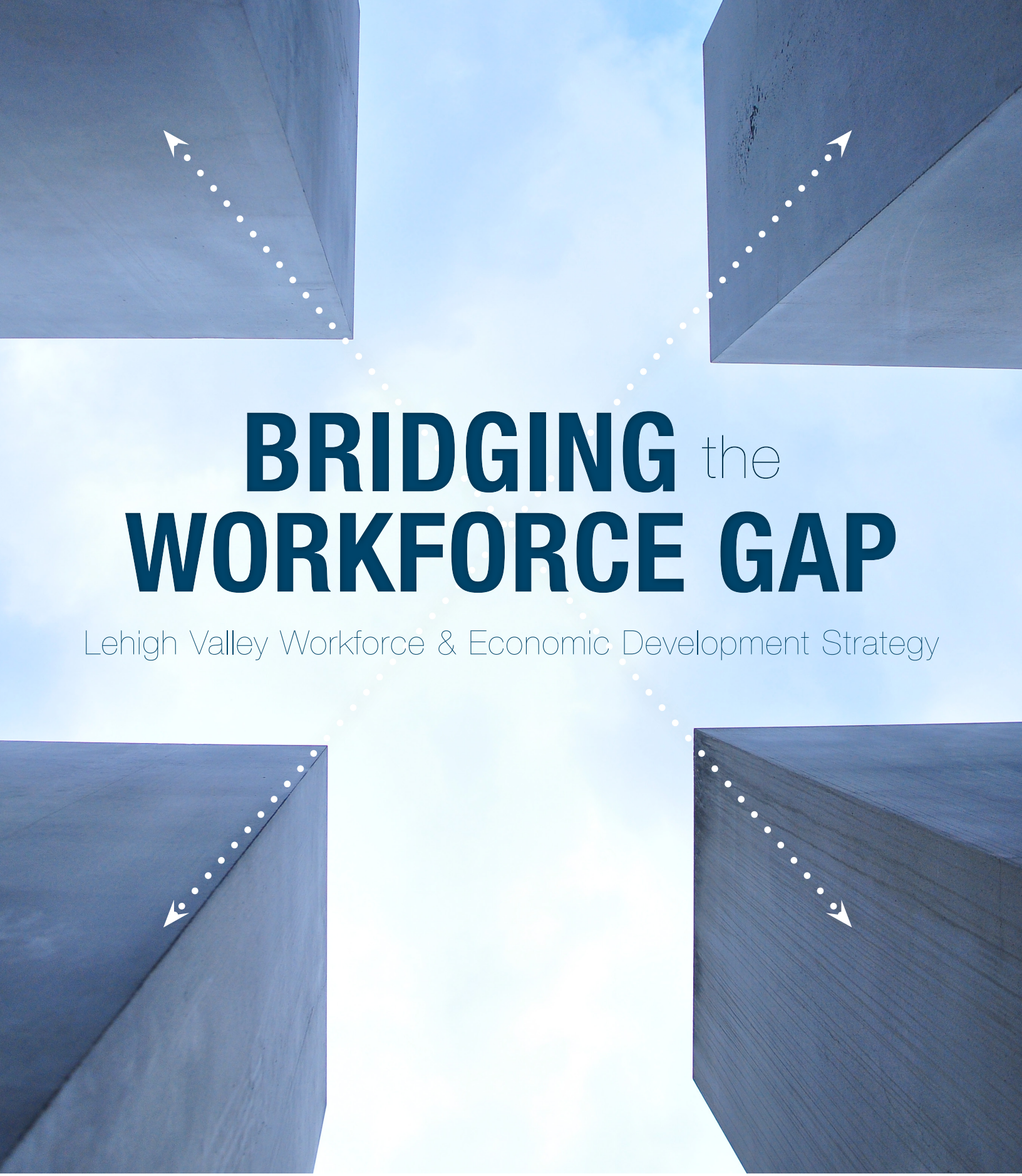

BRIDGING the WORKFORCE GAP

Lehigh Valley Workforce & Economic Development Strategy

A report to Lehigh Valley Workforce Investment Board, Inc. and Lehigh Valley Economic development Corporation

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OXFORD ECONOMICS

CONTENTS

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The continued road to recovery in Pennsylvania requires quality workforce, education and training programs that deliver the knowledge, skills and abilities needed to support current industry, foster economic growth, promote incumbent worker advancement and put people back to work in high priority occupations in targeted industry sectors.

In May 2014, the Lehigh Valley Workforce Investment Board, Inc. and the Lehigh Valley Partnership for Regional Economic Performance, which includes the Lehigh Valley Economic Development Corporation, Small Business Development Center at Lehigh University and Manufacturers Resource Center, received grant funding from the JOBS1st Lehigh Valley Collaborative. This Collaborative includes several goals to accelerate workforce development, including the development of a Workforce and Economic Development Strategy Plan. To achieve this goal, Lehigh Valley required further alignment of data and workforce intelligence in tandem with the Pennsylvania Center for Workforce Information and Analysis.

This study serves as a catalyst and case study for the continued strategic alignment and integration of workforce development, education and economic development in the Lehigh Valley.

SCOPE OF REPORT

The Lehigh Valley Workforce and Economic Development Strategic Plan assesses the workforce training system in the region and includes a gap analysis to support economic growth of target industries. The primary objectives of research in this report focus on examining regional talent pipeline, cataloging the region's workforce support service providers, identifying target sectors and future workforce needs, completing a gap analysis of education talent output compared to occupation demand, assessing resource efficiency, and recommending implementation strategies.

REGIONAL BACKGROUND

The U.S. economy is experiencing significant post-recession recovery across many regions in the nation, with GDP growth rates hitting 11-year highs in the last half of 2014.[1] Lehigh Valley's economy has reaped much of the gains of national growth, combined with regional strengths, adding more than 22,100

1 Oxford Economics database

new jobs between 2010 and 2014. Certain industries such as management of companies and enterprises; administrative and support activities; and transportation and warehousing have experienced job growth in excess of 10, 20 and even 40 percent, respectively, over the past 5 years.

The results of this exceptional job growth require specific, focused action within the education and workforce training system to ensure that an adequate supply of talent will continue to meet the demands of businesses within Lehigh Valley. Similarly, areas of talent supply that are overabundant require strategies and action to ensure alignment to career opportunities and ultimately growth and retention of talent within Lehigh Valley.

EXECUTIVE SUMMARY

This summary outlines specific data-driven findings and strategies to better align education, workforce development and economic development activities to support the talent needs of businesses in five key sectors within Lehigh Valley. Through collaboration with leadership at Lehigh Valley Economic Development Corporation and Lehigh Valley Workforce Investment Board, the five key regional sectors identified are: Manufacturing; Transportation, Warehousing and Logistics; Health Care and Social Assistance; Professional, Scientific and Technical Services; and Finance and Insurance.[2] Within these sectors, the leadership team and consultants identified 55 key occupation classifications that represent the primary workforce focus within the target sectors.

Overall, the region's workforce and talent development system is well-aligned to meet the needs of employers, except in a few key occupation and career areas that are unique to key sectors. This reflects a well-established and integrated workforce and education system. Specific occupations that warrant an increase in post-secondary education and training are centered primarily in manufacturing, transportation and finance. Some health care occupations also show a need for better education alignment.

Although the region has done well in supplying the needs of employers in most occupations, this study's gap analysis revealed that 14 out of 55 key occupation classifications are under-represented in the current education and talent development system, creating a gap between the projected demand and existing supply of talent. Seven of these 14 occupations fall within the manufacturing sector, including maintenance & repair workers, carpenters, machinists, machine operators, supervisors-mechanics & production/operating workers, electricians, and industrial machinery mechanics. Other sectors with a projected demand gap include Health Care & Social Assistance (home health aides, nursing assistants, EMTs & paramedics); Transportation, Warehousing & Logistics (truck drivers, truck mechanics diesel engine specialists) and Finance & Insurance (insurance sales agents; securities, commodities and financial services sales agents).

2 For a description of the selection criteria, please see section 5 of the report.

Conversely, there are 4 out of 55 occupations in which the region appears to be generating too many completions, creating a supply surplus that exceeds the projected workforce demand. This includes three occupations in Health Care & Social Assistance sector (medical assistants, pharmacy technicians & registered nurses), and one in the Manufacturing sector (welders, cutters, solderers & brazers). These occupations identified to have a demand gap and supply surplus present opportunities for continued improvement and excellence in the education and talent development system, and this study presents potential key strategies that will help position Lehigh Valley to address future workforce needs.

Lehigh Valley is in a unique position of opportunity. Net new job growth is very positive within the region, which creates significant opportunities for residents to begin careers as well as advance careers. The region is home to numerous educational institutions that cover a range of post-secondary training levels across many career disciplines. This convergence of job growth and education availability enables a range of implementation strategies and flexibility for regional economic and workforce advancement, many of which are described in the subsequent pages of the executive summary.

OTHER KEY FINDINGS

- The demographic mix of Lehigh Valley residents appear to be becoming more equally distributed over the next five years. A rise in the more mature demographic (55-69 years old), coupled with a rise a younger demographic (20-39 years old) and a decline in the middle-age demographic (40-59 years old), indicates increased diversity of Lehigh Valley's age range.
- Historic declines in grade 12 enrollment suggest that over the next five years, the pool of Lehigh Valley youth applicants to post-secondary institutions in LV will shrink. This reflects the overall decline in the 16-19 year old cohort through 2019 and further implies that alternative strategies to recruit learners and ensure a robust post-secondary-trained talent pipeline is locally produced.
- Lehigh Valley residents typically work in Lehigh Valley. About 35% of LV residents commute out of the region for work, normally toward Philadelphia or across the border into New Jersey. Data indicates that about half of the residents who commute out of the region earn in excess of $3,333 per month and are in professional and service industries.

- Analysis of regional wage/compensation differences show that wholesale trade; information; manufacturing; finance and insurance; and professional scientific and technical services are sectors that have substantial wage differences between Lehigh Valley, Central New Jersey (Hunterdon, Somerset, Middlesex and Mercer Counties) and the Philadelphia MSA. Manufacturing in Central New Jersey shows a wage difference of approximately $32,000/yr. compared to Lehigh Valley.[3] Finance and insurance in both Central New Jersey and Philadelphia pay roughly $30,000/yr. more compared to Lehigh Valley. Professional, technical and scientific services in Central New Jersey pay about $36,600 more than Lehigh Valley. Ultimately, wage differences in nearby locations can entice an increased number of commuters, as shown by the commuting data in the observation above.
- Projections indicate that Lehigh Valley will add 22,150 new jobs over the next five years. Notable sectors include: health care and social assistance (10,100 new jobs); transportation and warehousing (3,700 new jobs); finance and insurance (3,150 new jobs) and professional, scientific and technical services (2,450 new jobs).
- While manufacturing jobs are projected to decline overall, certain specific manufacturing industries show strong new job growth. Projections indicate that fabricated metal product manufacturing and electrical equipment, appliance and component manufacturing will add more than 600 new jobs over the next five years. Wood product manufacturing, plastics and rubber manufacturing and machine manufacturing also indicate strong new job growth through 2020.
- Though manufacturing shows an overall decline in job growth, output/productivity is on the rise. This largely stems from more advanced productive machinery and technology, resulting in fewer, more technically proficient jobs.

OVERVIEW OF KEY STRATEGIES

Based on the key findings, a number of strategies emerged. Several are higher-level general strategies that focus more on continued strengthening of Lehigh Valley's economic development, workforce development and education structure,

3 Much of the wage difference can be explained by the different composition of manufacturing employment in each of the locations. Central New Jersey typically has more technically advanced manufacturing and pharmaceutical manufacturing, which has higher levels of compensation on average, compared to Lehigh Valley's broader base of manufacturing sectors.

predominately through increased engagement and collaboration. Other strategies focus specifically on addressing a gap or surplus within the education and talent development system. The following outlines high-level strategies:[4]

GENERAL STRATEGIES

- Development of an ongoing process to update and track workforce/ talent supply and demand.
- Institute regular opportunities for LVWIB and LVEDC to share individual organization data and findings with the broader public, such as an Annual Summit or establishing regular events.
- Build a strong collaborative environment with education. This would include the establishment of a Talent and Education Supply Council with an aim to increase the workforce and economic development linkages with education and business.
- Establish linkages and articulation agreements between education programs and institutions.
- Incorporate LVWIB's common employability skills in all public and private education training curricula in Lehigh Valley.
- Decrease high school dropout rates through expansion of "Graduate Allentown" and other dropout intervention agencies/organizations.
- Integration of Workforce Innovation and Opportunity Act (WIOA) standards for measuring success and return on investment of the workforce system.
- Establish LVWIB's workforce system called PA CareerLink® Lehigh Valley as a National Occupational Competency Testing Institute (NOCTI) Industry Resource Center for technical assessments.
- Build capacity for adult education, literacy and English language acquisition,
- Identify and analyze transportation issues impacting workforce development.

FOCUSED STRATEGIES

Manufacturing

- Identify and prioritize demand gaps that align to industry-recognized post-secondary vocation, credentials, certificates and degrees.

4 More detailed explanation and recommended implementation are further described in the report

- Develop a community campaign to build better awareness of opportunities in manufacturing, especially careers with demand gaps.
- Engage companies in industry sectors showing decline in jobs, before a worker adjustment and retraining notification (WARN) is issued, specifically to build a more integrated response process to support companies that may be encountering difficulties that Lehigh Valley public organizations can address.
- Continuation of connecting dislocated workers from declining manufacturing sectors to opportunities in growth sectors.
- Engagement with employers to identify root causes of supply/talent issues.
- Target and engage employers in growth sectors to better determine competency and skills needs.
- Develop a manufacturing collaborative that involves small, medium and large manufacturing employers.
- Develop a fully integrated mechatronics program for traditional and non-traditional and incumbent workers.

Transportation, Warehousing and Logistics

- Develop a database for Lehigh Valley that tracks enrollment and completions in truck driving—link database to General Strategy 1 (ongoing process to track talent supply and demand).
- Conduct a marketing campaign to reimage/rebrand occupations within transportation, warehousing and logistics.
- Establish a transportation, warehousing and logistics employer partnership that is separate from the current manufacturing employer partnership.
- Engage transportation/warehousing and third party logistics (3PL) community to determine willingness to support education development in shipping clerk occupations.

Health Care and Social Assistance

- Identify and prioritize demand gaps that align with industry recognized post-secondary vocation, credentials, certificates, and degrees.
- Market career pathways into emerging health occupations, given the large demand gap for specific direct care workers such as community health workers and home health aides.

- Expand enrollment pipeline and entry-level technical training.
- Analyze existing health care workers skills and seek to transition to higher demand occupations.
- Develop career pathway guide and engagement strategy to help reduce talent surplus in specific health care professions such as medical assistants.
- Expand industry partnership to explore and analyze working with local medical college training.
- Expand community college healthcare program pipeline to medical college.

Finance and Insurance

- Develop a customer service representative training program specifically targeting call center operations for the financial services sector.
- Engage employers in sector and other relevant sectors to determine if employers are having difficulties finding talent in this career. This stems from a finding that indicated a low pipeline of office management program completions.
- Develop a system to measure state licensing passage rates for key high-demand occupations such as financial advisers and insurance sales agents.
- Coordinate with employers to further contextualize the outcommuting talent issue and the extent that employers are affected. This would involve communicating wage differences with Lehigh Valley businesses, as well as coordinating a joint response within LVEDC and employers to promote careers, opportunities and recruitment strategies within Lehigh Valley.

Professional, Scientific and Technical Services

- Expand the role of the LVEDC's Entrepreneurship Council of the Lehigh Valley.
- Establish an LVWIB Industry Partnership.

GENERAL STRATEGIES

	Finding	Recommended Strategy	Recommended Implementation	Lead
1	Skill sets of learners in the LV are fairly well aligned with the occupational demand for the skills being developed.	Develop an ongoing process for tracking workforce supply and demand.	1a. Use Gap Analysis as aid in curriculum review/development and evaluate program effectiveness through engagement with education providers.	LVEDC, LVWIB
			1b. Expand the Gap Analysis to include an ongoing data-driven employer survey that gathers real-time information about workforce needs, competencies, hiring trends.	LVEDC, LVWIB
			1c. Establish an annual report of the demand and supply, based on the methodology in the report and enhance data gathering to include employer-specific feedback on workforce needs.	Education Providers
			1d. Develop a sector based business “open house” to encourage understanding of employers needs for high-demand occupations.	LVEDC and LVWIB
2	Both LVWIB and LVEDC indicated a strong desire via interviews with leadership to work more closely.	Institute regular opportunities to share individual organizational data and findings.	2a. Conduct regular meetings with each organization’s leadership.	LVEDC and LVWIB
			2b. Co-sponsor regular events in the community such as an Annual Summit. (The findings of this report could serve as the inaugural event.)	LVEDC and LVWIB
3	Via a meeting with trainers and educators, institutions indicated a strong desire to report data accurately. Not all education institutions report to IPEDS.	Build a stronger collaborative environment with education	3a. Establish an Education Council with the goal of increasing collaboration on labor market information that impacts training, credentials, certificates, degrees and career pathways	LVEDC and LVWIB
			3b. Establish a dual role between economic and workforce development to ensure academic training pipeline success.	LVEDC, LVWIB, Training Providers
4	Some educational institutions and training providers lose track of learners after program completion. As a result, it is difficult to measure employment success or continuing education.	Establish linkages and articulation agreements between education programs and institutions.	4a. Evaluate current credit acceptance across vocational and higher levels of skilled education programs.	LVWIB, Training Providers
			4b.Where gaps exist that prevent learners from transferring credits, work with institutions to build articulation agreements to allow credit transfer.	LVWIB and LVEDC
			4c. Develop a learner tracking system prioritized by program, which follows a learner through career (or at least first job or two). Determine alignment of employment with program completed. Phase in 1 or 2 programs at a time.	LVWIB, Education Providers
			4d. Track training program success by linking program to job placement, in alignment with the Workforce Innovation and Opportunities Act (WIOA).	LVWIB, Education Providers

	Finding	Recommended Strategy	Recommended Implementation	Lead
5	Most sectors require a set of foundational skills necessary to effectively perform job duties.	Incorporate LVWIB's common employability skills in all public and private education training curricula in Lehigh Valley, as modelled after the National Network on Business and Industry Associations	5a. Education providers and curriculum planners evaluate course and curriculum content to ensure that classroom instruction and learner assessments align to these foundational competencies.	LVEDC, LVWIB, Training Providers
			5b. Through assessment of competencies, education institutions can equip learners with the necessary credentials to signal to employers their work readiness.	
			5c. Develop competency-based training providing verifiable alignment to job requirements.	
6	Region is losing talent from the secondary education system because of dropouts	Decrease high school dropout rates.	Ensure re-engagement strategies are embedded in the K-12 education system. Best Practices: Graduate Allentown and Allentown Re-engagement Center.	LVWIB
7	Workforce Innovation and Opportunity Act (WIOA) has put forth new standards for measuring the success of workforce programs.	Integration of Workforce Innovation and Opportunity Act (WIOA) standards for measuring success and return on investment of the workforce system	LVWIB can build a data-driven program cost-benefit evaluation system that can be used to communicate funding across all mandated programs as well as grant programs, outcomes and estimates of economic benefits that indicate return on investment.	LVWIB
8	The ability to provide nationally accredited assessments and certifications across professional and technical skills will help streamline PA CareerLink® Lehigh Valley's services and better align adult and dislocated workers to careers.	Establish LVWIB's workforce system called PA CareerLink® Lehigh Valley as a National Occupational Competency Testing Institute (NOCTI) Industry Resource Center for technical assessments	Implementation Note: Depending on the assessments performed, PA CareerLink® Lehigh Valley and LVWIB may have to be authorized by other organizations or councils, such as the Manufacturing Skills Standards Council (MSSC).	LVWIB
9	Ensure continued visibility and transparency in the process of selecting vendors	Increase continued transparency between LVWIB and community on selection of training providers and where specific dollars flow.	Engage LVEDC in the Request for Process (RFP) process to ensure that LVEDC aware of new and existing workforce initiatives as they are being formulated.	LVEDC and LVWIB
10	4.1% Northampton County residents and 8.6% of Lehigh County residents over the age of five speak English "less than well." In Allentown, this number is almost 18%. This language barrier prevents working-aged individuals from entering into certain high-demand occupations.	Build capacity for adult education, literacy and English language acquisition	10a. Build capacity for adult education, literacy and English language acquisition activities to provide workforce preparation and integrated education and training within career pathways.	LVWIB, Literacy Providers, Training Providers
			10b. Integrate an English language acquisition program for adults into Lehigh Valley's workforce system.	
			10c. Work with the Greater Lehigh Valley Chamber of Commerce Nonprofit and Business Council to serve as the catalyst for "connecting our community through collaboration" as the next step of systematic integration.	
11	2/3 of Lehigh Valley residents live and work in LV.	Identify and analyze transportation issues impacting workforce development.	11a. Continuously analyze commuting patterns with LANTA.	LVWIB
			11b. Use LANTA to market workforce centers	LVWIB
			11c. Engage counties to improve transportation access to workforce centers	LVWIB

MANUFACTURING

	Finding	Recommended Strategy	Recommended Implementation	Lead
1	Many manufacturers in the Lehigh Valley are expected to grow whereas slightly more are expected to decline (for a net loss of 600 jobs over the next five years), creating significant job churn within manufacturing.	1.S1. Identify and prioritize demand gaps that align with industry recognized post-secondary vocation, credentials, certificates, and degrees.	Develop a marketing plan for manufacturing in high demand occupations.	LVWIB
		1.S2. Develop community campaign to build better awareness of opportunities in manufacturing demand gap areas.		LVWIB
		1.S3. Engage companies in industries with declining jobs (before WARN notice) to determine risk of job loss.	Expand the Integrated Response Team as outlined in the 2014/2015 Jobs 1st grant. Section IV.B.2.f.	LVWIB
		1.S4. Continue the model of connecting dislocated workers from declining sectors into job opportunities in growth sectors.	Continue to use and expand PA CareerCoach and other online career transition tools.	LVWIB
		1.S5. Work with employers to identify root cause of supply/talent issues.	Work with K-12 on career pathways in growth industries.	LVWIB
		1. S6. Target employers in growth sectors to determine competency/ skills.	1.S6.a. Analyze and assess existing training to understand what gaps exist.	LVWIB
			1.S6.b. Develop shared-training program that specifically targets small to mid-sized companies who utilize similar machinery and technology.	LVWIB
			1.S6.c. Utilize training as a foundation for learners who might want to advance into a mechatronics program. Use industry partnerships to develop a shared training platform.	LVWIB
		1.S7. Develop a LV manufacturing collaborative.		LVWIB
2	Part of the decline in manufacturing employment is attributed to increasing advanced manufacturing techniques that require fewer workers with higher level skills.	2.S1. Develop a fully integrated mechatronics program (2-year and 4-year colleges) for traditional and non-traditional/incumbent workers.	2.S1.a.Rebranding of manufacturing training course names (i.e., mechatronics).	LVWIB, Training Providers
			2.S1.b. Develop educational training partnerships onsite in the workforce system to provide training in critical gap areas.	

TRANSPORTATION, WAREHOUSING AND LOGISTICS

	Finding	Recommended Strategy	Recommended Implementation	Lead
1	Truck drivers show a significant gap across multiple driving occupations. Currently, there are about 3 job openings per 1 completion of a CDL program.	Develop a database for Lehigh Valley that tracks enrollment and completions in truck driving programs.	Link database to General strategy 1.	LVWIB, LCTI, NCC and LCCC
			Heighten the importance of this industry through marketing or advertising campaign. Note--Truck trailers provide mobile billboards that would travel all over Lehigh Valley and across the US.	
2	Sector is one of the Valley's largest and expected to grow by 19% over next decade (creating 3,700 new jobs). Heightened focus on the needs of this sector is critically important.	S2a. Marketing to reimage/ rebrand occupation and careers within sector.	Develop educational training partnerships onsite in the workforce system to provide training in critical gap areas.	LVEDC
		S2b. Establish a separate transportation, warehousing and logistics employer partnership apart from manufacturing.	Analyze entire supply chain through the Industry Partnerships.	LVWIB
3	Despite significant demand for key entry and intermediate occupations such as: shipping, receiving & traffic clerks and production planning & expediting clerks, currently no institutions reported training for these occupations.	Engage transportation/ warehousing and 3PL community to determine willingness to support education and training development in this occupation--especially vocational and technical schools.		LVEDC, LVWIB and career/ technical schools

HEALTH CARE AND SOCIAL ASSISTANCE

	Finding	Recommended Strategy	Recommended Implementation	Lead
1	Demand exists for direct care workers to support licensed health care professionals due to limited in-patient demand vs. increased out-patient demand.	Identify and prioritize demand gaps that align with industry recognized post-secondary vocation, credentials, certificates, and degrees.		LVWIB and Health Care Employers
2	There is a significant demand gap in Community Health Workers and Home Health Aides.	2. S1.Market career pathways into emerging health occupations.		LVWIB and Health Care Employers
		2.S2. Expand entry level technical training.	Explore capacity capabilities with area training providers	LVWIB and Health Care Employers
		2.S3. Expand enrollment pipeline.	Coordinate with high school counselors and career service providers.	LVWIB, K-14 Education
3	Significant demand exists for entry-level technical careers within healthcare and this will continue to grow substantially over the next five years.	3.S1. Analyze existing health care workers skills in order to transition to higher demand occupations.	Provide dislocated workers with Career Maps that shows the path along a career continuum.	LVWIB
		3.S2. Develop a Career Pathway to reduce talent surplus levels in other health care professions and provide a transition guide.		LVWIB
		3.S3. Expand Industry Partnership to explore and analyze working with local medical college training.		LVWIB
		3.S4. Expand Community College healthcare program pipeline to medical college.		LVWIB

FINANCE AND INSURANCE

	Finding	Recommended Strategy	Recommended Implementation	Lead
1	Customer service occupations show significant demand across all sectors and is specifically critical within the finance and insurance sector	Develop a customer service representative training program specifically targeting call center operations for the financial services sector.		LVWIB, Training Providers
2	Office management and support occupations appear to lack adequate training pipeline	2.S1. Review data and engage employers in this sector and other relevant sectors to determine if employers are having difficulties finding talent in these occupations	Produce list of various job titles and descriptions that can be used to better engage employers to define need	LVWIB
		2.S2. Work with high school guidance counselors to increase career awareness of high demand occupations.		LVWIB
		2.S3. Connect 2 or 4 year programs to incumbent worker training opportunities for those in various office functions that are related to First-line Supervisors of Office and Admin Support.	First Line Supervisors are often promoted from the technical position for which they were initially recruited to a supervisory role. Some non-finance employers reported that incumbent training might make this transition easier	LVWIB, Training Providers
		2.S4. Establish career and education pathway marketing campaign to describe opportunities from post-secondary vocational awards to 2-year and 4-year degreed programs		LVWIB , Training Providers
3	Some key high-demand occupations require state licensing and often correspond to 4-year degrees (e.g. insurance sales agents, financial advisers, etc.)	Develop a system to measure state licensing passage rates in Lehigh Valley	3a. Compare passage rates against average annual demand for the occupation.	LVEDC, LVWIB, 4-year colleges
			3b. If gap exists, evaluate the feasibility of establishing, extending/modifying a program at a four year university	
4	Wages in adjacent New Jersey counties for the Finance and Insurance sector are 34% higher than in Lehigh Valley, which likely results in commuting toward these areas and others in search of higher earnings.	4.S1. Coordinate with employers to further contextualize the outcommuting talent issue and the extent that employers are affected	4a. Identify potential employer responses for supporting talent attraction/retention, such as work from home, flexibility, etc. to compete on non-wage, quality of life alternatives.	LVEDC and LVWIB
		4.S2. Communicate wage differences with businesses in Lehigh Valley		LVEDC
		4.S3. Coordinate joint industry-LVEDC response to promote careers, opportunities and recruitment strategies to draw out-commuting residents back into jobs in the region, or recruit new talent into Lehigh Valley.	4b. Develop a talent attraction/retention online portal and structure for more engaged social networking within Lehigh Valley	LVEDC and LVWIB

PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES

	Finding	Recommended Strategy	Recommended Implementation	Lead
1	Sector projected to add more than 2,400 new jobs over the next five years. Sector also characterized by many small businesses.	1.S1. Expand the role of the Entrepreneurship Council of LVEDC 1.S2 Establish LVWIB Industry Partnership	Connect talent in related programs/disciplines to small business community & incubator/Ben Franklin	LVEDC, Education Providers
2	The sector and occupations (especially those requiring Bachelor's or higher) pay significantly less in the region compared to neighboring areas. Companies routinely reported that search areas for professional and scientific talent routinely stretch to NJ for entry and mid-level. Senior searches typically require national searches.		Build awareness campaign of job or business development opportunities in Lehigh Valley for learners with degrees--especially: Computer Science, Engineers and Software Developers	LVEDC
			Link entrepreneurship opportunities with Ben Franklin and Small Business Development Center at LU to grow existing entrepreneurship base within the region	LVEDC

1: INTRODUCTION

In recent years, leadership from the Lehigh Valley Economic Development Corporation (LVEDC) and the Lehigh Valley Workforce Investment Board, Inc. (LVWIB) has undertaken proactive roles in local and regional economic, workforce and education data collection. Both organizations regularly produce summary reports and research findings on the Valley's economy. Most recently, both organizations recognized a need to engage in a rigorous data-driven process of identifying workforce gaps and subsequent strategies. To achieve this goal, Lehigh Valley Partnership for Regional Economic Performance (of which LVEDC is a member) partnered with LVWIB to secure a JOBS1st PA Regional Partnership Grant from Pennsylvania. JOBS1st grants were designed to better align resources and training efforts across Pennsylvania and more specifically, "develop better employer-driven training programs so that job seekers acquire the skills needed to match jobs available now and into the future."[5]

This project helps to address one of eight goals of the Lehigh Valley collaboration, specifically: the creation of the Workforce and Economic Development Strategic Plan. The primary focuses of the research emphasize:

- Examining the talent pipeline, both training providers and workforce supply
- Catalogue region's workforce support service providers
- Identifying target sectors and articulate future workforce needs
- Complete a gap analysis of education talent output compared to occupation demand
- Assess resource efficiency and areas where economies of scale can be created
- Recommend implementation strategies
- Identify best practices or innovative programs at the state or national level

5 Press Release 5/8/2014: Office of the Governor: Governor Corbett Awards JOBS1st PA Regional Partnership Grants to Strengthen Workforce Development Collaboration

This report outlines key data findings, strategies and best practices and informed feedback from area businesses and stakeholders focused on driving regional prosperity through education, workforce development and economic development collaboration. While many broad strategies can be undertaken and focused across many different sectors, resources are limited. As such, prioritized strategies focused on five key sectors, specifically: Health Care and Social Assistance; Manufacturing; Transportation, Warehousing and Logistics; Finance and Insurance; and Professional, Scientific and Technical Services are described. Using an occupation-based approach to identify skill needs within each sector, we identified 54 target occupations that met specific criteria of education level, compensation and demand (or growth).

