

PENNSYLVANIA'S STATE SYSTEM OF HIGHER EDUCATION



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UNIVERSITY

Northeast Pennsylvania's **SUPPLY/ DEMAND GAP ANALYSIS**

A report for Pennsylvania's
State System of Higher Education

2016



Pennsylvania's
STATE SYSTEM
of Higher Education

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GLOSSARY OF TERMS

The following descriptions provide a point of reference to understand terminology as well as the types of data and analysis undertaken in this study, reflecting historic and contemporary narratives.

Fastest Growing: A term used to describe the relative growth (percent change) of an industry or occupation in a given time period. Fastest growing industries and occupations in this study are identified by the highest relative change in jobs between 2014 and 2024.

High Demand: A term used to describe the demand for workers in a given occupation. High demand occupations are identified as having the highest number of new and replacement jobs projected between 2014 and 2024.

Industry Change: A measure of the change in employment within an industry, used to identify whether an industry is growing or declining, as well as the rate of change. Projected changes lay out expectations of growth/decline for specific industries.

Job Postings: The number of unique (de-duplicated) online postings for a job in a given occupation.

Location Quotient: A comparative statistic used to calculate the relative employment concentration of a given industry or occupation against the average employment of the industry in a larger geography (for example, countrywide). Industries with a higher location quotient (usually greater than 1.2) indicate that the region has a comparative advantage or specialization in the production of that good or service or has a high degree of specialization within its workforce.

New and Replacement Jobs: A demand-side estimate of the number of job openings in an occupation that result from new job growth as well as replacement demand. Replacement demand comprises occupation job leavers based on separations, retirement, and death.

Occupation Jobs: A measure of employment within an occupation category, used to identify which occupations have been growing or declining, as well as the rate of change. Projected changes lay out expectations of growth/decline for specific occupation categories.

Sub-regions: Geographic areas within Pennsylvania defined for more focused workforce and education gap analyses. Sub-regions were determined primarily on Partnerships for Regional Economic Performance (PREP) boundaries. PREP is Pennsylvania's network of business assistance partners, designed to help companies start, grow, and prosper. Please refer to Appendix A for mapping of the Sub-regions and PREP boundaries.

ACRONYMS USED

ACS: American Community Survey

BLS: Bureau of Labor Statistics

CIP: Classification of Instructional Programs

DOE: United States Department of Education

DOL: United States Department of Labor

EMSI: Economic Modeling Specialists International

CEW: Center on Education and the Workforce (Georgetown University)

IPEDS: Integrated Postsecondary Education Data System

LAUS: Local Area Unemployment Statistics

LEHD: Longitudinal Employment and Housing Dynamics

NAICS: North American Industry Classification System

NCES: National Center for Education Statistics

OES: Occupational Employment Statistics

O*NET: Occupational Network

PUMS: Public Use Microdata Sample

QCEW: Quarterly Census of Employment and Wages

SOC: Standard Occupational Classification

1. INTRODUCTION

Pennsylvania’s State System of Higher Education (State System) comprises 14 universities, four branch campuses, multiple regional centers and the McKeever Environmental Learning Center.¹ The universities are located in rural, suburban, and small-town settings around Pennsylvania. The State System’s two educational hubs (with locations in Harrisburg—the Dixon University Center, and Philadelphia—State System @ Center City) offer academic programs through a consortium of public and private colleges and universities.

Per Act 188 of 1982, the State System’s mission “is the provision of instruction for undergraduate and graduate students to and beyond the master’s degree in the liberal arts and sciences, and in the applied fields, including the teaching profession.” In doing so, the State System’s purpose is “to provide high quality education at the lowest possible cost to students.”² Analysis and understanding of the economy and workforce the State System supports, as well as the alignment between education programs and talent needs, further advances the State System’s mission and philosophy. This is the goal of the State System’s Supply/Demand Gap Analysis Project. It enables effective and targeted strategies and decision-making, grounded in data-driven evidence. Through two earlier reports—‘Pennsylvania’s Workforce Characteristics Report’³ and ‘Degrees of Value: College Majors and the Pennsylvania State System’s Contribution to the Workforce’⁴— foundation was laid for the State System’s Supply/Demand Gap Analysis Project. This supply/demand gap analysis report establishes the framework to ‘crosswalk’ education programs with relevant occupations. This crosswalk establishes the relationship between the workforce

1 One of the State System’s entities, System-wide Functions and Services, is primarily located at the Dixon University Center in Harrisburg and includes: System-wide shared administrative services; System leadership functions of the Chancellor and Board of Governors; some System-wide initiatives and grants managed on behalf of the universities; and the academic, student, and facilities support for the multi-university sites in Harrisburg and Philadelphia.

2 The State System’s Economic and Employment Impact on the Commonwealth of Pennsylvania—released April 15, 2015.

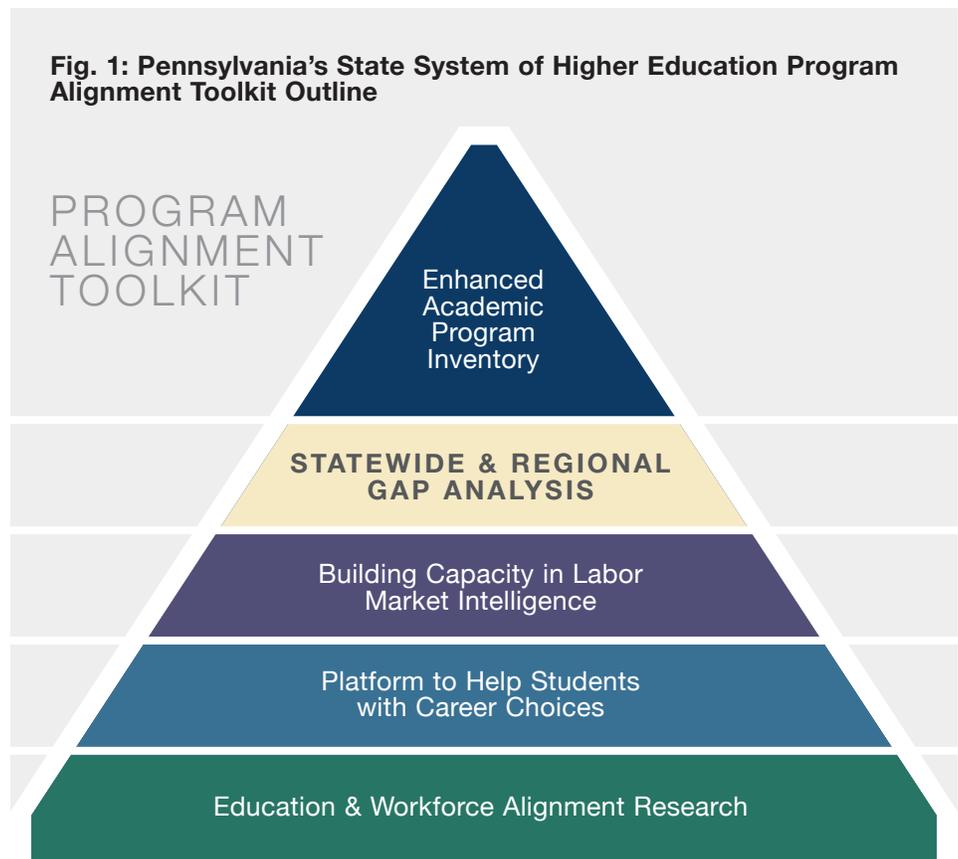
3 Pennsylvania’s Workforce Characteristics Report—a collaboration between the Pennsylvania State System of Higher Education and Oxford Economics with input from Georgetown University’s Center on Education and the Workforce, provides detailed demand-side projections for occupations within Pennsylvania, as well as other labor market intelligence for skilled occupations.

4 *Degrees of Value: College Majors and the Pennsylvania State System’s Contribution to the Workforce* is an education and workforce analysis of the Commonwealth with a particular emphasis on the State System’s Universities’ output produced by Georgetown University’s Center on Education and the Workforce.

employed in specific occupations and the degrees that those workers earned. The goal of this report is to understand this relationship in the context of Pennsylvania’s projected skilled workforce needs and education output.

This study and the broader set of deliverables under the State System’s Supply/Demand Gap Analysis Project will assist universities and education planners by providing an infrastructure of resources for internal planning, as well as external engagement. Understanding key gaps and surpluses within Pennsylvania helps to better align policy and strategic direction in order to continue supporting the talent needs of the Commonwealth.

The results of the State System’s Supply/Demand Gap Analysis project will become part the State System’s Program Alignment Toolkit (see Figure below)—an infrastructure of resources that are being created to assist the State System’s universities to increase their individual and collective impact on Pennsylvania’s economy. The Program Alignment Toolkit complements the existing Business Intelligence Environment the State System has created to support data driven decision-making. This environment includes forward-thinking, data-rich projects such as the Financial Risk Dashboard, the Data Warehouse project, and the upcoming Student Success Dashboard.



ABOUT PENNSYLVANIA STATE SYSTEM OF HIGHER EDUCATION

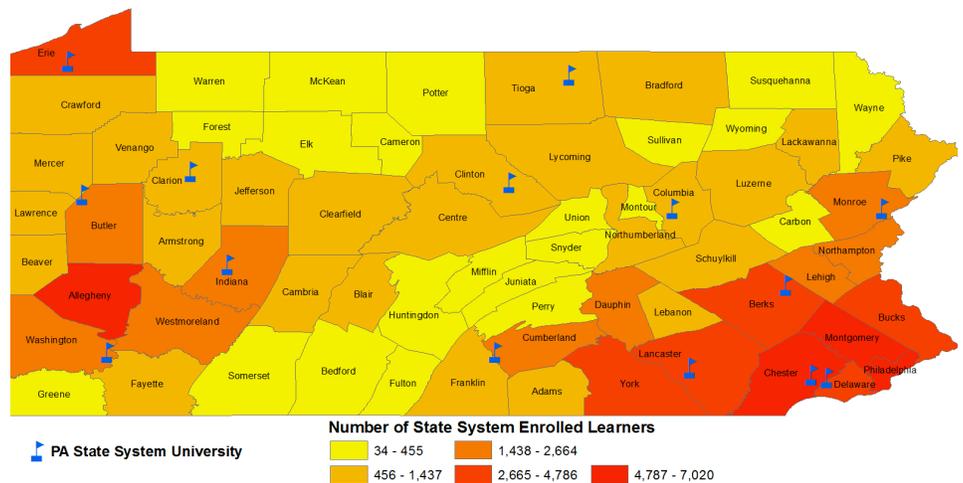
Pennsylvania's State System of Higher Education was established by statute on July 1, 1983, although the 14 universities that comprise the State System have a much longer history dating back to the 19th century.

Today, the State System serves over 110,000 students, with learners coming from every county in Pennsylvania, making it among the largest providers of higher education in Pennsylvania and the United States. It also employs more than 12,000 faculty and staff, making it one of the largest employers in the Commonwealth. Nearly 88% of students enrolled in the State System are from Pennsylvania and the vast majority of students remain after graduation—about 80%.*

The State System generates more than \$6.7 billion in annual economic activity within Pennsylvania. This economic value in turn supports approximately 62,000 jobs through the State System's direct employment, operational expenditures with vendors and suppliers across Pennsylvania, and spending of those who are employed as a result of the State System's operations.

* Pennsylvania's State System of Higher Education – Student Data Fact Center
 ** The State System's Economic and Employment Impact on the Commonwealth of Pennsylvania – Released April 15, 2015

Fig. 2: State System Learner Enrollment by County – Fall 2014



Source: Pennsylvania State System of Higher Education

1.1 Goal of the Supply/Demand Gap Analysis Report

This Supply/Demand Gap Analysis Report is specific to the Northeast Pennsylvania region. It builds on information provided in an earlier State System report entitled Northeast Pennsylvania's Workforce Characteristics Technical Report. In the Workforce Characteristics Report, Northeast Pennsylvania's region was defined to include the following counties: Bradford, Carbon, Lackawanna, Luzerne, Monroe, Pike, Sullivan, Susquehanna, Tioga, Wayne, and Wyoming. The report also contains a set of economic, workforce, demographic, and socio-economic information to contextualize the Supply/Demand Gap Analysis.

The Supply/Demand Gap Analysis Report provides a data-driven perspective of employer demand (growing occupations across the region) and postsecondary education supply (degree production by program and level). The report will assist the State System universities with strategic engagement, program development and evaluation, student engagement, and marketing. The Supply/Demand Gap Analysis Report contains research specific to Northeast Pennsylvania in the following areas:

- Industry sector and occupation job changes and projections for new and replacement job demand to 2024;
- Size of education production by broad degree category;
- Links between occupations and education programs; and
- Analysis of gaps at the occupational level (presenting a structure to review occupations that have excess employer demand as well as those that have surplus).

While the State System's Gap Analysis project is critical to understanding the connections between education programs and occupations, it is important to note a few caveats to this Supply/Demand Gap Analysis Report:

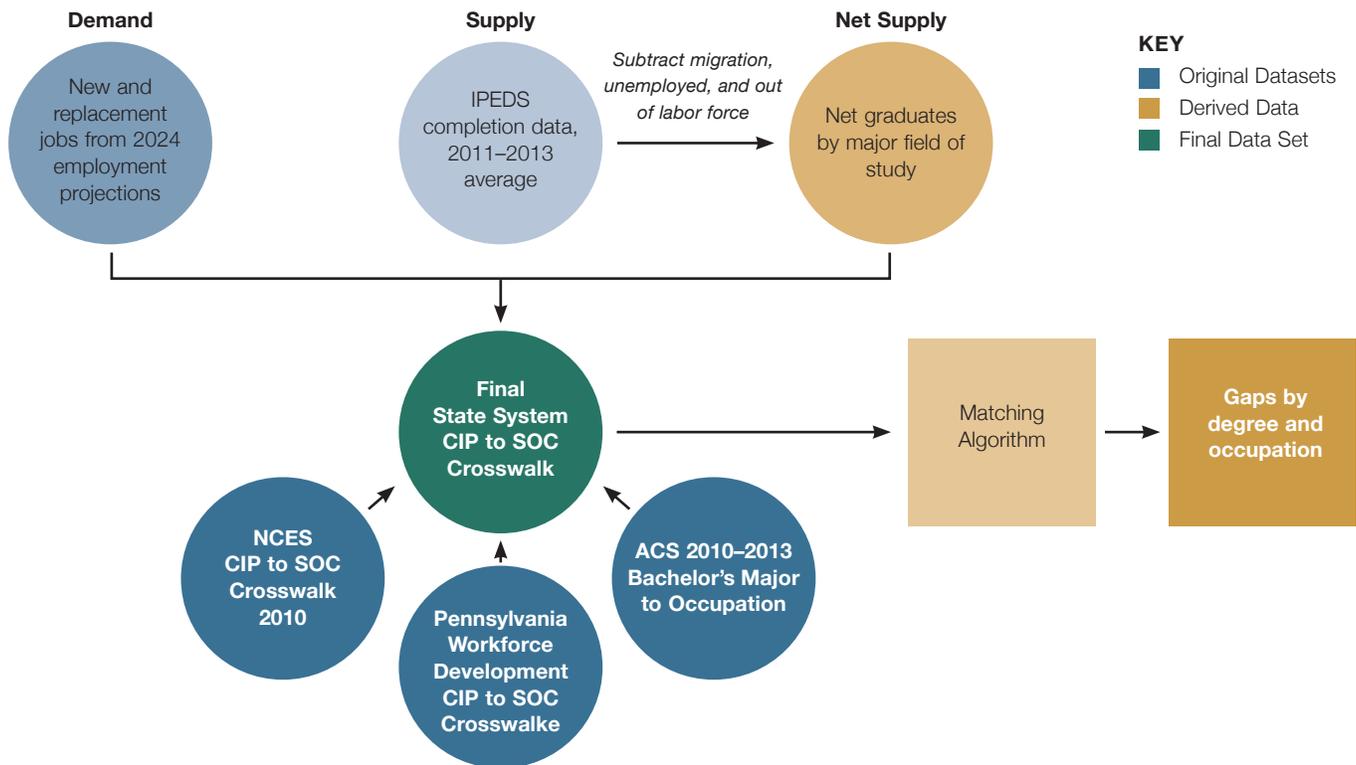
- When considering making adjustments to programs in degree areas related to occupations displaying gaps, further research should be considered to confirm the extent of alignment needed to arrive at equilibrium with the labor market.
- Government data that captures labor market demand lags real-time employer demand as well higher education industry trends. As such, the gap analysis findings may lag these market changes.
- This analysis only focuses on program output as a supply pool (i.e. new

ABOUT GAP ANALYSIS

A gap analysis comparing educational supply and occupational demand serves as a critical first step in efforts to align education programs with the workforce needs of Pennsylvania employers. A gap analysis provides a data-driven perspective of demand and supply, which can be connected to a larger process of program evaluation and strategic planning, engagement with employers, and student career guidance. The analysis itself is not the solution, but can lend credible insight to guide decision-making at the strategic level.

Figure 3 provides a high-level flow chart of the process to calculate gaps/surpluses. A methodological description of the supply/demand gap modeling process can be found in Appendix E.

Fig. 3: Overview of the gap analysis methodology for the State System



Source: Oxford Economics

graduates). However, regional workforces comprise additional pools of supply—specifically: employed workers, skilled unemployed workers, and skilled underemployed workers. When evaluating gaps, this analysis focuses on new and replacement demand, as opposed to job churn. This helps to mitigate some of the issues involving the employed workforce.

1.2 Structure of the Gap Analysis Report

This Supply/Demand Gap Analysis Report for Northeast Pennsylvania is organized as follows:

- Section 1** Introduction and background information.
- Section 2** Overview of changes in Northeast Pennsylvania’s industry sectors from a historic and projected point of view, as well as fast growing and most competitive industries.
- Section 3** Overview of changes in Northeast Pennsylvania’s occupations including additional detail on skilled occupations as well as high demand occupations, the fastest growing occupations, and occupations that are highly concentrated in Northeast Pennsylvania.
- Section 4** Evaluation of output of education programs at the associate’s, bachelor’s, and graduate level, as well as the State System’s contribution to the total output of bachelor’s degrees.
- Section 5** Comparison of demand for skilled occupations against supply of relevant education program completions.
- Section 6** Conclusion and areas of future research.
- Section 7** Additional information on the Gap Analysis project and contributing organizations.
- Section 8** List of key data sources used in the report.

While the main body of this report provides a high level summary, the Appendices provide an abundance of information for those seeking additional detail.

Appendix A provides a map of the state sub-region boundaries along with economic development and workforce boundaries as defined by PREP and WIA.

Appendix B provides a description of O*NET Job Zone codes.

Appendix C provides further detail about strong, limited and weak connections between education programs and occupations.

Appendix D provides detailed industry employment and projections to 2024.

Appendix E provides a crosswalk and gap analysis methodology.

Appendix F provides gap analysis results for over 500 occupations.

Appendix G provides the crosswalk of programs to occupations.

2. INDUSTRY PROFILE OF NORTHEAST PENNSYLVANIA

Industry growth is a key driver of demand for occupations and talent. Hence, understanding the structure of Northeast Pennsylvania's industry sectors offers valuable insights into career opportunities that exist. As the State System implements strategies to increase the economic competitiveness of its workforce and ultimately the economic competitiveness of the state, it is important to understand the connection between occupations and industry jobs. The state's workforce changes and labor demand are presented in multiple ways in this section including:

- Major (2-digit) industries;
- Largest 4-digit industries in 2014;
- Largest growth 4-digit industries from 2014 to 2024;
- Fastest growing 4-digit industries from 2014 to 2024; and
- Industries (4-digit) with high location quotient (or concentration) in 2014.

This section explores the current strengths in Northeast Pennsylvania's economy by industry and examines trends that may affect industry structure in the coming years. A table of all 4-digit North American Industrial Classification System (NAICS) sector employment and projections for the region can be found in Appendix D.

The following sub-section begins the analysis by examining major industry groups in Northeast Pennsylvania in 2014 and projected growth to 2024.

2.1 Major Industry Groups

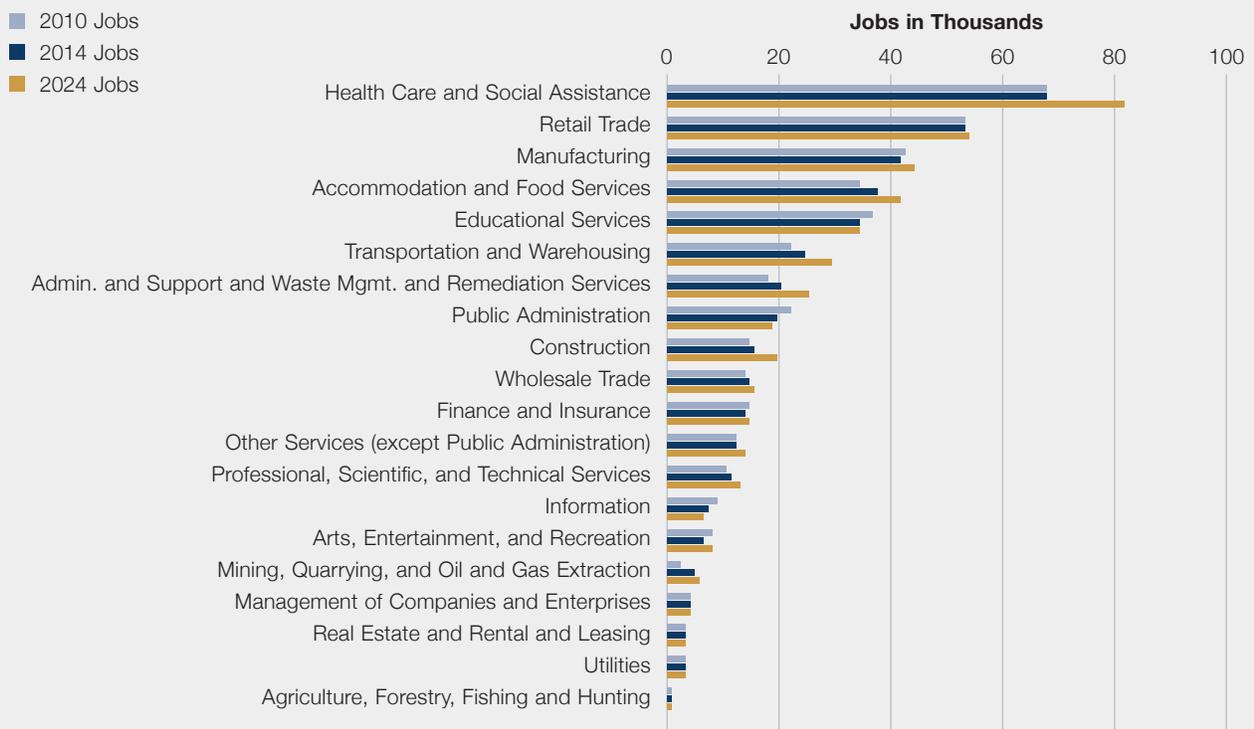
In 2014 the largest 2-digit industries in Northeast Pennsylvania include education and health services, trade, transportation and utilities, and professional and business services. As can be seen in Figure 4, health care and social assistance accounts for the most jobs (approximately 68,100 jobs), followed by retail trade, manufacturing, accommodation and food services, and education services. Furthermore, each of these industry sectors, except education services and manufacturing, added a significant number of new jobs between 2010 and 2014, reflecting both economic recovery from the recession,

as well as continued sector growth, stemming in part from the place-based competitiveness of these sectors in the Northeast US.⁵

Projections indicate that healthcare and social assistance will add an additional 13,900 new jobs in the region between 2014 and 2024 (20% growth). Administrative and support and waste management and remediation services and transportation and warehousing are projected to add nearly 9,400 new jobs combined (21% growth)—which will require talent in various business disciplines to support this growth.

Substantial economic transformation is taking place across several sectors. While many sectors have experienced moderate or strong growth over the past several years, noted exceptions of job decline include government,

Fig. 4: Employment by Major Industry, 2010, 2014, and 2024



Source: BLS (QCEW); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

⁵ The strong transportation network linkages in Pennsylvania, as well as strong economic ties to other areas outside of Pennsylvania, such as New York and Washington D.C. enable a high degree of place-based competitiveness for the region.

education and information. The causes of these reductions may differ. For example, reductions in government employment could reflect changes in legislative priorities and budgets, while reductions in information are largely due to the decline in newspaper and book publishers. This, however, is offset by substantial growth in other sectors discussed earlier.

Fig. 4 depicts the number of jobs in 2010, 2014 and projections out to 2024 for each of the broad industry sectors.

2.2 Largest 4-Digit Industries

The largest 4-digit industries in Northeast Pennsylvania are identified by the volume of 2014 employment. Industry sectors that employ the most workers are critical foundations to a regional economy. In Northeast Pennsylvania, the ten⁶ largest 4-digit industry classifications employed 32% of total jobs in 2014 (128,600 jobs out of 399,600 total jobs in the region). The largest industries include restaurants and other eating places, elementary and secondary schools, and general medical and surgical hospitals. Fig. 5 below displays the region's ten largest 4-digit industry sectors in 2014 and employment projections to 2024.

