The Lehigh Valley

Talent Supply and Industry Sector Analysis

And

Strategic Action Plan

FINAL REPORT – JUNE 2018

LEHIGH VALLEY economic development

MDB INSIGHT

WorkforceBoard Lehigh Valley

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Definition of Terms

Allentown-Bethlehem-Easton MSA: A Metropolitan Statistical Area (MSA) is a geographical region with a relatively high population density at its core and close economic ties throughout the area. The United States Office of Management and Budget has designated the Lehigh Valley area of Pennsylvania as part of the Allentown–Bethlehem–Easton, PA Metropolitan Statistical Area. The counties in the Metropolitan area are Carbon, Lehigh, Northampton and part of Warren County.

Apprenticeship: An apprenticeship is a combination of on-the-job training and classroom learning. This form of training results in a skilled certification qualification. An apprenticeship relationship is usually administered by an employer. Employees are hired and trained through in-house on-the-job learning that are traditionally specific to a skilled trade, with periods of in-class training held throughout the apprenticeship.

Co-op: A Cooperative program (Co-op) combines' classroom education with practical, structured work experience. It differs from the apprenticeship as it is usually provided by an educational institution. A student can complete a number of co-op placements throughout the period of academic study and receive academic credit for each. A co-op can be either paid or unpaid depending on the type of program.

Economic Development: Economic development is the range of activities, policies, and programs of a state, region, or municipality used to "create conditions that enable long-run economic growth." These activities often include investments in the "generation of new ideas, knowledge transfer, and infrastructure" and rely on cooperation between the public and private sectors.[1]

Employability Skills: The skills you need to enter, stay in, and progress in the world of work—whether you work on your own or as a part of a team. Examples of Employability Skills include fundamental skills such as communication, personal management skills and teamwork skills[2].

Internship: Traditionally, an intern receives on-the-job training in the workplace. Internships are usually completed as part of coursework and students receive credit towards final program completion. They can be completed full time or part time and can be paid or unpaid.

Job shadowing: Job shadowing may be completed over a few hours to a few weeks and involves observing an employee in their workplace. Students interact and network with practitioners while gaining industry exposure to inform their career pathway decisions.

Low-skill jobs: Low-skill jobs are a segment of the workforce associated with a limited skill set or minimal economic value for the work performed. It is generally characterized by a lower educational attainment, such as a high school diploma, GED or lack thereof, and typically results in smaller wages.

LVEDC: Lehigh Valley Economic Development Corporation

Middle-Skill Jobs: those that require more education and training than a high school diploma but less than a four-year college degree.[3]

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[1] Feldman, Maryann, Theodora Hadjimichael, Tom Kemeny, and Lauren Lanahan. 2014. "Economic Development: A Definition and Model for Investment." Chapel Hill, NC: University of North Carolina. http://www.eda.gov/tools/files/research-reports/investment-definition-model.pdf

[2] http://www.conferenceboard.ca/(X(1)S(ug1kch5np0oijmduafz3f1a5))/spse/employability-skills.aspx?AspxAutoDetectCookieSupport=1#

[3] https://www.hbs.edu/competitiveness/research/Pages/middle-skills.aspx

NAICS: The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy[4].

SOC: The Standard Occupational Classification (SOC) system is a federal statistical standard used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data[5].

Target Sector: Target sectors best match the unique competitive advantages in the area, as well as the needs of particular industry sectors. The five industry target sectors in this strategy are Advanced Manufacturing and Food and Beverage Manufacturing, High Value Business Services, Transportation, Logistics, Warehousing and Wholesale, Health care Services and Life Science Research and Manufacturing.

The Lehigh Valley: The Lehigh Valley located in eastern Pennsylvania, is a two-county region of Lehigh County and Northampton County. Within the counties are 62 distinct municipalities, including three cities, namely, Allentown, Bethlehem, and Easton. The area is part of the Allentown–Bethlehem–Easton, PA–NJ Metropolitan Statistical Area which also includes the neighboring counties of Carbon (PA) and Warren (NJ).

WBLV: Workforce Board Lehigh Valley

Workforce Development: Workforce development is the range of activities, policies, and programs used to "create, sustain, and retain a viable workforce" that can support current and future business and industry across a state, region, or municipality. This may include education and training, job matching, and employer engagement. It also involves the coordination of public- and private-sector efforts, providing individuals with career opportunities and supporting business and industry workforce needs.[6]

[4] https://www.census.gov/eos/www/naics/

[5] https://www.bls.gov/soc/

[6] Haralson, Lyn E. 2010. "What Is Workforce Development?" Bridges. St. Louis, MO: Federal Reserve Bank of St. Louis. https://www.stlouisfed.org/publications/bridges/spring-2010/what-is-workforce-development.

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1. Executive Summary

Shifting economies, global competitiveness, and the immense speed by which technology is advancing are all contributing to the increasing employer demand for higher skill and education levels as they seek to recruit talent. This rising concern for qualified candidates has embedded itself into the discussion of supply and demand alignment. Such discussions are driving conversations, strategic planning and increased collaboration among economic development, workforce development, education institutions and employers. Communities are recognizing the necessity to be proactive and forward-thinking in how they respond to business needs for a skilled and talented labor force. This is driving the necessity for economic and workforce development to work cohesively and in-step with a common agenda to retain a competitive position in the attraction and retention of businesses and a skilled talent pool.

Lehigh Valley Economic Development Corporation and Workforce Board Lehigh Valley have chosen this time to take proactive steps to link business and education within a collaborative environment that supports creation of a strong ecosystem. The goal is to ensure the Lehigh Valley has a talent pipeline that meets the current and future needs of its key economic sectors. It is about influencing skills development to support labor demand today and being responsive to labor demand as industry and businesses transform in the 21st century economy.

The approach used to develop the Lehigh Valley Talent Supply and Industry Sector Analysis & Strategic Action Plan Strategy combined research and analysis of the current economic and workforce context in the Lehigh Valley with a comprehensive consultation and engagement process. This consultation and engagement involved a range of stakeholders from throughout the Lehigh Valley across five priority sectors, and included employers, job-seekers, community organizations, municipal and State leaders, and sector associations. The insights, perspectives, and knowledge shared created a strong foundation that resulted in informed strategic directions, and actions to implement those directions.

2. About This Report

2.1 The Lehigh Valley

The Lehigh Valley is the 65th largest regional economy in the United States, with a $39.1 billion private sector GDP. It is located in eastern Pennsylvania and is a two-county region of Lehigh County and Northampton County. Within the counties are 62 distinct municipalities, including three cities, namely, Allentown, Bethlehem, and Easton. The area is part of the Allentown–Bethlehem–Easton, PA–NJ Metropolitan Statistical Area which also includes the neighboring counties of Carbon (PA) and Warren (NJ).

The Lehigh Valley is a destination for people to live. Whether it be relocating within the region (likely from rural to urban settings) or attracting people from outside and inside Pennsylvania, the Lehigh Valley and its main urban areas are experiencing higher rates of in-migration than the State averages. It is also interesting to note the higher rates of in-migration from those that come from abroad to Allentown relative to the other areas in the Lehigh Valley.

For the purpose of the Strategic Action Plan and its embedded recommendations and actions, the following vision applies:

The Lehigh Valley is a place admired as a best practice for a regional approach to solving employer and employee needs through collaboration and data-driven self-awareness, making its talent supply strong and adaptable to meet the demands of current and future employers and increasing the competitiveness of the regional economy.

2.2 Project Objective

The Talent Supply and Industry Sector Analysis was undertaken through a partnership between the Lehigh Valley Economic Development Corporation (LVEDC) and Workforce Board Lehigh Valley (WBLV). The purpose of the analysis is to define trends and shortfalls in talent supply in specific industry clusters within the Lehigh Valley.

A second goal of the project is to develop a Strategic Action Plan that will guide communication and implementation strategies for the region over the next five years. This 'road map' will enable the region to develop economic and workforce development and education strategies that support efforts to establish a continuous talent pipeline within the Lehigh Valley and ensure a competitive and sustainable economy.

2.3 Process

The approach used to conduct the analysis and inform the strategic plan combined research of the current economic context using both public and private (subscription) sources with a comprehensive consultation and engagement process. This consultation and engagement involved a range of stakeholders from throughout the Lehigh Valley across five priority industry sectors and included

employers, job-seekers, community organizations, municipal and State leaders, and sector associations. The insights, perspectives, and knowledge shared created a strong foundation that resulted in informed strategic directions and actions to advance solutions and drive impact.

The approach followed a six-stage process as illustrated in Figure 1.

Figure 1: Project Approach

Talent Supply and Demand Data Collection

Data discussed or shown in graphs and charts throughout the report are compiled from the following sources:

- United States Census Bureau American Community Survey Estimates
- United States Census Bureau County Business Patterns
- United States Census Bureau Longitudinal Employer-Household Dynamics Statistics
- United States Census Bureau of Labor Statistics Occupational Employment Survey Estimates
- Lehigh Valley Planning Commission Forecast Estimates
- Chmura JobsEQ® Platform Industry and Occupation Snapshot Estimates
- Integrated Postsecondary Education Data System Graduate Estimates
- LVEDC Postsecondary and Technical School Surveys

The above information (where applicable) was collected for the following geographic descriptions:

- United States
- Pennsylvania
- Lehigh County
- Northampton County
- Cities of Allentown, Bethlehem, Easton
- 59 distinct boroughs and townships in the Lehigh and Northampton counties

All data is available in the *Technical Report (Appendix A)*.