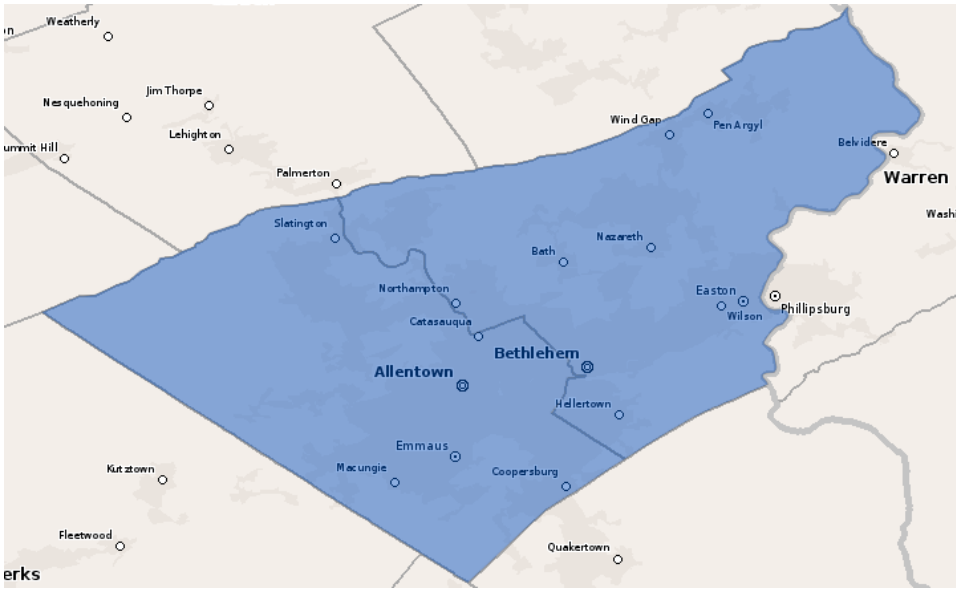
Lehigh Valley's current education and talent development system appears well aligned across the bulk of occupations and careers within the region. There are certain areas of semi-skilled and high-skilled occupations that show notable surpluses or gaps. The majority of the strategies outlined focus on a locally produced approach to filling talent needs, as opposed to relying on importing talent to meet demand. The development and deployment of a locally produced strategy requires close integration of economic development, workforce development, education, industry partners and community leaders to mobilize resources, convene relevant parties, build awareness and/or implement strategies. Strategic focus should largely be sector-based in order to maximize reach and address workforce issues that are widespread in Lehigh Valley and in some cases the U.S.

This report is broken into 12 sections. Sections 2 – 4 describe regional characteristics, trends and other broader economic information. Section 5 provides more detailed background of the key sectors and target occupations. Section 6 highlights key findings from the gap analysis. Section 7 provides an overview of general strategies and best practices that can be applied in Lehigh Valley. Sections 8 – 12 provide sector-specific findings about industry growth/decline, target occupation gaps, as well as strategies, discussion and best practices. Further detailed data, methodology and content can be found in the addendums.

2: LEHIGH VALLEY

Lehigh and Northampton counties comprise the geographic area of Lehigh Valley. Within the context of this research, industry, occupation and education data that is presented, reflects this geography.

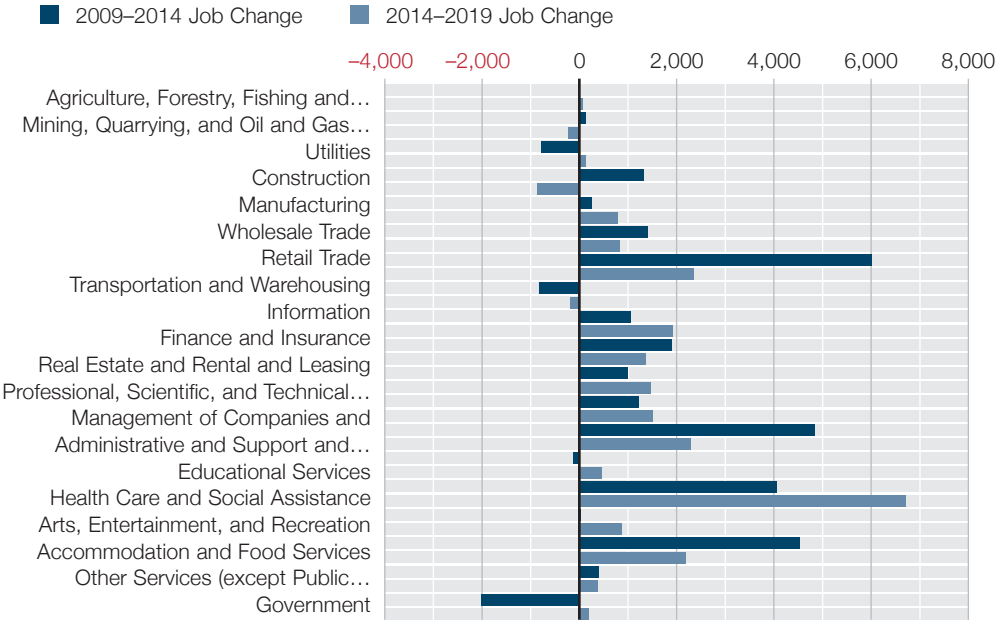
FIGURE 2.1: Map of Lehigh Valley



3: REGIONAL JOB GROWTH OVERVIEW

Historically, Lehigh Valley has seen significant net growth over the past five years, resulting in the creation of over 24,400 new jobs. Overall economic activity appears to be strengthening in several key sectors, including: health care and social assistance; transportation and warehousing; business services; finance and insurance and accommodation and food services. Furthermore, the region is projected to add 22,150 new jobs over the next 5 years. Notable growth in sectors that require more skilled labor include: health care and social assistance (10,100 new jobs); transportation and warehousing (3,700 new jobs); finance and insurance (3,150 new jobs); and professional, technical and scientific services (2,450 new jobs). Figure 3.1 outlines historic and projected growth by 2-digit NAICS sector.[6]

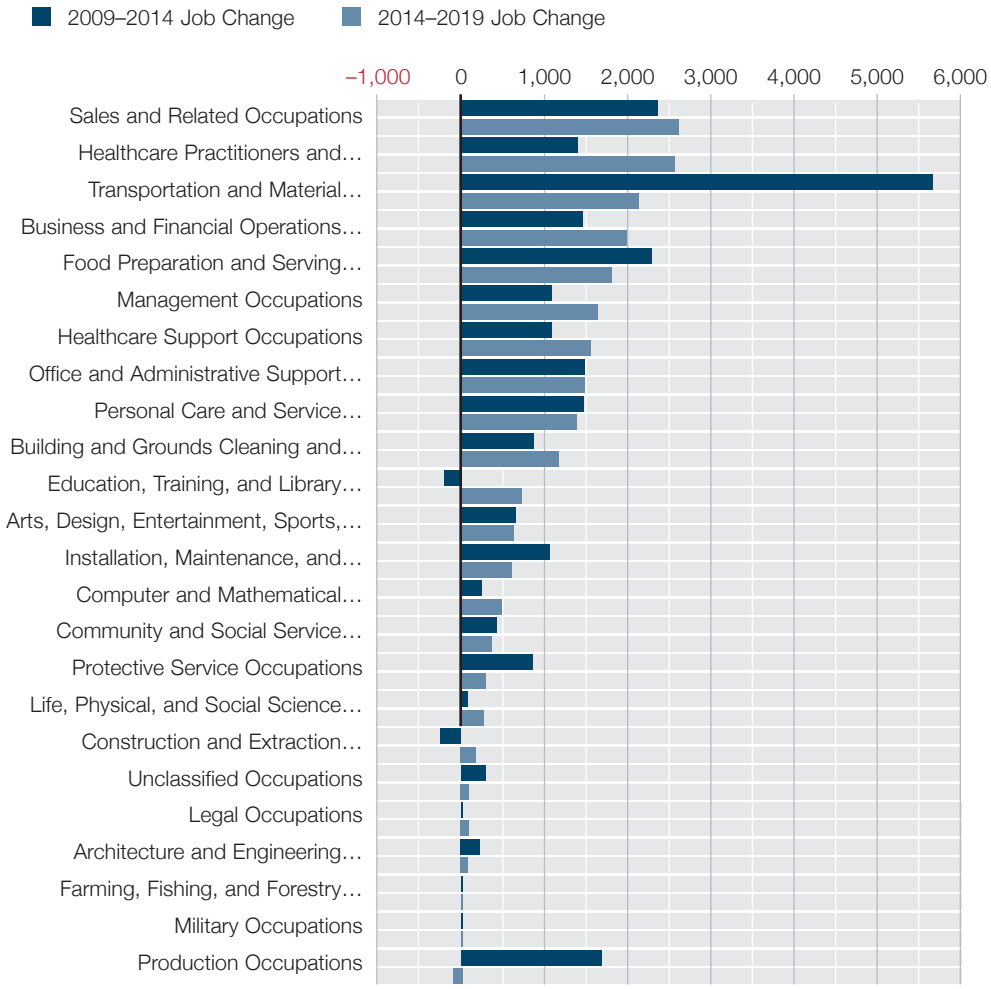
FIGURE 3.1 – Historic and Projected Industry Change



6 NAICS refers to the North American Industry Classification System, a hierarchical system used to define and describe industry sectors

Similarly, industry growth spawns growth and demand for occupations that are employed within those growing sectors. As such, some of the fastest growing occupations within Lehigh Valley include: transportation and material moving, sales and related, healthcare practitioners and technical occupations and business and financial occupations. Collectively, these top growing occupations make up 45% of the historic job growth and 42% of projected new job growth. Figure 3.2 outlines to growth by 2-digit SOC code.[7]

FIGURE 3.2 – Historic and Projected Occupation Job Growth



7 SOC refers to Standard Occupation Classifications, a hierarchical coding system for describing occupation categories and functions.

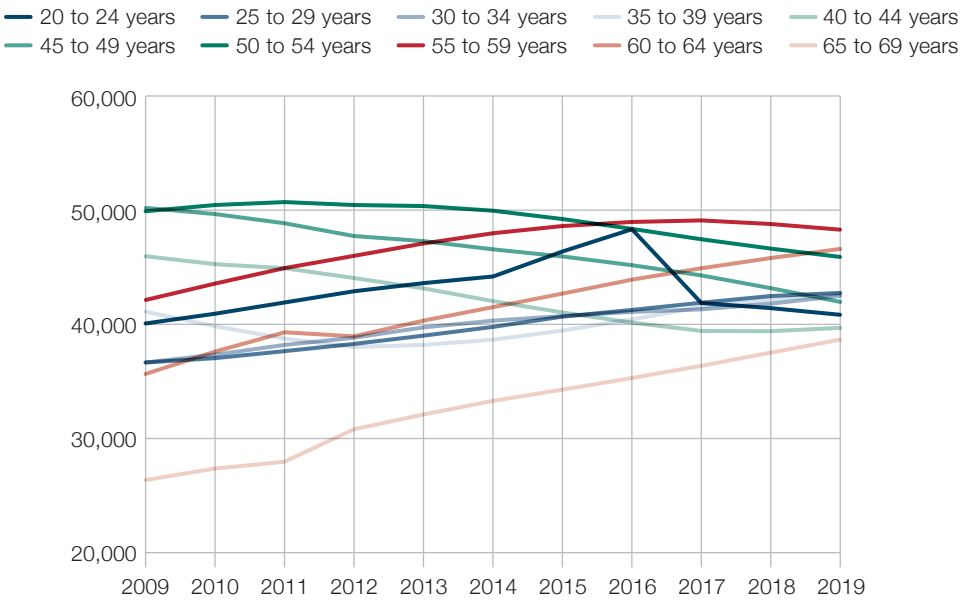
4: REGIONAL WORKFORCE AND EDUCATION

WORKFORCE CHARACTERISTICS

This section outlines key attributes of Lehigh Valley's workforce and education output, specifically: demographics, commuting patterns, a comparison of wages in neighboring regions, high-school graduation changes and dropouts, post-secondary enrolment and post-secondary completions.

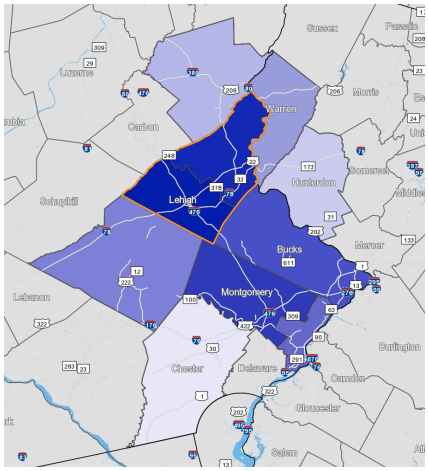
Looking at the breakdown of the working-age demographic,[8] a historic and projected "convergence" indicates that there will be a more even population distribution across cohorts. Interestingly, a rise in younger ages (20-39 years old) is largely offset by a decline in middle-aged workers (40-54 years old), while the mature population shows significant growth.

FIGURE 4.1 – Lehigh Valley Working-Age Population by Cohort



8 Working-age demographic does not presume current employment. This only evaluates the age distribution of Lehigh Valley residents.

FIGURE 4.2 – Where Lehigh Valley Residents Commute



	Count	Share
All Counties	276,177	100.00%
Lehigh County, PA	112,976	40.90%
Northampton County, PA	66,317	24.00%
Montgomery County, PA	13,033	4.70%
Bucks County, PA	10,134	3.70%
Philadelphia County, PA	6,229	2.30%
Berks County, PA	5,735	2.10%
Warren County, NJ	5,640	2.00%
Monroe County, PA	4,634	1.70%
Hunterdon County, NJ	3,624	1.30%
Chester County, PA	3,609	1.30%
All Other Locations	44,246	16.00%

As economic and job growth occur in Lehigh Valley, the age diversity of the area's residents may help to ease transition between retiring Baby Boomers and those who can fill vacant job roles. However, a declining middle-age cohort could put some experiential pressure to find specific talent. Of particular interest on this chart is the rapid aging of Lehigh Valley workforce over the next 5 years. Note the rapid rise in workers aged between 60 and 70 years of age; and during that same period workers aged 55-59 will become the single largest cohort in the Valley.

65% of Lehigh Valley residents commute to jobs within Lehigh Valley. Of the remaining 35% of residents who commute to jobs outside of the region, about half earn in excess of $3,333 per month. Most of these workers are in professional and service industries and not manufacturing.[9]

One potential reason for the large level of higher paid outcommuters stems from the differences in industry wages compared to nearby areas. Figure 4.3 on the next page shows the top wage differences compared to the Philadelphia area and Central New Jersey in five sectors. For example, in a relatively short travel distance, workers in finance and insurance can increase their wage/salary by about 35% and workers in professional, technical and scientific services can increase their wage/salary by about 42%. Many of the top wage differences also align to the target sectors in Lehigh Valley.

Strategies for beginning to address this issue are described in the finance and insurance and professional, scientific and technical services sections of this report.

9 Information compiled from U.S. Census Longitudinal Employment and Housing Dynamics.

FIGURE 4.3 – Wage Differences between Lehigh Valley, Central New Jersey and Philadelphia MSA

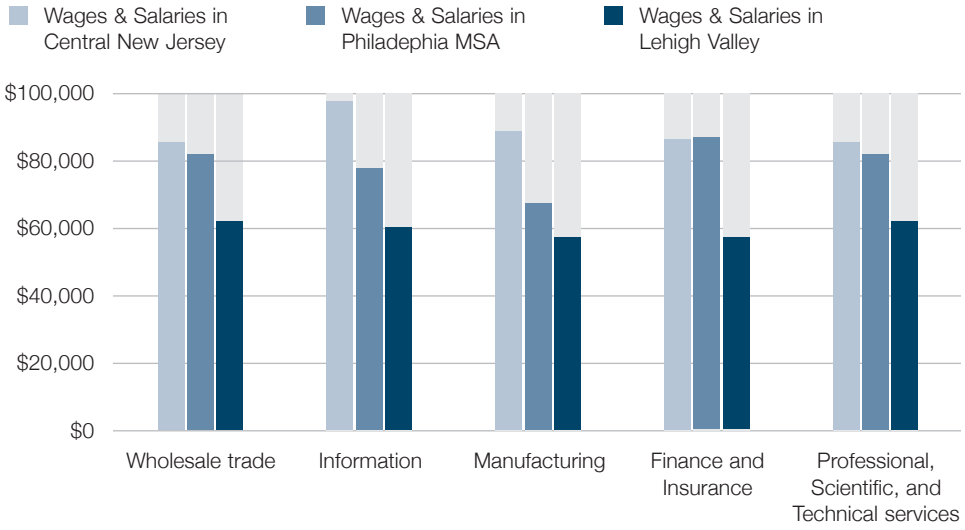


TABLE 4.1

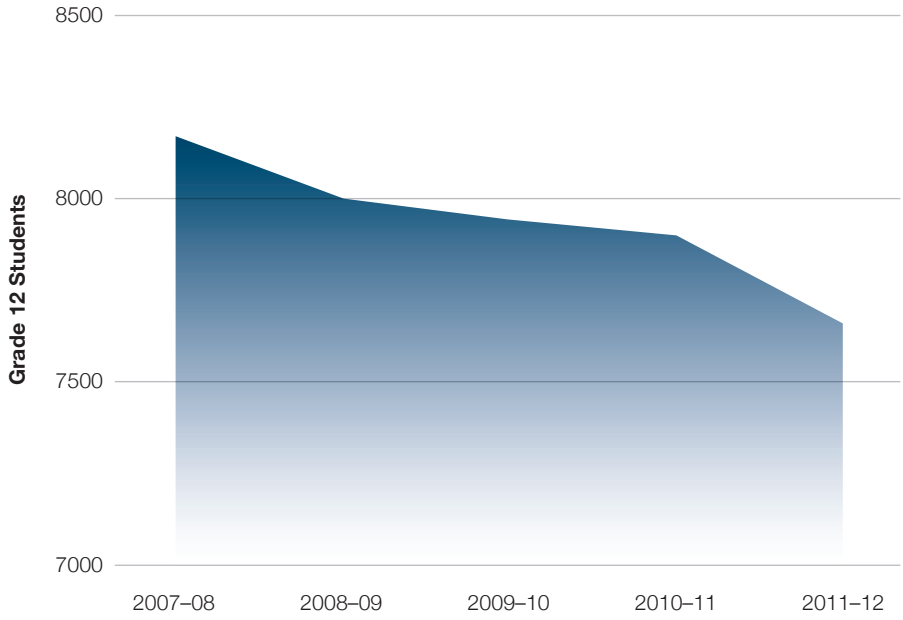
NAICS Code	Industry Sector Category	Wages & Salaries in Central New Jersey	Wages & Salaries in Philadelphia MSA	Wages & Salaries in Lehigh Valley
42	Wholesale Trade	$85,196	$81,337	$61,872
51	Information	$97,914	$77,636	$59,726
31	Manufacturing	$89,056	$67,074	$57,164
52	Finance and Insurance	$86,197	$86,957	$56,627
54	Professional, Scientific, and Technical Services	$84,601	$81,097	$47,989

* Represents average of all occupations within industry in the sector. Note: that the composition of specific industry classifications within each area are different, which would likely result in total industry wage differences.

EDUCATION SUPPLY

A key segment of future talent, post-secondary enrollment and ultimately long-term residents originate in the K-12 system. High school completions have been steadily declining, predominately due to a decline in enrollment. This simply reflects a decrease in the number of families with high school aged children. Projections indicate that the high school demographic will begin to increase within the next five years. Figure 4.2 illustrates the historic decline in Grade 12 enrollment.

FIGURE 4.2 – Lehigh Valley Public School—Grade 12 Enrollment



5: TARGET SECTORS & KEY OCCUPATIONS

SELECTION OF TARGET INDUSTRY GROUPS

In December 2014 EMSI and Oxford Economics worked closely with the LVEDC/LVWIB leadership team to arrive at a list of five industry sectors that meet key criteria that warrant focused strategies. The process of identifying the five industry sectors involved alignment with:

- Previous LVEDC research and strategies completed in collaboration with Garner Economics
- LVWIB research on the Lehigh Valley economy and workforce
- Pennsylvania Target Industries

The team also considered key data attributes, such as employment growth, wages, and employment concentration. Other considerations included, tacit knowledge of the economy including key employers, intended growth by new or incumbent companies, and whether the industries in question were capable of driving growth in other industries. Through this process the leadership team selected the following five industry sectors:

- Healthcare & Social Assistance
- Manufacturing
- Finance & Insurance
- Professional, Scientific & Technical Services, and
- Transportation & Warehousing

Together, these sectors make up 158,800 (about 44%) of the total jobs in the region.

KEY OCCUPATIONS

With target industry groups identified, EMSI and Oxford Economics went through an iterative process to identify key occupations. Specifically, key occupations:

- Should typically offer an average wage equal to or higher than the "living wage" for the region. Living wage is based on MIT's living wage calculator and using a family with 2 adults and 1 child as a rough proxy for an average family (approximately $16.58/hour).
- Should have a typical entry level of education requiring some form of postsecondary education (e.g. non-degree award through and professional (or PhD) degree.
- Should have at least 75 workers in 2014.
- Preference was giving to occupations with a high "% of total jobs in the target sector" as this indicates occupations that are particularly concentrated within each industry sector.

In certain instances of exceptionally high demand or a particular workforce focus, certain criteria were relaxed. The leadership team added a few additional occupations that also warranted targeted effort. In total, 54 key occupations comprise the workforce focus of the target sectors. The full, detailed list of these occupations can be found in table 5.1.

In aggregate, occupations within the target group are clearly significant to the long-term economic health of the Lehigh Valley region. Many of the target occupations are STEM or Green and reflect a strong need to support emerging high-skilled talent needs within the area. Some initiatives, which include collaboration between K-12 education, LVEDC and LVWIB are already underway to support this growing demand. The Lehigh Valley STEM Education Plan outlines strategies to begin address the future demand and pipeline of STEM education in order to competitively position Lehigh Valley as a STEM economy.[10] Other occupations are also classified as "high priority occupations" which indicates a significant demand for talent to support the needs of regional businesses.

Several statistics can be cited to provide rationale for the selection of these occupations 2014, the target occupations composed 24% of the Valley's employment, but between 2014 and 2024 these occupations will compose

10 This initiative includes collaboration amongst the Da Vinci Science Center, K-12 Education, LVEDC, LVWIB, area businesses and community leaders

28% of regional growth. This indicates that the target occupations are gaining a larger presence in the regional workforce, relative to other occupations. In terms of median wages, the target occupations earn $21.18/hour, compared to the regional average of $19.56/hour, indicating that investment in these occupations will, by and large, improve the lives of Lehigh Valley residents by raising regional wage levels.

TABLE 5.1 – List of Target Occupations for Lehigh Valley, with Jobs Earnings and Projected Growth

SOC Code	Occupation	2014 Jobs	2014 Median Hourly Earnings	2014-2019 Projected % Growth	Primary Industry Category
11-2022	Sales Managers	600	$48.03	17%	Supportive
11-3051	Industrial Production Managers	436	$46.17	8%	Manufacturing
13-2011	Accountants & Auditors	3,075	$29.76	11%	Multiple Categories, Finance & Insurance, Professional, Technical & Scientific Services
15-1121	Computer Systems Analysts	1,062	$36.24	19%	Multiple Categories, Finance & Insurance, Professional, Technical & Scientific Services
15-1131	Computer Programmers	598	$34.61	3%	Professional, Technical & Scientific Services
15-1132	Software Developers, Applications	1,110	$37.15	12%	Professional, Technical & Scientific Services
15-1133	Software Developers, Systems Software	580	$48.47	13%	Professional, Technical & Scientific Services
15-1134	Web Developers	418	$23.31	23%	Professional, Technical & Scientific Services
15-1142	Network & Computer Systems Administrators	816	$32.62	7%	Professional, Technical & Scientific Services
15-1151	Computer User Support Specialists	1,113	$20.03	13%	Professional, Technical & Scientific Services
15-1152	Computer Network Support Specialists	301	$28.52	8%	Professional, Technical & Scientific Services
15-1152	Computer Network Support Specialists	301	$28.52	8%	Professional, Technical & Scientific Services
17-2051	Civil Engineers	576	$32.89	9%	Professional, Technical & Scientific Services
17-2071	Electrical Engineers	364	$38.36	7%	Manufacturing

SOC Code	Occupation	2014 Jobs	2014 Median Hourly Earnings	2014-2019 Projected % Growth	Primary Industry Category
17-2112	Industrial Engineers	572	$40.66	11%	Manufacturing
17-2141	Mechanical Engineers	491	$40.58	13%	Multiple Categories, Manufacturing, Professional, Technical & Scientific Services
17-3024	Electro-Mechanical Technicians	17	$23.01	18%	Professional, Technical & Scientific Services
17-3026	Industrial Engineering Technicians	110	$26.48	8%	Manufacturing
21-1094	Community Health Workers	88	$13.32	16%	Healthcare & Social Assistance
29-1141	Registered Nurses	6,505	$31.73	20%	Healthcare & Social Assistance
29-2041	Emergency Medical Technicians & Paramedics	916	$17.82	21%	Healthcare & Social Assistance
29-2052	Pharmacy Technicians	743	$13.47	7%	Healthcare & Social Assistance
31-1011	Home Health Aides	3,239	$9.72	23%	Healthcare & Social Assistance
31-1014	Nursing Assistants	5,028	$13.50	15%	Healthcare & Social Assistance
31-1015	Orderlies	52	$12.31	31%	Healthcare & Social Assistance
31-9092	Medical Assistants	1,604	$15.03	17%	Healthcare & Social Assistance
41-3021	Insurance Sales Agents	2,259	$26.59	18%	Finance & Insurance
41-3031	Securities, Commodities & Financial Services Sales Agents	2,004	$22.30	33%	Finance & Insurance
41-4011	Sales Representatives, Technical & Scientific Products	503	$39.79	14%	Manufacturing
43-1011	Supervisors - Office & Administrative Support Workers	2,825	$25.87	9%	Professional, Technical & Scientific Services
43-4051	Customer Service Representatives	6,336	$15.04	6%	Finance & Insurance
43-5061	Production, Planning & Expediting Clerks	858	$23.00	8%	Transportation & Warehousing
43-5071	Shipping, Receiving & Traffic Clerks	1,860	$15.34	8%	Transportation & Warehousing

SOC Code	Occupation	2014 Jobs	2014 Median Hourly Earnings	2014-2019 Projected % Growth	Primary Industry Category
43-6014	Secretaries	6,042	$15.35	8%	Supportive
47-2031	Carpenters	2,553	$17.03	7%	Supportive
47-2061	Construction Laborers	2,972	$14.53	13%	Supportive
47-2111	Electricians	1,210	$22.75	12%	Supportive
49-1011	Supervisors - Mechanics, Installers & Repairers	771	$33.96	12%	Manufacturing
49-3023	Automotive Service Technicians & Mechanics	2,117	$16.57	14%	Supportive
49-3031	Bus & Truck Mechanics & Diesel Engine Specialists	760	$20.28	14%	Transportation & Warehousing
49-9041	Industrial Machinery Mechanics	907	$23.83	21%	Manufacturing
49-9043	Maintenance Workers, Machinery	391	$21.85	12%	Manufacturing
49-9071	Maintenance & Repair Workers, General	3,479	$18.45	8%	Manufacturing
51-1011	Supervisors - Production & Operating Workers	1,373	$28.79	5%	Manufacturing
51-4011	Computer-Controlled Machine Tool Operators, Metal & Plastic	366	$18.07	20%	Manufacturing
51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal & Plastic	67	$25.71	30%	Manufacturing
51-4041	Machinists	1,354	$19.89	13%	Manufacturing
51-4081	Multiple Machine Tool Setters, Operators & Tenders, Metal & Plastic	434	$17.85	0%	Manufacturing
51-4121	Welders, Cutters, Solderers & Brazers	428	$18.82	27%	Manufacturing
51-5112	Printing Press Operators	528	$17.95	-9%	Manufacturing

SOC Code	Occupation	2014 Jobs	2014 Median Hourly Earnings	2014-2019 Projected % Growth	Primary Industry Category
51-9061	Inspectors, Testers, Sorters, Samplers & Weighers	1,161	$17.91	13%	Manufacturing
51-9111	Packaging & Filling Machine Operators & Tenders	1,236	$15.13	7%	Manufacturing
53-3032	Heavy & Tractor-Trailer Truck Drivers	5,892	$19.63	20%	Transportation & Warehousing
53-3033	Light Truck or Delivery Services Drivers	2,394	$14.92	13%	Transportation & Warehousing
53-7051	Industrial Truck & Tractor Operators	2,965	$15.88	4%	Transportation & Warehousing

6: GAP/SURPLUS STUDY HIGHLIGHTS

This report outlines the economy of Lehigh Valley and provides a workforce gap analysis to determine how well the region's post-secondary program output is satisfying regional workforce demand.

GAP VS. SURPLUS

Within the context of this analysis, a demand gap represents instances where education program completions (i.e. the number of program completions defined by Classification of Instructional Program (CIP) codes) do not amount to the demand for occupation job openings (i.e. the number of new and replacement jobs categorized by Standard Occupation Classification (SOC) codes). A supply surplus indicates that the number of CIP completions is greater than the demand for occupation job openings.

The following are some of the key findings of the analysis:

OVERVIEW OF REGIONAL INDUSTRIES

- The three largest industry sectors in Lehigh Valley are Health Care & Social Assistance, Retail Trade, Government, and Manufacturing. Together these sectors make up 158,786 jobs or approximately 44% of total regional employment as of 2014. All notable industry sectors except Government are projected to continue to grow by 3% or greater between 2014 and 2024.
- Other important industry sectors with notable projected growth are Transportation & Warehousing (+3,691 jobs); Finance & Insurance (+3,149 jobs); and Professional, Scientific, & Technical Services (+2,433 jobs).
- Through a collaborative process, five target industry groups were identified: Healthcare & Social Assistance; Manufacturing; Finance

& Insurance; Professional, Scientific, & Technical Services; and Transportation & Warehousing.

- Lehigh Valley employment concentration (LQ) excels in three of the five sectors, namely: Transportation & Warehousing (1.67), Health Care & Social Assistance (1.34), and Manufacturing (1.25). Lehigh Valley also considerably out performs neighboring peer regions in both Transportation & Warehousing, and Manufacturing.
- Median wages for the five target industry sectors are all above the regional median of $42,290. Notably, median wages are lower in the Lehigh Valley in all five target sectors than in both the Philadelphia MSA and the Central New Jersey MSA.

OVERVIEW OF REGIONAL OCCUPATIONS

- Office & administrative support occupations comprise the largest occupation group in Lehigh Valley with 53,341 jobs, followed by sales & related occupations. Legal occupations and architectural & engineering occupations have the highest median earnings of $38.70 per hour and $35.81 per hour, respectively.
- Fifty-three target occupations were collaboratively selected based on their alignment to target sectors and post-secondary education. In 2014, the target occupations composed 24% of the Valley's employment.
- Between 2014 and 2024 the target occupations are projected to compose 28% of regional growth, indicating that the target occupations are building a larger presence in the regional workforce relative to other occupations.
- In terms of median wages, the target occupations earn $21.18 per hour, compared to the regional median of $19.56 per hour, indicating that investment in these occupations will, by and large, improve the lives of Lehigh Valley residents by raising regional wage levels.

PROGRAM GAP ANALYSIS

DEMAND GAPS

- Graduates and jobs are fairly well matched to target occupations at both the associate's degree and bachelor's degree levels in Lehigh

Valley. Only two significant demand gaps appear at the bachelor degree level. Securities, commodities and financial services sales agents show a demand gap of 126 and wholesale and manufacturing sales agents of technical and scientific products show a demand gap of 16. Lehigh Valley does not currently offer education programs that align to these occupations.).

- At the associate's degree level registered nurses show demand gap of 31 and web developers show a demand gap of 13.
- Post-secondary vocational certificate (PSV) education levels and lower were less well-matched in the target occupations: Heavy and tractor-trailer truck drivers exhibited the largest gap (393 annual openings for 207 average annual program completions). The second largest gap was for industrial truck and tractor operators, which shows an annual demand gap of 186
- There are ten significant gaps at the bachelor's level in non-target occupations. The largest is in personal and financial advisors (demand gap of 46), followed by medical and clinical laboratory technologists (demand gap of 27) and appraisers and assessors of real estate (demand gap of 22). Non-target occupations at the associate's level are typically well matched.
- For the non-target occupations, high turnover, labor intensive occupations such as freight, stock, and hand material movers appear to have the largest gaps in vocational (PSV) and lower educational levels.[11]

SUPPLY SURPLUSES

- Five programs show significant supply surpluses of graduates over jobs at the bachelor's level for target occupations. Accountants and auditors showed the largest surplus (110 annual openings compared to 176 program completions). Mechanical engineers show a talent surplus of 34 followed by a talent surplus of 33 sales managers. [12]
- Two associate's degree level non-target occupations show education surpluses. These are registered nurses (supply surplus of 31) and web developers (supply surplus of 13).