Fig. 5: Northeast Pennsylvania's Largest 4-Digit Industries and Projections, 2014-2024

Industry Title	2014 Jobs	2024 Jobs	New Jobs 2014-2024	% Change 2014-2024
Elementary and Secondary Schools	23,879	23,728	-151	-0.6%
Restaurants and Other Eating Places	23,575	25,429	1,854	7.9%
General Medical and Surgical Hospitals	15,617	17,572	1,955	12.5%
Warehousing and Storage	10,888	14,281	3,393	31.2%
Executive, Legislative, and Other General Government Support	10,681	10,536	-145	-1.4%
Grocery Stores	10,546	10,521	-25	-0.2%
Traveler Accommodation	9,321	10,905	1,584	17.0%
Nursing Care Facilities (Skilled Nursing Facilities)	8,235	9,808	1,573	19.1%
Individual and Family Services	8,113	10,291	2,178	26.8%
Colleges, Universities, and Professional Schools	7,766	7,915	149	1.9%
Total, 10 Largest	128,621	140,986	12,365	9.6%

Source: BLS (QCEW); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

6 There are over 300 4-digit industries in Pennsylvania reporting employment to QCEW.

2.3 Largest Growth 4-Digit Industries

The largest sectors do not necessarily generate the most new jobs. The largest growth industries are identified by the largest change in jobs from 2014 to 2024. Projections for Northeast Pennsylvania indicate that the top ten largest growth industries in the region will add about 19,800 new jobs between 2014 and 2024. Many industries in the top ten largest growth employ several occupations that require university-level skill specializations. For example:

- **Individual and family services** employ numerous counselors, social and community managers and healthcare practitioners, as well as business operations specialists and human resource specialists. Projections indicate that individual and family services is slated to grow by 2,200 new jobs between 2014 and 2024.
- **General medical and surgical hospitals** employ a diverse range of health care professionals at multiple levels of educational attainment. This includes professions from surgeons to medical secretaries, as well as a range of nursing professions such as nursing assistants, licensed practical nurses and registered nurses. Projections indicate the industry will add 2,000 new jobs between 2014 and 2024.

Industry sectors that are projected to add significant numbers of new jobs to Northeast Pennsylvania over the next ten years will provide opportunities to establish stronger business collaboration and course alignment to these sectors. Furthermore, State System universities currently offer a range of degree programs in business, computer science and health that align well to opportunities within these high-growth sectors. Fig. 6 on the next page displays the ten largest growth industries projected to 2024.

Fig. 6: Northeast Pennsylvania's Top 10 Largest Growth Sectors and Projections, 2014-2024

Industry Title	2014 Jobs	2024 Jobs	New Jobs 2014-2024	% Change 2014-2024
Warehousing and Storage	10,888	14,281	3,393	31.2%
Employment Services	7,415	10,628	3,213	43.3%
Individual and Family Services	8,113	10,291	2,178	26.8%
General Medical and Surgical Hospitals	15,617	17,572	1,954	12.5%
Restaurants and Other Eating Places	23,575	25,429	1,854	7.9%
Outpatient Care Centers	4,492	6,206	1,713	38.1%
Traveler Accommodation	9,321	10,905	1,584	17.0%
Nursing Care Facilities (Skilled Nursing Facilities)	8,235	9,808	1,573	19.1%
Other Amusement and Recreation Industries	5,059	6,243	1,184	23.4%
Offices of Other Health Practitioners	3,058	4,223	1,165	38.1%
Total, 10 Largest Growth	95,773	115,586	19,811	20.7%

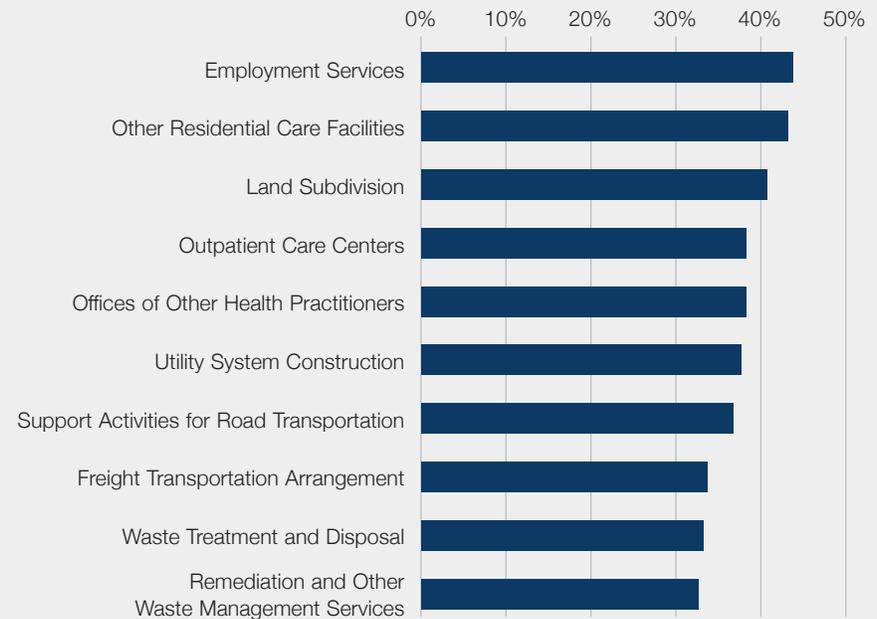
Source: BLS (QCEW); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

2.4 Fastest Growing 4-Digit Industries

The fastest growing 4-digit industries are identified by the highest relative change (percent change) projected to occur between 2014 and 2024. The fastest growing industries represent emerging sectors within Northeast Pennsylvania that may present opportunities for collaboration and support from postsecondary education and training institutions. Given the aging population in the U.S. and Pennsylvania, the health care sector is driving demand for workers. The fastest growing industries in Northeast Pennsylvania include home employment services, other residential care facilities, and land subdivision.

Fig. 7 depicts the fastest growing industries in Northeast Pennsylvania and the projected growth from 2014 to 2024 and Fig. 8 displays the employment in the fastest growing industries, projected job growth, and 10-year new and replacement jobs.

Fig. 7: Northeast Pennsylvania's Fastest Growing 4-Digit Industries and Projections, 2014-2024



Source: BLS (QCEW); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

Fig. 8: Northeast Pennsylvania's Fastest Growing 4-Digit Industries and Projections, 2014-2024

Industry Title	2014 Jobs	2024 Jobs	New Jobs 2014-2024	% Change 2014-2024
Employment Services	7,415	10,628	3,213	43.3%
Other Residential Care Facilities	392	560	168	42.9%
Land Subdivision	113	159	46	40.7%
Outpatient Care Centers	4,492	6,206	1,714	38.2%
Offices of Other Health Practitioners	3,058	4,223	1,165	38.1%
Utility System Construction	2,465	3,385	920	37.3%
Support Activities for Road Transportation	462	631	169	36.6%
Freight Transportation Arrangement	460	614	154	33.5%
Waste Treatment and Disposal	338	450	112	33.1%
Remediation and Other Waste Management Services	548	727	179	32.7%
Total, 10 Fastest Growing	19,743	27,583	7,840	39.7%

Source: BLS (QCEW); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

2.5 Concentration of Industries

Certain Northeast Pennsylvania industries have a greater concentration within the region as compared to the nation. A location quotient (LQ) for an industry provides perspective on statewide concentration in industry classifications. When evaluated jointly with the industry employment data, one gains a sense of the industry sectors that might benefit from efforts to align educational opportunities with economic development (i.e. industries that State System universities may consider engaging in larger conversations about aligning employer and educational needs).

Location quotients equal to 1 indicate that the area's industry concentration is equal to the national concentration of the same industry. Industries with higher location quotients (usually greater than 1.2) indicate that a region has a concentration in the production of that good or service, relative to the rest of the nation. A value of 1.5 indicates that industry employment within the region is 1.5 times more concentrated than the U.S. average. A location quotient below 1 indicates that industry employment within the region is less concentrated compared to the U.S. average. Note: High employment industries do not necessarily result in large location quotients, as this is a relative statistic.

The location quotient chart provides three key pieces of information. The vertical axis indicates the location quotient value. The horizontal axis indicates whether the industry sector is projected to grow or decline over the next 10 years. The size of the bubble indicates the size of employment in the industry.

Industries with high LQ's that are adding new jobs suggest that the comparative regional advantage may be creating further job growth. When viewed together, large employment industries (large bubbles) that have high concentrations (high LQs) and add new jobs (high growth), are significant driving forces for regional growth and advancement.

Industry sectors that are highly concentrated in Northeast Pennsylvania include: spring and wire product manufacturing, RV parks and recreational camps, nonferrous metal production and processing, and warehousing and storage.

Fig. 9 on the next page displays the most concentrated industries (as measured by LQ) for Northeast Pennsylvania at the 4-digit NAICS level in 2014. The figure reflects the comparative advantage Northeast Pennsylvania enjoys in various manufacturing sectors (both advanced and non-advanced). Warehousing and storage also shows high levels of concentration, highlighting those sectors that support the strong manufacturing base.

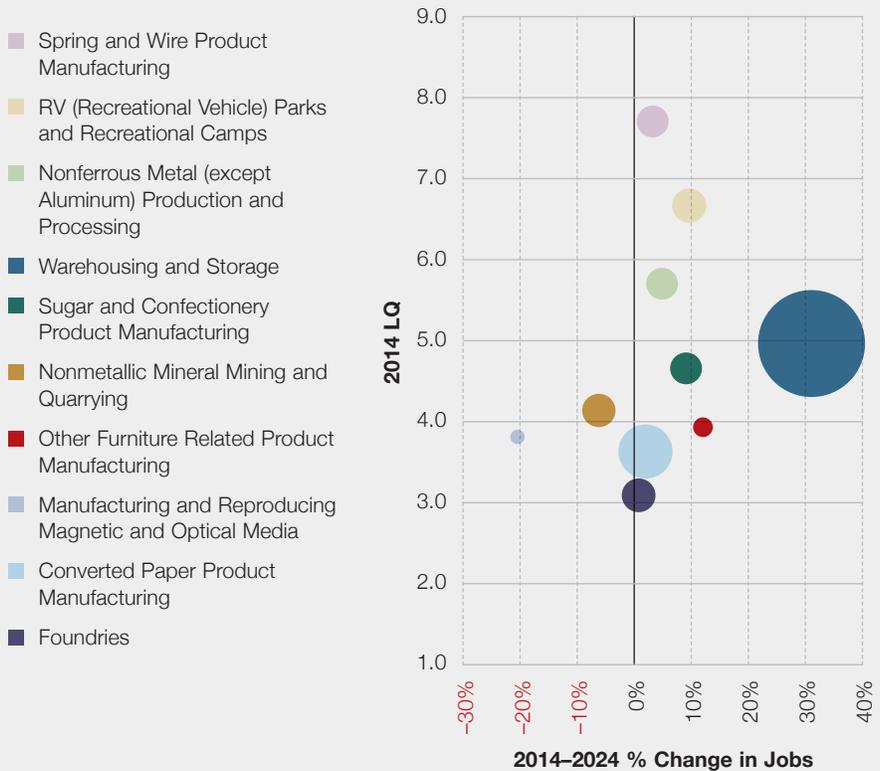
The next section provides information on occupational employment and describes the types of jobs people hold in Northeast Pennsylvania.

How to read a Location Quotient chart

The location quotient (LQ) bubble chart provides three key sources of information: level of concentration, as indicated by the LQ value, the % change in the variable measured—industries and occupations in this report—and the number of jobs employed. The LQ value is located on the vertical chart. As described above, values above the 1 on the vertical axis indicate higher levels of concentration compared to the national average. Bubbles that are situated above zero on the horizontal axis indicate positive job growth. Finally, larger bubbles indicate that the employment within the measured indicate larger levels of employment.

If one were to divide the bubble chart into sections, bubbles with LQ's greater than 1 located in the upper right hand section indicate highly concentrated industries that are projected to grow, whereas bubbles with LQ's greater than 1 in the left side indicate highly concentrated industries that are projected to decline. Similarly, LQ's less than one but on the right side, indicate job growth, but with a low concentration of employment, relative to the US average. Finally, LQ's less than one and on the left side indicate a low level of employment concentration with projected job loss.

Fig. 9: Northeast Pennsylvania’s Most Concentrated 4-Digit Industries and Projected Growth, 2014-2024



Source: BLS (QCEW); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

Fig. 10: Northeast Pennsylvania’s Most Concentrated 4-Digit Industries and Projected Growth, 2014-2024

Industry Title	2014 LQ	% Change 2014-2024	2014 Jobs
Spring and Wire Product Manufacturing	7.7	3.4%	971
RV (Recreational Vehicle) Parks and Recreational Camps	6.7	9.7%	1,150
Nonferrous Metal (except Aluminum) Production and Processing	5.7	4.9%	1,038
Warehousing and Storage	5.0	31.2%	10,888
Sugar and Confectionery Product Manufacturing	4.7	9.1%	948
Nonmetallic Mineral Mining and Quarrying	4.1	-6.1%	1,086
Other Furniture Related Product Manufacturing	3.9	12.2%	394
Manufacturing and Reproducing Magnetic and Optical Media	3.8	-20.4%	190
Converted Paper Product Manufacturing	3.6	2.1%	2,838
Foundries	3.1	0.8%	1,140

Source: BLS (QCEW); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

3. OCCUPATIONAL PROFILE OF NORTHEAST PENNSYLVANIA

Examining occupational employment data reveals the importance of skills, experience and knowledge of workers. It showcases the types of jobs in which Northeast Pennsylvania's workforce is currently employed and projected to be employed by 2024. When evaluating occupation employment and demand, it is important to note that an occupation can be found in many different industry sectors. For example, every major industry sector employs accountants and auditors to maintain books, payroll, and ensure reporting compliance. This analysis compiles occupational employment across all industry sectors and reports the total number of jobs, median annual wages, and demand (10-year new and replacement jobs) for each occupation classification. The analysis also considers the educational attainment level that is typically required to gain employment in an occupation.

The region's workforce changes and labor demand are presented in multiple ways in this section including:

- Major occupation groups (2-digit SOC);
- Skilled occupations;
- Largest detailed occupations (6-digit SOC) in 2014;
- Occupations (6-digit SOC) with high location quotient (or concentration) in 2014; and
- Occupations aligning to educational attainment at the associate's degree level as well as the bachelor's and graduate degree level, specifically:
 - Top high demand occupations (6-digit SOC) from 2014 to 2024, and
 - Fastest growing occupations (6-digit SOC) from 2014 to 2024.

The following sub-section begins the analysis by examining major occupation groups in Northeast Pennsylvania in 2014 and projected growth to 2024.

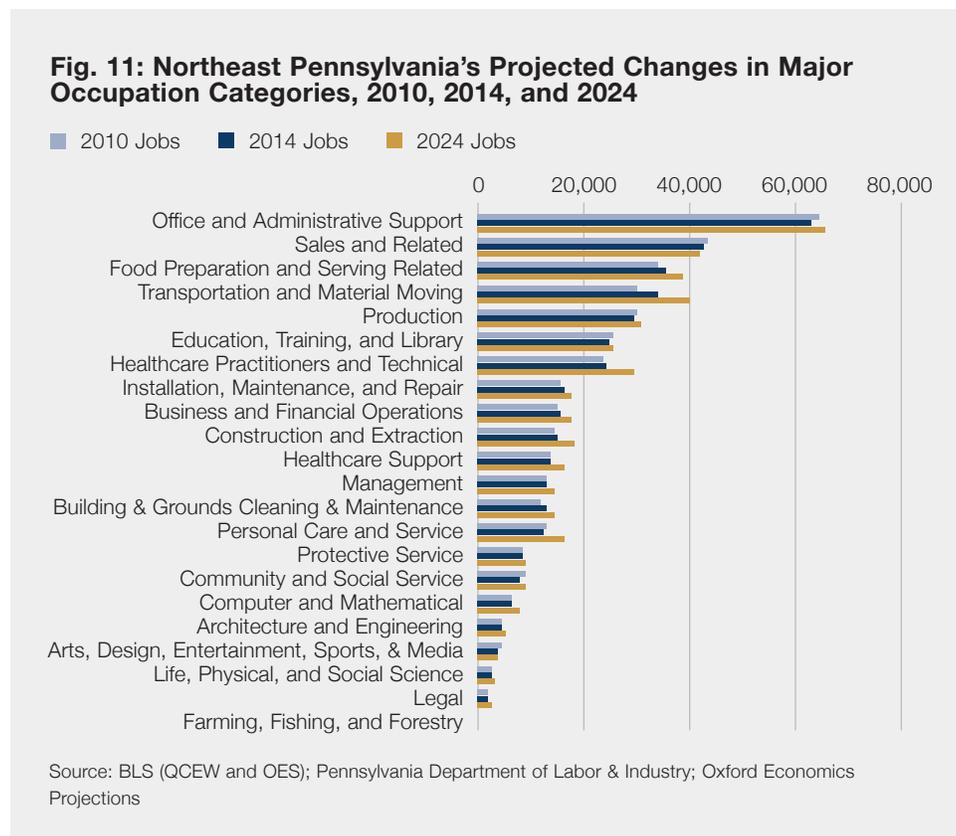
3.1 Major Occupation Groups

In Northeast Pennsylvania, several occupation categories are projected to grow over the next 10 years, from 2014 to 2024, as well as require a significant

level of replacement labor.⁷ Certain major occupation categories—at the 2-digit Standard Occupation Classification (SOC) level—experienced substantial growth in recent years and are expected to continue to lead the pack to 2024. Between 2010 and 2014 Northeast Pennsylvania experienced growth in several occupation categories that are typically aligned with postsecondary education, including:

- Healthcare practitioners and technical occupations (1,200 new jobs);
- Business and financial occupations (160 new jobs);
- Computer and mathematical occupations (450 new jobs); and
- Life, physical, and social science occupations (400 new jobs).

Furthermore, these four occupation categories are projected to add 76,500 new jobs between 2014 and 2024 and will account for nearly one fifth of the total projected occupation job growth in Northeast Pennsylvania.



⁷ This estimate accounts for the need to replace workers who leave an occupation permanently due to retirement, death, or a change in occupation.

Identifying Skilled Occupations

For this analysis a “skilled” occupation is defined as an occupation in O*NET Job Zones* Three, Four or Five. The O*NET program is the nation’s primary source of occupational information. Central to the project is the O*NET database, containing information on hundreds of standardized and occupation-specific descriptors. The database, which is available to the public at no cost, is continually updated by surveying a broad range of workers from each occupation.** Most occupations in Job Zone Three require training in vocational schools, related on-the-job experience, or an associate’s degree. Most occupations in Job Zone Four require a four-year bachelor’s degree, but some do not. Most occupations in Job Zone Five require graduate school. For example, they may require a master’s degree, and some require a Ph.D., M.D., or J.D. (law degree).

For a more detailed description of O*NET Job Zones and training requirements see Appendix B.

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

** <http://www.onetcenter.org/overview.html>

3.2 Skilled Occupations Overview

The Northeast Pennsylvania economy had 399,600 jobs in 2014, a number which is projected to grow to 439,300 in 2024—an increase of about 39,800 jobs or a 9.9 percent change. It is important to note that the share of Northeast Pennsylvania jobs that will require some postsecondary education will increase from 2014 to 2024, showing the employer demand for skilled workers will continue to grow. The growth in skilled occupations (Job Zones 3, 4 and 5) from 2014 to 2024 is projected to be 10.9 percent as compared to 9.2 percent for low skilled occupations (Job Zones 1 and 2). These are defined as skilled jobs or skilled occupations in the State System’s Gap Analysis Project using terminology from the O*NET program.

Fig. 12 shows the number of jobs in Northeast Pennsylvania by skilled occupations (Job Zones 3-5) and low skilled occupations (Job Zones 1-2) in 2014 as well as projected growth to 2024 for each set of occupations.

Fig. 12: Northeast Pennsylvania Projected Job Growth by Job Zone, 2014-2024

	2014	2024	% Change 2014-2024	Share 2014	Share 2024
Northeast Pennsylvania, Total Jobs	399,586	439,344	9.9%	100%	100%
Job Zones 1-2 (Low Skilled)	219,288	239,471	9.2%	55%	55%
Job Zones 3-5 (Skilled)	180,298	199,873	10.9%	45%	45%

Source: BLS (QCEW); Pennsylvania Department of Labor & Industry, O*NET; Oxford Economics Projections

3.3 Largest Occupations

Top occupations in the state are driven by industry composition. Medical centers employ a cadre of health professionals, while enterprise management companies employ a range of business professionals. Given the dominating presence of health care and social assistance, accommodation and food services, and retail trade establishments in Northeast Pennsylvania, top occupations include: retail salespersons; cashiers; laborers and freight, stock, and material movers; food preparation and serving workers; and office clerks. Fig. 13 highlights the top occupations in the state, 10-year job growth projections, and new and replacement jobs⁸. The Job Zone is also included to indicate skill level for each occupation.⁹

8 New and replacement job change takes into account demand for occupations based on: industry growth (new jobs), occupation productivity, workforce ageing (retirements and deaths), migration and other factors that would contribute to new and replacement job openings.

9 Job Zone One and Two represent low skilled occupations and Job Zone Three, Four and Five represent skilled occupations.

Fig. 13: Largest Occupations in Northeast Pennsylvania and Projected Growth, 2014-2024

Occupation Title	Job Zone	2014	2024	% Change 2014-2024	10-year New and Replacement Jobs
Retail Salespersons	2	15,010	15,520	3.4%	5,960
Cashiers	1	13,012	11,907	-8.5%	5,015
Laborers and Freight, Stock, and Material Movers, Hand	2	10,273	13,435	30.8%	6,864
Combined Food Preparation and Serving Workers, Including Fast Food	1	9,835	11,118	13.0%	5,508
Office Clerks, General	2	8,579	8,591	0.1%	1,987
Registered Nurses	3	8,544	10,329	20.9%	3,515
Waiters and Waitresses	1	7,435	8,277	11.3%	4,776
Customer Service Representatives	2	7,333	8,216	12.0%	3,099
Stock Clerks and Order Fillers	2	6,893	6,969	1.1%	2,485
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	3	6,859	7,688	12.1%	1,719
Heavy and Tractor-Trailer Truck Drivers	2	6,604	7,680	16.3%	2,467
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	2	6,132	6,403	4.4%	1,677
Nursing Assistants	2	5,518	6,729	21.9%	2,325
Maintenance and Repair Workers, General	3	4,564	5,023	10.1%	1,464
Elementary School Teachers, Except Special Education	4	4,477	4,459	-0.4%	1,108

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

3.4 Concentration of Occupations

Growth in areas of comparative advantage provides career opportunities that reflect statewide workforce concentration. Just as industry location quotient analysis is used to determine industry concentration, occupation location quotient analysis is used to evaluate specializations that exist within Northeast Pennsylvania’s workforce, which may indicate the presence of key occupation clusters. A classic example of one such cluster would be Silicon Valley’s large concentration of IT and computer programming occupations. The presence of occupation concentration (especially skilled occupations) indicates areas of opportunity for postsecondary institutions to support workforce needs for occupations that have strong employment advantages within the region.

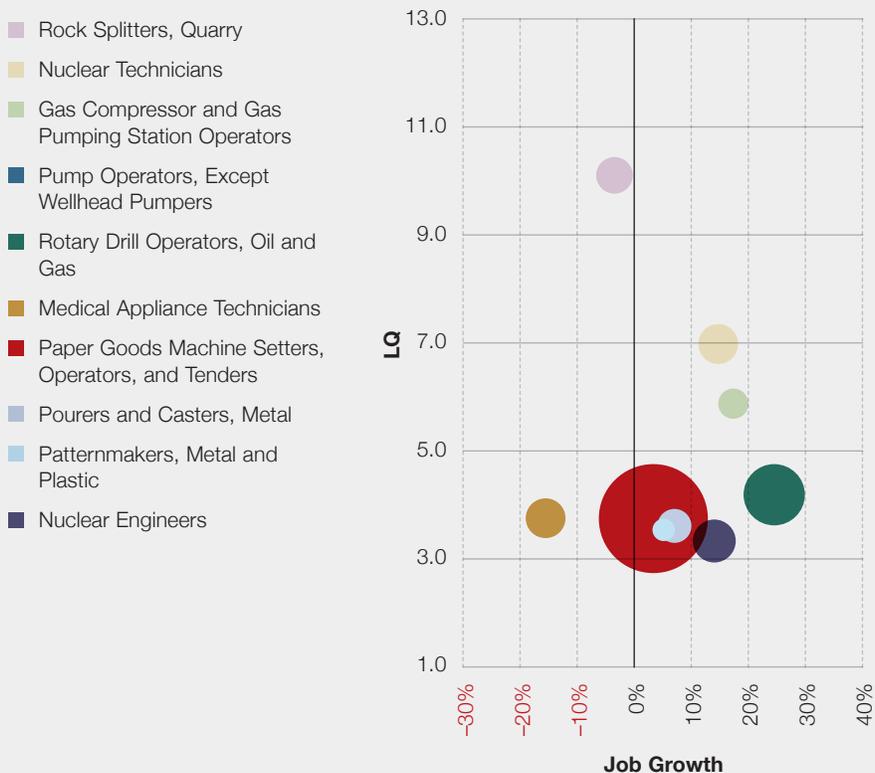
Location quotients equal to 1 indicate that the area’s occupation concentration is equal to the national concentration of the same occupation. Occupations with higher location quotients (usually greater than 1.2) indicate that a region

has a concentration or comparative advantage in the occupation, relative to the rest of the nation. A value of 1.5 indicates that occupation employment within the region is 1.5 times more concentrated compared to the U.S. average. A location quotient below 1 indicates that occupation employment within the region is less concentrated compared to the U.S. average. Note: High employment occupations do not necessarily result in large location quotients, as this is a comparative statistic.

