NCES CIP-SOC crosswalk can be found at <https://nces.ed.gov/ipeds/cipcode/post3.aspx?y=56>.

<sup>2</sup> Six occupational clusters and three credential types included in this analysis account for 97.1% of all jobs that typically require postsecondary education.

## Analysis Three: 2032 Statewide Workforce Credential and Postsecondary-level Skills Shortage

Figure 1.3 Statewide 2032 Postsecondary-level Skilled Workforce Shortage



Source: Baker Tilly Analysis

This analysis examines the difference between the 2022-2032 projected growth of jobs requiring postsecondary credentials and degrees and the projected change in the size of the workforce with postsecondary-level skills and credentials by 2032.

A postsecondary-level skilled workforce includes Pennsylvanians aged 25-64<sup>3</sup> who have received some postsecondary education and participate in the workforce. A shortage is defined as a cumulative difference in the job growth and the change in the size of the workforce. For the purposes of this analysis, only jobs that typically require postsecondary-level skills and credentials were analyzed. Analysis is presented in 10-year age bands to illuminate the drivers of the postsecondary-level skilled workforce shortage.

<sup>3</sup> In this analysis, working age is defined as 25-64. When comparing educational attainment and occupational statistics, this age grouping is typically used. As an example, BLS Employment Projections calculates educational attainment by specific occupations for workers over 25 years and older. <https://www.bls.gov/emp/tables/educational-attainment.htm>

## 2.0 Statewide 2023 Workforce Credential Gap

This analysis compares the annual demand for jobs that require postsecondary-level skills and credentials in Pennsylvania to the supply of newly credentialed workers from Pennsylvania's postsecondary institutions. To complete this analysis, it was vital to understand 1) employers' demand for jobs that typically require postsecondary-level skills and credentials, 2) the supply of credentialed workers, and 3) the difference between the two. This research provides both a critical data foundation and insight for stakeholders across the commonwealth to make strategic and tactical decisions to fuel Pennsylvania's economy and workforce.

The statewide 2023 workforce credential gap analysis provides data in the following areas:

- Pennsylvania's annual demand for jobs that typically require postsecondary-level skills and credentials, grouped into "occupational clusters," and the credentials typically required for the jobs.<sup>4</sup>
- Current credentials awarded by Pennsylvania's postsecondary institutions and the subsequent annual supply of credentialed workers entering Pennsylvania's workforce.
- The degree of alignment between Pennsylvania's current demand for jobs that typically require postsecondary-level skills and credentials<sup>5</sup> and the postsecondary credential supply.

The following assumptions and caveats should be considered when reviewing this current workforce credential gap analysis:

- The analysis is focused on the alignment between supply and demand in occupational job clusters and the postsecondary credentials needed to meet the demand. The analysis does not provide details regarding the specific academic majors or areas of study needed to meet demand, nor does it provide analysis by region (for regional analysis see Section 3: Regional 2023 Workforce Credential Gap Analysis).
- Workforce credential gap analysis considers only the supply of postsecondary credentials and degrees produced by Pennsylvania's postsecondary institutions. It does not consider individuals with such credentials who might move to Pennsylvania.
- Analysis of employer demand for jobs that typically require postsecondary-level skills and credentials, as well as postsecondary credential supply, lag real-time data and may not fully capture demand and supply changes.
- The analysis does not consider the number of Pennsylvanians who develop and earn postsecondary-level skills and credentials at institutions that do not report credential award data through public data sources.
- Newly credentialed workers are not the only source of supply for jobs that typically require postsecondary-level skills and credentials. Other supply sources could include already employed workers, unemployed workers with postsecondary-level skills and credentials, and underemployed workers with postsecondary-level skills and credentials. However, the unemployment rate in Pennsylvania is currently 3.4%, which is close to a ten-year low. This indicates that there is a limited supply of additional workers who have already obtained postsecondary credentials to fill these gaps.<sup>6</sup>

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<sup>4</sup> Occupational clusters are defined as occupations classified by O\*NET to typically require an associate's degree or higher in order to be adequately prepared to perform.

<sup>5</sup> Definition of jobs that typically require postsecondary-level skills and credentials or occupations and other key terms can be found in the glossary (Appendix A).

<sup>6</sup> <https://www.bls.gov/eag/eag.pa.htm>

## 2.1 EVALUATING 2023 JOB DEMAND FOR POSTSECONDARY-LEVEL SKILLS AND CREDENTIALS

### 2.1.1 BACKGROUND OF ANALYSIS

The skills and knowledge required of the workforce by employers in Pennsylvania was used to evaluate the demand for jobs that typically require postsecondary-level skills and credentials and compute the postsecondary workforce credential gap.

This analysis focuses nearly exclusively on the demand for jobs that typically require postsecondary-level skills and credentials or occupations that typically require some level of postsecondary education. The figures and tables below provide the 2023 demand for newly credentialed workers in Pennsylvania by job description (which are aggregated into “occupational clusters”) and categorized by credential level (e.g., certificate and associate degrees, bachelor’s degrees, or graduate degrees). The analysis demonstrates an ongoing need for new workers with postsecondary-level skills and credentials to fulfill the demands of a growing economy in Pennsylvania.

### 2.1.2 DATA SOURCES AND METHODOLOGY

#### Defining Annual Demand

Annual demand is derived from the Pennsylvania Department of Labor and Industry’s Center for Workforce Information and Analysis (CWIA)’s Occupational Employment 2022-2024 Short-Term Forecast (short-term forecast), which provides jobs that typically require postsecondary-level skills and credentials. The CWIA forecast follows a methodology<sup>7</sup> developed by the U.S. Bureau of Labor Statistics (BLS). CWIA forecasts are available at the detailed six-digit Standard Occupational Classification (SOC) level but are part of an overall classification that enables aggregation.<sup>8</sup> For this analysis, two-digit SOC codes were used and then aggregated into occupational clusters.

The short-term forecast includes the 2022 estimated employment and total demand. Estimated employment refers to the number of jobs in the Pennsylvania economy, while total demand reflects a projection of the number of annual job openings. Total demand includes occupational openings from one of the three following sources: growth, exits, and transfers. Growth is defined as the number of net new jobs or new positions created in that occupation. Exits refer to the number of employees whose jobs need to be replaced, retiring or exiting the workforce entirely. Transfers are employees changing employment from one occupation to another.

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<sup>7</sup> [https://www.workstats.dli.pa.gov/Documents/Forecasts/STOF\\_Methodology.pdf](https://www.workstats.dli.pa.gov/Documents/Forecasts/STOF_Methodology.pdf)

<sup>8</sup> From BLS: *The Standard Occupational Classification (SOC) is a system where all workers are classified into one of 867 detailed occupations according to their occupational definition. To facilitate classification, detailed occupations are combined to form 459 broad occupations, 98 minor groups, and 23 major groups. The more digits in the SOC code, the more detailed the job description (i.e., six-digit SOC codes will be aggregated eventually into two-digit SOC codes). Detailed occupations in the SOC with similar job duties, and in some cases skills, education, and/or training, are grouped together. (<https://www.bls.gov/soc/>)*

For this analysis, CWIA's data is used, but with a slightly modified definition and described as "annual demand." Annual demand is the combination of job growth and exits, but it excludes job transfers. Job transfers signify a loss for one occupation and a gain for another. This methodology aligns with similar research studies calculating workforce credential gaps.<sup>9</sup>

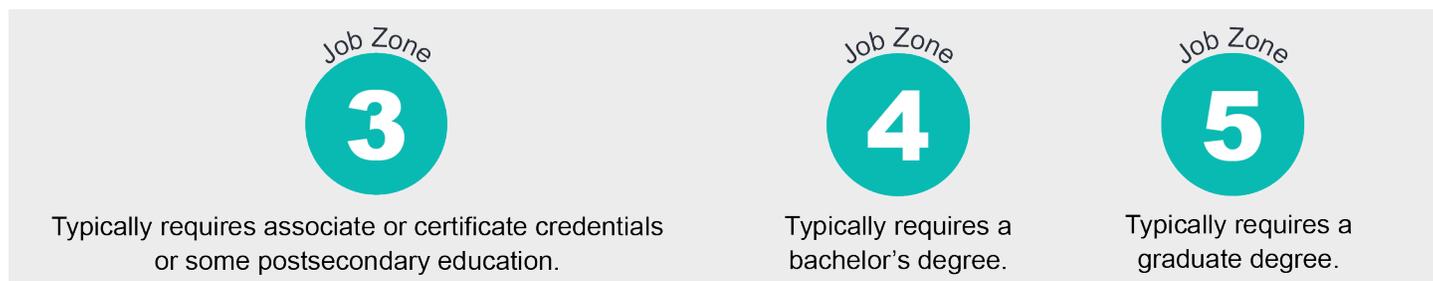
### Identifying Jobs That Typically Require Postsecondary-level Skills and Credentials

Occupations that typically require postsecondary-level skills and credentials were identified to compare annual demand with postsecondary credential supply. This analysis defines occupations that typically require a postsecondary credential or some postsecondary education as "occupations that typically require post-secondary level skills and credentials" or "jobs that typically require postsecondary-level skills and credentials." Postsecondary credential levels that typically are required for job occupation titles were defined using terminology from the O\*NET program.<sup>10</sup> The database of skills, knowledge, and credentials required for a given job is determined through surveys of occupation experts and workers from each occupation. The O\*NET database divides all job occupation titles into "Job Zones," which are described on O\*NET's website as, "a group of occupations that are similar in:

- How much education people need to do the work.
- How much related experience people need to do the work.
- How much on-the-job training people need to do the work."

Job Zones range from 1 (lowest level of education required) to 5 (highest level of education required), with Job Zones 3, 4, and 5 typically requiring at least some postsecondary-level skills or education (see Figure 2.1 below). In this analysis, 2023 annual demand is segmented by the postsecondary credential type typically required to fulfill the role.<sup>11</sup>

Figure 2.1 Occupations That Typically Require Postsecondary-level Skills and Credentials



Source: O\*NET, Baker Tilly Analysis

<sup>9</sup> Gronberg et al. (2022) Workforce demand and the skills gap in Texas. Texas A&M University Private Enterprise Research Center. Retrieved October 26, 2023, from [https://bush.tamu.edu/wp-content/uploads/2023/03/workforce\\_demand.pdf](https://bush.tamu.edu/wp-content/uploads/2023/03/workforce_demand.pdf).

Leigh, D. E., & Gill, A. M. (2007). Do community colleges respond to local needs?: Evidence from California. W.E. Upjohn Institute for Employment Research. Retrieved January 7, 2024, from [https://research.upjohn.org/up\\_press/16/](https://research.upjohn.org/up_press/16/)

<sup>10</sup> <https://www.onetonline.org/help/online/zones>

<sup>11</sup> Two adjustments to the O\*Net classification were made for this analysis. Occupations within the personal care and culinary occupation codes were reassigned to O\*NET Job Zone 2 to remove occupations that may require credential codes aligned with institutions that primarily provide private technical programming and are not aligned with the purpose of this study. Registered nurses were reclassified from Job Zone 5 to Job Zone 4 to reflect the job requirements of the occupation more accurately.

### **2.1.3 2023 JOB DEMAND FOR POSTSECONDARY-LEVEL SKILLS AND CREDENTIALS**

The Pennsylvania economy had 6.29 million jobs in 2022. Occupations that require postsecondary-level skills and credentials (jobs in Job Zones 3-5) consisted of 2.96 million of the overall totals, or 47.1% of the total jobs in 2022. Occupations that typically require postsecondary-level skills and credentials in Pennsylvania are projected to grow more rapidly than occupations that do not require postsecondary credentials over the next ten years. A more detailed discussion of forecasted demand growth for jobs that typically require postsecondary-level skills and credentials is in Section 4.2: Projected Growth of Jobs that Require Postsecondary Credentials or Degrees.

Figure 2.2 presents the 2022 estimated occupational employment by Job Zone. Pennsylvania Occupational employment reflects the total number of jobs in the Commonwealth. Occupations that require an associate degree or certificate credential (Job Zone 3) make up 37.6%, or 1.11 million of the total jobs that typically require postsecondary-level skills and credentials in Pennsylvania.<sup>12</sup> Positions in Job Zone 4, typically requiring a bachelor's degree, make up 46.9% of the total positions typically requiring postsecondary-level skills and credentials, or 1.39 million jobs. Job Zone 5, typically requiring graduate degrees, consists of 0.46 million jobs or 15.5% of the total occupations that typically require postsecondary-level skills and credentials in Pennsylvania.

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<sup>12</sup> Sub-totals do not sum to totals presented in short-term forecast. Less than 1% of six-digit SOC Code data in the short-term forecast is suppressed due to BLS' confidentiality guidelines, which require the suppression of values below a certain threshold to protect the identity of survey respondents. Only six-digit data is presented in table Figure 2.2.

Figure 2.2 Pennsylvania 2022 Estimated Occupational Employment by Job Zone

<b>Jobs by Category</b>	<b>2022 Estimated Occupational Employment</b>	<b>% of 2022 Estimated Occupational Employment</b>	<b>% of 2022 Estimated Occupational Employment in Job Zones 3-5</b>
<b>Pennsylvania, Total Jobs</b>	<b>6,289,310</b>	<b>100.0%</b>	
<b>Jobs That Do Not Typically Require Postsecondary-level Skills and Credentials (Job Zones 1-2)</b>	<b>3,329,900</b>	<b>52.9%</b>	
Job Zone 1: Jobs That Do Not Typically Require Postsecondary-level Skills and Credentials	376,360	6.0%	
Job Zone 2: Jobs That Do Not Typically Require Postsecondary-level Skills and Credentials	2,929,500	46.6%	
<b>Jobs That Typically Require Postsecondary-level Skills and Credentials (Job Zones 3-5)</b>	<b>2,959,410</b>	<b>47.1%</b>	<b>100.0%</b>
Job Zone 3: Typically Requiring Associate degree or certificate credentials	1,113,460	17.7%	37.6%
Job Zone 4: Typically Requiring Bachelor's Degrees	1,387,080	22.1%	46.9%
Job Zone 5: Typically Requiring Graduate Degrees	458,870	7.3%	15.5%

Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, O\*NET, Baker Tilly Analysis

The 2022 job totals were used as a base year to calculate the 2023 annual demand. The 2023 annual demand is the difference in job growth between 2023 and 2022 in addition to projected job exits (e.g. retirements). Figure 2.3 presents the 2023 annual demand for occupations that require postsecondary-level skills and credentials. Annual demand was 52,797 for jobs in Job Zone 3 or jobs that typically require associate degrees or certificate credentials. The annual demand was 53,418 for occupations in Job Zone 4 or jobs that typically require bachelor’s degrees.

Figure 2.3 Pennsylvania Demand for Jobs That Typically Require Postsecondary-level Skills and Credentials by Job Zone/Credential Type

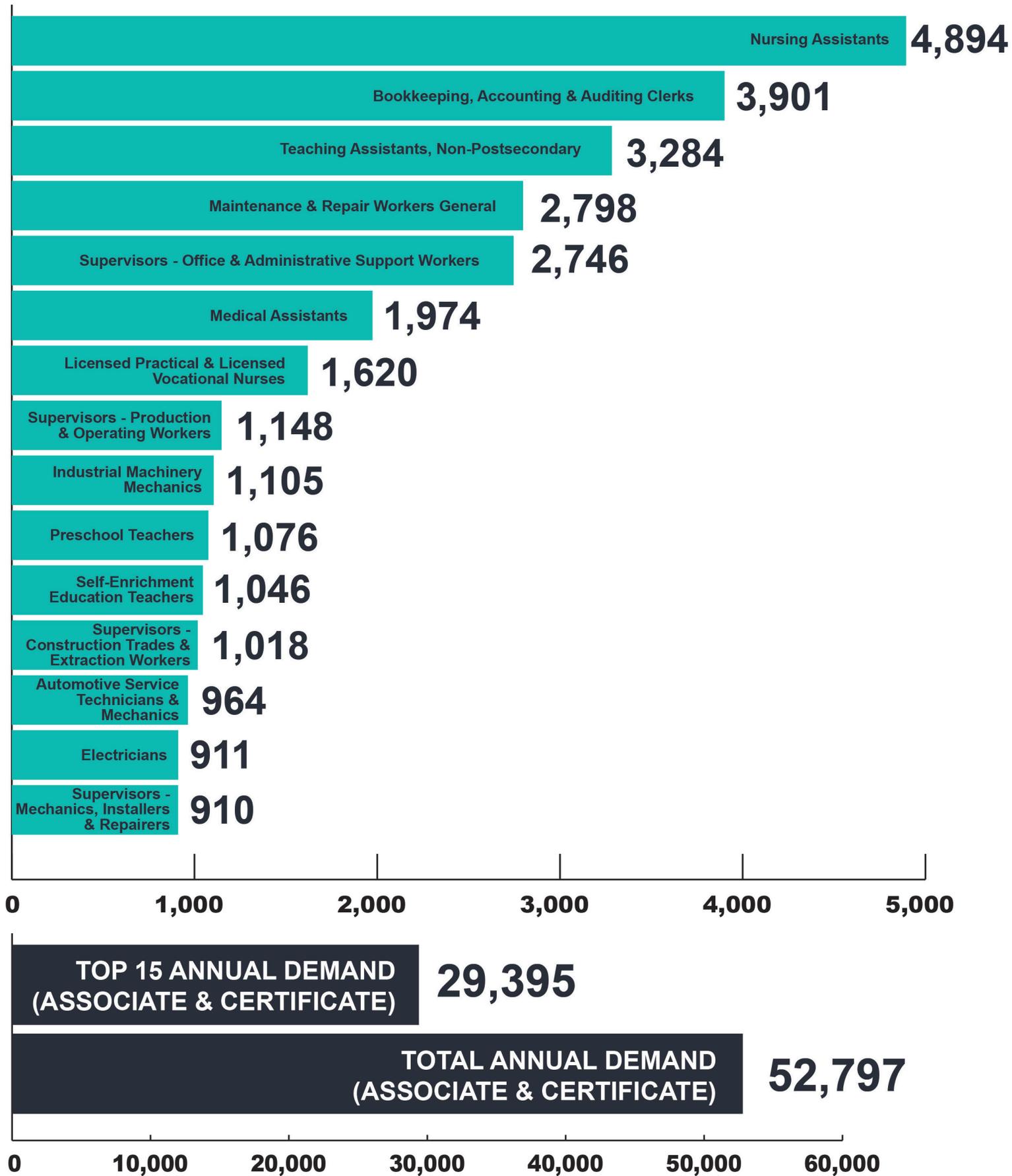
<b>Jobs by Category</b>	<b>2023 Annual Demand</b>
<b>Jobs Requiring Postsecondary-level Skills and Credentials (Job Zones 3-5)</b>	<b>125,829</b>
Job Zone 3: Typically Requiring Associate degree or certificate credentials	52,797
Job Zone 4: Typically Requiring Bachelor’s Degree	53,418
Job Zone 5: Typically Requiring Graduate Degree	19,614

Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, O\*NET, Baker Tilly Analysis

**2.1.3A HIGH-DEMAND OCCUPATIONS TYPICALLY REQUIRING ASSOCIATE DEGREE OR CERTIFICATE CREDENTIALS**

Figure 2.4 shows the top 15 occupational titles that typically require associate degree or certificate credentials by 2023 demand. The top 15 positions account for 55.7% of the 2023 annual demand for occupations typically requiring associate degree or certificate credentials.

Figure 2.4 Pennsylvania High-Demand Occupations That Typically Require Associate Degree or Certificate Credentials by 2023 Annual Demand

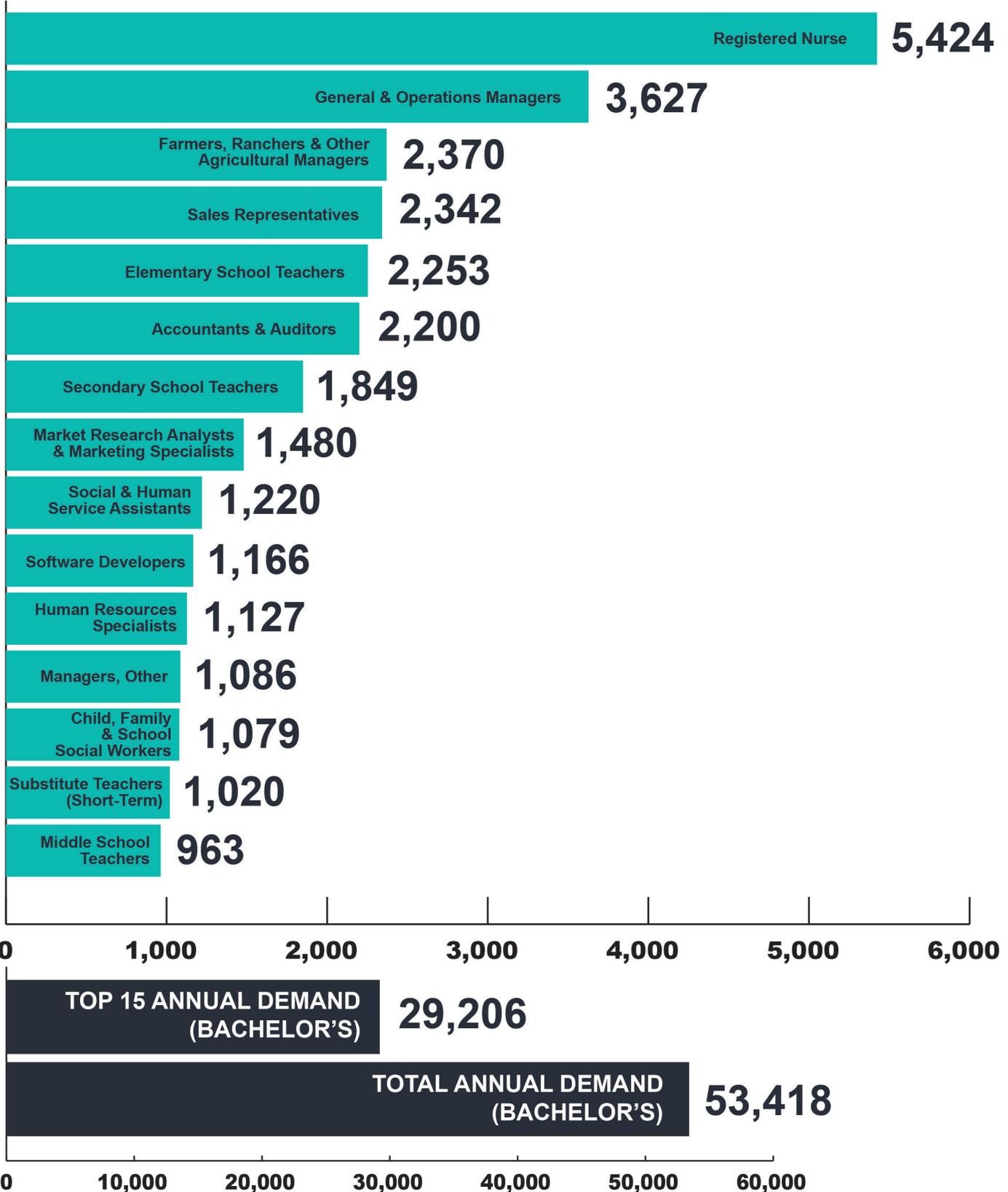


Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, O\*NET, Baker Tilly Analysis

### 2.1.3B HIGH-DEMAND OCCUPATIONS TYPICALLY REQUIRING BACHELOR'S DEGREES

Figure 2.5 shows the top 15 occupational titles by 2023 annual demand that typically require a bachelor's degree. These account for 54.7% of the 2023 annual demand for occupations typically requiring bachelor's degree credentials.

Figure 2.5 Pennsylvania High-Demand Occupations That Typically Require Bachelor's Degrees by 2023 Annual Demand

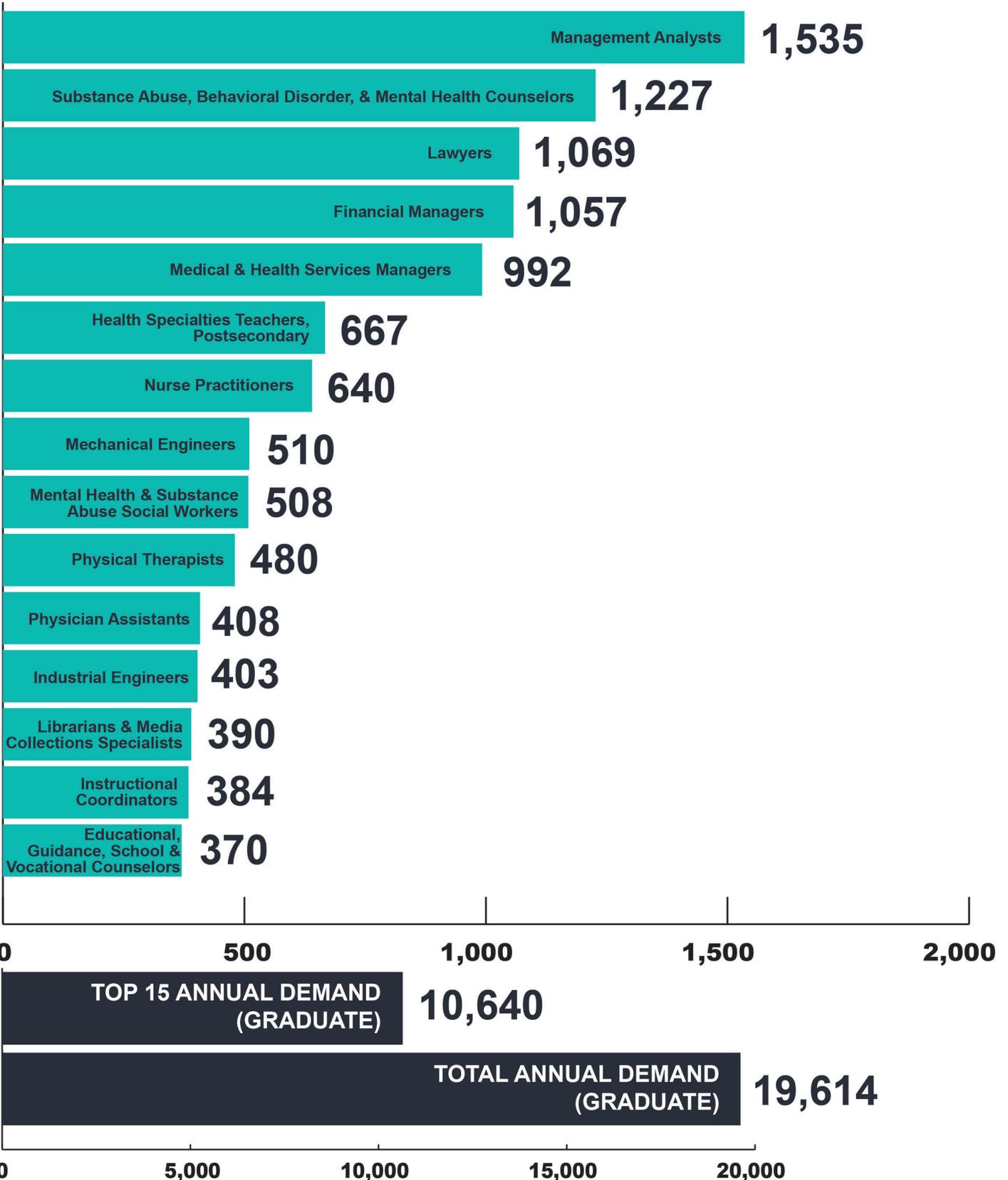


Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, O\*NET, Baker Tilly Analysis

### 2.1.3C HIGH-DEMAND OCCUPATIONS TYPICALLY REQUIRING GRADUATE DEGREES

Figure 2.6 shows the top 15 occupational titles by 2023 annual demand that typically require a graduate degree. They account for 54.2% of the 2023 annual demand for occupations typically requiring a graduate degree credentials.