11 Typically these types of occupations do not necessarily require post-secondary education and lower wage rates reflect lower skill levels needed to perform the job function.

12 As discussed in the Professional, Technical and Scientific Services section of this report, many of these learners are likely taking positions outside of Lehigh Valley, which will largely mitigate the regional talent surplus.

7: GENERAL STRATEGIES

A number of observations, both quantitative and qualitative arose during the course of research and interviews with leadership and local stakeholders. Some observations and subsequent strategies focus on long-term sustainability of information gathering and communication, while others focus on improving data gathering, transparency, employer engagement efforts and opportunities for disadvantaged and dislocated workers. In many cases, best practices are included as an example of how other areas and organizations have carried out similar strategies and in some cases organizations within Lehigh Valley. The following strategies are:

1 Develop ongoing process for tracking workforce supply and demand.

The gap analysis provides a good starting baseline for ongoing tracking of demand for talent and the institutions providing a supply. Currently, the skills sets of learners in Lehigh Valley are well aligned to occupational demand, overall. However, gaps and surpluses still exist and demand for skills can change over time. As such, the need for review of curricula and programs, communication of demand gaps and stronger engagement with employers, such as business "open houses" will assist in promoting long-term workforce alignment to economic need.

BEST PRACTICE
MONROE COMMUNITY COLLEGE, NY

Monroe Community College-Expanding gap analysis database: In order to be more data and employer driven in decision making, Monroe Community College (MCC) established a new Economic Development and Innovative Workforce Services Division. This happened in response to a change in the manufacturing base within the region, which moved from a few large employers to an increasingly fragmented base of small and mid-size manufacturers. The division underwent an intensive data gathering effort that included employer identification, engagement, as well as primary and secondary data gathering. The content gathered through this exercise continues to be updated and used to connect regional needs to program planning, curriculum design and communication with faculty and administration.

2 **Institute regular opportunities to share individual organizational data and findings.**

The roles of LVEDC and LVWIB often result in communication with the same companies and organizations on various topics related to the economy and workforce. In order to close the communication loop amongst each other, both organizations expressed the need to work more closely and communicate more regularly to share individual organizational data and findings. These discussions would take place in between the organizations, as well as sponsored events to communicate with the community.

3 **Build a strong collaboration environment with education.**

A key finding during the research process identified noted areas of post-secondary education and training that were not currently reported in national education statistics for education institutions, specifically IPEDS. As part of this strategy, a recommended implementation involved establishing an education council to increase collaboration and communication between economic development, employers, and workforce development. Secondly, in order to ensure a central repository of key information, establishing a dedicated person tasked with collating information and helping to facilitate increased collaboration and communication between workforce development, economic development and education would help to improve the overall missions of each organization.

4 **Create linkages between programs and institutions.**

Increases in nontraditional students are occurring in today's education and workforce landscape. Learners follow education pathways that don't always easily lend to recognition for past learning achievements and classroom credit. Additionally, education institutions often lose track of learners after program completion. An evaluation of Lehigh Valley's current credit acceptance across vocational and higher education programs is recommended. If gaps in credit acceptance exist, institutions should be encouraged to build articulation agreements to allow credit transfer. On the backend of this endeavor, development of a learner tracking system (prioritized by program) will enable institutions to follow students through their education and careers and assist in determining how well aligned programs are to the careers they're intended to train.

BEST PRACTICE
MIDLANDS TECHNICAL COLLEGE

Midlands Technical College-Evaluate Program Effectiveness: To assess program performance, Midlands Technical College (MTC) has developed an innovative, data-driven evaluation of their programs in four key discipline areas: healthcare; advanced manufacturing; energy; and information systems. The evaluation measures upstream and downstream performance metrics related to the key disciplines, taking into account: 1) incoming supply of high-school students by district; 2) sources of college awareness and connection to program (e.g. how students became aware of the program); 3) current proficiency of incoming students; 4) career pathway alignment with the Education-Economic Development Act; 5) program graduation/success rates; 6) employer/workforce need; and 7) revenues and costs of running the programs in the four clusters.

5 Leverage PA CareerLink® Lehigh Valley foundational training in all educational training curriculums.

A common theme found through the business community often corresponds to basic foundational skills. Many training systems exist and Lehigh Valley has PA CareerLink® as a valuable resource to inform foundational skills training. Alignment of course and curriculum content to include foundational skills, as well as assessments that lead to a credential will: a) help ensure that classroom instruction and learner assessment align to foundational competencies and b) signal employers that learners with the credential are capable of doing the work required. Ultimately, development of competency-based training will provide verifiable alignment to job requirement and employer need.

BEST PRACTICE
ELECTRICITY HR CANADA

Electricity HR Canada-Utilizing Competency-Based Training: In order to bridge the gap between what is taught in the classroom and what tasks will be performed on the job, Electricity HR Canada developed competency profiles for nine key occupation groups that outline the knowledge, skills and abilities required for incumbents to perform their jobs safely, effectively and properly. Learners and incumbents are trained and assessed according to these profiles to help ensure direct linkages between what is taught and how skills are applied in work situations.

6 Decrease high school dropout rates.

Data from the national center for education statistics indicates that approximately 900 high school students dropped out in 2009—latest year available. Often these students struggle with a broad range of employment and social behavior issues through their lifetime. As such, expansion of programs and services to keep students in secondary education would help reduce long-term unemployment for these individuals. Graduate Allentown is an example of one such program that could potentially be expanded to the rest of Lehigh Valley.

BEST PRACTICE
GRADUATE ALLENTOWN

Community in Schools, Lehigh Valley-Reducing H.S. dropouts: In February 2015, Allentown School District and Community in Schools, Lehigh Valley implemented a Graduate Allentown initiative, aimed at working one-on-one with at-risk youth, as well as working with students (and their families) to connect to appropriate resources. The CIS model of intensive learner support and targeted services resulted in 91% of seniors graduating (nationally).

7 Integrate new WIOA standards for tracking funding, participants, and success measurements that also factor in cost-benefit, accountability and transparency. Develop a system that enhances the content and measures return on investment results.

The new vision of the Workforce Innovation and Opportunity Act (WIOA), seeks to build more transparency into how public investment into the workforce assists adults, dislocated workers and youth. Part of WIOA involves updated performance metrics across multiple programs, designed to measure effectiveness and assist in continuous improvement. LVWIB is well positioned to being unrolling these metrics, as well as building a superior system that translates these metrics into communication of the economic value and return on investment LVWIB provides the region. This system would both demonstrate transparency by WIOA standards, as well as call attention to the valuable services provided by LVWIB.

BEST PRACTICE
A/D WORKS

Arapahoe/Douglas Works-ROI of WIA programs: In response to a growing desire to demonstrate economic value and accountability for workforce investment programs Arapahoe/Douglas Works (A/D Works) develops an annual impact report and cost-benefit analysis—now in its seventh year of production. The report focuses on the various WIA programs, number served, value to the economy (cost-benefit ratios) and returns to taxpayers' public investment.

LVWIB will include LVEDC in the Request for Proposal (RFP) process to ensure LVEDC is aware of new and existing workforce initiatives as they are being formulated.

8 Establish PA CareerLink® Lehigh Valley as an authorized National Occupational Competency Testing Institute (NOCTI) assessment center.

Based on similar rationale for foundational skills credentialing within the education programs, enabling streamline PA CareerLink® Lehigh Valley to test and certify specific skills, will help to streamline services and better align adult and dislocated workers to careers that they are well positioned to pursue. These credentials serve as a signal to employers that workers have the right skills to perform needed job functions, thereby reducing hiring risk. One note on implementation, however, recognizes that some assessments must be authorized by other organizations or councils, such as the Manufacturing Skills Standards Council (MSSC).

BEST PRACTICE
WORK READY OREGON

Work Ready Oregon-National Career Readiness Certificate and Certified Work Ready Community: ACT's national career readiness certificate (NCRC) is a portable credential that demonstrates to employers an individual's level of workplace competency and employability. Additionally, in response to demonstrating individual work readiness, ACT also built a Certified Work Ready Community (CWRC), which is a process through which communities can establish a collaborative data-driven process for development and deployment of NCRC goals within the area, as well as alignment with employer need. Oregon and various locations within the state is one such CWRC that uses its career readiness certification to recruit businesses and connect employers to competent job seekers.

9 Leverage resources to provide adult education, literacy and English language acquisition activities concurrently and contextually with workforce preparation and workforce training.

Approximately 3.5% (17,900) adults within Lehigh Valley do not speak English proficiently. This ultimately restricts career mobility and options for a potentially large pool of workers in the region. In some sectors such as manufacturing and transportation, this pool of talent could help bridge certain shortages, should language barriers be removed. Additional awareness of career/education opportunities after ESL for this segment of Lehigh Valley's population may also help to remedy the issue.

BEST PRACTICE
HOTOS COMMUNITY COLLEGE

Hostos Community College (CUNY)-Integrating ESL learners: Instructors in the CUNY Language Immersion Program (CLIP) lead tours around the campus that introduce students to the Single Stop center (lead by a national non-profit organization dedicated to helping low-income families and individuals build economic security), student clubs, the writing center, athletic facilities, library, student success coach center and baby-sitting service for day-time student-parents. The focus of these tours is to integrate ESL learners into the campus environment and encourage participation in other areas of the college.

8: MANUFACTURING

OVERVIEW

Manufacturing in Lehigh Valley covers a range of products and includes businesses of all sizes. Overall, jobs in manufacturing are declining.[13] However, pockets of significant job growth within some sub-sectors are noteworthy. Projections indicate that fabricated metal product manufacturing and electrical equipment, appliance and component manufacturing will each add more than 300 new jobs over the next 5 years. Wood product manufacturing, plastics and rubber manufacturing and machine manufacturing also show strong new job growth. As such, demand for new and replacement jobs for key occupations such as maintenance and repair workers, machinists, various machine operators, and maintenance and mechanic workers will be sufficiently high to warrant consideration from the workforce development system. Figure 8.1 and table 8.1 illustrate industry job change at the sub-sector level, while figure 8.2 and table 8.2 show key occupation demand gaps and surpluses.

BEST PRACTICE
IOWA WORKFORCE DEVELOPMENT

Iowa Early Warning/Layoff Aversion – Iowa Workforce Development: In order to better prepare a workforce for career transition and even avert layoffs within the state, Iowa Workforce Development undertook a three-year study to develop an early warning/layoff aversion system. The system is designed to identify industries and companies that are at risk of layoffs and avert these layoffs through a multi-stakeholder approach that involved workforce development, economic development, education, industry partnership and other community-based organizations and agencies.

13 Evidence across the U.S. suggests that the decline in manufacturing jobs is due in part to the sector becoming more capital intensive and efficient, thus requiring fewer workers. Other causes stem from increased competition from abroad, as well as decreased demand for output within specific sectors.

DISCUSSION

Many of the workforce challenges associated with manufacturing in the Lehigh Valley reflect national trends in this sector. Nationally, manufacturing output is rising faster than national (GNP) output is rising, yet there is little to no growth in overall employment projected. There are two main reasons behind this trend. Both were confirmed through employer interviews. First, advanced manufacturing techniques required to maintain competiveness generally rely on fewer, more technically sophisticated workers than what was required previously. As this new equipment is introduced, fewer employees are needed. Second, many employees working in a manufacturing plant are in fact not employees of the company. During employer interviews specific instances were reported where functions previously performed by employees of the company are now performed by an on-site third party vendor. For example, one employer now uses a 3PL service provider to package and ship goods directly from the plant whereas this function was previously performed by direct employees of the manufacturer. In addition, some manufacturers take advantage of various third party employee arrangements to maintain staffing flexibility in order to adjust for fluctuating or seasonal customer demand. One manufacturer interviewed, for instance, maintains a full time representative of a temporary employment agency on-site to help manage daily fluctuations in temp worker requirements.

BEST PRACTICE
CONNECT DISLOCATED WORKERS

Connect Dislocated Workers: Newton, IA Maytag/Whirlpool Closure: When faced with a mass layoff and closing of a company that had been headquartered in a small rural city for nearly a century, local officials and regional workforce develop engaged in a data-driven effort to identify strategies to transition dislocated workers. Using a Regional Innovation Grant, the area undertook a detailed study of the skills and competencies of their workers to identify which potential careers they would match. Simultaneously, the region also analyzed the industries that typically employ the occupations of the dislocated workers or occupations that matched their skill sets. Armed with this information, local officials began to campaign to identify and solicit new employers into the area. Additionally, the small business development center also worked with dislocated workers to start new businesses and retain the talent with in the area. Within 18 months, Newton had attracted more than 1,200 new jobs spanning wind turbine blade and tower manufacturing, information technology, telecom, engineering R&D (formed by former Maytag R&D staff) and a call center.

One of the most important features of workforce preparedness and training is that outside of a few occupations (welders, et al; sales; machinists) there are relatively fewer program completions entering the manufacturing workforce in Lehigh Valley. Wages in manufacturing are 36% lower in the Lehigh Valley than in neighboring New Jersey counties. While it is reasonable to speculate that this might contribute to recruitment and retention problems in the region—with the possible exception of maintenance workers—evidence that the wage gap caused recruitment/retention in these occupations was not uncovered. Nevertheless, a 36% wage difference is significant and quite possibly some high school graduates seeking good manufacturing jobs migrate to higher paying adjacent counties without entering any of Lehigh Valley's post-secondary training programs. Many businesses in Lehigh Valley are working to expand the pool of interested applicants in entry level manufacturing positions. A potential hurdle faced in expanding this pool is the wage difference with neighboring New Jersey and even greater Philadelphia.

Most manufacturers report that at the entry level they are primarily interested in workers with the basic educational and work ethic skills required to perform required tasks but that once hired, most training is provided by the supervisor or in a customized setting. The ability to support this need for customized training across a wide array of relatively small companies is a significant workforce development challenge confronting Lehigh Valley in this sector. The need for company-specific training is particularly important as workers transition from one manufacturing industry to another. This capability to transition between industries is especially important in the Lehigh Valley where significant the growth and decline is occurring in many different manufacturing industries over the next five years (see table below). Hence, it is important that

BEST PRACTICE
REACHING K-12

B Braun/Catasauqua and Rensselaer Polytechnic Institute: Locally, B Braun works with Catasauqua Area High School to participate in a career awareness program that specifically works with nine-graders to provide a real-world connection between education and careers. B Braun employees put on a career development class and work with students to see how developing key skills and abilities can lead to good careers. At Rensselaer, a team of students designed an outreach and teaching module for 6-12th graders using Lego toys. The module is designed on a three-axis motion platform that demonstrates additive and subtractive manufacturing concepts at a micro scale.

LVWIB continue to build on its strategy of providing upskill training to dislocated workers transitioning from one manufacturing industry to another. Similarly, it is important through the manufacturing industry partnership for the LVWIB to stay engaged with those industries that are shrinking and expanding so that dislocated workers can be trained in the competencies that these employers require.

One specific training program that would assist manufacturing in the Valley would be to establish a fully integrated mechatronics program. These programs are both suitable for 2 and 4 year colleges; particularly if they target both incumbent and entry level workers, respectively. These programs are particularly important to those industries that are rapidly transitioning to more technology-driven integrated production platforms ("advanced manufacturing").

Maintenance is a critical role in manufacturing both in the Lehigh Valley and nationally. During employer interviews, recruitment for experienced maintenance supervisors was described as intense and routinely required very wide regional search areas. This might reflect higher wages in neighboring counties, or simply reflect the overall competition for too few available workers in a capital intensive sector. Regardless, the ability to keep equipment running efficiently is mission-critical. Moreover, all industries ranging from basic (food, apparel) to advanced (medical devices, electronics) have highly specialized equipment that is often configured uniquely to meet the requirements of a specific plant. Support from the LVWIB to provide customized incumbent training in assisting manufacturers in training a pipeline of maintenance personnel would be a welcomed initiative. Training for maintenance is particularly complex since in addition to the challenges of learning to service highly specialized equipment, there is the added challenge that maintenance typically occurs off-hours when shifts are not operating. Helping manufacturers to pool maintenance training resources,

BEST PRACTICE

LEHIGH VALLEY MANUFACTURING RESOURCE CENTER

Promoting Manufacturing Careers – What's So Cool About Manufacturing? (MRC): To promote manufacturing careers and build awareness of the diversity and advanced technologies used within the sector, Lehigh Valley employers supported a video campaign conducted by middle school learners. As part of a campaign called "Dream it Do it," the Manufacturers Resource Center (MRC) connected students to supporting manufacturers to develop a video on the company, processes, technology, people and other unique qualities of the business, that were then submitted as part of a video competition.

for example going to different plants and conducting maintenance at different times, might be one way that the LVWIB can help address this very complex issue.

BEST PRACTICE

MICHIGAN MANUFACTURING CONNECT

Promoting Manufacturing Careers – Capital Area Manufacturing Council (Lansing, MI): Michigan Manufacturing Connect is an initiative developed through a collaborative effort by area manufacturing companies to build awareness of the great careers in manufacturing. Through a partnership with a local TV channel CAMC has put together a sustained outreach and promotional effort that focuses on 12 local manufacturers. The initiative will engage area residents through multiple channels, including social networks, website exposure and television.

FIGURE 8.1 – Largest Manufacturing Sectors and Projections

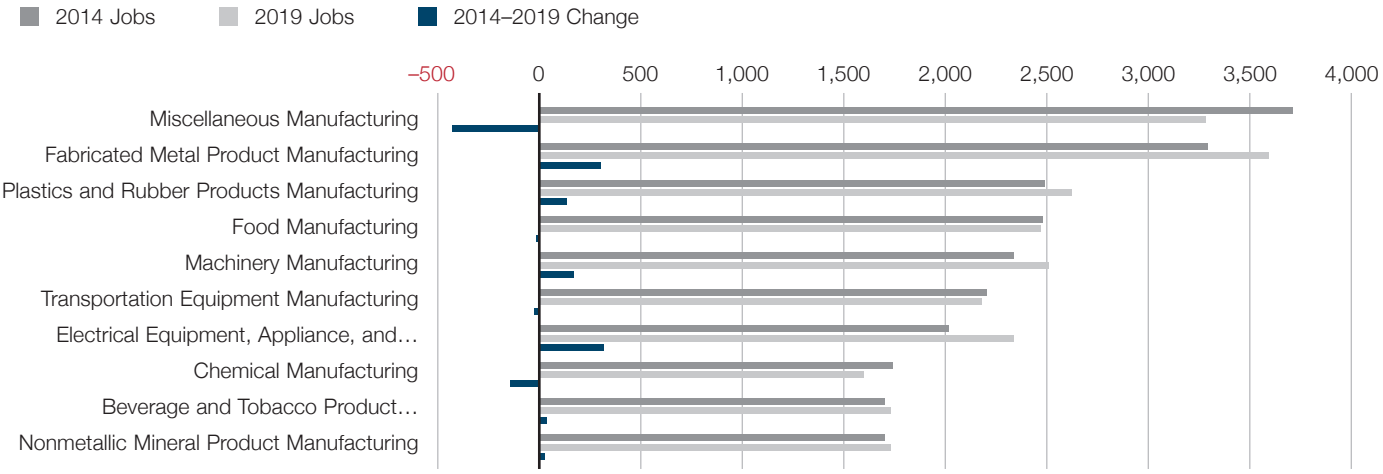


TABLE 8.1 – Manufacturing Industry Projections, Wages and Salaries and Establishments

NAICS	Description	2014 Jobs	2019 Jobs	2014–2019 Change	2014–2019 % Change	2014 Wages & Salaries	2013 Establishments
339	Miscellaneous Manufacturing	3,714	3,271	-443	-12%	$49,477	66
332	Fabricated Metal Product Manufacturing	3,299	3,601	302	9%	$56,077	136
326	Plastics and Rubber Products Manufacturing	2,498	2,635	137	5%	$51,340	41
311	Food Manufacturing	2,483	2,480	-3	-0%	$52,395	55
333	Machinery Manufacturing	2,345	2,517	172	7%	$65,098	51
336	Transportation Equipment Manufacturing	2,206	2,184	-22	-1%	$53,745	13
335	Electrical Equipment, Appliance, and Component Manufacturing	2,025	2,343	318	16%	$69,781	24
325	Chemical Manufacturing	1,758	1,607	-151	-9%	$65,252	41
312	Beverage and Tobacco Product Manufacturing	1,715	1,742	27	2%	$60,079	20
327	Nonmetallic Mineral Product Manufacturing	1,709	1,738	29	2%	$61,118	53
331	Primary Metal Manufacturing	1,329	1,369	40	3%	$87,183	15
315	Apparel Manufacturing	1,072	689	-383	-36%	$29,878	38
334	Computer and Electronic Product Manufacturing	1,045	672	-373	-36%	$87,030	38
322	Paper Manufacturing	1,011	1,012	1	0%	$55,431	15
337	Furniture and Related Product Manufacturing	959	746	-213	-22%	$44,984	33
323	Printing and Related Support Activities	745	674	-71	-10%	$45,123	51
321	Wood Product Manufacturing	582	717	135	23%	$35,239	20
314	Textile Product Mills	227	117	-110	-48%	$37,321	16
313	Textile Mills	138	61	-77	-56%	$32,774	7
324	Petroleum and Coal Products Manufacturing	124	109	-15	-12%	$49,293	7
316	Leather and Allied Product Manufacturing	48	74	26	54%	$17,173	1

FIGURE 8.2 – Key Manufacturing Occupation Demand Gaps and Surpluses

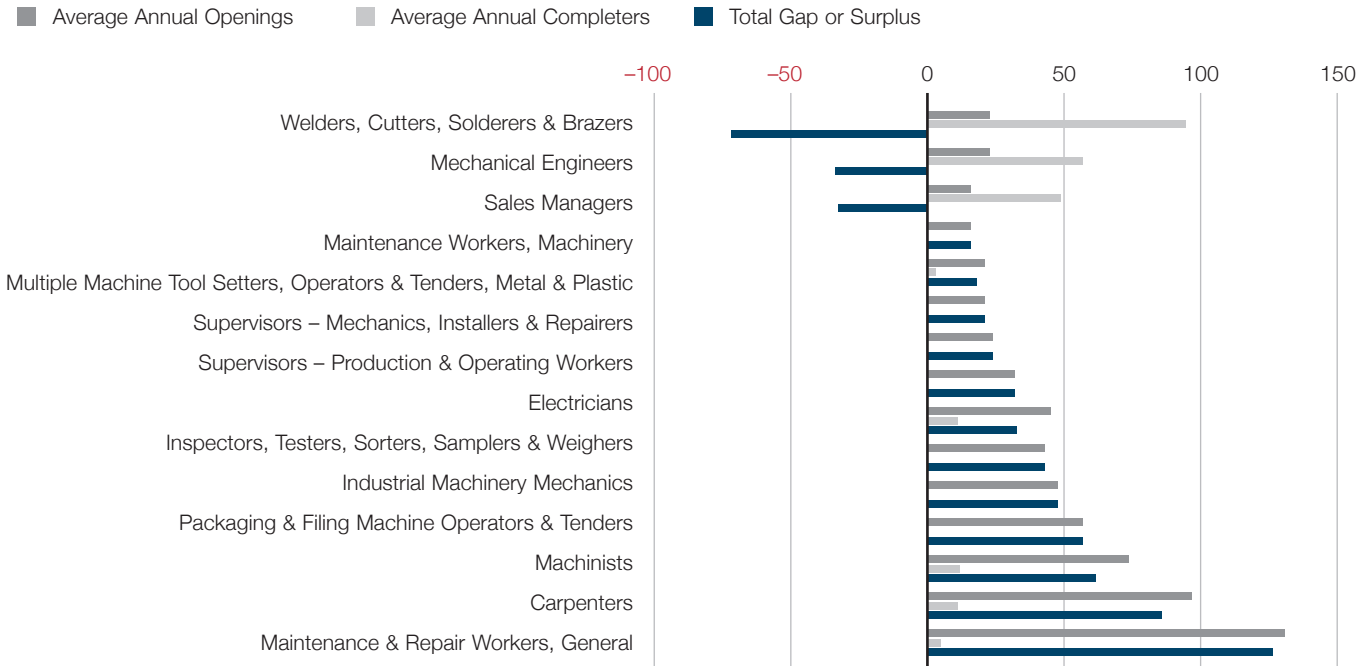


TABLE 8.2 – Key Manufacturing Occupation Demand Gaps and Surpluses

SOC Code	Occupation	2014 Jobs	2014-2019 Projected % Growth	Average Annual Openings	Average Annual Program Completions	Total Gap or Surplus	2014 Median Hourly Earnings
51-4121	Welders, Cutters, Solderers & Brazers	428	27%	23	95	-72	$ 18.82
17-2141	Mechanical Engineers	491	13%	23	57	-34	$ 40.58
11-2022	Sales Managers	600	17%	16	49	-33	$ 48.03
49-9043	Maintenance Workers, Machinery	391	12%	16	0	16	$ 21.85
51-4081	Multiple Machine Tool Setters, Operators & Tenders, Metal & Plastic	434	0%	21	3	18	$ 17.85
51-4011	Computer-Controlled Machine Tool Operators, Metal & Plastic	366	20%	21	0	21	$ 18.07
49-1011	Supervisors - Mechanics, Installers & Repairers	771	12%	24	0	24	$ 33.96
51-1011	Supervisors - Production & Operating Workers	1,373	5%	32	0	32	$ 28.79
47-2111	Electricians	1210	12%	45	11	33	$ 22.75
51-9061	Inspectors, Testers, Sorters, Samplers & Weighers	1,161	13%	43	0	43	$ 17.91
49-9041	Industrial Machinery Mechanics	907	21%	48	0	48	$ 23.83
51-9111	Packaging & Filling Machine Operators & Tenders	1,236	7%	57	0	57	$ 15.13
51-4041	Machinists	1,354	13%	74	12	62	$ 19.89
47-2031	Carpenters	2,553	7%	97	11	86	$ 17.03
49-9071	Maintenance & Repair Workers, General	3,479	8%	131	5	127	$ 18.45

9: HEALTH CARE AND SOCIAL ASSISTANCE

OVERVIEW

Job growth in Health Care and Social Assistance is nearly positive across all subsectors. Employment is predominately driven by general medical and surgical hospitals led by only a few businesses and offices of physicians, which comprise many smaller establishments. New job growth over the next five years is largely driven by general medical and surgical hospitals (almost 1,900 new jobs), offices of physicians (almost 1,000 new jobs), retirement and assisted living facilities (more than 600 new jobs), home health care services (about 630 new jobs) and individual and family services (nearly 500 new jobs). This growth creates significant demand across a spectrum of skill sets and training programs. Key occupations that indicate significant output of education and training include nursing assistants, medical assistants, pharmacy technicians, and registered nurses. Figure 9.1 and table 9.1 illustrate the growth of subsectors within healthcare and social assistance, while figure 9.2 and table 9.2 illustrate demand gaps and surpluses for talent within the education and training system.

DISCUSSION

Lehigh Valley is dominated by its two large health network systems: St. Luke's University Health Network and the Lehigh Valley Health Network. The next largest sector, offices of physicians, includes primarily small establishments, many of which hold affiliation with one of these two large health networks. The sector is experiencing strong growth while operating in a complex, highly regulated environment with rapid technological change. Moreover, the industry is a major employer for a range of the highly skilled workers (doctors, specialists) to lower skilled workers (orderlies, food service workers). As teaching hospitals, Lehigh Valley Health Network and St. Luke's provide a strong local supply of highly skilled talent. As discussed below, there is some

transition recommended for the middle spectrum of occupations and some new initiatives for the lower end of the occupational spectrum warrant additional consideration.

For all occupations, however, there is a near continuous need for technological training as patient interface and medical record keeping transition to increasingly sophisticated electronic formats. Based on employer interviews it appears that companies provide technological training on-site to incumbent workers. This is presumably integrated into training programs for various technical medical occupations as well. LVWIB's existing healthcare industry partnership is an appropriate forum to continuously review with training providers whether administrative technologies (billing, record keeping) that are being taught are consistent with the current practices of the Valley's largest healthcare employers.

Changes in federal health care legislation and aging demographics are increasing the demand for home health aide and community health workers. Home health aide workers in particular are a difficult position to recruit because of lower wages and sometimes highly demanding work situations. Forecasts indicate the annual demand for home health aid workers is nearly 180 new and replacement jobs over the next five years. One aspect to successful recruitment into this occupation—absent a significant yet difficult to achieve wage increase—will be defining a career progression that leads from home health aid worker to in-hospital (or equivalent) patient or community health care. One major employer interviewed did express some interest in establishing this type of career progression. There is reportedly some debate within the health care profession as to whether community health workers (for example, health care navigators) would benefit from higher educational training or whether their strength lies in neighborhood activism. LVWIB can explore strategies to bridge this gap in a way that appeals to each segment.

BEST PRACTICE

CAMPAIGN FOR NURSING'S FUTURE

Campaign for Nursing's Future – Johnson and Johnson: Launched in 2002, Johnson and Johnson's Campaign for Nursing's Future seeks to address the shortage of nurses across the U.S. The campaign highlights various careers and specialties within the nursing profession, including entry-level medical professions and provides useful tools and information for those interested in getting started down the path to becoming a nurse.

Given the overall growth in demand for health care workers across occupations it is interesting to note that medical assistants appears to show a surplus of program completions (about 450 more completions than projected job openings). This may create an opportunity to encourage some medical assistant students to pursue higher education levels such as nursing to help alleviate the surplus. For this strategy to make sense, however, more understanding is required as to the degree of difficulty currently confronting newly graduated medical assistants in seeking appropriate positions given the apparent surplus in this category of program completions.

One area with an apparent demand gap is nursing assistants (about 100 excess openings). Strategies to promote this career and encourage young learners into this shorter education program would help to alleviate the gap. For example, a campaign to highlight this profession and the various career paths and professionals employed as nursing assistants would create awareness of the opportunity. Just as with manufacturing, this gap is another indication of available career progressions (this time in health) that do not necessarily require a four year degree.