The location quotient chart provides three key pieces of information. The vertical axis indicates the location quotient value. A value of 1.5 indicates that employment within the region is 1.5 times more concentrated compared to the average region in the U.S. The horizontal axis indicates whether the occupation is projected to grow or decline over the next 10 years. Occupations with high LQ's that are adding new jobs suggest that the comparative regional advantage may be creating further employment opportunities. The size of the bubble indicates the number of jobs within the occupations. When viewed together skilled occupations with large employment (large bubbles) that have comparative advantages (high LQs) and are adding new jobs (high growth), are likely critical areas of regional workforce needs and warrant closer evaluation of program availability and completion to support statewide workforce demand.

In Northeast Pennsylvania, occupations that are highly concentrated include rock splitters, quarry; nuclear technicians; gas compressor and gas pumping station operators; pump operators, except wellhead pumpers; and rotary drill operators, oil and gas. Fig. 14 illustrates the LQ, projected job change and employment size of the most concentrated occupations (as measured by LQ) in Northeast Pennsylvania in 2014. Fig. 15 provides detailed data on the occupations, including LQ, 2014 jobs, projected 2024 jobs and projected percent change in jobs.

Fig. 14: Northeast Pennsylvania's Most Concentrated Occupations and Projected Growth, 2014-2024



Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

Fig. 15: Northeast Pennsylvania's Most Concentrated Occupations and Projected Growth, 2014-2024

Occupation Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
Rock Splitters, Quarry	10.1	109	105	-3.7%
Nuclear Technicians	7.0	132	151	14.4%
Gas Compressor and Gas Pumping Station Operators	5.9	82	96	17.1%
Pump Operators, Except Wellhead Pumps	4.3	156	195	25.0%
Rotary Drill Operators, Oil and Gas	4.2	328	407	24.1%
Medical Appliance Technicians	3.8	148	125	-15.5%
Paper Goods Machine Setters, Operators, and Tenders	3.8	1,022	1,055	3.2%
Pourers and Casters, Metal	3.6	103	110	6.8%
Patternmakers, Metal and Plastic	3.5	40	42	5.0%
Nuclear Engineers	3.3	164	186	13.4%

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

3.5 Occupations Aligning to Associate's Degrees

Northeast Pennsylvania employment projections to 2024 conducted by the State System's Gap Analysis project indicate significant growth in many occupations that align with postsecondary education. Occupations that generally align to associate's degree programs are categorized as Job Zone Three.

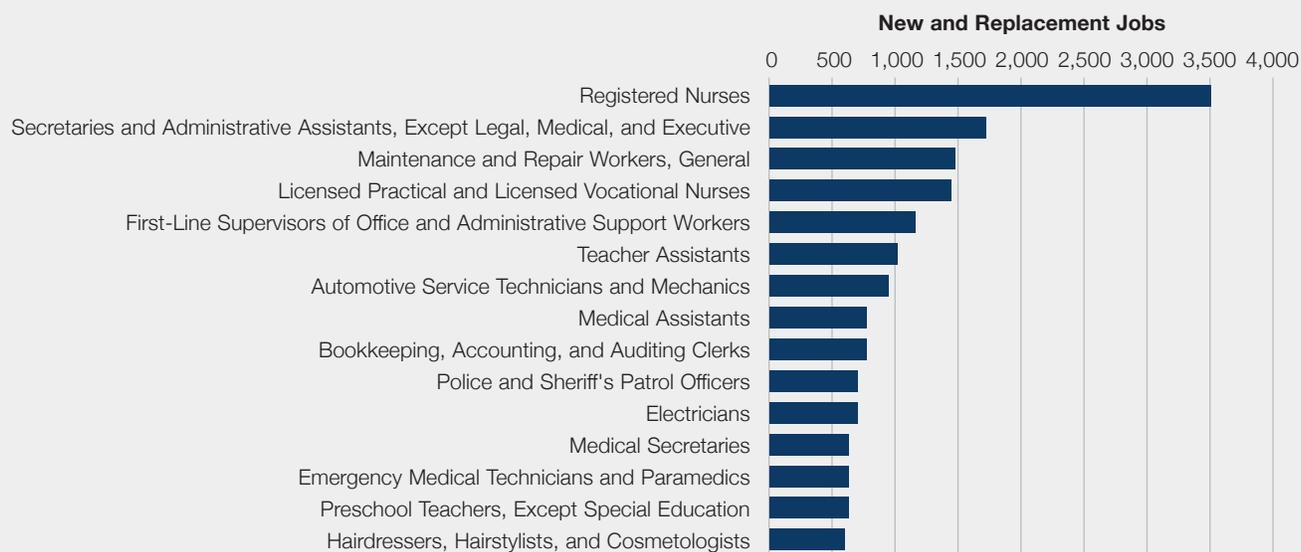
Looking ahead, many Job Zone Three occupations show significant growth and demand. In Northeast Pennsylvania, projections indicate 12.1 percent growth in Job Zone Three occupations between 2014 and 2024. Job demand is further emphasized through both new job growth and replacement job openings as workers in the profession retire, relocate, or change jobs. The projected new and replacement demand for Job Zone Three occupations is 34,000 between 2014 and 2024.

3.5.1 Top High Demand Occupations Aligning to Associate's Degrees

High demand occupations are identified as having the largest projected new and replacement demand between 2014 and 2024. The top high demand occupations in the region are largely driven by industry demand for skilled workers and typically the largest occupations in the region. However, career changes and the demographic characteristics of those who are currently employed—specifically age—also influence replacement demand. Occupations that employ an older demographic, specifically those aged 55 and older, will face increasing pressure to replace workers as older workers approach retirement age.

High demand occupations aligned to associate's degrees include: registered nurses, secretaries and administrative assistants, and maintenance and repair workers, general. Fig. 16 and Fig. 17 highlight Northeast Pennsylvania's top high demand occupations aligning to associate's degrees, projected job growth, and 10-year new and replacement jobs.

Fig. 16: Top High Demand Occupations Aligning to Associate's Degrees in Northeast Pennsylvania, 2014-2024



Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

Fig. 17: Employment Projections for Top High Demand Occupations Aligning to Associate's Degrees in Northeast Pennsylvania, 2014-2024

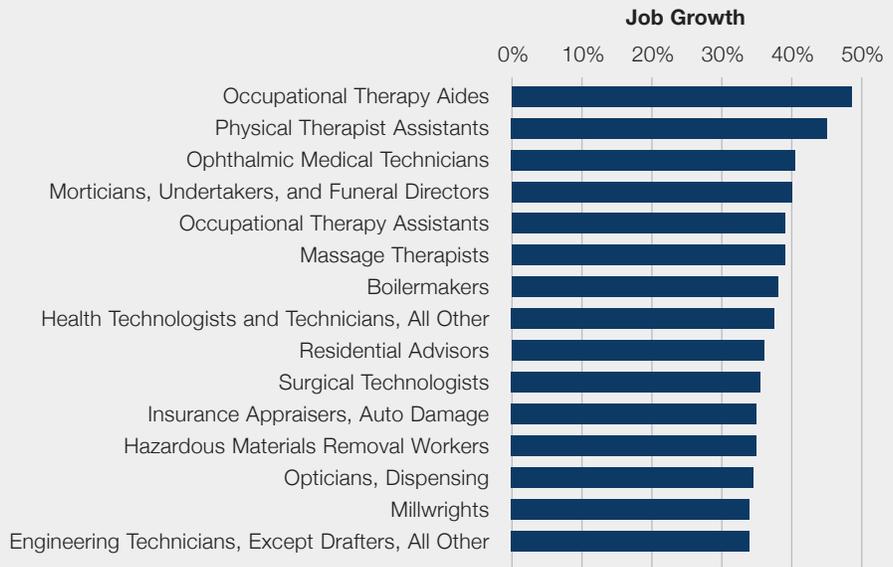
Occupation Title	2014 Jobs	2024 Jobs	% Change 2014-2024	10-year New and Replacement Jobs
Registered Nurses	8,544	10,329	20.9%	3,515
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	6,859	7,688	12.1%	1,719
Maintenance and Repair Workers, General	4,564	5,023	10.1%	1,464
Licensed Practical and Licensed Vocational Nurses	2,679	3,394	26.7%	1,423
First-Line Supervisors of Office and Administrative Support Workers	3,795	4,038	6.4%	1,152
Teacher Assistants	3,544	3,680	3.8%	1,017
Automotive Service Technicians and Mechanics	2,527	2,732	8.1%	940
Medical Assistants	1,629	2,061	26.5%	759
Bookkeeping, Accounting, and Auditing Clerks	4,195	4,534	8.1%	754
Police and Sheriff's Patrol Officers	2,259	2,164	-4.2%	716
Electricians	1,386	1,713	23.6%	705
Medical Secretaries	1,482	1,948	31.4%	639
Emergency Medical Technicians and Paramedics	1,125	1,374	22.1%	620
Preschool Teachers, Except Special Education	1,077	1,383	28.4%	615
Hairdressers, Hairstylists, and Cosmetologists	1,308	1,540	17.7%	602

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

3.5.2 Fastest Growing Occupations Aligning to Associate's Degrees

The fastest growing occupations are identified by the highest relative change (percent change) projected to occur between 2014 and 2024. In Northeast Pennsylvania, the fastest growing occupations are largely driven by industry growth and demand. Growing industries reflect the needs of the broader economy. Given the aging population in the U.S. and Pennsylvania, the health care sector is driving demand for workers. The fastest growing occupations aligning to associate's degrees include: occupational therapy aides; physical therapy assistants; ophthalmic medical technicians; morticians, undertakers, and funeral directors; and massage therapists. Fig. 18 and Fig. 19 highlight the fastest growing occupations in the region that align to associate's degrees, projected job growth, and 10-year new and replacement jobs.

Fig. 18: Fastest Growing Occupations Aligning to Associate's Degrees in Northeast Pennsylvania, 2014-2024



Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

**Fig. 19: Employment Projections for Fastest Growing Occupations
Aligning to Associate's Degrees in Northeast Pennsylvania, 2014-2024**

Occupation Title	2014 Jobs	2024 Jobs	% Change 2014-2024	10-year New and Replacement Jobs
Occupational Therapy Aides	35	52	48.6%	27
Physical Therapist Assistants	313	454	45.0%	225
Ophthalmic Medical Technicians	74	104	40.5%	39
Morticians, Undertakers, and Funeral Directors	82	115	40.2%	57
Occupational Therapy Assistants	170	236	38.8%	118
Massage Therapists	152	211	38.8%	75
Boilermakers	71	98	38.0%	64
Health Technologists and Technicians, All Other	179	246	37.4%	81
Residential Advisors	474	644	35.9%	408
Surgical Technologists	243	329	35.4%	109
Insurance Appraisers, Auto Damage	37	50	35.1%	26
Hazardous Materials Removal Workers	169	228	34.9%	119
Opticians, Dispensing	231	311	34.6%	159
Millwrights	91	122	34.1%	53
Engineering Technicians, Except Drafters, All Other	168	225	33.9%	98

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

3.6 Occupations Aligning to Bachelor's and Graduate Degrees

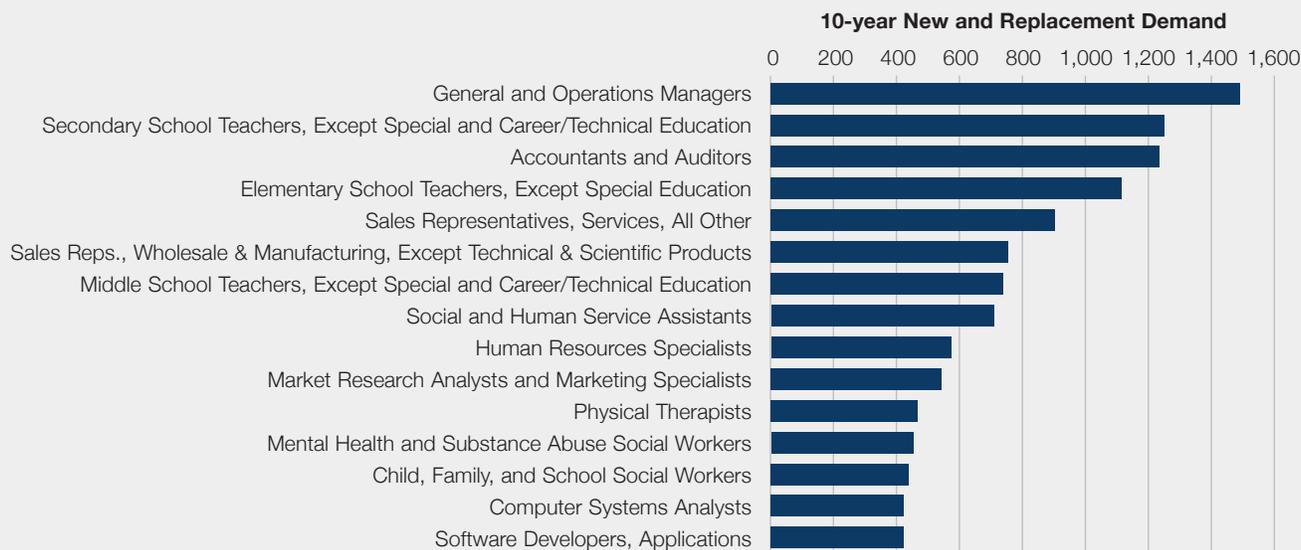
Job Zones Four and Five describe occupations that typically require a bachelor's degree or graduate degree. Northeast Pennsylvania's employment projections indicate that occupations typically requiring a bachelor's degree or higher will grow 9.5 percent between 2014 and 2024. This projected growth will result in total demand for new and replacement job openings of nearly 28,800 over the same time period.

3.6.1 Top High Demand Occupations Aligning to Bachelor's and Graduate Degrees

High demand occupations are identified as having the largest projected new and replacement demand between 2014 and 2024. The top high demand occupations in the region are largely driven by industry demand for skilled workers and typically the largest occupations in the region. However, career changes and the demographic characteristics of those who are currently employed—specifically age—also influence replacement demand. Occupations that employ an older demographic, specifically those aged 55 and older, will face increasing pressure to replace workers as older workers approach retirement age.

High demand occupations aligning to bachelor's and graduate degree level education include: general and operations managers, secondary school teachers, accountants and auditors, elementary school teachers, and sales representatives, all other. Fig. 20 and Fig. 21 highlight the top high demand occupations in the region aligning to bachelor's and graduate degrees, projected job growth, and 10-year new and replacement jobs.

Fig. 20: Top High Demand Occupations Aligning to Bachelor’s and Graduate Degrees in Northeast Pennsylvania, 2014-2024



Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

Fig. 21: Employment Projections for Top High Demand Occupations Aligning to Bachelor’s and Graduate Degrees in Northeast Pennsylvania, 2014-2024

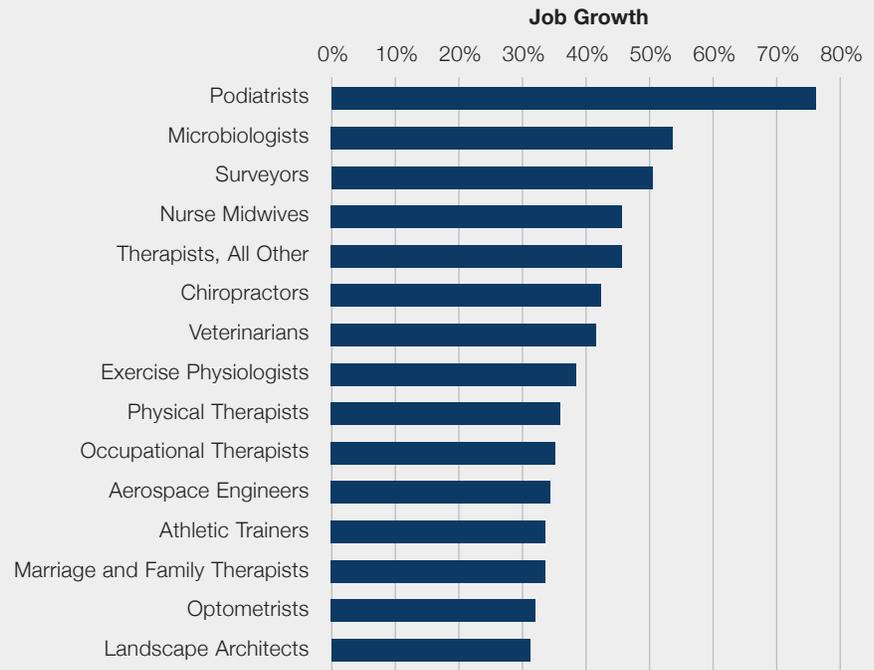
Occupation Title	2014 Jobs	2024 Jobs	% Change 2014-2024	10-year New and Replacement Jobs
General and Operations Managers	4,459	5,152	15.5%	1,486
Secondary School Teachers, Except Special and Career/Technical Education	4,118	3,962	-3.8%	1,247
Accountants and Auditors	2,919	3,181	9.0%	1,233
Elementary School Teachers, Except Special Education	4,477	4,459	-0.4%	1,108
Sales Representatives, Services, All Other	1,735	2,138	23.2%	901
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	4,153	3,942	-5.1%	754
Middle School Teachers, Except Special and Career/Technical Education	1,929	2,184	13.2%	739
Social and Human Service Assistants	1,567	1,802	15.0%	702
Human Resources Specialists	1,230	1,541	25.3%	574
Market Research Analysts and Marketing Specialists	1,204	1,547	28.5%	537
Physical Therapists	710	968	36.3%	459
Mental Health and Substance Abuse Social Workers	819	1,033	26.1%	444
Child, Family, and School Social Workers	1,187	1,348	13.6%	438
Computer Systems Analysts	1,022	1,264	23.7%	423
Software Developers, Applications	960	1,237	28.9%	414

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

3.6.2 Fastest Growing Occupations Aligning to Bachelor's and Graduate Degrees

The fastest growing occupations are identified by the highest relative change (percent change) projected to occur between 2014 and 2024. In Northeast Pennsylvania, the fastest growing occupations aligning to bachelor's and graduate degrees include: podiatrists, microbiologists, surveyors, nurse midwives, and therapists, all other. Fig. 22 and Fig. 23 highlight Northeast Pennsylvania's fastest growing occupations aligning to bachelor's and graduate degrees, projected job growth, and 10-year new and replacement jobs.

Fig. 22: Fastest Growing Occupations Aligning to Bachelor's and Graduate Degrees in Northeast Pennsylvania, 2014-2024



Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

Fig. 23: Employment Projections for Fastest Growing Occupations Aligning to Bachelor's and Graduate Degrees in Northeast Pennsylvania, 2014-2024

Occupation Title	2014	2024	% Change 2014-2024	10-year New and Replacement Jobs
Podiatrists	37	65	75.7%	43
Microbiologists	28	43	53.6%	24
Surveyors	67	101	50.7%	51
Nurse Midwives	11	16	45.5%	6
Therapists, All Other	31	45	45.2%	18
Chiropractors	96	137	42.7%	63
Veterinarians	150	212	41.3%	115
Exercise Physiologists	21	29	38.1%	10
Physical Therapists	710	968	36.3%	459
Occupational Therapists	411	557	35.5%	211
Aerospace Engineers	26	35	34.6%	16
Athletic Trainers	89	119	33.7%	57
Marriage and Family Therapists	93	124	33.3%	52
Optometrists	97	128	32.0%	63
Landscape Architects	35	46	31.4%	22

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

The next section provides a high-level overview of Northeast Pennsylvania's education program output by broad degree category.

4. POSTSECONDARY PROGRAM COMPLETIONS IN NORTHEAST PENNSYLVANIA

Northeast Pennsylvania is home to many different postsecondary institutions, offering a range of degree programs. As reported by the National Center for Education Statistics (NCES), there are approximately 25 higher education institutions in the region that awarded an associate's degree or higher between 2011 and 2013.¹⁰ These institutions graduated, on average, 10,300 students annually from 2011 to 2013 with an associate's degree or higher.¹¹ The top major fields of study include business, management, marketing, and related support services; health professions and related programs; education; psychology; and biological and biomedical sciences.

Pennsylvania's State System of Higher Education is a large contributor to bachelor's and graduate degree completions. The State System universities in the region include: East Stroudsburg University (ESU) and Mansfield University (Man U). These universities produce approximately 26% of the total bachelor's degrees and above in the region.¹²

4.1 Associate's Degree Completions

Northeast Pennsylvania is home to approximately 14 different institutions that offer a range of associate's degree programs.¹³ From 2011 to 2013, these institutions in Northeast Pennsylvania awarded, on average, 1,800 associate's degrees annually. The top three program areas in the region's associate degree production include:

- Health professions and related programs,
- Business, management, marketing, and related support services, and
- Liberal arts and sciences, general studies and humanities.

10 This number includes the location of a physical campus/structure with learner enrolment as reported to NCES. Institutions with extension campuses that report enrollment at their main campus may not be captured within this list.

11 This number is the 3-year average completions from 2011 to 2013 as reported to NCES.

12 This number is based on the 3-year average completions from 2011 to 2013 as reported to NCES.

13 This number includes the location of a physical campus/structure as reported to NCES. Institutions with extension campuses that report to their main campus may not be captured within this list.

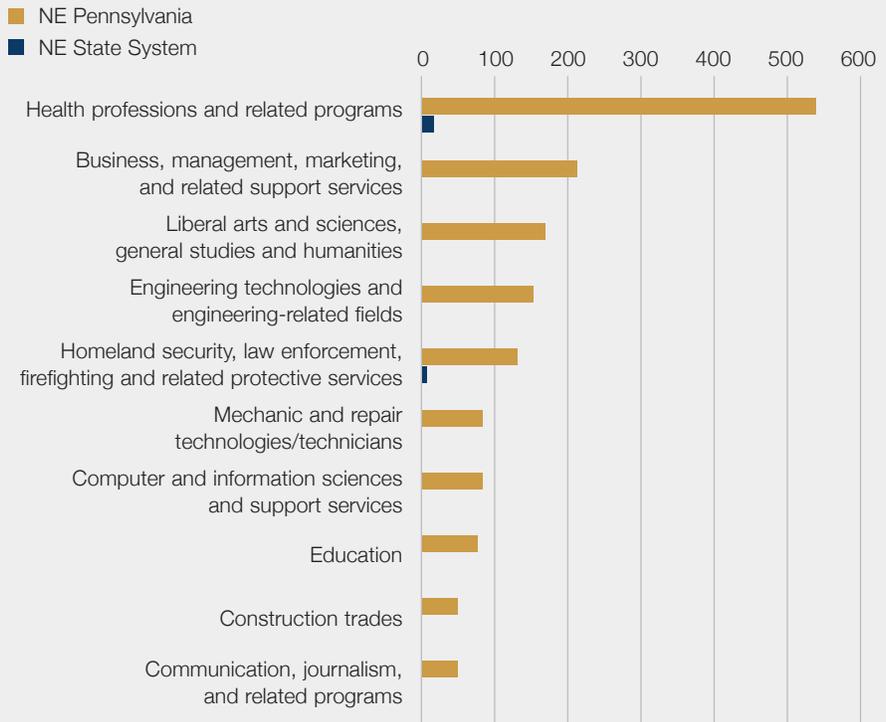
Of the 1,800 average annual completions of associate's degrees, these three program areas accounted for 53% of completions in the region.

4.1.1 State System Associate's Degree Completions

From 2011 to 2013, one out of the two State System universities in Northeast Pennsylvania awarded associate's degrees. On average, Man U awarded 26 associate's degrees annually and accounted for 1% of associate's degree completions in the region. The top program areas for associate's degrees in the Northeast State System include:

- Health professions and related programs,
- English language and literature/letters, and
- Homeland security, law enforcement, firefighting and related protective services.

Fig. 24: Associate's Degrees Program Completions in Northeast Pennsylvania and the Northeast State System, 2011-2013 Annual Average



Source: National Center for Education Statistics (IPEDS) 2011-2013 Completions

Of the 26 average annual completions of associate's degrees within the Northeast State System, these three program areas account for 95% of associate's degree completions.