Figure 2.6 Pennsylvania High-Demand Occupations That Typically Require Graduate Degrees by 2023 Annual Demand



Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, O\*NET, Baker Tilly Analysis

### 2.1.4 2023 JOB DEMAND BY OCCUPATIONAL CLUSTERS

A key step in the demand analysis is the aggregating of individual occupational titles (e.g. nursing assistant) into six occupational clusters (e.g. healthcare). Occupational titles are provided by the Bureau of Labor Statistics SOC taxonomy, which includes 867 six-digit occupational titles. The six-digit occupational titles are part of 23 occupational groups, or two-digit SOC codes. Because this analysis aimed to understand high-level job demand and postsecondary credential supply, these 23 two-digit SOC codes were aggregated into six “occupational clusters” that align with other studies.<sup>13</sup> Figure 2.7 provides the mapping of two-digit SOC codes to occupational clusters.

Figure 2.7 Mapping of Two-Digit SOC Codes to Occupational Clusters

Two-Digit SOC Code	Occupational Cluster
11 - Management Occupations	Managerial, Business, and Professional Office
13 - Business and Financial Operations Occupations	Managerial, Business, and Professional Office
41 - Sales and Related Occupations	Managerial, Business, and Professional Office
43 - Office and Administrative Support Occupations	Managerial, Business, and Professional Office
15 - Computer and Mathematical Occupations	STEM
17 - Architecture and Engineering Occupations	STEM
19 - Life, Physical, and Social Science Occupations	STEM
21 - Community and Social Service Occupations	Community, Legal, Protective Services, and Arts
23 - Legal Occupations	Community, Legal, Protective Services, and Arts
27 - Arts, Design, Entertainment, Sports, and Media Occupations	Community, Legal, Protective Services, and Arts
33 - Protective Service Occupations	Community, Legal, Protective Services, and Arts
29 - Healthcare Practitioners and Technical Occupations	Healthcare
31 - Healthcare Support Occupations	Healthcare
37 - Building and Grounds Cleaning and Maintenance Occupations	Trade, Maintenance, and Repair
45 - Farming, Fishing, and Forestry Occupations	Trade, Maintenance, and Repair
47 - Construction and Extraction Occupations	Trade, Maintenance, and Repair
49 - Installation, Maintenance, and Repair Occupations	Trade, Maintenance, and Repair

<sup>13</sup> Occupational clusters were developed specifically for this analysis but generally align with McCourt School of Public Policy Center on Education and the Workforce, “After Everything: Projections of Jobs, Education, and Training Requirements through 2031” (2023).

Two-Digit SOC Code	Occupational Cluster
51 - Production Occupations	Trade, Maintenance, and Repair
53 - Transportation and Material Moving Occupations	Trade, Maintenance, and Repair
25 - Educational Instruction and Library Occupations	Education

*Note: Standard Occupational Classification (SOC) system is a federal statistical standard used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data*  
*Source: U.S. Bureau of Labor Statistics, Baker Tilly Analysis*

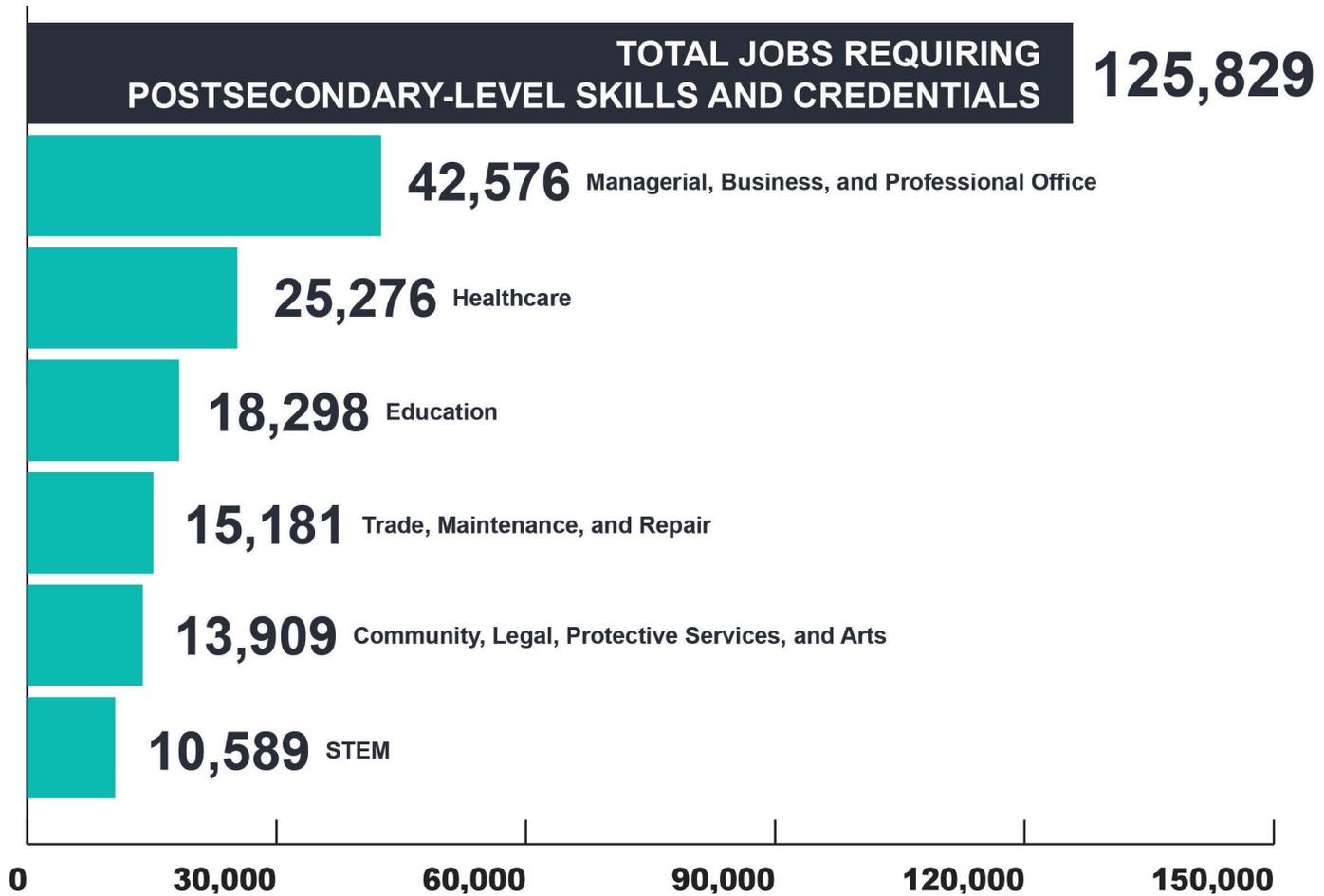
Approximately 97% of 2023 annual workforce demand in Pennsylvania that typically requires postsecondary-level skills and credentials is included in the following six occupational clusters:<sup>14</sup>

- Managerial, Business, and Professional Office
- Healthcare
- Trade, Maintenance, and Repair
- STEM
- Education
- Community, Legal, Protective Services, and Arts

Figure 2.8 presents the 2023 annual workforce demand in Pennsylvania by occupational cluster.

<sup>14</sup> Positions that typically require postsecondary-level skills and credentials that were not included in this analysis include culinary (e.g. chef) or personal care (e.g. hair stylist) occupations.

Figure 2.8 Pennsylvania 2023 Annual Demand for Jobs That Typically Require Postsecondary-level Skills and Credentials by Occupational Cluster

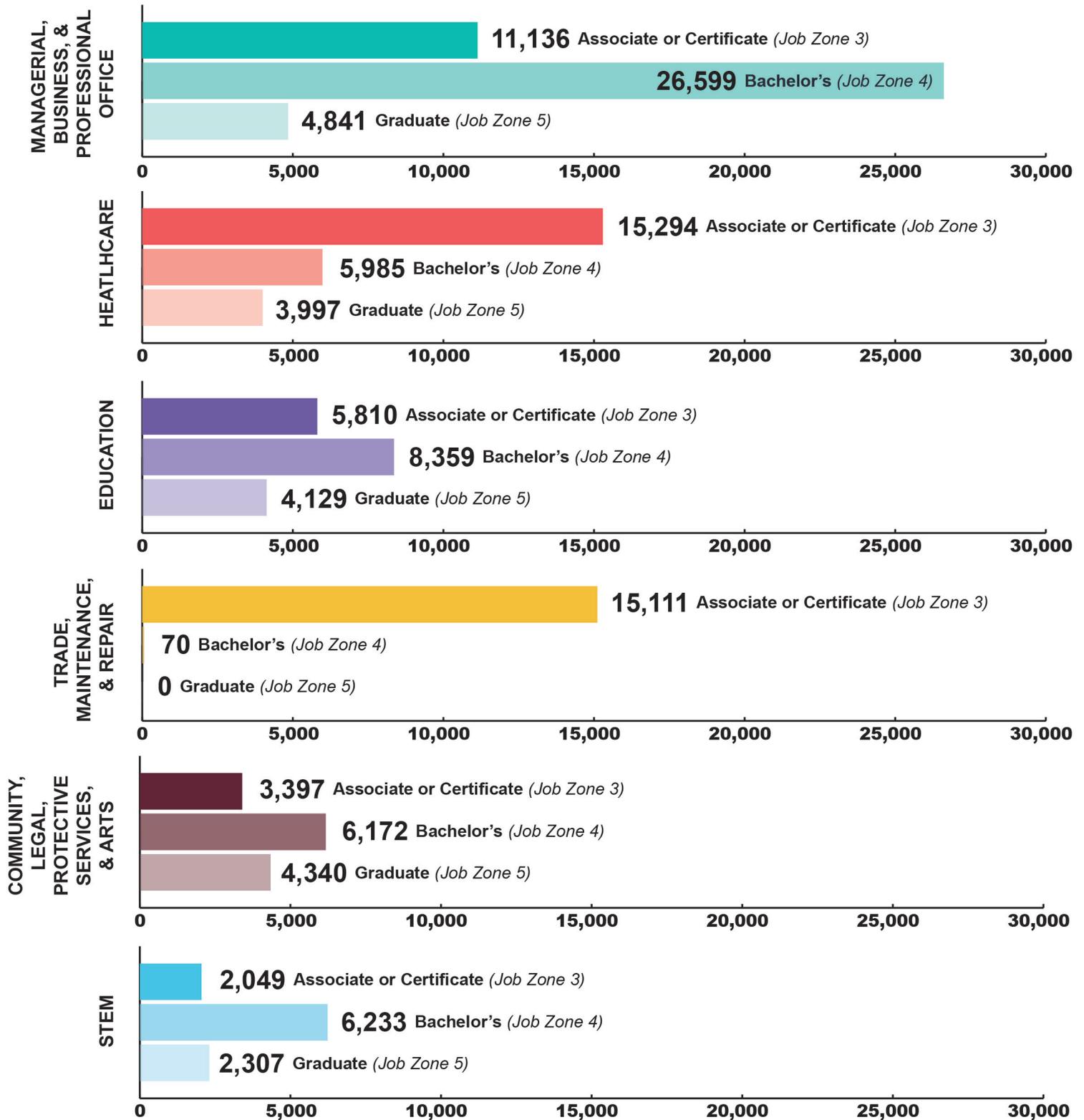


Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, O\*NET, U.S. Bureau of Labor Statistics, Baker Tilly Analysis

Figure 2.9 presents the 2023 annual demand data at a more granular level--by occupational cluster and aligned postsecondary credential type. Annual demand by occupational cluster and postsecondary credential type is the primary demand metric compared to postsecondary credential supply to determine if and where workforce credential gaps exist.

Figure 2.9 Pennsylvania 2023 Annual Demand for Jobs That Typically Require Postsecondary-level Skills and Credentials by Occupational Cluster and Credential Type

**TOTAL JOBS REQUIRING POSTSECONDARY-LEVEL SKILLS AND CREDENTIALS: 125,829**



Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, O\*NET, U.S. Bureau of Labor Statistics, Baker Tilly Analysis

## **2.1.4A OCCUPATIONAL CLUSTER SHARE OF OVERALL DEMAND AND BREAKDOWN OF REQUIRED DEGREE TYPE**

**Managerial, Business, and Professional Office** occupations account for 33.8% of Pennsylvania's 2023 demand for workers with postsecondary-level skills and credentials, and 62.5% of the occupational cluster's total demand is from occupations typically requiring bachelor's degrees. Examples of jobs typically requiring varying postsecondary credential levels in these occupations are as follows:

- Associate or certificate: bookkeeping, accounting, and auditing clerks
- Bachelor's degree: accountants and auditors
- Graduate degree: management analysts

**Healthcare** occupations account for 20.1% of Pennsylvania's 2023 demand for workers with postsecondary-level skills and credentials, and 60.5% of the occupational cluster's demand is for occupations typically requiring associate degree or certificate credentials. Examples of jobs typically requiring varying postsecondary credential levels in these occupations are as follows:

- Associate or certificate: nursing assistants
- Bachelor's degree: registered nurses
- Graduate degree: nurse practitioners

**Education** occupations account for 14.5% of Pennsylvania's 2023 demand for workers with postsecondary-level skills and credentials, and 45.7% of the occupational cluster's cumulative demand is from occupations typically requiring bachelor's degrees. Examples of jobs typically requiring varying postsecondary credential levels in these occupations are as follows:

- Associate or certificate: pre-school teachers
- Bachelor's degree: elementary school teachers
- Graduate degree: postsecondary health specialties teachers

**Trade, Maintenance, and Repair** occupations account for 12.1% of Pennsylvania's 2023 demand for workers with postsecondary-level skills and credentials, and nearly 100% of the occupational cluster's demand comes from occupations typically requiring associate degree or certificate credentials. Examples of jobs typically requiring varying postsecondary credential levels in these occupations are as follows:

- Associate or certificate: automotive service technicians and mechanics
- Bachelor's degree: transportation inspectors

**Community, Legal, Protective Services, and Arts** occupations account for 11.1% of Pennsylvania's 2023 demand for workers with postsecondary-level skills and credentials, with 44.4% of the occupational cluster's demand coming from occupations typically requiring bachelor's degrees, and an additional 31.2% coming from occupations typically requiring graduate degrees. Examples of jobs typically requiring varying postsecondary credential levels in these occupations are as follows:

- Associate or certificate: police and sheriff's patrol officers
- Bachelor's degree: child, family, and school social workers
- Graduate degree: lawyers

**STEM** occupations account for 8.4% of Pennsylvania's 2023 demand for workers with postsecondary-level skills and credentials, and 58.9% of the occupational cluster's demand is from occupations typically requiring bachelor's degrees. Examples of jobs typically requiring varying postsecondary credential levels in these occupations are as follows:

- Associate or certificate: computer user support specialists
- Bachelor’s degree: software developers
- Graduate degree: mechanical engineers

## 2.2 EVALUATING 2023 POSTSECONDARY CREDENTIAL SUPPLY

### 2.2.1 BACKGROUND OF ANALYSIS

This research also analyzes the credential supply provided by postsecondary institutions in Pennsylvania in 2023. Postsecondary credential supply is used to compare against annual workforce demand to understand the workforce credential gaps between postsecondary credential production and postsecondary credentials required to fill current jobs in Pennsylvania. The Commonwealth’s annual postsecondary credential supply across all private and public non-profit postsecondary education institutions, including both two-year and four-year institutions, was analyzed.

This analysis distinguishes between postsecondary credential awards, defined as the total number of completions or “awards” from Pennsylvania postsecondary institutions, and postsecondary credential supply, a metric that incorporates an adjustment to the awards to account for people awarded a postsecondary credential who will not enter the Pennsylvania workforce due to re-enrolling in another postsecondary program (“re-enrollment”) or moving out of state after the award of their postsecondary credential (“out-migration”).

The analysis of credential awards represents the total output of postsecondary institutions in Pennsylvania but does not provide the complete picture of the newly credentialed workforce supply. Conceptually, the supply of postsecondary credentialed workers should include the reality that some postsecondary credential earners continue their education with an additional credential (e.g., an earner of a bachelor’s degree in biology may pursue a medical degree). Additionally, earners will enter the workforce outside of Pennsylvania (i.e., out-migrate to another state).

The determination of credential supply takes re-enrollment and out-migration into consideration through informed assumptions from public and proprietary data<sup>15</sup> and is designed to represent the supply of newly credentialed workers from Pennsylvania’s postsecondary institutions. Not included in the calculation of postsecondary credential supply is the number of newly credentialed workers who earned their certificate or degree outside of Pennsylvania and moved to the Commonwealth.

### 2.2.2 CALCULATING POSTSECONDARY CREDENTIAL SUPPLY FOR WORKFORCE CREDENTIAL GAP ANALYSIS

As stated in the methodology section (2.2.1), a person who earns a postsecondary credential in Pennsylvania may not enter the workforce in Pennsylvania. To incorporate that reality, research was developed to understand the rate of re-enrollment (postsecondary credential earners who stay in postsecondary education institutions to pursue a subsequent postsecondary credential) and out-migration (postsecondary credential earners who leave the state after receiving a certificate or award). The analysis outlined below was used to calculate the 2022 postsecondary credential supply from the 2022 postsecondary credential awards.

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<sup>15</sup> Proprietary data in this analysis is derived from Lightcast Developer Profile and is used to understand the out-migration rate by credential type.

**Re-enrollment:** When weighted by the number of completions in Pennsylvania, approximately 22% of associate and certificate postsecondary credential earners went on to immediately enter another postsecondary program of study.<sup>16</sup> According to the U.S. Census, nationally, 25% of 25–34-year-old bachelor’s degree recipients earned a graduate degree after obtaining their bachelor’s degree.<sup>17</sup> This data was applied to 2022 postsecondary credential award totals in Pennsylvania through a re-enrollment assumption that reduced postsecondary credential supply by 22% for associate and certificate awards and 25% for bachelor’s degree awards.<sup>18</sup>

**Out-migration:** The out-migration assumption used data gathered from Lightcast’s Profile Analytics.<sup>19</sup> Data indicated that more than 50% of postsecondary credential earners exit the Commonwealth after graduation (40% of associate/certificate earners, 50% of bachelor’s earners, and 65% of graduate degree earners).<sup>20</sup> Postsecondary credential supply was reduced by the above rates to reflect the number of newly credentialed Pennsylvanians positioned to enter the Pennsylvania workforce.<sup>21</sup>

Across all three postsecondary credential types (associate, bachelor’s, and graduate), postsecondary credential supply is 38% of postsecondary credential awards, as seen in Figure 2.10. The ratio varies by postsecondary credential type due to the variance in re-enrollment and out-migration assumptions. Associate and certificate credential supply is 47% of postsecondary credential awards, 38% for bachelor’s degrees, and 33% for graduate degrees.

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<sup>16</sup> According to the weighted average for certificate and associate credential completions by Pennsylvania institutions using the percentages provided by the National Student Clearinghouse Research Center’s “Snapshot Report – Degree Pathways”.

<sup>17</sup> Data provided in the most recent “Current Population Survey, Annual Social and Economic Supplement” provided by the U.S. Census indicated that 29% of 25–34-year-old bachelor’s earners had earned a graduate degree higher than a bachelor’s. This ratio was reduced to 25% to reflect that some students enter the workforce before going on to earn a second degree.

<sup>18</sup> Additionally, 4.5% of graduate degrees were assumed to continue education (i.e. master’s degree earner continuing to a PHD). This total matched the “unmatched degrees” (as described below) for this credential type.

<sup>19</sup> Lightcast is a proprietary data source. As stated on their website “Lightcast Profile Analytics is built from individual profiles of over 120 million workers in the United States. Profiles data can provide ... levels of detail for labor market analytics, especially with regard to ... school-level alumni outcomes.” Data sources within the Profile Analytics report are proprietary. <https://kb.lightcast.io/en/articles/6957504-profiles-methodology>

<sup>20</sup> Note that totals are rounded to the nearest 5%.

<sup>21</sup> According to *The State of Innovation: Building a Stronger and Fairer Economy in New Jersey (2021)*, Pennsylvania’s higher education out-migration rate was 51%, which was greater than New York (45%), California (32%) and Texas (29%) and others, but was lower than Massachusetts (55%), Maryland (58%), New Jersey (62%), Connecticut (62%), and others. <https://www.njeda.gov/wp-content/uploads/2021/02/StrongerAndFairerNewJerseyEconomyReport.pdf>

Figure 2.10 Pennsylvania Postsecondary Credential Award and Supply

Postsecondary Credential Type	2022 Postsecondary Credential Awards	2022 Postsecondary Credential Supply	2022 Credential Supply as a % of 2022 Credential Awards
Associate and Certificate	34,611	16,113	47%
Bachelor	86,393	32,416	38%
Graduate	51,167	17,108	33%
<b>Total</b>	<b>172,171</b>	<b>65,637</b>	<b>38%</b>

Source: U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Lightcast, U.S. Census Bureau, National Student Clearinghouse Research Center, Baker Tilly Analysis

### 2.2.3 2023 ESTIMATED POSTSECONDARY CREDENTIAL SUPPLY

The most recent IPEDS data available at the time of writing this report was for 2022. To compare the 2023 annual demand with postsecondary credential supply, it was necessary to estimate the 2023 postsecondary credential supply using the 2022 postsecondary credential supply as the base year. The 2023 postsecondary credential supply was calculated by applying the average percentage change for postsecondary credentials awarded for the five years (2017 to 2022) with an adjustment for 2023 demographic changes in the number of high school graduates and adult learners.<sup>22</sup> Note that the growth/decline rate is calculated for each postsecondary credential type and is applied to each individual program/major; individual programs are not projected separately.

Figure 2.11 2023 Pennsylvania Postsecondary Credential Supply Estimates

Postsecondary Credential Type	2023 Postsecondary Credential Supply
Associate or Certificate	15,663
Bachelor	32,069
Graduate	17,124
<b>Total</b>	<b>64,857</b>

Source: U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Lightcast, U.S. Census Bureau, National Student Clearinghouse Research Center, Western Interstate Commission for Higher Education, Center for Rural Pennsylvania, Pennsylvania’s State System of Higher Education, Baker Tilly Analysis

## 2.3 STATEWIDE 2023 WORKFORCE CREDENTIAL GAP ANALYSIS

### 2.3.1 BACKGROUND OF ANALYSIS

The 2023 workforce credential gap analysis compares annual demand in Pennsylvania’s 2023 workforce against the 2023 postsecondary credential supply. The analysis aims to understand the relationship between the jobs the Pennsylvania economy demands and the annual credentialed

<sup>22</sup> Additional detail on credential supply projection methodology is discussed in Appendix B

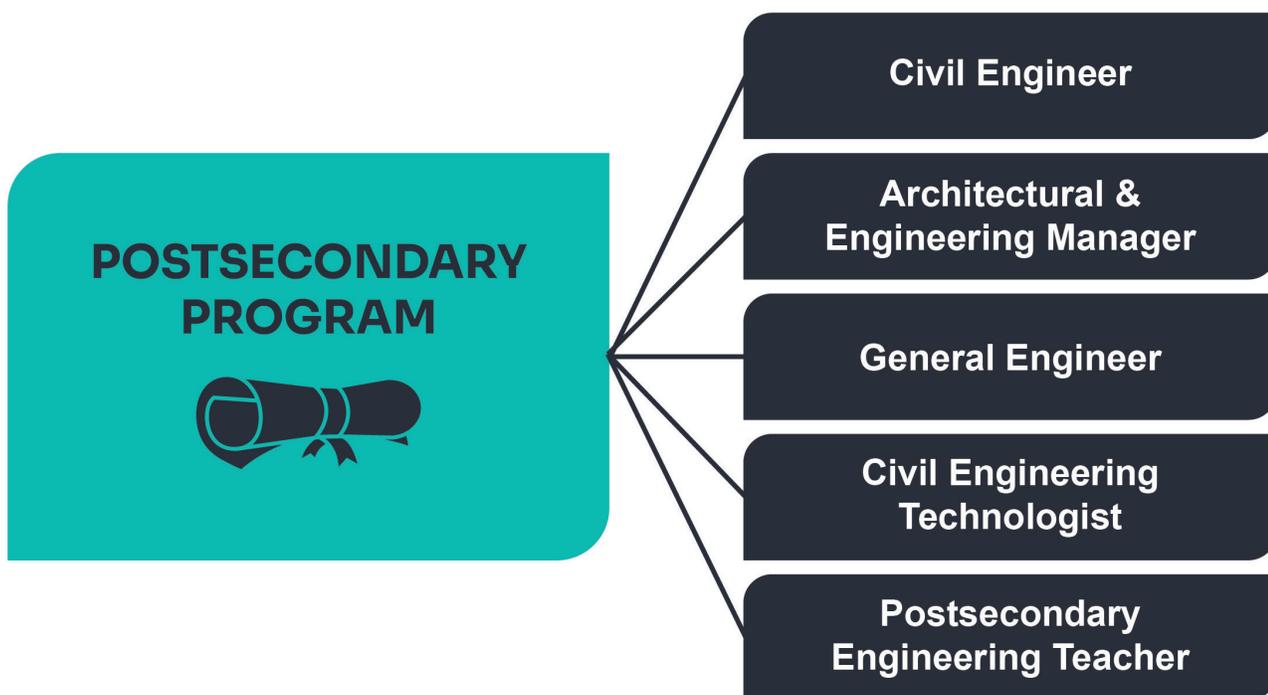
workers provided by Pennsylvania postsecondary institutions. This is done by directly comparing annual demand and postsecondary credential supply by three credential types, six occupational clusters, and the resulting 18 combinations of postsecondary credential type and occupational cluster (as discussed in section 2.1.4 “Evaluating Demand by Occupational Clusters”).