FIGURE 9.1 – Largest Health Care and Social Assistance Sectors and Projections

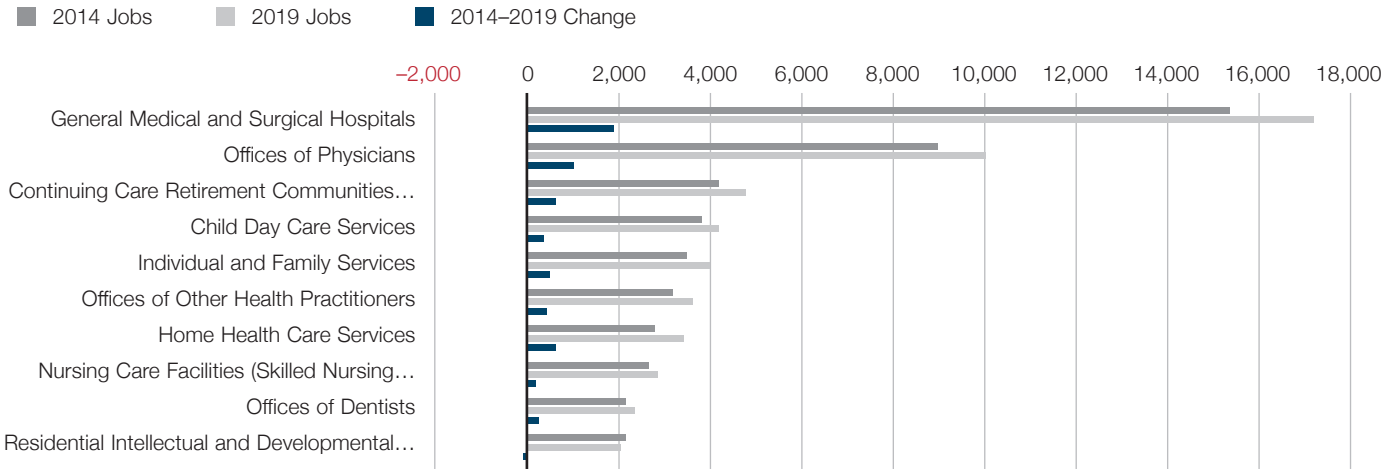


TABLE 9.1 – Health Care and Social Assistance Industry Projections, Wages and Salaries and Establishments

NAICS	Description	2014 Jobs	2019 Jobs	2014–2019 Change	2014–2019 % Change	2014 Wages & Salaries	2013 Establishments
6221	General Medical and Surgical Hospitals	15,355	17,220	1,865	12%	$51,611	13
6211	Offices of Physicians	9,003	9,980	977	11%	$87,038	481
6233	Continuing Care Retirement Communities and Assisted Living Facilities for the Elderly	4,174	4,781	607	15%	$25,804	50
6244	Child Day Care Services	3,827	4,180	353	9%	$15,837	208
6241	Individual and Family Services	3,521	4,010	489	14%	$21,801	450
6213	Offices of Other Health Practitioners	3,167	3,619	452	14%	$40,753	273
6216	Home Health Care Services	2,795	3,426	631	23%	$28,819	36
6231	Nursing Care Facilities (Skilled Nursing Facilities)	2,666	2,829	163	6%	$36,691	22
6212	Offices of Dentists	2,133	2,338	205	10%	$48,907	289
6232	Residential Intellectual and Developmental Disability, Mental Health, and Substance Abuse Facilities	2,127	2,050	-77	-4%	$31,452	102
6214	Outpatient Care Centers	1,715	2,089	374	22%	$34,384	54
6215	Medical and Diagnostic Laboratories	1,186	1,326	140	12%	$66,619	64
6219	Other Ambulatory Health Care Services	1,154	1,366	212	18%	$33,730	32
6223	Specialty (except Psychiatric and Substance Abuse) Hospitals	603	742	139	23%	$47,216	6
6222	Psychiatric and Substance Abuse Hospitals	442	478	36	8%	$40,225	1
6242	Community Food and Housing, and Emergency and Other Relief Services	400	428	28	7%	$41,341	28
6243	Vocational Rehabilitation Services	385	335	-50	-13%	$26,172	16
6239	Other Residential Care Facilities	289	300	11	4%	$24,743	8

FIGURE 9.2 – Key Health Care Occupation Demand Gaps and Surpluses

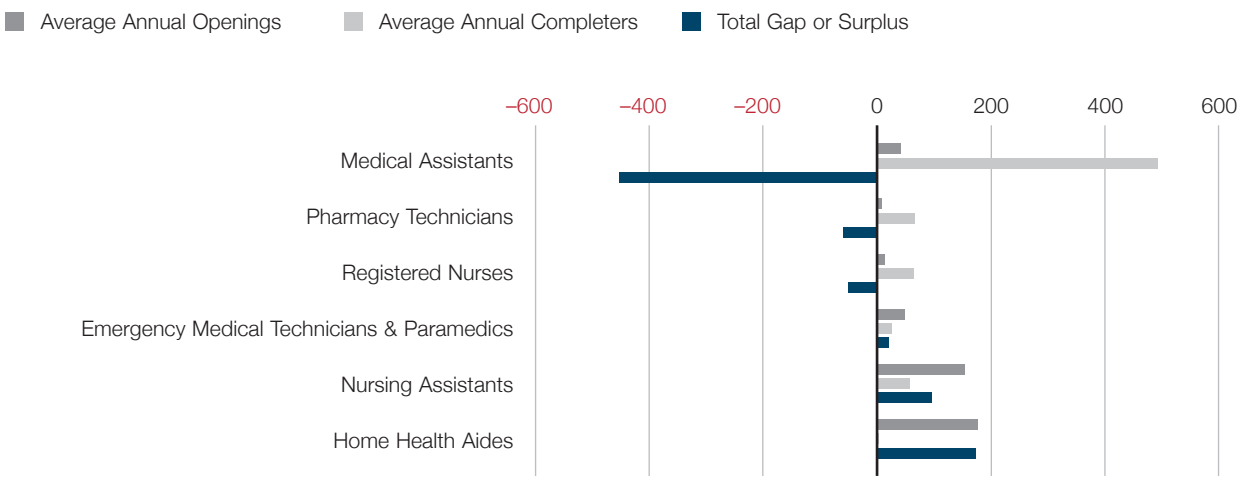


TABLE 9.2 – Key Health Care and Social Assistance Occupation Demand Gaps and Surpluses

SOC Code	Occupation	2014 Jobs	2014-2019 Projected % Growth	Average Annual Openings	Average Annual Program Completions	Total Gap or Surplus	2014 Median Hourly Earnings
31-9092	Medical Assistants	1,604	17%	43	495	-452	$15.03
29-2052	Pharmacy Technicians	743	7%	9	67	-58	$13.47
29-1141	Registered Nurses	6,505	20%	15	65	-50	$31.73
31-1015	Orderlies	52	31%	0	0	0	$12.31
21-1094	Community Health Workers	88	16%	1	0	1	$13.32
29-2041	Emergency Medical Technicians & Paramedics	916	21%	51	28	23	$17.82
31-1014	Nursing Assistants	5,028	15%	156	59	97	$13.50
31-1011	Home Health Aides	3,239	23%	178	3	174	$9.72

10: TRANSPORTATION, WAREHOUSING AND LOGISTICS

OVERVIEW

Historically among the fastest growing sectors in the region, Transportation, Warehousing and Logistics is a critical industry sector within Lehigh Valley. Projections indicate 14% new job growth over the next five years in warehousing and storage, as well as general freight trucking, which will add a combined 1,900 new jobs. Additionally, there are a number of key occupations that are predominately found within this sector, specifically: truck drivers; shipping, receiving and traffic clerks; and production, planning and expediting clerks. Projections indicate that new and replacement job demand for these key occupations approach almost 900 job openings annually. This ultimately creates need for a continuous pipeline of education and talent development to serve the needs of the sector. Figure 10.1 and table 10.1 illustrates the subsector changes within Transportation, Warehousing and Logistics, while figure 10.2 and table 10.2 show demand gaps.

DISCUSSION

The transportation, warehousing and logistics sector has the highest location quotient—a measure of regional employment concentration—of any of the major sectors examined for this study in the Lehigh Valley. In addition, it continues to grow and is expected to generate 3,149 new jobs over the next five years. In fact, the two largest industries have the fastest rate of projected growth of all industries in this sector: warehousing and storage; and general freight trucking with each projecting employment growth of 14% over five years. By and large, the Lehigh Valley's workforce and the growing demand from this sector are fairly well aligned. However, the occupations grouped around "truck drivers" indicate the most stress between talent supply and employer demand.

Commercial truck drivers are in shortage across the country; therefore, it is not shocking that a similar situation exists in the Lehigh Valley. The Lehigh Valley, however, is very reliant on this sector as a source of job and value creation compared to many other locations in the US. The following three occupation classifications account for most of the skills gap in this sector: Industrial Truck and Tractor Operators (a demand gap of 187); Heavy and Tractor-Trailer Operators (a demand gap of 193); and Light Truck Drivers (a demand gap of 107); for a total projected shortage of 495 CDL positions. It appears that there are two issues reported by some educators in the Valley that appear to be obstacles to increasing the number of program completions in these occupations. Specifically, there is a limitation on available training equipment and too few interested applicants, or too few applicants who speak English proficiently (a CDL requirement).

BEST PRACTICE

ATTRACTING NEW DRIVERS THROUGH BRANDING

Attracting New Drivers through Branding – Long Haul Trucking (Minnesota): Using their tractors and trailers as moving billboards, Long Haul Trucking is advertising their business and recruiting new drivers. Eye-catching paint jobs produced by an in-house graphic designer are seen across the country as the trucks run their routes. Quest Global of Cartersville, GA has also adopted a similar tactic of rebranding and reimaging their company through new logos, social media, and new decal packages on their fleet. Both companies view their fleets as mobile billboards and both have experienced increased success at driver recruitment.

One recommended strategy to expand the pool of training applicants is to integrate English as a Second Language (ESL) training with the CDL training program. In other occupations, English is not always a requirement. However, for commercial truck drivers it is and educators report that some interested applicants are already being turned away because of the language requirement. A second way to expand the pool of applicants is a more systematic outreach to underemployed populations who might not be aware of job opportunities that have relatively good pay. To address these and other specific concerns of the sector, it is further recommended that LVWIB's manufacturing and logistics industry partnership be split into two groups; one for manufacturing and the other dedicated specifically to the transportation, warehousing and logistics sector.

In addition, employers interviewed from this sector expressed an interest in

more life-cycle training for warehouse workers. Distribution centers often house complex operations that include tracking, labelling, loading, etc. Workers who are understand how these various “touch-points” interact with each other are better positioned to assist the company and promote their own careers-particularly those with supervisory aspirations. LVWIB might consider promoting incumbent training that addresses this employer concern

All leadership interviewed in this project appreciated the importance of this sector to the Valley’s economic prosperity. A number of others interviewed recognize the significant growth within the sector yet did not fully consider the workforce demand implications and support the sector needed to continue creating more new jobs. There are secondary economic benefits from this sector as well, for example: the presence of large 3PL service providers who support the region’s manufacturing base by keeping logistics streamlined and competitive. In addition, the presence of logistics experts fuel growth in occupations not necessarily associated with trucking (for example, software and modeling expertise). Finally, even though wages in neighboring areas are higher, employers did not indicate that competition for labor was a particular concern.

FIGURE 10.1 – Largest Transportation, Warehousing and Logistics Sectors and Projections

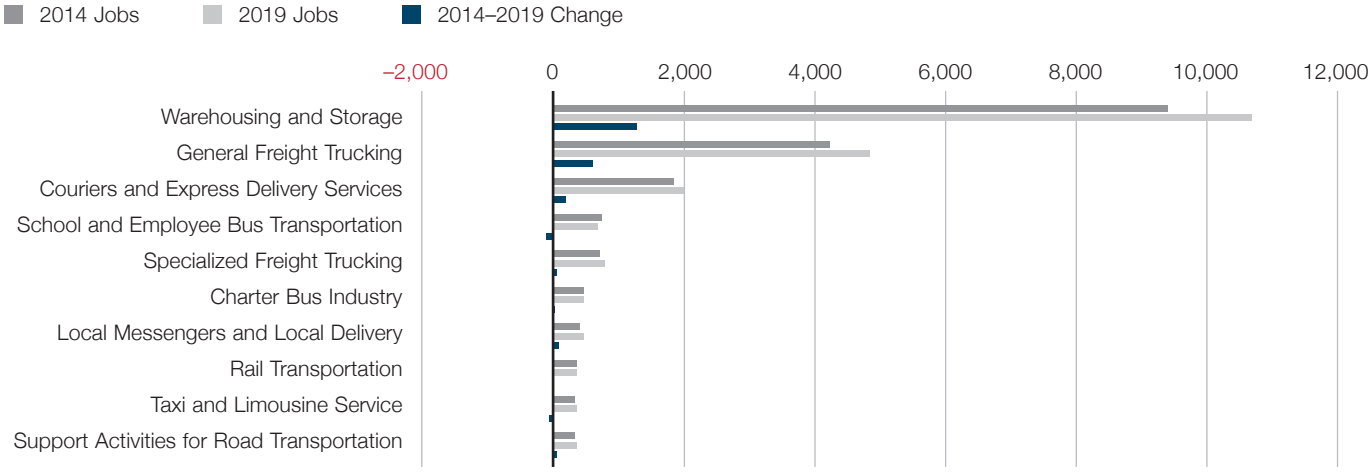


TABLE 10.1 – Transportation, Warehousing and Logistics Industry Projections, Wages and Salaries and Establishments

NAICS	Description	2014 Jobs	2019 Jobs	2014–2019 Change	2014–2019 % Change	2014 Wages & Salaries	2013 Establishments
4931	Warehousing and Storage	9,389	10,676	1,287	14%	$38,021	79
4841	General Freight Trucking	4,231	4,843	612	14%	$46,406	171
4921	Couriers and Express Delivery Services	1,837	2,030	193	11%	$34,467	23
4854	School and Employee Bus Transportation	753	672	-81	-11%	$27,408	10
4842	Specialized Freight Trucking	736	780	44	6%	$45,884	58
4855	Charter Bus Industry	458	482	24	5%	$45,298	3
4922	Local Messengers and Local Delivery	403	488	85	21%	$28,585	17
4821	Rail Transportation	368	386	18	5%	$76,222	0
4853	Taxi and Limousine Service	347	366	19	5%	$18,576	10
4884	Support Activities for Road Transportation	320	383	63	20%	$35,021	15
4869	Other Pipeline Transportation	277	318	41	15%	$128,978	6
4885	Freight Transportation Arrangement	170	191	21	12%	$44,328	12
4811	Scheduled Air Transportation	121	85	-36	-30%	$49,588	7
4859	Other Transit and Ground Passenger Transportation	113	104	-9	-8%	$18,304	4
4812	Nonscheduled Air Transportation	107	93	-14	-13%	$66,363	7
4881	Support Activities for Air Transportation	61	72	11	18%	$46,157	3
4882	Support Activities for Rail Transportation	55	71	16	29%	$40,045	3
4889	Other Support Activities for Transportation	40	46	6	15%	$21,777	4

FIGURE 10.2 – Key Transportation, Warehousing and Logistics Occupation Demand Gaps and Surpluses

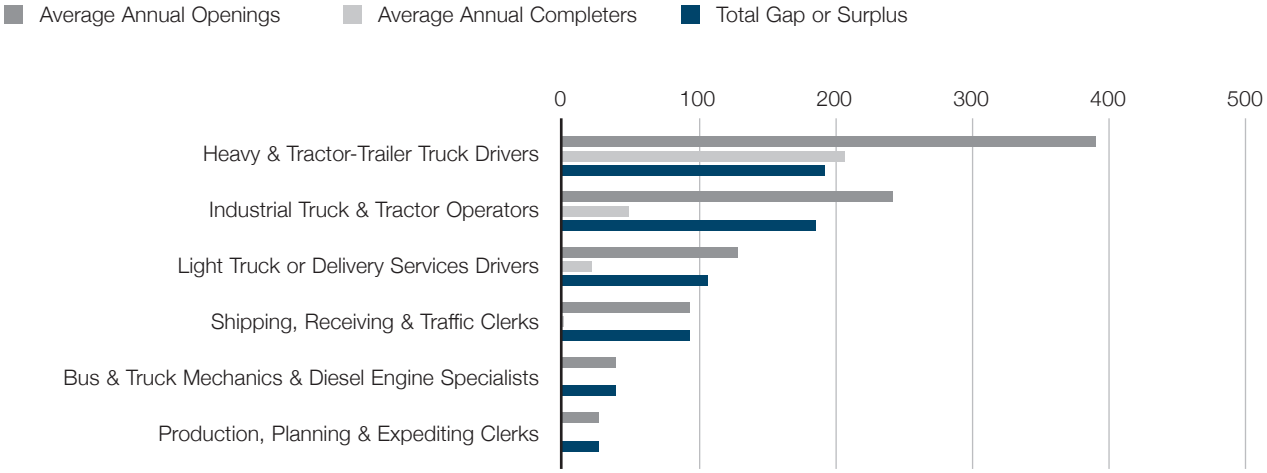


TABLE 10.2 – Key Transportation, Warehousing and Logistics Occupation Demand Gaps and Surpluses

SOC Code	Occupation	2014 Jobs	2014-2019 Projected % Growth	Average Annual Openings	Average Annual Program Completions	Total Gap or Surplus	2014 Median Hourly Earnings
43-5061	Production, Planning & Expediting Clerks	858	8%	27	0	27	$23.00
43-5071	Shipping, Receiving & Traffic Clerks	1,860	8%	95	1	94	$15.34
49-3031	Bus & Truck Mechanics & Diesel Engine Specialists	760	14%	41	0	41	$20.28
53-3032	Heavy & Tractor-Trailer Truck Drivers	5,892	20%	393	207	186	$19.63
53-3033	Light Truck or Delivery Services Drivers	2,394	13%	129	22	107	$14.92
53-7051	Industrial Truck & Tractor Operators	2,965	4%	243	50	193	$15.88

11: FINANCE AND INSURANCE

OVERVIEW

Finance and Insurance projections indicate overall growth. However, certain sectors such as insurance carriers and depository credit intermediation (i.e. banks and credit unions) indicate decline over the next 5 years. Other financial investment activities (i.e. portfolio management, investment advice, etc.) show strong growth forecasts, which will put pressure on the education system to produce an adequate supply of talent such as securities, commodities and financial services sale agents to fulfill industry need. Figure 11.1 and table 11.1 show current employment and projected growth for sub-industry categories within Finance and Insurance. Figure 11.2 and table 11.2 show specific gaps and surpluses for key occupations within the sector.

DISCUSSION

Finance and Insurance is one of the most complex workforce development sectors to analyze in the Lehigh Valley. On the surface, talent needs for the sector appear well-aligned with the number of program completions roughly equal to the number of openings for most key occupations. However, this alignment is somewhat misleading because Lehigh University's contribution to the annual supply consists of learners who do not remain in the area after program completion. While Lehigh University's graduates count toward Lehigh Valley's "supply," most Lehigh University graduates appear to accept positions outside of the Valley upon graduation.[14] Therefore, although the University makes an out-sized contribution to the strength of the finance and insurance sector in the region, the alignment of talent is likely not as strong as the data suggest. This would be particularly relevant to the accounting and auditing occupation in figure 11.2.

14 This assumption stems from Lehigh University's first destinations report for the class of 2013

In addition, the sector faces significant wage pressure from surrounding counties. Wages for the sector in adjacent New Jersey counties average $14,358 more (34%) than what is paid in the Lehigh Valley. The reasons for these differences may stem from a number of factors that include: cost of living differences in neighboring areas, value of the occupation in difference areas (i.e. revenue generated), or inter-firm differences across the regions. Based upon employer interviews, there was anecdotal evidence of some skill gap pressure. Many interviewees (from all sectors) indicated that recruitment of financial professionals routinely requires a search area that includes central New Jersey. On the other hand, for three of the most significant gaps reported: securities and commodities agents; insurance sales agents; and financial advisors the issue is most likely one of reporting. These positions require state licensing and the results of licensing exams are generally not reported at a local level. Additionally, commute times into and out of Lehigh Valley during peak hours can be long. If given a chance to improve other quality of life factors (i.e. financial, time with family/friends, etc.) many outcommuters may opt to work locally and allocate their commuting time to more fulfilling activities. To this end, strategies that focus on engaging businesses to understand the talent availability issue, communicate wage differences and coordinate a joint public-private response would help to alleviate recruitment issues through leveraging local talent.

BEST PRACTICE
FUEL MILWAUKEE

FUEL Milwaukee (www.fuelmilwaukee.org): A Regional Talent Network and portal serves multiple functions geared toward, news and events, community engagement, networking and job postings. The heart of the portal is centered around a Career Center, wherein people can find job postings, develop member profiles and network with other members on shared interests. The mission of FUEL Milwaukee is to attract and retain top talent to the Milwaukee Region by promoting community engagement, positive regional images and contemporary workplace practices.

A demand gap for customer service representatives (CSRs) of about 149 annually also likely affects the finance and insurance sector disproportionately, although not exclusively. Employers have noted that LVWIB and the PA CareerLink® Lehigh Valley workforce system provide a broad scope of business and industry services and resources to address the workforce and training needs for this occupation. However, many finance operations in the Valley are related to bill collection, customer service and other customer interfacing

occupations and so the CSR gap is particularly important to that sector. It should also be noted, that the gap in this occupation is probably larger than reported due to the closure of one institution (Pennsylvania School of Business) whose graduates are counted in the "supply" reported in this report. Currently, CSR training is embedded in the curriculum of many (if not most) training programs. However, given the technological and corresponding managerial changes occurring in call and shared service centers—a sector that is a natural recruitment target for the Lehigh Valley—training programs that specifically support finance and insurance related call center technologies would help address the current workforce gap as well as support LVEDC's recruitment efforts.

Secretaries and Administrative Assistants also show a demand gap of 105 positions. "Secretarial" demand can seem an antiquated concept as most modern offices have shed the concept of personal executive secretaries. This occupational category is probably best understood as general office management and support and lends itself to many different job titles, as well as a combination of office support functions (e.g. invoicing, event coordination, presentation preparation, etc.). In addition, Front-Line Supervisors show a demand gap of 53. This shortfall was confirmed in employer interviews in which it was reported that incumbent employees who were hired for a technical competency or role and are ready to rise to a supervisory role often could use training assistance to expand competencies beyond technical and toward supervisory.

FIGURE 11.1 – Largest Finance and Insurance Sectors and Projections

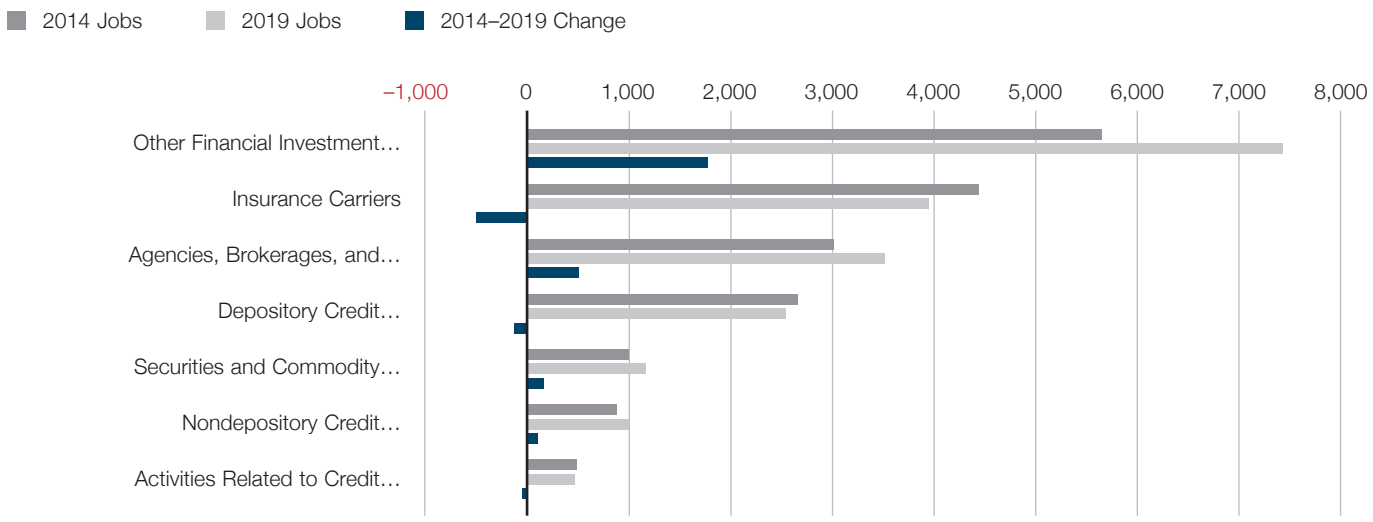


TABLE 11.1 – Finance and Insurance Industry Projections, Wages and Salaries and Establishments

NAICS	Description	2014 Jobs	2019 Jobs	2014–2019 Change	2014–2019 % Change	2014 Wages & Salaries	2013 Establishments
5239	Other Financial Investment Activities	5,647	7,419	1,772	31%	$55,053	106
5241	Insurance Carriers	4,447	3,959	-488	-11%	$63,718	75
5242	Agencies, Brokerages, and Other Insurance Related Activities	3,012	3,522	510	17%	$52,808	270
5221	Depository Credit Intermediation	2,658	2,545	-113	-4%	$42,148	271
5231	Securities and Commodity Contracts Intermediation and Brokerage	1,006	1,163	157	16%	$95,057	58
5222	Nondepository Credit Intermediation	890	997	107	12%	$45,142	32
5223	Activities Related to Credit Intermediation	502	463	-39	-8%	$50,386	40

FIGURE 11.2 – Key Finance and Insurance Occupation Demand Gaps and Surpluses

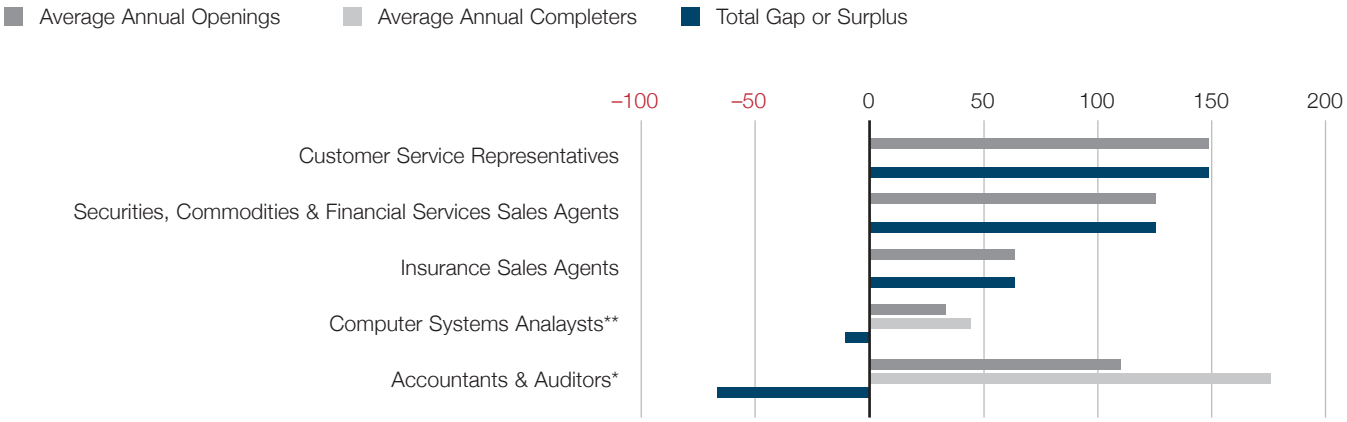


TABLE 11.2 – Key Finance and Insurance Occupation Demand Gaps and Surpluses

SOC Code	Occupation	2014 Jobs	2014-2019 Projected % Growth	Average Annual Openings	Average Annual Program Completions	Total Gap or Surplus	2014 Median Hourly Earnings
41-3021	Insurance Sales Agents	2,259	18%	64	0	64	$26.59
41-3031	Securities, Commodities & Financial Services Sales Agents	2,004	33%	126	0	126	$22.30
43-4051	Customer Service Representatives	6,336	6%	149	0	149	$15.04
13-2011	Accountants & Auditors*	3,075	11%	110	176	-67	$29.76
15-1121	Computer Systems Analysts**	1,062	19%	33	44	-11	$36.24

* Also found in professional, scientific and technical services
** Also found in professional, scientific and technical services

12: PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES

OVERVIEW

Another growing sector, projections indicate that Professional, Scientific and Technical Services will add nearly 1,500 new jobs over the next five years. Specific subsectors driving this growth include: management, scientific and technical consulting services; scientific research and development services; computer system design and related services; accounting, tax preparation, bookkeeping and payroll services; and architectural, engineering and related services. With a spectrum of different growing industries, the resultant demand for talent is equally diverse, ranging from computer systems support to civil engineering. Similarly, many of the occupations within this sector are also found in many other sectors, such as an accountant working in a manufacturing facility, or a computer programmer working in a government office. Of the key occupations identified, many require advanced degrees in engineering, computer science or accounting and management. Figure 12.1 and table 12.1 illustrate the subsector growth within the Professional, Scientific and Technical sector, while figure 12.2 and table 12.2 show the demand gaps and surpluses of talent output within Lehigh Valley.

DISCUSSION

Professional, Scientific and Technical Services sector faces many of the same workforce development issues as finance and insurance. The sector's seemingly well-aligned workforce development programs mask several potential sources of strain. Similar to finance and insurance, Lehigh University's contribution to the local work force is likely overstated in the statistics. Presumably, most Lehigh Valley STEM graduates, especially at the bachelor's level and higher accept positions outside of the Lehigh Valley upon graduation. For example, reported

surpluses in civil and mechanical engineers, as well as accountants and auditor, likely reflect graduates of Lehigh University many of whom do not accept positions in the area upon graduation.[15]

Talent exportation creates opportunities to recruit companies seeking that talent into Lehigh Valley. In addition, the Ben Franklin incubation program is seeking to create more opportunity for budding entrepreneurs in area. This approach should be further explored by LVWIB and the LVEDC through the Entrepreneurship Council of Lehigh Valley already housed in the LVEDC. Further expansion and integration between this sector and small business development and incubation initiatives appears to be the best approach to producing and keeping this talent in the region.

One hurdle to retaining talent from this sector in Lehigh Valley is no other sector showed a greater disparity in wages compared to neighboring counties. On average, wages in the adjacent New Jersey counties were $33,108 (43%) higher than they were in the Lehigh Valley. This strain was particularly noted during employer interviews citing intense recruitment pressure for scientific titles in Lehigh Valley. Junior scientific positions required a search area that included all of New Jersey and senior positions reportedly require national search areas.

The gap in Supervisors of Office Workers is nearly identical to the gap in front line supervisors previously discussed in the Finance and Insurance Sector. Just as was the case with Front Line Supervisors, the challenge in this occupation is upskilling technical workers for supervisory roles as their careers progress.