Fig. 25: Associate's Degrees Total Program Completions in Northeast Pennsylvania and the Northeast State System, 2011-2013 Annual Average

Major Category	NE Pennsylvania 3-year Average Associate Completions	Share of Total NE Pennsylvania Associate Completions	NE State System 3-year Average Associate Completions	Share of Total NE State System Associate Completions
Total	1,760	100.0%	26	100.0%
Health professions and related programs	544	30.9%	15	57.0%
Business, management, marketing, and related support services	217	12.3%	0	0.0%
Liberal arts and sciences, general studies and humanities	172	9.8%	0	0.0%
Engineering technologies and engineering-related fields	155	8.8%	0	0.0%
Homeland security, law enforcement, firefighting and related protective services	133	7.5%	4	13.9%
Mechanic and repair technologies/technicians	82	4.7%	0	0.0%
Computer and information sciences and support services	81	4.6%	1	5.1%
Education	75	4.3%	0	0.0%
Construction trades	50	2.9%	0	0.0%
Communication, journalism, and related programs	50	2.8%	0	0.0%
Visual and performing arts	39	2.2%	0	0.0%
Social sciences	29	1.7%	0	0.0%
Public administration and social service professions	24	1.3%	0	0.0%
Family and consumer sciences/human sciences	21	1.2%	0	0.0%
Personal and culinary services	17	1.0%	0	0.0%
Communications technologies/technicians and support services	17	0.9%	0	0.0%
Parks, recreation, leisure, and fitness studies	12	0.7%	0	0.0%
Legal professions and studies	8	0.5%	0	0.0%
Precision production	7	0.4%	0	0.0%
English language and literature/letters	6	0.4%	6	24.1%
Multi/interdisciplinary studies	5	0.3%	0	0.0%
Biological and biomedical sciences	3	0.2%	0	0.0%
Theology and religious vocations	3	0.2%	0	0.0%
Agriculture, agriculture operations, and related sciences	2	0.1%	0	0.0%
Natural resources and conservation	2	0.1%	0	0.0%
Mathematics and statistics	2	0.1%	0	0.0%
Architecture and related services	1	0.1%	0	0.0%
Transportation and materials moving	1	0.1%	0	0.0%

Source: National Center for Education Statistics (IPEDS) 2011-2013 Completions

Fig. 24 highlights the top 10 program areas for associate's completions in Northeast Pennsylvania, along with the corresponding Northeast State System associate's completions.

Fig. 25 on the previous page provides the total number of associate's degrees awarded in Northeast Pennsylvania by major field of study as well as the total number of associate's degrees awarded by the State System.

4.2 Bachelor Degree Completions

Northeast Pennsylvania is home to approximately 13 different institutions that offer a range of bachelor's degree programs.¹⁴ From 2011 to 2013, these institutions in Northeast Pennsylvania awarded, on average, 5,200 bachelor's degrees annually. The top three program areas in the region's bachelor degree production include:

- Business, management, marketing, and related support services,
- Health professions and related programs, and
- Education.

Of the 5,200 average annual completions of bachelor's degrees, these three program areas accounted for 44% of completions in the region.

4.2.1 State System Bachelor's Degree Completions

From 2011 to 2013, both State System universities in Northeast Pennsylvania awarded bachelor's degrees. On average, these institutions awarded 1,800 bachelor's degrees annually. The three universities accounted for 34% of bachelor's degree completions in the region and include: ESU (1,244 annual average bachelor completions), and Man U (556 annual average bachelor completions). The top program areas for bachelor's degrees in the Northeast State System include:

- Education,
- Business, management, marketing, and related support services, and
- Health professions and related programs.

Of the 1,800 average annual completions of bachelor's degrees within the

¹⁴ This number includes the location of a physical campus/structure as reported to NCES. Institutions with extension campuses that report to their main campus may not be captured within this list.

Northeast State System, these three program areas account for 40% of bachelor's degree completions.

Fig. 26 highlights the top program areas for bachelor's completions in Northeast Pennsylvania, along with the corresponding Northeast State System bachelor's completions.

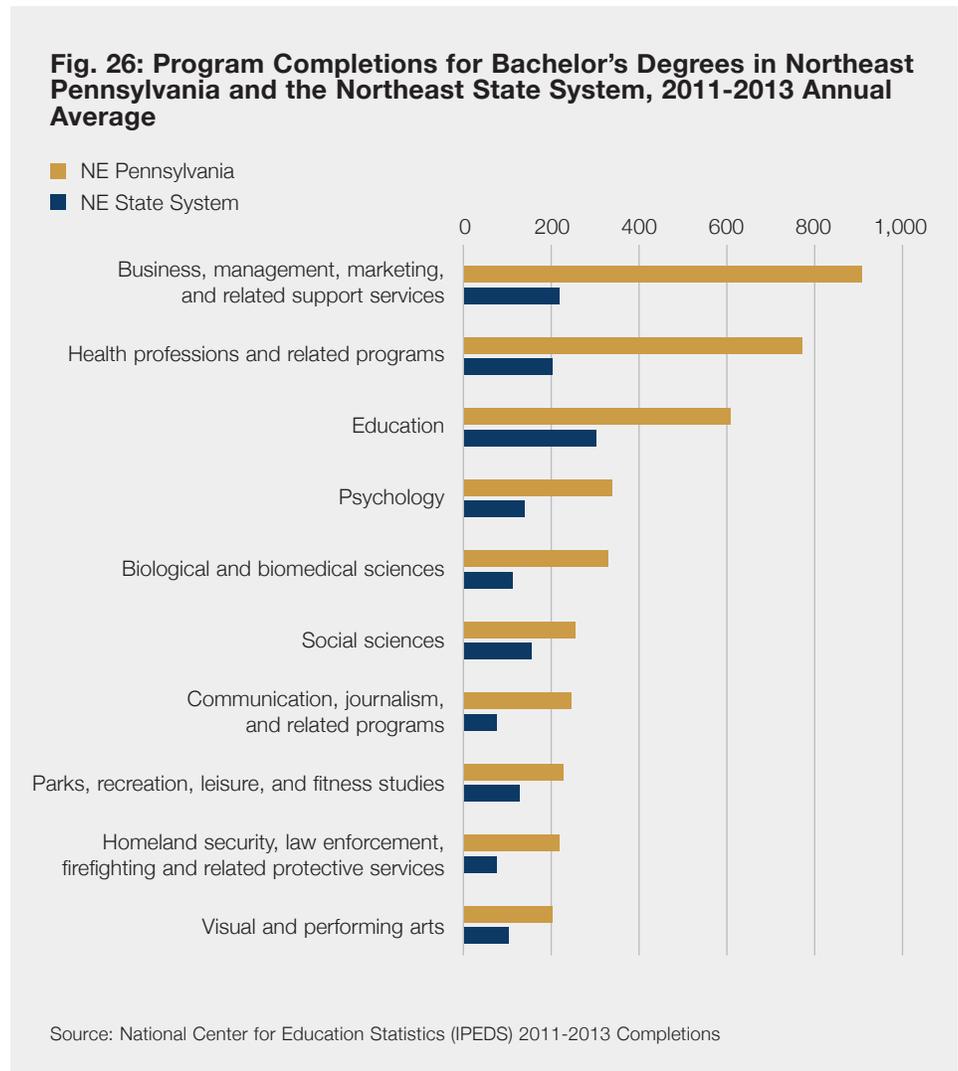


Fig 27 on the next page provides the total number of bachelor's degrees awarded in Northeast Pennsylvania by major field of study as well as the total number of bachelor's degrees awarded by the State System.

Fig. 27: Total Program Completions for Bachelor's Degrees in Northeast Pennsylvania and the State System, 2011-2013 Annual Average

Major Category	NE Pennsylvania 3-year Average Bachelor Completions	Share of Total NE Pennsylvania Bachelor Completions	NE State System 3-year Average Bachelor Completions	Share of Total NE State System Bachelor Completions
Total	5,236	100.0%	1,800	100.0%
Business, management, marketing, and related support services	910	17.4%	219	12.1%
Health professions and related programs	771	14.7%	196	10.9%
Education	613	11.7%	297	16.5%
Psychology	334	6.4%	134	7.4%
Biological and biomedical sciences	326	6.2%	110	6.1%
Social sciences	258	4.9%	154	8.6%
Communication, journalism, and related programs	246	4.7%	75	4.1%
Parks, recreation, leisure, and fitness studies	232	4.4%	126	7.0%
Homeland security, law enforcement, firefighting and related protective services	221	4.2%	69	3.9%
Visual and performing arts	199	3.8%	104	5.8%
Liberal arts and sciences, general studies and humanities	160	3.1%	10	0.6%
English language and literature/letters	150	2.9%	71	3.9%
History	144	2.8%	60	3.3%
Public administration and social service professions	112	2.1%	31	1.7%
Computer and information sciences and support services	101	1.9%	29	1.6%
Theology and religious vocations	97	1.85%	0	0.0%
Engineering	61	1.2%	0	0.0%
Mathematics and statistics	54	1.0%	28	1.5%
Physical sciences	53	1.0%	27	1.5%
Multi/interdisciplinary studies	42	0.8%	8	0.4%
Philosophy and religious studies	32	0.6%	9	0.5%
Foreign languages, literatures, and linguistics	32	0.6%	12	0.6%
Family and consumer sciences/human sciences	27	0.5%	6	0.4%
Communications technologies/technicians and support services	26	0.5%	26	1.5%
Natural resources and conservation	17	0.3%	0	0.0%
Transportation and materials moving	7	0.1%	0	0.0%
Area, ethnic, cultural, gender, and group studies	6	0.1%	0	0.0%
Engineering technologies and engineering-related fields	3	0.05%	0	0.0%
Architecture and related services	1	0.0%	0	0.0%

Source: National Center for Education Statistics (IPEDS) 2011-2013 Completions

4.3 Graduate Degree Completions

Northeast Pennsylvania is home to approximately 9 different institutions that offer a range of graduate degree programs.¹⁵ From 2011 to 2013, these institutions in Northeast Pennsylvania awarded, on average, 3,300 graduate degrees annually. The top three program areas in the region's associate degree production include:

- Education,
- Health professions and related programs, and
- Business, management, marketing, and related support services.

Of the 3,300 average annual completions of graduate degrees, these three program areas accounted for 83% of completions in the region.

4.3.1 State System Graduate Degree Completions

From 2011 to 2013, both State System universities in Northeast Pennsylvania awarded graduate degrees. On average, these institutions awarded 450 graduate degrees annually. The universities accounted for 13% of graduate degree completions in the region and include: ESU (314 annual average graduate completions) and Man U (134 annual average graduate completions). The top program areas for graduate degrees in the Northeast State System include:

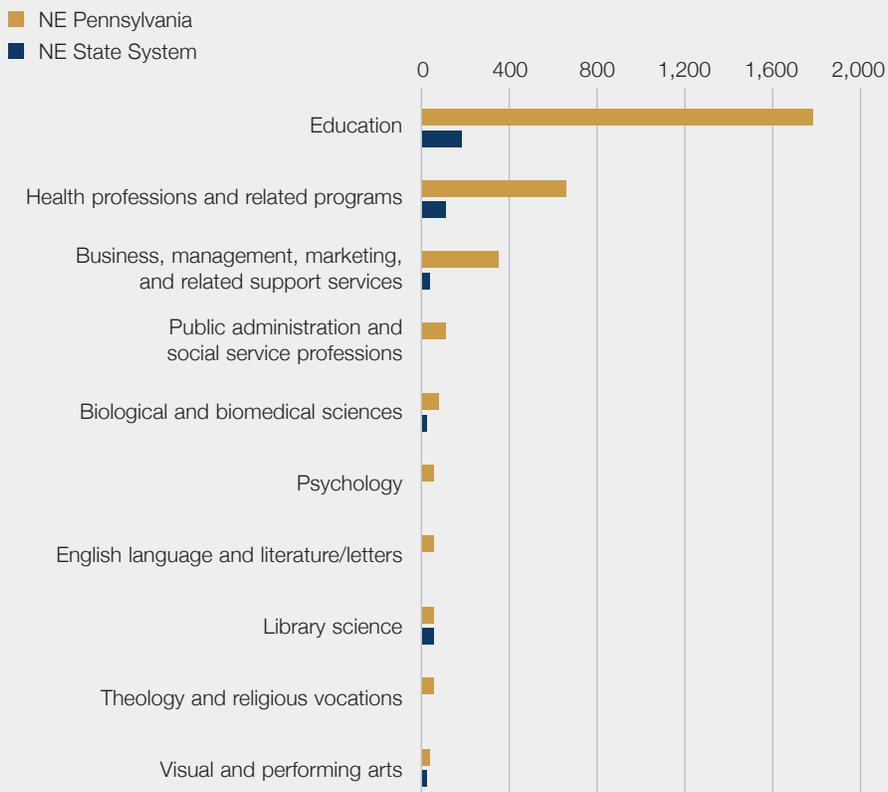
- Education,
- Health professions and related programs, and
- Library science.

Of the 450 average annual completions of graduate degrees within the State System, these three program areas account for 77% of graduate degree completions.

Fig. 28 highlights the top 10 program areas for graduate completions in Northeast Pennsylvania, along with the corresponding State System graduate completions.

¹⁵ This number includes the location of a physical campus/structure as reported to NCES. Institutions with extension campuses that report to their main campus may not be captured within this list.

Fig. 28: Program Completions for Graduate Degrees in Northeast Pennsylvania and the State System, 2011-2013 Annual Average



Source: National Center for Education Statistics (IPEDS) 2011-2013 Completions

Fig. 29 on the next page provides the total number of graduate degrees awarded in Northeast Pennsylvania by major category as well as the total number of graduate degrees awarded by the State System.

The next section evaluates the combination of completions by degree type (education supply) against the demand for skilled labor by occupation to determine whether potential gaps (excess demand or supply surplus) exist within the commonwealth’s postsecondary education system.

Fig. 29: Total Program Completions for Graduate Degrees in Northeast Pennsylvania and the State System, 2011-2013 Annual Average

Major Category	NE Pennsylvania 3-year Average Graduate Completions	Share of Total NE Pennsylvania Graduate Completions	NE State System 3-year Average Graduate Completions	Share of Total NE State System Graduate Completions
Total	3,329	100.0%	448	100.0%
Education	1,768	53.1%	187	41.6%
Health professions and related programs	647	19.4%	104	23.3%
Business, management, marketing, and related support services	335	10.1%	27	5.9%
Public administration and social service professions	116	3.5%	0	0.0%
Biological and biomedical sciences	79	2.4%	18	3.9%
Psychology	62	1.9%	0	0.0%
English language and literature/letters	58	1.8%	0	0.0%
Library science	55	1.7%	55	12.3%
Theology and religious vocations	53	1.6%	0	0.0%
Visual and performing arts	36	1.1%	12	2.6%
Parks, recreation, leisure, and fitness studies	30	0.9%	29	6.4%
Multi/interdisciplinary studies	17	0.5%	0	0.0%
Engineering	14	0.4%	0	0.0%
Communication, journalism, and related programs	12	0.4%	0	0.0%
Engineering technologies and engineering-related fields	9	0.3%	0	0.0%
Social sciences	8	0.2%	8	1.8%
Homeland security, law enforcement, firefighting and related protective services	7	0.2%	0	0.0%
History	6	0.2%	4	0.8%
Physical sciences	6	0.2%	0	0.0%
Computer and information sciences and support services	6	0.2%	6	1.3%
Philosophy and religious studies	4	0.1%	0	0.0%
Mathematics and statistics	1	0.0%	0	0.0%

Source: National Center for Education Statistics (IPEDS) 2011-2013 Completions

5. OVERVIEW OF GAP ANALYSIS

A gap analysis comparing educational supply and occupational demand serves as a critical first step in efforts to align education programs with the workforce needs of Pennsylvania employers. It provides a data-driven perspective of employer demand (growing occupations across the state) and postsecondary education supply (degree production by program and level). This section focuses on the demand gaps and supply surpluses for skilled occupations in Northeast Pennsylvania.¹⁶

To make the connection between employer demand and education supply a crosswalk between the taxonomy of occupation codes (Standard Occupation Codes, or SOC) and major programs (Classification of Instructional Program or CIP) is required. The State System's Gap Analysis project conducted original research to enhance the traditional taxonomy of major program to occupation crosswalk using American Community Survey data that demonstrate a broader spectrum of connections between education programs and occupations.¹⁷ This hybrid crosswalk connected the CIP and SOC using both the NCES and Pennsylvania standard crosswalks and the additional real-world connections using the American Community Survey.

¹⁶ Skilled occupations are occupations in Job Zones 3, 4, and 5.

¹⁷ The existing crosswalks available include a national NCES crosswalk and a state crosswalk specific to Pennsylvania. Additional connections were made using data available in the ACS.

EDUCATION TO OCCUPATION CROSSWALKS AND WHAT SETS THIS GAP ANALYSIS APART FROM PREVIOUS STUDIES

Typical gap analysis will use one of two approaches when building a crosswalk: The Department of Education (DOE) crosswalk or the American Community Survey (ACS) crosswalk.

The DOE crosswalk, completed through collaboration with the Bureau of Labor Statistics and the National Center for Education Statistics (NCES), attempts to link occupation classifications (SOC code) to their related educational programs (CIP code). The drawback is that there is often not a one-to-one connection between education programs and occupations and in even some extreme cases, education programs related to occupations do not match the reality of careers people enter. Another drawback is that occupations often employ a range of degree and non-degree completers, which reflects the reality of the labor market. For example a customer representative for a technology company may have a bachelor's degree in computer programming, whereas a customer service representative for a retail company may only have a high school diploma.

The ACS crosswalk is built on a large survey sample consisting of 160 education program codes and 261 occupation classifications (note: these are not as detailed as CIP and SOC codes), reflecting the careers individuals take after they complete their education programs. Whereas DOE's crosswalk seeks to state what should be, the ACS crosswalk states what is. This approach is very practical when dealing with education programs that don't match closely to a specific occupation (e.g. liberal arts degrees, history degrees, etc.). Additionally, ACS data provide a measure that estimates the demand for workers with various levels of postsecondary education in a given occupation. For example if 21% of customer service representatives have a bachelor's degree, then only 21% of the annual demand for customer service representatives will be counted against the supply of matching education programs.

The methodology developed for this gap analysis bridges the two approaches above. Occupations that

are linked through DOE are not discounted, even if ACS suggests that there are relatively few degree completions entering the occupation field. Additionally, the use of ACS more closely captures the reality of where degree holders have found employment in Pennsylvania and surrounding states—note the geography for measuring gaps was restricted to Pennsylvania only, however occupation to education linkages were built on a multi-state region. While there are certainly exceptions to the rule, which were ultimately reviewed on a case-by-case basis as described in detail in Appendix E, the approach does capture the vast majority of relevant and compelling connections between education programs and occupations. Lastly, the methodology takes into account the labor market behavior of both employers and employees in the following ways:

- It provides a measure of education distribution by degree level demonstrating that a range of skill levels can exist within occupation classification.
- It captures the demand and range for bachelor's degree field of study within an occupation classification.*
- It provides a reality-driven process to connect bachelor's degree field of study to occupations, especially in the liberal arts programs.
- It provides a regionalized crosswalk that better reflects the competition for jobs in Pennsylvania and the surrounding region.

By modeling these features, this gap analysis accounts for issues that were not accounted for in previous gap analysis studies.

* The ACS reports two separate pieces of information: highest level of educational attainment for an individual and major field of study for an individual's bachelor degree. The major field of study is not reported for associate's degrees or graduate degrees.

5.1 How to use the Gap Analysis

The gap analysis results are presented as two main sets of findings: demand gaps (excess employer demand) and supply surpluses. Each outcome has a different set of implications for area stakeholders, postsecondary education institutions, and learners. These outcomes are summarized briefly below and then described further in each relevant section.

The uses of a gap analysis are many and varied and include:

- **Strategic engagement:** Increased collaboration and alignment between regional employers and education programs helps ensure a competitive, vibrant regional economy. The gap analysis enables this process by helping postsecondary institutions identify areas of employer need. The analysis provides a data-driven starting point to begin conversations with employers on how postsecondary institutions can help meet education/training needs in the regional economy.
- **Enhanced program development/evaluation:** The gap analysis serves as an additional tool for decision-making in academic program planning by addressing one aspect of the external eco-system—alignment of academic programs to the regional labor market.
- **Student engagement/career guidance:** The analysis provides information that can be used for career guidance and job search. The gap analysis results can inform learners about the alignment of education programs to careers, as well as the market demand for jobs.
- **Marketing:** By highlighting information about high demand occupations that are linked to education programs, postsecondary education institutions can demonstrate how learners will succeed after program completion. Where compelling information exists, this can be used in student recruitment efforts.

While the State System's Gap Analysis project is critical to understanding the connections between education programs and occupations, it is important to recall the caveats of this Gap Analysis report:

- When considering making adjustments to programs in degree areas related to occupations displaying gaps, further research should be considered to confirm the extent of alignment needed to arrive at equilibrium with the labor market.
- Government data that capture labor market demand lag real-time employer demand as well as higher education industry trends. As such, the gap analysis findings may lag these market changes.

- This analysis only focuses on program output as a supply pool (i.e. new graduates). However, regional workforces comprise additional pools of supply—specifically: employed workers, skilled unemployed workers, and skilled underemployed workers. When evaluating gaps, this analysis focuses on new and replacement demand, as opposed to job churn.¹⁸ This helps to mitigate some of the issues involving the employed workforce.

Excess Employer Demand (Demand Gap)

A demand gap exists where the regional supply of talent is insufficient to support the workforce needs of businesses located there. Where such gaps exist businesses will likely seek talent from outside the area, which can become costly from an HR perspective. This especially affects small and medium sized businesses that usually do not have well-developed HR functions. Additionally,

ABSOLUTE DEMAND GAP VS. RELATIVE DEMAND GAP

Results for demand gaps in this analysis are calculated in two different ways. An absolute demand gap is a nominal comparison, wherein the supply of program completions which align to an occupation is subtracted from the demand for those aligned occupations. This produces a “headcount” of the additional number of program completions needed to meet the demand within an occupation.

A relative demand gap is a ratio of program supply to occupation demand, which is expressed as a percentage. A percentage below 100% indicates excess employer demand relatively (e.g. the number of program completers is less than the occupation demand), whereas a value over 100% indicates that there are more program completions relative to occupation demand.

This analysis factors in both the absolute measure and relative measure to enable a broader perspective for interpretation. For example, an occupation that may indicate an average annual demand for 40 jobs per year with 30 annual completers would require 25% more completions to bridge the gap ($30 / 40 = 0.75$). However, this absolute gap would suggest that the increased amount of program output—10 additional completers—is relatively small. Therefore for program planning purposes, both perspectives are helpful to set the context of the demand gap.

¹⁸ Replacement jobs include retirements, deaths, and other workers who permanently leave an occupation. Job churn occurs when a worker leaves one job for another, but continues working in the same occupation.

employers—especially those in more rural areas—may face higher costs as they attempt to draw in workers from more populated areas.

This creates an opportunity to expand output or develop programs. For education institutions, gaps present an opportunity for program expansion (where current programs align, but are not creating enough output). The strategy for increasing output may differ—whether capacity or learner recruitment is a constraining factors. If a program does not exist, a gap may present an opportunity for new program development.

Learners may gain a competitive employment edge when excess employer demand exists. For learners, when demand exceeds supply, graduates in relevant disciplines usually benefit—providing opportunities for career progression and higher earnings in both the short and long term.

Supply Surplus (Supply Gap)

A supply surplus for an occupation exists when the number of program completions within a region exceeds the employer demand. This presents some key implications to consider.

ABSOLUTE SUPPLY SURPLUS VS. RELATIVE SUPPLY SURPLUS

Results for supply surpluses are calculated in two different ways. An absolute supply surplus is a nominal comparison, wherein the supply of program completions which align to an occupation is subtracted from the demand for those aligned occupations. This produces a “headcount” of the number of program completions that exceed the projected demand for a given occupation.

A relative supply surplus is a ratio of program supply to occupation demand, which is expressed as a percentage. A percent above 100% indicates a relative supply surplus (e.g. the number of program completers is more than the occupation demand).

This analysis factors both ways to enable a broader perspective for interpretation. For example, an occupation that may indicate an average annual demand for 40 jobs per year with 50 annual completers would suggest that there are about 25% more completions than the workforce demands for occupations that tie to that program ($50 / 40 = 1.25$). However, this absolute gap would suggest that the increased amount of program output—10 additional completers—is relatively small. Furthermore, this may indeed fall within “tolerable levels” of program supply surplus. Therefore for programming planning and evaluation purposes, both perspectives are helpful to set the context of the supply surplus.

If employer demand is less than education production in relevant occupations, learners are likely to leave the region after graduation causing learner attrition and out-migration. Surpluses in talent supply can also suppress wages for graduates in certain careers. Classic labor market economic theory suggests that increased competition for jobs will put downward pressure on wages—i.e. the more people competing for the same job gives an employer a better bargaining position for wage/salary. While a college degree in and of itself has a measured wage premium, specific programs areas may have a range of wage premiums based on the supply of new talent competing for jobs and the conditions of the labor market.

5.2 Excess Demand Gaps for Skilled Occupations

Excess demand gaps exist for many skilled occupations within Northeast Pennsylvania.¹⁹ The degree programs that align to these occupations span associate's degrees through graduate degrees. Recall that a demand gap exists where the regional supply of talent is insufficient to support the workforce needs of businesses located there. The top excess demand gaps are identified by the size of the annual gap.