### **2.3.2 LINKING 2023 POSTSECONDARY-LEVEL DEMAND AND 2023 POSTSECONDARY CREDENTIAL SUPPLY**

Comparing annual postsecondary credential demand with postsecondary credential supply requires a “crosswalk” between the taxonomy of occupations (Standard Occupation Classification or “SOC”) and educational programs (Classification of Instructional Program or “CIP”). A national crosswalk<sup>23</sup> developed by the Bureau of Labor Statistics and the U.S. Department of Education’s National Center for Education Statistics (NCES crosswalk) is the primary source for links between SOC and CIP codes in this analysis.<sup>24</sup> When warranted, supplemental CIP to SOC linkages were applied from the Pennsylvania CIP-SOC crosswalk developed by CWIA.<sup>25</sup>

A critical characteristic of CIP-SOC crosswalks is that connections are technically defined as “many-to-many relationships” between SOC and CIP codes. This means that a given program can supply multiple occupations, and multiple programs can supply a given occupation. Figures 2.12(a) and 2.12(b) show an example of these relationships.

Figure 2.12(a) One Postsecondary Program Can Lead to Many Occupations



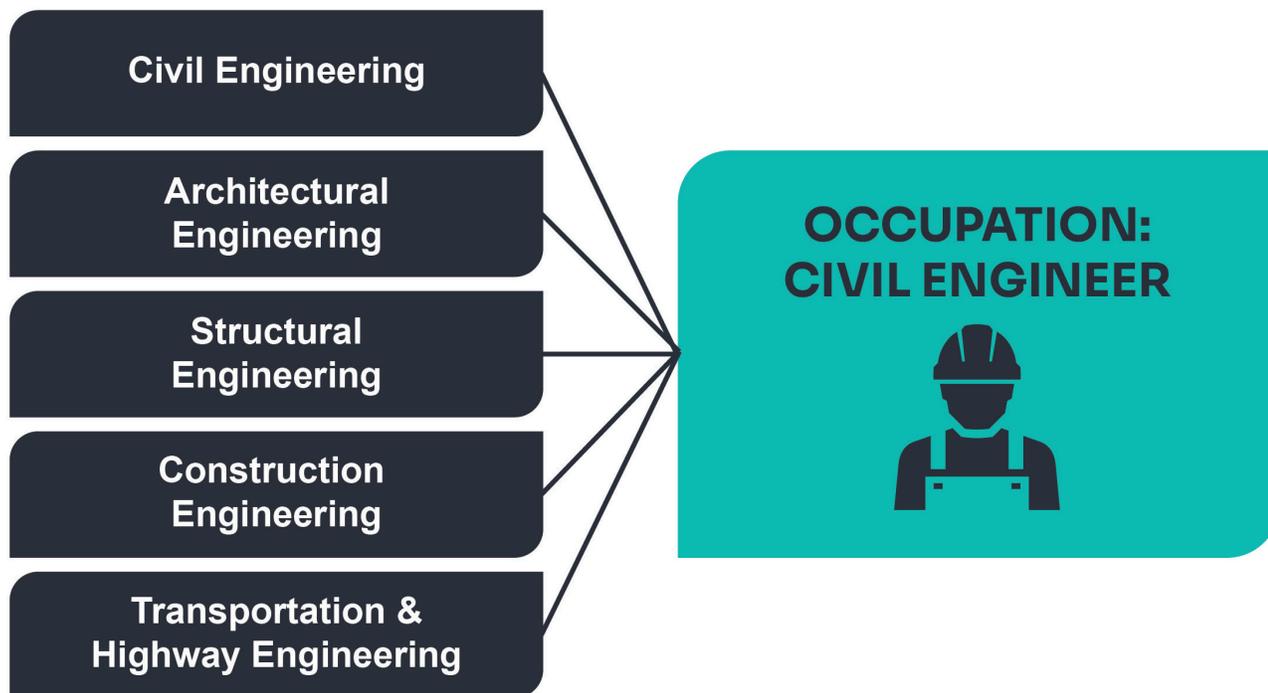
*Note: The above exhibit is not an exhaustive list of all occupations supplied by Civil Engineering program.  
Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, State University System of Florida, Baker Tilly Analysis*

<sup>23</sup> <https://nces.ed.gov/ipeds/cipcode/resources.aspx?y=56>

<sup>24</sup> Completed in fall of 2023 using the CIP 2020 to SOC 2018 Crosswalk download provided by NCES.

<sup>25</sup> Example: communications and media studies is unmatched in NCES Crosswalk. The program was matched with news analysts, reporters & journalists, public relations specialists, editors, and writers and authors.

Figure 2.12(b) Many Postsecondary Programs Can Lead to One Occupation



*Note: The above exhibit is not an exhaustive list of all academic programs that can lead to an occupation as a Civil Engineer.*

*Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, State University System of Florida, Baker Tilly Analysis*

Because this analysis is designed to understand the supply (credential) and demand (workforce) gaps from 18 combinations of occupational clusters and postsecondary credential types, rather than individual programs, a custom methodology was developed to align educational programs with these occupational clusters. The methodology involves a direct and indirect matching process that incorporates the research and connections of the NCES CIP-SOC crosswalk while aggregating granular six-digit SOC detail to the occupational cluster level.

**Direct Match:** NCES' crosswalk was utilized to link SOC and CIP codes if the typical education required for the position (from O\*NET) matched the postsecondary credential type of the program and the 2023 annual demand exceeded 100 for the six-digit Occupation.<sup>26</sup> If a CIP code matched multiple SOC codes, the postsecondary credential supply was allocated evenly between all matches for direct and indirect matches identified below.<sup>27</sup>

For example, the job title “news analysts, reporters, and journalists,” which typically requires a bachelor’s degree, was directly matched with eight specific bachelor-level journalism programs (e.g., broadcast journalism).

<sup>26</sup> A limitation of the NCES' CIP-SOC crosswalk is that it does not consider the credential type of the program and the typical minimum requirements of the occupation. As an example, a bachelor's degree with a major in history is linked with the occupation: history, postsecondary teacher. However, this occupation typically requires a graduate degree. Expanding the CIP-SOC crosswalk for credential type is an area of research that should be explored.

<sup>27</sup> Example - if 100 credentials were awarded in a specific program (CIP code) and the crosswalk identified four SOC code matches, the number of credentials allocated to each SOC code would be 25.

**Indirect Match:** Major programs were linked with the occupational clusters with frequent CIP-SOC links, even if there was not a direct link in the NCES' CIP-SOC crosswalk. Postsecondary credential supply not allocated through direct matches was assigned to a job cluster if over 60% of the high-level program codes (two-digit CIP) matched to a job cluster. The postsecondary credential type was maintained in the indirect matching process.<sup>28</sup>

For example, the occupation “industrial engineers” is in Job Zone 5, indicating the position typically requires a graduate degree. To ensure that bachelor’s degree earners in programs such as industrial engineering were allocated appropriately, postsecondary credential supply in this program was allocated to the STEM occupational cluster, based on research indicating that 61% of all programs in the two-Digit CIP of engineering matched to an occupation in the STEM occupational cluster in the NCES’ crosswalk.

**Unmatched Postsecondary Credentials:** If a postsecondary credential did not match through the direct and indirect matching process, it remained unmatched<sup>29</sup> and was assumed to fall into the re-enrollment assumption.

## 2.4 STATEWIDE 2023 WORKFORCE CREDENTIAL GAP ANALYSIS RESULTS

Figure 2.13 Occupational Cluster and Credential Types Included



Source: Baker Tilly Analysis

After completing the crosswalk, annual demand was compared to postsecondary credential supply across the six occupational clusters, three postsecondary credential types, and resulting 18 combinations. Areas where annual demand is greater than postsecondary credential supply for an occupational cluster, or credential type as a whole, result in a workforce credential gap. Areas where postsecondary credential supply is greater than annual demand result in a workforce credential surplus. The percent unfulfilled demand (% unfulfilled demand) represents the workforce credential gap for a portion of the data divided by the related annual demand. For example, if an occupational cluster has a workforce credential gap of 100 and an annual demand of 500, this will result in an unfulfilled demand of 20%. Areas with a surplus are represented as 0% unfulfilled demand and have a positive number in the “2023 workforce credential (gap) surplus” column.

It is critical to point out that this analysis compares the annual demand to the postsecondary credential supply – or the supply of newly credentialed workers from postsecondary institutions only in Pennsylvania. The analysis does not consider the ability of those who earn postsecondary credentials in other states to fill the workforce credential gap.

<sup>28</sup> See Appendix Table 3 for table that outlines two-digit CIP indirect matches to occupational clusters.

<sup>29</sup> 8.4% of all credential awards were unmatched, with 18.0% in associate and certificate credentials, 6.9% in bachelor’s, and 4.5% in graduate.

### 2.4.1 2023 STATEWIDE WORKFORCE CREDENTIAL GAPS

The following tables and accompanying insights present the 2023 statewide workforce credential gaps by cluster (Figure 2.14) and then by cluster and by each postsecondary credential type: associate and certificate credentials (Figure 2.15), bachelor’s degrees (Figure 2.16), and graduate degrees (Figure 2.17).

Figure 2.14 2023 Pennsylvania Workforce Credential Gaps by Occupational Cluster: All Jobs Typically Requiring Postsecondary-level Skills and Credentials

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Managerial, Business, and Professional Office	42,576	18,467	(24,109)	57%
Education	18,298	5,847	(12,451)	68%
Trade, Maintenance, and Repair	15,181	2,970	(12,211)	80%
Healthcare	25,276	14,309	(10,967)	43%
Community, Legal, Protective Services, and Arts	13,909	8,700	(5,209)	37%
STEM	10,589	14,564	3,975	0%
<b>Total</b>	<b>125,829</b>	<b>64,857</b>	<b>(60,972)</b>	<b>48%</b>

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Baker Tilly Analysis

#### Key Insights:

- As seen in Figure 2.14, in 2023, Pennsylvania had 60,972 fewer postsecondary credentialed workers than the economy of Pennsylvania demanded. Nearly half (48%) of the demand for all jobs that typically require postsecondary-level skills and credentials was unfilled. Stated another way: postsecondary credential supply meets a little more than half of the annual demand.
- Five out of six occupational clusters have a workforce credential gap, indicating that annual demand exceeds postsecondary credential supply. The most significant workforce credential gaps by occupational cluster are in managerial, business, and professional office (24,109), education (12,451), and trade, maintenance, and repair (12,211).
- The only occupational cluster with a surplus is the STEM cluster, where postsecondary credential supply is 3,975 greater than annual demand.
- Trade, maintenance, and repair has the greatest unfilled demand as a share of annual demand, with 80% of annual demand not being met by 2023 postsecondary credential supply, followed by education (68%) and managerial, business, and professional office (57%).

## 2.4.2 ASSOCIATE DEGREE AND CERTIFICATE WORKFORCE CREDENTIAL GAP

Figure 2.15 2023 Pennsylvania Workforce Credential Gaps by Occupational Cluster: Typically Requiring Associate Degree or Certificate Credentials

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Managerial, Business, and Professional Office	11,136	2,279	(8,857)	80%
Education	5,810	519	(5,291)	91%
Trade, Maintenance, and Repair	15,111	2,963	(12,148)	80%
Healthcare	15,294	6,174	(9,120)	60%
Community, Legal, Protective Services, and Arts	3,397	1,604	(1,793)	53%
STEM	2,049	2,124	75	0%
<b>Total</b>	<b>52,797</b>	<b>15,663</b>	<b>(37,134)</b>	<b>70%</b>

Note: Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in Pennsylvania (Figure 2.14).

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Baker Tilly Analysis

### Key Insights:

- Figure 2.15 shows that Pennsylvania postsecondary institutions supplied 37,134 fewer credentialed workers than the economy of Pennsylvania demanded for associate and certificate credential earners in 2023.
- The 37,134 workforce credential gap for jobs typically requiring associate and certificate credentials accounts for 61% of the statewide 60,972 gap.
- Unfilled demand totaled 70%, which means postsecondary credential supply only meets 30% of the demand.
- Five out of six occupational clusters have a workforce credential gap, indicating that annual demand exceeds postsecondary credential supply. The most significant workforce credential gaps by occupational clusters are in trade, maintenance, and repair (12,148), healthcare (9,120), and managerial, business, and professional office (8,857).
- Similar to the overall Pennsylvania trends, the occupational cluster with a surplus is the STEM cluster.
- Education has the largest unfilled ratio, with 91% of annual demand not being met with current postsecondary credential supply, followed by trade, maintenance, and repair (80%), and managerial, business, and professional office (80%).

### 2.4.3 BACHELOR'S DEGREE WORKFORCE CREDENTIAL GAPS

Figure 2.16 2023 Pennsylvania Workforce Credential Gaps by Occupational Cluster: Typically Requiring Bachelor's Degrees

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Managerial, Business, and Professional Office	26,599	11,208	(15,391)	58%
Education	8,359	3,452	(4,907)	59%
Trade, Maintenance, and Repair	70	8	(62)	89%
Healthcare	5,985	4,107	(1,878)	31%
Community, Legal, Protective Services, and Arts	6,172	4,489	(1,683)	27%
STEM	6,233	8,805	2,572	0%
<b>Total</b>	<b>53,418</b>	<b>32,069</b>	<b>(21,349)</b>	<b>40%</b>

Note: Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in Pennsylvania (Figure 2.14).

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Baker Tilly Analysis

#### Key Insights:

- As seen in Figure 2.16, in 2023, Pennsylvania postsecondary institutions supplied 21,349 fewer credentialed workers than what the economy of Pennsylvania demanded for the number of bachelor's degree earners, with unmet demand totaling 40% of annual demand.
- The 21,349 workforce credential gap for jobs typically requiring bachelor's degrees accounts for 35% of the 60,972 statewide workforce credential gap.
- Five out of six occupational clusters have a workforce credential gap, with the most significant cluster gaps being in the managerial, business, and professional office (15,391), education (4,907), and healthcare (1,878).
- The only occupational cluster with a surplus is the STEM cluster. The STEM bachelor's degree cluster has the largest surplus, with postsecondary credential supply exceeding annual demand by 2,572.
- In terms of unfilled demand, managerial, business, and professional office and the education clusters both have unfilled demand ratios greater than 50%, indicating that postsecondary credential supply is less than half of demand for these clusters.

#### 2.4.4. GRADUATE DEGREE WORKFORCE CREDENTIAL GAPS

Figure 2.17 2023 Pennsylvania Workforce Credential Gaps by Occupational Cluster: Typically Requiring Graduate Degrees

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Managerial, Business, and Professional Office	4,841	4,979	138	0%
Education	4,129	1,875	(2,254)	55%
Trade, Maintenance, and Repair	-	-	-	0%
Healthcare	3,997	4,028	31	0%
Community, Legal, Protective Services, and Arts	4,340	2,607	(1,733)	40%
STEM	2,307	3,635	1,328	0%
<b>Total</b>	<b>19,614</b>	<b>17,124</b>	<b>(2,490)</b>	<b>13%</b>

Note: Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in Pennsylvania (Figure 2.14).

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Baker Tilly Analysis

#### Key Insights:

- As seen in Figure 2.17, in 2023, Pennsylvania postsecondary institutions supplied 2,490 fewer credentialed workers than the economy of Pennsylvania demanded for graduate degree earners. Unmet demand of 13% is lower than the combined average of 48% for all credential types, indicating that workforce credential gaps for graduate degrees are less severe than for other postsecondary credential types.
- The 2,490 workforce credential gap for jobs typically requiring graduate degrees accounts for 4% of the 60,972 statewide workforce credential gap.
- The education cluster and the community, legal, protective services, and arts cluster have workforce credential gaps of 2,254 and 1,733 respectively. Education has the greater unfilled demand ratio at 55%, while community, legal, protective services, and arts have unfilled demand ratios of 40%.

## 3.0 Regional 2023 Workforce Credential Gap Analysis

In addition to the analysis on the statewide workforce credential gap, an analysis was completed on each of the five regions of Pennsylvania and broken out individually in this section. Each region's analysis includes key attributes of the region including total working age population, degree attainment overall and by county, and the number and type of postsecondary institutions in the region. Each regional breakout also details the region's workforce credential gap overall, by degree type, and by occupational cluster.

### 3.1 REGIONAL 2023 WORKFORCE CREDENTIAL GAP BACKGROUND

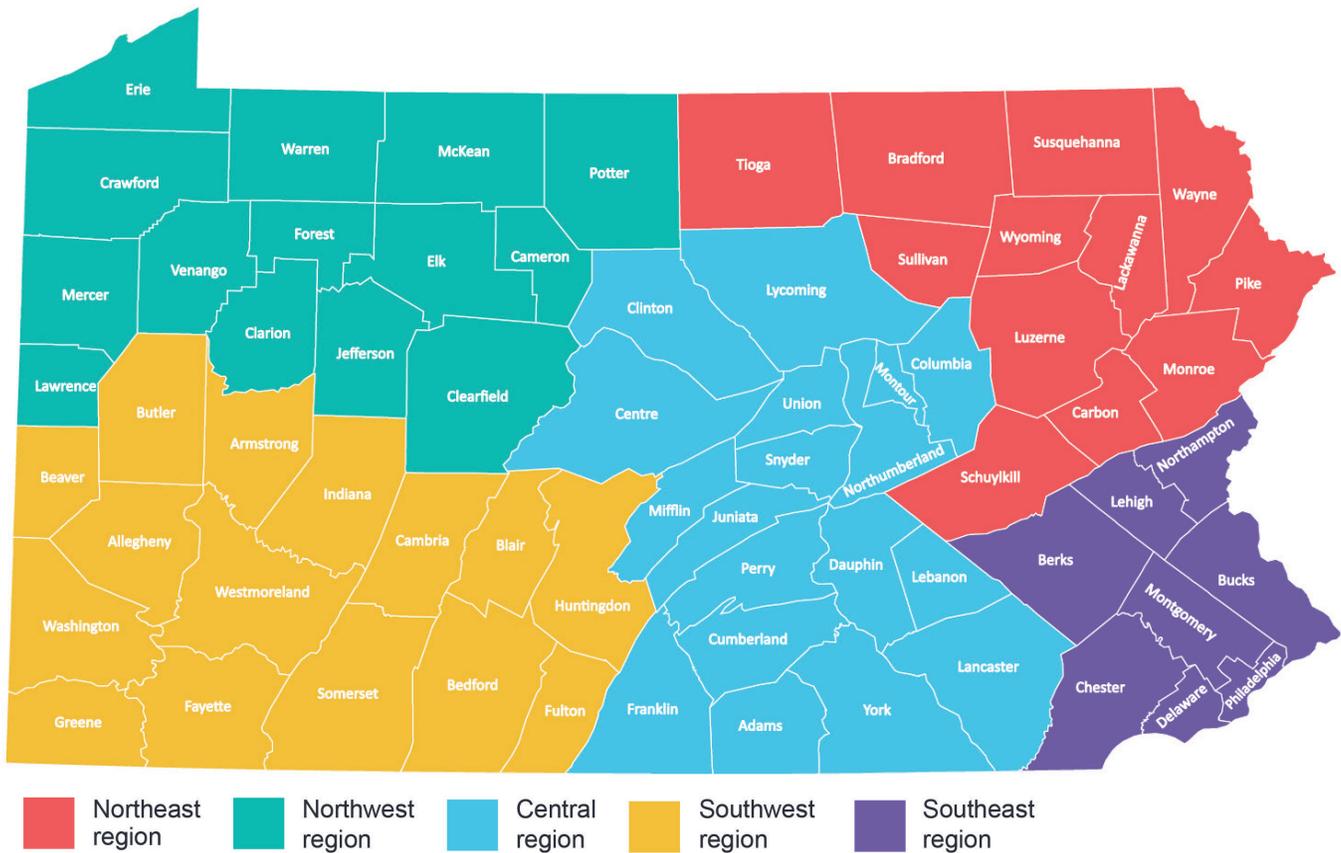
The need to analyze Pennsylvania's workforce credential gap on a regional level is driven by the Commonwealth's economic diversity. In this analysis, Pennsylvania's counties are segmented into five geographic regions, as seen in Figure 3.1: Northwest, Southwest, Central, Northeast, and Southeast. These regions align with those identified by Pennsylvania's Partnerships for Regional Economic Performance (PREP)<sup>30</sup>. PREP, a program of the Pennsylvania Department of Community and Economic Development (DCED), is a network of partnerships that is "designed to encourage regional coordination in economic development efforts, yielding superior customer service to the business community and a comprehensive, efficient statewide economic delivery strategy<sup>31</sup>." The alignment of regional definitions means that future regional research can combine economic development and higher education priorities. Figure 3.1 provides a map of the counties and the regions they align with in this analysis.

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<sup>30</sup> <https://dced.pa.gov/programs/prep/>. PREP consists of 10 regions. Each workforce gap region contains two prep regions; for example, the counties included in the PREP regions of "Southwest" and "Southern Alleghenies" are the same counties included in the "Southwest region" for the workforce gap regions.

<sup>31</sup> IBID

Figure 3.1 Pennsylvania Workforce Credential Gap Regions



Source: Baker Tilly Analysis

Figure 3.2 outlines the total population of working-age adults (25-64)<sup>32</sup> by region and degree attainment. Degree attainment includes associate, bachelor’s, and graduate degrees but does not include non-degree postsecondary certificate credentials due to data limitations. Only the Southeast and Southwest regions have degree attainment higher than the national average of 46.5%.<sup>33</sup>

<sup>32</sup> In this analysis, working age is defined as 25-64. When comparing educational attainment and occupational statistics, this age grouping is typically used. As an example, BLS Employment Projections calculates educational attainment by specific occupations for workers over 25 years and older. <https://www.bls.gov/emp/tables/educational-attainment.htm>

<sup>33</sup> U.S. Census Bureau. (2022). Total population (table B01003). American Community Survey 1-Year and 5-Year Estimates. Retrieved January 5, 2024, from <https://data.census.gov/>. In a methodology matching the Lumina Foundation, county attainment averages utilize 5-year ACS estimates and state and national averages utilize 1-year ACS estimates. Per U.S. Census, 1-year estimates should be used with populations greater than 65,000.

Figure 3.2 Pennsylvania Population and Working Age Degree Attainment By Regions

Regions	Total Population	Working Age Population	Working Age Degree Attainment
Southeast Region	5,323,448	2,792,300	50.6%
Southwest Region	2,920,662	1,510,894	49.7%
Central Region	2,644,879	1,323,602	40.6%
Northeast Region	1,199,622	615,381	36.6%
Northwest Region	900,597	451,501	36.3%
<b>Statewide</b>	<b>12,989,208</b>	<b>6,693,678</b>	<b>47.7%</b>

*Note: Degree attainment includes associate, bachelor's, and graduate degrees, but does not include non-degree postsecondary certificate credentials.*

*Pennsylvania degree attainment calculated from Lumina Foundation. Regional attainment averages from U.S. Census. Source: U.S. Census Bureau, Baker Tilly Analysis*

The analyses of the workforce credential gap in each region are presented in individual sections below. Each regional section includes data and analysis on the region's population and attainment statistics, number of institutions, occupational demand and postsecondary credential supply alignment (gap/surplus).

### 3.2 REGIONAL WORKFORCE CREDENTIAL GAP METHODOLOGY

The regional workforce credential gap analysis generally follows the same methodology identified in the statewide workforce credential gap analysis (Section 2.0 of this report) with the following exceptions:

Calculation of 2023 job demand for postsecondary-level skills and credentials: The CWIA 2022 Short-Term Occupational Forecast, which was used in the statewide workforce credential gap analysis, is not available regionally as of February 2024. To calculate regional occupational demand, this analysis therefore uses a different source – the number of current job openings as of October 2023. Job opening data is sourced from CWIA's *Online Job Postings*<sup>34</sup>, which provides county-level data for the number of online job postings for occupations at the same six-digit SOC level used for statewide analysis. Job opening data is used as a proxy for the annual occupational demand in each region, but the data is more accurately described as a "moment-in-time" measure of demand in October 2023. This limitation likely results in the underreporting of demand and gaps.<sup>35</sup> In fact, the sum of the five regional workforce credential gaps is 47,641, which is 78% of the statewide workforce gap of 60,972.

<sup>34</sup> <https://www.workstats.dli.pa.gov/dashboards/Pages/Online-Job-Postings.aspx>

<sup>35</sup> CWIA 2022 Short-Term Occupational Forecast estimates approximately 126,000 statewide occupational demand for occupations that require postsecondary skills and credentials. October 2023 CWIA job opening data estimates approximately 112,000 statewide occupational openings for jobs that require postsecondary skills and credentials, indicating that the regional annual demand total is approximately 89% of the annual statewide demand.

**Exception for bachelor’s level jobs in the education cluster:** For the regional analysis, the one exception to using job opening data as a proxy for demand is for jobs in the education cluster that typically require a bachelor’s degree (e.g., elementary school teachers). Job openings for these jobs are cyclical, corresponding with the school calendar. Therefore, the October 2023 job opening data does not accurately reflect demand. To account for this, a separate methodology was developed for bachelor level jobs in education. Demand, supply, and workforce credential gaps were calculated from PDE’s *Educator Preparation and Certification Report*.<sup>36</sup> Because of cyclicity in graduate level teacher hiring and the absence of a corresponding report for bachelor level jobs in the education cluster, the regional workforce credential gap analysis does not analyze jobs in the education cluster that typically require graduate degrees (e.g., postsecondary teachers/professors).<sup>37</sup> The regional postsecondary credential supply analysis utilizes the same methodology as the statewide analysis, utilizing 2023 projected credential supply<sup>38</sup>, with the additional step of assigning credential production to the five regions based on the institution’s location as reported to IPEDS. Postsecondary credential earners are assumed to stay within the region where they earned their credentials, although the assumptions for re-enrollment and out-migration from the state remain the same as the statewide analysis and are applied equally to each region.