15 This assumption stems from Lehigh University's first destinations report for the class of 2013

FIGURE 12.1 – Largest Professional, Scientific and Technical Sectors and Projections

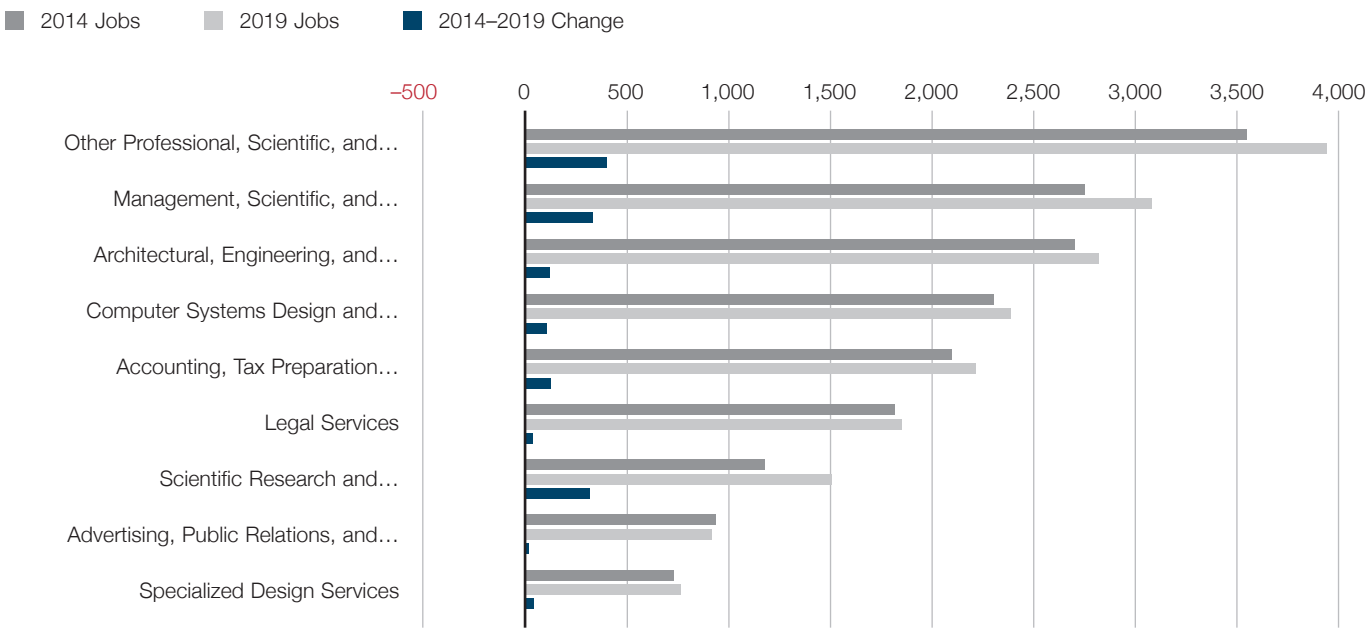


TABLE 12.1 – Professional, Scientific and Technical Industry Projections, Wages and Salaries and Establishments

NAICS	Description	2014 Jobs	2019 Jobs	2014–2019 Change	2014–2019 % Change	2014 Wages & Salaries	2013 Establishments
5411	Legal Services	1,828	1,858	30	2%	$63,357	324
5412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	2,105	2,231	126	6%	$41,311	205
5413	Architectural, Engineering, and Related Services	2,702	2,831	129	5%	$67,837	199
5414	Specialized Design Services	727	760	33	5%	$30,005	39
5415	Computer Systems Design and Related Services	2,302	2,405	103	4%	$60,129	195
5416	Management, Scientific, and Technical Consulting Services	2,756	3,094	338	12%	$50,452	186
5417	Scientific Research and Development Services	1,184	1,505	321	27%	$47,477	22
5418	Advertising, Public Relations, and Related Services	933	923	-10	-1%	$50,920	57
5419	Other Professional, Scientific, and Technical Services	3,561	3,958	397	11%	$22,306	104

FIGURE 12.2 – Key Professional, Scientific and Technical Occupation Demand Gaps and Surpluses

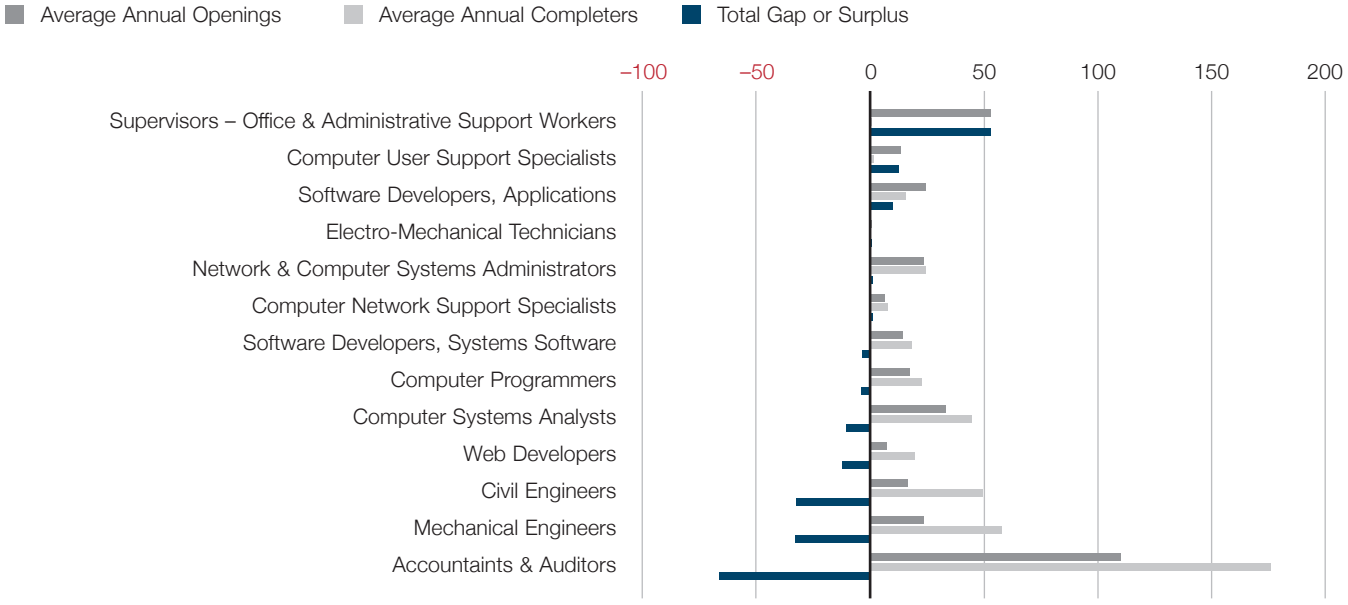


TABLE 12.2 – Key Professional, Scientific and Technical Occupation Demand Gaps and Surpluses

SOC Code	Occupation	2014 Jobs	2014-2019 Projected % Growth	Average Annual Openings	Average Annual Program Completions	Total Gap or Surplus	2014 Median Hourly Earnings
43-1011	Supervisors - Office & Administrative Support Workers	2,825	9%	53	0	53	$25.87
15-1151	Computer User Support Specialists	1,113	13%	13	1	12	$20.03
15-1132	Software Developers, Applications	1,110	12%	24	15	9	$37.15
17-3024	Electro-Mechanical Technicians	17	18%	0	0	0	$23.01
15-1142	Network & Computer Systems Administrators	816	7%	23	24	-1	$32.62
15-1152	Computer Network Support Specialists	301	8%	6	7	-1	$28.52
15-1133	Software Developers, Systems Software	580	13%	14	18	-4	$48.47
15-1131	Computer Programmers	598	3%	17	22	-5	$34.61
15-1121	Computer Systems Analysts	1,062	19%	33	44	-11	$36.24
15-1134	Web Developers	418	23%	7	19	-13	$23.31
17-2051	Civil Engineers	576	9%	16	49	-33	$32.89
17-2141	Mechanical Engineers	491	13%	23	57	-34	$40.58
13-2011	Accountants & Auditors	3,075	11%	110	176	-67	$29.76

ADDENDUM 1: DETAILED GAP ANALYSIS

INTRODUCTION

This addendum contains detailed data and results of the gap analysis, along with methodology and detailed occupation data. The addendum is broken into three chapters. Chapter 1 introduces industry employment and trends in the Lehigh Valley economy. The goal of Chapter 1 is to provide data past and projected employment growth by industry, and comparisons of regional competitiveness using location quotient (LQ) and wages to compare region to two nearby regions that indicate workforce commuting connections (i.e. LV residents commute to these two nearby areas to work and residents from the nearby areas commute to Lehigh Valley for work as well). Chapter 2 evaluates fifty-three critical occupations that are necessary to support five key industry sectors in the Lehigh Valley within the context of overall occupational data for the region. The goal is contextualize the Service Region's target occupations among all occupations present within the region. Chapter 3 assesses notable gaps between educational output and demand for workers in these critical occupations. After a brief conclusion, detailed information on methodology and data are provided in the appendices.

1: TARGET INDUSTRY OVERVIEW

This chapter provides a regional comparison of industry sector employment concentration and wages across Lehigh Valley Lehigh Valley, Central New Jersey and Philadelphia. The goal of the chapter is to contextualize regional competitiveness using location quotient (LQ) and this chapter sets the stage for Chapter 2, which analyzes fifty-three critical occupations that are necessary to support economic development in the Lehigh Valley. Chapter 3 builds on the previous two chapters by assessing notable gaps between educational output and demand for workers in these critical occupations.

Table 1.1 and figure 1.1 compare the employment concentration of the industry sectors in the Lehigh Valley, measured in terms of location quotients (LQs) to the LQ's of the Philadelphia MSA and Central New Jersey.[16] Although having strong metropolitan presences nearby can be a benefit to economic development in some sense, these nearby metros can also compete for talent that currently resides in the Lehigh Valley—as evidenced by the commuting flow map earlier in this report.

LQs are used to assess national competitiveness by comparing the concentration of employment in a given industry against the concentration of employment for that same industry across the nation. An LQ equal to 1 means that the percentage of total employment comprised by an industry in the region exactly matches the percentage of total employment comprised by that industry in the nation. An LQ greater than one means that the industry comprises a greater proportion of total regional employment compared to the national level.

High LQs (usually anything greater than 1.2) are an indication that the region has a comparative advantage or specialization in certain industries relative to the rest of the nation or potentially to other competing regions. When evaluated jointly with job counts and expected job growth, high LQs give a sense of the

16 The counties included in Philadelphia MSA are Philadelphia, Montgomery, Chester and Bucks. The counties included in the Central New Jersey MSA are Hunterdon, Somerset, Middlesex, and Mercer.

industry sectors that have the greatest potential for workforce development opportunities and where regional economic development professionals should likely focus their efforts.

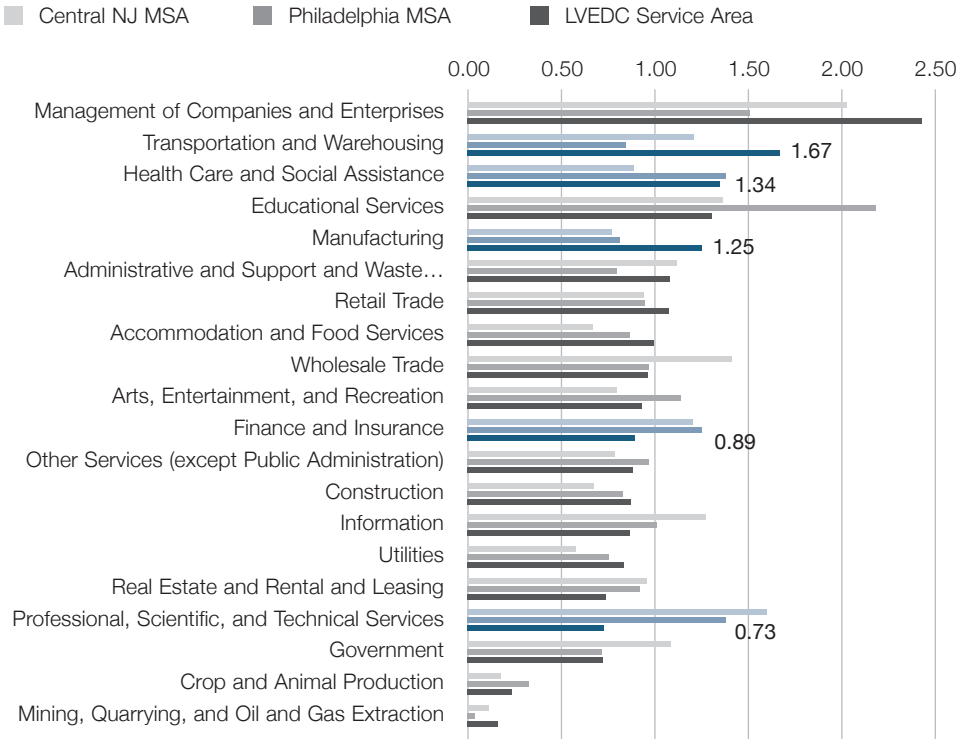
TABLE 1.1 – Employment Concentration by Industry Sector in Lehigh Valley Compared to The Philadelphia MSA and Central New Jersey

NAICS Code	Description	LQ in Central New Jersey	LQ in Philadelphia MSA	LQ in Lehigh Valley
55	Management of Companies and Enterprises	2.02	1.50	2.42
48	Transportation and Warehousing	1.20	0.84	1.67
62	Health Care and Social Assistance	0.89	1.37	1.34
61	Educational Services	1.36	2.18	1.30
31	Manufacturing	0.77	0.81	1.25
56	Administrative and Support and Waste Management and Remediation Services	1.12	0.79	1.08
44	Retail Trade	0.94	0.95	1.07
72	Accommodation and Food Services	0.67	0.86	0.99
42	Wholesale Trade	1.41	0.97	0.96
71	Arts, Entertainment, and Recreation	0.80	1.14	0.93
52	Finance and Insurance	1.20	1.25	0.89
81	Other Services (except Public Administration)	0.78	0.97	0.88
23	Construction	0.67	0.83	0.87
51	Information	1.27	1.01	0.86
22	Utilities	0.57	0.75	0.84
53	Real Estate and Rental and Leasing	0.95	0.92	0.73
54	Professional, Scientific, and Technical Services	1.59	1.38	0.73
90	Government	1.08	0.72	0.73
11	Crop and Animal Production	0.18	0.32	0.24
21	Mining, Quarrying, and Oil and Gas Extraction	0.11	0.04	0.16

Source: EMSI Complete Data 2014.3

LQs for the five target industry sectors are labeled in figure 1.1. Lehigh Valley shows high employment concentration of three of the five sectors, specifically: Transportation & Warehousing (LQ 1.67), Health Care & Social Assistance (LQ 1.34), and Manufacturing (LQ 1.25). In terms of employment concentration, Lehigh Valley also considerably out performs neighboring peer regions in both Transportation & Warehousing, and Manufacturing. For example, the LQ for Transportation & Warehousing is 1.2 and 0.84 in Central New Jersey and Philadelphia, respectively. In Healthcare & Social Assistance, Lehigh Valley is barely edged out by the Philadelphia MSA with and LQ of 1.37. The remaining two sectors: Finance & Insurance, and Professional, Scientific & Technical Services have location quotients lower the 1.0 indicating that on a per worker basis fewer workers are employed in these sectors compared to the national average. However, these industries have strengths in terms of growth (as indicated in table 1.1) and earnings (as indicated in table 1.3 following). Furthermore, the fact that both neighboring regions are highly competitive in these sectors creates the potential for the Lehigh Valley to build on the success of its neighboring metropolitans, and the potential recruit back some of its own workforce to staff new businesses.

FIGURE 1.1 – 2014 Location Quotients for Lehigh Valley, Philadelphia MSA and Central New Jersey MSA



Source: EMSI Complete Data 2014.3

Another industry in Lehigh Valley with a strong LQ is Management of Companies & Enterprises and Educational Services, which was considered as a target but ultimately not selected because the specific companies represented in this sector cover a range of manufacturing operations and other target sectors.[17]

Table 1.2 and figure 1.2 show median salaries and earnings of workers by industry comparing Lehigh Valley to the Philadelphia MSA and the Central New Jersey MSA. The wage and salary data displayed here includes most forms of compensation for labor but excludes supplements in the form of benefits, bonuses, and other forms of extra compensation.

TABLE 1.2 – Earnings by industry sector in Lehigh Valley, Compared to The Philadelphia MSA and Central New Jersey

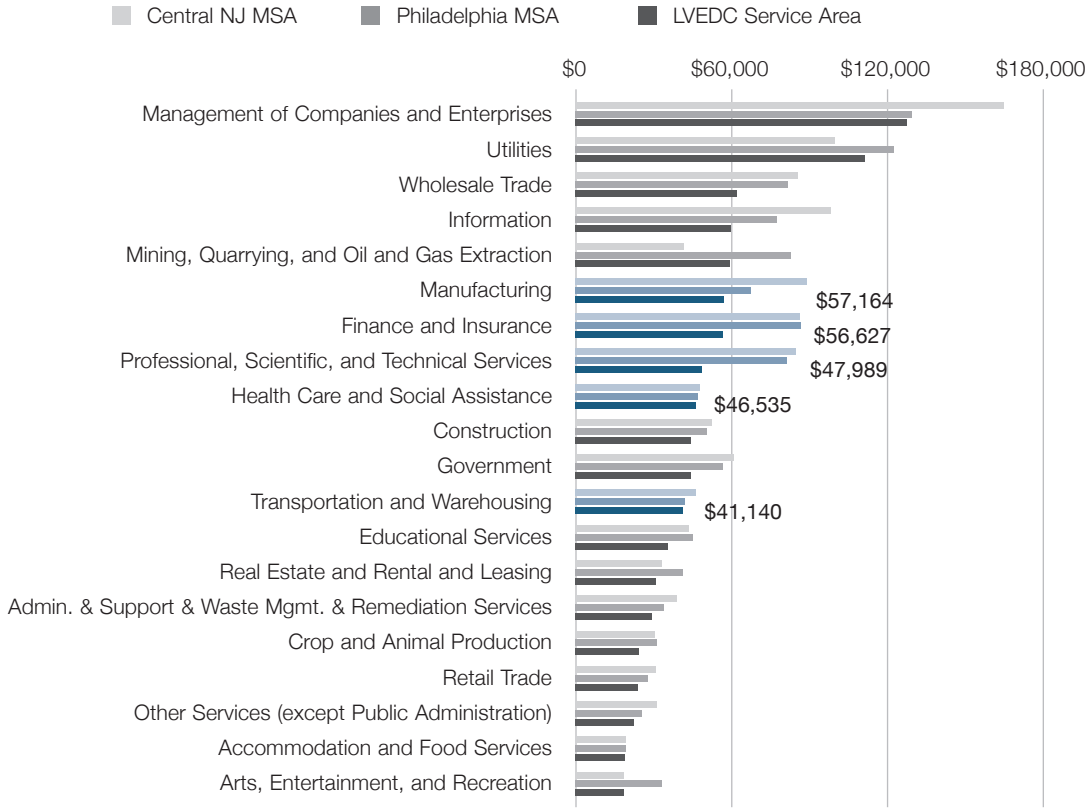
NAICS Code	Description	Wages & Salaries in Central New Jersey	Wages & Salaries in Philadelphia MSA	Wages & Salaries in Lehigh Valley
55	Mgmt. of Companies and Enterprises	$164,316	$129,375	$127,052
22	Utilities	$99,546	$122,108	$111,162
42	Wholesale Trade	$85,196	$81,337	$61,872
51	Information	$97,914	$77,636	$59,726
21	Mining, Quarrying, and Oil and Gas Extraction	$41,446	$82,963	$59,419
31	Manufacturing	$89,056	$67,074	$57,164
52	Finance and Insurance	$86,197	$86,957	$56,627
54	Professional, Scientific, and Technical Services	$84,601	$81,097	$47,989
62	Health Care and Social Assistance	$47,811	$46,815	$46,535
23	Construction	$52,219	$50,521	$44,265
90	Government	$60,406	$56,615	$43,943
48	Transportation and Warehousing	$46,093	$41,946	$41,140
61	Educational Services	$43,873	$44,973	$35,053
53	Real Estate and Rental and Leasing	$33,023	$41,111	$30,657
56	Admin. and Support and Waste Mgmt. and Remediation Services	$38,801	$33,995	$29,152
11	Crop and Animal Production	$30,370	$31,414	$24,268
44	Retail Trade	$30,849	$27,752	$23,908
81	Other Services (except Public Admin.)	$31,177	$25,611	$22,426
72	Accommodation and Food Services	$19,362	$19,439	$18,639
71	Arts, Entertainment, and Recreation	$18,572	$32,952	$18,338
	Total	**$58,714**	**$52,566**	**$42,290**

Source: EMSI Complete Data 2014.3

17 Bureau of Labor Statistics (BLS) states that Management of Companies & Enterprises captures headquarters employment for businesses of any sort. In this case the notable corporate presences in Lehigh Valley are associated with businesses already captured in the target industries, such as Crayola, Just Born and B. Braun in Manufacturing.

As in figure 1.1, earnings for the five target industry sectors noted at the outset of this section are labeled in figure 1.2 to distinguish the target sectors from the non-target sectors. Median wages for the five target industry sectors are all above the regional median of $42,290, except for transportation and warehousing. Notably, median wages are lower in the Lehigh Valley in all five target sectors than in both the Philadelphia MSA and the Central New Jersey MSA. This fact should not be taken strictly as a sign that workers in the Lehigh Valley are underpaid because part of this difference stems from cost of living differences in urban areas compared to the less urban towns and cities of Lehigh Valley. However, the difference is much more pronounced in some sectors, indicating that wage differences are not just due to cost of living but also due to other industry factors. For example, in the Healthcare & Social Assistance sector the difference in wages is relatively small (1% lower than Philadelphia, and 3% lower than Central New Jersey). Conversely, workers in the Professional, Scientific & Technical Services sector in Lehigh Valley are paid 69% less than those in Philadelphia and 76% lower than those in Central New Jersey.

FIGURE 1.2 – 2014 Wages & Salaries Lehigh Valley, Philadelphia MSA and Central New Jersey MSA



2: TARGET OCCUPATION OVERVIEW

INTRODUCTION

As with industries, EMSI and Oxford Economics assisted the LVEDC and LVWIB in selecting a group of "target occupations" that serve as critical criteria of talent needs for the target industries. Determination of these target occupations is critical as it establishes a link between economic development, which helps expand the size of the Lehigh Valley regional economy, and workforce development and ensures that businesses can find workers and workers can find jobs. The 53 target occupations selected by the project team can be found in Appendix 5 in matrix form (table A5.1). An overview of all regional occupations is provided here in an effort to contextualize those target occupations within overall regional employment.

JOBS BY OCCUPATION

Federal agencies use the Standard Occupational Classification (SOC) system to classify workers into occupational categories based on work performed. The 2010 SOC system contains more than 800 detailed occupations organized according to a five-digit hierarchical coding structure. Detailed occupations with similar job duties are further combined to form 23 major groups. Table 2.1 shows the breakdown of employment in the Lehigh Valley organized by major SOC group. Information on current and projected jobs, job change, average annual job openings, and wage rates is also supplied.

Office & administrative support occupations comprise the largest occupation group in Lehigh Valley at 53,341 jobs, followed by sales & related occupations. Legal occupations and architectural & engineering occupations have the highest median earnings of $38.70/hour and 35.81/hour, respectively. Several of the higher-paying occupation groups are also projected to experience job growth over the next ten years, such as healthcare practitioners & technical occupations (18%), management (16%), and business and financial operations

TABLE 2.1 – Current and Projected Jobs, Job Change, and Median Hourly Earnings by Major Occupation Group in Lehigh Valley, 2014 to 2024

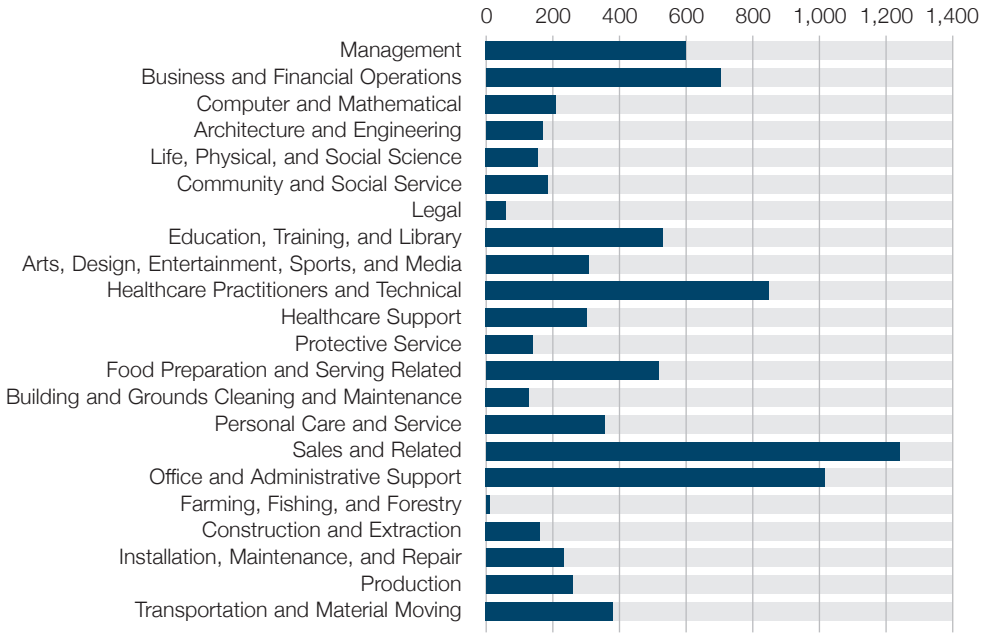
SOC Code	Description	2014 Current Jobs	2024 Projected Jobs	Change	% Change	Median Hourly Earnings	Average Annual Job Openings
11-0000	Management	18,143	21,008	2,865	16%	$35.11	733
13-0000	Business and Financial Operations	17,625	20,955	3,330	19%	$28.67	764
15-0000	Computer and Mathematical	6,856	7,739	883	13%	$33.29	214
17-0000	Architecture and Engineering	5,085	5,479	394	8%	$35.81	173
19-0000	Life, Physical, and Social Science	2,536	2,983	447	18%	$30.94	126
21-0000	Community and Social Service	5,945	6,530	585	10%	$20.40	206
23-0000	Legal	1,705	1,878	173	10%	$38.70	53
25-0000	Education, Training, and Library	20,531	21,612	1,081	5%	$24.99	571
27-0000	Arts, Design, Entertainment, Sports, and Media	8,824	9,984	1,160	13%	$16.83	345
29-0000	Healthcare Practitioners and Technical	21,436	25,362	3,926	18%	$35.76	903
31-0000	Healthcare Support	12,877	15,231	2,354	18%	$13.34	514
33-0000	Protective Service	5,351	5,881	530	10%	$18.39	197
35-0000	Food Preparation and Serving Related	25,585	28,608	3,023	12%	$10.41	1,324
37-0000	Building and Grounds Cleaning and Maintenance	12,982	14,893	1,911	15%	$12.25	490
39-0000	Personal Care and Service	15,534	17,908	2,374	15%	$10.39	629
41-0000	Sales and Related	46,438	51,191	4,753	10%	$15.30	1,853
43-0000	Office and Administrative Support	53,341	56,074	2,733	5%	$15.94	1,607
45-0000	Farming, Fishing, and Forestry	639	667	28	4%	$12.55	24
47-0000	Construction and Extraction	13,898	15,023	1,125	8%	$19.11	466
49-0000	Installation, Maintenance, and Repair	13,109	14,610	1,501	11%	$20.40	489
51-0000	Production	22,959	24,140	1,181	5%	$16.99	681
53-0000	Transportation and Material Moving	27,824	31,692	3,868	14%	$15.58	1,122

Source: EMSI Complete Data 2014.3

(19%). As briefly touched upon in the introduction, the growth and demand for these occupations are inextricably linked to the growth of the target industries they support, such as finance and insurance, healthcare and professional, scientific and technical services.

Figure 2.1 provides a slightly different look at the average annual job openings, specifically for workers with some college or above. This is broken out by occupation category over the next ten years. “Job openings” refer to new jobs due to growth plus replacement jobs due to worker turnover. Between 2014 and 2024, the occupations with the highest number of average annual job openings for workers with some college or above occurs in sales & related occupations, office & administrative support occupations, and healthcare practitioners & technical occupations. Two other categories specifically relevant to the target occupations that also offer a significant number of annual openings are healthcare support and production. The annual openings in figure 2.1 reflect need from post-secondary education institutions to provide an annual talent pipeline.

Figure 2.1 – Ten-year Average Annual Job Openings for Occupations Requiring Some College and Above—Broken out by Occupation Category in Lehigh Valley



Source: EMSI Complete Data 2014.3

3: PROGRAM GAP ANALYSIS

The results that appear in this chapter present a focused view of the occupations projected to have a regional gap or surplus relative to program output. Programs are analyzed at three different levels: postsecondary vocational certifications, associate's degrees, and bachelor's degrees according to the average entry level education[18]. Occupations that were identified as target occupations in conjunction with input from the Lehigh Valley Economic Development Corporation have been prioritized in the analysis.

Each table includes:

- The SOC code and occupation title,
- The average annual openings associated with that occupation and completion data has been de-duplicated using the process outlined in Appendix 3,
- The average annual program completions between 2011 and 2013, and
- The gap or surplus figure.

If the numbers are positive, there is a shortage or "gap" of program completions—i.e., there are more job openings in those occupations than there are graduates or program completions. If the numbers are negative, then there are fewer annual job openings compared to the "surplus" of program completions for those occupation classifications. The median hourly wage rate for occupations is also included.

INTERPRETING GAP/SURPLUS ANALYSIS RESULTS

The gap analysis is intended to serve as a point of departure for LVEDC to

18 Average entry level education is determined using data reported to the Bureau of Labor Statistics' Quarterly Census of Employment and Wages. Data is reported at the national level, so alternate paths to employment may exist in the Lehigh Valley region.

engage education and other area stakeholders on regional workforce needs. A surplus or deficit of workers in a particular category does not necessarily indicate a problem for the region, and it is important that each occupation group be evaluated on a case-by-case basis.

Other information should also be considered when evaluating these surpluses and gaps. For example, only the post-secondary educational supply pipeline is considered in this analysis because these numbers can be tracked at the county and school level. However, other sources of supply exist as well—unemployed workers, industry trained pipelines, in-migrators, and job changers from other occupational categories can also be a source of skilled occupations. Particular to this analysis is that many of occupations that align to post-secondary vocational (PSV) levels could be filled by persons with some college, a high school degree, or less. High school graduates also do not show up in the data (unless flagged in the additional data as a certificate or diploma completion for a particular skill.) These types of considerations are useful when evaluating specific types of occupations—for which secondary data sources (e.g., regional, state, and federal data) do not take into account for this. Primary data collection methods (i.e., interviews and surveys) are among the only ways to obtain information on this type of supply pipeline, which further supports many of the recommendations and strategies of employer engagement, collaboration and additional primary research described in the executive summary.

Since labor markets involve a complex interaction between talent production, availability and need, education supply and workforce demand are constantly in a state of change (minor and major). As a general rule of thumb, only programs with considerable gaps or surpluses are considered worthy of closer examination, as they potentially pose long-term strategic issues. Given the size and characteristics of Lehigh Valley workforce, any gap or surplus within 10 jobs either above or below zero should be considered within the normal range of labor market fluctuations.

Once evaluated across the education institutions, LVEDC and LVWIB, specific implications should be considered for programs with substantial surpluses or gaps. These implications include:

- **Surplus:** Oversupply of specific education program completions may lead to higher attrition rates (i.e., brain drain). In other words, the region is educating a workforce that is leaving after program completion because of a lack of jobs. Note: In the analysis of Lehigh Valley where the population density is high in neighboring areas, a surplus of program completions may seek out career opportunities in these areas.

- **Gap:** Undersupply of specific program completions may lead to missed opportunities for economic growth and put pressure on local businesses to find necessary human capital elsewhere. In other words, the region's education institutions are not providing the necessary workforce for the region and thereby shifting the burden on the industries to find workers in other economies to fill the needed occupations. This translates into higher human resources costs and decreased efficiencies in the economic system. This also provides an opportunity for institutions to develop new programs. Note: Given population density in the areas bordering the service region, a completion gap may be filled by other institutions near the service region. This potential scenario will need to be taken into consideration from the leadership.

POSTSECONDARY CERTIFICATE LEVEL GAP ANALYSIS-TARGET OCCUPATIONS

Figure 3.1 provides an illustration that summarizes the top ten gaps for LVEDC postsecondary certificate level programs. Heavy and tractor-trailer truck drivers exhibited the largest gap (393 annual openings for 66 average annual program completions). The second largest gap was for industrial truck and tractor operators, which shows an annual demand of 243 compared to a three year average annual supply of 50 graduates. The third largest gap was for home health aides with 178 annual job openings compared to only three average annual regional graduates.