In Northeast Pennsylvania, six out of the top twenty demand gaps are occupations related to health care and combine for an average annual demand gap of nearly 131. This reflects the strong growth in the health care and social assistance industry. The largest average annual demand gap in the region exists for registered nurses with an excess demand of 53. Physicians and surgeons, EMTs, LPNs, family and general practitioners, and medical and clinical laboratory technicians combine for an average annual demand gap of 78.

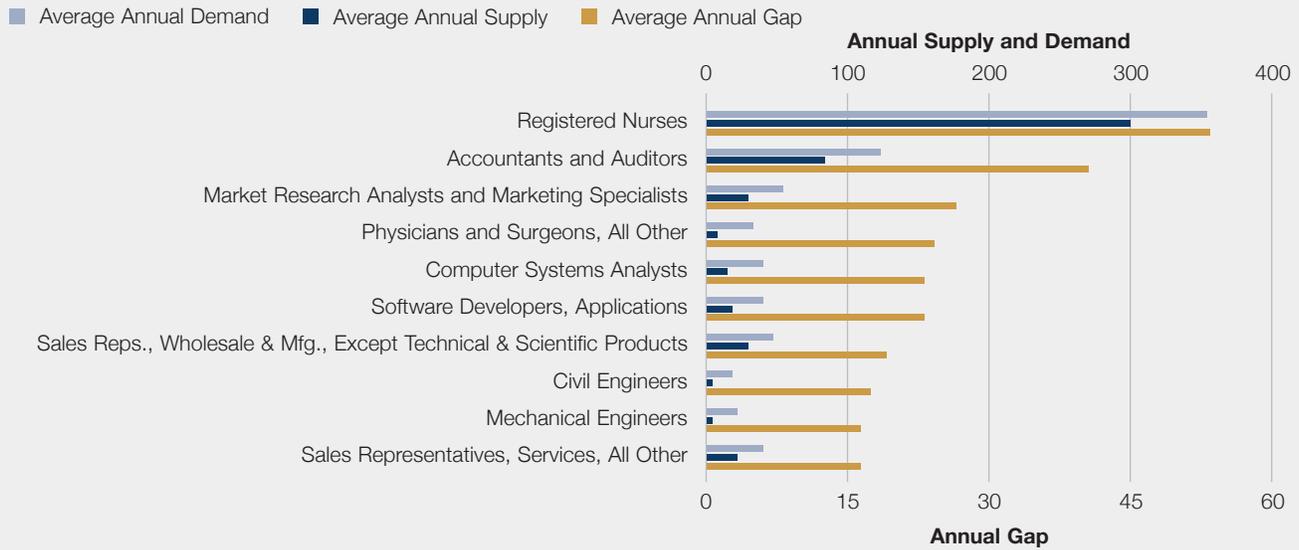
Additionally, growth in professional, technical and scientific services has driven significant demand for business, computer and engineering occupations, which, in-turn, has driven the demand for STEM majors.²⁰ Computer and engineering occupations that indicate large gaps include computer systems analysts; software developers, applications; computer programmers; civil engineers, mechanical engineers; and industrial engineers. These occupations combined for an average annual demand gap of 105.

Fig. 30 and Fig. 31 provide further detail about the top occupation gaps that indicate excess employer demand. The table includes the occupation title,

¹⁹ Skilled occupations are occupations in Job Zones 3, 4, and 5.

²⁰ STEM majors include programs in the fields of Science, Technology, Engineering, and Mathematics.

Fig. 30: Top Demand Gaps for Skilled Occupations in Northeast Pennsylvania



Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections; NCES (IPEDS 2011-2013 Completions)

Fig. 31: Top Demand Gaps for Skilled Occupations in Northeast Pennsylvania

Occupation Title	Job Zone	Average Annual Demand	Average Annual Supply	Average Annual Gap	S/D Ratio
Registered Nurses	3	353	300	53	0.85
Accountants and Auditors	4	122	82	40	0.67
Market Research Analysts and Marketing Specialists	4	53	27	26	0.51
Physicians and Surgeons, All Other	5	31	7	24	0.23
Computer Systems Analysts	4	38	15	23	0.39
Software Developers, Applications	4	41	18	23	0.44
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	4	47	28	19	0.60
Civil Engineers	4	19	2	17	0.11
Mechanical Engineers	4	20	4	16	0.20
Sales Representatives, Services, All Other	4	38	22	16	0.58
Computer Programmers	4	24	9	15	0.38
Emergency Medical Technicians and Paramedics	3	20	5	15	0.25
Licensed Practical and Licensed Vocational Nurses	3	34	19	15	0.56
Maintenance and Repair Workers, General	3	18	3	15	0.17
Family and General Practitioners	5	18	4	14	0.22
Industrial Machinery Mechanics	3	13	1	12	0.08
Claims Adjusters, Examiners, and Investigators	4	24	13	11	0.54
Industrial Engineers	4	13	2	11	0.15
Human Resources Specialists	4	44	34	10	0.77
Medical and Clinical Laboratory Technologists	4	14	4	10	0.29

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections; NCES (IPEDS 2011-2013 Completions)

occupation job zone, projected annual employer demand (for associate's degrees and higher), the annual supply of program completions (allocated to the occupation), the average annual gap, and a ratio of supply to demand (S/D Ratio).

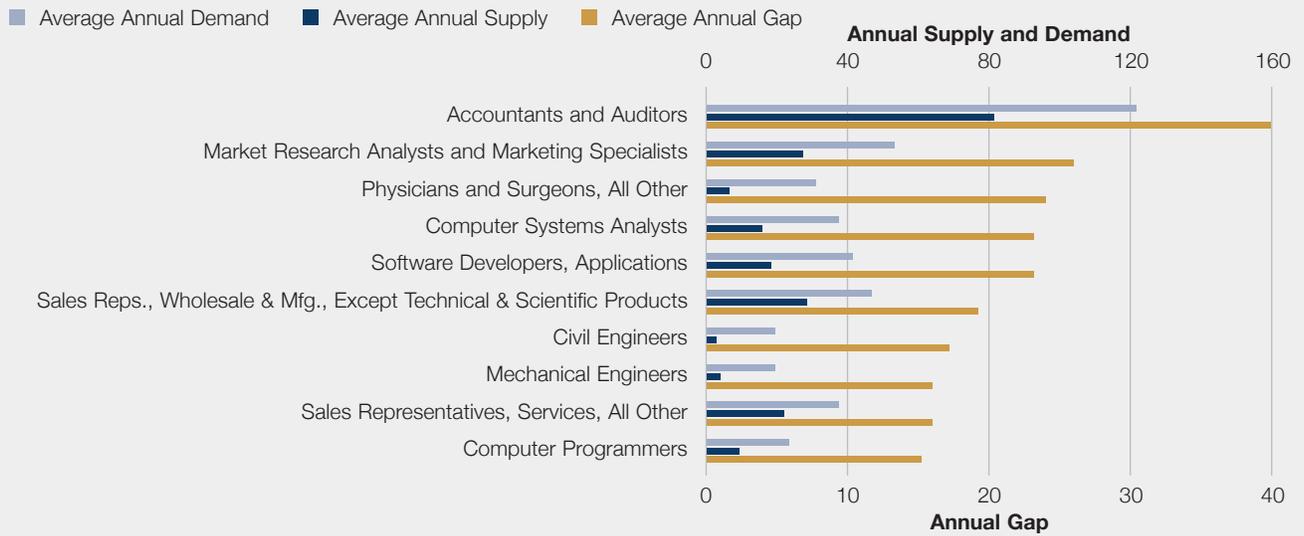
5.3 Excess Demand Gaps For Occupations Aligning to Bachelor's and Graduate Degrees

This section focuses on demand gaps for occupations that typically require a bachelor's or higher degree—occupations categorized by Job Zones Four and Five. Recall that a demand gap exists where the regional supply of talent is insufficient to support the workforce needs of businesses located there.

In Northeast Pennsylvania, growth in professional, technical and scientific services has driven significant demand for business occupations. Business and sales occupations account for eleven out of the top twenty excess demand gaps in the region that align to bachelor's and graduate degrees. These occupations include accountants and auditors, market research analysts and marketing specialists, sales representatives (services and wholesale), claims adjusters, human resource specialists, cost estimators, compliance officers, financial analysts, insurance sales agents, and insurance underwriters. In total, these business occupations combine for an annual demand gap of 158.

Fig. 32 highlights the demand gap results for the top bachelor's and graduate degree level occupations. Fig. 33 includes the occupation title, occupation job zone, projected annual employer demand (for associate's degrees and higher), the annual supply of program completions (allocated to the occupation), the average annual gap, and a ratio of supply to demand (S/D Ratio).

Fig. 32: Top Bachelor's and Graduate Degree-Level Demand Gaps in Northeast Pennsylvania



Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections; NCES (IPEDS 2011-2013 Completions)

Fig. 33: Top Bachelor's and Graduate Degree-Level Demand Gaps in Northeast Pennsylvania

Occupation Title	Job Zone	Average Annual Demand	Average Annual Supply	Average Annual Gap	S/D Ratio
Accountants and Auditors	4	122	82	40	0.67
Market Research Analysts and Marketing Specialists	4	53	27	26	0.51
Physicians and Surgeons, All Other	5	31	7	24	0.23
Computer Systems Analysts	4	38	15	23	0.39
Software Developers, Applications	4	41	18	23	0.44
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	4	47	28	19	0.60
Civil Engineers	4	19	2	17	0.11
Mechanical Engineers	4	20	4	16	0.20
Sales Representatives, Services, All Other	4	38	22	16	0.58
Computer Programmers	4	24	9	15	0.38
Family and General Practitioners	5	18	4	14	0.22
Claims Adjusters, Examiners, and Investigators	4	24	13	11	0.54
Industrial Engineers	4	13	2	11	0.15
Human Resources Specialists	4	44	34	10	0.77
Medical and Clinical Laboratory Technologists	4	14	4	10	0.29
Cost Estimators	4	21	12	9	0.57
Compliance Officers	4	15	8	7	0.53
Financial Analysts	4	21	14	7	0.67
Insurance Sales Agents	4	16	9	7	0.56
Insurance Underwriters	4	13	7	6	0.54

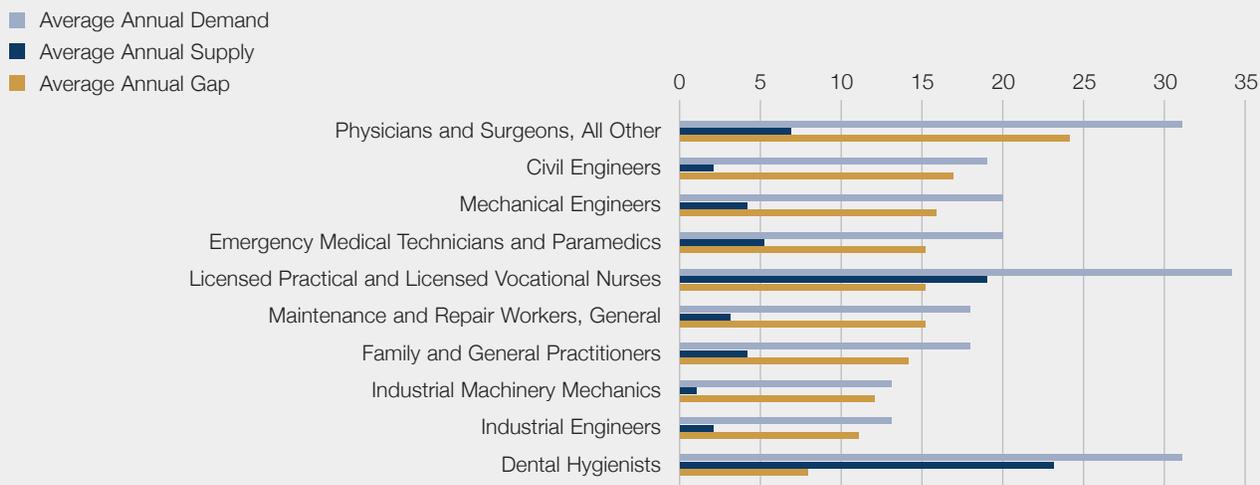
Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections; NCES (IPEDS 2011-2013 Completions)

5.4 Excess Demand Gaps for Occupations Without a State System Match

The breadth of programs offered at State System universities indicates a number of strong linkages to occupations. However, many occupations within Northeast Pennsylvania show excess demand for which the Northeast State System universities did not produce completers in a matching program area. Furthermore, analysis indicates continued demand for these occupations over the next decade. Recall that a demand gap exists where the regional supply of talent is insufficient to support the workforce needs of businesses located there.

Fig. 34 displays the top excess demand gaps for occupations that did not have matching State System University program completers. Physicians and surgeons, all other show the largest excess annual demand gap at 24. This is followed by: civil engineers, mechanical engineers, EMTs, LPNs, and maintenance and repair workers.

Fig. 34: Top Demand Gaps for Skilled Occupations in Northeast Pennsylvania Without a State System Program



Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections; NCES (IPEDS 2011-2013 Completions)

Fig. 35 provides detailed information for each occupation including the occupation title, occupation job zone, projected annual employer demand (for associate's degrees and higher), the annual supply of program completions (allocated to the occupation), the average annual gap, and a ratio of supply to demand (S/D Ratio).

Fig. 35: Top Demand Gaps for Skilled Occupations in Northeast Pennsylvania Without a State System Program

Occupation Title	Job Zone	Average Annual Demand	Average Annual Supply	Average Annual Gap	S/D Ratio
Physicians and Surgeons, All Other	5	31	7	24	0.23
Civil Engineers	4	19	2	17	0.11
Mechanical Engineers	4	20	4	16	0.20
Emergency Medical Technicians and Paramedics	3	20	5	15	0.25
Licensed Practical and Licensed Vocational Nurses	3	34	19	15	0.56
Maintenance and Repair Workers, General	3	18	3	15	0.17
Family and General Practitioners	5	18	4	14	0.22
Industrial Machinery Mechanics	3	13	1	12	0.08
Industrial Engineers	4	13	2	11	0.15
Dental Hygienists	3	31	23	8	0.74
Financial Analysts	4	21	14	7	0.67
Medical Assistants	3	28	21	7	0.75
Survey Researchers	5	6	1	5	0.17
Mental Health Counselors	5	30	25	5	0.83
Surgeons	5	7	2	5	0.29
Computer-Controlled Machine Tool Operators, Metal and Plastic	3	8	3	5	0.38
Rehabilitation Counselors	5	24	20	4	0.83
Healthcare Social Workers	5	25	21	4	0.84
Pharmacy Technicians	3	6	2	4	0.33
Opticians, Dispensing	3	5	1	4	0.20

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections; NCES (IPEDS 2011-2013 Completions)

5.5 Supply Surplus Gaps

Supply surplus gaps for skilled occupations cover occupations in Job Zones Three, Four and Five. The degree programs that align to these occupations span associate's degrees through graduate degrees. Recall that a supply surplus for an occupation exists where the number of program completions within a region exceeds the employer demand. The top supply surplus gaps are identified by the size of the annual gap.

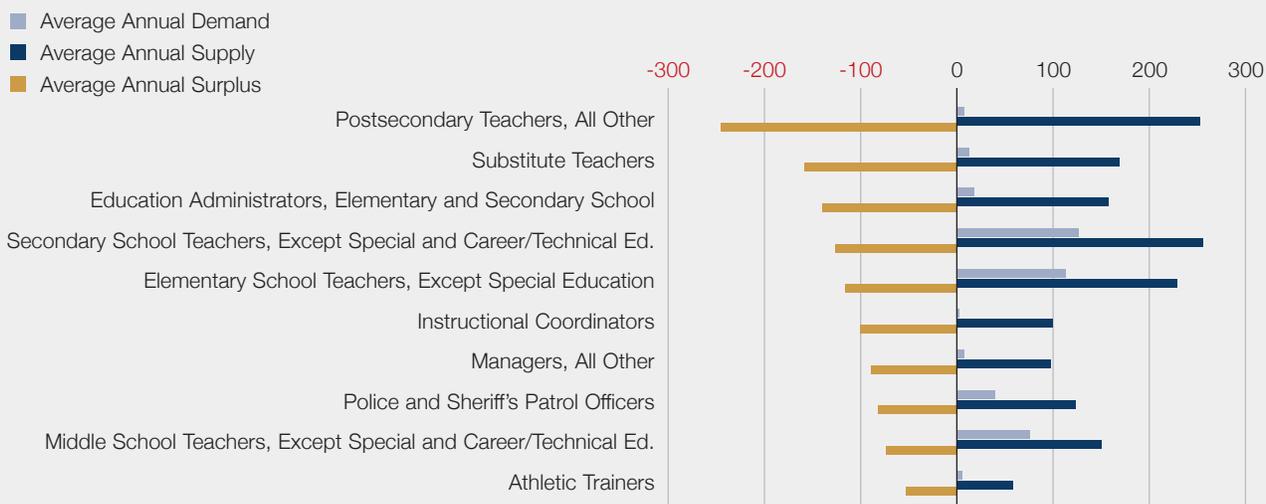
The top supply surpluses within Northeast Pennsylvania cover a broad range of both technical and non-technical occupations. When considering program changes in degree areas related to occupations displaying a supply surplus, further research should be considered to confirm the extent of alignment needed to arrive at equilibrium with the labor market.

In Northeast Pennsylvania, the data reveal the number of graduates that are aligned to postsecondary teachers, all other greatly exceed the annual demand for workers by 241 completions. Other occupations that indicate a supply surplus in Northeast Pennsylvania are concentrated in the education occupations and include: substitute teachers; education administrators, elementary and secondary schools; secondary school teachers; elementary school teachers; and instructional coordinators. Program completers in the top supply surplus occupations may face increased competition for occupations related to their field of study within the region.

Fig. 36 illustrates the top supply surpluses for skilled occupations in Northeast Pennsylvania. Fig. 37 provides the occupation title, occupation job zone, projected annual employer demand (for associate's degrees and higher), the annual supply of program completions (allocated to the occupation), the average annual gap, and a ratio of supply to demand (S/D Ratio).

This section provided an overview of gaps from the perspective of excess demand and supply surpluses. It is intended to set the data-driven foundation for understanding current alignment of education production in Northeast Pennsylvania compared to the region's employer demand for graduates in specific program areas. Results for the gaps are largely driven by industry employment growth. As market conditions change, the resulting demand for skilled workers will also change. Therefore, results of this analysis should be taken in the context of changing industry sector employment and occupational demand.

Fig. 36: Top Surpluses for Skilled Occupations in Northeast Pennsylvania



Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections; NCES (IPEDS 2011-2013 Completions)

Fig. 37: Top Surpluses for Skilled Occupations in Northeast Pennsylvania

Occupation Title	Job Zone	Average Annual Demand	Average Annual Supply	Average Annual Gap	S/D Ratio
Postsecondary Teachers, All Other	5	8	249	-241	31.13
Substitute Teachers	3	12	167	-155	13.92
Education Administrators, Elementary and Secondary School	5	17	156	-139	9.18
Secondary School Teachers, Except Special and Career/Technical Education	4	126	252	-126	2.00
Elementary School Teachers, Except Special Education	4	112	226	-114	2.02
Instructional Coordinators	5	2	100	-98	50.00
Managers, All Other	4	9	97	-88	10.78
Police and Sheriff's Patrol Officers	3	40	121	-81	3.03
Middle School Teachers, Except Special and Career/Technical Education	4	75	148	-73	1.97
Athletic Trainers	5	5	56	-51	11.20
Education Administrators, Postsecondary	5	6	55	-49	9.17
Physical Therapists	5	46	91	-45	1.98
English Language and Literature Teachers, Postsecondary	5	3	47	-44	15.67
Occupational Therapists	5	21	65	-44	3.10
Medical and Health Services Managers	5	28	68	-40	2.43
Physician Assistants	5	13	51	-38	3.92
Librarians	5	10	46	-36	4.60
Speech-Language Pathologists	5	15	51	-36	3.40
Directors, Religious Activities and Education	4	11	45	-34	4.09
Clinical, Counseling, and School Psychologists	5	16	47	-31	2.94

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections; NCES (IPEDS 2011-2013 Completions)

6. CONCLUSION

The State System Gap Analysis report provides a data-driven foundation for program planning and alignment in order to drive economic value and career success within the state and its regions. The analysis itself is not the solution, but can lend credible insight to guide decision-making at the strategic level. The content is designed to be a starting point and resource for program evaluation and planning.

It is important to remember that the results for the gaps are largely driven by industry employment growth. As labor market conditions change, the resulting demand for skilled workers will also change. Therefore, the results of this analysis should be taken in a context of changing industry sector employment and occupational demand.

Additionally, areas of future research should be considered when considering program evaluation and planning. These areas include (but are not limited to):

- Strong vs. weak occupation to education alignment,
- Wage trend research and supply/demand effects on wages,
- Career pathways, outcomes, and lifetime earnings,
- Issues of mal-employment²¹ and underemployment,²² and
- Program alignment best practices.

As more insights into the connections between education programs and labor market outcomes are gained, students, universities, workers, and employers will all benefit significantly.

21 Mal-employment is a specific type of underemployment that exists in the labor market. This occurs when college-educated workers choose to work in occupations that do not utilize the skills and abilities gained in college. An example of this would include a person who has a bachelor's degree in political science but works as bartender. For more on mal-employment see Harrington and Fogg (2011) "Rising Mal-Employment and the Great Recession: The Growing Disconnection between Recent College Graduates and the College Labor Market."

22 Underemployment occurs in the labor market when workers' skills, experience, and willingness to work are not fully utilized. An example of this would include a person who is employed part-time but wants to work full-time.

7. ABOUT THE STATE SYSTEM'S GAP ANALYSIS PROJECT

The gap analysis methodology and report was produced through a multi-organization collaboration that consisted of Pennsylvania's State System of Higher Education Office of the Chancellor and Oxford Economics USA Inc. —the team. Throughout the project and research process, the team sought feedback and insight from senior administration and representatives from each of the 14 State System Universities. The team also drew on insight and feedback from Georgetown University's Center on Education and the Workforce as well as subject matter experts involved in labor market intelligence and education program alignment.

The modeling and results presented here are based on information provided by third parties, upon which Oxford Economics has relied in producing its report and forecasts in good faith. Any subsequent revision or update of those data will affect the assessments and projections shown.

Oxford Economics is a key adviser to corporate, financial, government and education decision-makers and thought leaders. Oxford Economics' worldwide client base now comprises over 1000 international organizations, including leading multinational companies and financial institutions; key government bodies and trade associations; and top universities, consultancies, and think tanks.

This report is confidential to stakeholders of Pennsylvania's State System of Higher Education and may not be published or distributed without their prior written permission. Contact information for such request is provided below:

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8. DATA SOURCES KEY

Bureau of Labor Statistics (BLS):

- QCEW - Quarterly Census of Employment & Wages - <http://www.bls.gov/cew/>
- OES – Occupational Employment Statistics - <http://www.bls.gov/oes/>
- LAUS – Local Area Unemployment Statistics - <http://www.bls.gov/lau/>

U.S. Census Bureau (Census):

- LEHD – Longitudinal Employer-Household Dynamics - <http://lehd.census.gov/>
- ACS – American Community Survey - <http://www.census.gov/acs/www/>
- SAIPE – Small Area Income and Poverty Estimates - <http://www.census.gov/did/www/saipe/>

National Center for Education Statistics (NCES):

- IPEDS – Integrated Postsecondary Education Data System (National Center for Education Statistics) - <https://nces.ed.gov/ipeds/>

Pennsylvania Department of Labor and Industry (PADLI):

- www.paworkstats.pa.gov

O*NET Resource Center (O*NET)

- Job Zones – www.onetonline.org/help/online/zones

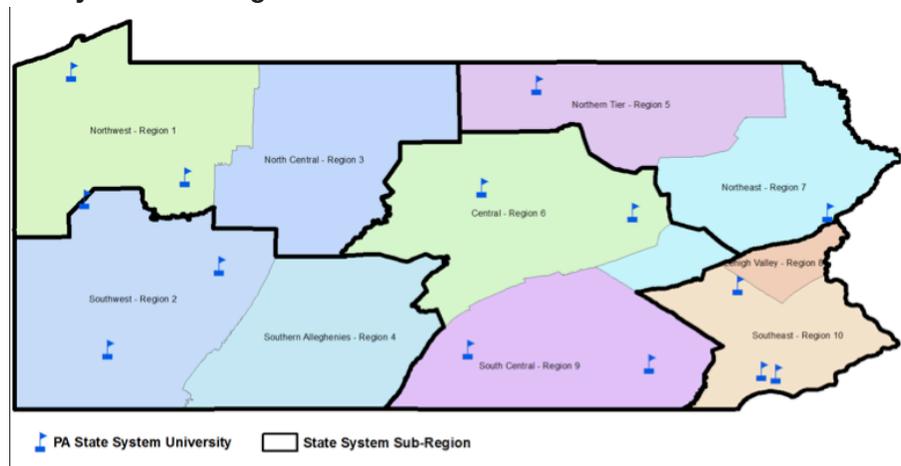
Economic Modeling Specialists International (EMSI)

APPENDIX A: STATE SYSTEM SUB-REGIONS WITH PREP REGIONS AND WIA REGIONS

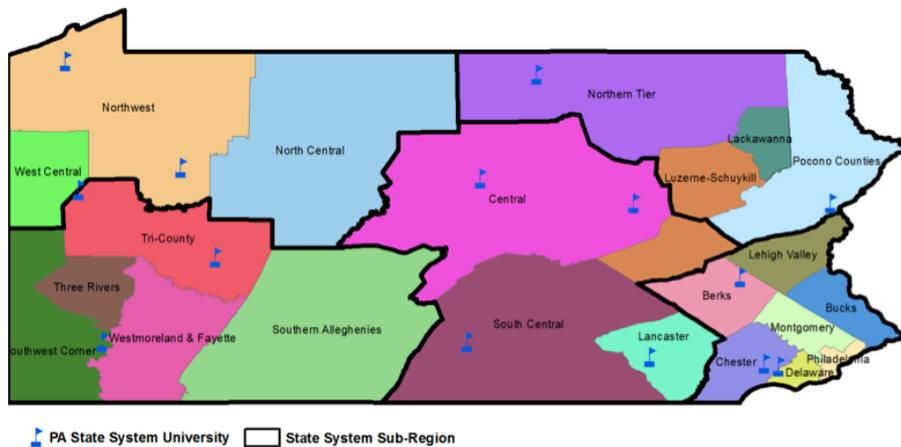
Partnerships for Regional Economic Performance (PREP) regions provide geographic context of how the Pennsylvania Department of Community & Economic Development divides resources and services to support business development, start-ups, investment and other economic development initiatives. To define sub-regions for this project, PREP regions served as the starting point. The following figures outline the sub-regions in relation to PREP regions.