Industry Sector Selection

LVEDC's Sustainable Economic Development Strategy highlights five optimal target industry sectors for the Lehigh Valley based on the site-specific characteristics of the regional economy. These five target sectors best match the unique competitive advantages in the area, as well as the needs of particular industry sectors. The five industry sectors of focus in this strategy include:

- Advanced Manufacturing and Food and Beverage Manufacturing
- High Value Business Services
- Transportation, Logistics, Warehousing and Wholesale
- Health Care Services
- Life Science Research and Manufacturing

The definition breakdown for each industry sector is available in the *Industry Sector Definition Report (Appendix B)*.

Engagement and Consultation Activities

The research phase included three types of engagement and consultation activities, each involving a range of stakeholders from throughout the Lehigh Valley, and targeting the five industry sectors. These consultations were designed to encourage participants to share their experiences and insights on the availability of skilled talent in the Lehigh Valley, workforce issues and challenges, and gaps and opportunities that would improve the region's positioning in having a strong pipeline of talent.

Engagement and consultation activities included:

- **Employer Telephone Survey –** A statistically valid survey of 315 randomly selected businesses across the five target industry sectors throughout the Lehigh Valley; companies contacted were also given the opportunity to answer the survey questions online if they preferred. The survey was open from October 20, 2017 through January 12, 2018.
- **Stakeholder Interviews –** A total of 32 one-on-one telephone interviews were conducted with business, community, municipal and State leaders in the Lehigh Valley. These interviews were guided by open-ended questions to promote conversation, each averaging approximately 20-30 minutes in length.
- **Focus Groups –** Eight focus groups were hosted in the Lehigh Valley with select groups including the Lehigh Valley Economic Development Corporation Board of Directors, educational stakeholders, the Education and Talent Supply Council, target sector employers, association, not-for-profit stakeholders, and the Lehigh Valley Professionals group (job-seekers). Focus groups were held in November 2017 and April 2018 and were each two hours.

Results from the employer survey and a consultation summary are available in the *Employer Survey and Consultation Summary Report (Appendix C)*.

2.4 Notes for The Reader

Insight gathered from the engagement and consultation activities are marked within sections of this report. Conclusions drawn from these activities are a reflection of the responses given at those sessions with those specific stakeholders and should not be taken as generalizations about all employers within the target industry sectors.

Insight gathered and analyzed from the LVEDC Educational Survey does not include responses from local proprietary schools (McCann, WTTI, Lincoln Tech, and Triangle Tech).

If you have any further questions on data sourcing or methodology used throughout this report, please contact Karianne M. Gelinas, LVEDC Director of Talent Supply at kgelinas@lehighvalley.org.

3. Talent Demand Assessment

3.1 Industry and Occupation Overview

2015 County Business Patterns data reveals that there are over 14,000 businesses in the Lehigh Valley employing over 329,000 individuals. The majority of employment is concentrated in educational services, and health care and social assistance (81,325), manufacturing (48,294), retail trade (37,889), professional, scientific, and management, and administrative and waste management (33,243). Figure 2 provides a breakdown of all industries by total employment.

The top employing industry sectors in the Lehigh Valley are Health care and social assistance (51,348), Manufacturing (47,524), Retail trade (37,756) and Educational services industry (29,578). The proportion of industry employment for all industries is similar to the employment percentage seen in Pennsylvania.

Figure 2: Percentage of the labor force by industry, 2016 (Industries within the Target Sectors Highlighted)

Industry (NAICS)	The Lehigh Valley	% of total industry
Total	**319,644**	**100%**
Health care and social assistance	51,348	16.1%
Manufacturing	47,524	14.9%
Retail trade	37,756	11.8%
Educational services	29,578	9.3%
Accommodation and food services	20,703	6.5%
Construction	16,399	5.1%
Professional, scientific, and technical services	16,029	5.0%
Transportation and warehousing	15,181	4.7%
Administrative and support and waste management services	14,606	4.6%
Finance and insurance	14,250	4.5%
Other services, except public administration	13,649	4.3%
Wholesale trade	10,599	3.3%
Public administration	9,305	2.9%
Arts, entertainment, and recreation	6,914	2.2%
Information	5,757	1.8%
Real estate and rental and leasing	4,351	1.4%
Utilities	3,295	1.0%
Agriculture, forestry, fishing and hunting	1,500	0.5%
Mining, quarrying, and oil and gas extraction	472	0.1%
Management of companies and enterprises	428	0.1%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

When examining employment by occupation, the top occupations are related to management, business, science-related, and art-based activities (Figure 3). These occupations accounted for 35% of the total employed population in the Lehigh Valley. Employment in sales and office related activities (25% of the total employed population) were the second highest followed by service-based occupations (17% of the

total employed population). A drilled down view of specific occupations (Figure 3) highlights seven occupation types that account for 56% of all jobs available by the Lehigh Valley employers. These occupation types include:

- Office and administrative support occupations (14%)
- Sales and related occupations (10%)
- Management occupations (9%)
- Production occupations (7%)
- Education, training, and library occupations (6%)
- Food preparation and serving related occupations (5%)
- Material moving occupations (5%)

Figure 3: Percentage of the labor force by Occupations, 2016 (Occupations within the Target Sectors Highlighted)

Occupations (SOC)	The Lehigh Valley	% of Total Occupations
Total	**319,644**	**100%**
Office and administrative support occupations	46,171	14%
Sales and related occupations	33,176	10%
Management occupations	28,184	9%
Production occupations	22,424	7%
Education, training, and library occupations	18,772	6%
Food preparation and serving related occupations	17,396	5%
Material moving occupations	14,708	5%
Business and financial operations occupations	13,811	4%
Health diagnosing and treating practitioners and other technical occupations	13,189	4%
Construction and extraction occupations	12,718	4%
Transportation occupations	12,320	4%
Building and grounds cleaning and maintenance occupations	11,794	4%
Personal care and service occupations	11,675	4%
Installation, maintenance, and repair occupations	10,491	3%
Healthcare support occupations	9,197	3%
Computer and mathematical occupations	7,254	2%
Health technologists and technicians	6,907	2%
Architecture and engineering occupations	6,767	2%
Community and social services occupations	6,490	2%
Arts, design, entertainment, sports, and media occupations	5,015	2%
Life, physical, and social science occupations	2,832	1%
Firefighting and prevention, and other protective service workers including supervisors	2,752	1%
Law enforcement workers including supervisors	2,418	1%
Legal occupations	2,280	1%
Farming, fishing, and forestry occupations	903	0.3%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

3.2 Target Sector Industry and Occupation Overview

As of 2017, the Lehigh Valley's target sector industries employed over 175,000 individuals. Together, the five target sector industries saw a collective growth of 18,215 workers over the last 5 years (2012-2017) or about an annual 2% increase in its total employment. Looking outwards, the next five years forecast that the target sector industries have an anticipated net employment growth of 7,267 workers. The five-year forecast also predicts that the target sectors will see approximately 37,700 workers leave these industries due to retirements, and 51,775 workers transfer out of these industries and into other industries. Taking into account all three figures (reflecting statistical rounding), the target sector industries have an anticipated replacement demand of 96,826 workers. Figure 4 provides a detailed outlook of each target sector industry.

Figure 4: Industry Snapshot of Current and Forecasted Employment, the Lehigh Valley

Target Sector	Employment in 2017	Total Employment Change (2012-2017)	Average Annual Growth Rate (2012-2017)	Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand±
Advanced Manufacturing and Food and Beverage Processing	24,764	2,564	8%	23,955	-809	11,956
Life Science Research and Manufacturing	10,388	214	-1%	10,953	565	5,354
High Value Business Services	53,126	1,358	2%	54,835	1,709	28,952
Transportation, Logistics, Warehousing and Wholesale	34,271	10,019	5%	35,734	1,463	20,978
Health Care Services	53,056	4,060	2%	57,395	4,339	29,586
Total	**175,605**	**18,215**	**2%**	**182,872**	**7,267**	**96,826**

Source: Chmura JobsEQ® Platform, Q4 2017

± Total Replacement Demand = Number of workers transferring (moving to another industry) and exiting the industry (retiring) + the anticipated employment growth change

3.2.1 Advanced Manufacturing and Food and Beverage Manufacturing

Advanced manufacturing and food and beverage processing is an important contributor to the Lehigh Valley economy (Figure 5). Accounting for $1.74 Billion in wages paid in the region in 2017, this sector is in the midst of a significant transformation. As customer demands change, numerous new subsector opportunities have arisen with this target sector, positioning the Lehigh Valley to continue advancing

activity within this industry. Currently, the Lehigh County boasts the highest concentration of beverage processing activity when compared to other Pennsylvania counties.

Figure 5: Employment Characteristics, Advanced Manufacturing and Food and Beverage Processing, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
24,764	2,564	8% ↑	$70,302 (annual)	$1.74 Billion (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

The Lehigh Valley boasts a unique mix of assets to accommodate this fast-changing industry. When examining the industry's forecasted demand scenario (Figure 6), it can be seen that the industry will need to replace nearly 12,000 workers in the next five years. Approximately 4,685 workers are anticipated to exit the workforce in the next five years, with another 8,074 workers transferring to another industry.