FIGURE 3.1 – Supply and Demand for Target Occupations at the Postsecondary Certificate Levels and Lower in Lehigh Valley

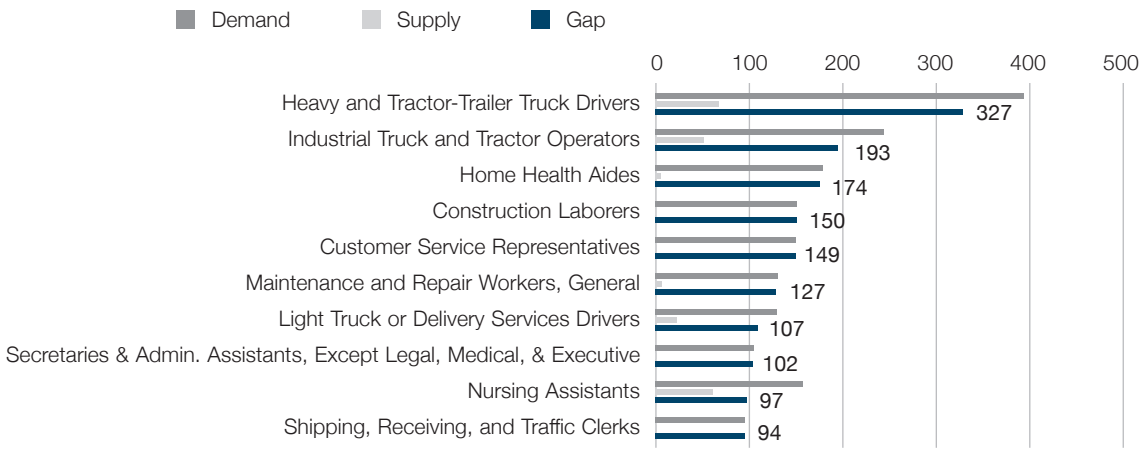


TABLE 3.1 – Supply and Demand for Target Occupations at the Postsecondary Certificate Levels and Lower in Lehigh Valley

SOC Code	Description	Average Annual Job Openings	Average Annual Completions	Total Gap or Surplus	Median Hourly Wage
53-3032	Heavy and Tractor-Trailer Truck Drivers	393	66	327	$ 19.63
53-7051	Industrial Truck and Tractor Operators	243	50	193	$ 15.88
31-1011	Home Health Aides	178	3	174	$ 9.72
47-2061	Construction Laborers	150	0	150	$ 14.53
43-4051	Customer Service Representatives	149	0	149	$ 15.04
49-9071	Maintenance and Repair Workers, General	131	5	127	$ 18.45
53-3033	Light Truck or Delivery Services Drivers	129	22	107	$ 14.92
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	105	3	102	$ 15.35
31-1014	Nursing Assistants	156	59	97	$ 13.50
43-5071	Shipping, Receiving, and Traffic Clerks	95	1	94	$ 15.34
47-2031	Carpenters	97	11	86	$ 17.03
41-3021	Insurance Sales Agents	64	0	64	$ 26.59
51-4041	Machinists	74	12	62	$ 19.89
51-9111	Packaging and Filling Machine Operators and Tenders	57	0	57	$ 15.13
43-1011	First-Line Supervisors of Office and Administrative Support Workers	53	0	53	$ 25.87
49-9041	Industrial Machinery Mechanics	48	0	48	$ 23.83
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	43	0	43	$ 17.91
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	41	0	41	$ 20.28
47-2111	Electricians	45	11	33	$ 22.75
51-1011	First-Line Supervisors of Production and Operating Workers	32	0	32	$ 28.79
43-5061	Production, Planning, and Expediting Clerks	27	0	27	$ 23.00
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	24	0	24	$ 33.96
29-2041	Emergency Medical Technicians and Paramedics	51	28	23	$ 17.82
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	21	0	21	$ 18.07
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	21	3	18	$ 17.85
49-9043	Maintenance Workers, Machinery	16	0	16	$ 21.85
15-1151	Computer User Support Specialists	13	1	12	$ 20.03
49-3023	Automotive Service Technicians and Mechanics	97	86	11	$ 16.57
51-5112	Printing Press Operators	11	2	9	$ 17.95
51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic	4	0	4	$ 25.71
21-1094	Community Health Workers	1	0	1	$ 13.32
31-1015	Orderlies	0	0	0	$ 12.31
29-1141	Registered Nurses	15	65	-50	$ 31.73
29-2052	Pharmacy Technicians	9	67	-58	$ 13.47
51-4121	Welders, Cutters, Solderers, and Brazers	23	95	-72	$ 18.82
31-9092	Medical Assistants	43	495	-452	$ 15.03

If wage goals are important for the region, then factoring in wage levels is useful when reviewing the gap analysis. Examining wages of home health aides, which does have the third largest gap, reveals a rate of $9.72 an hour – which is only half of overall median wages for the region of $18.89. Therefore, expanding programs in this area should be carefully considered prior to investment. For example, perhaps a vocational & technical school is best aligned to meet these specific needs.

Table 3.1 lists supply and demand in tabular form for all target occupations in which average entry levels of education of certificate programs and lower. Gaps (or surpluses) of less than 10 are considered within the expected boundaries of normal frictional employment and are therefore not considered significant for decision making purposes.

There are four programs in Lehigh Valley that are training for occupations with a significant surplus of workers. Medical assistants has the largest surplus of 452 (43 regional openings compared with 495 graduates).[19] Welders, cutters, solderers, and brazers is second largest with a surplus 72 program completions; followed by pharmacy technicians (supply surplus of 58) and registered nurses (supply surplus of 50). It is likely that the additional annual openings in areas outside of Lehigh Valley are being filled by education program completions—especially considering the proximity of the region to large employment area that is the New York-New Jersey metropolis. A review of placement rates could provide additional information, as institutions in these other metro areas are likely producing similar talent as well.

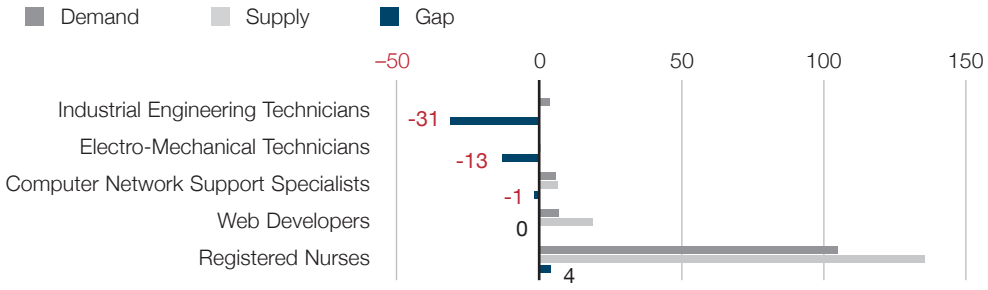
The section titled “Notable Workforce Gaps in Non-Target Occupations” addresses occupations that are not target, yet still indicate noteworthy regional workforce gaps for PSV education levels and lower (table 3.4). Surpluses in non-target occupations are then discussed.

ASSOCIATE’S LEVEL GAP ANALYSIS

Figure 3.2 on the next page provides an illustration of the top gaps for Lehigh Valley’s associate’s degree level programs. Jobs and graduates are matching extremely well at the associate’s level, as the analysis revealed no significant gaps (over 10) at the associate’s level in Lehigh Valley region for target occupations.

19 In some instances surpluses

FIGURE 3.2: Supply and Demand for Target Occupations at the Associates Degree Level in Lehigh Valley



Similar to the previous table, table 3.2 displays supply and demand for all associate's level programs in the target occupations. There were only two occupations at the associate's degree level with significant surpluses: registered nurses (supply surplus of 31) and web developers (supply surplus of 13).

TABLE 3.2 – Supply and Demand for Target Occupations at the Associate's Degrees in Lehigh Valley

SOC Code	SOC Title	Average Annual Job Openings	Average Annual LVEDC Completions	Total Gap or Surplus	Median Hourly Wage
17-3026	Industrial Engineering Technicians	4	0	4	$ 26.48
17-3024	Electro-Mechanical Technicians	0	0	0	$ 23.01
15-1152	Computer Network Support Specialists	6	7	-1	$ 28.52
15-1134	Web Developers	7	19	-13	$ 23.31
29-1141	Registered Nurses	105	136	-31	$ 31.73

BACHELOR'S LEVEL GAP ANALYSIS

Figure 3.3 on the next page provides an illustration of the top gaps for Lehigh Valley's bachelor's degree level programs. LVEDC exhibited two significant gaps at the bachelor degree level: securities, commodities, and financial service sales agents (gap of 126) and wholesale and manufacturing sales representatives of technical and scientific products. All other occupations appear well supplied.

The large gap in securities, commodities, and financial services agents may have several explanations. The first is the wage difference. Since it is possible to live in Lehigh Valley and commute to work in New York or New Jersey, many

may opt for the higher wages paid in those metropolitan areas. A second line of reasoning is that financial sales agents is a relatively high turnover job, so there are many more average annual openings than in other occupations with lower turnover.

FIGURE 3.3: Supply and Demand for Target Occupations at the Bachelor's Degree Level in Lehigh Valley

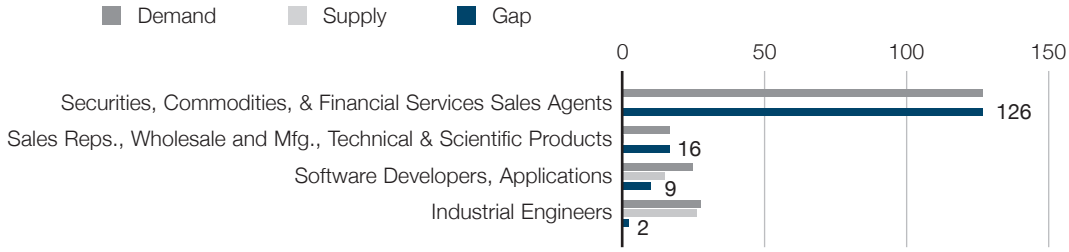


TABLE 3.3: Supply and Demand for Target Occupations at the Bachelor's Degree Level in Lehigh Valley

SOC Code	SOC Title	Average Annual Job Openings	Average Annual LV Completions	Total Gap or Surplus	Median Hourly Wage
41-3031	Securities, Commodities, and Financial Services Sales Agents	126	0	126	$22.30
41-4011	Sales Representatives, Wholesale & Mfg., Technical and Scientific Products	16	0	16	$39.79
15-1132	Software Developers, Applications	24	15	9	$37.15
17-2112	Industrial Engineers	28	26	2	$40.66
15-1142	Network and Computer Systems Administrators	23	24	-1	$32.62
17-2071	Electrical Engineers	11	12	-2	$38.36
11-3051	Industrial Production Managers	15	18	-3	$46.17
15-1133	Software Developers, Systems Software	14	18	-4	$48.47
15-1131	Computer Programmers	17	22	-5	$34.61
15-1121	Computer Systems Analysts	33	44	-11	$36.24
17-2051	Civil Engineers	16	49	-33	$32.89
11-2022	Sales Managers	16	49	-33	$48.03
17-2141	Mechanical Engineers	23	57	-34	$40.58
13-2011	Accountants and Auditors	110	176	-67	$29.76

Similar to the previous table, table 3.3 displays supply and demand for all bachelor level programs. Tables 3.4 through 3.6 address the occupations that were not identified as target occupations by EMSI and the LVEDC.

There were five programs within the identified target occupations that show significant surpluses at the bachelor's level. The largest surplus was found in accountants and auditors (110 annual openings compared to 176 graduates). This was followed by a surplus of 34 mechanical engineers and 33 sales managers.

Gaps and surpluses in **non-targeted occupations** will be addressed in the following two sections.

WORKFORCE GAPS IN NON-TARGET OCCUPATIONS

In addition to knowing how well educational programs in Lehigh Valley are serving the target occupations, it is helpful to be aware of the fields of opportunity where significant gaps may exist outside those targeted areas. This analysis provides context about non-target occupations that may serve as further opportunities for education program development or review. Table 3.4 contains a list of supply and demand for non-target occupations at the post-secondary certificate level and below. Occupations with 10 or fewer gaps have been removed, as these are considered within acceptable boundaries of normal frictional employment. The median hourly earnings for workers in the service region are included in the table for convenience.

High turnover, non-target occupations that typically do not require post-secondary education, such as: laborers and freight, stock, and material movers, hand; combined food preparation and serving workers, including fast food; cashiers; retail salespersons; waiters and waitresses; and janitors and cleaners, except maids and housekeeping cleaners appear to have the largest gaps in Lehigh Valley

Table 3.5 lists the supply and demand for associate degree level non-target occupations. Note that those occupations with 10 or fewer gaps have been removed, as these are considered within acceptable boundaries of normal frictional employment. The median hourly earnings for workers in the service region are included in the table for convenience.

As seen in the target occupations, jobs and graduates at the associate's degree level are well matched even for non-target occupations. The only significant gap is eleven in medical and clinical laboratory technicians. Median wages in this

TABLE 3.4: Supply and Demand for Non-Target Occupations at the Post-Secondary Vocational Award or Certificate Level or Lower in Lehigh Valley

SOC Code	SOC Title	Average Annual Job Openings	Average Annual Completions	Total Gap or Surplus	Median Hourly Wage
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	518	0	518	$ 13.02
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	367	15	352	$ 8.94
41-2011	Cashiers	351	0	351	$ 9.08
41-2031	Retail Salespersons	329	8	321	$ 10.66
35-3031	Waiters and Waitresses	262	0	262	$ 9.98
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	212	0	212	$ 12.45
43-5081	Stock Clerks and Order Fillers	204	0	204	$ 10.56
53-7064	Packers and Packagers, Hand	203	0	203	$ 14.24
37-2012	Maids and Housekeeping Cleaners	178	0	178	$ 10.15
43-9061	Office Clerks, General	173	2	170	$ 13.92
51-2092	Team Assemblers	158	0	158	$ 15.15
41-9022	Real Estate Sales Agents	111	0	111	$ 13.98
33-9032	Security Guards	106	0	106	$ 11.30
37-3011	Landscaping and Groundskeeping Workers	105	0	105	$ 12.23
35-2021	Food Preparation Workers	106	4	102	$ 10.22
41-1011	First-Line Supervisors of Retail Sales Workers	92	0	92	$ 15.44
35-9021	Dishwashers	86	0	86	$ 8.93
43-4171	Receptionists and Information Clerks	86	1	84	$ 13.04
39-9021	Personal Care Aides	85	2	83	$ 10.34
39-3011	Gaming Dealers	79	0	79	$ 10.71
51-9198	Helpers--Production Workers	71	0	71	$ 12.88
11-9141	Property, Real Estate, and Community Association Managers	67	0	66	$ 17.31
35-2014	Cooks, Restaurant	85	19	65	$ 11.94
43-3031	Bookkeeping, Accounting, and Auditing Clerks	73	13	61	$ 17.69
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	61	2	59	$ 25.65
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	59	0	59	$ 16.51
53-3031	Driver/Sales Workers	54	0	54	$ 10.19
35-3011	Bartenders	51	0	51	$ 10.26
41-9091	Door-to-Door Sales Workers, News and Street Vendors, and Related Workers	51	0	51	$ 7.58
35-9031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	49	0	49	$ 9.97
35-2012	Cooks, Institution and Cafeteria	49	2	47	$ 13.03
43-3011	Bill and Account Collectors	47	0	47	$ 13.34
43-3071	Tellers	42	0	42	$ 11.76
25-9041	Teacher Assistants	49	8	42	$ 11.73
35-3022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	40	0	40	$ 8.61
11-9051	Food Service Managers	39	0	39	$ 18.57
35-9011	Dining Room and Cafeteria Attendants and Bartender Helpers	38	0	38	$ 9.14
39-2021	Nonfarm Animal Caretakers	38	0	38	$ 10.18
11-9199	Managers, All Other	40	3	37	$ 18.19
43-4151	Order Clerks	36	0	35	$ 14.52

SOC Code	SOC Title	Average Annual Job Openings	Average Annual Completions	Total Gap or Surplus	Median Hourly Wage
35-3041	Food Servers, Nonrestaurant	34	0	34	$ 9.39
41-2021	Counter and Rental Clerks	34	0	34	$ 13.25
41-3099	Sales Representatives, Services, All Other	34	0	34	$ 23.21
53-7061	Cleaners of Vehicles and Equipment	32	0	32	$ 10.34
39-9041	Residential Advisors	30	0	30	$ 11.32
43-5021	Couriers and Messengers	30	0	30	$ 15.57
41-1012	First-Line Supervisors of Non-Retail Sales Workers	29	0	29	$ 23.90
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	29	0	29	$ 27.11
39-3091	Amusement and Recreation Attendants	28	0	28	$ 8.99
53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	28	0	28	$ 21.92
51-2022	Electrical and Electronic Equipment Assemblers	32	5	28	$ 14.86
11-9013	Farmers, Ranchers, and Other Agricultural Managers	27	0	27	$ 11.43
43-4081	Hotel, Motel, and Resort Desk Clerks	27	0	27	$ 10.64
43-5032	Dispatchers, Except Police, Fire, and Ambulance	26	0	26	$ 18.98
43-3021	Billing and Posting Clerks	31	6	26	$ 16.83
53-7081	Refuse and Recyclable Material Collectors	25	0	25	$ 13.74
27-4021	Photographers	24	0	24	$ 11.23
21-1093	Social and Human Service Assistants	24	0	24	$ 13.05
41-2022	Parts Salespersons	24	0	24	$ 15.67
49-9052	Telecommunications Line Installers and Repairers	24	0	24	$ 31.87
47-2081	Drywall and Ceiling Tile Installers	23	0	23	$ 14.87
47-2181	Roofers	23	0	23	$ 15.40
51-9199	Production Workers, All Other	22	0	22	$ 14.38
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	22	0	22	$ 11.63
39-3031	Ushers, Lobby Attendants, and Ticket Takers	22	0	22	$ 8.60
31-9091	Dental Assistants	22	0	22	$ 16.28
27-2042	Musicians and Singers	20	0	20	$ 20.47
53-3022	Bus Drivers, School or Special Client	25	4	20	$ 13.91
53-7011	Conveyor Operators and Tenders	26	5	20	$ 15.21
53-3021	Bus Drivers, Transit and Intercity	24	4	20	$ 15.86
41-9021	Real Estate Brokers	20	0	20	$ 21.77
43-5052	Postal Service Mail Carriers	19	0	19	$ 27.56
53-3041	Taxi Drivers and Chauffeurs	23	5	19	$ 10.44
39-9099	Personal Care and Service Workers, All Other	19	0	19	$ 10.36
33-3051	Police and Sheriff's Patrol Officers	18	0	18	$ 31.42
47-2141	Painters, Construction and Maintenance	18	0	18	$ 15.93
37-1011	First-Line Supervisors of Housekeeping and Janitorial Workers	18	1	18	$ 17.07
51-3011	Bakers	20	2	18	$ 11.72
33-3012	Correctional Officers and Jailers	20	3	17	$ 24.34
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	17	0	17	$ 30.27
35-2011	Cooks, Fast Food	18	1	17	$ 8.86

SOC Code	SOC Title	Average Annual Job Openings	Average Annual Completions	Total Gap or Surplus	Median Hourly Wage
51-6011	Laundry and Dry-Cleaning Workers	17	0	17	$ 11.12
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	19	3	16	$ 17.01
39-5011	Barbers	19	2	16	$ 10.51
51-9196	Paper Goods Machine Setters, Operators, and Tenders	16	0	16	$ 17.66
51-2041	Structural Metal Fabricators and Fitters	14	0	14	$ 20.50
11-3071	Transportation, Storage, and Distribution Managers	14	1	14	$ 39.91
51-3092	Food Batchmakers	13	0	13	$ 17.11
47-2221	Structural Iron and Steel Workers	13	0	13	$ 19.70
51-2099	Assemblers and Fabricators, All Other	13	0	13	$ 13.41
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	15	2	13	$ 20.23
51-3021	Butchers and Meat Cutters	13	0	13	$ 16.98
33-9091	Crossing Guards	16	3	13	$ 12.26
53-6021	Parking Lot Attendants	13	0	13	$ 10.72
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	13	0	13	$ 30.08
33-9092	Lifeguards, Ski Patrol, and Other Recreational Protective Service Workers	16	4	12	$ 8.96
41-9041	Telemarketers	12	0	12	$ 15.86
43-9041	Insurance Claims and Policy Processing Clerks	12	0	11	$ 19.43
51-8091	Chemical Plant and System Operators	11	0	11	$ 25.02
43-3051	Payroll and Timekeeping Clerks	14	3	11	$ 18.69
39-1011	Gaming Supervisors	11	0	11	$ 21.46
43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	11	0	11	$ 12.75
25-3021	Self-Enrichment Education Teachers	11	0	11	$ 15.09
49-3093	Tire Repairers and Changers	14	3	11	$ 12.84
41-2012	Gaming Change Persons and Booth Cashiers	11	0	11	$ 13.40
39-1021	First-Line Supervisors of Personal Service Workers	11	0	11	$ 14.45
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	3	14	-11	$ 17.73
29-2071	Medical Records and Health Information Technicians	12	25	-13	$ 16.32
51-4199	Metal Workers and Plastic Workers, All Other	4	20	-15	$ 16.75
31-9093	Medical Equipment Preparers	3	24	-21	$ 17.02
29-2061	Licensed Practical and Licensed Vocational Nurses	64	86	-22	$ 21.57
39-5092	Manicurists and Pedicurists	8	32	-25	$ 8.47
31-9011	Massage Therapists	11	35	-25	$ 13.29
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	35	62	-28	$ 21.32
43-6013	Medical Secretaries	27	63	-35	$ 15.50
39-5094	Skincare Specialists	6	72	-66	$ 13.07
29-2099	Health Technologists and Technicians, All Other	2	78	-76	$ 25.80
43-9199	Office and Administrative Support Workers, All Other	12	96	-83	$ 17.39
39-5012	Hairdressers, Hairstylists, and Cosmetologists	96	300	-205	$ 10.65

* Note gaps or surpluses of less than 10 have been removed as these are considered as within the expected boundaries of normal frictional employment. Source: EMSI Gap Analysis Model

TABLE 3.5: Supply and Demand for Non-Target Occupations at the associates's degree Level in Lehigh Valley

SOC Code	SOC Title	Average Annual Job Openings	Average Annual Completions	Total Gap or Surplus	Median Hourly Wage
29-2012	Medical and Clinical Laboratory Technicians	13	2	11	$ 19.46
31-2021	Physical Therapist Assistants	11	24	-12	$ 22.12
17-3011	Architectural and Civil Drafters	5	17	-13	$ 22.06
23-2011	Paralegals and Legal Assistants	6	24	-19	$ 22.43
29-2021	Dental Hygienists	12	31	-19	$ 32.22
27-4012	Broadcast Technicians	2	32	-30	$ 18.44
25-2011	Preschool Teachers, Except Special Education	13	49	-36	$ 10.21

* Note gaps or surpluses of less than 10 have been removed as these are considered as within the expected boundaries of normal frictional employment.

occupation, at $19.46, are slightly above the overall region median of $18.89. There are six occupations with surplus figures, the largest of which is preschool teachers (except special education). This is followed by broadcast technicians (supply surplus of 30), and dental hygienists (supply surplus of 10).

In table 3.6, a list of supply and demand for non-target occupations at the bachelor's degree level is displayed. Note that those occupations with 10 or fewer gaps have been removed, as these are considered within acceptable boundaries of normal frictional employment. The median hourly earnings for workers in the service region are included in the table for convenience.

There are ten significant gaps at the bachelor's level in the non-target occupations. The largest is in personal and financial advisors (demand gap of 46), followed by medical and clinical laboratory technologists (demand gap of 27) and appraisers and assessors of real estate (demand gap of 22).

The top three surpluses were in natural sciences managers (supply surplus of 450 more graduates than jobs), architectural and engineering managers (supply surplus of 190), and health care practitioners and technical workers, all others (supply surplus of 94).

TABLE 3.6: Supply and Demand for Non-Target Occupations at the Bachelor Degree Level in Lehigh Valley

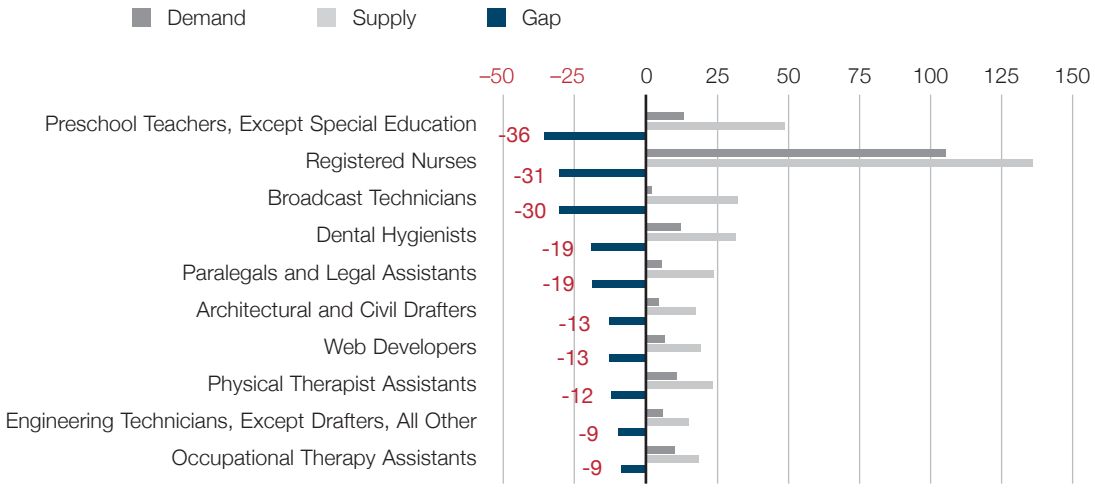
SOC Code	SOC Title	Average Annual Job Openings	Average Annual Completions	Total Gap or Surplus	Median Hourly Wage
13-2052	Personal Financial Advisors	177	131	46	$ 29.71
29-2011	Medical and Clinical Laboratory Technologists	27	<1	27	$ 27.89
13-2021	Appraisers and Assessors of Real Estate	22	<1	22	$ 18.81
13-1121	Meeting, Convention, and Event Planners	19	<1	19	$ 22.54
21-1023	Mental Health and Substance Abuse Social Workers	15	1	15	$ 17.88
11-3031	Financial Managers	43	30	13	$ 44.74
13-1071	Human Resources Specialists	29	17	13	$ 28.92
25-3099	Teachers and Instructors, All Other	14	2	12	$ 19.90
25-2022	Middle School Teachers, Except Special and Career/Technical Education	20	8	12	$ 28.28
39-9032	Recreation Workers	24	13	12	$ 11.22
11-2021	Marketing Managers	14	25	-11	$ 60.33
19-2041	Environmental Scientists and Specialists, Including Health	3	15	-12	$ 27.48
17-2041	Chemical Engineers	2	16	-13	$ 49.14
25-2012	Kindergarten Teachers, Except Special Education	7	21	-14	$ 26.21
17-2199	Engineers, All Other	5	19	-15	$ 36.23
15-2031	Operations Research Analysts	2	17	-15	$ 29.79
25-3011	Adult Basic and Secondary Education and Literacy Teachers and Instructors	5	20	-15	$ 22.31
21-1021	Child, Family, and School Social Workers	12	27	-15	$ 24.08
27-1024	Graphic Designers	35	52	-16	$ 17.14
27-3031	Public Relations Specialists	11	29	-18	$ 27.22
11-1011	Chief Executives	41	61	-20	$ 54.96
29-1129	Therapists, All Other	3	23	-20	$ 26.37
11-3021	Computer and Information Systems Managers	8	30	-23	$ 50.04
13-1111	Management Analysts	37	60	-23	$ 32.90
11-1021	General and Operations Managers	86	110	-24	$ 45.36
25-2021	Elementary School Teachers, Except Special Education	50	75	-25	$ 29.07
13-1161	Market Research Analysts and Marketing Specialists	42	71	-30	$ 27.08
19-2031	Chemists	10	40	-30	$ 32.59
27-2012	Producers and Directors	8	46	-38	$ 25.23
27-3091	Interpreters and Translators	14	72	-58	$ 17.02
11-1031	Legislators	6	66	-61	$ 12.22
13-1051	Cost Estimators	25	98	-73	$ 27.01
27-3043	Writers and Authors	25	103	-78	$ 17.14
29-9099	Healthcare Practitioners and Technical Workers, All Other	2	96	-94	$ 22.77
11-9041	Architectural and Engineering Managers	7	197	-190	$ 60.85
11-9121	Natural Sciences Managers	3	453	-450	$ 68.16

* Note gaps or surpluses of less than 10 have been removed as these are considered as within the expected boundaries of normal frictional employment.

ASSOCIATE'S LEVEL SURPLUS ANALYSIS

Figure 3.4 illustrates the top 10 surpluses in the combined target and non-target occupational sectors. There are eight significant (more than 10 graduates over annual openings) surpluses. Six were found in non-target occupations and only two in target occupations, as discussed in the above sections. Preschool teachers, except special education revealed the largest surplus at 36, followed by registered nurses (a target occupation) with a surplus of 31, and broadcast technicians (surplus of 30) are the top three surpluses at the associate's degree level.

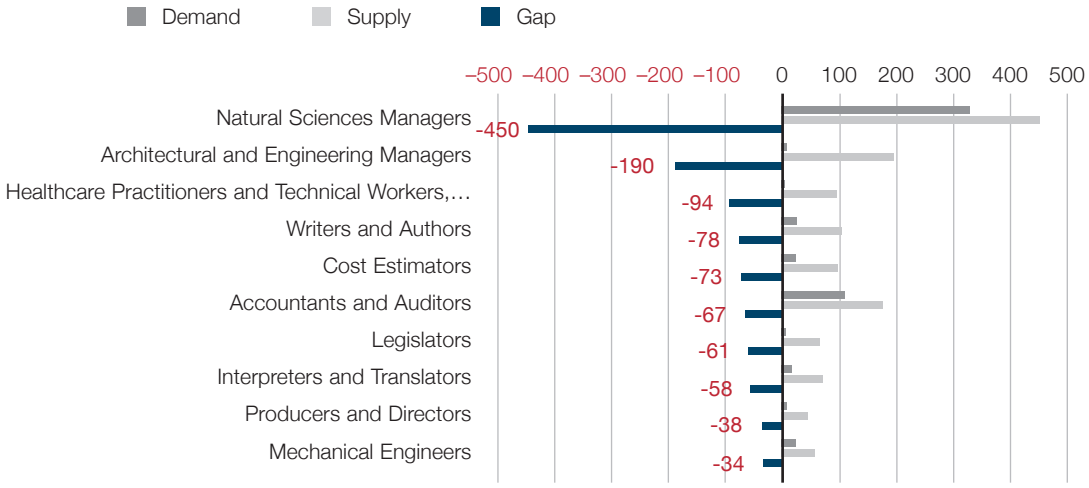
FIGURE 3.4: Top Surplus at the Associate's Degree Level in Lehigh Valley (Combined Target and Non-Target Occupations)



BACHELOR'S LEVEL SURPLUS ANALYSIS

Figure 3.5 illustrates the top 10 surpluses in the combined target and non-target occupational sectors. All ten are significant surpluses (more than 10 graduates over annual openings). None of the top ten surplus occupations were found in the target groups; however some do align to the five key industries. Due to Lehigh Valley's proximity to the larger metropolitan areas of New York and New Jersey, it is highly likely that graduates may be finding work in those areas. This implies that oversupply of specific education program completions may be leading to higher attrition rates (i.e., brain drain). In other words, the region is educating a workforce that is leaving after program completion because of a lack of jobs. A review of placement rates could better illuminate the situation.

FIGURE 3.5: Top Surplus at the Bachelor's Degree Level in Lehigh Valley (Combined Target and Non-Target Occupations)



APPENDIX 1: ABOUT EMSI DATA

As stated in Chapter 2, EMSI data were used to calculate the projected number of annual job openings from 2014 to 2024. These projections take into account openings or loss due to job growth (positive or negative) and openings due to replacement needs. In order to capture a complete picture of industry employment, EMSI gathers and integrates economic, labor market, demographic, and education data from over 90 government and private-sector sources, creating a comprehensive and current database that includes both published data and detailed estimates with full coverage of the United States.

More specifically, EMSI develops this data by combining covered employment data from Quarterly Census of Employment and Wages (QCEW-produced by the Department of Labor) with total employment data in Regional Economic Information System (REIS-published by the Bureau of Economic Analysis or BEA). This is augmented with County Business Patterns (CBP) and Non-employer Statistics (NES) published by the US Census Bureau. Projections are based on the latest-available EMSI industry data, 15-year past local trends in each industry, growth rates in statewide and (where available) sub-state area industry projections published by individual state agencies, and (in part) growth rates in national projections from the Bureau of Labor Statistics.

Through this combination of data sources, EMSI is able to fill gaps in individual sources (such as suppressions and missing proprietors). This yields a composite database that leverages the strengths of all its sources. Finally, EMSI's database is updated quarterly, providing the most up-to-date integrated information possible.

APPENDIX 2: PROGRAM-TO-OCCUPATION MAPPING

Table A2.1 on the following pages displays the crosswalk between educational programs (CIP codes) and occupations (SOC codes) that EMSI used to complete the gap analysis. Also listed are the adjustment factors that were applied to the annual completer figures for graduates in each instructional program. The methodology for these factors is described in Appendix 3, with the occupational based weight figure recounted under “De-duplication of Annual Openings” and the educational level adjustments recounted under “Education Level Adjustments.”