An additional map of Pennsylvania's Workforce Investment Act (WIA) regional boundaries is also provided.

State System Sub-regions and PREP Boundaries



State System Sub-regions and WIA Boundaries



APPENDIX B:

O*NET JOB ZONE CODES

The O*NET program is the nation's primary source of occupational information. Central to the project is the O*NET database, containing information on hundreds of standardized and occupation-specific descriptors. The database, which is available to the public at no cost, is continually updated by surveying a broad range of workers from each occupation.²³

JOB ZONE ONE: Little or No Preparation Needed

- *Education* – Some of these occupations may require a high school diploma or GED certificate.
- *Related Experience* – Little or no previous work-related skill, knowledge, or experience is needed for these occupations. For example, a person can become a waiter or waitress even if he/she has never worked before.
- *Job Training* – Employees in these occupations need anywhere from a few days to a few months of training. Usually, an experienced worker could show you how to do the job.
- *Job Zone Examples* – These occupations involve following instructions and helping others. Examples include taxi drivers, amusement and recreation attendants, counter and rental clerks, nonfarm animal caretakers, continuous mining machine operators, and waiters/waitresses.

JOB ZONE TWO: Some Preparation Needed

- *Education* – These occupations usually require a high school diploma.
- *Related Experience* – Some previous work-related skill, knowledge, or experience is usually needed. For example, a teller would benefit from experience working directly with the public.
- *Job Training* – Employees in these occupations need anywhere from a few months to one year of working with experienced employees. A recognized apprenticeship program may be associated with these occupations.

²³ <https://www.onetonline.org/help/online/zones>

- *Job Zone Examples* – These occupations often involve using your knowledge and skills to help others. Examples include sheet metal workers, forest fire fighters, customer service representatives, physical therapist aides, salespersons (retail), and tellers.

JOB ZONE THREE: Medium Preparation Needed

- *Education* – Most occupations in this zone require training in vocational schools, related on-the-job experience, or an associate's degree.
- *Related Experience* – Previous work-related skill, knowledge, or experience is required for these occupations. For example, an electrician must have completed three or four years of apprenticeship or several years of vocational training, and often must have passed a licensing exam, in order to perform the job.
- *Job Training* – Employees in these occupations usually need one or two years of training involving both on-the-job experience and informal training with experienced workers. A recognized apprenticeship program may be associated with these occupations.
- *Job Zone Examples* – These occupations usually involve using communication and organizational skills to coordinate, supervise, manage, or train others to accomplish goals. Examples include food service managers, electricians, agricultural technicians, legal secretaries, occupational therapy assistants, and medical assistants.

JOB ZONE FOUR: Considerable Preparation Needed

- *Education* – Most of these occupations require a four-year bachelor's degree, but some do not.
- *Related Experience* – A considerable amount of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.
- *Job Training* – Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.
- *Job Zone Examples* – Many of these occupations involve coordinating, supervising, managing, or training others. Examples include accountants, sales managers, database administrators, teachers, chemists, art directors, and cost estimators.

JOB ZONE FIVE: Extensive Preparation Needed

- *Education* – Most of these occupations require graduate school. For example, they may require a master’s degree, and some require a Ph.D., M.D., or J.D. (law degree).
- *Related Experience* – Extensive skill, knowledge, and experience are needed for these occupations. Many require more than five years of experience. For example, surgeons must complete four years of college and an additional five to seven years of specialized medical training to be able to do their job.
- *Job Training* – Employees may need some on-the-job training, but most of these occupations assume that the person will already have the required skills, knowledge, work-related experience, and/or training.
- *Job Zone Examples* – These occupations often involve coordinating, training, supervising, or managing the activities of others to accomplish goals. Very advanced communication and organizational skills are required. Examples include librarians, lawyers, sports medicine physicians, wildlife biologists, school psychologists, surgeons, treasurers, and controllers.

APPENDIX C: STRONG, LIMITED AND WEAK EDUCATION PROGRAM TO OCCUPATION CONNECTIONS²⁴

	Direct Connection	Limited Connection	Weak Connection
Surplus	Definitive surplus of graduates to projected demand; indicates strong market relationship between CIP and SOC(s) suggesting limited need for additional investments in program.	Apparent surplus of graduates in most related occupations. Likely intense competition for limited job opportunities. Moderate occupation ties require identification of special market links prior to added program investments.	Data indicates surplus of graduates likely, however the weak connection of the education program to specific occupations does not conform to traditional supply/demand data analysis.
Balanced	Balanced supply of graduates relative to demand. Job competition for newly minted graduates will be competitive, but opportunities in related occupations exist.	Apparent balanced supply of graduates relative to job demand in most related occupations. Data may be indeterminate relative to labor surplus or shortage situation. Added program review required to determine if greater labor market opportunities are present due to emerging or evolving occupations.	Data indicates balanced supply of graduates likely, but the weak connection to specific occupations does not conform to traditional supply/demand data analysis. Review occupational connections in CIP to SOC crosswalk to determine possible job market opportunities.
Gap	Definitive gap of completers relative to occupation demand. Data indicates likely shortages. Program is a strong candidate for additional resources and targeted recruitment efforts increase supply.	Apparent gap of graduates relative to job demand in at least one closely related occupation. Job opportunities may exist in at least one other related occupation. More research worthwhile to determine possible added occupation connections.	Data indicates gap of graduates likely, but weak connection to specific occupations does not conform to traditional supply/demand data analysis. Related jobs may exist but are not directly connected to the program. Review crosswalk for possible occupation links.

24 The relationship matrix is drawn from: Labor Supply/Demand Analysis: Approaches and Concerns (2010) by Richard Froeschle formerly of the Texas Workforce Commission's Labor Market and Career Information (LMCI). While this context is important to know, Oxford Economics' methodology sought to minimize these issues by developing a crosswalk that uses real world education program to occupation matches through U.S. Census ACS data to more closely reflect the careers program completers actually enter into after graduation.

APPENDIX D: 4-DIGIT INDUSTRY EMPLOYMENT PROJECTIONS

The table below displays the employment numbers for industries at the four-digit NAICS level in Northeast Pennsylvania in 2014 and 2024. It also provides the detailed NAICS code, industry title, 2014 industry LQ, and projected job growth to 2024.

NAICS	Industry Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
Total	All Industries	1.0	399,586	439,344	9.9%
1111	Oilseed and Grain Farming	0.1	18	22	22.2%
1112	Vegetable and Melon Farming	0.3	77	87	13.0%
1113	Fruit and Tree Nut Farming	0.0	16	17	6.3%
1114	Greenhouse, Nursery, and Floriculture Production	0.3	144	149	3.5%
1119	Other Crop Farming	0.1	18	18	0.0%
1121	Cattle Ranching and Farming	0.3	143	134	-6.3%
1122	Hog and Pig Farming	0.3	25	28	12.0%
1123	Poultry and Egg Production	0.1	12	14	16.7%
1124	Sheep and Goat Farming	0.6	3	3	0.0%
1125	Aquaculture	0.8	14	12	-14.3%
1129	Other Animal Production	0.8	42	41	-2.4%
1131	Timber Tract Operations	1.2	24	30	25.0%
1132	Forest Nurseries and Gathering of Forest Products	1.2	8	9	12.5%
1133	Logging	0.7	101	79	-21.8%
1141	Fishing	0.1	1	1	0.0%
1142	Hunting and Trapping	0.3	2	2	0.0%
1151	Support Activities for Crop Production	0.0	44	38	-13.6%
1152	Support Activities for Animal Production	1.5	126	150	19.0%
1153	Support Activities for Forestry	0.5	25	24	-4.0%
2111	Oil and Gas Extraction	0.9	518	669	29.2%
2121	Coal Mining	1.2	253	195	-22.9%
2123	Nonmetallic Mineral Mining and Quarrying	4.1	1,086	1,020	-6.1%
2131	Support Activities for Mining	2.2	2,839	3,548	25.0%
2211	Electric Power Generation, Transmission and Distribution	1.2	1,747	1,634	-6.5%

NAICS	Industry Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
2212	Natural Gas Distribution	1.6	557	572	2.7%
2213	Water, Sewage and Other Systems	1.5	943	1,072	13.7%
2361	Residential Building Construction	0.9	1,706	1,913	12.1%
2362	Nonresidential Building Construction	0.9	1,744	2,295	31.6%
2371	Utility System Construction	1.8	2,465	3,385	37.3%
2372	Land Subdivision	0.9	113	159	40.7%
2373	Highway, Street, and Bridge Construction	1.1	1,295	1,701	31.4%
2379	Other Heavy and Civil Engineering Construction	0.2	77	85	10.4%
2381	Foundation, Structure, and Building Exterior Contractors	0.6	1,310	1,547	18.1%
2382	Building Equipment Contractors	0.7	3,880	4,562	17.6%
2383	Building Finishing Contractors	0.4	838	901	7.5%
2389	Other Specialty Trade Contractors	1.4	2,467	2,883	16.9%
3111	Animal Food Manufacturing	1.4	228	236	3.5%
3112	Grain and Oilseed Milling	0.1	13	13	0.0%
3113	Sugar and Confectionery Product Manufacturing	4.7	948	1,035	9.2%
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing	1.0	479	496	3.5%
3115	Dairy Product Manufacturing	1.4	537	513	-4.5%
3116	Animal Slaughtering and Processing	1.2	1,687	1,952	15.7%
3117	Seafood Product Preparation and Packaging	0.2	16	22	37.5%
3118	Bakeries and Tortilla Manufacturing	1.9	1,620	1,741	7.5%
3119	Other Food Manufacturing	0.8	436	505	15.8%
3121	Beverage Manufacturing	1.7	962	1,153	19.9%
3122	Tobacco Manufacturing	1.8	72	86	19.4%
3131	Fiber, Yarn, and Thread Mills	0.5	41	22	-46.3%
3132	Fabric Mills	1.8	292	247	-15.4%
3133	Textile and Fabric Finishing and Fabric Coating Mills	1.3	124	117	-5.6%
3141	Textile Furnishings Mills	0.3	45	55	22.2%
3149	Other Textile Product Mills	0.9	167	147	-12.0%
3151	Apparel Knitting Mills	0.6	25	30	20.0%
3152	Cut and Sew Apparel Manufacturing	0.5	165	200	21.2%
3159	Apparel Accessories and Other Apparel Manufacturing	2.5	84	71	-15.5%
3162	Footwear Manufacturing	0.0	0	0	0.0%
3169	Other Leather and Allied Product Manufacturing	0.4	12	14	16.7%
3211	Sawmills and Wood Preservation	1.3	349	440	26.1%
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing	2.6	547	711	30.0%
3219	Other Wood Product Manufacturing	2.4	1,487	1,904	28.0%
3221	Pulp, Paper, and Paperboard Mills	1.2	367	388	5.7%
3222	Converted Paper Product Manufacturing	3.6	2,838	2,896	2.0%

NAICS	Industry Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
3231	Printing and Related Support Activities	1.2	1,660	1,392	-16.1%
3241	Petroleum and Coal Products Manufacturing	0.5	163	175	7.4%
3251	Basic Chemical Manufacturing	0.6	264	317	20.1%
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	0.8	213	206	-3.3%
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	0.2	26	33	26.9%
3254	Pharmaceutical and Medicine Manufacturing	2.7	2,244	2,639	17.6%
3255	Paint, Coating, and Adhesive Manufacturing	0.7	119	138	16.0%
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	1.8	547	582	6.4%
3259	Other Chemical Product and Preparation Manufacturing	1.1	276	284	2.9%
3261	Plastics Product Manufacturing	2.5	4,027	4,189	4.0%
3262	Rubber Product Manufacturing	0.6	223	272	22.0%
3271	Clay Product and Refractory Manufacturing	0.8	95	119	25.3%
3272	Glass and Glass Product Manufacturing	2.5	605	581	-4.0%
3273	Cement and Concrete Product Manufacturing	1.3	666	683	2.6%
3274	Lime and Gypsum Product Manufacturing	1.9	81	101	24.7%
3279	Other Nonmetallic Mineral Product Manufacturing	1.0	201	203	1.0%
3311	Iron and Steel Mills and Ferroalloy Manufacturing	1.6	420	500	19.0%
3312	Steel Product Manufacturing from Purchased Steel	0.0	0	0	0.0%
3313	Alumina and Aluminum Production and Processing	1.7	283	304	7.4%
3314	Nonferrous Metal (except Aluminum) Production and Processing	5.7	1,038	1,089	4.9%
3315	Foundries	3.1	1,140	1,149	0.8%
3321	Forging and Stamping	2.6	755	768	1.7%
3322	Cutlery and Handtool Manufacturing	0.5	61	78	27.9%
3323	Architectural and Structural Metals Manufacturing	1.3	1,415	1,569	10.9%
3324	Boiler, Tank, and Shipping Container Manufacturing	0.8	239	255	6.7%
3325	Hardware Manufacturing	0.6	40	36	-10.0%
3326	Spring and Wire Product Manufacturing	7.7	971	1,004	3.4%
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	0.9	1,000	990	-1.0%
3328	Coating, Engraving, Heat Treating, and Allied Activities	0.4	176	184	4.5%
3329	Other Fabricated Metal Product Manufacturing	1.0	853	834	-2.2%
3331	Agriculture, Construction, and Mining Machinery Manufacturing	0.3	187	213	13.9%
3332	Industrial Machinery Manufacturing	0.9	299	345	15.4%
3333	Commercial and Service Industry Machinery Manufacturing	0.9	219	219	0.0%
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing	0.4	150	176	17.3%
3335	Metalworking Machinery Manufacturing	0.5	258	294	14.0%
3339	Other General Purpose Machinery Manufacturing	0.4	281	270	-3.9%
3341	Computer and Peripheral Equipment Manufacturing	0.3	158	191	20.9%

NAICS	Industry Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
3342	Communications Equipment Manufacturing	0.3	80	96	20.0%
3343	Audio and Video Equipment Manufacturing	0.6	37	40	8.1%
3344	Semiconductor and Other Electronic Component Manufacturing	0.3	374	413	10.4%
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	0.5	548	507	-7.5%
3346	Manufacturing and Reproducing Magnetic and Optical Media	3.8	190	151	-20.5%
3351	Electric Lighting Equipment Manufacturing	0.7	102	99	-2.9%
3353	Electrical Equipment Manufacturing	0.5	226	226	0.0%
3359	Other Electrical Equipment and Component Manufacturing	0.8	287	297	3.5%
3362	Motor Vehicle Body and Trailer Manufacturing	0.8	335	401	19.7%
3363	Motor Vehicle Parts Manufacturing	0.4	677	739	9.2%
3364	Aerospace Product and Parts Manufacturing	0.3	464	439	-5.4%
3365	Railroad Rolling Stock Manufacturing	0.4	35	43	22.9%
3369	Other Transportation Equipment Manufacturing	0.8	78	94	20.5%
3371	Household and Institutional Furniture and Kitchen Cabinet Manufacturing	0.4	294	333	13.3%
3372	Office Furniture (including Fixtures) Manufacturing	0.4	110	114	3.6%
3379	Other Furniture Related Product Manufacturing	3.9	394	442	12.2%
3391	Medical Equipment and Supplies Manufacturing	1.9	1,746	1,585	-9.2%
3399	Other Miscellaneous Manufacturing	1.2	986	906	-8.1%
4231	Motor Vehicle and Motor Vehicle Parts and Supplies Merchant Wholesalers	1.4	1,344	1,345	0.1%
4232	Furniture and Home Furnishing Merchant Wholesalers	0.7	196	210	7.1%
4233	Lumber and Other Construction Materials Merchant Wholesalers	1.8	1,088	1,307	20.1%
4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers	0.5	967	1,029	6.4%
4235	Metal and Mineral (except Petroleum) Merchant Wholesalers	0.3	93	97	4.3%
4236	Household Appliances and Electrical and Electronic Goods Merchant Wholesalers	0.6	570	572	0.4%
4237	Hardware, and Plumbing and Heating Equipment and Supplies Merchant Wholesalers	1.0	709	792	11.7%
4238	Machinery, Equipment, and Supplies Merchant Wholesalers	0.8	1,524	1,450	-4.9%
4239	Miscellaneous Durable Goods Merchant Wholesalers	0.6	532	590	10.9%
4241	Paper and Paper Product Merchant Wholesalers	0.8	270	279	3.3%
4242	Drugs and Druggists' Sundries Merchant Wholesalers	0.6	337	397	17.8%
4243	Apparel, Piece Goods, and Notions Merchant Wholesalers	0.2	88	85	-3.4%
4244	Grocery and Related Product Merchant Wholesalers	1.3	2,685	2,901	8.0%
4245	Farm Product Raw Material Merchant Wholesalers	0.2	36	41	13.9%
4246	Chemical and Allied Products Merchant Wholesalers	0.6	237	283	19.4%
4247	Petroleum and Petroleum Products Merchant Wholesalers	1.3	368	369	0.3%
4248	Beer, Wine, and Distilled Alcoholic Beverage Merchant Wholesalers	0.6	321	387	20.6%
4249	Miscellaneous Nondurable Goods Merchant Wholesalers	1.2	1,154	1,204	4.3%

NAICS	Industry Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
4251	Wholesale Electronic Markets and Agents and Brokers	0.7	1,882	1,917	1.9%
4411	Automobile Dealers	1.1	3,730	4,160	11.5%
4412	Other Motor Vehicle Dealers	1.1	436	468	7.3%
4413	Automotive Parts, Accessories, and Tire Stores	1.3	1,965	2,152	9.5%
4421	Furniture Stores	0.7	454	443	-2.4%
4422	Home Furnishings Stores	0.6	445	474	6.5%
4431	Electronics and Appliance Stores	0.7	991	949	-4.2%
4441	Building Material and Supplies Dealers	1.2	3,833	3,829	-0.1%
4442	Lawn and Garden Equipment and Supplies Stores	1.5	627	638	1.8%
4451	Grocery Stores	1.4	10,546	10,521	-0.2%
4452	Specialty Food Stores	1.0	660	631	-4.4%
4453	Beer, Wine, and Liquor Stores	1.8	826	937	13.4%
4461	Health and Personal Care Stores	1.2	3,591	3,491	-2.8%
4471	Gasoline Stations	1.7	4,326	4,121	-4.7%
4481	Clothing Stores	1.0	2,874	2,628	-8.6%
4482	Shoe Stores	1.1	622	661	6.3%
4483	Jewelry, Luggage, and Leather Goods Stores	1.0	397	356	-10.3%
4511	Sporting Goods, Hobby, and Musical Instrument Stores	0.9	1,335	1,446	8.3%
4512	Book Stores and News Dealers	0.7	178	167	-6.2%
4521	Department Stores	1.0	3,845	3,375	-12.2%
4529	Other General Merchandise Stores	1.2	6,084	6,202	1.9%
4531	Florists	1.0	179	163	-8.9%
4532	Office Supplies, Stationery, and Gift Stores	1.0	854	718	-15.9%
4533	Used Merchandise Stores	0.5	244	265	8.6%
4539	Other Miscellaneous Store Retailers	1.4	1,211	1,258	3.9%
4541	Electronic Shopping and Mail-Order Houses	2.4	2,280	2,920	28.1%
4542	Vending Machine Operators	1.8	188	182	-3.2%
4543	Direct Selling Establishments	2.5	973	866	-11.0%
4811	Scheduled Air Transportation	0.1	131	173	32.1%
4812	Nonscheduled Air Transportation	0.1	8	7	-12.5%
4831	Deep Sea, Coastal, and Great Lakes Water Transportation	0.0	0	0	0.0%
4832	Inland Water Transportation	0.6	46	61	32.6%
4841	General Freight Trucking	1.5	4,102	4,727	15.2%
4842	Specialized Freight Trucking	1.6	2,036	2,409	18.3%
4851	Urban Transit Systems	0.7	497	619	24.5%
4852	Interurban and Rural Bus Transportation	2.7	174	157	-9.8%
4853	Taxi and Limousine Service	0.6	146	129	-11.6%
4854	School and Employee Bus Transportation	2.7	1,956	2,063	5.5%

NAICS	Industry Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
4855	Charter Bus Industry	2.0	178	166	-6.7%
4859	Other Transit and Ground Passenger Transportation	0.5	138	168	21.7%
4862	Pipeline Transportation of Natural Gas	0.9	76	78	2.6%
4869	Other Pipeline Transportation	0.2	4	5	25.0%
4871	Scenic and Sightseeing Transportation, Land	0.4	14	13	-7.1%
4879	Scenic and Sightseeing Transportation, Other	0.1	1	1	0.0%
4881	Support Activities for Air Transportation	0.3	166	161	-3.0%
4882	Support Activities for Rail Transportation	2.1	200	237	18.5%
4883	Support Activities for Water Transportation	0.0	1	1	0.0%
4884	Support Activities for Road Transportation	1.4	462	631	36.6%
4885	Freight Transportation Arrangement	0.8	460	614	33.5%
4889	Other Support Activities for Transportation	1.0	90	88	-2.2%
4911	Postal Service	1.2	2,040	1,608	-21.2%
4921	Couriers and Express Delivery Services	0.7	1,005	1,110	10.4%
4922	Local Messengers and Local Delivery	1.1	174	193	10.9%
4931	Warehousing and Storage	5.0	10,888	14,281	31.2%
5111	Newspaper, Periodical, Book, and Directory Publishers	1.5	1,790	1,454	-18.8%
5112	Software Publishers	0.1	116	120	3.4%
5121	Motion Picture and Video Industries	0.5	491	465	-5.3%
5122	Sound Recording Industries	0.2	7	8	14.3%
5151	Radio and Television Broadcasting	1.0	663	677	2.1%
5152	Cable and Other Subscription Programming	0.1	24	20	-16.7%
5171	Wired Telecommunications Carriers	0.9	1,595	1,392	-12.7%
5172	Wireless Telecommunications Carriers (except Satellite)	0.1	43	43	0.0%
5179	Other Telecommunications	0.3	83	62	-25.3%
5182	Data Processing, Hosting, and Related Services	2.0	1,612	1,584	-1.7%
5191	Other Information Services	0.7	688	800	16.3%
5221	Depository Credit Intermediation	1.2	5,923	5,602	-5.4%
5222	Nondepository Credit Intermediation	0.9	1,542	1,731	12.3%
5223	Activities Related to Credit Intermediation	0.2	160	145	-9.4%
5231	Securities and Commodity Contracts Intermediation and Brokerage	0.3	365	396	8.5%
5232	Securities and Commodity Exchanges	0.3	7	9	28.6%
5239	Other Financial Investment Activities	0.4	489	531	8.6%
5241	Insurance Carriers	1.1	3,739	4,217	12.8%
5242	Agencies, Brokerages, and Other Insurance Related Activities	0.7	2,054	2,347	14.3%
5251	Insurance and Employee Benefit Funds	0.1	1	1	0.0%
5311	Lessors of Real Estate	0.4	697	710	1.9%
5312	Offices of Real Estate Agents and Brokers	0.5	381	353	-7.3%