Figure 6: Industry Snapshot of Employment Demand, Advanced Manufacturing and Food and Beverage Processing, the Lehigh Valley

Target Sector	Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exits (2017-2022)	Anticipated Transfers (2017-2022)
Advanced Manufacturing and Food and Beverage Processing	23,955	- 809 ↓	11,956	4,685	8,074

Source: Chmura JobsEQ® Platform, Q4 2017

3.2.2 Life Science Research and Manufacturing

Life Science Research and Manufacturing industry have boasted many success stories in the Lehigh Valley (Figure 7). Over the last five years, this $898 Million (in wages) industry was at the forefront of combatting viruses such as Ebola. A specialized industry, life science research and manufacturing activities remain a critical sector for local post-secondary institutions. A strong growth in the healthcare services industry also complements the importance of this target sector.

Figure 7: Employment Characteristics, Life Science Research and Manufacturing, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
10,388	214	-1% ↓	$86,441 (annual)	$898 Million (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

When examining the industry's forecasted demand scenario (Figure 8), it can be seen that the industry will need to replace nearly half of its existing workers in the next five years. Approximately 1,999 workers within this industry are anticipated to exit the workforce in the next five years, with another 2,789 workers transferring to another industry. The industry is also forecasted to add another 565 workers.

Figure 8: Industry Snapshot of Employment Demand, Life Science Research and Manufacturing, the Lehigh Valley

Target Sector	Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exits (2017-2022)	Anticipated Transfers (2017-2022)
Life Science Research and Manufacturing	10,953	565 ↑	5,354	1,999	2,789

Source: Chmura JobsEQ® Platform, Q4 2017

3.2.3 High Value Business Services

The High Value Business Services industry has the largest employment among the target sectors in the Lehigh Valley (Figure 9). Valued as a $3.45 Billion (in wages) industry, the high value business services industry is well suited in the Lehigh Valley. The Lehigh Valley's central location puts companies in close proximity to the financial and insurance centers of New York and Philadelphia. A strong cluster of shared service and back office facilities already exist in the Lehigh Valley, which has supported the continued growth of this target sector industry.

Figure 9: Employment Characteristics, High Value Business Services, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
53,126	1,358	2% ↑	$64,953 (annual)	$3.45 Billion (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

When examining the industry's forecasted demand scenario (Figure 10), it can be seen that the industry will need to replace 28,952 workers in the next five years. Approximately 10,930 workers within this industry are anticipated to exit the workforce in the next five years, with another 16,313 workers transferring to another industry. Despite the industry being quite volatile (as occupations under this target sector are often transferable among other industries) is it still forecasted to add another 1,709 workers in the next five years.

Figure 10: Industry Snapshot of Employment Demand, High Value Business Services, the Lehigh Valley

Target Sector	Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exits (2017-2022)	Anticipated Transfers (2017-2022)
High Value Business Services	54,835	1,709 ↑	28,952	10,930	16,313

Source: Chmura JobsEQ® Platform, Q4 2017

3.2.4 Transportation, Logistics, Warehousing and Wholesale

Employment in Transportation, logistics, warehousing and wholesale activities are on the rise (Figure 11). Paying nearly $1.88 Billion in wages, companies such as Amazon.com and FedEx are assisting the Lehigh Valley in its reputation as a formidable location (compared to other Pennsylvania locations) for investment.

Figure 11: Employment Characteristics, Transportation, Logistics, Warehousing and Wholesale, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
34,271	10,019	5% ↑	$54,743 (annual)	$1.88 Billion (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

When examining the industry's forecasted demand scenario (Figure 12), it can be seen that the industry will need to replace 20,978 workers (over 60%) in the next five years. Approximately 7,825 workers within this industry are anticipated to exit the workforce in the next five years, with another 11,688 workers transferring to another industry. Similar to the high value business services, the transportation, logistics, warehousing, and wholesale is volatile (as occupations under this target sector are often transferable among other industries) and is forecasted to add another 1,463 workers in the next five years.

Figure 12: Industry Snapshot of Employment Demand, Transportation, Logistics, Warehousing and Wholesale, the Lehigh Valley

Target Sector	Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exits (2017-2022)	Anticipated Transfers (2017-2022)
Transportation, Logistics, Warehousing and Wholesale	35,734	1,463 ↑	20,978	7,825	11,688

Source: Chmura JobsEQ® Platform, Q4 2017

3.2.5 Health Care Services

Over the past five years, the healthcare service industry has continued on as one of the largest industry sectors in the Lehigh Valley (Figure 13). Accounting for $2.46 Billion in wages paid in the region, this sector can be found throughout the Lehigh Valley, from the populated urban centers to more rural communities.

Figure 13: Employment Characteristics, Health Care Services, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
53,056	4,060	2% ↑	$46,452 (annual)	$2.46 Billion (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

When examining the industry's forecasted demand scenario (Figure 14), it can be seen that the industry will need to replace 29,586 workers in the next five years. Approximately 12,330 workers within this industry are anticipated to exit the workforce in the next five years, with another 12,911workers transferring to another industry. Perhaps unique to this target sector is the amount of anticipated new employment needed, with approximately 4,339 workers added to the total employment demand.

Figure 14: Industry Snapshot of Employment Demand, Health Care Services, the Lehigh Valley

Target Sector	Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exits (2017-2022)	Anticipated Transfers (2017-2022)
Healthcare Services	57,395	4,339 ↑	29,586	12,330	12,911

Source: Chmura JobsEQ® Platform, Q4 2017

3.3 Employer Challenges

A survey and a series of focus groups were undertaken to validate the anticipated demand challenges and supplement industry data. Observations, as presented, reflect the views, perceptions, and opinions of the respondents.

3.3.1 A Regional Lens on Employer Challenges

- Historical perceptions of the Lehigh Valley's heavy industrial manufacturing jobs have colored perceptions of modern manufacturing. These outdated perceptions tend to reflect manufacturing jobs in a less-than-positive light among parents and other career influencers.
- Employability ("soft") skills are as important to employers as technical skills and education. Job candidates are not prepared for the expectations or underestimate the value that employers place

on skills such as communication, motivation, teamwork, ability to follow directions and conflict resolution.

- With near full employment in the region for low-to high-skilled jobs, there is a demand on employers to increase wages as a competitive tool to attract talent. This demand is creating a wage gap versus skill gap environment as businesses that cannot offer a more competitive wage are often left with a lower-skilled labor pool to draw from.
- Some employers find growth is restrained by staffing challenges. This concern expands to potential new businesses relocating to the area, as access to talent is a key influencer to the relocation decision. It also impacts on existing businesses looking to expand operations.
- Skilled professionals active in the job market who previously worked at corporate offices both locally and abroad have salary expectations that do not align with compensation offered by other employers in the region.
- Challenges around employee training exist. Larger companies are often willing to train, but cautious about investing in employees who may leave to work for a competitor. Smaller companies struggle with training costs, the inability to release staff from work, and access to the right training. They often rely on technical schools and/or community colleges to train their workforce.
- Disconnections exist between the needs and expectations of employers and the wants and expectations of an evolving workforce. Today's workforce expectations include integrated technologies that workers are accustomed to in their personal lives, spaces that are designed for greater collaboration or socialization, and workplaces that place emphasis on nurturing emotional, physical, and cognitive well-being.
- Employers express concerns about the need to transfer technical and cultural knowledge from experienced employees who are approaching retirement to employees who will succeed them.

3.3.2 Target Sector Industry Challenges

A statistically valid telephone survey of 315 randomly selected businesses in the five priority sectors throughout the Lehigh Valley was conducted. Companies contacted were also given the opportunity to answer the survey questions online if they preferred. Summary findings from the survey are presented below. These observations reflect the views, perceptions, and opinions of the respondents.

Advanced Manufacturing and Food and Beverage Manufacturing

- 46% of all employer responses indicated they hired between 1-5 individuals over the past 12 months
- 65% of the employer responses are looking to hire between 1-10 employees in the next 12 months
- 72% of the employer responses indicated they experienced challenges in recruiting, hiring or retaining talent for specific occupations
- Machinists, Engineers, Welders, Mechanics, General Labor, and Electricians are the most difficult skills to retain, recruit or hire

- 68% of all employers identified that a skilled talent pool (both middle-skilled and high-skilled) was essential to their future operations

Life Science Research and Manufacturing

- 44% of all employer responses indicated they hired between 1-5 employees over the past 12 months
- 55% of the employer responses are looking to hire between 1-10 employees in the next 12 months
- 67% of the employer responses indicated they experienced challenges in hiring talent for specific occupations
- Engineers, Mechanics, Chemical operators, and IT Analysts are the most difficult skills to retain, recruit or hire
- 89% of all employers identified that a skilled talent pool (both middle-skilled and high-skilled) was essential to their future operations

High Value Business Services

- 58% of all employer responses indicated they hired between 1-5 individuals over the past 12 months
- 75% of the employer responses are looking to hire between 1-10 employees in the next 12 months
- 59% of the employer responses indicated they experienced challenges in recruiting, hiring or retaining talent for specific occupations
- Sales, Engineers, Accountants, and Attorneys are the most difficult skills to retain, recruit or hire
- 79% of all employers identified that a skilled talent pool (both middle-skilled and high-skilled) was essential to their future operations