TABLE A2.1: Program to Occupation Mapping with Employment Adjustment Factors

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
3.0103	Environmental Studies	19-2041	Environmental Scientists and Specialists, Including Health	0.68	3	6	53
		19-4091	Environmental Science and Protection Technicians, Including Health	0.32	42	54	85
3.0104	Environmental Science	19-2041	Environmental Scientists and Specialists, Including Health	0.68	3	6	53
		19-4091	Environmental Science and Protection Technicians, Including Health	0.32	42	54	85
4.0201	Architecture	11-9041	Architectural and Engineering Managers	0.58	11	16	63
		17-1011	Architects, Except Landscape and Naval	0.42	6	10	63
5.0101	African Studies	25-1099	Postsecondary Teachers	1.00	3	5	21
5.0102	American/United States Studies/ Civilization	25-1099	Postsecondary Teachers	1.00	3	5	21
5.0103	Asian Studies/ Civilization	25-1099	Postsecondary Teachers	1.00	3	5	21
5.011	Russian Studies	25-1099	Postsecondary Teachers	1.00	3	5	21
5.0125	German Studies	25-1099	Postsecondary Teachers	1.00	3	5	21
5.0199	Area Studies, Other	25-1099	Postsecondary Teachers	1.00	3	5	21
5.0203	Hispanic-American, Puerto Rican, and Mexican-American/ Chicano Studies	25-1099	Postsecondary Teachers	1.00	3	5	21
5.0207	Women's Studies	25-1099	Postsecondary Teachers	1.00	3	5	21
9.0101	Speech Communication and Rhetoric	27-3012	Public Address System and Other Announcers	0.11	54	61	94
		27-3031	Public Relations Specialists	0.25	16	20	75
		27-3043	Writers and Authors	0.64	12	15	66
9.0102	Mass Communication/ Media Studies	27-3022	Reporters and Correspondents	0.13	12	16	79
		27-3041	Editors	0.26	12	16	74
		27-3043	Writers and Authors	0.61	12	15	66
9.0199	Communication and Media Studies, Other	27-3021	Broadcast News Analysts	0.00	12	16	79
		27-3022	Reporters and Correspondents	0.13	12	16	79
		27-3041	Editors	0.26	12	16	74
		27-3043	Writers and Authors	0.61	12	15	66

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
9.0401	Journalism	27-3021	Broadcast News Analysts	0.00	12	16	79
		27-3022	Reporters and Correspondents	0.13	12	16	79
		27-3041	Editors	0.26	12	16	74
		27-3043	Writers and Authors	0.61	12	15	66
9.0908	Technical and Scientific Communication	25-1099	Postsecondary Teachers	0.78	3	5	21
		27-3041	Editors	0.19	12	16	74
		27-3042	Technical Writers	0.03	19	26	74
9.9999	Communication, Journalism, and Related Programs, Other	27-3041	Editors	0.28	12	16	74
		27-3043	Writers and Authors	0.64	12	15	66
		27-3099	Media and Communication Workers, All Other	0.09	37	50	81
10.0202	Radio and Television Broadcasting Technology/Technician	27-4012	Broadcast Technicians	1.00	50	63	95
10.0203	Recording Arts Technology/Technician	27-4011	Audio and Video Equipment Technicians	1.00	50	63	95
10.0304	Animation, Interactive Technology, Video Graphics and Special Effects	27-1014	Multimedia Artists and Animators	1.00	34	43	87
10.0399	Graphic Communications, Other	51-5111	Prepress Technicians and Workers	0.21	71	80	98
		51-5112	Printing Press Operators	0.79	85	93	99
11.0101	Computer and Information Sciences, General	11-3021	Computer and Information Systems Managers	0.08	19	27	73
		15-1111	Computer and Information Research Scientists	0.00	6	9	51
		15-1121	Computer Systems Analysts	0.34	20	28	76
		15-1122	Information Security Analysts	0.03	29	43	77
		15-1134	Web Developers	0.18	23	31	84
		15-1141	Database Administrators	0.05	22	32	79
		15-1142	Network and Computer Systems Administrators	0.20	34	49	88
		15-1143	Computer Network Architects	0.04	27	41	85
		15-1199	Computer Occupations, All Other	0.06	34	49	86

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
11.0103	Information Technology	15-1111	Computer and Information Research Scientists	0.00	6	9	51
		15-1121	Computer Systems Analysts	0.33	20	28	76
		15-1122	Information Security Analysts	0.03	29	43	77
		15-1132	Software Developers, Applications	0.28	11	16	67
		15-1133	Software Developers, Systems Software	0.16	11	16	67
		15-1134	Web Developers	0.17	23	31	84
		15-1143	Computer Network Architects	0.04	27	41	85
11.0199	Computer and Information Sciences, Other	11-3021	Computer and Information Systems Managers	1.00	19	27	73
11.0201	Computer Programming/ Programmer, General	15-1122	Information Security Analysts	0.03	29	43	77
		15-1131	Computer Programmers	0.14	19	28	78
		15-1132	Software Developers, Applications	0.23	11	16	67
		15-1133	Software Developers, Systems Software	0.13	11	16	67
		15-1134	Web Developers	0.14	23	31	84
		15-1143	Computer Network Architects	0.03	27	41	85
		15-1151	Computer User Support Specialists	0.20	40	57	91
		15-1152	Computer Network Support Specialists	0.06	40	57	91
		51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic	0.03	82	93	98
11.0202	Computer Programming, Specific Applications	15-1131	Computer Programmers	0.27	19	28	78
		15-1132	Software Developers, Applications	0.46	11	16	67
		15-1133	Software Developers, Systems Software	0.26	11	16	67
11.0401	Information Science/ Studies	11-3021	Computer and Information Systems Managers	0.26	19	27	73
		15-1133	Software Developers, Systems Software	0.53	11	16	67
		15-1199	Computer Occupations, All Other	0.21	34	49	86
11.0701	Computer Science	11-3021	Computer and Information Systems Managers	0.06	19	27	73

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		15-1122	Information Security Analysts	0.02	29	43	77
		15-1131	Computer Programmers	0.13	19	28	78
		15-1132	Software Developers, Applications	0.21	11	16	67
		15-1133	Software Developers, Systems Software	0.12	11	16	67
		15-1134	Web Developers	0.13	23	31	84
		15-1143	Computer Network Architects	0.03	27	41	85
		15-1151	Computer User Support Specialists	0.19	40	57	91
		15-1152	Computer Network Support Specialists	0.06	40	57	91
		15-1199	Computer Occupations, All Other	0.05	34	49	86
11.0801	Web Page, Digital/ Multimedia and Information Resources Design	15-1122	Information Security Analysts	0.05	29	43	77
		15-1134	Web Developers	0.27	23	31	84
		15-1143	Computer Network Architects	0.07	27	41	85
		27-1014	Multimedia Artists and Animators	0.14	34	43	87
		27-1024	Graphic Designers	0.47	31	44	91
11.0901	Computer Systems Networking and Telecommunications	15-1121	Computer Systems Analysts	0.37	20	28	76
		15-1122	Information Security Analysts	0.04	29	43	77
		15-1134	Web Developers	0.19	23	31	84
		15-1143	Computer Network Architects	0.05	27	41	85
		15-1151	Computer User Support Specialists	0.28	40	57	91
		15-1152	Computer Network Support Specialists	0.09	40	57	91
11.1001	Network and System Administration/ Administrator	11-3021	Computer and Information Systems Managers	0.09	19	27	73
		15-1122	Information Security Analysts	0.04	29	43	77
		15-1134	Web Developers	0.20	23	31	84
		15-1142	Network and Computer Systems Administrators	0.23	34	49	88
		15-1143	Computer Network Architects	0.05	27	41	85
		15-1151	Computer User Support Specialists	0.29	40	57	91

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		15-1152	Computer Network Support Specialists	0.09	40	57	91
11.1003	Computer and Information Systems Security/Information Assurance	15-1122	Information Security Analysts	0.04	29	43	77
		15-1134	Web Developers	0.21	23	31	84
		15-1141	Database Administrators	0.06	22	32	79
		15-1142	Network and Computer Systems Administrators	0.24	34	49	88
		15-1143	Computer Network Architects	0.05	27	41	85
		15-1151	Computer User Support Specialists	0.30	40	57	91
		15-1152	Computer Network Support Specialists	0.10	40	57	91
12.0301	Funeral Service and Mortuary Science, General	11-9061	Funeral Service Managers	0.21	38	46	80
		39-4011	Embalmers	0.00	63	85	97
		39-4021	Funeral Attendants	0.28	63	85	97
		39-4031	Morticians, Undertakers, and Funeral Directors	0.51	30	64	92
12.0401	Cosmetology/ Cosmetologist, General	39-5012	Hairdressers, Hairstylists, and Cosmetologists	0.87	86	95	99
		39-5091	Makeup Artists, Theatrical and Performance	0.00	83	90	99
		39-5092	Manicurists and Pedicurists	0.07	83	90	99
		39-5094	Skincare Specialists	0.06	83	90	99
12.0409	Aesthetician/ Esthetician and Skin Care Specialist	39-5094	Skincare Specialists	1.00	83	90	99
12.041	Nail Technician/ Specialist and Manicurist	39-5092	Manicurists and Pedicurists	1.00	83	90	99
12.0413	Cosmetology, Barber/ Styling, and Nail Instructor	39-5011	Barbers	0.16	91	96	99
		39-5012	Hairdressers, Hairstylists, and Cosmetologists	0.84	86	95	99
12.0501	Baking and Pastry Arts/Baker/Pastry Chef	51-3011	Bakers	1.00	86	92	99
12.0503	Culinary Arts/Chef Training	35-1011	Chefs and Head Cooks	0.13	70	86	98
		35-2014	Cooks, Restaurant	0.84	90	95	99
		35-2019	Cooks, All Other	0.02	90	95	99

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
12.0508	Institutional Food Workers	35-2011	Cooks, Fast Food	0.03	90	95	99
		35-2012	Cooks, Institution and Cafeteria	0.09	90	95	99
		35-2015	Cooks, Short Order	0.01	90	95	99
		35-2021	Food Preparation Workers	0.20	87	92	99
		35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	0.67	89	94	99
13.0101	Education, General	25-1099	Postsecondary Teachers	0.21	3	5	21
		25-2011	Preschool Teachers, Except Special Education	0.08	39	53	87
		25-2012	Kindergarten Teachers, Except Special Education	0.03	39	53	87
		25-2021	Elementary School Teachers, Except Special Education	0.32	3	5	50
		25-2022	Middle School Teachers, Except Special and Career/ Technical Education	0.13	3	5	50
		25-2031	Secondary School Teachers, Except Special and Career/ Technical Education	0.24	3	4	48
13.1001	Special Education and Teaching, General	25-2051	Special Education Teachers, Preschool	0.00	10	13	50
		25-2052	Special Education Teachers, Kindergarten and Elementary School	0.21	10	13	50
		25-2053	Special Education Teachers, Middle School	0.07	10	13	50
		25-2054	Special Education Teachers, Secondary School	0.13	10	13	50
		25-3098	Substitute Teachers	0.22	62	76	95
		25-3099	Teachers and Instructors, All Other	0.36	32	40	75
13.1202	Elementary Education and Teaching	25-2021	Elementary School Teachers, Except Special Education	1.00	3	5	50
13.1203	Junior High/ Intermediate/Middle School Education and Teaching	25-2022	Middle School Teachers, Except Special and Career/ Technical Education	0.35	3	5	50
		25-2031	Secondary School Teachers, Except Special and Career/ Technical Education	0.65	3	4	48
13.1205	Secondary Education and Teaching	25-2031	Secondary School Teachers, Except Special and Career/ Technical Education	1.00	3	4	48

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
13.121	Early Childhood Education and Teaching	25-2011	Preschool Teachers, Except Special Education	0.74	39	53	87
		25-2012	Kindergarten Teachers, Except Special Education	0.26	39	53	87
13.1306	Foreign Language Teacher Education	25-2022	Middle School Teachers, Except Special and Career/ Technical Education	0.35	3	5	50
		25-2031	Secondary School Teachers, Except Special and Career/ Technical Education	0.65	3	4	48
13.1401	Teaching English as a Second or Foreign Language/ESL Language Instructor	25-3011	Adult Basic and Secondary Education and Literacy Teachers and Instructors	1.00	32	40	75
13.1501	Teacher Assistant/Aide	25-9041	Teacher Assistants	1.00	62	76	95
14.0101	Engineering, General	11-9041	Architectural and Engineering Managers	0.62	11	16	63
		17-2199	Engineers, All Other	0.38	11	18	67
14.0501	Bioengineering and Biomedical Engineering	11-9041	Architectural and Engineering Managers	0.82	11	16	63
		17-2031	Biomedical Engineers	0.18	7	23	61
14.0701	Chemical Engineering	11-9041	Architectural and Engineering Managers	0.77	11	16	63
		17-2041	Chemical Engineers	0.23	8	12	67
14.0801	Civil Engineering, General	11-9041	Architectural and Engineering Managers	0.34	11	16	63
		17-2051	Civil Engineers	0.66	10	15	73
14.0901	Computer Engineering, General	11-9041	Architectural and Engineering Managers	0.11	11	16	63
		15-1122	Information Security Analysts	0.04	29	43	77
		15-1132	Software Developers, Applications	0.34	11	16	67
		15-1133	Software Developers, Systems Software	0.19	11	16	67
		15-1134	Web Developers	0.21	23	31	84
		15-1143	Computer Network Architects	0.05	27	41	85
		17-2061	Computer Hardware Engineers	0.07	18	28	73
14.1001	Electrical and Electronics Engineering	11-9041	Architectural and Engineering Managers	0.22	11	16	63
		17-2071	Electrical Engineers	0.29	12	21	70
		17-2072	Electronics Engineers, Except Computer	0.49	12	21	70

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
14.1201	Engineering Physics/ Applied Physics	11-9041	Architectural and Engineering Managers	0.62	11	16	63
		17-2199	Engineers, All Other	0.38	11	18	67
14.1401	Environmental/ Environmental Health Engineering	11-9041	Architectural and Engineering Managers	0.52	11	16	63
		17-2081	Environmental Engineers	0.30	8	12	60
		17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	0.18	19	28	78
14.1801	Materials Engineering	11-9041	Architectural and Engineering Managers	0.30	11	16	63
		13-1051	Cost Estimators	0.70	55	67	95
		17-2131	Materials Engineers	0.00	16	25	74
14.1901	Mechanical Engineering	11-9041	Architectural and Engineering Managers	0.16	11	16	63
		13-1051	Cost Estimators	0.37	55	67	95
		17-2141	Mechanical Engineers	0.41	14	26	77
		51-8021	Stationary Engineers and Boiler Operators	0.06	77	88	97
14.3501	Industrial Engineering	11-9041	Architectural and Engineering Managers	0.25	11	16	63
		17-2112	Industrial Engineers	0.75	19	28	78
14.9999	Engineering, Other	11-9041	Architectural and Engineering Managers	0.62	11	16	63
		17-2199	Engineers, All Other	0.38	11	18	67
15.0101	Architectural Engineering Technology/Technician	17-3029	Engineering Technicians, Except Drafters, All Other	1.00	60	83	97
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	17-3023	Electrical and Electronics Engineering Technicians	1.00	60	83	97
15.0403	Electromechanical Technology/ Electromechanical Engineering Technology	51-2023	Electromechanical Equipment Assemblers	1.00	88	95	99
15.0613	Manufacturing Engineering Technology/Technician	17-2112	Industrial Engineers	0.77	19	28	78
		17-3026	Industrial Engineering Technicians	0.10	60	83	97
		27-1021	Commercial and Industrial Designers	0.12	31	44	91
15.0702	Quality Control Technology/Technician	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	1.00	75	84	97

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
15.0805	Mechanical Engineering/ Mechanical Technology/Technician	17-3027	Mechanical Engineering Technicians	1.00	60	83	97
15.1301	Drafting and Design Technology/Technician, General	17-3011	Architectural and Civil Drafters	1.00	41	73	96
		17-3019	Drafters, All Other	0.00	41	73	96
15.1302	CAD/CADD Drafting and/or Design Technology/Technician	17-3011	Architectural and Civil Drafters	1.00	41	73	96
15.1303	Architectural Drafting and Architectural CAD/ CADD	17-3011	Architectural and Civil Drafters	1.00	41	73	96
15.1601	Nanotechnology	17-2199	Engineers, All Other	1.00	11	18	67
16.0101	Foreign Languages and Literatures, General	27-3091	Interpreters and Translators	1.00	37	50	81
16.0301	Chinese Language and Literature	27-3091	Interpreters and Translators	1.00	37	50	81
16.0501	German Language and Literature	27-3091	Interpreters and Translators	1.00	37	50	81
16.0901	French Language and Literature	27-3091	Interpreters and Translators	1.00	37	50	81
16.0905	Spanish Language and Literature	27-3091	Interpreters and Translators	1.00	37	50	81
16.12	Classics and Classical Languages, Literatures, and Linguistics, General	27-3091	Interpreters and Translators	1.00	37	50	81
19.0501	Foods, Nutrition, and Wellness Studies, General	29-1031	Dietitians and Nutritionists	0.03	21	25	65
		39-9021	Personal Care Aides	0.97	80	88	98
19.0708	Child Care and Support Services Management	25-2011	Preschool Teachers, Except Special Education	1.00	39	53	87
19.0709	Child Care Provider/ Assistant	39-9011	Childcare Workers	1.00	75	84	97
22.0001	Pre-Law Studies	23-1011	Lawyers	1.00	1	1	4
22.0301	Legal Administrative Assistant/Secretary	43-6012	Legal Secretaries	1.00	67	81	97
22.0302	Legal Assistant/ Paralegal	23-2011	Paralegals and Legal Assistants	0.51	38	58	92
		23-2093	Title Examiners, Abstractors, and Searchers	0.34	46	59	88
		23-2099	Legal Support Workers, All Other	0.14	46	59	88

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
23.0101	English Language and Literature, General	25-1099	Postsecondary Teachers	1.00	3	5	21
24.0101	Liberal Arts and Sciences/Liberal Studies	25-1099	Postsecondary Teachers	1.00	3	5	21
25.0301	Library and Archives Assisting	25-4031	Library Technicians	0.48	58	67	87
		43-4121	Library Assistants, Clerical	0.52	46	56	91
26.0101	Biology/Biological Sciences, General	11-9121	Natural Sciences Managers	1.00	7	11	44
26.0202	Biochemistry	11-9121	Natural Sciences Managers	0.57	7	11	44
		19-1021	Biochemists and Biophysicists	0.00	1	4	50
		19-1042	Medical Scientists, Except Epidemiologists	0.43	1	2	8
26.0204	Molecular Biology	11-9121	Natural Sciences Managers	0.57	7	11	44
		19-1029	Biological Scientists, All Other	0.00	1	4	50
		19-1042	Medical Scientists, Except Epidemiologists	0.43	1	2	8
26.1201	Biotechnology	11-9121	Natural Sciences Managers	1.00	7	11	44
26.1501	Neuroscience	11-9121	Natural Sciences Managers	1.00	7	11	44
26.1599	Neurobiology and Neurosciences, Other	11-9121	Natural Sciences Managers	0.08	7	11	44
		19-1042	Medical Scientists, Except Epidemiologists	0.06	1	2	8
		25-1099	Postsecondary Teachers	0.86	3	5	21
27.0101	Mathematics, General	11-9121	Natural Sciences Managers	0.71	7	11	44
		15-2041	Statisticians	0.29	8	11	45
27.0501	Statistics, General	11-9121	Natural Sciences Managers	0.71	7	11	44
		15-2041	Statisticians	0.29	8	11	45
30.0101	Biological and Physical Sciences	11-9121	Natural Sciences Managers	1.00	7	11	44
30.1501	Science, Technology and Society	11-9121	Natural Sciences Managers	1.00	7	11	44
30.1801	Natural Sciences	11-9121	Natural Sciences Managers	1.00	7	11	44
30.2501	Cognitive Science	11-9121	Natural Sciences Managers	1.00	7	11	44
31.0504	Sport and Fitness Administration/ Management	27-2022	Coaches and Scouts	0.37	32	40	83
		39-9031	Fitness Trainers and Aerobics Instructors	0.27	45	55	90
		39-9032	Recreation Workers	0.37	45	55	90
31.0505	Kinesiology and Exercise Science	29-1128	Exercise Physiologists	0.00	8	15	41

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		29-1129	Therapists, All Other	1.00	8	15	41
38.0101	Philosophy	25-1099	Postsecondary Teachers	1.00	3	5	21
38.0201	Religion/Religious Studies	25-1099	Postsecondary Teachers	1.00	3	5	21
39.0601	Theology/Theological Studies	21-2011	Clergy	1.00	21	25	49
40.0101	Physical Sciences	11-9121	Natural Sciences Managers	1.00	7	11	44
40.0202	Astrophysics	11-9121	Natural Sciences Managers	1.00	7	11	44
40.0501	Chemistry, General	11-9121	Natural Sciences Managers	0.27	7	11	44
		19-2031	Chemists	0.73	4	7	61
40.0699	Geological and Earth Sciences/ Geosciences, Other	11-9121	Natural Sciences Managers	1.00	7	11	44
40.0801	Physics, General	11-9121	Natural Sciences Managers	1.00	7	11	44
40.9999	Physical Sciences, Other	11-9121	Natural Sciences Managers	1.00	7	11	44
41.0101	Biology Technician/ Biotechnology Laboratory Technician	19-4021	Biological Technicians	1.00	37	46	85
41.0301	Chemical Technology/ Technician	19-4031	Chemical Technicians	0.35	54	66	93
		51-8091	Chemical Plant and System Operators	0.45	80	91	99
		51-9011	Chemical Equipment Operators and Tenders	0.20	70	81	97
42.0101	Psychology, General	19-3031	Clinical, Counseling, and School Psychologists	0.90	1	1	8
		19-3039	Psychologists, All Other	0.10	1	1	8
43.0102	Corrections	33-1011	First-Line Supervisors of Correctional Officers	0.00	58	71	92
		33-3012	Correctional Officers and Jailers	1.00	73	86	98
43.0199	Corrections and Criminal Justice, Other	33-3012	Correctional Officers and Jailers	1.00	73	86	98
43.0202	Fire Services Administration	33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	0.00	53	77	95
43.0203	Fire Science/ Fire-fighting	33-2011	Firefighters	1.00	59	79	98
43.9999	Homeland Security, Law Enforcement, Firefighting and Related Protective Services, Other	33-1099	First-Line Supervisors of Protective Service Workers, All Other	0.13	59	71	92
		33-9031	Gaming Surveillance Officers and Gaming Investigators	0.08	74	84	97

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		33-9091	Crossing Guards	0.27	90	94	99
		33-9092	Lifeguards, Ski Patrol, and Other Recreational Protective Service Workers	0.38	64	73	93
		33-9099	Protective Service Workers, All Other	0.14	64	73	93
44	Human Services, General	11-9151	Social and Community Service Managers	0.05	25	31	67
		21-1011	Substance Abuse and Behavioral Disorder Counselors	0.10	16	21	48
		21-1012	Educational, Guidance, School, and Vocational Counselors	0.05	16	21	48
		21-1013	Marriage and Family Therapists	0.02	16	21	48
		21-1014	Mental Health Counselors	0.22	16	21	48
		21-1015	Rehabilitation Counselors	0.05	16	21	48
		21-1019	Counselors, All Other	0.01	16	21	48
		21-1021	Child, Family, and School Social Workers	0.08	16	22	64
		21-1022	Healthcare Social Workers	0.05	16	22	64
		21-1023	Mental Health and Substance Abuse Social Workers	0.10	16	22	64
		21-1091	Health Educators	0.03	39	47	79
		21-1092	Probation Officers and Correctional Treatment Specialists	0.03	19	25	83
		21-1093	Social and Human Service Assistants	0.20	50	60	89
		21-1094	Community Health Workers	0.02	39	47	79
		21-1099	Community and Social Service Specialists, All Other	0.02	39	47	79
44.0701	Social Work	21-1013	Marriage and Family Therapists	0.12	16	21	48
		21-1019	Counselors, All Other	0.09	16	21	48
		21-1021	Child, Family, and School Social Workers	0.55	16	22	64
		21-1092	Probation Officers and Correctional Treatment Specialists	0.23	19	25	83
45.0101	Social Sciences, General	19-3099	Social Scientists and Related Workers, All Other	0.00	6	10	48
		19-4061	Social Science Research Assistants	1.00	42	54	85

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		17-3031	Surveying and Mapping Technicians	1.00	68	89	99
45.0901	International Relations and Affairs	11-1031	Legislators	1.00	27	33	73
46	Construction Trades, General	11-9021	Construction Managers	0.06	59	66	94
		47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	0.08	82	89	99
		47-2021	Brickmasons and Blockmasons	0.01	93	96	100
		47-2031	Carpenters	0.26	87	93	99
		47-2041	Carpet Installers	0.01	92	95	99
		47-2044	Tile and Marble Setters	0.01	92	95	99
		47-2051	Cement Masons and Concrete Finishers	0.02	96	97	99
		47-2071	Paving, Surfacing, and Tamping Equipment Operators	0.01	97	99	100
		47-2073	Operating Engineers and Other Construction Equipment Operators	0.06	93	97	100
		47-2081	Drywall and Ceiling Tile Installers	0.06	96	98	100
		47-2082	Tapers	0.02	96	98	100
		47-2111	Electricians	0.13	79	93	99
		47-2121	Glaziers	0.02	91	95	100
		47-2131	Insulation Workers, Floor, Ceiling, and Wall	0.01	94	97	99
		47-2141	Painters, Construction and Maintenance	0.05	89	93	99
		47-2151	Pipelayers	0.01	89	96	99
		47-2152	Plumbers, Pipefitters, and Steamfitters	0.06	89	96	99
		47-2181	Roofers	0.06	95	97	100
		47-2211	Sheet Metal Workers	0.02	90	97	100
		47-2221	Structural Iron and Steel Workers	0.03	91	96	100
		47-3013	Helpers--Electricians	0.01	94	97	100
		47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	0.01	94	97	100
46.0101	Mason/Masonry	47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	0.80	82	89	99

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		47-2021	Brickmasons and Blockmasons	0.09	93	96	100
		47-2044	Tile and Marble Setters	0.12	92	95	99
46.0201	Carpentry/Carpenter	47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	0.24	82	89	99
		47-2031	Carpenters	0.76	87	93	99
46.0302	Electrician	47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	0.35	82	89	99
		47-2111	Electricians	0.56	79	93	99
		47-3013	Helpers--Electricians	0.03	94	97	100
		49-2098	Security and Fire Alarm Systems Installers	0.06	76	90	98
46.0399	Electrical and Power Transmission Installers, Other	47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	0.85	82	89	99
		49-9051	Electrical Power-Line Installers and Repairers	0.15	83	94	99
46.0401	Building/Property Maintenance	37-1011	First-Line Supervisors of Housekeeping and Janitorial Workers	0.10	83	89	98
		47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	0.16	82	89	99
		49-9071	Maintenance and Repair Workers, General	0.73	83	94	99
46.0412	Building/Construction Site Management/ Manager	47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	1.00	82	89	99
46.0502	Pipefitting/Pipefitter and Sprinkler Fitter	47-2152	Plumbers, Pipefitters, and Steamfitters	1.00	89	96	99
46.0503	Plumbing Technology/ Plumber	47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	0.44	82	89	99
		47-2151	Pipelayers	0.06	89	96	99
		47-2152	Plumbers, Pipefitters, and Steamfitters	0.34	89	96	99
		47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	0.04	94	97	100
		47-4071	Septic Tank Servicers and Sewer Pipe Cleaners	0.12	87	91	99
47.0101	Electrical/Electronics Equipment Installation and Repair, General	49-2092	Electric Motor, Power Tool, and Related Repairers	0.00	77	93	99
		49-9099	Installation, Maintenance, and Repair Workers, All Other	1.00	80	90	98

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
47.0104	Computer Installation and Repair Technology/Technician	49-2011	Computer, Automated Teller, and Office Machine Repairers	0.81	54	75	96
		49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	0.19	64	89	99
47.0105	Industrial Electronics Technology/Technician	49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	0.08	64	89	99
		51-2021	Coil Winders, Tapers, and Finishers	0.11	88	95	99
		51-2022	Electrical and Electronic Equipment Assemblers	0.81	88	95	99
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1.00	83	96	99
47.0603	Autobody/Collision and Repair Technology/Technician	49-3021	Automotive Body and Related Repairers	0.70	91	97	100
		51-9122	Painters, Transportation Equipment	0.30	93	97	100
47.0604	Automobile/ Automotive Mechanics Technology/Technician	49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	0.00	64	89	99
		49-3023	Automotive Service Technicians and Mechanics	1.00	85	96	99
47.0606	Small Engine Mechanics and Repair Technology/Technician	49-3051	Motorboat Mechanics and Service Technicians	0.58	88	96	100
		49-3053	Outdoor Power Equipment and Other Small Engine Mechanics	0.42	88	96	100
47.9999	Mechanic and Repair Technologies/ Technicians, Other	39-1012	Slot Supervisors	0.13	58	68	94
		47-4041	Hazardous Materials Removal Workers	0.42	81	87	97
		49-3093	Tire Repairers and Changers	0.45	90	95	100
48.0501	Machine Tool Technology/Machinist	51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	0.10	90	96	100
		51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	0.02	95	98	99
		51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	0.12	94	98	100

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	0.02	88	98	100
		51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	0.06	92	97	100
		51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	0.02	89	95	99
		51-4041	Machinists	0.50	86	97	99
		51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	0.13	91	96	100
		51-4199	Metal Workers and Plastic Workers, All Other	0.03	91	96	100
48.0507	Tool and Die Technology/Technician	51-4111	Tool and Die Makers	1.00	83	96	100
48.0508	Welding Technology/ Welder	51-4121	Welders, Cutters, Solderers, and Brazers	0.87	92	98	100
		51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	0.13	92	98	100
48.0599	Precision Metal Working, Other	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	0.00	87	94	99
		51-4199	Metal Workers and Plastic Workers, All Other	1.00	91	96	100
48.0703	Cabinetmaking and Millwork	51-7011	Cabinetmakers and Bench Carpenters	0.63	86	91	98
		51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	0.17	94	97	99
		51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	0.20	93	97	100
49.0101	Aeronautics/Aviation/ Aerospace Science and Technology, General	11-3071	Transportation, Storage, and Distribution Managers	1.00	63	71	94
49.0102	Airline/Commercial/ Professional Pilot and Flight Crew	53-2011	Airline Pilots, Copilots, and Flight Engineers	0.35	19	28	87
		53-2012	Commercial Pilots	0.65	19	28	87
49.0202	Construction/ Heavy Equipment/ Earthmoving Equipment Operation	47-2071	Paving, Surfacing, and Tamping Equipment Operators	0.06	97	99	100
		47-2073	Operating Engineers and Other Construction Equipment Operators	0.58	93	97	100

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		47-4051	Highway Maintenance Workers	0.29	92	97	100
		47-5021	Earth Drillers, Except Oil and Gas	0.07	89	95	100
49.0205	Truck and Bus Driver/Commercial Vehicle Operator and Instructor	53-3021	Bus Drivers, Transit and Intercity	0.04	85	92	98
		53-3022	Bus Drivers, School or Special Client	0.04	85	92	98
		53-3032	Heavy and Tractor-Trailer Truck Drivers	0.65	90	95	99
		53-3033	Light Truck or Delivery Services Drivers	0.21	90	95	99
		53-3041	Taxi Drivers and Chauffeurs	0.05	76	83	96
		53-4031	Railroad Conductors and Yardmasters	0.01	77	88	99
49.0299	Ground Transportation, Other	53-3099	Motor Vehicle Operators, All Other	0.01	82	87	97
		53-7011	Conveyor Operators and Tenders	0.10	90	96	99
		53-7051	Industrial Truck and Tractor Operators	0.89	94	98	100
50.0301	Dance, General	27-2031	Dancers	1.00	66	76	96
50.0401	Design and Visual Communications, General	27-1021	Commercial and Industrial Designers	0.12	31	44	91
		27-1024	Graphic Designers	0.88	31	44	91
50.0402	Commercial and Advertising Art	27-1019	Artists and Related Workers, All Other	0.07	34	43	87
		27-1021	Commercial and Industrial Designers	0.12	31	44	91
		27-1024	Graphic Designers	0.82	31	44	91
50.0407	Fashion/Apparel Design	27-1022	Fashion Designers	1.00	31	44	91
50.0408	Interior Design	27-1025	Interior Designers	1.00	31	44	91
50.0409	Graphic Design	27-1011	Art Directors	0.19	34	43	87
		27-1014	Multimedia Artists and Animators	0.18	34	43	87
		27-1019	Artists and Related Workers, All Other	0.05	34	43	87
		27-1024	Graphic Designers	0.58	31	44	91
		51-9123	Painting, Coating, and Decorating Workers	0.00	93	97	100
50.0411	Game and Interactive Media Design	25-1099	Postsecondary Teachers	0.85	3	5	21