NAICS	Industry Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
5313	Activities Related to Real Estate	0.4	722	828	14.7%
5321	Automotive Equipment Rental and Leasing	0.7	367	418	13.9%
5322	Consumer Goods Rental	0.8	353	371	5.1%
5323	General Rental Centers	1.0	117	146	24.8%
5324	Commercial and Industrial Machinery and Equipment Rental and Leasing	1.5	625	709	13.4%
5331	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	0.1	6	6	0.0%
5411	Legal Services	0.7	2,228	2,372	6.5%
5412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	0.5	1,479	1,592	7.6%
5413	Architectural, Engineering, and Related Services	0.5	2,279	2,611	14.6%
5414	Specialized Design Services	0.5	194	227	17.0%
5415	Computer Systems Design and Related Services	0.3	1,435	1,798	25.3%
5416	Management, Scientific, and Technical Consulting Services	0.6	2,164	2,307	6.6%
5417	Scientific Research and Development Services	0.1	160	176	10.0%
5418	Advertising, Public Relations, and Related Services	0.3	363	441	21.5%
5419	Other Professional, Scientific, and Technical Services	0.8	1,466	1,759	20.0%
5511	Management of Companies and Enterprises	0.6	3,958	4,400	11.2%
5611	Office Administrative Services	0.1	109	97	-11.0%
5612	Facilities Support Services	2.3	920	1,155	25.5%
5613	Employment Services	0.7	7,415	10,628	43.3%
5614	Business Support Services	1.1	2,919	3,252	11.4%
5615	Travel Arrangement and Reservation Services	1.5	884	825	-6.7%
5616	Investigation and Security Services	0.7	1,742	2,112	21.2%
5617	Services to Buildings and Dwellings	0.7	4,152	4,284	3.2%
5619	Other Support Services	0.8	713	690	-3.2%
5621	Waste Collection	1.7	796	994	24.9%
5622	Waste Treatment and Disposal	0.9	338	450	33.1%
5629	Remediation and Other Waste Management Services	1.4	548	727	32.7%
6111	Elementary and Secondary Schools	1.0	23,879	23,728	-0.6%
6112	Junior Colleges	0.7	1,467	1,438	-2.0%
6113	Colleges, Universities, and Professional Schools	0.9	7,766	7,915	1.9%
6114	Business Schools and Computer and Management Training	0.1	26	25	-3.8%
6115	Technical and Trade Schools	0.9	395	477	20.8%
6116	Other Schools and Instruction	0.5	590	625	5.9%
6117	Educational Support Services	0.1	65	86	32.3%
6211	Offices of Physicians	1.0	7,029	7,626	8.5%
6212	Offices of Dentists	0.9	2,428	2,696	11.0%
6213	Offices of Other Health Practitioners	1.3	3,058	4,223	38.1%
6214	Outpatient Care Centers	2.0	4,492	6,206	38.2%

NAICS	Industry Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
6215	Medical and Diagnostic Laboratories	1.0	700	827	18.1%
6216	Home Health Care Services	0.9	3,312	4,381	32.3%
6219	Other Ambulatory Health Care Services	2.2	1,893	2,359	24.6%
6221	General Medical and Surgical Hospitals	1.0	15,617	17,572	12.5%
6222	Psychiatric and Substance Abuse Hospitals	1.9	1,295	1,564	20.8%
6223	Specialty (except Psychiatric and Substance Abuse) Hospitals	0.6	417	459	10.1%
6231	Nursing Care Facilities (Skilled Nursing Facilities)	1.6	8,235	9,808	19.1%
6232	Residential Intellectual and Developmental Disability, Mental Health, and Substance Abuse Facilities	1.9	3,893	4,741	21.8%
6233	Continuing Care Retirement Communities and Assisted Living Facilities for the Elderly	1.1	2,823	3,599	27.5%
6239	Other Residential Care Facilities	0.8	392	560	42.9%
6241	Individual and Family Services	1.3	8,113	10,291	26.8%
6242	Community Food and Housing, and Emergency and Other Relief Services	0.5	210	239	13.8%
6243	Vocational Rehabilitation Services	1.0	1,070	1,241	16.0%
6244	Child Day Care Services	1.3	3,129	3,595	14.9%
7111	Performing Arts Companies	0.3	108	133	23.1%
7112	Spectator Sports	1.0	400	497	24.3%
7113	Promoters of Performing Arts, Sports, and Similar Events	1.5	545	667	22.4%
7114	Agents and Managers for Artists, Athletes, Entertainers, and Other Public Figures	0.3	20	20	0.0%
7115	Independent Artists, Writers, and Performers	0.3	45	56	24.4%
7121	Museums, Historical Sites, and Similar Institutions	0.6	390	458	17.4%
7131	Amusement Parks and Arcades	0.3	188	234	24.5%
7132	Gambling Industries	0.3	200	185	-7.5%
7139	Other Amusement and Recreation Industries	1.3	5,059	6,243	23.4%
7211	Traveler Accommodation	1.7	9,321	10,905	17.0%
7212	RV (Recreational Vehicle) Parks and Recreational Camps	6.7	1,150	1,261	9.7%
7213	Rooming and Boarding Houses	0.5	22	27	22.7%
7223	Special Food Services	1.5	2,718	2,818	3.7%
7224	Drinking Places (Alcoholic Beverages)	1.1	1,152	1,173	1.8%
7225	Restaurants and Other Eating Places	0.8	23,575	25,429	7.9%
8111	Automotive Repair and Maintenance	1.0	2,509	2,665	6.2%
8112	Electronic and Precision Equipment Repair and Maintenance	0.6	179	226	26.3%
8113	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance	0.7	421	479	13.8%
8114	Personal and Household Goods Repair and Maintenance	0.2	47	48	2.1%
8121	Personal Care Services	1.0	1,958	2,289	16.9%
8122	Death Care Services	1.2	499	604	21.0%
8123	Drycleaning and Laundry Services	1.0	911	945	3.7%

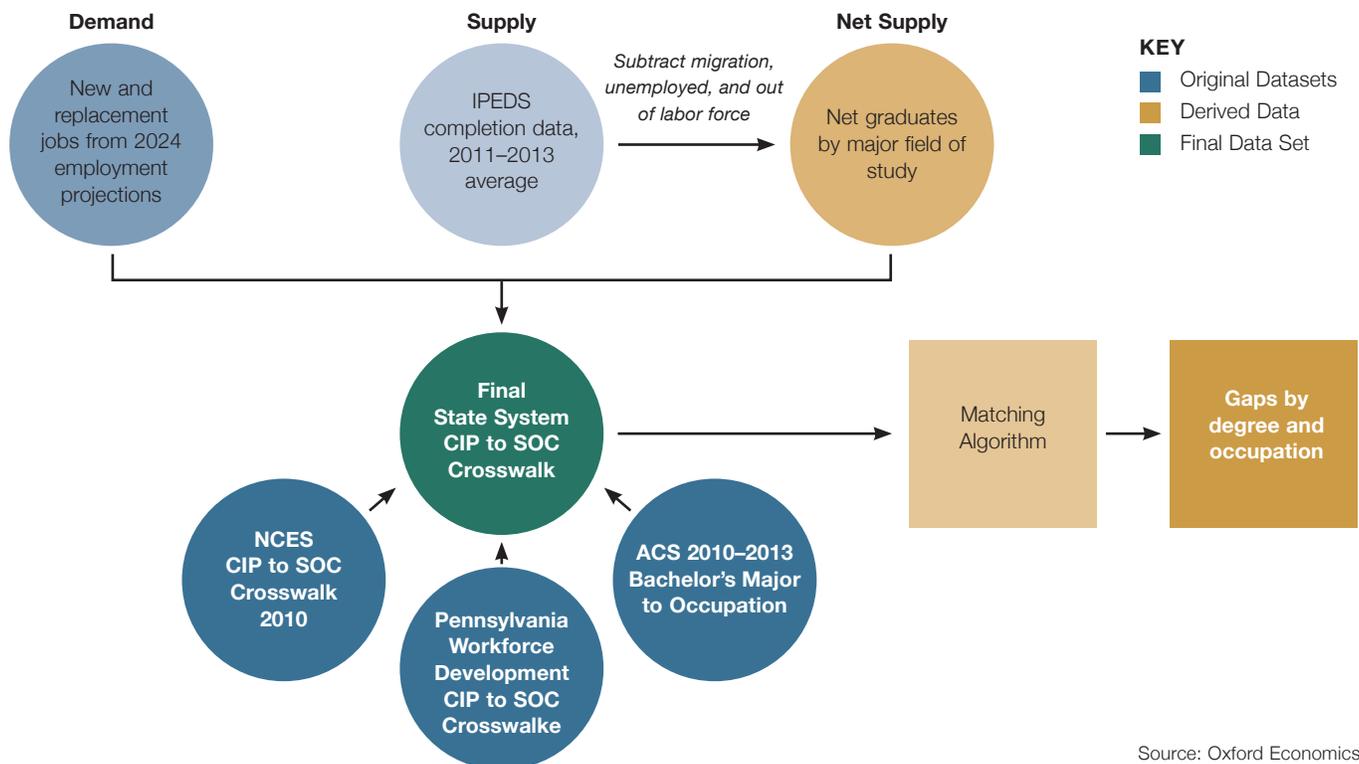
NAICS	Industry Title	2014 LQ	2014 Jobs	2024 Jobs	% Change 2014-2024
8129	Other Personal Services	0.4	365	462	26.6%
8131	Religious Organizations	2.0	1,074	1,071	-0.3%
8132	Grantmaking and Giving Services	0.3	140	127	-9.3%
8133	Social Advocacy Organizations	0.4	236	269	14.0%
8134	Civic and Social Organizations	1.4	1,595	1,655	3.8%
8139	Business, Professional, Labor, Political, and Similar Organizations	1.8	2,235	2,562	14.6%
8141	Private Households	0.2	128	131	2.3%
9211	Executive, Legislative, and Other General Government Support	1.2	10,681	10,536	-1.4%
9221	Justice, Public Order, and Safety Activities	0.6	3,547	3,736	5.3%
9231	Administration of Human Resource Programs	0.2	546	581	6.4%
9241	Administration of Environmental Quality Programs	0.9	875	892	1.9%
9251	Administration of Housing Programs, Urban Planning, and Community Development	2.0	481	462	-4.0%
9261	Administration of Economic Programs	0.2	364	355	-2.5%
9281	National Security and International Affairs	1.8	3,066	2,549	-16.9%

Source: BLS (QCEW and OES); Pennsylvania Department of Labor & Industry; Oxford Economics Projections

APPENDIX E: METHODOLOGY

The data-driven process involved in developing this gap analysis required multiple steps including compiling education output and forecasting occupation demand. Broadly speaking, supply-side educational completion data were assembled at the program level for State System Universities as well as other institutions within Pennsylvania. A three-year average was used to mitigate year-to-year variability in completions. A mapping analysis, known as a crosswalk, was developed looking at education programs and occupations and using a combination of the National Center for Education Statistics' (NCES) and US Census American Community Survey (ACS) data. The crosswalk was applied to occupation demand projections, which were produced by Oxford Economics and updated to 2014-2024, to calculate both new and replacement jobs. Linking annual program completions (supply) and annual occupation

Fig. 38: Summary of Gap Analysis Methodology

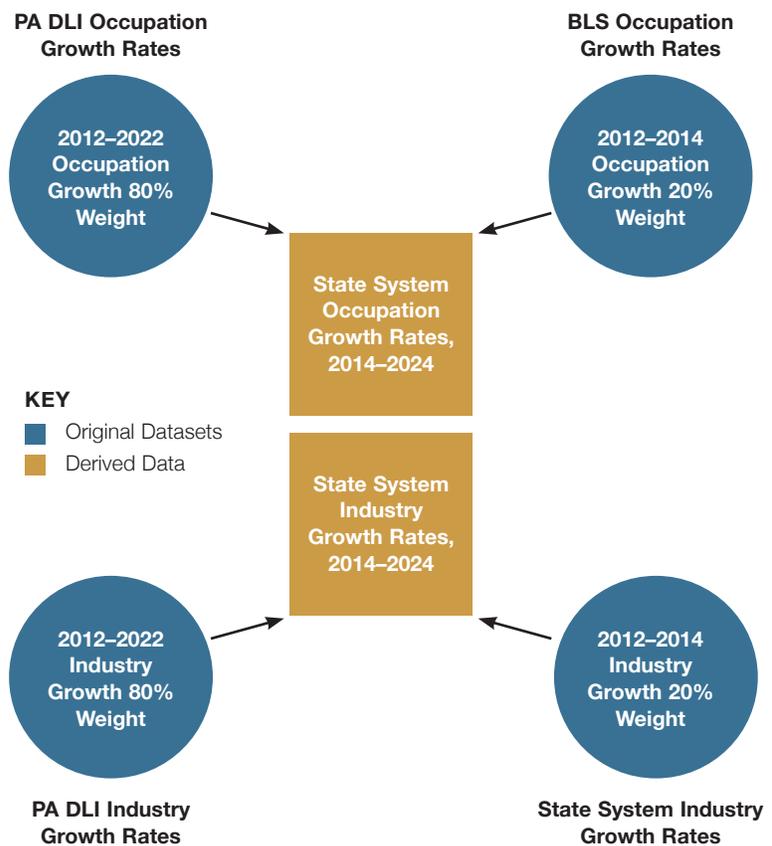


Source: Oxford Economics

projections (demand) enabled the calculation of the difference between the two, providing an insight into potential workforce gaps and surpluses for educational institutions to consider. Figure 38 provides a high-level flow chart of the process to calculate gaps/surpluses

A primary goal of the research was to produce updated forecasts for industries and occupations at the county level for Pennsylvania. Figure 39 provides a summary of the growth rate calculations used in the forecasts.

Fig. 39: Summary of Growth Rate Calculations



APPENDIX F: GAP ANALYSIS RESULTS

The following table provides the results of the gap analysis for all detailed occupations in Northeast Pennsylvania. The following information is provided in the table below:

- A description of the occupation – SOC Code and occupation title.
- A description of the level of the occupation – Job Zone.
- Gap indicator with the following color codes:
 - Green = Projected excess employer demand
 - Purple = Projected excess demand at specific degree level
 - Yellow = Projected balance
 - Blue = Projected supply surplus
- Average annual supply, demand, and gap number for each occupation and the detailed degree level supply, demand, and gap number for each occupation.
- The ratio of average annual supply to average annual demand (S/D Ratio).

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual Demand	Average Annual Supply	Average Annual Gap	S/D Ratio	Associate Demand	Associate Supply	Associate Gap	Bachelor Demand	Bachelor Supply	Bachelor Gap	Graduate Demand	Graduate Supply	Graduate Gap
11-1011	Chief Executives	5		15	14	1	0.93	0	0	0	13	7	6	2	7	-5
11-1021	General and Operations Managers	4		98	110	-12	1.12	0	0	0	74	42	32	24	68	-44
11-2021	Marketing Managers	4		5	3	2	0.60	0	0	0	5	3	2	0	0	0
11-2022	Sales Managers	4		10	10	0	1.00	0	0	0	9	5	4	1	4	-3
11-3011	Administrative Services Managers	3		5	3	2	0.60	0	0	0	5	3	2	0	0	0
11-3021	Computer and Information Systems Managers	4		18	25	-7	1.39	0	0	0	11	5	6	7	20	-13
11-3031	Financial Managers	4		10	14	-4	1.40	0	0	0	6	4	2	3	10	-7
11-3051	Industrial Production Managers	4		9	9	0	1.00	0	0	0	8	4	4	1	4	-3
11-3061	Purchasing Managers	4		2	1	1	0.50	0	0	0	2	1	1	0	0	0
11-3071	Transportation, Storage, and Distribution Managers	4		7	5	2	0.71	0	0	0	7	5	2	0	0	0
11-3121	Human Resources Managers	4		6	10	-4	1.67	0	0	0	3	2	1	3	8	-5
11-9021	Construction Managers	4		8	5	3	0.63	0	0	0	8	5	3	0	0	0
11-9031	Education Administrators, Preschool and Childcare Center/Program	4		5	29	-24	5.80	0	0	0	1	1	0	3	29	-26
11-9032	Education Administrators, Elementary and Secondary School	5		17	156	-139	9.18	0	0	0	0	0	0	17	156	-139
11-9033	Education Administrators, Postsecondary	5		6	55	-49	9.17	0	0	0	0	0	0	6	55	-49
11-9039	Education Administrators, All Other	5		1	10	-9	10.00	0	0	0	0	0	0	1	10	-9
11-9041	Architectural and Engineering Managers	5		8	12	-4	1.50	0	0	0	4	2	2	3	10	-7
11-9051	Food Service Managers	3		4	21	-17	5.25	1	9	-8	3	12	-9	0	0	0
11-9081	Lodging Managers	3		7	27	-20	3.86	1	4	-3	6	23	-17	0	0	0
11-9111	Medical and Health Services Managers	5		28	68	-40	2.43	0	0	0	17	19	-2	11	49	-38
11-9121	Natural Sciences Managers	5		1	4	-3	4.00	0	0	0	0	0	0	1	4	-3
11-9141	Property, Real Estate, and Community Association Managers	4		4	2	2	0.50	0	0	0	4	2	2	0	0	0
11-9151	Social and Community Service Managers	4		13	28	-15	2.15	0	0	0	7	11	-4	6	17	-11
11-9199	Managers, All Other	4		9	97	-88	10.78	0	0	0	7	74	-67	2	22	-20

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual		S/D Ratio	Associate		Bachelor		Graduate	
				Demand	Supply		Demand	Supply	Demand	Supply	Demand	Supply
13-1022	Wholesale and Retail Buyers, Except Farm Products	3		6	4	2	0	0	6	4	2	0
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	4		12	7	5	0	0	12	7	5	0
13-1031	Claims Adjusters, Examiners, and Investigators	4		24	13	11	0	0	24	13	11	0
13-1032	Insurance Appraisers, Auto Damage	3		2	1	1	0	0	2	1	1	0
13-1041	Compliance Officers	4		15	8	7	0	0	15	8	7	0
13-1051	Cost Estimators	4		21	12	9	0	0	21	12	9	0
13-1071	Human Resources Specialists	4		44	34	10	0	0	31	17	14	-4
13-1075	Labor Relations Specialists	4		12	9	3	0	0	8	5	3	-2
13-1081	Logisticians	4		9	9	0	0	0	8	4	4	-3
13-1111	Management Analysts	4		26	43	-17	0	0	13	7	6	-24
13-1121	Meeting, Convention, and Event Planners	4		6	19	-13	0	0	6	19	-13	0
13-1131	Fundraisers	4		3	2	1	0	0	3	2	1	0
13-1141	Compensation, Benefits, and Job Analysis Specialists	4		3	2	1	0	0	3	2	1	0
13-1151	Training and Development Specialists	4		15	12	3	0	0	11	6	5	-1
13-1161	Market Research Analysts and Marketing Specialists	4		53	27	26	0	0	31	21	10	17
13-1199	Business Operations Specialists, All Other	4		8	5	3	0	0	8	5	3	0
13-2011	Accountants and Auditors	4		122	82	40	0	0	98	59	39	23
13-2031	Budget Analysts	4		4	3	1	0	0	2	1	1	2
13-2041	Credit Analysts	4		7	5	2	0	0	5	3	2	3
13-2051	Financial Analysts	4		21	14	7	0	0	15	9	6	6
13-2052	Personal Financial Advisors	4		10	6	4	0	0	8	5	3	1
13-2053	Insurance Underwriters	4		13	7	6	0	0	13	7	6	0
13-2061	Financial Examiners	4		3	2	1	0	0	2	1	1	1
13-2071	Credit Counselors	4		3	2	1	0	0	3	2	1	0
13-2072	Loan Officers	3		19	11	8	0	0	19	11	8	0
13-2081	Tax Examiners and Collectors, and Revenue Agents	3		4	3	1	0	0	4	3	1	0

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual Demand	Average Annual Supply	Average Annual Gap	S/D Ratio	Associate Demand	Associate Supply	Associate Gap	Bachelor Demand	Bachelor Supply	Bachelor Gap	Graduate Demand	Graduate Supply	Graduate Gap
15-1121	Computer Systems Analysts	4		38	15	23	0.39	0	0	0	28	10	18	9	4	5
15-1122	Information Security Analysts	4		2	1	1	0.50	0	0	0	2	1	1	0	0	0
15-1131	Computer Programmers	4		24	9	15	0.38	0	0	0	19	7	12	6	3	3
15-1132	Software Developers, Applications	4		41	18	23	0.44	0	0	0	29	11	18	12	7	5
15-1134	Web Developers	3		7	2	5	0.29	0	0	0	7	2	5	0	0	0
15-1141	Database Administrators	4		10	4	6	0.40	0	0	0	7	3	4	3	1	2
15-1142	Network and Computer Systems Administrators	4		5	2	3	0.40	0	0	0	4	2	2	1	1	0
15-1143	Computer Network Architects	4		4	2	2	0.50	0	0	0	3	1	2	1	1	0
15-1151	Computer User Support Specialists	3		31	27	4	0.87	8	18	-10	23	8	15	0	0	0
15-1152	Computer Network Support Specialists	4		2	1	1	0.50	0	0	0	2	1	1	0	0	0
15-1199	Computer Occupations, All Other	4		10	4	6	0.40	0	0	0	8	3	5	2	1	1
15-2011	Actuaries	4		3	3	0	1.00	0	0	0	3	3	0	0	0	0
15-2031	Operations Research Analysts	5		4	2	2	0.50	0	0	0	4	2	2	0	0	0
17-1022	Surveyors	4		3	10	-7	3.33	0	0	0	3	10	-7	0	0	0
17-2041	Chemical Engineers	4		3	1	2	0.33	0	0	0	3	1	2	0	0	0
17-2051	Civil Engineers	4		19	2	17	0.11	0	0	0	19	2	17	0	0	0
17-2071	Electrical Engineers	4		9	6	3	0.67	0	0	0	5	2	3	4	4	0
17-2081	Environmental Engineers	5		4	1	3	0.25	0	0	0	4	1	3	0	0	0
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	4		3	0	3	0.00	0	0	0	3	0	3	0	0	0
17-2112	Industrial Engineers	4		13	2	11	0.15	0	0	0	13	2	11	0	0	0
17-2131	Materials Engineers	4		3	0	3	0.00	0	0	0	3	0	3	0	0	0
17-2141	Mechanical Engineers	4		20	4	16	0.20	0	0	0	16	3	13	4	1	3
17-2171	Petroleum Engineers	4		3	0	3	0.00	0	0	0	3	0	3	0	0	0
17-2199	Engineers, All Other	4		5	2	3	0.40	0	0	0	5	2	3	0	0	0
17-3011	Architectural and Civil Drafters	4		3	23	-20	7.67	3	23	-20	0	0	0	0	0	0
17-3013	Mechanical Drafters	3		1	10	-9	10.00	1	10	-9	0	0	0	0	0	0
17-3029	Engineering Technicians, Except Drafters, All Other	3		5	14	-9	2.80	2	13	-11	2	1	1	0	0	0
17-3031	Surveying and Mapping Technicians	3		2	7	-5	3.50	2	7	-5	0	0	0	0	0	0

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual Demand	Average Annual Supply	Average Annual Gap	S/D Ratio	Associate Demand	Associate Supply	Associate Gap	Bachelor Demand	Bachelor Supply	Bachelor Gap	Graduate Demand	Graduate Supply	Graduate Gap
19-1022	Microbiologists	5		2	5	-3	2.50	0	0	0	1	1	0	1	4	-3
19-1042	Medical Scientists, Except Epidemiologists	5		12	40	-28	3.33	0	0	0	0	0	0	12	40	-28
19-2031	Chemists	4		18	16	2	0.89	0	0	0	10	11	-1	9	5	4
19-2041	Environmental Scientists and Specialists, Including Health	4		4	7	-3	1.75	0	0	0	4	7	-3	0	0	0
19-2042	Geoscientists, Except Hydrologists and Geographers	4		2	4	-2	2.00	0	0	0	2	4	-2	0	0	0
19-3022	Survey Researchers	5		6	1	5	0.17	0	0	0	0	0	0	6	1	5
19-3031	Clinical, Counseling, and School Psychologists	5		16	47	-31	2.94	0	0	0	0	0	0	16	47	-31
19-3039	Psychologists, All Other	5		1	10	-9	10.00	0	0	0	0	0	0	1	10	-9
19-4021	Biological Technicians	4		10	12	-2	1.20	0	0	0	10	12	-2	0	0	0
19-4031	Chemical Technicians	3		8	4	4	0.50	0	0	0	8	4	4	0	0	0
19-4041	Geological and Petroleum Technicians	4		2	9	-7	4.50	2	9	-7	0	0	0	0	0	0
19-4051	Nuclear Technicians	3		2	11	-9	5.50	2	11	-9	0	0	0	0	0	0
19-4061	Social Science Research Assistants	4		1	1	0	1.00	0	0	0	1	1	0	0	0	0
19-4091	Environmental Science and Protection Technicians, Including Health	4		4	5	-1	1.25	0	0	0	4	5	-1	0	0	0
19-4093	Forest and Conservation Technicians	3		1	1	0	1.00	0	0	0	1	1	0	0	0	0
19-4099	Life, Physical, and Social Science Technicians, All Other	3		5	6	-1	1.20	0	0	0	5	6	-1	0	0	0
21-1011	Substance Abuse and Behavioral Disorder Counselors	5		18	20	-2	1.11	0	0	0	7	11	-4	11	9	2
21-1012	Educational, Guidance, School, and Vocational Counselors	5		16	22	-6	1.38	0	0	0	0	0	0	16	22	-6
21-1013	Marriage and Family Therapists	5		4	4	0	1.00	0	0	0	0	0	0	4	4	0
21-1014	Mental Health Counselors	5		30	25	5	0.83	0	0	0	0	0	0	30	25	5
21-1015	Rehabilitation Counselors	5		24	20	4	0.83	0	0	0	0	0	0	24	20	4
21-1019	Counselors, All Other	5		2	14	-12	7.00	0	0	0	0	0	0	2	14	-12
21-1021	Child, Family, and School Social Workers	4		38	54	-16	1.42	0	0	0	25	43	-18	13	10	3
21-1022	Healthcare Social Workers	5		25	21	4	0.84	0	0	0	0	0	0	25	21	4