Transportation, Logistics, Warehousing and Wholesale

- 37% of all employer responses indicated they hired between 1-5 individuals over the past 12 months
- 50% of the employer responses are looking to hire between 1-10 employees in the next 12 months
- 79% of the employer responses indicated they experienced challenges in recruiting, hiring or retaining talent for specific occupations
- Truck drivers, Forklift operators, Mechanics, and Warehouse workers are the most difficult skills to retain, recruit or hire
- 67% of all employers identified that a skilled talent pool (both middle-skilled and high-skilled) was essential to their future operations

Health Care Services

- 29% of all employer responses indicated they hired between 1-5 individuals over the past 12 months
- 45% of the employer responses are looking to hire between 1-10 employees in the next 12 months
- 76% of the employer responses indicated they experienced challenges in recruiting, hiring or retaining talent for specific occupations
- Nurses, medical assistants, caregivers/home health aides, certified nurse aides, and paramedics are the most difficult skills to retain, recruit or hire
- 86% of all employers identified that a skilled talent pool (both middle-skilled and high-skilled) was essential to their future operations

4. Talent Supply Assessment

Talent supply is measured by determining the availability of the labor force in the Lehigh Valley and the educational qualifications of the population. To gain an accurate reflection, it is necessary to also understand talent demand which is measured by identifying critical occupations, levels of job creation and difficulties in retaining and recruiting talent. The educational survey used to inform on talent supply includes responses from all of the regional CTEs, colleges, and universities including East Stroudsburg and Kutztown. Responses were not received from proprietary schools (McCann, WTTI, Lincoln Tech, and Triangle Tech) and are not included in the scan.

It is important to understand the skill levels of graduates and the skill levels of the employed labor force, as compared to the current and anticipated future needs of businesses. Identifying the supply of local graduates and the high growth sectors in the Lehigh Valley, current and potential future shortages can be determined. Although graduates are not the only talent supply for businesses, they represent a significant pool of local candidates to fill vacancies and support economic growth. Unless existing trends are reversed, these identified critical occupations will require the attraction of labor from outside the Lehigh Valley.

4.1 Talent Supply Age Characteristics

According to U.S. Census Bureau Population Estimate (as of July 1), the population of the Lehigh Valley in 2017 is 669,899. This is an increase from 596,871 residents in 2005. Examining age characteristics also identifies that the Lehigh Valley has an aging talent supply. The analysis of the population based on broad age groups showed that the senior population 60 years and above grew from 18% in 2010 to 24% in 2017. Additionally, the core talent supply aged 25-54 years decreased by 2%, which correlates with a loss of approximately 5,891 people. The Lehigh Valley talent supply by broad age groups shows that even if the outgoing talent supply of 91,410 residents is replaced by the future talent supply of 81,233 people in the next ten years, it still results in a shortage of 10,177 people in the labor force. Thus, approximately 10,177 jobs may go vacant, and this does not take into account the increased demand for talent based on economic activity, rather simply existing talent exiting the labor market.

Figure 15: The Lehigh Valley talent supply by broad age groups, 2017

Talent Supply Description	Age Groups	Population as of 2017	% of the labor force
Future talent supply in next ten years	5-14 years	81,233	12%
Incoming talent supply	15-24 years	90,026	13%
Core talent supply	25-54 years	254,219	38%
Outgoing talent supply	55-64 years	91,410	14%

Source: U.S. Census Bureau, Population Division, June 2018

4.2 Talent Supply Skill Characteristics

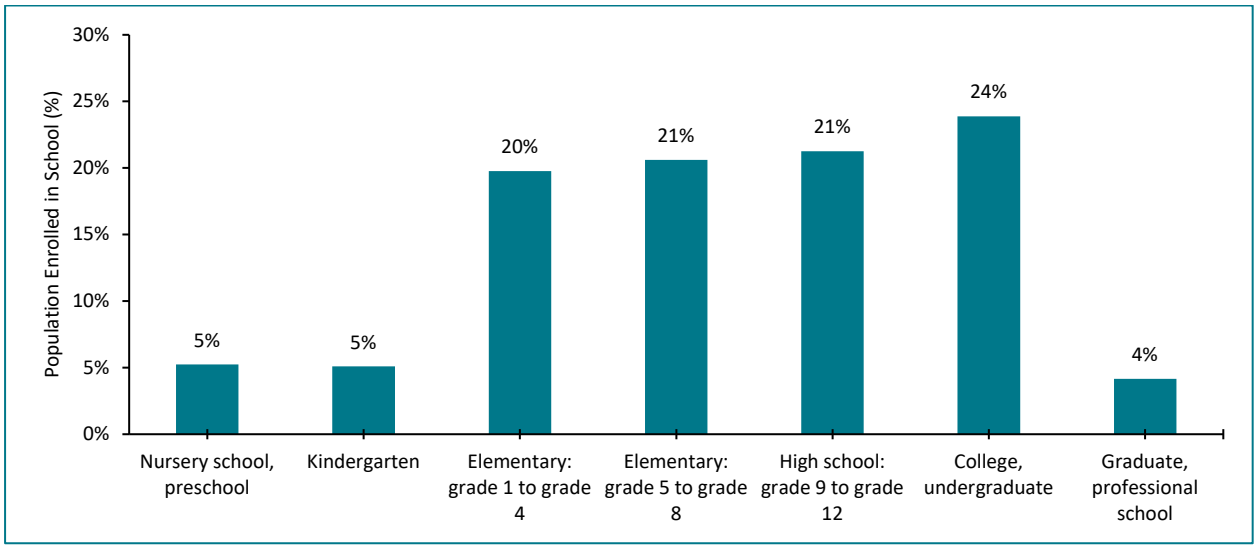
Analyzing the skill level of the current talent supply is important in identifying potential skill gaps that exist in the Lehigh Valley. The analysis of skill levels can help identify if the current workforce meets the employer demand or if a skills gap does exist, informing what skills need to be targeted, and how training can contribute to closing the gap. The skill levels in the Lehigh Valley are determined by analyzing the levels of:

- School enrollment
- Graduation levels
- Skills training programs

School Enrollment

The proportion of school enrollment based on of the total population in the Lehigh Valley has been consistent from 2005 to 2016 at 24% (Figure 16). Of the 159,974 population, three years and over were enrolled in school. Of this, 41% were enrolled in Elementary school from grade 1 to grade 8, and 21% were enrolled in High School, from grade 9 to grade 12. 28% of the population was enrolled in College or Higher Education of which 24% were Undergraduates.

Figure 16: Population 3 years and over enrolled in school, 2016



Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Graduation Levels

On analyzing data provided to the LVEDC by colleges and universities in the Lehigh Valley (Figure 17), it was determined that approximately 32,064 students graduated from public higher education institutions in the Lehigh Valley over the last three years.

Figure 17: Total Graduates from the Lehigh Valley, 2014-2017

Total graduates (credit)	2014-2015	2015-2016	2016-2017
	10,950	11,023	10,091

Source: LVEDC Educational Survey, 2018. Note: The above figure only includes credit graduate programs. Data for non-credit, secondary, or adult programs are not included.

Skills Training Programs

In examining workplace opportunities offered by Career and Technical Centers (CTCs), and colleges and universities in the Lehigh Valley (Figure 18), there is consistent availability of approximately 6,100 workplace opportunities for students on an annual basis. Workplace opportunities include apprenticeships, internships, co-ops, and job shadowing opportunities, with internships and co-ops being the preferred skill training program offered by education institutions.

Figure 18: Workplace Opportunities, the Lehigh Valley, 2014 to 2017

Workplace Opportunities	2014-2015	2015-2016	2016-2017
Apprenticeships	25	19	34
Internships	3,648	3,843	3,885
Co-ops	1,889	1,711	1,689
Job shadowing	544	518	559
Total	**6,106**	**6,091**	**6,167**