### 3.3 REGIONAL WORKFORCE CREDENTIAL GAP ANALYSIS RESULTS

Below is a breakout section for each individual region analyzed. Each regional breakout includes regional attributes, such as total working age population, and postsecondary degree attainment overall and by county. The breakouts also provide detailed information about the workforce credential gap for each region including the gap by degree type and by occupational cluster overall and by degree type within each occupational cluster.

#### 3.3.1 THE SOUTHEAST REGION

##### **Southeast Pennsylvania: Regional Attributes**

Pennsylvania’s Southeast Region contains the greater Philadelphia area, including Philadelphia County and the surrounding counties (see Figure 3.3). The total population of the region is 5.3 million with 2.8 million people, or 52% of the total, considered working age (25-64 years) as seen in Figure 3.4.

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<sup>36</sup> PDE (2022), *Act 82 of 2018: Report on Educator Preparation and Certification*. Additional regional data provided by PDE. *Educator Preparation and Certification Report* is a required annual report that includes data on the teaching certificates issued, including Instruction 1 certificates, the award received by fully licensed teachers entering the workforce.

<sup>37</sup> For education jobs requiring a bachelor’s degree, the workforce credential gap was calculated as the number of emergency type 1 certificates issued plus reported vacancies within each region. To calculate the number of job openings, the workforce credential gap was added to the credential supply (Instruction 1 credentials).

<sup>38</sup> See Section 2.2.3 Postsecondary Credential Supply Projections.

Figure 3.3 Southeast Region and Counties Included

Source: U.S. Census Bureau, Baker Tilly Analysis

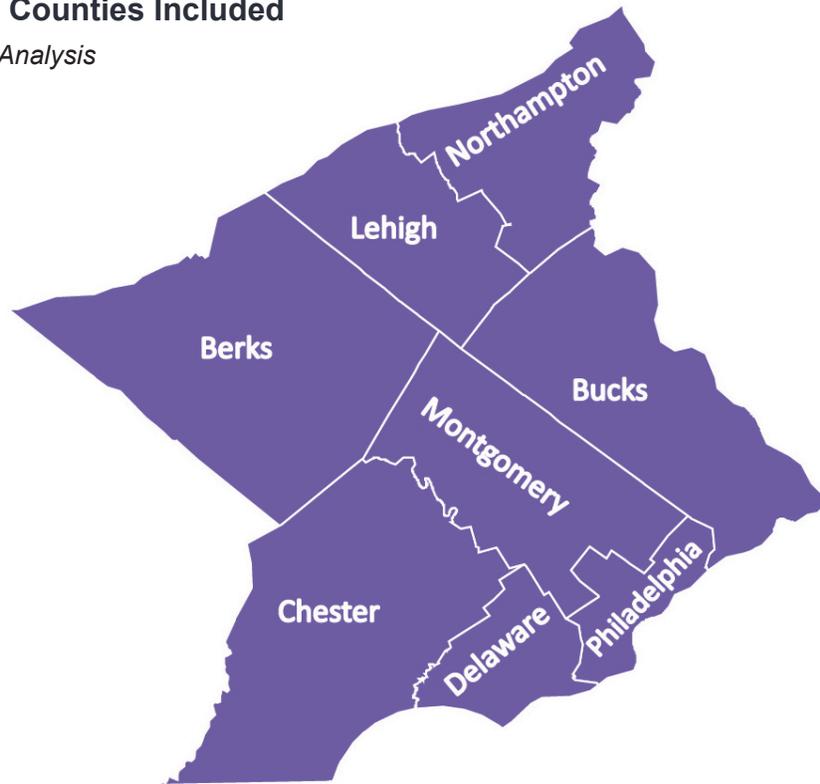


Figure 3.4 Southeast Region Working Age and Total Population by County

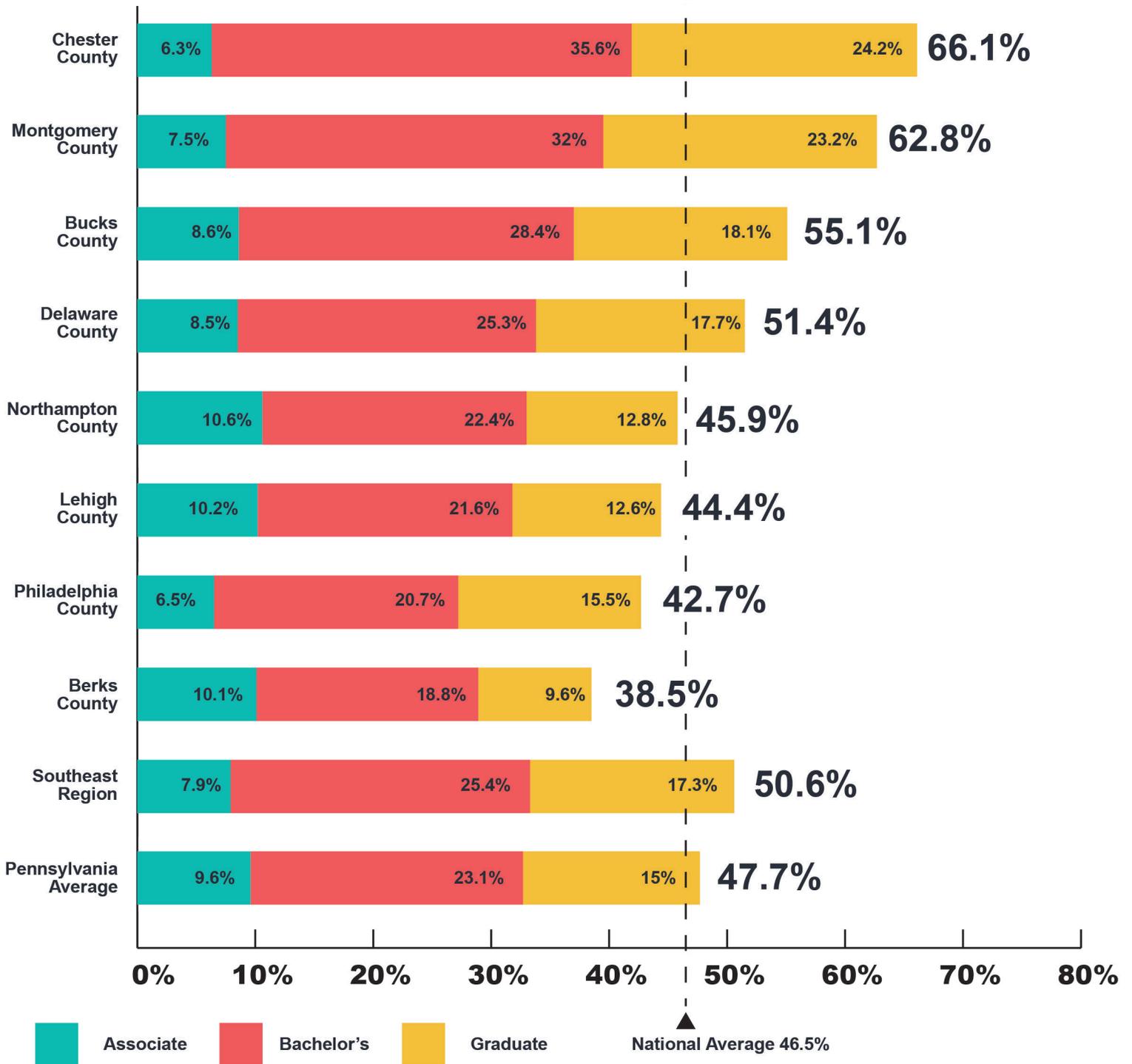
Geographic Region	Working Age Population	Total Population
Pennsylvania Total	6,693,678	12,989,208
Southeast Region Total	2,792,300	5,323,448
Philadelphia County	866,793	1,593,208
Montgomery County	447,746	856,399
Bucks County	338,510	645,163
Delaware County	295,314	575,312
Chester County	276,400	536,474
Berks County	217,068	428,483
Lehigh County	191,761	374,110
Northampton County	158,708	314,299

Note: Working Age includes population aged 25-64

Source: U.S. Census Bureau, Baker Tilly Analysis

In 2022, 51% of the working age population in the Southeast region earned an associate degree or higher, including 25% who earned bachelor’s degrees (see Figure 3.5). Four of the eight counties have lower postsecondary attainment than the national average of 46.5%, including Philadelphia County, the most populous county in the region.

Figure 3.5 Southeast Region Degree Attainment by County



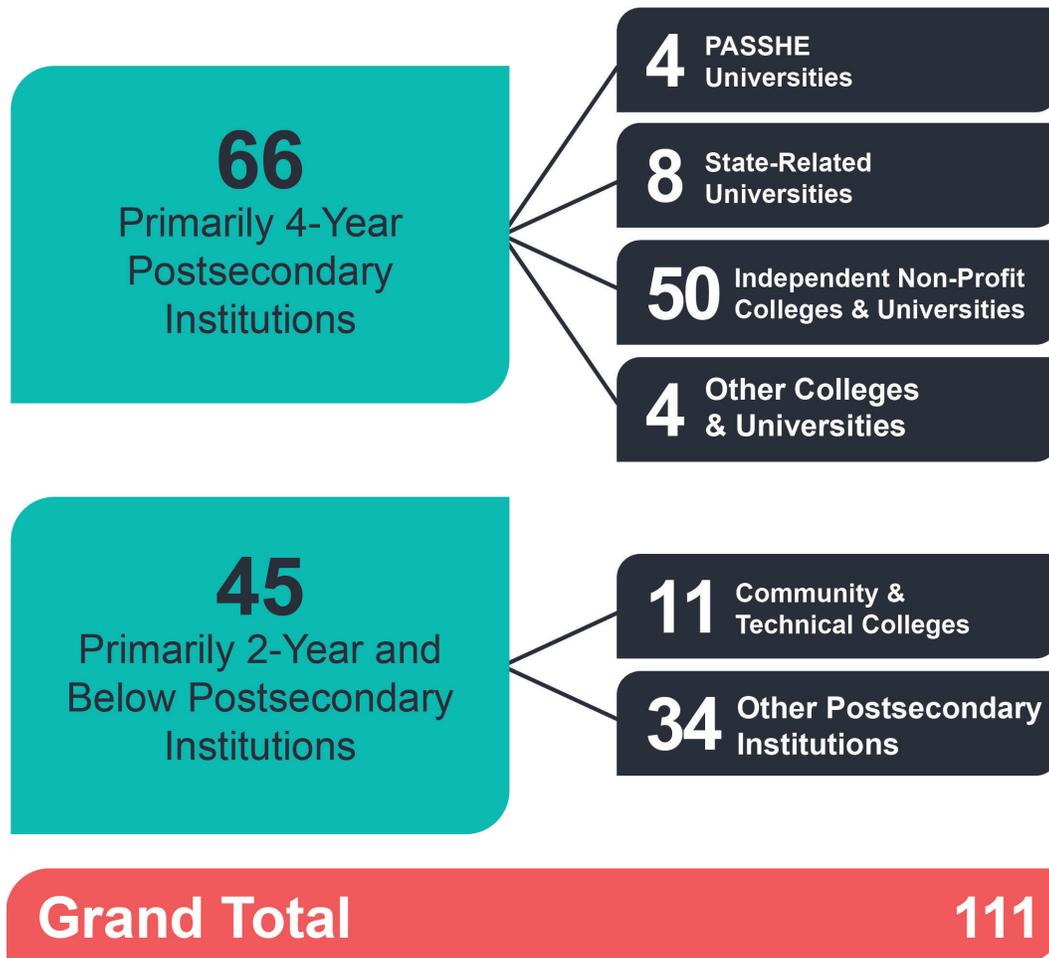
Note: Degree attainment reflects the highest degree attained and includes associate, bachelor's, and graduate degrees, but does not include non-degree postsecondary certificate credentials.

Pennsylvania and National Attainment from Lumina Foundation. County attainment and regional averages from U.S. Census.

Source: U.S. Census Bureau, Lumina Foundation, Baker Tilly Analysis

The Southeast region contains 111 postsecondary campuses<sup>39</sup> of which four are PASSHE universities, eight are state-related universities, 11 are community or technical colleges, 50 are independent non-profit colleges and universities, four are other primarily four-year colleges and universities, and 34 are other primarily two-year postsecondary institutions<sup>40</sup> (See Figure 3.6).

Figure 3.6 Southeast Region Institutions and Campuses by Postsecondary Sector



Notes: Includes main and branch campuses for PASSHE universities, state-related universities, and community colleges. Other Colleges and Universities include four-year for-profit universities. Other Postsecondary Institutions include less than two-year public institutions and private two-year and less than two-year institutions (both for-profit and not-for-profit).  
 Source: U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

### Southeast Pennsylvania: 2023 Workforce Credential Gap Analysis

Southeast Pennsylvania has 25,741 more job openings for positions that require postsecondary-level skills and credentials currently than the annual postsecondary credential supply in the region. The majority of the workforce credential gap is from occupations that typically require a bachelor’s degree (16,138). The workforce credential gap is second largest for associate degrees and certificates (7,706) followed by graduate degrees (1,896) (see Figure 3.7).

<sup>39</sup> For the entirety of the regional analyses, this includes branch and main campuses for PASSHE universities, state-related universities, and community colleges.

<sup>40</sup> Other colleges and universities include four-year for-profit universities. Other postsecondary Institutions include public less-than two-year institutions and private two-year and less-than two-year institutions (both for-profit and not-for-profit).

Figure 3.7 Southeast Region 2023 Workforce Credential Gap by Postsecondary Credential Type

Postsecondary Credential Type	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Associate & Certificate	14,440	6,734	(7,706)	53%
Bachelor's	29,404	13,266	(16,138)	55%
Graduate	9,640	7,744	(1,896)	20%
<b>Total</b>	<b>53,484</b>	<b>27,743</b>	<b>(25,741)</b>	<b>48%</b>

Note: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding.  
 Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

- Managerial, business, and professional office, education, and trade, maintenance, and repair have unfilled demand levels of over 50%—meaning the postsecondary credential supply is less than half of the current occupational openings.
- Occupations in the managerial, professional, and professional office occupational cluster account for 10,272 (or 40%) of the total 25,741 workforce credential gap. The primary driver of this workforce credential gap is occupations that typically require bachelor’s degrees.
- Occupations in the healthcare cluster account for 5,589 (22%) of the overall workforce credential gap in the Southeast region, with occupations typically requiring associate degrees and certificates and bachelor’s degrees accounting for most of the gap (91.5%) within the cluster.
- Occupations in the STEM cluster account for 4,817 (19%) of the Southeast region’s workforce credential gap. Occupations typically requiring a bachelor’s degree account for most of the workforce credential gap (78%).
- Occupations in the educational cluster account for 3,215 of the overall workforce credential gap; 2,266 of these occupations typically require a bachelor’s degree (e.g. pre-K – 12 teachers).

These data points are summarized in Figures 3.8 through 3.11.

**Figure 3.8 Southeast Region 2023 Workforce Credential Gap by Occupational Cluster: All Jobs Typically Requiring Postsecondary-level Skills and Credentials**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Managerial, Business, and Professional Office	18,418	8,146	(10,272)	56%
Healthcare	12,155	6,566	(5,589)	46%
STEM	10,213	5,396	(4,817)	47%
Education	5,158	1,943	(3,215)	62%
Trade, Maintenance, and Repair	3,627	1,361	(2,266)	62%
Community, Legal, Protective Services, and Arts	3,913	4,332	419	0%
<b>Total</b>	<b>53,484</b>	<b>27,743</b>	<b>(25,741)</b>	<b>48%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Southeast Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.9 Southeast Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Associate Degree or Certificate Credentials**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Managerial, Business, and Professional Office	2,131	934	(1,197)	56%
Healthcare	5,676	2,519	(3,157)	56%
STEM	1,220	740	(480)	39%
Education	886	330	(556)	63%
Trade, Maintenance, and Repair	3,617	1,360	(2,257)	62%
Community, Legal, Protective Services, and Arts	910	852	(58)	6%
<b>Total</b>	<b>14,440</b>	<b>6,734</b>	<b>(7,706)</b>	<b>53%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Southeast Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.10 Southeast Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Bachelor's Degrees**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Managerial, Business, and Professional Office	12,634	4,566	(8,068)	64%
Healthcare	3,916	1,959	(1,957)	50%
STEM	6,867	3,112	(3,755)	55%
Education	4,272	1,613	(2,659)	62%
Trade, Maintenance, and Repair	10	1	(9)	89%
Community, Legal, Protective Services, and Arts	1,705	2,015	310	0%
<b>Total</b>	<b>29,404</b>	<b>13,266</b>	<b>(16,138)</b>	<b>55%</b>

*Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Southeast Region*

*Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis*

**Figure 3.11 Southeast Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Graduate Degrees**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Managerial, Business, and Professional Office	3,653	2,647	(1,006)	28%
Healthcare	2,563	2,088	(475)	19%
STEM	2,126	1,543	(583)	27%
Education	-	-	-	0%
Trade, Maintenance, and Repair	-	-	-	0%
Community, Legal, Protective Services, and Arts	1,298	1,465	167	0%
<b>Total</b>	<b>9,640</b>	<b>7,744</b>	<b>(1,896)</b>	<b>20%</b>

*Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Southeast Region*

*Jobs typically requiring graduate degrees in the education cluster were not analyzed for regional workforce gaps*

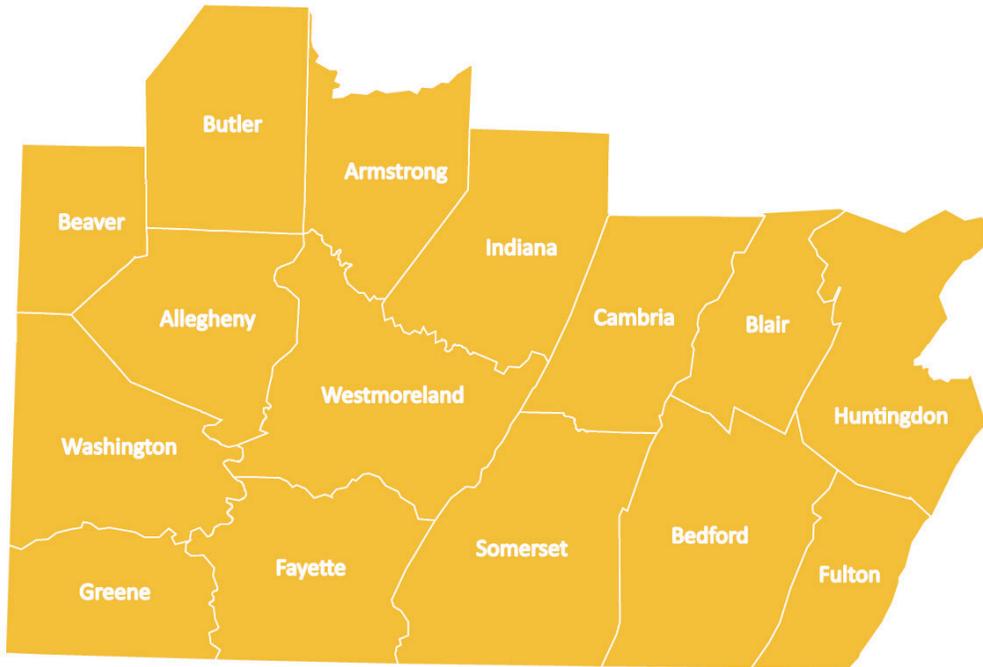
*Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis*

### 3.3.2 THE SOUTHWEST REGION

#### Southwest Pennsylvania: Regional Attributes

Pennsylvania's Southwest region includes the greater Pittsburgh area including Allegheny County and the surrounding counties (see Figure 3.12). The total population of the region is 2.9 million with 1.5 million people, or 52% of the total, considered working age, 25-64 years old (see Figure 3.13).

Figure 3.12 Southwest Region and Counties Included



Source: U.S. Census Bureau, Baker Tilly Analysis

Figure 3.13 Southwest Region Working Age and Total Population by County

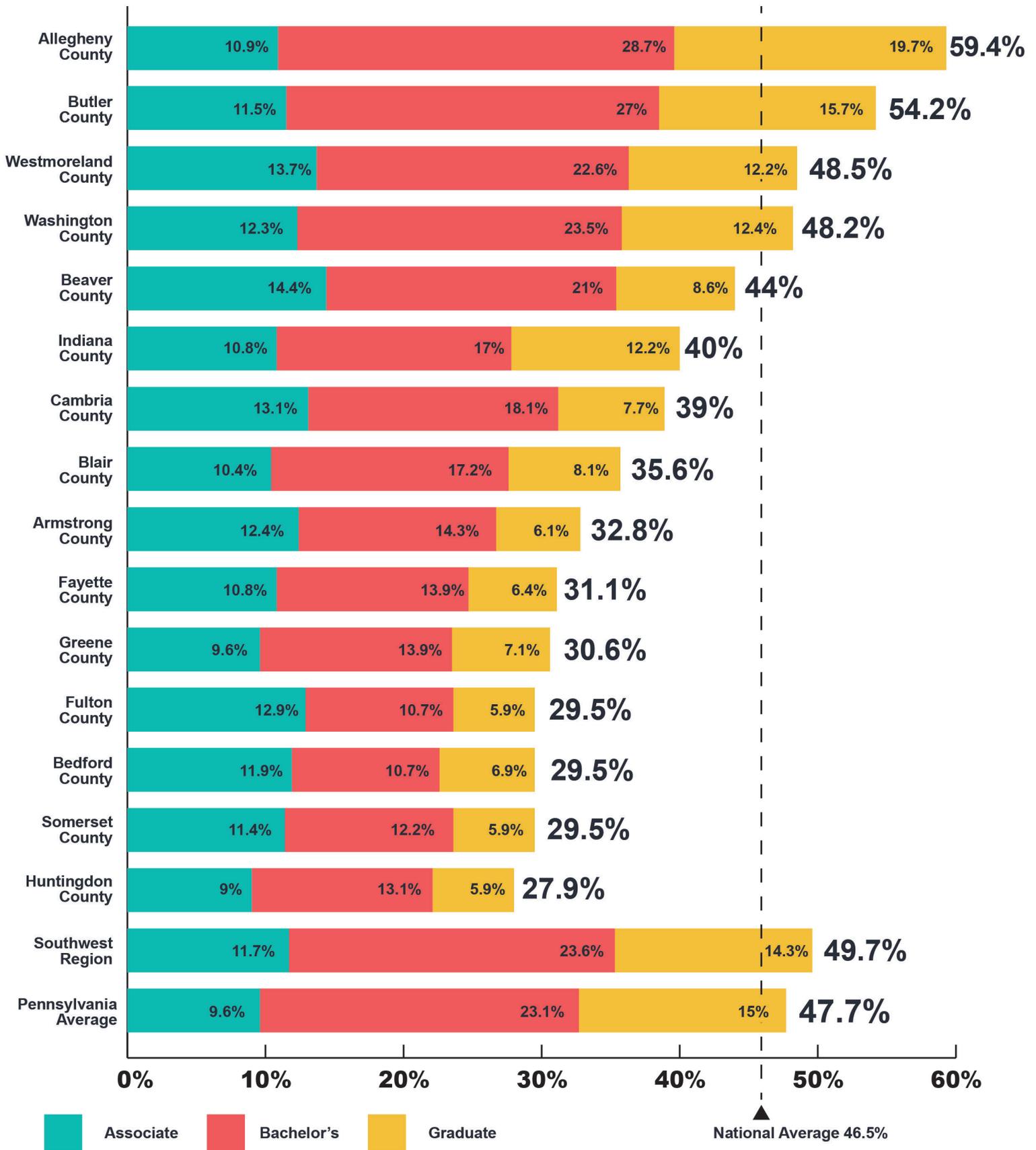
Geographic Region	Working Age Population	Total Population
<b>Pennsylvania Total</b>	<b>6,693,678</b>	<b>12,989,208</b>
<b>Southwest Region Total</b>	<b>1,510,894</b>	<b>2,920,662</b>
Allegheny County	660,256	1,245,310
Westmoreland County	180,587	354,414
Washington County	106,804	209,631
Butler County	101,334	194,562
Beaver County	86,315	167,629
Cambria County	65,027	133,263
Fayette County	66,575	128,417
Blair County	61,800	122,640
Indiana County	37,936	83,394
Somerset County	38,190	73,802
Armstrong County	33,615	65,538
Bedford County	23,931	47,613
Huntingdon County	22,639	44,123
Greene County	18,483	35,781
Fulton County	7,402	14,545

Note: Working Age includes population aged 25-64

Source: U.S. Census Bureau, Baker Tilly Analysis

In 2022, 50% of the working age population in the Southwest region earned an associate degree or higher, including 24% who earned bachelor's degrees (see Figure 3.14). Eleven of the fifteen counties have a lower attainment than the national average of 46.5%.