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual		S/D Ratio	Associate		Bachelor		Graduate		
				Demand	Supply		Demand	Supply	Demand	Supply	Demand	Supply	Gap
21-1023	Mental Health and Substance Abuse Social Workers	5		40	57	1.43	0	0	27	46	13	11	2
21-1029	Social Workers, All Other	5		2	3	1.50	0	0	2	3	0	0	0
21-1091	Health Educators	4		6	14	2.33	0	0	4	6	2	8	-6
21-1092	Probation Officers and Correctional Treatment Specialists	4		12	20	1.67	0	0	9	17	4	3	1
21-1093	Social and Human Service Assistants	4		33	64	1.94	7	21	26	43	0	0	0
21-1094	Community Health Workers	4		1	2	2.00	0	0	1	2	0	0	0
21-1099	Community and Social Service Specialists, All Other	4		2	0	0.00	0	0	0	0	2	0	2
21-2011	Clergy	5		6	27	4.50	0	0	3	9	3	18	-15
21-2021	Directors, Religious Activities and Education	4		11	45	4.09	0	0	8	24	3	21	-18
23-2011	Paralegals and Legal Assistants	3		13	17	1.31	2	5	11	12	0	0	0
23-2091	Court Reporters	3		2	2	1.00	0	0	2	2	0	0	0
23-2093	Title Examiners, Abstractors, and Searchers	3		4	4	1.00	0	0	4	4	0	0	0
25-1011	Business Teachers, Postsecondary	5		8	21	2.63	0	0	0	0	8	21	-13
25-1021	Computer Science Teachers, Postsecondary	5		4	10	2.50	0	0	0	0	4	10	-6
25-1022	Mathematical Science Teachers, Postsecondary	5		2	5	2.50	0	0	0	0	2	5	-3
25-1032	Engineering Teachers, Postsecondary	5		5	13	2.60	0	0	0	0	5	13	-8
25-1042	Biological Science Teachers, Postsecondary	5		4	10	2.50	0	0	0	0	4	10	-6
25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	5		1	3	3.00	0	0	0	0	1	3	-2
25-1052	Chemistry Teachers, Postsecondary	5		2	5	2.50	0	0	0	0	2	5	-3
25-1054	Physics Teachers, Postsecondary	5		2	5	2.50	0	0	0	0	2	5	-3
25-1063	Economics Teachers, Postsecondary	5		2	4	2.00	0	0	0	0	2	4	-2
25-1065	Political Science Teachers, Postsecondary	5		1	7	7.00	0	0	0	0	1	7	-6
25-1066	Psychology Teachers, Postsecondary	5		3	8	2.67	0	0	0	0	3	8	-5

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual		S/D Ratio	Associate		Bachelor		Graduate		
				Demand	Supply		Demand	Supply	Demand	Supply	Demand	Supply	Gap
25-1067	Sociology Teachers, Postsecondary	5		3	7	2.33	0	0	0	0	3	7	-4
25-1071	Health Specialties Teachers, Postsecondary	5		7	23	3.29	0	0	0	0	7	23	-16
25-1072	Nursing Instructors and Teachers, Postsecondary	5		2	28	14.00	0	0	0	0	2	28	-26
25-1081	Education Teachers, Postsecondary	5		3	7	2.33	0	0	0	0	3	7	-4
25-1121	Art, Drama, and Music Teachers, Postsecondary	5		9	23	2.56	0	0	0	0	9	23	-14
25-1122	Communications Teachers, Postsecondary	5		2	11	5.50	0	0	0	0	2	11	-9
25-1123	English Language and Literature Teachers, Postsecondary	5		3	47	15.67	0	0	0	0	3	47	-44
25-1124	Foreign Language and Literature Teachers, Postsecondary	5		2	6	3.00	0	0	0	0	2	6	-4
25-1125	History Teachers, Postsecondary	5		2	4	2.00	0	0	0	0	2	4	-2
25-1126	Philosophy and Religion Teachers, Postsecondary	5		2	9	4.50	0	0	0	0	2	9	-7
25-1191	Graduate Teaching Assistants	5		2	4	2.00	0	0	0	0	2	4	-2
25-1194	Vocational Education Teachers, Postsecondary	3		6	3	0.50	0	0	6	3	0	0	0
25-1199	Postsecondary Teachers, All Other	5		8	249	31.13	0	0	0	0	8	249	-241
25-2011	Preschool Teachers, Except Special Education	3		33	47	1.42	7	27	26	20	6	0	0
25-2012	Kindergarten Teachers, Except Special Education	4		10	14	1.40	0	0	7	7	0	3	-4
25-2021	Elementary School Teachers, Except Special Education	4		112	226	2.02	0	0	36	43	-7	76	-107
25-2022	Middle School Teachers, Except Special and Career/Technical Education	4		75	148	1.97	0	0	24	29	-5	50	-69
25-2023	Career/Technical Education Teachers, Middle School	4		2	4	2.00	0	0	0	0	0	2	-2
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	4		126	252	2.00	0	0	42	57	-15	84	-111
25-2032	Career/Technical Education Teachers, Secondary School	4		9	17	1.89	0	0	3	4	-1	6	-8

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual		S/D Ratio	Associate		Bachelor		Graduate			
				Demand	Supply		Demand	Supply	Demand	Supply	Demand	Supply	Gap	Gap
25-2051	Special Education Teachers, Preschool	4		1	4	4.00	0	0	0	0	0	1	4	-3
25-2052	Special Education Teachers, Kindergarten and Elementary School	4		24	53	2.21	0	0	6	7	18	18	46	-28
25-2053	Special Education Teachers, Middle School	4		7	16	2.29	0	0	2	2	5	5	14	-9
25-2054	Special Education Teachers, Secondary School	4		19	41	2.16	0	0	5	5	14	14	36	-22
25-3021	Self-Enrichment Education Teachers	3		4	3	0.75	0	0	4	3	1	0	0	0
25-3097	Teachers and Instructors, All Other, Except Substitute Teachers	3		4	3	0.75	0	0	4	3	1	0	0	0
25-3098	Substitute Teachers	3		12	167	13.92	0	0	8	7	1	4	160	-156
25-4021	Librarians	5		10	46	4.60	0	0	0	0	10	10	46	-36
25-4031	Library Technicians	4		5	14	2.80	0	0	5	14	0	0	0	0
25-9031	Instructional Coordinators	5		2	100	50.00	0	0	0	0	2	100	100	-98
25-9041	Teacher Assistants	3		39	70	1.79	11	39	28	31	0	0	0	0
27-1011	Art Directors	4		1	3	3.00	0	0	1	3	0	0	0	0
27-1024	Graphic Designers	4		12	31	2.58	0	0	12	31	0	0	0	0
27-1025	Interior Designers	4		4	9	2.25	0	0	4	9	0	0	0	0
27-1026	Merchandise Displayers and Window Trimmers	3		7	19	2.71	0	0	7	19	0	0	0	0
27-2012	Producers and Directors	4		9	28	3.11	0	0	9	28	0	0	0	0
27-2022	Coaches and Scouts	4		12	25	2.08	0	0	7	11	4	4	14	-10
27-3011	Radio and Television Announcers	3		2	7	3.50	0	0	2	7	0	0	0	0
27-3022	Reporters and Correspondents	4		2	5	2.50	0	0	2	5	0	0	0	0
27-3031	Public Relations Specialists	4		7	21	3.00	0	0	7	21	0	0	0	0
27-3041	Editors	4		4	10	2.50	0	0	4	10	0	0	0	0
27-3042	Technical Writers	4		1	2	2.00	0	0	1	2	0	0	0	0
27-4011	Audio and Video Equipment Technicians	3		2	7	3.50	0	0	2	7	0	0	0	0
27-4021	Photographers	3		1	5	5.00	0	0	1	5	0	0	0	0
29-1031	Dietitians and Nutritionists	5		6	17	2.83	0	0	3	5	3	12	12	-9
29-1051	Pharmacists	5		32	57	1.78	0	0	0	0	32	32	57	-25
29-1061	Anesthesiologists	5		3	1	0.33	0	0	0	0	3	3	1	2
29-1062	Family and General Practitioners	5		18	4	0.22	0	0	0	0	18	18	4	14

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual Demand	Average Annual Supply	Average Annual Gap	S/D Ratio	Associate Demand	Associate Supply	Associate Gap	Bachelor Demand	Bachelor Supply	Bachelor Gap	Graduate Demand	Graduate Supply	Graduate Gap
29-1063	Internists, General	5		1	0	1	0.00	0	0	0	0	0	0	1	0	1
29-1064	Obstetricians and Gynecologists	5		1	0	1	0.00	0	0	0	0	0	0	1	0	1
29-1066	Psychiatrists	5		3	1	2	0.33	0	0	0	0	0	0	3	1	2
29-1067	Surgeons	5		7	2	5	0.29	0	0	0	0	0	0	7	2	5
29-1069	Physicians and Surgeons, All Other	5		31	7	24	0.23	0	0	0	0	0	0	31	7	24
29-1071	Physician Assistants	5		13	51	-38	3.92	0	0	0	0	0	0	13	51	-38
29-1081	Podiatrists	5		4	1	3	0.25	0	0	0	0	0	0	4	1	3
29-1122	Occupational Therapists	5		21	65	-44	3.10	0	0	0	0	0	0	21	65	-44
29-1123	Physical Therapists	5		46	91	-45	1.98	0	0	0	0	0	0	46	91	-45
29-1125	Recreational Therapists	4		3	3	0	1.00	0	0	0	3	3	0	0	0	0
29-1126	Respiratory Therapists	3		10	18	-8	1.80	7	15	-8	2	2	0	0	0	0
29-1127	Speech-Language Pathologists	5		15	51	-36	3.40	0	0	0	0	0	0	15	51	-36
29-1129	Therapists, All Other	4		1	8	-7	8.00	0	0	0	0	0	0	1	8	-7
29-1141	Registered Nurses	3		353	300	53	0.85	157	154	3	196	146	50	0	0	0
29-1151	Nurse Anesthetists	5		4	13	-9	3.25	0	0	0	0	0	0	4	13	-9
29-1171	Nurse Practitioners	5		12	23	-11	1.92	0	0	0	0	0	0	12	23	-11
29-1181	Audiologists	5		2	7	-5	3.50	0	0	0	0	0	0	2	7	-5
29-2011	Medical and Clinical Laboratory Technologists	4		14	4	10	0.29	0	0	0	14	4	10	0	0	0
29-2012	Medical and Clinical Laboratory Technicians	3		20	29	-9	1.45	6	25	-19	14	4	10	0	0	0
29-2021	Dental Hygienists	3		31	23	8	0.74	23	21	2	8	3	5	0	0	0
29-2031	Cardiovascular Technologists and Technicians	3		2	1	1	0.50	0	0	0	2	1	1	0	0	0
29-2032	Diagnostic Medical Sonographers	3		3	19	-16	6.33	2	19	-17	1	0	1	0	0	0
29-2034	Radiologic Technologists	3		15	33	-18	2.20	10	20	-10	5	13	-8	0	0	0
29-2041	Emergency Medical Technicians and Paramedics	3		20	5	15	0.25	9	2	7	10	3	7	0	0	0
29-2052	Pharmacy Technicians	3		6	2	4	0.33	0	0	0	6	2	4	0	0	0
29-2053	Psychiatric Technicians	3		1	0	1	0.00	0	0	0	1	0	1	0	0	0
29-2055	Surgical Technologists	3		5	16	-11	3.20	3	15	-12	3	1	2	0	0	0
29-2056	Veterinary Technologists and Technicians	3		5	11	-6	2.20	2	11	-9	2	1	1	0	0	0

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual		S/D Ratio	Associate		Bachelor		Graduate	
				Demand	Supply		Demand	Supply	Demand	Supply	Demand	Supply
29-2061	Licensed Practical and Licensed Vocational Nurses	3		34	19	0.56	34	19	0	0	0	0
29-2071	Medical Records and Health Information Technicians	3		5	3	0.60	0	0	5	3	2	0
29-2081	Opticians, Dispensing	3		5	1	0.20	0	0	5	1	4	0
29-2099	Health Technologists and Technicians, All Other	3		4	10	2.50	1	7	2	4	-2	0
29-9011	Occupational Health and Safety Specialists	4		4	1	0.25	0	0	4	1	3	0
29-9012	Occupational Health and Safety Technicians	3		2	2	1.00	0	0	2	2	0	0
29-9091	Athletic Trainers	5		5	56	11.20	0	0	3	32	-29	24
31-2011	Occupational Therapy Assistants	3		4	6	1.50	0	0	4	6	-2	0
31-2021	Physical Therapist Assistants	3		19	42	2.21	10	33	8	9	-1	0
31-9011	Massage Therapists	3		2	1	0.50	0	0	2	1	1	0
31-9091	Dental Assistants	3		9	11	1.22	5	10	4	1	3	0
31-9092	Medical Assistants	3		28	21	0.75	28	21	7	0	0	0
31-9094	Medical Transcriptionists	3		2	1	0.50	0	0	2	1	1	0
31-9096	Veterinary Assistants and Laboratory Animal Caretakers	3		1	5	5.00	1	5	0	0	0	0
31-9097	Phlebotomists	3		5	23	4.60	5	23	0	0	0	0
33-1012	First-Line Supervisors of Police and Detectives	3		8	25	3.13	3	15	5	10	-5	0
33-1099	First-Line Supervisors of Protective Service Workers, All Other	3		2	4	2.00	0	0	2	4	-2	0
33-2011	Firefighters	3		6	10	1.67	2	2	4	7	-3	0
33-3012	Correctional Officers and Jailers	3		11	30	2.73	5	19	5	11	-6	0
33-3021	Detectives and Criminal Investigators	3		4	8	2.00	0	0	4	8	-4	0
33-3051	Police and Sheriff's Patrol Officers	3		40	121	3.03	14	70	26	52	-26	0
33-9021	Private Detectives and Investigators	3		1	3	3.00	0	0	1	3	-2	0
35-1011	Chefs and Head Cooks	3		2	14	7.00	2	14	0	0	0	0
39-1021	First-Line Supervisors of Personal Service Workers	3		11	6	0.55	0	0	11	6	5	0
39-4031	Morticians, Undertakers, and Funeral Directors	3		4	0	0.00	0	0	4	0	4	0

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual		S/D Ratio	Associate		Bachelor		Graduate	
				Demand	Supply		Demand	Supply	Demand	Supply	Demand	Supply
39-9011	Childcare Workers	3		12	13	1.08	0	0	12	13	0	0
39-9031	Fitness Trainers and Aerobics Instructors	3		28	44	1.57	0	0	28	44	0	0
39-9032	Recreation Workers	4		27	43	1.59	0	0	27	43	0	0
39-9041	Residential Advisors	3		12	19	1.58	0	0	12	19	0	0
41-1012	First-Line Supervisors of Non-Retail Sales Workers	4		2	1	0.50	0	0	2	1	0	0
41-3011	Advertising Sales Agents	3		6	18	3.00	0	0	6	18	0	0
41-3021	Insurance Sales Agents	4		16	9	0.56	0	0	16	9	7	0
41-3031	Securities, Commodities, and Financial Services Sales Agents	4		11	7	0.64	0	0	9	5	4	2
41-3099	Sales Representatives, Services, All Other	4		38	22	0.58	0	0	38	22	16	0
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	4		6	4	0.67	0	0	6	4	2	0
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	4		47	28	0.60	0	0	47	28	19	0
41-9031	Sales Engineers	4		3	1	0.33	0	0	3	1	2	0
43-1011	First-Line Supervisors of Office and Administrative Support Workers	3		61	79	1.30	16	53	45	26	19	0
43-3031	Bookkeeping, Accounting, and Auditing Clerks	3		33	36	1.09	10	23	23	13	10	0
43-3061	Procurement Clerks	3		1	1	1.00	0	0	1	1	0	0
43-4011	Brokerage Clerks	3		4	3	0.75	0	0	4	3	1	0
43-4031	Court, Municipal, and License Clerks	3		2	3	1.50	0	0	2	3	-1	0
43-4061	Eligibility Interviewers, Government Programs	3		8	14	1.75	0	0	8	14	-6	0
43-4131	Loan Interviewers and Clerks	3		7	6	0.86	3	4	4	2	2	0
43-4161	Human Resources Assistants, Except Payroll and Timekeeping	3		5	4	0.80	1	2	4	2	2	0
43-5061	Production, Planning, and Expediting Clerks	3		18	14	0.78	4	6	14	8	6	0
43-6011	Executive Secretaries and Executive Administrative Assistants	3		7	6	0.86	2	3	5	3	2	0
43-6012	Legal Secretaries	3		9	8	0.89	3	4	6	4	2	0

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual		S/D Ratio	Associate		Bachelor		Graduate				
				Demand	Supply		Demand	Supply	Demand	Supply	Demand	Supply	Gap	Gap	
43-6013	Medical Secretaries	3		32	27	5	0.84	10	14	22	13	9	0	0	0
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	3		82	73	9	0.89	25	39	57	34	23	0	0	0
43-9011	Computer Operators	3		1	0	1	0.00	0	0	1	0	1	0	0	0
43-9041	Insurance Claims and Policy Processing Clerks	3		13	11	2	0.85	4	7	9	5	4	0	0	0
43-9199	Office and Administrative Support Workers, All Other	3		8	6	2	0.75	2	3	6	4	2	0	0	0
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	3		12	7	5	0.58	0	0	12	7	5	0	0	0
47-2111	Electricians	3		18	15	3	0.83	18	15	3	0	0	0	0	0
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairs	3		19	12	7	0.63	5	4	14	8	6	0	0	0
49-2011	Computer, Automated Teller, and Office Machine Repairs	3		3	0	3	0.00	3	0	3	0	0	0	0	0
49-2022	Telecommunications Equipment Installers and Repairs, Except Line Installers	3		2	0	2	0.00	1	0	1	0	1	0	0	0
49-2094	Electrical and Electronics Repairs, Commercial and Industrial Equipment	3		1	17	-16	17.00	1	17	0	0	0	0	0	0
49-2098	Security and Fire Alarm Systems Installers	3		2	2	0	1.00	2	2	0	0	0	0	0	0
49-3023	Automotive Service Technicians and Mechanics	3		17	17	0	1.00	17	17	0	0	0	0	0	0
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	3		8	9	-1	1.13	8	9	0	0	0	0	0	0
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	3		2	0	2	0.00	2	0	2	0	0	0	0	0
49-9012	Control and Valve Installers and Repairs, Except Mechanical Door	3		1	0	1	0.00	1	0	1	0	0	0	0	0
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	3		8	21	-13	2.63	8	21	0	0	0	0	0	0
49-9041	Industrial Machinery Mechanics	3		13	1	12	0.08	13	1	0	0	0	0	0	0
49-9043	Maintenance Workers, Machinery	3		4	0	4	0.00	4	0	4	0	0	0	0	0
49-9044	Millwrights	3		2	0	2	0.00	2	0	2	0	0	0	0	0

Occupation Code	Occupation Title	Job Zone	Gap Indicator	Average Annual		S/D Ratio	Associate		Bachelor		Graduate				
				Demand	Supply		Demand	Supply	Demand	Supply	Demand	Supply	Gap	Gap	
49-9051	Electrical Power-Line Installers and Repairers	3		9	7	2	0.78	9	7	2	0	0	0	0	0
49-9062	Medical Equipment Repairers	3		3	12	-9	4.00	3	12	-9	0	0	0	0	0
49-9071	Maintenance and Repair Workers, General	3		18	3	15	0.17	18	3	15	0	0	0	0	0
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	3		8	3	5	0.38	8	3	5	0	0	0	0	0
51-4041	Machinists	3		6	2	4	0.33	6	2	4	0	0	0	0	0
51-4111	Tool and Die Makers	3		2	1	1	0.50	2	1	1	0	0	0	0	0
51-8012	Power Distributors and Dispatchers	3		1	0	1	0.00	1	0	1	0	0	0	0	0

APPENDIX G: CROSSWALK OF PROGRAMS TO OCCUPATIONS

(Full List Available Upon Request)

Occupation Code	Occupation Title	Degree Code	Degree Title	NCES	PA	ACS
11-1021	General and Operations Managers	44.0401	Public Administration	•		•
		50.1001	Arts, Entertainment, and Media Management, General		•	
		50.1002	Fine and Studio Arts Management		•	
		50.1003	Music Management		•	
		50.1004	Theatre/Theatre Arts Management		•	
		52.0101	Business/Commerce, General	•		•
		52.0201	Business Administration and Management, General	•	•	•
		52.0204	Office Management and Supervision	•		
		52.0205	Operations Management and Supervision	•		
		52.0206	Non-Profit/Public/Organizational Management	•		
		52.0213	Organizational Leadership	•		
		52.0299	Business Administration, Management and Operations, Other	•		
		52.0501	Business/Corporate Communications		•	
		52.0701	Entrepreneurship/Entrepreneurial Studies	•		•
		52.0703	Small Business Administration/Management	•		
		52.0799	Entrepreneurial and Small Business Operations, Other	•		
		52.0801	Finance, General			•
		52.1101	International Business/Trade/Commerce	•		•
		52.1201	Management Information Systems, General		•	
		52.1206	Information Resources Management		•	
		52.1207	Knowledge Management		•	
		52.1299	Management Information Systems and Services, Other		•	
		52.1301	Management Science			•

Occupation Code	Occupation Title	Degree Code	Degree Title	NCES	PA	ACS
13-1161	Market Research Analysts and Marketing Specialists	45.0101	Social Sciences, General	•		
		45.0602	Applied Economics			•
		45.9999	Social Sciences, Other	•		
		52.0101	Business/Commerce, General	•		
		52.0601	Business/Managerial Economics	•		
		52.1401	Marketing/Marketing Management, General	•	•	•
		52.1402	Marketing Research	•	•	•
		52.1403	International Marketing	•	•	•
		52.1499	Marketing, Other	•	•	
		13-2011	Accountants and Auditors	43.0117	Financial Forensics and Fraud Investigation	•
45.0601	Economics, General				•	
45.0603	Econometrics and Quantitative Economics				•	
45.0605	International Economics				•	
45.0699	Economics, Other				•	
52.0101	Business/Commerce, General			•		
52.0301	Accounting			•	•	•
52.0303	Auditing			•	•	•
52.0304	Accounting and Finance			•	•	•
52.0305	Accounting and Business/Management			•	•	•
52.0399	Accounting and Related Services, Other			•	•	
52.0601	Business/Managerial Economics				•	
52.0801	Finance, General			•	•	
52.0804	Financial Planning and Services				•	
52.0807	Investments and Securities				•	
52.0899	Finance and Financial Management Services, Other			•	•	
52.1304	Actuarial Science				•	
52.1601	Taxation			•		•
15-1121	Computer Systems Analysts	11.0101	Computer and Information Sciences, General	•		•
		11.0103	Information Technology	•		•
		11.0501	Computer Systems Analysis/Analyst	•	•	•
		11.0701	Computer Science		•	
		11.0801	Web Page, Digital/Multimedia and Information Resources Design	•	•	
		11.0803	Computer Graphics		•	
		11.0804	Modeling, Virtual Environments and Simulation		•	

Occupation Code	Occupation Title	Degree Code	Degree Title	NCES	PA	ACS
		11.0899	Computer Software and Media Applications, Other		•	
		11.0901	Computer Systems Networking and Telecommunications			•
		52.1201	Management Information Systems, General	•		
		52.1207	Knowledge Management	•		
		52.1299	Management Information Systems and Services, Other	•		
29-1141	Registered Nurses	51.0000	Health Services/Allied Health/Health Sciences, General	•	•	
		51.0704	Health Unit Manager/Ward Supervisor	•	•	
		51.3801	Registered Nursing/Registered Nurse	•	•	•
		51.3803	Adult Health Nurse/Nursing	•	•	•
		51.3805	Family Practice Nurse/Nursing	•	•	•
		51.3808	Nursing Science	•	•	•
		51.3818	Nursing Practice	•	•	•
		51.3899	Registered Nursing, Nursing Administration, Nursing Research and Clinical Nursing, Other	•	•	•