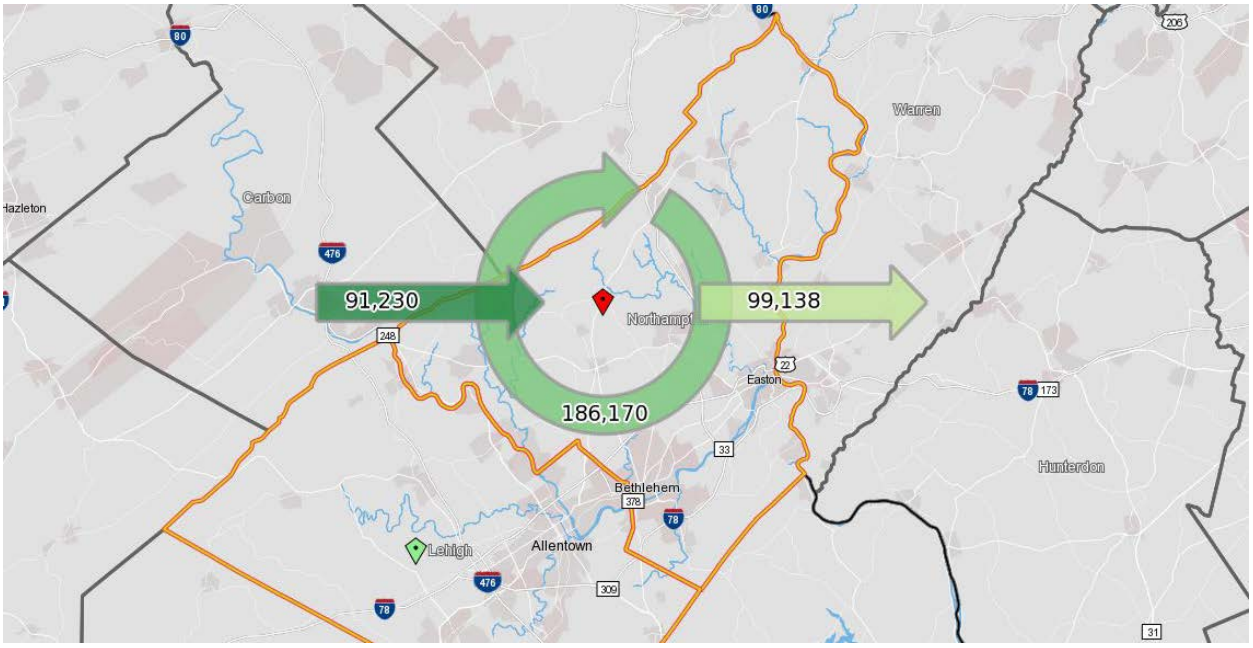
Source: LVEDC Educational Survey, 2018

4.3 Talent Supply Commuting Patterns

Commuting patterns can be used to identify talent sheds at the regional and sub-regional levels, which can help employers determine how wide to cast their local net for talent. The OnTheMap online tool from the U.S. Census Bureau was updated with 2015 data on commuting patterns in March 2018. This data uses unemployment insurance-covered employers and Census data from individuals to determine commuting patterns at many geography levels.

In 2015, approximately 277,490 individuals were employed in the Lehigh Valley, and 285,308 individuals who lived in the Lehigh Valley were employed. This discrepancy is explained by the 91,320 individuals who commute into the Lehigh Valley for work (and live outside of the Lehigh Valley) and the 99,138 individuals who make the opposite trip out of the Lehigh Valley for work (Figure 19). Therefore, 186,170 individuals work and live in the Lehigh Valley, and have a commute that falls fully within the region; this accounts for 65.4% of all those living in the Lehigh Valley who are employed.

Figure 19: Inflow Outflow Job Counts (Primary Jobs), the Lehigh Valley, 2015



Source: U.S. Census Bureau, Center for Economic Studies

4.4 Talent Supply by Occupation and Target Sectors

To gain an understanding of the talent supply needs in the Lehigh Valley, a combination of occupational data and primary research was examined. The occupational data examined existing supply and forecasted occupational growth and the primary research examined survey findings from an educational survey conducted by LVEDC in early 2018 with the Lehigh Valley's colleges, universities, and CTCs.

4.4.1 Occupational Outlook

In 2017 there were a total of 320,516 jobs in the Lehigh Valley. The top ten growing occupations and top ten declining occupations related to the target sectors in the Lehigh Valley are shown in Figure 20 and Figure 21, respectively.

Figure 20: Top Ten Growing Occupations in the Lehigh Valley (2017)

Occupation	Annual Percent Change, Projected Demand 2017-2022	Current Demand	Forecasted Demand	Forecasted Needed Employment
Home Health Aides	3.6%	1,858	2,223	365
Personal Care Aides	3.2%	4,585	5,373	788
Medical Assistants	2.4%	1,803	2,029	226

Occupation	Annual Percent Change, Projected Demand 2017-2022	Current Demand	Forecasted Demand	Forecasted Needed Employment
Software Developers, Applications	2.2%	1,056	1,180	124
Phlebotomists	2.1%	453	503	50
Mental Health and Substance Abuse Social Workers	2.0%	404	445	41
Mental Health Counselors	2.0%	387	427	40
Social and Human Service Assistants	1.9%	791	868	77
Medical Secretaries	1.8%	1,471	1,609	138
Nonfarm Animal Caretakers	1.8%	504	551	47
Total - All Occupations	**0.6%**	**320,516**	**329,861**	**9,345**

Source: Chmura JobsEQ® Platform, Q4 2017

Figure 21: Top Ten Declining Occupations in the Lehigh Valley (2017)

Occupation	Annual Percent Change, Projected Demand 2017-2022	Current Demand	Forecasted Demand	Forecasted Needed Employment
Sewing Machine Operators	-2.5%	554	489	-65
Electrical and Electronic Equipment Assemblers	-2.3%	861	765	-96
Legal Secretaries	-2.2%	268	240	-28
Executive Secretaries and Executive Administrative Assistants	-2.0%	1,124	1,014	-110
Postal Service Mail Sorters, Processors, and Processing Machine Operators	-1.9%	325	295	-30
Assemblers and Fabricators, All Other	-1.7%	589	540	-49
Photographers	-1.3%	254	238	-16
Team Assemblers	-1.2%	3,264	3,074	-190
Inspectors, Testers, Sorters, Samplers, and Weighers	-1.1%	1,611	1,522	-89
Cutting, Punching, and Press Machine Setters, Operators, and Tenders	-1.1%	378	357	-21
Total - All Occupations	**0.6%**	**320,516**	**329,861**	**9,345**

Source: Chmura JobsEQ® Platform, Q4 2017

Both figures indicate a shift towards healthcare services and IT/computer system applications and a move away from occupations that have been impacted by the advancement of technology in the workplace that has led to the automation of certain skills (ex. package processing).

4.4.2 Occupational Outlook by Target Sector

Common Occupations Across All Industry Sectors

In examining common occupational titles (ranging from high-skilled to middle-skilled talent) across all industry sectors, a total of 26,592 jobs are potentially being shared (Figure 22). The common occupations, for the majority, have historically illustrated significant growth (approximately 4,151 from 2012). However, looking out five years, it is anticipated that the supply will continue to grow but at a slower pace. This trend might be a reflection of the impact of workplace dynamics. As technology advancements emerge within workplaces, so does the risk of automation and efficiencies. Traditional occupations across all industries such as general labor is being replaced by machines or new assembly line processes. However, technology advancements can also support the creation of new occupations. Occupations focused on technology support or security such as computer system analysts or information security analysts are forecasted to grow naturally in the Lehigh Valley. This indicates an anticipated growing demand for these occupations.

Figure 22: Common Occupations and Supply Outlook

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Laborers and Freight, Stock, and Material Movers, Hand	12,231	3,768	12,984	753
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	4,738	-20	4,911	173
General and Operations Managers	3,457	140	3,568	111
Security Guards	2,324	309	2,385	61
Financial Managers	857	-45	926	69
Computer Systems Analysts	840	-11	863	23
Network and Computer Systems Administrators	679	12	690	11
Chief Executives	434	1	420	-14
Human Resources Managers	250	-4	259	9
Computer Network Architects	232	3	236	4
Database Administrators	223	5	233	10
Purchasing Managers	151	-2	154	3
Information Security Analysts	115	-1	129	14
Training and Development Managers	61	-4	63	2
Total Common Occupations	**26,592**	**4,151**	**27,821**	**1,229**

Source: Chmura JobsEQ® Platform, Q4 2017

Advanced Manufacturing and Food and Beverage Manufacturing

Analyzing occupational figures that are best aligned with the advanced manufacturing and Food and Beverage Manufacturing target sector (Figure 23), it is anticipated that the current supply of talent in 2017 is higher than the anticipated supply in 2022. This suggests that the focus of the advanced

manufacturing target sector will be on the retention of existing talent and a focus on replacing any exiting (retiring) talent. Occupations within this sector that are anticipated to continue being in demand and may have a potential supply shortage include production workers and machine operators, which is consistent with the responses received through the employer survey.

Figure 23: Advanced Manufacturing and Food and Beverage Manufacturing Occupations and Supply Outlook

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Team Assemblers	3,264	531	3,074	-190
First-Line Supervisors of Production and Operating Workers	1,657	122	1,640	-17
Inspectors, Testers, Sorters, Samplers, and Weighers	1,611	218	1,522	-89
Packaging and Filling Machine Operators and Tenders	1,540	313	1,564	24
Helpers--Production Workers	1,103	181	1,182	79
Electrical and Electronic Equipment Assemblers	862	97	766	-96
Welders, Cutters, Solderers, and Brazers	719	21	725	6
Machinists	714	25	712	-2
Assemblers and Fabricators, All Other	590	91	541	-49
Laundry and Dry-Cleaning Workers	587	36	579	-8
Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	563	23	509	-54
Sewing Machine Operators	554	-196	489	-65
Computer-Controlled Machine Tool Operators, Metal and Plastic	507	18	500	-7
All other advanced manufacturing occupations	9,413	741	9,131	-282
Total Advanced Manufacturing Occupations	**23,684**	**2,221**	**22,934**	**-750**

Source: Chmura JobsEQ® Platform, Q4 2017. All other advanced manufacturing occupations include printing press operators, bakers, mixing and blending machine setters, operators, and tenders, food batchmakers, cutting, punching, and press machine setters, operators, and tenders, production workers, etc.

In 2017, the McKinsey Global Institute (MGI) released a research study focused on the impact of automation and the future of work. In the MGI report, manufacturing was noted to be profoundly impacted by automation. The report notes that occupations in this sector are under automation stress due to the repetitive duties. Technological advancement will replace these skills in the future and sway Advanced Manufacturing businesses to attract high-skilled and middle-skilled employees with more technological experience.