Figure 3.14 Southwest Region Working Age Degree Attainment Rate by County



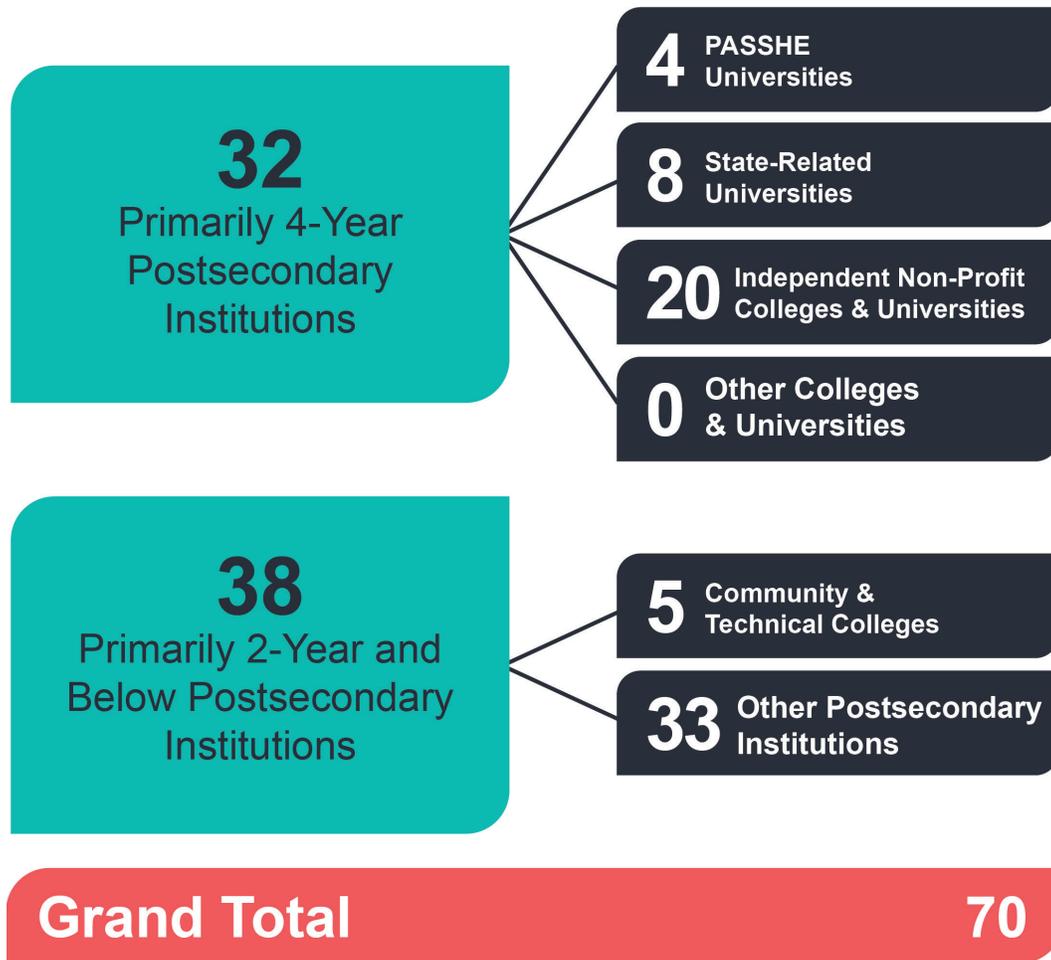
Notes: Degree attainment reflects the highest degree attained and includes associate, bachelor's, and graduate degrees, but does not include non-degree postsecondary certificate credentials.

Pennsylvania and National Attainment from Lumina Foundation. County attainment and regional averages from U.S. Census.

Source: U.S. Census Bureau, Lumina Foundation, Baker Tilly Analysis

The Southwest Region contains 70 postsecondary campuses of which four are PASSHE universities, eight are state-related universities, five are community or technical colleges, 20 are independent non-profit colleges and universities, and 33 are other primarily two-year postsecondary institutions (see Figure 3.15).

Figure 3.15 Southwest Region Institutions and Campuses by Postsecondary Sector



*Notes: Includes main and branch campuses for PASSHE universities, state-related universities, and community colleges. Other Colleges and Universities include four-year for-profit universities. Other Postsecondary Institutions include less than two-year public institutions and private two-year and less than two-year institutions (both for-profit and not-for-profit).*  
*Source: U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis*

### Southwest Pennsylvania: 2023 Workforce Credential Gap Analysis

Southwest Pennsylvania has 15,995 more job openings for positions that require postsecondary-level skills and credentials currently than the annual credential supply of the postsecondary institutions in the region, of which the majority of the workforce credential gap (8,493) is from occupations that typically require a bachelor's degree. Associate degrees and certificates provide the second largest workforce credential gap (5,923) followed by graduate degrees (1,580) (See Figure 3.16).

Figure 3.16 Southwest Region 2023 Workforce Credential Gap by Postsecondary Credential Type

Postsecondary Credential Type	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Associate & Certificate	10,247	4,324	(5,923)	58%
Bachelor's	15,531	7,038	(8,493)	55%
Graduate	5,087	3,507	(1,580)	31%
<b>Total</b>	<b>30,865</b>	<b>14,870</b>	<b>(15,995)</b>	<b>52%</b>

Note: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding.  
 Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

- The unfilled demand ratio is higher than 50% for the following clusters: managerial, business, and professional office, healthcare, and trade, maintenance, and repair. An unfilled demand ratio of 50% or higher indicates that annual credential supply does not meet half of the current occupational openings (or annual demand).
- Occupations in the managerial, professional, and professional office occupational cluster account for 6,159 (or 39%) of the total 15,995 workforce credential gap. The primary driver of this workforce credential gap is occupations that typically require bachelor’s degrees.
- Occupations in the healthcare cluster account for 5,183 (32%) of the overall workforce credential gap in the Southwest region, with occupations typically requiring associate degrees and certificates and bachelor’s degrees accounting for most of the gap (85%).
- Occupations in the trade, maintenance, and repair cluster account for 1,817 (11%) of the Southwest region’s workforce credential gap. This is entirely driven by occupations that typically require an associate degree or certificate.
- Occupations in the educational cluster account for 869 of the workforce credential gap; 515 of these occupations typically require a bachelor’s degree (e.g. pre-K – 12 teachers).

These data points are summarized in Figures 3.17 through 3.20

**Figure 3.17 Southwest Region 2023 Workforce Credential Gap by Occupational Cluster: All Jobs Typically Requiring Postsecondary-level Skills and Credentials**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Managerial, Business, and Professional Office	9,797	3,638	(6,159)	63%
Healthcare	8,619	3,436	(5,183)	60%
Trade, Maintenance, and Repair	2,598	781	(1,817)	70%
STEM	5,633	4,039	(1,594)	28%
Education	2,004	1,135	(869)	43%
Community, Legal, Protective Services, and Arts	2,214	1,841	(373)	17%
<b>Total</b>	<b>30,865</b>	<b>14,870</b>	<b>(15,995)</b>	<b>52%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Southwest Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.18 Southwest Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Associate Degree or Certificate Credentials**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Managerial, Business, and Professional Office	1,286	622	(664)	52%
Healthcare	4,365	1,794	(2,571)	59%
Trade, Maintenance, and Repair	2,590	781	(1,809)	70%
STEM	926	637	(289)	31%
Education	458	104	(354)	77%
Community, Legal, Protective Services, and Arts	622	387	(235)	38%
<b>Total</b>	<b>10,247</b>	<b>4,324</b>	<b>(5,923)</b>	<b>58%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Southwest Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.19 Southwest Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Bachelor's Degrees**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Managerial, Business, and Professional Office	6,722	2,037	(4,685)	70%
Healthcare	2,677	860	(1,817)	68%
Trade, Maintenance, and Repair	8	-	(8)	100%
STEM	3,738	2,163	(1,575)	42%
Education	1,546	1,031	(515)	33%
Community, Legal, Protective Services, and Arts	840	947	107	0%
<b>Total</b>	<b>15,531</b>	<b>7,038</b>	<b>(8,493)</b>	<b>55%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Southwest Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.20 Southwest Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Graduate Degrees**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Managerial, Business, and Professional Office	1,789	979	(810)	45%
Healthcare	1,577	782	(795)	50%
Trade, Maintenance, and Repair	-	-	-	0%
STEM	969	1,240	271	0%
Education	-	-	-	0%
Community, Legal, Protective Services, and Arts	752	507	(245)	33%
<b>Total</b>	<b>5,087</b>	<b>3,507</b>	<b>(1,580)</b>	<b>31%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Southwest Region

Jobs typically requiring graduate degrees in the education cluster were not analyzed for regional workforce gaps

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

### 3.3.3 THE CENTRAL REGION

#### Central Pennsylvania: Regional Attributes

Pennsylvania's Central region contains Lancaster, Lower Paxton Township, and Harrisburg (see Figure 3.21). The region's total population is 2.6 million with 1.3 million people, or 50% of the total, considered working age (25-64 years old) as seen in Figure 3.22.

Figure 3.21 Central Region and Counties Included



Source: U.S. Census Bureau, Baker Tilly Analysis

Figure 3.22 Central Region Working Age and Total Population by County

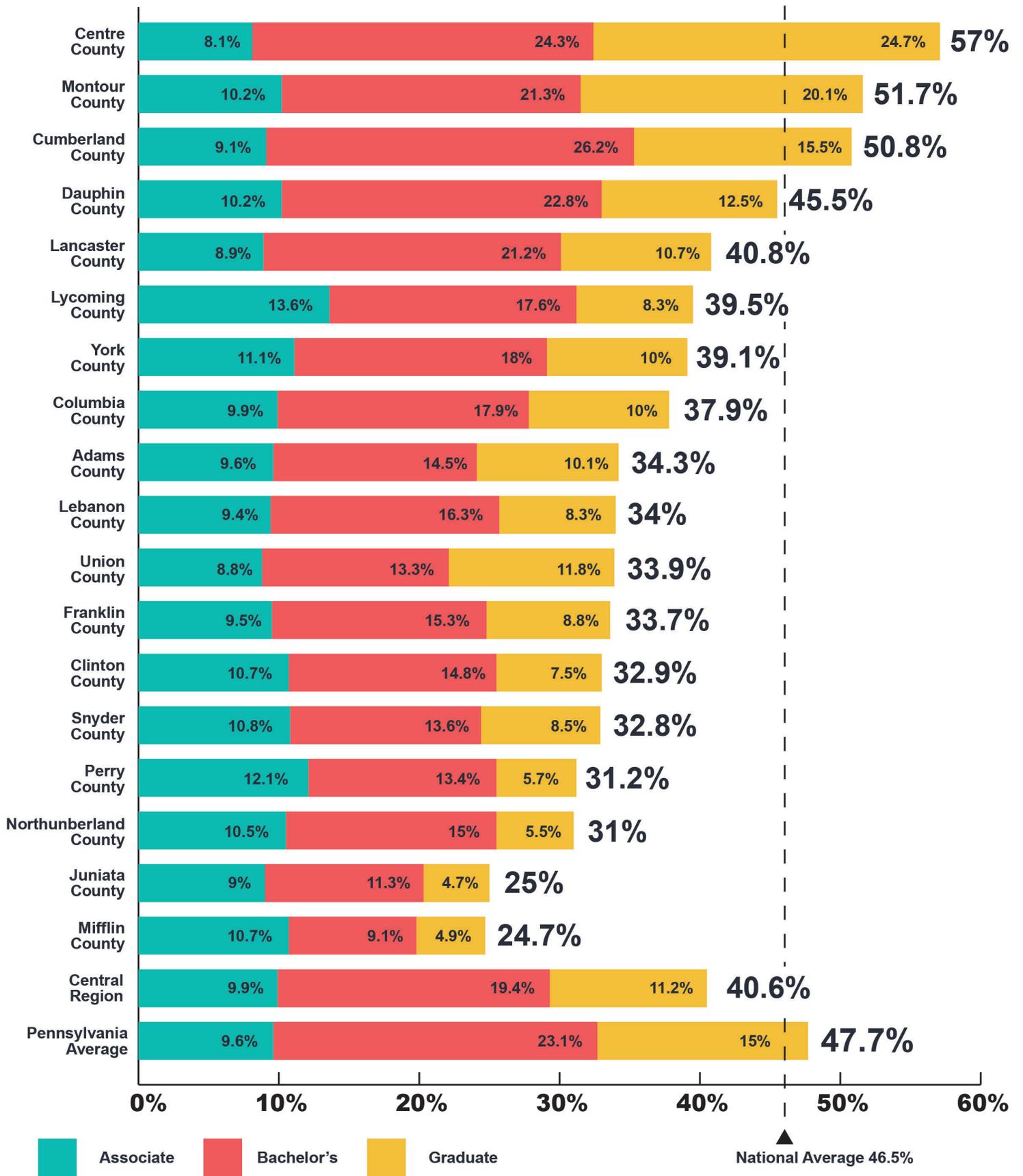
<b>Geographic Region</b>	<b>Working Age Population</b>	<b>Total Population</b>
<b>Pennsylvania Total</b>	<b>6,693,678</b>	<b>12,989,208</b>
<b>Central Region Total</b>	<b>1,323,602</b>	<b>2,644,879</b>
Lancaster County	270,787	553,202
York County	236,686	457,051
Dauphin County	148,505	286,108
Cumberland County	133,225	261,269
Centre County	73,280	158,665
Franklin County	79,245	156,084
Lebanon County	70,055	143,258
Lycoming County	57,390	114,022
Adams County	51,675	104,604
Northumberland County	47,208	91,340
Columbia County	30,582	64,924
Mifflin County	22,370	46,146
Perry County	24,177	45,941
Union County	20,911	42,908
Snyder County	18,687	39,797
Clinton County	17,690	37,860
Juniata County	11,654	23,535
Montour County	9,475	18,165

*Note: Working Age includes population aged 25-64*

*Source: U.S. Census Bureau, Baker Tilly Analysis*

In 2022, 41% of the working age population in the Central region have earned an associate degree or higher, including 19% earning bachelor's degrees (see Figure 3.23). Fifteen of the 18 counties have a lower attainment than the national average of 46.5%, including Lancaster County, the highest populated county in the region.

Figure 3.23 Central Region Degree Attainment by County



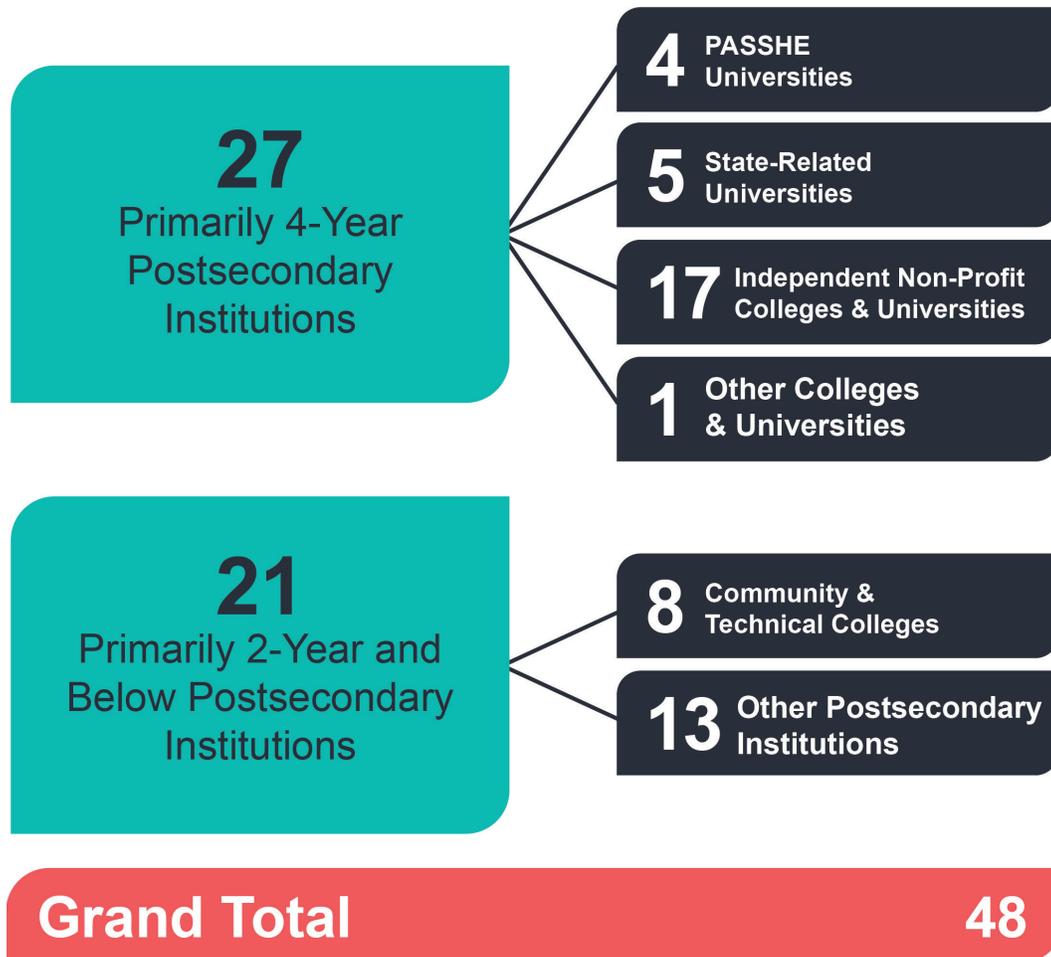
Notes: Degree attainment reflects the highest degree attained and includes associate, bachelor's, and graduate degrees, but does not include non-degree postsecondary certificate credentials.

Pennsylvania and National Attainment from Lumina Foundation. County attainment and regional averages from U.S. Census.

Source: U.S. Census Bureau, Lumina Foundation, Baker Tilly Analysis

The Central Region contains 48 postsecondary campuses of which four are PASSHE universities, five are state-related universities, eight are community or technical colleges, 17 are independent non-profit colleges and universities, one is another primarily 4-year college and university, and 13 are other primarily 2-year postsecondary institutions (See Figure 3.24).

Figure 3.24 **Central Region Institutions and Campuses by Postsecondary Sector**



*Notes: Includes main and branch campuses for PASSHE universities, state-related universities, and community colleges. Other Colleges and Universities include four-year for-profit universities. Other Postsecondary Institutions include less than two-year public institutions and private two-year and less than two-year institutions (both for-profit and not-for-profit).*  
 Source: U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

### Central Pennsylvania: 2023 Workforce Credential Gap Analysis

The Central region is home to the main campus of Pennsylvania State University, which awarded 12% of all bachelor’s degrees in Pennsylvania in 2022, the largest of any institution with a student population drawn from across the Commonwealth. An assumption of the regional workforce credential gap is that all postsecondary credential earners work in the same region where they earned their postsecondary credentials. While this assumption holds true in most regions, it is likely less applicable to Central Pennsylvania. Thus, this analysis may overestimate the number of individuals with postsecondary credentials that stay in the region. Given this caveat the analysis shows a surplus supply of bachelor’s level credentials in this region although there is still a workforce credential gap for bachelor’s degrees in healthcare and education. The region does have a workforce credential gap in both associate and graduate jobs.

Central Pennsylvania has 2,225 more job openings for positions that require postsecondary-level skills and credentials currently than the annual postsecondary credential supply of the postsecondary institutions in the region, of which the majority of the workforce credential gap (2,194) is from occupations that typically require an associate degree or certificate credential. Graduate degrees provide the second largest workforce credential gap (467), while occupations typically requiring a bachelor's degree have an estimated surplus (436) (See Figure 3.25).

Figure 3.25 Central Region 2023 Workforce Credential Gap by Postsecondary Credential Type

Postsecondary Credential Type	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Associate & Certificate	5,217	3,023	(2,194)	42%
Bachelor's	8,778	9,214	436	0%
Graduate	2,877	2,410	(467)	16%
<b>Total</b>	<b>16,872</b>	<b>14,647</b>	<b>(2,225)</b>	<b>13%</b>

*Note: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis*

- The unfilled demand ratio is higher than 50% in the following clusters: healthcare and trade, maintenance, and repair. An unfilled demand ratio of 50% or higher indicates that annual postsecondary credential supply does not meet half of the current occupational openings (or annual demand).
- Occupations in the healthcare cluster contribute 2,301 to the overall workforce credential gap in the Central region, with occupations typically requiring associate/certificate and graduate credentials accounting for most of the gap (76%).
- Occupations in the educational cluster contribute 1,043 to the overall workforce credential gap, of which 920 typically require a bachelor's degree (e.g. pre-K – 12 teachers).
- Occupations in the trade, maintenance, and repair occupational cluster contribute 988 to the overall workforce credential gap. This is entirely driven by occupations that typically require an associate degree or certificate.
- Occupations in the following three clusters: managerial, business, and professional office, STEM, and community, legal, protective services, and arts combine for a surplus of 2,108.

The data points are summarized in Figures 3.26 through 3.29.

**Figure 3.26 Central Region 2023 Workforce Credential Gap by Occupational Cluster: All Jobs Typically Requiring Postsecondary-level Skills and Credentials**

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Healthcare	4,455	2,154	(2,301)	52%
Education	2,247	1,204	(1,043)	46%
Trade, Maintenance, and Repair	1,525	537	(988)	65%
Managerial, Business, and Professional Office	4,729	4,788	59	0%
Community, Legal, Protective Services, and Arts	1,132	1,654	522	0%
STEM	2,784	4,311	1,527	0%
<b>Total</b>	<b>16,872</b>	<b>14,647</b>	<b>(2,225)</b>	<b>13%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Central Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.27 Central Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Associate Degree or Certificate Credentials**

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Healthcare	2,177	1,157	(1,020)	47%
Education	187	64	(123)	66%
Trade, Maintenance, and Repair	1,523	530	(993)	65%
Managerial, Business, and Professional Office	652	535	(117)	18%
Community, Legal, Protective Services, and Arts	311	218	(93)	30%
STEM	367	519	152	0%
<b>Total</b>	<b>5,217</b>	<b>3,023</b>	<b>(2,194)</b>	<b>42%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Central Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.28 Central Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Bachelor's Degrees**

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Healthcare	1,248	695	(553)	44%
Education	2,060	1,140	(920)	45%
Trade, Maintenance, and Repair	2	7	5	0%
Managerial, Business, and Professional Office	3,294	3,338	44	0%
Community, Legal, Protective Services, and Arts	463	1,011	548	0%
STEM	1,711	3,023	1,312	0%
<b>Total</b>	<b>8,778</b>	<b>9,214</b>	<b>436</b>	<b>0%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Central Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.29 Central Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Graduate Degrees**

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Healthcare	1,030	302	(728)	71%
Education	-	-	-	0%
Trade, Maintenance, and Repair	-	-	-	0%
Managerial, Business, and Professional Office	783	915	132	0%
Community, Legal, Protective Services, and Arts	358	425	67	0%
STEM	706	769	63	0%
<b>Total</b>	<b>2,877</b>	<b>2,410</b>	<b>(467)</b>	<b>16%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Central Region.

Jobs typically requiring graduate degrees in the education cluster were not analyzed for regional workforce gaps.

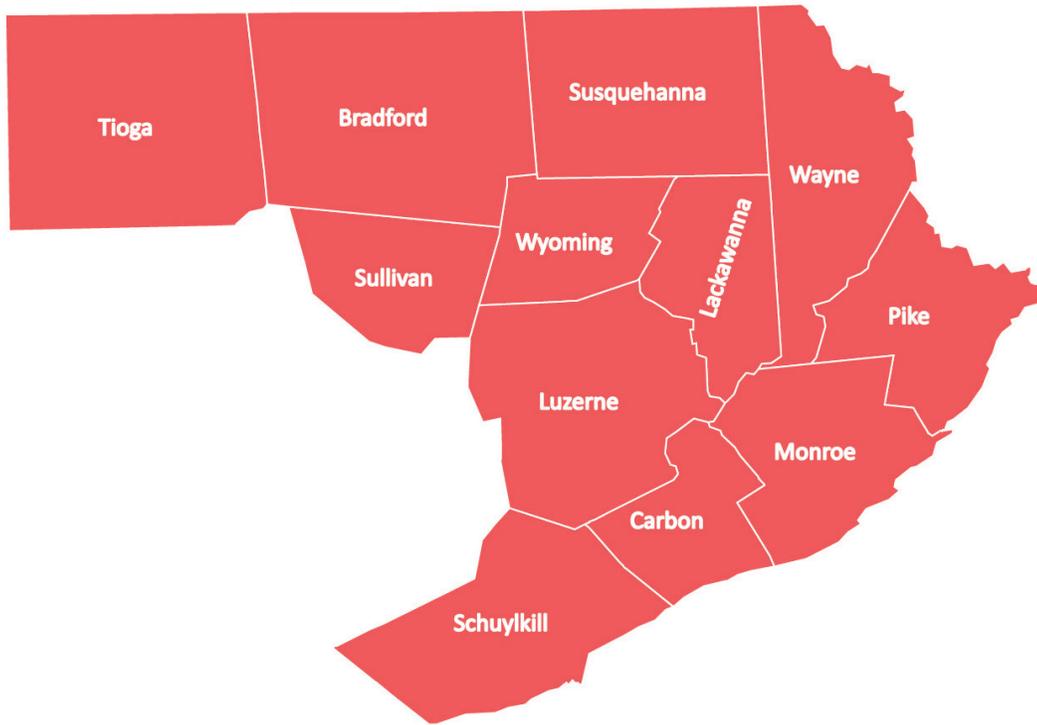
Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

### 3.3.4 THE NORTHEAST REGION

#### Northeast Pennsylvania: Regional Attributes

Pennsylvania's Northeast region contains Scranton and Wilkes-Barre City (see Figure 3.30). The region's total population is 1.2 million with 0.6 million people, or 51% of the total, considered working age (25-64 years old) as seen in Figure 3.31.