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		27-1014	Multimedia Artists and Animators	0.15	34	43	87
50.0501	Drama and Dramatics/ Theatre Arts, General	27-2011	Actors	0.36	38	43	89
		27-2012	Producers and Directors	0.35	20	26	84
		27-2099	Entertainers and Performers, Sports and Related Workers, All Other	0.29	53	60	91
50.0506	Acting	27-2011	Actors	1.00	38	43	89
50.0601	Film/Cinema/Video Studies	27-2012	Producers and Directors	1.00	20	26	84
50.0602	Cinematography and Film/Video Production	27-2012	Producers and Directors	1.00	20	26	84
50.0699	Film/Video and Photographic Arts, Other	27-4021	Photographers	1.00	42	52	93
50.0701	Art/Art Studies, General	27-1012	Craft Artists	0.11	34	43	87
		27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	0.09	34	43	87
		27-4021	Photographers	0.80	42	52	93
50.0702	Fine/Studio Arts, General	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	0.67	34	43	87
		27-1019	Artists and Related Workers, All Other	0.33	34	43	87
50.0901	Music, General	27-2042	Musicians and Singers	1.00	40	46	77
51.0602	Dental Hygiene/ Hygienist	29-2021	Dental Hygienists	1.00	9	64	97
51.0701	Health/Health Care Administration/ Management	11-9111	Medical and Health Services Managers	1.00	27	40	70
51.0705	Medical Office Management/ Administration	31-9092	Medical Assistants	1.00	69	91	98
51.0706	Health Information/ Medical Records Administration/ Administrator	11-9111	Medical and Health Services Managers	1.00	27	40	70
51.0707	Health Information/ Medical Records Technology/Technician	29-2071	Medical Records and Health Information Technicians	1.00	66	81	97
51.0708	Medical Transcription/ Transcriptionist	31-9094	Medical Transcriptionists	1.00	60	84	97
51.0713	Medical Insurance Coding Specialist/ Coder	29-2071	Medical Records and Health Information Technicians	0.23	66	81	97

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		31-9092	Medical Assistants	0.77	69	91	98
51.0714	Medical Insurance Specialist/Medical Biller	43-6013	Medical Secretaries	1.00	67	81	97
51.0716	Medical Administrative/ Executive Assistant and Medical Secretary	31-9092	Medical Assistants	0.52	69	91	98
		43-6011	Executive Secretaries and Executive Administrative Assistants	0.15	67	81	97
		43-6013	Medical Secretaries	0.34	67	81	97
51.0801	Medical/Clinical Assistant	31-9092	Medical Assistants	0.94	69	91	98
		31-9093	Medical Equipment Preparers	0.06	77	87	97
51.0803	Occupational Therapist Assistant	31-2011	Occupational Therapy Assistants	0.77	14	85	94
		31-2012	Occupational Therapy Aides	0.23	14	85	94
51.0805	Pharmacy Technician/ Assistant	29-2052	Pharmacy Technicians	1.00	62	82	98
51.0806	Physical Therapy Technician/Assistant	31-2021	Physical Therapist Assistants	0.82	28	80	97
		31-2022	Physical Therapist Aides	0.18	28	80	97
51.0808	Veterinary/Animal Health Technology/ Technician and Veterinary Assistant	29-2056	Veterinary Technologists and Technicians	0.59	62	82	98
		31-9096	Veterinary Assistants and Laboratory Animal Caretakers	0.41	66	81	98
51.0899	Allied Health and Medical Assisting Services, Other	29-2099	Health Technologists and Technicians, All Other	0.04	56	69	89
		29-9099	Healthcare Practitioners and Technical Workers, All Other	0.04	32	40	77
		31-9092	Medical Assistants	0.87	69	91	98
		31-9093	Medical Equipment Preparers	0.05	77	87	97
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	29-2041	Emergency Medical Technicians and Paramedics	0.93	65	85	98
		53-3011	Ambulance Drivers and Attendants, Except Emergency Medical Technicians	0.07	81	89	97
51.0905	Nuclear Medical Technology/ Technologist	29-2033	Nuclear Medicine Technologists	1.00	31	77	96
51.0909	Surgical Technology/ Technologist	29-2055	Surgical Technologists	1.00	62	82	98

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
51.091	Diagnostic Medical Sonography/ Sonographer and Ultrasound Technician	29-2032	Diagnostic Medical Sonographers	1.00	31	77	96
51.0911	Radiologic Technology/Science - Radiographer	29-2034	Radiologic Technologists	1.00	31	77	96
51.0913	Athletic Training/ Trainer	29-9091	Athletic Trainers	1.00	32	40	77
51.1004	Clinical/Medical Laboratory Technician	29-2012	Medical and Clinical Laboratory Technicians	1.00	31	48	92
51.1009	Phlebotomy Technician/ Phlebotomist	29-1199	Health Diagnosing and Treating Practitioners, All Other	0.37	10	13	26
		31-9097	Phlebotomists	0.63	77	90	99
51.1102	Pre-Medicine/Pre-Medical Studies	29-1069	Physicians and Surgeons, All Other	0.39	1	1	3
		29-1071	Physician Assistants	0.13	14	26	53
		31-9092	Medical Assistants	0.47	69	91	98
51.2011	Pharmaceutical Marketing and Management	11-2021	Marketing Managers	0.47	27	33	82
		11-2022	Sales Managers	0.53	27	33	82
51.2301	Art Therapy/Therapist	29-1128	Exercise Physiologists	0.00	8	15	41
		29-1129	Therapists, All Other	1.00	8	15	41
51.2602	Home Health Aide/ Home Attendant	31-1011	Home Health Aides	0.67	83	91	98
		39-9021	Personal Care Aides	0.33	80	88	98
51.3501	Massage Therapy/ Therapeutic Massage	31-9011	Massage Therapists	1.00	58	74	94
51.3801	Registered Nursing/ Registered Nurse	29-1141	Registered Nurses	1.00	6	45	91
51.3899	Registered Nursing, Nursing Administration, Nursing Research and Clinical Nursing, Other	25-1099	Postsecondary Teachers	0.21	3	5	21
		29-1141	Registered Nurses	0.74	6	45	91
		29-1151	Nurse Anesthetists	0.02	5	9	24
		29-1171	Nurse Practitioners	0.02	1	3	10
51.3901	Licensed Practical/ Vocational Nurse Training	29-2061	Licensed Practical and Licensed Vocational Nurses	1.00	78	95	99
51.3902	Nursing Assistant/ Aide and Patient Care Assistant/Aide	31-1014	Nursing Assistants	1.00	83	91	98

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		31-1015	Orderlies	0.00	83	91	98
51.9999	Health Professions and Related Clinical Sciences, Other	29-2099	Health Technologists and Technicians, All Other	0.48	56	69	89
		29-9099	Healthcare Practitioners and Technical Workers, All Other	0.52	32	40	77
52.0101	Business/Commerce, General	11-2022	Sales Managers	0.04	27	33	82
		11-3011	Administrative Services Managers	0.03	48	59	87
		11-3051	Industrial Production Managers	0.04	47	56	87
		11-3071	Transportation, Storage, and Distribution Managers	0.05	63	71	94
		11-9021	Construction Managers	0.05	59	66	94
		11-9151	Social and Community Service Managers	0.03	25	31	67
		11-9199	Managers, All Other	0.23	38	46	80
		11-1011	Chief Executives	0.12	27	33	73
		11-1021	General and Operations Managers	0.22	42	51	85
		13-1051	Cost Estimators	0.06	55	67	95
		13-1111	Management Analysts	0.13	18	23	65
52.0201	Business Administration and Management, General	11-2022	Sales Managers	0.04	27	33	82
		11-3011	Administrative Services Managers	0.03	48	59	87
		11-3051	Industrial Production Managers	0.03	47	56	87
		11-3071	Transportation, Storage, and Distribution Managers	0.04	63	71	94
		11-9021	Construction Managers	0.05	59	66	94
		11-9151	Social and Community Service Managers	0.02	25	31	67
		11-9199	Managers, All Other	0.20	38	46	80
		11-1011	Chief Executives	0.11	27	33	73
		11-1021	General and Operations Managers	0.20	42	51	85
		13-1051	Cost Estimators	0.05	55	67	95
		13-1111	Management Analysts	0.11	18	23	65
		37-1011	First-Line Supervisors of Housekeeping and Janitorial Workers	0.04	83	89	98

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		39-1011	Gaming Supervisors	0.04	58	68	94
		39-1021	First-Line Supervisors of Personal Service Workers	0.03	64	74	95
52.0203	Logistics, Materials, and Supply Chain Management	11-3071	Transportation, Storage, and Distribution Managers	0.73	63	71	94
		13-1081	Logisticians	0.27	44	58	89
52.0205	Operations Management and Supervision	11-3021	Computer and Information Systems Managers	0.04	19	27	73
		11-3051	Industrial Production Managers	0.06	47	56	87
		11-9021	Construction Managers	0.09	59	66	94
		13-1081	Logisticians	0.03	44	58	89
		39-1011	Gaming Supervisors	0.07	58	68	94
		39-1021	First-Line Supervisors of Personal Service Workers	0.06	64	74	95
		49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	0.12	74	86	97
		51-1011	First-Line Supervisors of Production and Operating Workers	0.16	76	84	97
		51-8013	Power Plant Operators	0.02	68	84	99
		51-8021	Stationary Engineers and Boiler Operators	0.02	77	88	97
		51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	0.02	80	91	99
		53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	0.14	74	83	98
		53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	0.15	74	83	98
52.0206	Non-Profit/Public/ Organizational Management	11-9151	Social and Community Service Managers	0.11	25	31	67
		11-9199	Managers, All Other	0.89	38	46	80
52.0301	Accounting	13-2011	Accountants and Auditors	0.96	12	22	79
		13-2041	Credit Analysts	0.03	29	37	81
		13-2081	Tax Examiners and Collectors, and Revenue Agents	0.02	42	52	89
52.0302	Accounting Technology/Technician and Bookkeeping	13-2082	Tax Preparers	0.06	41	50	83

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		43-3021	Billing and Posting Clerks	0.24	70	83	97
		43-3031	Bookkeeping, Accounting, and Auditing Clerks	0.55	72	83	97
		43-3041	Gaming Cage Workers	0.04	82	89	99
		43-3051	Payroll and Timekeeping Clerks	0.11	68	81	98
52.0399	Accounting and Related Services, Other	43-3031	Bookkeeping, Accounting, and Auditing Clerks	1.00	72	83	97
52.0401	Administrative Assistant and Secretarial Science, General	43-6011	Executive Secretaries and Executive Administrative Assistants	0.10	67	81	97
		43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	0.90	67	81	97
52.0408	General Office Occupations and Clerical Services	43-3061	Procurement Clerks	0.01	60	71	93
		43-4031	Court, Municipal, and License Clerks	0.01	65	81	97
		43-4071	File Clerks	0.02	66	78	96
		43-4151	Order Clerks	0.07	73	83	98
		43-4161	Human Resources Assistants, Except Payroll and Timekeeping	0.02	57	71	93
		43-4171	Receptionists and Information Clerks	0.17	74	85	98
		43-4199	Information and Record Clerks, All Other	0.01	60	77	96
		43-5011	Cargo and Freight Agents	0.01	71	83	97
		43-5052	Postal Service Mail Carriers	0.04	76	86	99
		43-5071	Shipping, Receiving, and Traffic Clerks	0.16	86	92	99
		43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.01	81	88	98
		43-9041	Insurance Claims and Policy Processing Clerks	0.03	65	77	96
		43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	0.02	80	89	98
		43-9061	Office Clerks, General	0.38	68	80	96
		43-9071	Office Machine Operators, Except Computer	0.01	76	86	98
		43-9199	Office and Administrative Support Workers, All Other	0.03	57	68	93

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
52.0499	Business Operations Support and Secretarial Services, Other	43-9199	Office and Administrative Support Workers, All Other	1.00	57	68	93
52.0701	Entrepreneurship/ Entrepreneurial Studies	11-9151	Social and Community Service Managers	0.05	25	31	67
		11-9199	Managers, All Other	0.38	38	46	80
		11-1011	Chief Executives	0.20	27	33	73
		11-1021	General and Operations Managers	0.37	42	51	85
52.0801	Finance, General	11-3031	Financial Managers	0.15	32	39	79
		13-2031	Budget Analysts	0.00	23	32	73
		13-2041	Credit Analysts	0.01	29	37	81
		13-2051	Financial Analysts	0.11	11	14	60
		13-2052	Personal Financial Advisors	0.66	14	19	73
		13-2072	Loan Officers	0.04	40	49	90
		13-2099	Financial Specialists, All Other	0.03	33	41	79
52.0899	Finance and Financial Management Services, Other	11-3031	Financial Managers	1.00	32	39	79
52.0904	Hotel/Motel Administration/ Management	11-9051	Food Service Managers	0.50	66	75	96
		11-9081	Lodging Managers	0.09	50	59	90
		39-9041	Residential Advisors	0.41	62	72	91
52.0905	Restaurant/Food Services Management	11-9051	Food Service Managers	1.00	66	75	96
52.0906	Resort Management	11-9081	Lodging Managers	1.00	50	59	90
52.1001	Human Resources Management/ Personnel Administration, General	11-3111	Compensation and Benefits Managers	0.00	31	40	81
		11-3121	Human Resources Managers	0.14	36	43	79
		13-1071	Human Resources Specialists	0.44	33	43	83
		13-1075	Labor Relations Specialists	0.18	33	43	83
		13-1141	Compensation, Benefits, and Job Analysis Specialists	0.07	40	52	89
		13-1151	Training and Development Specialists	0.16	39	48	81
52.1099	Human Resources Management and Services, Other	13-1071	Human Resources Specialists	0.53	33	43	83
		13-1075	Labor Relations Specialists	0.22	33	43	83

CIP	Program	SOC	Occupation	Occupational Based Weight	PSV Award or Some College	Associate's Degree	Bachelor's Degree
		39-1021	First-Line Supervisors of Personal Service Workers	0.25	64	74	95
52.1101	International Business/ Trade/Commerce	11-1011	Chief Executives	0.36	27	33	73
		11-1021	General and Operations Managers	0.64	42	51	85
52.1201	Management Information Systems, General	11-3021	Computer and Information Systems Managers	0.33	19	27	73
		15-1131	Computer Programmers	0.67	19	28	78
52.1299	Management Information Systems and Services, Other	11-3021	Computer and Information Systems Managers	1.00	19	27	73
52.1301	Management Science	15-2031	Operations Research Analysts	1.00	21	30	69
52.1401	Marketing/Marketing Management, General	11-2011	Advertising and Promotions Managers	0.03	21	26	87
		11-2021	Marketing Managers	0.18	27	33	82
		11-2022	Sales Managers	0.21	27	33	82
		13-1161	Market Research Analysts and Marketing Specialists	0.58	18	23	74
52.1501	Real Estate	11-9141	Property, Real Estate, and Community Association Managers	0.28	52	61	90
		13-2021	Appraisers and Assessors of Real Estate	0.05	40	51	90
		41-9021	Real Estate Brokers	0.10	43	52	90
		41-9022	Real Estate Sales Agents	0.57	43	52	90
52.1801	Sales, Distribution, and Marketing Operations, General	13-1022	Wholesale and Retail Buyers, Except Farm Products	0.03	57	66	95
		13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	0.04	48	59	91
		41-2031	Retail Salespersons	0.71	65	74	96
		41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	0.20	44	53	93
		41-9041	Telemarketers	0.02	72	82	97
52.2001	Construction Management	11-9021	Construction Managers	1.00	59	66	94

APPENDIX 3: PROGRAM GAP ANALYSIS METHODOLOGY

This appendix focuses on describing and understanding the methodology used in the program gap analysis. This requires data on both occupation demand (e.g., annual job openings) and education supply (e.g., number of postsecondary degree completions). These are then compared through an education "gap" analysis to determine whether an education program is potentially producing a surplus or shortage of workforce talent relative to the number of job openings. In this way, it is possible to see how the institution's current programs are satisfying regional workforce needs.

SUPPLY AND DEMAND MODEL

EMSI uses demand-side data (average annual openings) and supply-side data (postsecondary education output) to build a model to compare workforce demand with education supply. The purpose of this analysis is to find the difference or "gap" between the average annual openings for an occupation and the number of people completing postsecondary degrees for that occupation, within Lehigh and Northampton counties[20]. This made it possible to identify whether there may be talent shortages or surpluses within the service region. The institutions used in the analysis may be found in table A3.1

20 At the request of LVEDC, EMSI added completer data surveyed from the following institutions (that either did not report to IPEDS or exist outside the two-county service region): Bloomsburg, Lehigh Carbon Community College; Albright College; Career Institute of Technology; LCTI; McCann-Allentown; New Horizons; and Bethlehem ATVS.

TABLE A3.1 List of Institutions Used in the Gap Analysis

Institution Name
Albright College
Bethlehem Area Vocational-Technical School
Bloomsburg-Lehigh Carbon Community College
Career Institute of Technology
Cedar Crest College
DeSales University
Empire Beauty School-Lehigh Valley
International Academy of Medical Reflexology
International Institute for Restorative Practices
Lafayette College
Lehigh Career & Technical Institute
Lehigh Carbon Community College
Lehigh University
Lincoln Technical Institute-Allentown
McCann - Allentown
Metro Beauty Academy
Moravian College
Muhlenberg College
New Horizons
Northampton County Area Community College
Pennsylvania School of Business
Pennsylvania State University-Penn State Lehigh Valley
St Luke's Hospital School of Nursing
The Vision Academy
Triangle Tech Inc-Bethlehem
Welder Training and Testing Institute

Source: EMSI, IPEDs, LVEDC

The first step involves mapping the linkage between annual openings for a SOC code and the number of completions for an education program CIP code. The BLS provides information on the occupations that program completions of specific CIP codes are more likely to enter. Specific connections have been refined through previous engagements with education institutions and state departments of labor. Some programs have direct occupational ties. For example, a physical therapist assistant is a specific occupation that requires specialized postsecondary training. In this case, one CIP code (physical therapy technician/assistant) maps to only one SOC code (physical therapists assistants). This provides an easy comparison of annual openings for physical therapist assistants to the number of people completing the relevant program to see whether a talent shortage or surplus exists. Unfortunately, this is not always the case. More often than not an educational program maps to multiple occupations and an occupation maps to multiple educational programs. For this reason, EMSI has pioneered a method of de-duplicating program completions, such that the potential sources of supply are not double-counted for any occupation. The details of this process are outlined in this chapter, under "De-duplication of Annual Openings."

OCCUPATION DEMAND

EDUCATIONAL LEVEL ADJUSTMENTS

To capture occupation demand, EMSI uses a proprietary employment dataset that reflects total employment (i.e., employment covered by unemployment insurance as well as proprietor employment). The employment data reflects jobs for the third quarter of 2014. Within this dataset, EMSI calculates the number of regional annual job openings for the occupations that require different levels of postsecondary training.[21] The BLS also provides educational attainment data of current workers for each SOC code, broken out by their highest level of education attained. The data is presented as the percentage of workers in the SOC code with educational attainment ranging from less than a high school degree to a bachelor's degree. Using these data, EMSI adjusted the annual opening estimates for each SOC code to only incorporate the percentage of workers for the three different educational levels.

For example, as shown in table A3.2, there are three occupations trained for by Corrections (CIP code 43.0102). Within that cluster are an assortment of

21 See Appendix 1 for a description of the sources and processes of EMSI data.

career fields, including correctional officers and jailers, first-line supervisors of police and detectives, and first-line supervisors of correctional officers. Among correctional officers, the majority of job openings (75%) are available to somebody with "some college" or a postsecondary vocational award. Alternatively, for first-line supervisors of police and detectives, only 46% of job openings are accessible to a person without a college degree. The weighted average of job openings is calculated for each program at each program/degree level with program completions over the past three years. Not taking into account the educational attainment dynamics in this way would bias the result by over-counting potential job opportunities for program completions.[22]

TABLE A3.2: Educational Level Adjustments

CIP Code	CIP Title	SOC	Title	"Some College, No Degree" or Postsecondary Award or Lower	Associate's Degree or Lower
43.0102	Corrections	33-3012	Correctional Officers and Jailers	75%	88%
		33-1012	First-Line Supervisors of Police and Detectives	46%	62%
		33-1011	First-Line Supervisors of Correctional Officers	61%	75%
	Weighted Average			68%	85%

DE-DUPLICATION OF ANNUAL OPENINGS

Most educational programs are designed to train people for multiple occupational types, many of which are simultaneously linked with other educational programs, presenting a complexity when comparing supply and demand for any particular educational program. For instance, the Computer Systems Networking & Telecommunications program is mapped to three different occupations: computer support specialists, information security analysts, and computer systems analysts. If we focus on just one of the occupations for this list—computer support specialists—it is also mapped to 10 different educational programs, spanning program titles such as Computer Systems Analysis and Medical Office Computer Specialist.

22 Given the changing dynamics and need for more education in the existing workforce (i.e., skills-biased technology change in many occupations and industry sectors), this assumption is considered conservative.

To ensure that no double-counting occurs, it is necessary to either realign the program groupings to eliminate the mapping of occupations to multiple programs, or to determine what proportion of demand should be compared with supply numbers from each program. EMSI uses a formula that favors occupations with the largest number of annual openings, attributing a greater proportion of supply to these than those which produce a smaller number of annual openings. This methodology operates under the assumption that the higher-demand occupations are likely receiving a higher number of the graduates. Appendix 2 contains the detailed mapping of each CIP code to all relevant occupations including the occupational weights.

APPENDIX 4: DETAILED EMPLOYMENT PROJECTIONS

Table A4.1 displays the target occupations that were selected in conjunction with LVEDC's input. Corresponding data on annual openings, 2014 jobs, median hourly earnings, and absolute and percent change in jobs are provided for convenience. The programs with which they align can be found in table A2.1.

TABLE A4.1: Detailed Employment Projections Related to Existing Programs

SOC	Occupation	Average Annual Job Openings	2014 Jobs	Median Hourly Earnings	2010-2014 Change	Percent Change
11-3031	Financial Managers	54	1,087	$44.74	111	11%
11-3121	Human Resources Managers	12	221	$51.99	22	11%
13-2051	Financial Analysts	40	785	$33.99	57	8%
15-1133	Software Developers, Systems Software	21	580	$48.47	30	5%
15-1141	Database Administrators	7	178	$34.84	8	5%
15-1142	Network and Computer Systems Administrators	26	816	$32.62	44	6%
15-1143	Computer Network Architects	6	172	$42.19	-8	-4%
15-1151	Computer User Support Specialists	33	1,113	$20.03	-15	-1%
15-1199	Computer Occupations, All Other	8	256	$37.17	-2	-1%
15-2021	Mathematicians	<1	<10	Insf. Data	Insf. Data	Insf. Data
15-2031	Operations Research Analysts	3	73	$29.79	3	4%
17-2081	Environmental Engineers	7	143	$35.91	10	8%
17-2112	Industrial Engineers	35	572	$40.66	74	15%

SOC	Occupation	Average Annual Job Openings	2014 Jobs	Median Hourly Earnings	2010-2014 Change	Percent Change
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	<1	<10	Insf. Data	Insf. Data	Insf. Data
17-2199	Engineers, All Other	7	177	$36.23	9	5%
17-3029	Engineering Technicians, Except Drafters, All Other	7	141	$27.09	17	14%
19-1011	Animal Scientists	<1	<10	Insf. Data	Insf. Data	Insf. Data
21-2099	Religious Workers, All Other	3	122	$13.16	-6	-5%
29-1181	Audiologists	3	54	$34.96	5	10%
29-2054	Respiratory Therapy Technicians	<1	47	$24.98	3	7%
29-2056	Veterinary Technologists and Technicians	11	184	$14.58	35	23%
31-2011	Occupational Therapy Assistants	12	177	$22.49	28	19%
31-2021	Physical Therapist Assistants	14	242	$22.12	33	16%
31-2022	Physical Therapist Aides	3	63	$12.47	3	5%
31-9096	Veterinary Assistants and Laboratory Animal Caretakers	8	132	$10.87	17	15%
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	18	503	$39.79	-52	-9%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	138	3,737	$25.65	212	6%
41-9021	Real Estate Brokers	46	1,035	$21.77	141	16%
43-3011	Bill and Account Collectors	66	1,199	$13.34	89	8%
43-4111	Interviewers, Except Eligibility and Loan	13	447	$16.31	-28	-6%
43-6011	Executive Secretaries and Executive Administrative Assistants	18	1,096	$23.38	-38	-3%
43-6012	Legal Secretaries	5	262	$19.30	-17	-6%
43-9031	Desktop Publishers	<1	47	$21.06	-8	-15%
47-2044	Tile and Marble Setters	5	120	$17.20	-1	-1%

SOC	Occupation	Average Annual Job Openings	2014 Jobs	Median Hourly Earnings	2010-2014 Change	Percent Change
47-2081	Drywall and Ceiling Tile Installers	24	328	$14.87	68	26%
47-2141	Painters, Construction and Maintenance	21	594	$15.93	-236	-28%
49-2091	Avionics Technicians	<1	<10	Insf. Data	Insf. Data	Insf. Data
49-3043	Rail Car Repairers	<1	26	$22.73	3	13%
49-3051	Motorboat Mechanics and Service Technicians	6	61	$9.67	15	33%
49-9051	Electrical Power-Line Installers and Repairers	6	115	$31.44	8	7%
49-9052	Telecommunications Line Installers and Repairers	30	315	$31.87	63	25%
49-9093	Fabric Menders, Except Garment	<1	<10	Insf. Data	Insf. Data	Insf. Data
51-2023	Electromechanical Equipment Assemblers	3	94	$19.34	7	8%
51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	4	58	$16.10	11	23%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	20	473	$17.01	65	16%
51-4062	Patternmakers, Metal and Plastic	<1	14	$20.92	1	8%
51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	<1	47	$15.20	4	9%
51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	<1	50	$18.57	-4	-7%
51-6031	Sewing Machine Operators	6	576	$11.06	-170	-23%
51-9083	Ophthalmic Laboratory Technicians	5	107	$11.69	-2	-2%
51-9141	Semiconductor Processors	<1	22	$14.79	0	0%
53-4011	Locomotive Engineers	4	60	$23.78	8	15%
53-4012	Locomotive Firers	<1	<10	Insf. Data	Insf. Data	Insf. Data
53-7064	Packers and Packagers, Hand	221	2,802	$14.24	605	28%

APPENDIX 5: TARGET OCCUPATION SELECTION

Table A5.1 displays the selected target occupations alongside specific characteristics that further describe the type of occupation (i.e. HPO, Green, and STEM). The State HPO list is based on the list of 2014 High Priority Occupations, as published by the Pennsylvania Department of Labor & Industry (PADLI). The Green Job and STEM Job lists are based on occupations published by PADLI in 2010.

TABLE A5.1 – Target Occupation List

SOC Code	Occupation	Source	State HPO	Green Job	STEM Job
11-2022	Sales Managers	LV HPO List	Y	N	N
11-3051	Industrial Production Managers	Both Lists	Y	N	Y
13-2011	Accountants & Auditors	Both Lists	Y	N	Y
15-1121	Computer Systems Analysts	Both Lists	Y	N	Y
15-1131	Computer Programmers	Both Lists	Y	N	Y
15-1132	Software Developers, Applications	Both Lists	Y	N	Y
15-1133	Software Developers, Systems Software	Both Lists	Y	N	Y
15-1134	Web Developers	EMSI List	N	N	Y
15-1142	Network & Computer Systems Administrators	Both Lists	Y	N	Y
15-1150	Computer Support Specialists	LV HPO List	Y	N	Y
15-1152	Computer Network Support Specialists	EMSI List	N	N	Y
17-2051	Civil Engineers	Both Lists	Y	Y	Y
17-2071	Electrical Engineers	EMSI List	N	Y	Y
17-2112	Industrial Engineers	Both Lists	Y	Y	Y
17-2141	Mechanical Engineers	Both Lists	Y	Y	Y
17-3024	Electro-Mechanical Technicians	LV HPO List	N	Y	Y
17-3026	Industrial Engineering Technicians	Both Lists	N	Y	Y
21-1094	Community Health Workers	LV HPO List	N	N	N
29-1111	Registered Nurses	Both Lists	Y	N	Y
29-2041	Emergency Medical Technicians & Paramedics	Both Lists	Y	N	Y

SOC Code	Occupation	Source	State HPO	Green Job	STEM Job
29-2052	Pharmacy Technicians	Both Lists	N	N	Y
31-1011	Home Health Aides	LV HPO List	N	N	N
31-1012	Nursing Aides, Orderlies & Attendants	LV HPO List	N	N	N
31-9092	Medical Assistants	Both Lists	N	N	Y
41-3021	Insurance Sales Agents	Both Lists	Y	N	N
41-3031	Securities, Commodities & Financial Services Sales Agents	Both Lists	Y	N	N
41-4011	Sales Representatives, Technical & Scientific Products	Both Lists	Y	N	Y
43-1011	Supervisors - Office & Administrative Support Workers	Both Lists	Y	N	N
43-4051	Customer Service Representatives	Both Lists	Y	N	N
43-5061	Production, Planning & Expediting Clerks	Both Lists	Y	N	N
43-5071	Shipping, Receiving & Traffic Clerks	LV HPO List	Y	N	N
43-6014	Secretaries	LV HPO List	Y	N	N
47-2031	Carpenters	LV HPO List	Y	Y	Y
47-2061	Construction Laborers	LV HPO List	Y	Y	N
47-2111	Electricians	LV HPO List	Y	Y	Y
49-1011	Supervisors - Mechanics, Installers & Repairers	LV HPO List	Y	Y	N
49-3023	Automotive Service Technicians & Mechanics	LV HPO List	Y	N	Y
49-3031	Bus & Truck Mechanics & Diesel Engine Specialists	Both Lists	Y	N	Y
49-9041	Industrial Machinery Mechanics	Both Lists	Y	Y	Y
49-9043	Maintenance Workers, Machinery	LV HPO List	N	N	N
49-9071	Maintenance & Repair Workers, General	LV HPO List	Y	Y	N
51-1011	Supervisors - Production & Operating Workers	Both Lists	Y	Y	N
51-4011	Computer-Controlled Machine Tool Operators, Metal & Plastic	Both Lists	Y	N	Y
51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal & Plastic	LV HPO List	Y	N	Y
51-4041	Machinists	Both Lists	Y	Y	N
51-4081	Multiple Machine Tool Setters, Operators & Tenders, Metal & Plastic	LV HPO List	Y	N	N
51-4121	Welders, Cutters, Solderers & Brazers	Both Lists	Y	Y	Y
51-5112	Printing Press Operators	LV HPO List	Y	N	N
51-9061	Inspectors, Testers, Sorters, Samplers & Weighers	LV HPO List	Y	Y	N
51-9111	Packaging & Filling Machine Operators & Tenders	LV HPO List	Y	N	N
53-3032	Heavy & Tractor-Trailer Truck Drivers	Both Lists	Y	N	N
53-3033	Light Truck or Delivery Services Drivers	LV HPO List	Y	N	N
53-7051	Industrial Truck & Tractor Operators	LV HPO List	Y	N	N

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