The Lehigh Valley is well positioned to compete in the technologically advanced work pool for the manufacturing sector as the emerging talent pipeline from the postsecondary institutions has technology-related degrees in deeply rooted manufacturing related products such as systems engineering.

On analyzing the degrees, it can be determined that approximately 1,600 graduates with specific knowledge in these industries emerge from educational institutions in the Lehigh Valley. This includes individuals with certification, diploma, undergraduate and graduate degrees related to manufacturing, including production and engineering. Examples include the Line Worker Diploma Program, Welding, and Fabrication Program and Machine Tool Technology.

Figure 24: Graduates with Degrees related to Advanced Manufacturing and Food and Beverage Manufacturing, 2015 to 2017

Related Programs/Degrees	2015	2016	2017
Automotive Technology	107	119	119
Civil Engineering	75	63	68
Electrical and Electronics Engineering/Technology	171	192	214
Engineering	362	337	273
Industrial Systems Engineering	92	82	89
Manufacturing Degrees	87	112	120
Materials Sci. & Engineering	394	374	376
Mechanical Engineering and Technology	314	320	341
Total Graduates	**1,602**	**1,599**	**1,600**

Source: LVEDC Educational Survey, 2018

Based on the data analyzed, the Lehigh Valley does seem to have a healthy pool of qualified candidates capable of participating in the labor force today and in the future in the Advanced Manufacturing and Food and Beverage Manufacturing sector.

Life Science Research and Manufacturing

Analyzing occupational figures that are best aligned with the life science research and manufacturing target sector (Figure 25), it is anticipated that the current supply of talent in 2017 is lower than the anticipated supply in 2022. This suggests that the focus of the life science research and manufacturing target sector will be on the attraction and retention of new and existing talent. Occupations within this sector that are anticipated to be in high demand and may have a potential supply shortage include phlebotomists, medical technologists, and technicians.

Figure 25: Life Science Research and Manufacturing Occupations and Supply Outlook

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Medical and Clinical Laboratory Technologists	498	40	524	26
Phlebotomists	453	23	503	50
Medical and Clinical Laboratory Technicians	411	30	436	25
Medical Scientists, Except Epidemiologists	232	8	246	14
Chemists	229	0	234	5
Medical Equipment Preparers	135	13	140	5
Life, Physical, Social Science Technicians, All Other	97	11	101	4

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Chemical Engineers	81	7	84	3
Environmental Scientists and Specialists, Including Health	76	-8	79	3
Biomedical Engineers	64	0	66	2
Biochemists and Biophysicists	54	-2	56	2
Microbiologists	41	-1	42	1
Biological Scientists, All Other	36	0	38	2
Life Scientists, All Other	15	1	16	1
Epidemiologists	8	0	8	0
IT Related Degrees to Life Science Research and Manufacturing (Database Administrators, Computer Analysts)	455	8	469	14
Total Life Science Research and Manufacturing Occupations	**2,885**	**130**	**3,042**	**157**

Source: Chmura JobsEQ® Platform, Q4 2017

Occupations in life sciences have a lower proportion of automation potential. These knowledge-based occupations are reliant on a growing graduate base to backfill support positions as individual's progress in their careers. In analyzing degrees, it was determined that there were 1,031 life science research and manufacturing graduates from the Lehigh Valley colleges and universities in 2017 (Figure 26).

Figure 26: Graduates with Degrees related to Life Science Research and Manufacturing, 2015 to 2017

Related Programs/Degrees	2015	2016	2017
Behavioral Neuroscience	29	48	28
Biochemistry	45	34	45
Bioengineering	43	57	48
Biology	229	256	248
Biotechnology	73	81	101
General Bio life Sciences	129	118	128
Information Technology	414	432	433
Total Graduates without IT	**548**	**594**	**598**
Total Graduates with IT	**962**	**1,026**	**1,031**

Source: LVEDC Educational Survey, 2018

These degrees include basic biology and life science programs and core biotechnology programs including biochemistry, molecular biology, genetic engineering, and nanotechnology. Mechanics related to bioscience are involved in developing mechanical controls and manufacturing products for use in molecular processes. A high number of graduates in Chemistry also indicate that the region is well positioned to provide chemical analysts to meet business needs.

However, degrees in Bio-mechanics and Bio-engineering are currently unavailable at the Lehigh Valley colleges and universities, resulting in an out-of-region recruitment process for local businesses seeking

those skill sets; this could be considered a talent gap.

High Value Business Services

Analyzing occupational figures that are best aligned with the high value business services target sector (Figure 27), it is anticipated that the current supply of talent in 2017 is lower than the anticipated supply in 2022. This suggests that the focus of the high value business services target sector will be on the attraction and retention of new and existing talent. Occupations within this sector that are anticipated to be in high demand and may have a potential supply shortage include business services (secretarial functions), market research analysts and information clerks. It can be assessed that there is a potential shortage of information technology and computer systems related occupations.

Figure 27: High Value Business Service Occupations and Supply Outlook

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Office Clerks, General	6,585	442	6,509	-76
Customer Service Representatives	6,233	-7	6,273	40
Stock Clerks and Order Fillers	5,594	843	5,696	102
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	5,088	261	4,882	-206
First-Line Supervisors of Office and Administrative Support Workers	3,161	125	3,192	31
Bookkeeping, Accounting, and Auditing Clerks	3,111	101	3,054	-57
Accountants and Auditors	2,600	122	2,696	96
Receptionists and Information Clerks	2,517	127	2,623	106
Shipping, Receiving, and Traffic Clerks	1,877	400	1,911	34
Medical Secretaries	1,470	51	1,608	138
Market Research Analysts and Marketing Specialists	1,203	-20	1,307	104
Billing and Posting Clerks	1,193	31	1,261	68
Information Technology Related Occupations	5,235	124	5,294	59
All other High Value Business Service Occupations	22,474	-41	22,561	87
Total High Value Business Service Occupations	**68,341**	**2,559**	**68,867**	**526**

Source: Chmura JobsEQ® Platform, Q4 2017. All other High Value Business Service occupations include Human Resource Specialists, Bill and Account Collectors, Management Analysts, Lawyers, Tellers, Business Operations Specialists, Insurance Claims and Policy Processing Clerks, Purchasing Agents, Interviewers, Training and Development Specialists, etc.

In terms of automation disruption in the high value business services sector, finance, sales, and administrative occupations are most subject to automation, particularly in the data collection and processing activities. This includes bankers, tellers, secretaries, cashiers and sales representatives. The majority of graduates have accounting, finance, business, and information technology degrees with a smaller concentration of graduates with specialized business degrees (economics, human resources, marketing).

Figure 28: Graduates with Degrees related to High Value Business Services, 2015 to 2017

Related Programs/Degrees	2015	2016	2017
Accounting & Finance	519	525	518
Management and Business	255	268	301
Marketing	87	112	120
Economics & Statistics	48	61	49
Human Resource Management	21	25	28
Communication	28	29	22
Information Technology	414	432	433
Total Graduates	**958**	**1020**	**1,038**

Source: LVEDC Educational Survey, 2018

Transportation, Logistics, Warehousing and Wholesale

Analyzing occupational figures that are best aligned with the Transportation, Logistics, Warehousing and Wholesale target sector (Figure 29), it is anticipated that the current supply of talent in 2017 is significantly lower than the anticipated supply in 2022. This suggests that the focus of the transportation, logistics, warehousing, and wholesale target sector will be on the attraction and retention of new and existing talent. Occupations within this sector that are anticipated to be in high demand and may have a potential supply shortage include general laborers and truck drivers (both heavy and industrial operators), which is consistent with the responses received through the employer survey.

Figure 29: Transportation, Logistics, Warehousing and Wholesale Occupations and Supply Outlook

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Laborers and Freight, Stock, and Material Movers, Hand	12,231	3,768	12,984	753
Heavy and Tractor-Trailer Truck Drivers	5,743	1,242	5,912	169
Industrial Truck and Tractor Operators	3,615	1,345	3,763	148
Packers and Packagers, Hand	2,424	668	2,514	90
Light Truck or Delivery Services Drivers	2,335	398	2,411	76
Bus Drivers, School or Special Client	1,250	-178	1,264	14
Driver/Sales Workers	1,145	103	1,137	-8
First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	796	269	853	57
Cleaners of Vehicles and Equipment	736	43	772	36
First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	600	123	614	14
Bus Drivers, Transit and Intercity	458	-24	471	13
Taxi Drivers and Chauffeurs	440	8	431	-9

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Machine Feeders and Offbearers	354	114	376	22
All Other Transportation, Logistics, Warehousing and Wholesale Occupations	1,873	205	1,927	54
Total Transportation, Logistics, Warehousing and Wholesale Occupations	**34,000**	**8,084**	**35,429**	**1,429**

Source: Chmura JobsEQ® Platform, Q4 2017. All other Transportation, Logistics, Warehousing and Wholesale Occupations include Refuse and Recyclable Material Collectors, Automotive and Watercraft Service Attendants, Conveyor Operators and Tenders, Commercial Pilots, Motor Vehicle Operators, Crane and Tower Operators, Ambulance Drivers and Attendants, etc.

In addition, the MGI report shows that 60% of the transportation, logistics, warehousing, and wholesale target sector will be affected by automation, and unlike other primary sectors this will affect all types of occupations including management, data collection and processing, driving and manual labor. The high potential of automation has already begun to impact the evolution of the trucking industry and its related training activities. The advent of autonomous and semi-autonomous trucks is changing how truck drivers drive. From 'smart cruise' applications to collision mitigation systems, truck drivers are quickly requiring new skills reflecting technology sophistication.