Figure 3.30 Northeast Region and Counties Included



Source: U.S. Census Bureau, Baker Tilly Analysis

Figure 3.31 Northeast Region Working Age and Total Population by County

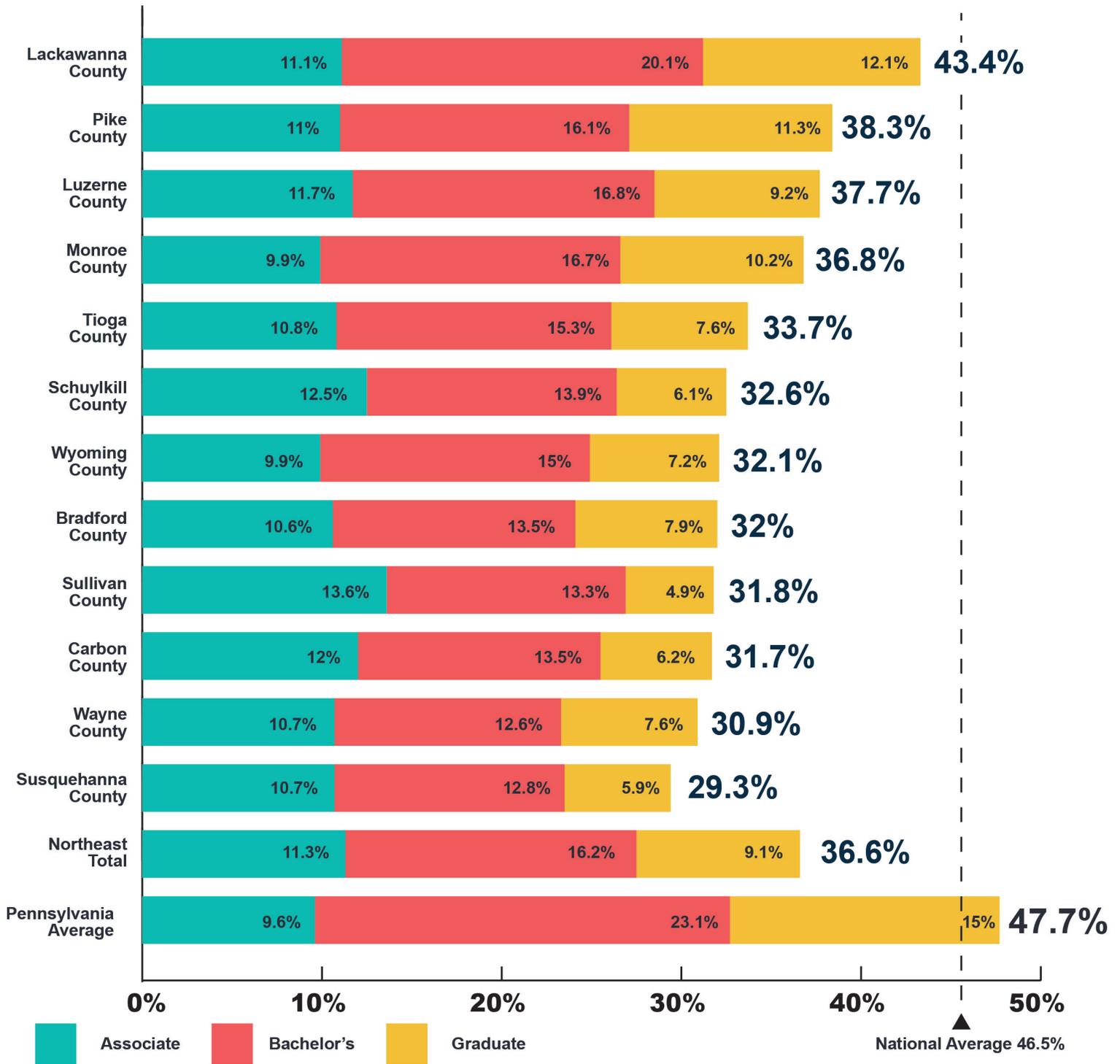
<b>Geographic Region</b>	<b>Working Age Population</b>	<b>Total Population</b>
<b>Pennsylvania Total</b>	<b>6,693,678</b>	<b>12,989,208</b>
<b>Northeast Total</b>	<b>615,381</b>	<b>1,199,622</b>
Luzerne County	166,738	325,396
Lackawanna County	108,811	215,672
Monroe County	88,083	168,128
Schuylkill County	74,898	143,201
Carbon County	34,025	65,018
Bradford County	29,471	60,159
Pike County	30,846	58,996
Wayne County	26,730	51,227
Tioga County	20,159	41,186
Susquehanna County	19,331	38,540
Wyoming County	13,150	26,219
Sullivan County	3,139	5,880

*Note: Working Age includes population aged 25-64*

*Source: U.S. Census Bureau, Baker Tilly Analysis*

In 2022, 37% of the working age population in the Northeast region have earned an associate degree or higher, including 16% earning bachelor's degrees (see Figure 3.32). All 12 counties have a lower attainment than the national average of 46.5%.

Figure 3.32 Northeast Region Degree Attainment by County



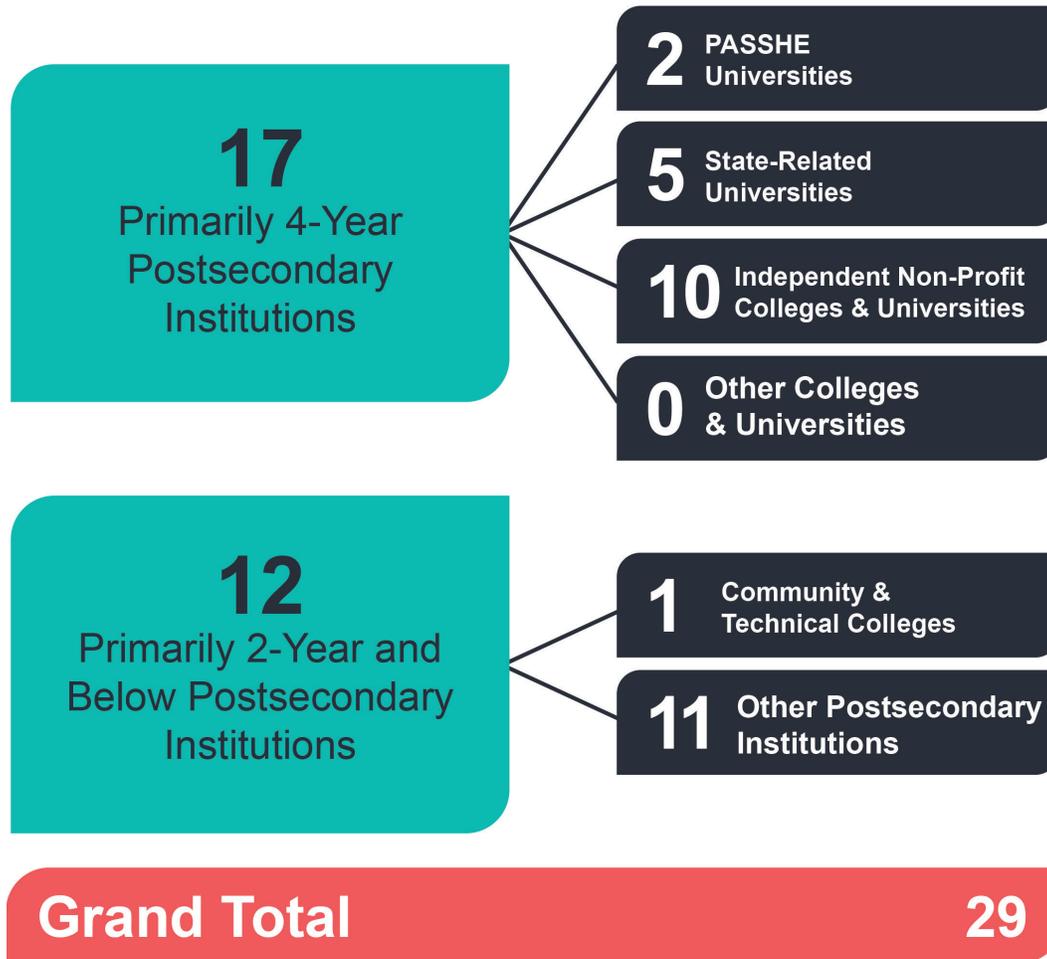
Note: Degree attainment reflects the highest degree attained and includes associate, bachelor's, and graduate degrees, but does not include non-degree postsecondary certificate credentials.

Pennsylvania and National Attainment from Lumina Foundation. County attainment and regional averages from U.S. Census.

Source: U.S. Census Bureau, Lumina Foundation, Baker Tilly Analysis

The Northeast region contains 29 postsecondary campuses of which two are PASSHE universities, five are state-related universities, one is a community or technical college, 10 are independent non-profit colleges and universities, and 11 are other primarily 2-year postsecondary institutions (see Figure 3.33).

Figure 3.33 Northeast Region Institutions and Campuses by Postsecondary Sector



Notes: Includes main and branch campuses for PASSHE universities, state-related universities, and community colleges. Other Colleges and Universities include four-year for-profit universities. Other Postsecondary Institutions include less than two-year public institutions and private two-year and less than two-year institutions (both for-profit and not-for-profit).

Source: U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

### Northeast Pennsylvania: 2023 Workforce Credential Gap Analysis

Northeast Pennsylvania has 2,825 more job openings for positions that require postsecondary-level skills and credentials currently than the annual postsecondary credential supply of the postsecondary institutions in the region, of which the majority of the workforce credential gap (1,429) is from occupations that typically require an associate degree or certificate credential. Bachelor’s degrees provide the second largest workforce credential gap (1,052) followed by graduate degrees (344) (See Figure 3.34).

Figure 3.34 Northeast Region 2023 Workforce Credential Gap by Postsecondary Credential Type

Postsecondary Credential Type	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Associate & Certificate	2,283	854	(1,429)	63%
Bachelor's	2,906	1,854	(1,052)	36%
Graduate	1,041	697	(344)	33%
<b>Total</b>	<b>6,230</b>	<b>3,405</b>	<b>(2,825)</b>	<b>45%</b>

Note: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding.  
 Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

- The unfilled demand ratio is higher than 50% in the following clusters: healthcare and trade, maintenance, and repair. An unfilled demand ratio of 50% or higher indicates that annual postsecondary credential supply does not meet half of the current occupational openings (or annual demand).
- Occupations in the healthcare cluster account for 1,195 (42%) of the overall workforce credential gap in the Northeast region, with occupations typically requiring associate degrees and certificates accounting for most of the gap (58%).
- Occupations in the trade, maintenance, and repair cluster account for 632 (22%) of the overall workforce credential gap. This is entirely driven by occupations that typically require an associate degree or certificate.
- Occupations in the managerial, business, and professional office cluster account for 552 (20%) of the overall workforce credential gap. Occupations that typically require a bachelor's degree account for most of the workforce credential gap (89%).
- Occupations in the educational cluster account for 196 of the overall workforce credential gap; 181 of these occupations typically require a bachelor's degree (e.g. pre-K – 12 teachers).

These data points are summarized in Figures 3.35 through 3.38.

**Figure 3.35 Northeast Region 2023 Workforce Credential Gap by Occupational Cluster: All Jobs Typically Requiring Postsecondary-level Skills and Credentials**

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Healthcare	2,335	1,140	(1,195)	51%
Trade, Maintenance, and Repair	755	123	(632)	84%
Managerial, Business, and Professional Office	1,476	924	(552)	37%
STEM	727	488	(239)	33%
Education	505	309	(196)	39%
Community, Legal, Protective Services, and Arts	432	421	(11)	3%
<b>Total</b>	<b>6,230</b>	<b>3,405</b>	<b>(2,825)</b>	<b>45%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Northeast Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.36 Northeast Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Associate Degree or Certificate Credentials**

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Healthcare	1,086	393	(693)	64%
Trade, Maintenance, and Repair	752	123	(629)	84%
Managerial, Business, and Professional Office	191	133	(58)	31%
STEM	101	71	(30)	30%
Education	32	17	(15)	46%
Community, Legal, Protective Services, and Arts	121	117	(4)	3%
<b>Total</b>	<b>2,283</b>	<b>854</b>	<b>(1,429)</b>	<b>63%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Northeast Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.37 Northeast Region's Gaps by Occupational Cluster for Occupations Typically Requiring Bachelor's Degrees**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Healthcare	701	429	(272)	39%
Trade, Maintenance, and Repair	3	-	(3)	100%
Managerial, Business, and Professional Office	1,049	558	(491)	47%
STEM	516	352	(164)	32%
Education	473	292	(181)	38%
Community, Legal, Protective Services, and Arts	164	223	59	0%
<b>Total</b>	<b>2,906</b>	<b>1,854</b>	<b>(1,052)</b>	<b>36%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Northeast Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.38 Northeast Region's Gaps by Occupational Cluster for Occupations Typically Requiring Graduate Degrees**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Healthcare	548	318	(230)	42%
Trade, Maintenance, and Repair	-	-	-	0%
Managerial, Business, and Professional Office	236	233	(3)	1%
STEM	110	64	(46)	41%
Education	-	-	-	0%
Community, Legal, Protective Services, and Arts	147	81	(66)	45%
<b>Total</b>	<b>1,041</b>	<b>697</b>	<b>(344)</b>	<b>33%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Northeast Region

Jobs typically requiring graduate degrees in the education cluster were not analyzed for regional workforce gaps

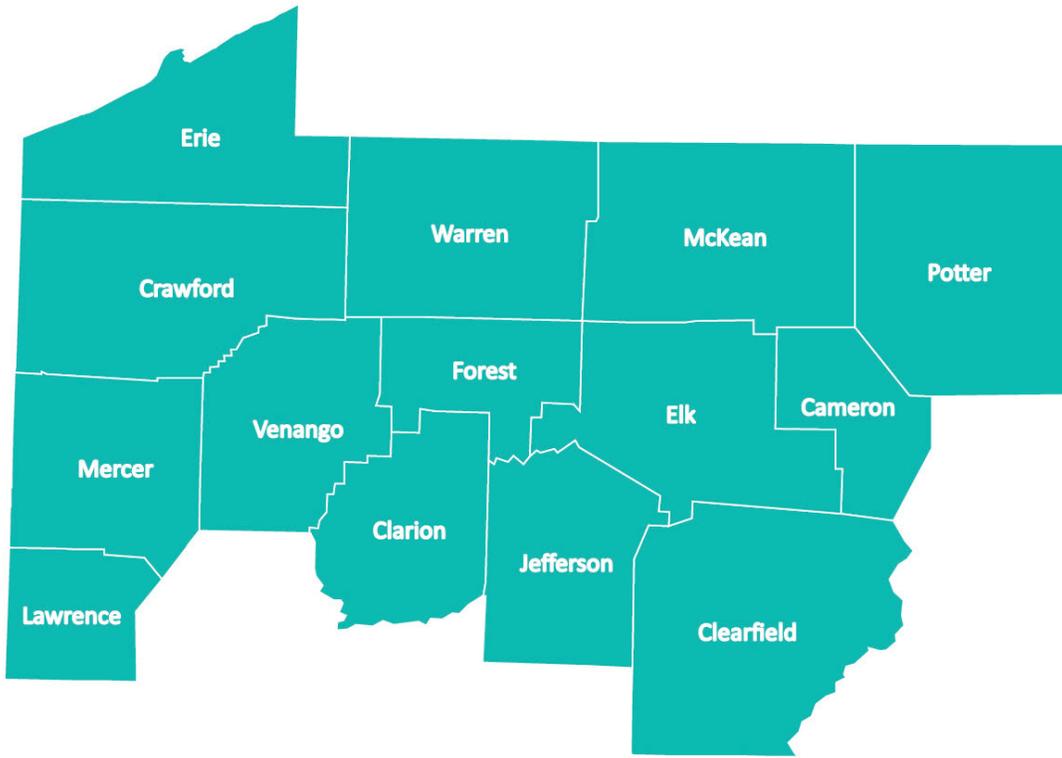
Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

### 3.3.5 THE NORTHWEST REGION

#### Northwest Pennsylvania: Regional Attributes

Pennsylvania's Northwest region's largest municipalities include Erie and Millcreek Township (See Figure 3.39). The region's total population is 900,000 with 500,000 people just over 50% of the total-- considered working age (25-64 years old) as seen in Figure 3.40.

Figure 3.39 Northwest Region and Counties Included



Source: U.S. Census Bureau, Baker Tilly Analysis

Figure 3.40 Northwest Region Working Age and Total Population by County

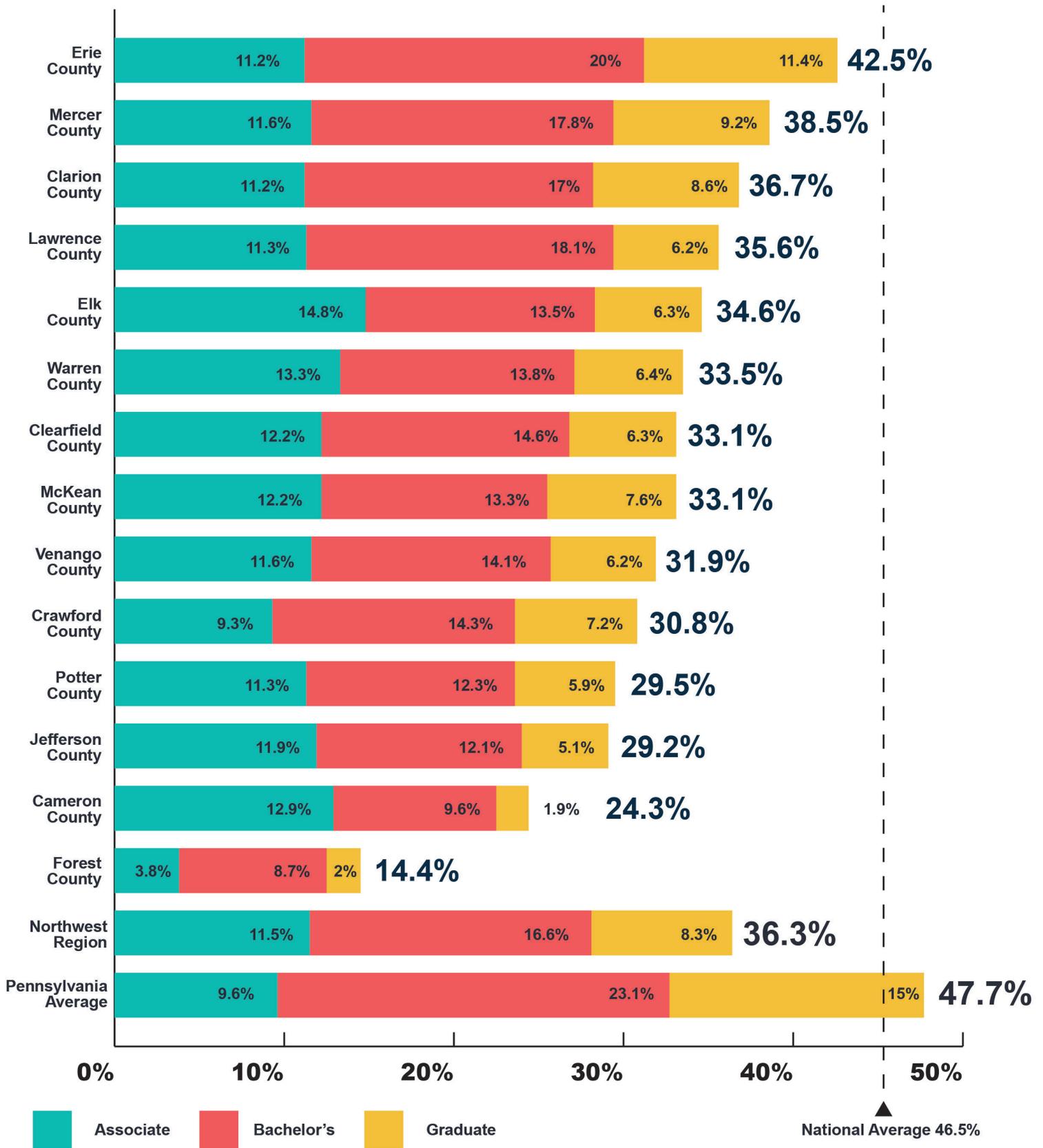
<b>Geographic Region</b>	<b>Working Age Population</b>	<b>Total Population</b>
<b>Pennsylvania Total</b>	<b>6,693,678</b>	<b>12,989,208</b>
<b>Northwest Total</b>	<b>451,501</b>	<b>900,597</b>
Erie County	135,972	270,495
Mercer County	54,152	110,600
Lawrence County	42,443	85,907
Crawford County	40,845	83,876
Clearfield County	42,692	79,707
Venango County	25,497	50,475
Jefferson County	22,120	44,326
McKean County	20,727	40,459
Warren County	19,195	38,492
Clarion County	17,965	37,489
Elk County	15,693	30,886
Potter County	7,870	16,390
Forest County	4,123	6,959
Cameron County	2,207	4,536

*Note: Working Age includes population aged 25-64*

*Source: U.S. Census Bureau, Baker Tilly Analysis*

In 2022, 37% of the working age population in the Northwest region earned an associate degree or higher, including 17% earning bachelor's degrees (see Figure 3.41). All 14 counties have a lower attainment than the national average of 46.5%.

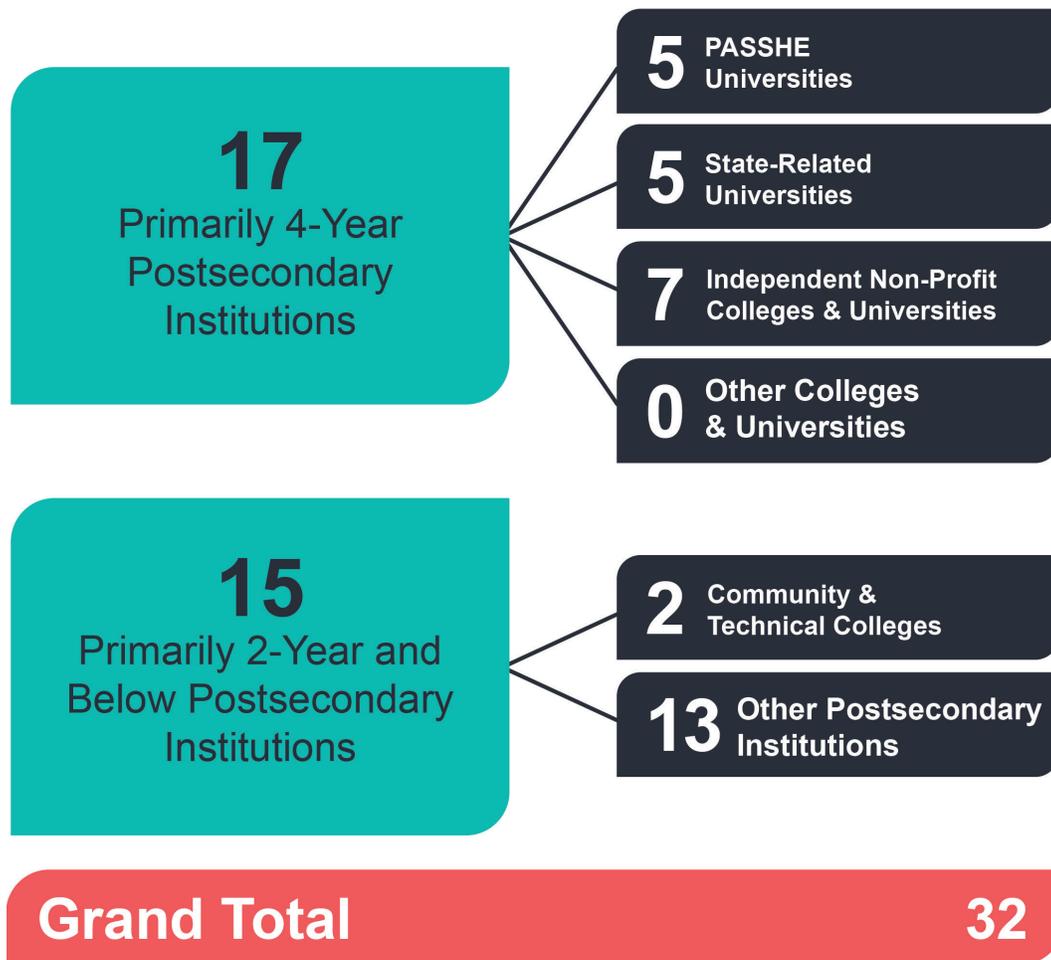
Figure 3.41 Northwest Region Degree Attainment by County



Note: Degree attainment reflects the highest degree attained and includes associate, bachelor's, and graduate degrees, but does not include non-degree postsecondary certificate credentials. Pennsylvania and National Attainment from Lumina Foundation. County attainment and regional averages from U.S. Census. Source: U.S. Census Bureau, Lumina Foundation, Baker Tilly Analysis

The Northwest region contains 32 postsecondary campuses of which five are PASSHE universities, five are state-related universities, two are community or technical colleges, seven are independent non-profit colleges and universities, and 13 are other primarily 2-year postsecondary institutions (see Figure 3.42).

Figure 3.42 Northwest Region Institutions and Campuses by Postsecondary Sector



*Notes: Includes main and branch campuses for PASSHE universities, state-related universities, and community colleges. Other Colleges and Universities include four-year for-profit universities. Other Postsecondary Institutions include less than two-year public institutions and private two-year and less than two-year institutions (both for-profit and not-for-profit).*

*Source: U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis*

### Northwest Pennsylvania: 2023 Workforce Credential Gap Analysis

Northwest Pennsylvania has 855 more job openings for positions that require postsecondary-level skills and credentials currently than the annual postsecondary credential supply of the postsecondary institutions in the region, of which the majority of the workforce credential gap (859) is from occupations that typically require associates or certificates degrees account. This workforce credential gap is larger than the total gap due to a surplus in graduate degrees. Bachelor's degrees provide the second largest workforce credential gap (146). Occupations typically requiring a graduate degree have an estimated surplus of 151 (see Figure 3.43).

Figure 3.43 Northwest Region 2023 Workforce Credential Gap by Postsecondary Credential Type

Postsecondary Credential Type	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Associate & Certificate	1,584	725	(859)	54%
Bachelor's	2,037	1,891	(146)	7%
Graduate	707	858	151	0%
<b>Total</b>	<b>4,328</b>	<b>3,473</b>	<b>(855)</b>	<b>20%</b>

Note: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding.  
 Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

- Trade, maintenance, and repair cluster has an unfilled demand ratio that is higher than 50%. An unfilled demand ratio of 50% or higher indicates that annual postsecondary credential supply does not meet half of the current occupational openings (or annual demand).
- Occupations in the healthcare cluster contribute 603 to the overall workforce credential gap in the Northwest region, with occupations typically requiring associate degrees and certificates and bachelor’s degrees accounting for all of the gap.
- Occupations in the managerial, business, and professional office occupational cluster contribute 263 to the overall workforce credential gap. The primary driver of this workforce credential gap is occupations that typically require bachelor’s degrees.
- Occupations in the trade, maintenance, and repair occupational cluster contribute 169 to the overall workforce credential gap. This is entirely driven by occupations that typically require an associate degree or certificate.
- Occupations in the educational cluster account for 163 of the overall workforce credential gap; an estimated 143 occupations typically require a bachelor’s degree (e.g. pre-K – 12 teachers).
- Occupations in the STEM and community, legal, protective services, and arts clusters combine for a surplus of 344.