The business survey shows that drivers in the Lehigh Valley are difficult positions for employers to fill. The LVEDC Educational Survey also shows that graduates in driver training programs have declined. With several businesses looking to hire 20+ employees in the next twelve months, there is a case for a talent gap in this industry.[7]

On analyzing degrees, the Lehigh Valley educational institutions do have certificate programs in CDL Driver Training and Logistics & Forklift Safety along with other programs in the transportation and warehousing industry, however with declining graduates over the past three years; there may be a need to educate the populous on the training opportunities associated with this industry and its increasing sophistication. The industry has evolved to one that now requires increased formalized education certificates.

Figure 30: Graduates with Degrees related to High Performance Manufacturing, 2015 to 2017

Related Programs/Degrees	2015	2016	2017
CDL Truck & Bus Driver	95	94	80
CDL Truck Driver Training	270	255	184
Logistics and Supply Chain Management	135	104	65
Total Graduates	**500**	**453**	**329**

Source: LVEDC Educational Survey, 2018

[7] Figures do not include responses from proprietary schools (McCann, WTTI, Lincoln Tech, and Triangle Tech).

Health Care Services

Analyzing occupational figures that are best aligned with the healthcare service target sector (Figure 31), it is anticipated that the current supply of talent in 2017 is significantly lower than the anticipated supply in 2022 both for practitioners and support service providers. This suggests that the focus of the healthcare services sector will be on the attraction and new and existing talent. Occupations within this sector that are anticipated to be in high demand and may have a potential supply shortage include registered nurses, nursing assistants, home health aides, and medical assistants, each consistent with the occupational challenges employers identified.

Figure 31: Health Care Service Occupations and Supply Outlook

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Registered Nurses	8,047	680	8,523	476
Nursing Assistants	4,341	17	4,559	218
Home Health Aides	1,858	407	2,223	365
Medical Assistants	1,804	39	2,030	226
Licensed Practical and Licensed Vocational Nurses	1,794	27	1,889	95
Physicians and Surgeons, All Other	1,250	14	1,327	77
Pharmacy Technicians	823	17	860	37
Pharmacists	791	24	803	12
Dental Assistants	693	33	753	60
Radiologic Technologists	649	49	681	32
Emergency Medical Technicians and Paramedics	631	-94	675	44
Physical Therapists	537	0	590	53
Dental Hygienists	524	26	569	45
Medical and Clinical Laboratory Technologists	498	40	524	26
All other Health Care Service Occupations	9,402	526	10,118	716
Total Health Care Service Occupations	**33,642**	**1,805**	**36,124**	**2,482**

Source: Chmura JobsEQ® Platform, Q4 2017. All other Health Care Service Occupations include Medical Records and Health Information Technicians, Physician Assistants, Occupational Therapists, Nurse Anesthetists, etc.

Similar to the life sciences research and manufacturing industry, occupations in healthcare services have a lower proportion of automation potential. There is an increasing role in the use of technology (ex. point of care technology, digitized health records, patient and staff identification systems) in the field which is leading to new desired skills in traditional occupations such as nursing and medical assistance (skills that are now part of today's college programs in these fields).

In analyzing degrees, graduates in nursing and nursing related programs are the third highest in the region compared to other postsecondary degrees. That being said, health related degrees in general in the Lehigh Valley have decreased slightly from 1,402 in 2015 graduates to 1,322 in 2017 (Figure 32).

Figure 32: Graduates with Degrees related to Health Care Services, 2015 to 2017

Related Programs/Degrees	2015	2016	2017
Health-Related Degrees	613	543	556
Medical Degrees	163	173	148
Nursing	626	629	618
Total Graduates	**1,402**	**1,345**	**1,322**

Source: LVEDC Educational Survey, 2018

The number of graduates has decreased over the years, indicating that the competitiveness of the sector might be affected in the short term. These numbers need to be monitored to assess if the declining trend continues over the longer term. Efforts should be focussed on improving awareness and increasing enrollment to meet employment opportunities.

4.5 Job Seeker Challenges

The summary findings of the perceptions of job seekers in the Lehigh Valley are presented below. These observations reflect the views, perceptions, and opinions of the respondents.

Job Seeker Challenges

- Easier access to data and information about what occupations are in demand, what companies are hiring, what skills/education are required for these jobs, what jobs pay, and how to successfully secure employment is needed
- A willingness to be flexible and keep an open mind to the jobs that are available and the importance of continuing to utilize and develop skills is necessary
- Access to public transportation causes access challenges as more development occurs in outlying areas away from the Lehigh Valley's population centers
- Language barriers can impede some job seekers because many jobs require basic ability to communicate in English
- Some job seekers face barriers that make mixing personal life commitments and work a challenge (i.e., childcare, interview readiness, being reliable in the workforce)
- On-the-job training is often necessary to strengthen relevant skills, yet job seekers are not effectively connecting to businesses offering these opportunities

5. Emerging Observations

5.1 Talent Gap Assessment

The talent demand and supply analysis show that the Lehigh Valley has a fairly robust talent pool (both existing and emerging as graduates), capable of participating in the labor force. The area is well positioned to compete in technology advancement as graduates in technology and related degrees are continuously increasing. Furthermore, the growth of workplace opportunities will enable the current and incoming talent pipeline to fully participate in the labor market and develop skills to meet the needs of employers.

In terms of industry needs, the Lehigh Valley needs to focus on developing programs that are individual to the sector. Key assessment outcomes are listed below:

- While occupations including welders, machine operators, truck drivers and packagers might be replaced by automation, the Lehigh Valley is well positioned in terms of technology advancement in the Advanced Manufacturing and Food and Beverage Manufacturing and Transportation, Logistics, Warehousing and Wholesale sectors. As such, employers will need to continue attracting, but more importantly retaining middle-skilled to high-skilled talent to ensure supply is maintained.
- The region is also well positioned to compete in the economy in terms of management and high skills jobs in High Value Business Services, Health Care Services and Life Science Research and Manufacturing. As these sectors are less affected by automation, there will need to be a concerted effort in continuing to grow these skillsets through higher education or attraction efforts.

5.2 Stakeholder Observations

5.2.1 Availability of Local, Skilled Talent in the Lehigh Valley

More companies have moved into the area and the unemployment rate of the Lehigh Valley has declined, leading to high levels of competition and increasing wages in sectors that have experienced growth, especially distribution, logistics, and advanced manufacturing.

Demand is high for technically skilled workers (CNC machinists, electromechanical technicians, mechanics, electricians, welders, Programmable Logic Controllers, etc.) highlighting a need for more ‘middle-skilled talent’ that has the right mix of education and technical aptitude/training. As the job market continues to tighten, some employers are developing their own apprenticeship programs where they are training employees and developing mentoring programs to complement that further.

5.2.2 Aligning the Education Sector with Employer Demands and Expectations

There is a strong desire from the business community to enhance collaborative efforts with the education sector. Businesses leaders want to see more opportunities for workplace learning incorporated into postsecondary programming through such channels as co-ops, internships, etc. Educating the population about where the jobs are, and the skills, experience, and education needed to

capitalize on these opportunities was also identified as necessary. These efforts should specifically target individuals who are in the process of entering or deciding a postsecondary pathway. Helping individuals make informed decisions with the local labor market information will offer a more realistic sense of what career opportunities are available.

Fostering a better realization of what career opportunities exist and how students can best prepare for them from kindergarten to postsecondary can promote and present jobs in compelling ways. Suggestions included school field trips to visit local employers and summer internships for high school students. Attention to students at the middle school and high school levels should also be a priority, specifically on the topics of vocational and technical school training opportunities. Consideration around creating more immersive and experiential experiences for students in 11th and 12th grades was also expressed. More internship opportunities with the region's small and medium-sized companies were seen to benefit the student and the business.

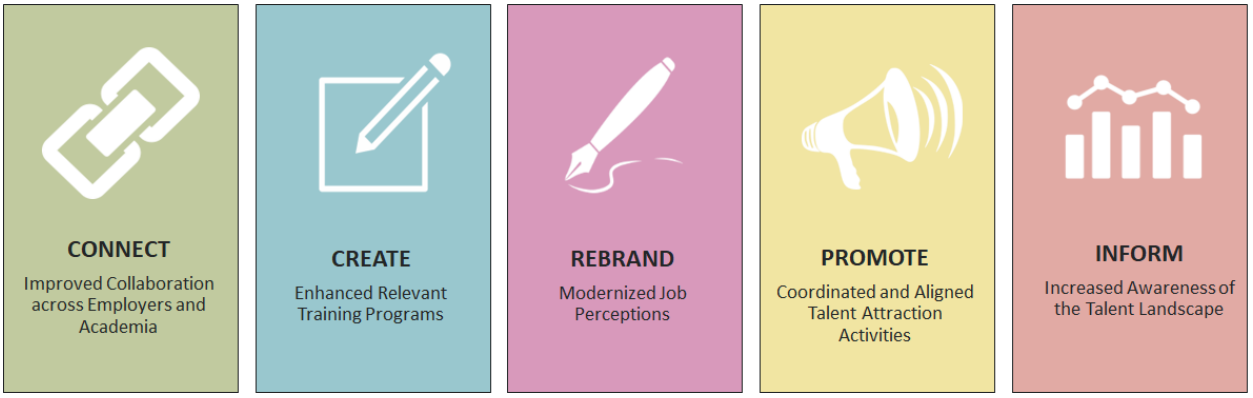
5.2.3 Flexibility Needed in Curriculum, Training and Workplace Opportunity Programs

Businesses and industry leaders spoke at length about the need to provide alternate methods of delivering training programs and curriculum. Suggestions included offering accelerated programs and shorter training with stackable credentials. Additionally, employers view noncredit programs that link outcomes to industry accredited skills as valuable. More focus on the employability skills and the cultural transition of moving from college to the workforce supports graduate transition.