These data points are summarized in Figures 3.44 through 3.47

**Figure 3.44 Northwest Region 2023 Workforce Credential Gap by Occupational Cluster: All Jobs Typically Requiring Postsecondary-level Skills and Credentials**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Healthcare	1,714	1,111	(603)	35%
Managerial, Business, and Professional Office	1,014	751	(263)	26%
Trade, Maintenance, and Repair	335	166	(169)	50%
Education	506	343	(163)	32%
Community, Legal, Protective Services, and Arts	309	374	65	0%
STEM	450	729	279	0%
<b>Total</b>	<b>4,328</b>	<b>3,473</b>	<b>(855)</b>	<b>20%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Northwest Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.45 Northwest Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Associate Degree or Certificate Credentials**

<b>Occupational Cluster</b>	<b>2023 Annual Demand</b>	<b>2023 Postsecondary Credential Supply</b>	<b>2023 Workforce Credential (Gap) Surplus</b>	<b>% Unfilled Demand</b>
Healthcare	916	310	(606)	66%
Managerial, Business, and Professional Office	141	56	(85)	60%
Trade, Maintenance, and Repair	335	166	(169)	50%
Education	29	9	(20)	70%
Community, Legal, Protective Services, and Arts	86	41	(45)	53%
STEM	77	143	66	0%
<b>Total</b>	<b>1,584</b>	<b>725</b>	<b>(859)</b>	<b>54%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Northwest Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.46 Northwest Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Bachelor's Degrees**

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Healthcare	480	292	(188)	39%
Managerial, Business, and Professional Office	686	516	(170)	25%
Trade, Maintenance, and Repair	-	-	-	0%
Education	477	334	(143)	30%
Community, Legal, Protective Services, and Arts	108	215	107	0%
STEM	286	534	248	0%
<b>Total</b>	<b>2,037</b>	<b>1,891</b>	<b>(146)</b>	<b>7%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Northwest Region

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

**Figure 3.47 Northwest Region 2023 Workforce Credential Gap by Occupational Cluster: Jobs Typically Requiring Graduate Degrees**

Occupational Cluster	2023 Annual Demand	2023 Postsecondary Credential Supply	2023 Workforce Credential (Gap) Surplus	% Unfilled Demand
Healthcare	318	509	191	0%
Managerial, Business, and Professional Office	187	179	(8)	4%
Trade, Maintenance, and Repair	-	-	-	0%
Education	-	-	-	0%
Community, Legal, Protective Services, and Arts	115	118	3	0%
STEM	87	53	(34)	39%
<b>Total</b>	<b>707</b>	<b>858</b>	<b>151</b>	<b>0%</b>

Notes: 2023 annual demand reflects the number of job openings as of October 2023. Totals may not sum due to rounding. Occupational clusters ordered by the size of the workforce credential gap for all jobs requiring postsecondary-level skills and credentials in the Northwest Region

Jobs typically requiring graduate degrees in the education cluster were not analyzed for regional workforce gaps

Source: U.S. Department of Education: National Center for Education Statistics: CIP to SOC Crosswalk, Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Pennsylvania Department of Education, Baker Tilly Analysis

# 4.0 Projected 2032 Statewide Shortage of Workers with Postsecondary-level Skills and Credentials

## 4.1 BACKGROUND OF ANALYSIS

This section of the report focuses on the long-term projected growth of jobs that typically require postsecondary-level skills and credentials in Pennsylvania through 2032 compared to the change in the projected workforce with postsecondary-level skills and credentials in Pennsylvania in 2032. Workforce shortages identified in this analysis cannot be filled without a population base that exceeds projections, significant increases in labor participation, an increase in the postsecondary attainment rate of Pennsylvanians, or a combination of these factors. Due to a lack of regional workforce projection data, no projection of future regional workforce credential needs is included in this document.

## 4.2 PROJECTED GROWTH OF JOBS THAT REQUIRE POSTSECONDARY CREDENTIALS OR DEGREES

The 10-year cumulative growth in jobs that will require postsecondary credentials or degrees is extrapolated from the Center for Workforce Information & Analysis (CWIA) Occupational Employment 2022-2024 Short-Term Forecast that was discussed in Section 2.1 of this report (“Evaluating 2023 Job Demand For Postsecondary-level Skills and Credentials”).<sup>41</sup> Job growth focuses solely on the growth of jobs or occupations<sup>42</sup> that typically require a postsecondary credential or degree.<sup>43</sup>

By 2032, Pennsylvania is expected to have 204,396 more jobs that typically require require postsecondary-level skills and credentials. This is an increase of 6.9% over eight years, which is a conservative projection.<sup>44</sup> The fields projected to need the highest overall increase in jobs requiring postsecondary-level skills and credentials and degrees are managerial, business, and professional office (64,229), healthcare (43,740), and education (34,447) occupational clusters. Fields projected to have the highest percentage increase in jobs requiring postsecondary credentials and degrees between 2022 and 2032 are in the following clusters: education (10.2%), healthcare (7.9%), and STEM (7.8%) (Figure 4.1).

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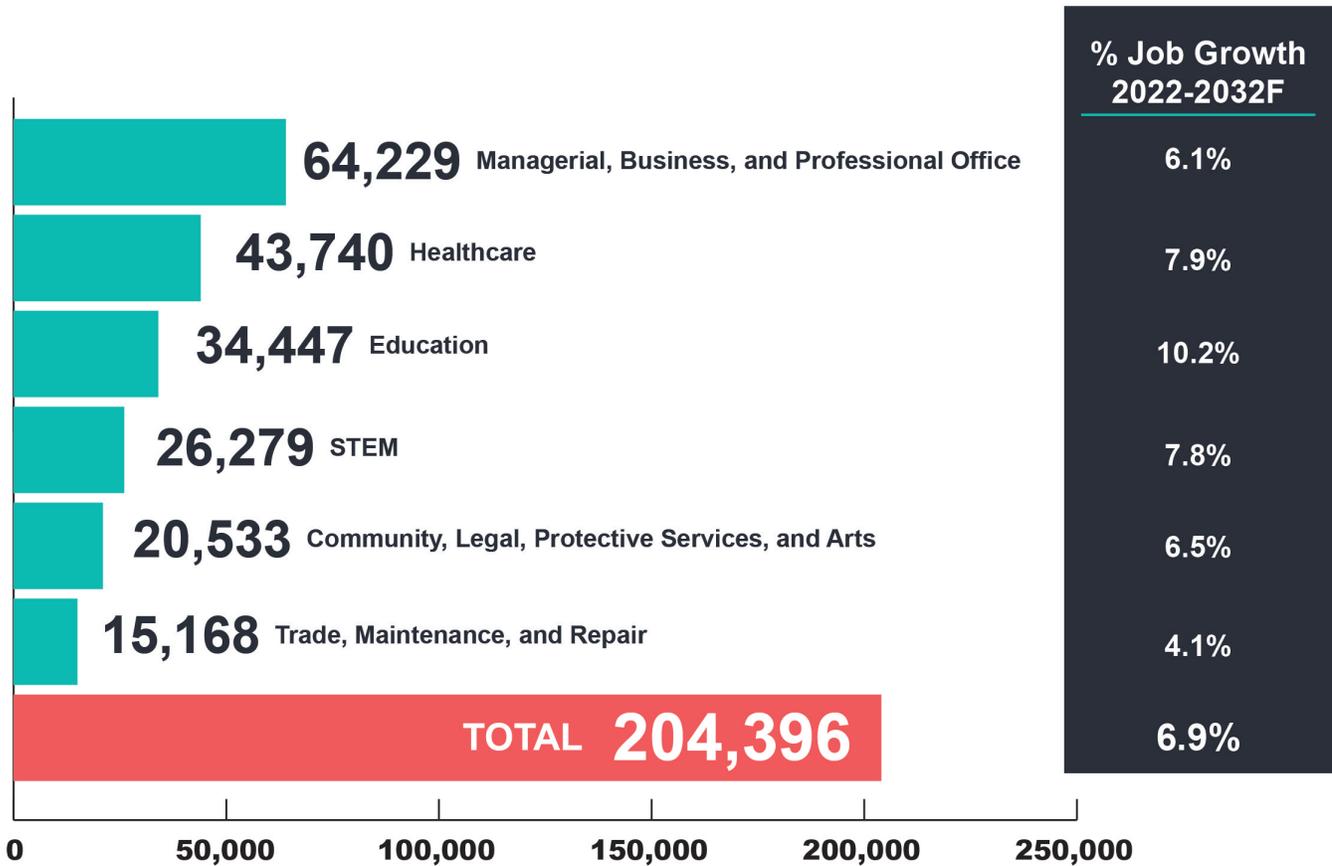
<sup>41</sup> Pennsylvania Department of Labor & Industry (2023). *Employment forecasts 2022-2024*. Center for Workforce Information & Analysis. Retrieved October 6, 2023, from <https://www.workstats.dli.pa.gov/Products/ShortTermForecasts/Pages/default.aspx> To extrapolate to 2032, the growth rate of occupational clusters was calculated from CWIA’s short-term forecast through 2024 and then that growth was utilized to forecast the following seven years (2025-2032).

<sup>42</sup> Job growth reflects the increase in the number of jobs over a period of time, and does not consider workforce exits.

<sup>43</sup> As discussed in Section 2.1 “Evaluating Annual Demand”, credentials typically required for job occupation titles (six-digit SOC codes) were identified from O\*NET Job Zones. Job Zones range from 1 (lowest) to 5 (highest), with Job Zones 3, 4, and 5 typically requiring postsecondary education. In this analysis, an occupation that typically requires postsecondary-level skills and credentials is an occupation with a Job Zone of 3, 4, or 5.

<sup>44</sup> In Carnevale, A.P., Smith, N., Van Der Werf, M., & Quinn, M.C. (2023). *After everything: Projections of jobs, education, and training requirements through 2031* from Georgetown University Center on Education and the Workforce (Retrieved December 13, 2023 <https://cew.georgetown.edu/cew-reports/projections2031/>); their study projects job growth for jobs typically requiring postsecondary-level skills and credentials to be 310,000 by 2031.

Figure 4.1 Pennsylvania 2022-2032 Projected Growth in Jobs That Typically Require Postsecondary-level Skills and Credentials by Occupational Cluster



Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, Baker Tilly Analysis

### 4.3 PENNSYLVANIA WORKFORCE WITH POSTSECONDARY-LEVEL SKILLS AND CREDENTIALS

The number of Pennsylvanians in the workforce with postsecondary-level skills and credentials is projected to decline 13,870 by 2032 (Figure 4.2). This calculation is based on:

- Working age population in Pennsylvania
- Pennsylvania working-age postsecondary attainment rate<sup>45</sup>
- U.S. labor force participation rate<sup>46</sup>

<sup>45</sup> Postsecondary attainment rate includes the population with non-degree postsecondary certificates, associate degrees, bachelor's degrees, graduate degrees, or who have attended some college but not received a certificate or degree.

<sup>46</sup> Data for Pennsylvania-specific labor participation rates by age bands was not identified, and U.S. Bureau of Labor Statistic projections are used in this analysis.

Figure 4.2 **Estimated 2022 and Projected 2032 Pennsylvania Workforce with Postsecondary-level Skills and Credentials**

	<u>2022</u>	<u>2032</u>	<u>Difference</u>
<b>PA Working Age Population</b>	6,610,059	6,334,211	(275,848)
<b>X</b>			
<b>PA Working Age Postsecondary Attainment Rate</b>	63%	65%	2%
<b>X</b>			
<b>U.S. Labor Force Participation Rate</b>	78.2%	78.8%	0.6%
<b>=</b>			
<b>Workforce with Postsecondary-Level Skills and Credentials</b>	3,257,545	3,243,675	(13,870)

Source: Center for Rural Pennsylvania, U.S. Census Bureau, U.S. Bureau of Labor Statistics, Baker Tilly Analysis

**Key findings:**

- The working-age (25-64) population in Pennsylvania is projected to decline by 275,848 from 2022-2032, primarily due to an aging population.
- Working-age postsecondary attainment is forecast to grow by 2.0 percentage points, but postsecondary attainment levels need to increase more to meet the future demands of the economy.
- Despite the overall projected increase in attainment, the 25-34 cohort’s postsecondary attainment is forecast to be 5.3% lower in 2032 than it was in 2022, primarily driven by declining enrollment of recent high school graduates in postsecondary institutions.
- The overall postsecondary attainment increase is driven by the exit of the 2022 population aged 55-64, which has lower attainment levels than younger populations, even with projected declines of the 25-34 population.
- The labor force participation rate is projected to grow 0.6 percentage points, mainly due to delayed retirement of the population in the 55-64 age bracket.

**4.3.1 PENNSYLVANIA WORKING AGE POPULATION**

Figure 4.3 shows the population between the ages of 25-64 was estimated to be 6.6 million in 2022 and is projected to decline by approximately 276,000 to 6.3 million in 2032, driven by an aging population.<sup>47</sup> While Pennsylvania’s population aged 25-54 is forecast to increase by 16,487 by 2032, nearly 300,000 working age Pennsylvanians will leave the workforce. More information is available in Appendix D.

<sup>47</sup> Center for Rural Pennsylvania. (2023). *Pennsylvania population projections for the next 30 years. Population projections*. Retrieved November 8, 2023, from <https://www.rural.pa.gov/data/population-projections> Current and projected populations of the working age population are sourced from *The Center for Rural Pennsylvania Population Projections*, which uses a demographic cohort model that “accounts for population based on births, deaths, and migration levels.” Age cohorts were calculated with five-year bands but are shown in ten-year bands for this analysis.

Figure 4.3 Pennsylvania Estimated 2022 and Projected 2032 Working Age Population by Age Cohort

Age Cohorts	2022 Population	2032 Population	Projected Change
25-34	1,660,357	1,592,713	(67,644)
35-44	1,617,550	1,673,822	56,272
45-54	1,559,676	1,587,535	27,859
55-64	1,772,476	1,480,141	(292,335)
<b>Working Age Total</b>	<b>6,610,059</b>	<b>6,334,211</b>	<b>(275,848)</b>

Note: 2022 estimated population is calculated as the weighted average of 2020, and 2025 estimates and projections, 2020 is weighted as 60%. 2032 projected population is calculated as the weighted average of 2030, and 2035, 2030 is weighted as 60%.

Source: Center for Rural Pennsylvania, Baker Tilly Analysis

#### 4.3.2 WORKING AGE POSTSECONDARY ATTAINMENT RATE

Calculations of postsecondary attainment include all Pennsylvanians with some college,<sup>48</sup> non-degree certificates, and degrees (e.g. associate degree, bachelor’s degree, or graduate degree). Postsecondary attainment rates for 2022 and preceding years were sourced from the U.S. Census Bureau’s American Community Survey (ACS). Attainment projections were calculated using data-informed assumptions from historical attainment rate changes, annual credential awards from the National Center for Education Statistics<sup>49</sup>, and postsecondary enrollment trends in Pennsylvania from Miller and Johnson (2022<sup>50</sup>). See Appendix E for additional information.

Figure 4.4 presents 2022 actual postsecondary attainment and projected 2032 postsecondary attainment in Pennsylvania by 10-year age bands. In 2022, the total Pennsylvania working-age postsecondary attainment rate was 63%, and the attainment rate is projected to grow to 65% in 2032. The primary driver of the increase is the exit of the 55-64 cohort, which has lower postsecondary attainment than younger cohorts that comprise the 2032 working-age population. Thus, while overall postsecondary attainment is projected to increase 2 percentage points overall, the increase is attributable to older cohorts of workers reaching retirement age and leaving the workforce. Older aged cohorts have a lower attainment rate than younger aged cohorts, meaning that as the Pennsylvania population ages, the attainment rate is projected to increase.

Increases in the postsecondary attainment rate of 35-44 and 45-54 cohorts are driven primarily by the attainment rate of the population entering the age bracket, but also include continued postsecondary attainment gains as adult learners.

<sup>48</sup> Some college typically includes attending college but not achieving a degree.

<sup>49</sup> U.S. Department of Education (n.d.), Integrated Postsecondary Education Data System (IPEDS), 2017-2022, Trend Generator, Completions. National Center for Education Statistics (n.d.). Retrieved October 19, 2023, from <https://nces.ed.gov/ipeds/>

<sup>50</sup> Pennsylvania Department of Education. (2022). Act 82 of 2018: Report on educator preparation and certification. Retrieved January 10 2024, from <https://www.education.pa.gov/DataAndReporting/Pages/Act82.aspx>.

Most critically, the 25-34 cohort's postsecondary attainment is forecast to be 5.3% lower in 2032 than it was in 2022, primarily driven by declining enrollment of recent high school graduates in postsecondary institutions. This highlights the future reality of Pennsylvania's workforce. As discussed below, the youngest working-age Pennsylvanians will have less postsecondary educational attainment than those directly older than them, which will have unknown consequences to the economy in 2032 and beyond.

**Figure 4.4 Pennsylvania 2022 Actual and 2032 Projected Working Age Postsecondary Attainment Rate by Age Cohort**

<b>Age Cohorts</b>	<b>2022 Actual Postsecondary Attainment Rate</b>	<b>2032 Projected Postsecondary Attainment Rate</b>	<b>Projected Percentage Point Change</b>
25-34	67.2%	61.9%	-5.3%
35-44	68.2%	70.7%	2.5%
45-54	58.4%	68.2%	9.8%
55-64	58.4%	58.4%	0.0%
<b>Working Age Total</b>	<b>63.0%</b>	<b>65.0%</b>	<b>2.0%</b>

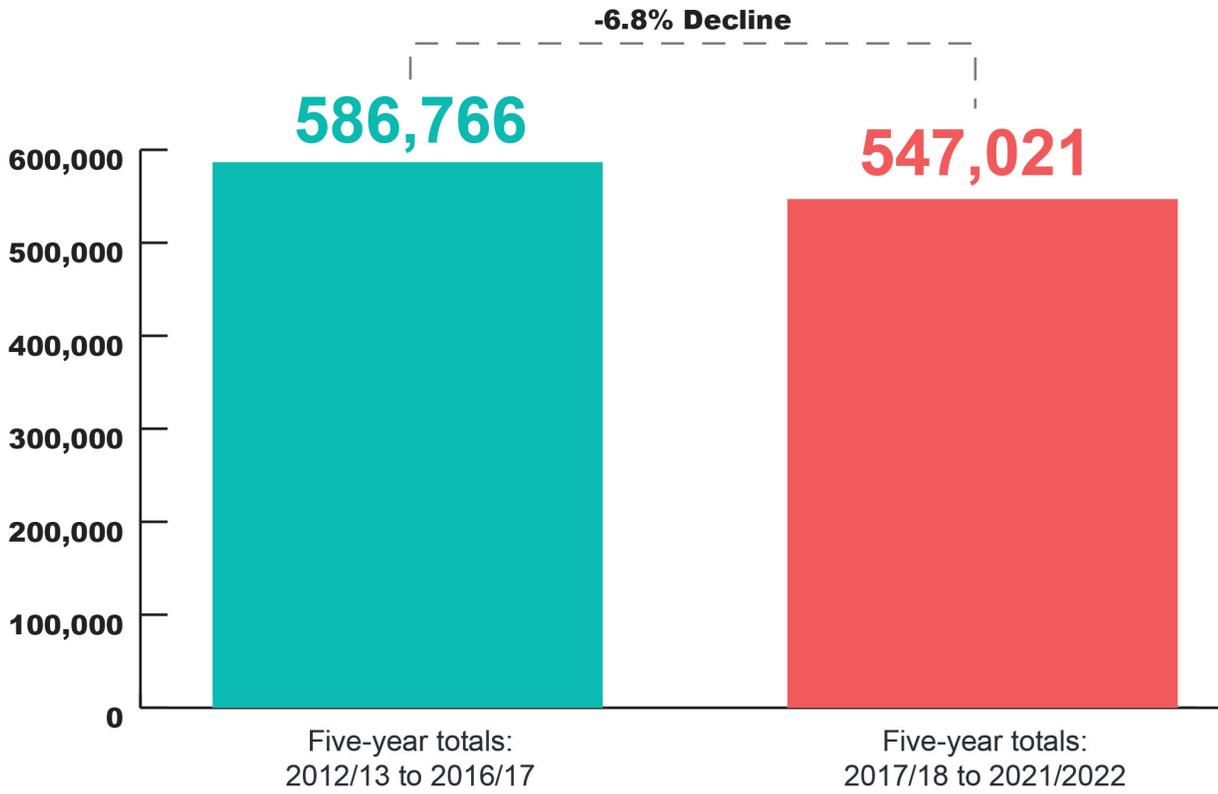
*Note: Working age totals are weighted by population of cohort*

*Source: U.S. Census Bureau, Pennsylvania Department of Education, Miller, C.M., & Johnson, R. (2022), U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Baker Tilly Analysis*

The projected postsecondary attainment decline of Pennsylvania's youngest working-age cohort is based on patterns that are apparent today. Figures 4.5 and 4.6 show that credential awards and postsecondary enrollment are declining. Pennsylvania's postsecondary institutions awarded 586,766 associate and bachelor's degrees from 2013-2017. Over the next five years, institutions only awarded 547,021 degrees, a decline of 6.8%.

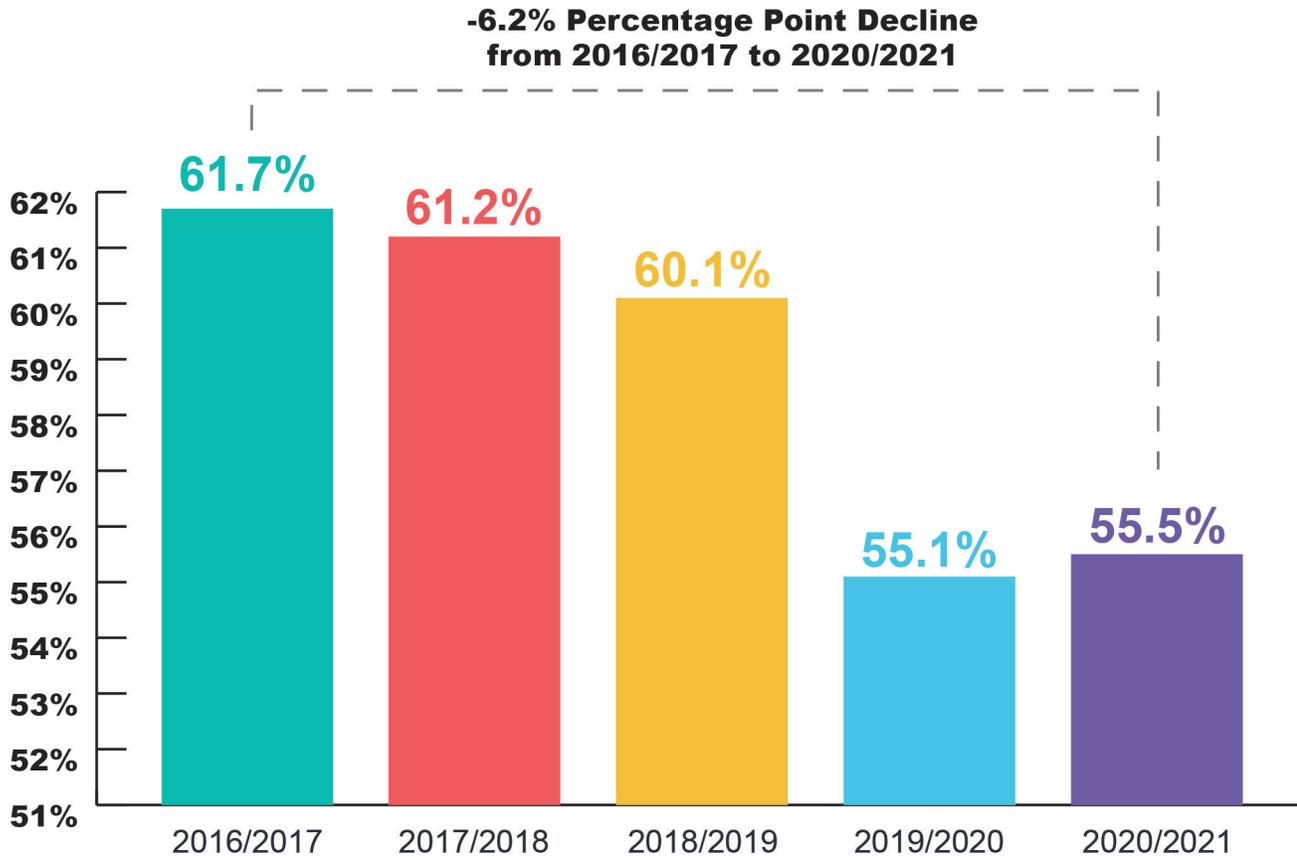
The percentage of recent high school graduates in Pennsylvania who enrolled in any postsecondary institution within one year of graduation decreased from 61.7% for high school graduates in the academic year of 2016-17 to 55.5% in academic year 2020-21 – a 6.2% decline. While impacts due to the Covid-19 pandemic likely contributed to part of the decline of enrollment in postsecondary institutions, the data shows much of the decline started prior to the Covid-19 pandemic. Before the Covid-19 pandemic, the rate of high school graduates enrolling in any postsecondary institution within one year of graduation decreased by 1.6% from academic years 2016-17 to 2018-19. (See Figure 4.6).

Figure 4.5 Associate and Bachelor's Awards by Pennsylvania Postsecondary Institutions, Cumulative Five-Year Totals between 2012/2013 and 2021/2022 Academic Years



Source: U.S. Department of Education: Integrated Postsecondary Education Data System (IPEDS), Baker Tilly Analysis

Figure 4.6 Percent of Pennsylvanians That Enrolled in a Postsecondary Institution within One Year of High School Graduation by Graduation Year



Source: Miller, C.M., & Johnson, R. (2022), Baker Tilly Analysis

### 4.3.3 LABOR FORCE PARTICIPATION RATE

To calculate the labor force participation rate of working age Pennsylvanians, data from the Bureau of Labor and Statistics (BLS) employment projections was utilized.<sup>51</sup> The BLS defines the labor force participation rate as the “percentage of the population that is either working or actively looking for work.”<sup>52</sup> Figure 4.7 shows that the labor force participation rate is projected to increase by 0.6 percentage points from 2022 to 2032, driven by a 3.2 percentage point increase in the 55-64 cohort, likely due to fewer retirements in the oldest working age cohort. The labor force participation rate in the United States is forecast to decline across all other cohorts, with 1.2% declines in the 25-34 and 35-44 cohorts, driven by projected participation declines among men in these cohorts.<sup>53</sup>

<sup>51</sup> U.S. Bureau of Labor Statistics. (n.d.). Educational attainment for workers 25 years and older by detailed occupations. Employment projections. Retrieved January 4, 2024, from <https://www.bls.gov/emp/tables/educational-attainment.htm>.

<sup>52</sup> U.S. Bureau of Labor Statistics (n.d.). Labor force statistics from the Current Population Survey (Concepts and Definitions). Current Population Survey. Retrieved January 18, 2024, from <https://www.bls.gov/cps/definitions.htm>

<sup>53</sup> U.S. Bureau of Labor Statistics. (2023). Employment projections 2022-2032 (News Release). Retrieved January 18, 2024, from <https://www.bls.gov/news.release/pdf/ecopro.pdf>

Figure 4.7 U.S. 2022 Actual and 2032 Projected Workforce Participation Rate By Age Cohorts

Age Cohorts	2022 Actual Participation Rate	2032 Projected Participation Rate	Projected Percentage Point Change
25-34	83.2%	82.1%	-1.2%
35-44	83.0%	81.9%	-1.2%
45-54	81.1%	80.9%	-0.2%
55-64	65.2%	68.4%	3.2%
<b>Working Age Total</b>	<b>78.2%</b>	<b>78.8%</b>	<b>0.6%</b>

Note: Working age totals are weighted by population of cohort

Source: U.S. Bureau of Labor Statistics, Baker Tilly Analysis

#### 4.3.4 PROJECTED CHANGE IN WORKFORCE WITH POSTSECONDARY-LEVEL SKILLS AND CREDENTIALS

Based on changes in the working age population, postsecondary attainment rate, and labor force participation rate in Pennsylvania detailed in the sections above, the workforce in Pennsylvania with postsecondary-level skills and credentials is projected to shrink by 13,870 by 2032. In Figure 4.8, workforce projections are broken out by age cohort, which provides insights into demographics to target for educational reform in Pennsylvania.

Projections indicate that the youngest age cohort (people between the ages of 25-34) provides a promising opportunity to increase postsecondary attainment rates. In 2032, it is currently projected that there will be 119,481 fewer 25-34 workers with postsecondary-level skills and credentials, primarily driven by declines in that cohort’s population size and attainment level.

An increase in the number of workers with postsecondary-level skills and credentials is projected to be approximately 189,694 in the 34-44 and 45-54 age groups, partly due to increased postsecondary attainment rates in those groups. However, this increase is not enough to offset the decline in postsecondary attainment rates project for the younger (25-34) and older (55-64) age group.

Figure 4.8 Estimated 2022 and Projected 2032 Pennsylvania Workforce with Postsecondary-level Skills and Credentials by Age Cohort

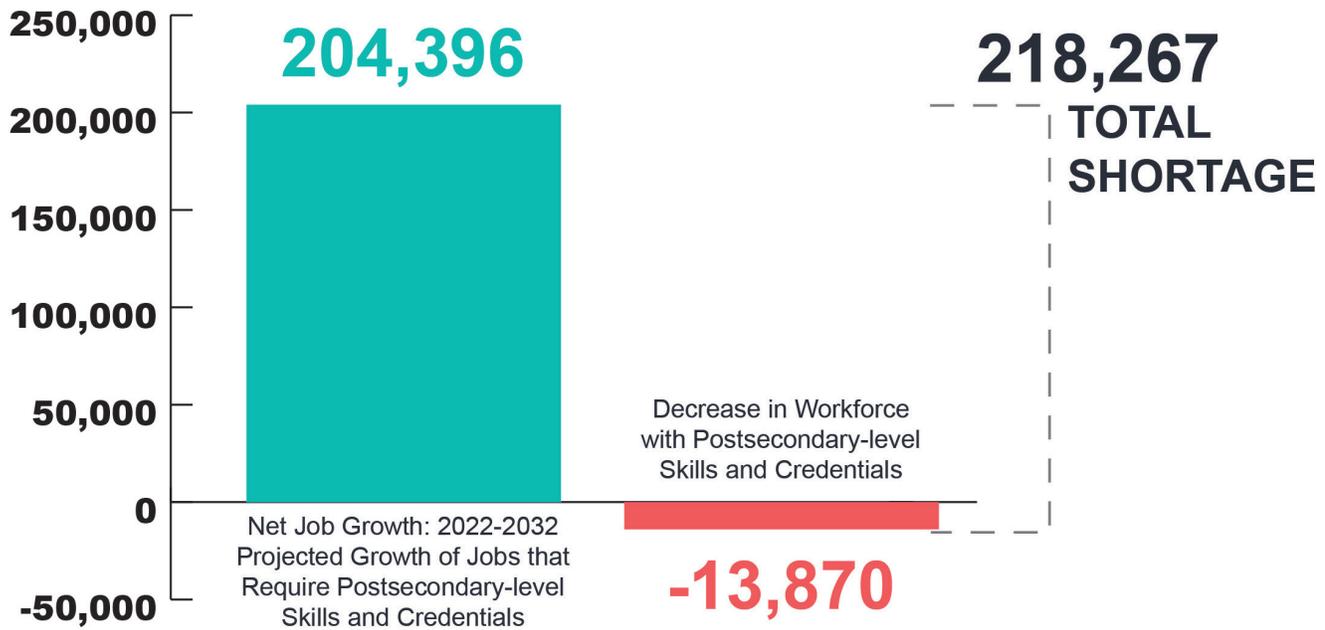
Age Cohorts	2022 Skilled Workforce	2032 Skilled Workforce	Projected Change
25-34	928,312	808,832	(119,481)
35-44	915,630	968,662	53,032
45-54	738,700	875,362	136,662
55-64	674,902	590,819	(84,083)
<b>Working Age Total</b>	<b>3,257,545</b>	<b>3,243,675</b>	<b>(13,870)</b>

Source: Center for Rural Pennsylvania, U.S. Census Bureau, U.S. Bureau of Labor Statistics, Baker Tilly Analysis

## 4.4 2032 STATEWIDE POSTSECONDARY-LEVEL SKILLED WORKFORCE SHORTAGE SUMMARY

The postsecondary-level skilled workforce shortage represents the additional number of Pennsylvanians with postsecondary-level skills and credentials that the economy will need to meet 2032 growth projections. The workforce shortage is calculated as the difference between the projected growth of jobs requiring postsecondary-level skills and credentials and the projected change in the number of individuals in the workforce with postsecondary-level skills and credentials, with a positive number indicating a shortage. By 2032, Pennsylvania is projected to have a 218,267 shortage in the workforce with credentials and postsecondary-level skills. (Figure 4.9).

Figure 4.9 Pennsylvania Projected 2032 Postsecondary-level Skilled Workforce Shortage



Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, Center for Rural Pennsylvania, U.S. Census Bureau, U.S. Bureau of Labor Statistics, Baker Tilly Analysis

To eliminate the projected postsecondary workforce shortage of 218,00 by 2032, Pennsylvania will need to increase its postsecondary attainment rate by 4.4% to 69.4% (assuming no drastic changes to population projections). Eliminating the workforce credential gap may require even more significant increases in postsecondary attainment from the younger, 25-44 age population, who are more likely to attend postsecondary institutions than the older 45-64 age population.

**Figure 4.10 Impacts of Hypothetical 2032 Pennsylvania Working Age Attainment Increases on Pennsylvania Projected 2032 Postsecondary-level Skilled Workforce Shortage**

<b>Hypothetical Percentage Point Increase in Attainment</b>	<b>0.0% increase</b>	<b>1.0% increase</b>	<b>2.0% increase</b>	<b>3.0% increase</b>	<b>4.0% increase</b>	<b>4.4% increase</b>
Hypothetical 2032 Attainment Rate	65.0%	66.0%	67.0%	68.0%	69.0%	69.4%
Incremental Credentialed Workers	0.0%	49,720	99,441	149,161	198,882	218,267
<b>Remaining Workforce Shortage</b>	<b>218,267</b>	<b>168,546</b>	<b>118,826</b>	<b>69,105</b>	<b>19,385</b>	<b>-</b>

Source: Pennsylvania Department of Labor & Industry: Center for Workforce Information and Analysis, Center for Rural Pennsylvania, U.S. Census Bureau, U.S. Bureau of Labor Statistics, Baker Tilly Analysis

## Appendix A: Glossary of Terms

**CIP-SOC Crosswalk:** Mapping of the relationships between the taxonomy of occupations (Standard Occupation Classification or SOC) and educational programs (Classification of Instructional Program or CIP).

**Postsecondary Credential Awards:** Represents the total postsecondary credential output of postsecondary institutions in Pennsylvania.

**Postsecondary Credential Supply:** Represents the supply of newly credentialed workers from Pennsylvania postsecondary institutions. Building from the postsecondary credential awards totals, it incorporates the reality that after receiving a postsecondary credential from a Pennsylvania postsecondary institution, some earners will enroll into a separate postsecondary program (re-enroll) and others will leave the state (out-migrate).

**Postsecondary Credential Type:** Segmentation of postsecondary credentials. In this analysis postsecondary credential types are segmented into three categories for supply and demand analysis: associate & certificate, bachelor's, and graduate.

**Gap:** Comparison of occupation demand to postsecondary credential supply. Areas where demand is greater than supply results in a "gap," and areas where supply is greater than demand results in a "surplus."

**Occupational Clusters:** The combining of 23 two-digit SOC codes aggregated into six occupational clusters with similar job characteristics.

**Occupational Demand:** Demand side estimate of the number of jobs demanded in Pennsylvania that result from growth and exits but does not include transfers. Growth is the number of net new jobs, or new positions in that occupation. Exits refer to the number of employees retiring or exiting the workforce entirely who therefore need to be replaced. Transfers are employees changing employment from one occupation to another and are not included in this definition.

## Appendix B: Postsecondary Credential Supply Forecast Methodology

The research presents the results of postsecondary credential supply projections for 2023 and beyond. 2023 postsecondary credential supply is estimated from 2022 postsecondary credential supply calculated in Section (2.2.3), multiplied by the five-year average annual historic rate of change in the change in postsecondary credentials (data from IPEDS) multiplied by the projected demographic changes in the number of high school graduates and adult learners in 2023. It is important to note that the growth/decline rate is calculated for each postsecondary credential type but is not calculated for individual programs or majors. Critically, this projection does not consider any reform proposals.

The historic rate of change was calculated as follows. From 2017-2022, postsecondary credential awards declined annually by 0.9%, with a decline of 2.1% for associate and certificate awards, decline of 1.5% for bachelor's degrees, and an increase of 1.1% for graduate degrees (Figure B.1). These trends were normalized for changes in historic population trends and to reflect the change in postsecondary credentials if there were no changes in the population of high school graduates or adult learners.

The demographic rate of change was calculated by calculating the projected population changes for three segments of postsecondary credential earners: in-state recent high school graduates, out-of-state high school graduates, and adult learners. Projections of in-state high school graduates were developed by Pennsylvania's State System of Higher Education (PASSHE)<sup>54</sup>. Projections of out-of-state high school graduates were accessed from the Western Interstate Commission for Higher Education (WICHE)'s 2020 report, "Knocking at the College Door"<sup>55</sup>, and adult learner populations projections use data compiled by the Pennsylvania State Data Center for the Center for Rural Pennsylvania. For recent high school grads, annual demographic growth rates were calculated for each postsecondary credential type separately to account for the varying length of time to complete a postsecondary credential or degree after high school graduation. For the last step, each postsecondary credential type was weighted by the ratio of completers for in-state high school graduates, out-of-state high school graduates, and adult learners from IPEDS completion and enrollment data<sup>56</sup>.

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<sup>54</sup> <https://www.passhe.edu/system-data/high-school.html>

<sup>55</sup> <https://www.wiche.edu/resources/knocking-at-the-college-door-10th-edition/>

<sup>56</sup> <https://nces.ed.gov/ipeds/>

# Appendix C: Postsecondary Credential Programs and Occupational Cluster Matching

This table provides the indirect matching mapping as discussed in Section 2.3.2.

## Postsecondary Credential Programs and Most Frequent Occupational Cluster

Postsecondary Credential Two-Digit Classification of Instructional Programs (CIP) Codes	Most Frequent Occupational Cluster
Agricultural/Animal/Plant/Veterinary Science and Related Fields	Unmatched
Architecture and Related Services	Unmatched
Area, Ethnic, Cultural, Gender, and Group Studies	Community, Legal, Protective Services, and Arts
Biological and Biomedical Sciences	STEM
Business, Management, Marketing, and Related Support Services	Managerial, Business, and Professional Office
Communication, Journalism, and Related Programs	Community, Legal, Protective Services, and Arts
Communications Technologies/Technicians and Support Services	Community, Legal, Protective Services, and Arts
Computer and Information Sciences and Support Services	STEM
Construction Trades	Trade, Maintenance, and Repair
Culinary, Entertainment, and Personal Services	Managerial, Business, and Professional Office
Education	Education
Engineering	STEM
Engineering/Engineering-Related Technologies/Technicians	STEM
English Language and Literature/Letters	Community, Legal, Protective Services, and Arts
Family and Consumer Sciences/Human Sciences	Unmatched
Foreign Languages, Literatures, and Linguistics	Community, Legal, Protective Services, and Arts
Health Professions and Related Programs	Healthcare
Health Professions Residency/Fellowship Programs	Healthcare
History	Unmatched
Homeland Security, Law Enforcement, Firefighting and Related Protective Services	Community, Legal, Protective Services, and Arts

<b>Postsecondary Credential Two-Digit Classification of Instructional Programs (CIP) Codes</b>	<b>Most Frequent Occupational Cluster</b>
Legal Professions and Studies	Community, Legal, Protective Services, and Arts
Library Science	Education
Mathematics and Statistics	STEM
Mechanic and Repair Technologies/Technicians	Trade, Maintenance, and Repair
Medical Residency/Fellowship Programs	Healthcare
Military Technologies and Applied Sciences	STEM
Multi/Interdisciplinary Studies	Unmatched
Natural Resources and Conservation	STEM
Parks, Recreation, Leisure, Fitness, and Kinesiology	Unmatched
Philosophy and Religious Studies	Unmatched
Physical Sciences	Unmatched
Precision Production	Trade, Maintenance, and Repair
Psychology	Unmatched
Public Administration and Social Service Professions	Unmatched
Science Technologies/Technicians	STEM
Social Sciences	Unmatched
Theology and Religious Vocations	Community, Legal, Protective Services, and Arts
Transportation and Materials Moving	Trade, Maintenance, and Repair
Visual and Performing Arts	Community, Legal, Protective Services, and Arts

# Appendix D: Pennsylvania Population Projections

Current and projected populations of the working age population are sourced from The Center for Rural Pennsylvania Population Projections, which uses a demographic cohort model that “accounts for population based on births, deaths, and migration (both in and out-migration) levels.” Age cohorts were projected in five-year bands but are combined and shown in ten-year bands for this analysis. The Center for Rural Pennsylvania provides population projections in five-year increments beginning in 2020. Because this analysis focuses on understanding the working age population that has postsecondary-level skills and credentials in 2022 and 2032, it was necessary to calculate populations for 2022 and 2032. Figure D.1 presents the result of the calculation by five-year age bands.

The Pennsylvania working age population in 2022 was calculated as a weighted average of the available projection years, 2020 and 2025. The 2020 population totals were weighted 60% and 2025 population totals were weighted 40% to reflect that 2022 is closer to 2020 than 2025.

Pennsylvania working age population in 2032 was calculated as a weighted average of the available projection years, 2030 and 2035. 2030 population totals were weighted 60% and 2035 population totals were weighted 40% to reflect that 2032 is closer to 2030 than 2035.

## Pennsylvania Estimated 2020-2035 Population Projections with 5-Year Age

Age Group	2020	2022	2025	2030	2032	2035
25-29	836,339	800,507	746,759	788,319	817,353	860,905
30-34	869,056	859,850	846,042	758,455	775,360	800,717
35-39	818,035	838,875	870,134	848,400	813,971	762,327
40-44	754,243	778,675	815,324	868,122	859,852	847,446
45-49	764,828	757,514	746,542	807,774	829,088	861,060
50-54	836,552	802,162	750,578	733,912	758,446	795,248
55-59	915,119	875,105	815,085	733,285	727,475	718,759
60-64	911,235	897,371	876,574	783,288	752,666	706,733
<b>Total</b>	<b>6,705,407</b>	<b>6,610,059</b>	<b>6,467,038</b>	<b>6,321,555</b>	<b>6,334,211</b>	<b>6,353,195</b>

*Note: 2022 estimated population is calculated as the weighted average of 2020, and 2025 estimates and projections, 2020 is weighted at 60%. 2032 projected population is calculated as the weighted average of 2030, and 2035, 2030 is weighted as 60%.*

*Source: Center for Rural Pennsylvania*

# Appendix E: Postsecondary Attainment Projection Methodology

Attainment Rate Projections Methodology. The 2022 postsecondary attainment rate was calculated from American Community Survey (ACS) data.<sup>57</sup> Attainment rates include all Pennsylvanians with “some college” or higher (e.g. associate degree, bachelor’s degree, or graduate degree) and were available in the following age cohorts: 25-34, 35-44, and 45-64. Due to the lack of granularity, all members of an age cohort were assumed to have the same attainment as the American Community Survey data (e.g. members of the 45-49 cohort were assumed to have the same attainment as the 60-64 cohort). Impacts of the following methodology can be seen in Figure E.1.

- ✓ To forecast changes in attainment over time, a baseline attainment rate was established by rolling forward the cohort’s 2022 attainment forward into the forecast (i.e. the 45-49 cohort was 57% in 2022, so the 50-54 baseline attainment rate is projected to be 57% in 2027, and the 55-59 baseline attainment rate is forecast to be 57% in 2032). For populations 40-64, there were no adjustments to the baseline attainment rate based on U.S. Census data of limited attainment increases for members of these cohorts.
- ✓ For the 30-34 and the 35-39 cohorts, the attainment rate was forecast to increase 2.3% every five years above the baseline attainment rate; this was based on a historical 4.6% increase in the attainment rate from 2011 to 2021 for the 25-34 cohort to the 35-44 cohort (ACS). This cohort represents “adult learners” who go back to a post-secondary institution later in their 30s to gain a credential.
  - To calculate the attainment rate for the 25-29 cohort in 2027, a baseline was established as per below. From this baseline, research-based adjustments were made to project attainment for these cohorts.
  - Baseline rate: 2022 attainment rates for the 25-29 cohort were assumed to be the baseline. In other words, without any other adjustments, 2027 attainment for the 25-29 cohort would equal the 2022 attainment rate (67.2%) for the 25-29 cohort.
  - Adjustment to baseline rate: As seen in Figure 4.5, associate and bachelor’s degrees declined 6.8% from 2018-2022<sup>58</sup> compared to the credentials awarded from 2013-17. This dataset provides the most realistic view of attainment declines for those who will be aged 25-29 in 2027.
  - Calculation of 2027 attainment rate for the 25-29 cohort: Decline was multiplied by the 2022 baseline. The formula is as follows:
    - $(1-0.068)*0.672=0.626$  (or 62.6%)
  - Totals may vary due to rounding.

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<sup>57</sup> U.S. Census Bureau. (2022). *Sex by age of educational attainment for the population 18 years and over (table B15001). American Community Survey 1-Year and 5-Year Estimates. Retrieved January 18, 2024, from <https://data.census.gov/>*

<sup>58</sup> U.S. Department of Education (n.d.), *Integrated Postsecondary Education Data System (IPEDS), 2017-2022, Trend Generator, Completions. National Center for Education Statistics (n.d.). Retrieved October 19, 2023, from <https://nces.ed.gov/ipeds/>*

- ✓ To calculate the attainment rate for the 25-29 cohort in 2032, a similar process was used establishing a baseline attainment rate and using research-based adjustments to project attainment for these cohorts.
  - Baseline rate: 2027 attainment rates for the 25-29 cohort were assumed to be the baseline. In other words, without any other adjustments, 2032 attainment for the 25-29 cohort would equal the 2027 attainment rate (62.6%) for the 25-29 cohort.
  - Adjustment to baseline rate: As seen in Figure 4.6, there was a 6.2% increase in recent high school graduates not attending any postsecondary institutions<sup>59</sup> in the year following graduation from 2017-21. To account for uncertainty of postsecondary enrollment patterns after the pandemic both in Pennsylvania and from other states, the baseline was adjusted by 60% of this effect, or 3.7% ( $.062 * 0.6 = .037$ ). If a high school graduate was 18 in 2021, they would be 29 in 2032, meaning that this decline provides the best dataset for attainment declines among Pennsylvanians who are 25-29 in 2032.
  - Calculation of 2032 attainment rate for the 25-29 cohort: Baseline rate of 62.6% combined with the 3.7 percentage point decline = 58.9%
  - Totals may vary due to rounding.

### Pennsylvania Estimated 2020-2035 Population Projections with 5-Year Age

Age Group	2020	2022	2025
25-29	67.2%	62.3%	59.2%
30-34	67.2%	67.2%	62.3%
35-39	68.2%	69.5%	69.5%
40-44	68.2%	70.5%	71.8%
45-49	58.4%	68.2%	70.5%
50-54	58.4%	58.4%	68.2%
55-59	58.4%	58.4%	58.4%
60-64	58.4%	58.4%	58.4%
<b>Total</b>	<b>63.0%</b>	<b>64.2%</b>	<b>65.0%</b>

Note: Total weighted by population

Source: ACS, PDE, IPEDS, Baker Tilly Analysis

<sup>59</sup> Miller, C.M., & Johnson, R. (2022). An examination of postsecondary enrollment trends of Pennsylvania high school graduates during the COVID-19 pandemic. Pennsylvania Department of Education Compliance Office. Retrieved November 30, 2023 from <https://www.education.pa.gov/DataAndReporting/ResearchEvaluation/Pages/Research-Reports.aspx>. 2020/2021 data provided by Pennsylvania Department of Education.

## Appendix F: References

- Bransberger, P., Falkenstern, C., & Lane, P. (2020, December).** Knocking at the college door: Projections of high school graduates [Publication No. 2B366]. Western Interstate Commission for Higher Education. Retrieved December 2, 2023 from <https://knocking.wiche.edu/wpcontent/uploads/sites/10/2020/12/Knocking-pdf-for-website.pdf>
- Carnevale, A.P., Smith, N., Van Der Werf, M., & Quinn, M.C. (2023).** After everything: Projections of jobs, education, and training requirements through 2031. Georgetown University Center on Education and the Workforce. Retrieved December 13, 2023, from <https://cew.georgetown.edu/cew-reports/projections2031/>
- Center for Rural Pennsylvania. (2023).** Pennsylvania population projections for the next 30 years. Population projections. Retrieved November 8, 2023, from <https://www.rural.pa.gov/data/population-projections>
- Lightcast. (n.d.). Developer Tool. Retrieved November 16, 2023,** from <https://lightcast.io/solutions/economic-and-workforce-development/developer>
- O\*NET. (n.d.). O\*NET-SOC 2019 occupations to 2018 SOC occupations. O\*NET resource center. Retrieved October, 2023,** from <https://www.onetcenter.org/crosswalks.html>
- O\*NET. (n.d.). O\*NET online help: Job zones. O\*NET onLine. Retrieved October, 2023,** from <https://www.onetonline.org/help/online/zones>
- Pennsylvania Department of Community & Economic Development. (n.d.). Partnerships for Regional Economic Performance (PREP). Retrieved February 14, 2024,** from <https://dced.pa.gov/programs/prep/>
- Pennsylvania Department of Education. (2022).** Act 82 of 2018: Report on educator preparation and certification. Retrieved January 10, 2024, from <https://www.education.pa.gov/DataAndReporting/Pages/Act82.aspx>.
- Pennsylvania Department of Education. (n.d.). Educational Names & Addresses (EdNA). Retrieved January 15, 2024,** from <http://www.edna.pa.gov>
- Pennsylvania Department of Education. (n.d.). Pennsylvania Department of Education.** <https://www.education.pa.gov/>
- Pennsylvania Department of Labor & Industry. (2023).** Employment forecasts 2022-2024. Center for Workforce Information & Analysis. Retrieved October 6, 2023, from <https://www.workstats.dli.pa.gov/Products/ShortTermForecasts/Pages/default.aspx>
- Pennsylvania Department of Labor & Industry (2023).** October 2023 Online job postings. Retrieved December 6, 2023, from <https://www.workstats.dli.pa.gov/dashboards/Pages/Online-Job-Postings.aspx>
- Pennsylvania's State System of Higher Education (n.d.). System Data – High School: High School Graduate Yield Rate. Retrieved December 2, 2023,** from <https://www.passhe.edu/system-data/high-school.html>
- U.S. Bureau of Labor Statistics. (n.d.). Civilian labor force, by age, sex, race, and ethnicity. Employment projections. Retrieved January 4, 2024,** from <https://www.bls.gov/emp/tables/civilian-labor-force-summary.htm>

- U.S. Bureau of Labor Statistics (n.d.). Educational attainment for workers 25 years and older by detailed occupations. Employment projections. Retrieved February 14, 2024,** from <https://www.bls.gov/emp/tables/educational-attainment.htm>
- U.S. Bureau of Labor Statistics. (2023).** Employment projections 2022-2032 (News Release). Retrieved January 18, 2024, from <https://www.bls.gov/news.release/pdf/ecopro.pdf>
- U.S. Bureau of Labor Statistics (n.d.).** Labor force statistics from the Current Population Survey (Concepts and Definitions). Current Population Survey. Retrieved January 18, 2024, from <https://www.bls.gov/cps/definitions.htm>
- U.S. Bureau of Labor Statistics. (n.d.). Standard occupational classification. Retrieved October 6, 2023,** from <https://www.bls.gov/soc/>
- U.S. Census Bureau. (n.d.). Current population survey - Annual social and economic supplements. Bureau of Labor Statistics. Retrieved October 6, 2023,** from <https://data.census.gov/>
- U.S. Census Bureau. (2022). Sex by age of educational attainment for the population 18 years and over (table B15001). American Community Survey 1-Year and 5-Year Estimates. Retrieved January 18, 2024,** from <https://data.census.gov/>
- U.S. Census Bureau. (2022).** Total population (table B01003). American Community Survey 1-Year and 5-Year Estimates. Retrieved January 5, 2024, from <https://data.census.gov/>
- U.S. Department of Education (n.d.). Integrated Postsecondary Education Data System (IPEDS), 2017-2022, completions, institutional characteristics. National Center for Education Statistics. Retrieved October 19, 2023,** from <https://nces.ed.gov/ipeds/>
- U.S. Department of Education. (n.d.). The Classification of Instructional Programs, CIP 2020 to SOC 2018 Crosswalk. National Center for Education Statistics. Retrieved October 15, 2023,** from <https://nces.ed.gov/ipeds/cipcode/resourc/es.aspx?y=56>