Educators and employers believe it is important to increase employer awareness of the value (return on investment) of apprenticeships, co-ops, and internships. Educators and employers recognize that graduates undergoing workplace opportunity training develop better communication and team building skills. They also have the opportunity to engage in day to day activities, facilitate and improve knowledge of procedures, documentation, and tools. Recently, local educational institutions have been encouraging the growth of these platforms as career paths for students, but there appears to be a disconnect in the number of local businesses investing in these types of workplace opportunities.

6. Strategy Pillars

Based on the key themes and analysis, distinct recommendations have emerged. In certain instances, these recommendations may support and advance existing initiatives that are underway in the Lehigh Valley. There are significant opportunities for collaboration and cooperation among lead organizations working to support the alignment of talent supply and demand in the region. The recommendations can be sorted into five key strategy pillars.



6.1 Strategy Recommendations

Recommendation N° 1 | CONNECT | Improved Collaboration across Business and Academia

Consultation and research findings highlight a need to inform students about job and career opportunities that employers are providing today, and about the future of the Lehigh Valley's job market. Improving collaboration between business and academia in the Lehigh Valley will improve the consistency and availability of certifications and training opportunities that employers are demanding, and schools are offering. Businesses report a high level of satisfaction with the certifications and training of employees, but a lower degree of satisfaction with employability skills such as critical thinking, problem solving and communication. The opportunity for dialogue related to these employability skills and how they can be integrated into curriculum and workplace learning will enhance the job search and workplace experience for the job seeker and the employer. Employability skills are critical to talent preparation and marketability. The region should consider ways to define employability skills and codify the instruction of those skills in a structured, consistent, systemic way. To do so will take consistent guidance from regional agencies and perseverance from local employers and educational institutions.

The education sector is looking to employers to inform career resources and provide more mentoring and workplace learning opportunities for students. There is a demand for employers to be actively involved in the schools. Students who have exposure to local employers through job experience opportunities can develop a base of knowledge that better prepares them to enter and be successful in the workforce. Encouraging employers to be more active in developing mentoring and experiential programs will help to grow the local talent pipeline. Opportunities through mentorships, apprenticeships, co-ops, and internships will provide an improved pool of workers.

Creating a unified approach and vision between employers and education providers throughout the Lehigh Valley is a critical step in better understanding what is needed to strengthen the Lehigh Valley competitiveness and economic prosperity.

Recommendation N° 2 |CREATE| Enhanced Relevant Training Programs

Consultation and research findings indicate that employers feel that the delivery of training programs is quite good. Several employers have turned to in-house training or have established relationships with online or postsecondary training programs/seminars. Employers noted that the lack of diversity in the types of training programs available in the Lehigh Valley is a challenge. Employers indicated that many local training programs are dated, and with rapidly changing business environments, training programs focused on technology skills and continuous learning were needed if companies are to remain competitive. Additionally, individuals entering the labor force, changing jobs, or re-entering the labor force after a period of unemployment often require new or improved skills that current training programs are not offering.

An added concern in the current workforce landscape is the number of workers expected to retire in the near future, which has fueled the need for replacement workers. Talent management of an employee includes hiring, training, and replacement and results in both time and monetary costs. Thus, it is important to develop effective and enhanced training programs to reduce staff turnover and provide opportunities for aging workers to remain in the workforce in some capacity. Suggestions included offering more non credit programs, especially tying the outcomes of the program to industry accredited skills, and a greater focus on employability skills and the cultural transition from moving from school to work.

Research findings also indicated that job seekers are unaware of workplace opportunities that exist in the Lehigh Valley. It is perceived by local employers that there is limited exposure for students to job opportunities and career pathways. There is a desire to improve the efficiency and effectiveness of connecting local job seekers with relevant job opportunities.

There was also a desire from stakeholders to increase awareness among employers about the differences and value (return on investment) between apprenticeships, co-ops, and internships. Local educational institutions support the growth of these platforms and are encouraging local businesses to invest in these types of training opportunities. Employers should consider engaging with educational institutions to validate specific skills training for their employees.

Recommendation N° 3 | REBRAND| Modernized Job Perceptions

Based on the insights shared by local stakeholders, there is a perception of manufacturing jobs as low-paying and having limited future growth. These perceptions affect interest in manufacturing jobs, and available talent for the types of positions that today's advanced manufacturers need. There is a desire to rebrand these employment opportunities and industries, focusing on the sophistication of the technologies they use and the quality of the jobs they offer.

Suggestions to support the rebrand include, highlighting success stories of current employees, demonstrating the strength of career paths in these traditional industries, and working with educational institutions (grade school, high school and postsecondary) to demonstrate potential career paths in these industries beyond general labor.

Recommendation N° 4 | PROMOTE | Coordinated and Aligned Talent Attraction Activities

Consultation activities indicated that employers are finding it difficult to fill vacancies locally. Comments reflected a very tight labor market and stiff competition among a limited talent pool, making talent attraction from outside the Lehigh Valley a top priority. Attracting external talent requires community and cultural developers that support key attributes such as developing quality of place, quality of life, improving transit, providing affordable housing options, and the creation of unique local experiences (cultural assets or tourism assets), in addition to a central repository that showcases the depth and breadth of the available employment opportunities. Promotion of the region and all it offers requires marketing not only on job boards or job fairs but through promotion of the Lehigh Valley as a community of choice. Collaboratively investing in marketing and investing in community development will support a broader awareness of the employment opportunities available and promote the region as a viable option to relocate.

Recommendation N° 5 | INFORM| Increased Awareness of the Lehigh Valley's Talent Landscape

Reliable, accurate and relevant information is a necessity to the decision-making process. As educators, workforce organizations, and economic development agencies explore solutions to address the supply and demand disconnect, now and looking to the future, there is recognition that the appropriate systems and processes must be utilized. Understanding how the interests of students in local schools and postsecondary streams are impacting programming enrollment and the number of graduates in relevant fields is valuable information as it ultimately influences what jobs these graduates will be pursuing. Further, having a clear picture of where individuals are seeking work, both from an industry and geographic lens informs the commuter flows and helps to validate the types of skills and competencies that are leaving the Lehigh Valley each day.

With access to this type of data, strategies can be directed to influence student career pathways towards the employment opportunities that are locally available, in addition to local campaigns to inform commuters that they can work closer to home. To achieve the goal of attracting and retaining talent, and build a strong talent pipeline, having the necessary systems in place to collect, analyze and monitor local data will serve to produce important intelligence to influence and inform decisions.

6.2 Driving Action through Vision

To build on these recommendations of CONNECT, CREATE, ENGAGE, PROMOTE, and INFORM, the vision will provide an overarching, forward-focused talent alignment of the Lehigh Valley in 20 years. Recognizing that significant efforts are already underway involving key stakeholders on the supply and demand sides of the talent market, the vision is not organization specific. It depicts a reflection of how successful the Lehigh Valley has been in building an ecosystem that fosters talent development, talent attraction and retention, and talent alignment with the region's economic climate. The vision becomes a driver of actions that support the vision being achieved. For the purpose of the Strategic Action Plan and its embedded recommendations and actions the following vision applies:

The Lehigh Valley is a place admired as a best practice for a regional approach to solving employer and employee needs through collaboration and data-driven self-awareness, making its talent supply strong and adaptable to meet the demands of current and future employers and increasing the competitiveness of the regional economy.

7. Action Plan

7.1 Interpreting the Action Plan

Timing and Priority

The level of priority should consider:

1. The level of immediacy based on regional objectives
2. The potential to contribute to an increase in the attraction and retention of talent in the Lehigh Valley
3. The resources required (i.e., the capacity to implement given the current state)

The timeline assigned to each action may be operationalized as:

- Short-term – within a year
- Medium-term – 1-3 years
- Longer term – 3-5 years

For each action presented, it is important to identify a lead organization, along with potential partner organizations that can contribute to implementation and monitoring. Review by LVEDC and WBLV and the identified organizations is necessary to validate the alignment with organization mandates, priorities, and available resources.

7.2 Role Clarity

Economic Development

At its most basic level, economic development has been defined as the "sustained, concerted actions of communities and policymakers… [to] improve the standard of living and economic health of a specific locality".[8] Over time, the economic development practice has passed through various distinct phases:

In practice, this generally translates into the following types of activities in the community:

- Support and foster industry and business growth
- Investment Attraction and Aftercare
- Business Retention & Expansion (BR&E)
- Economic Gardening
- Entrepreneurial Support
- Incubation, Acceleration, and Technology Transfer
- Tourism Development and Destination Marketing
- Intersects with Workforce Development (on Talent Demand)

[8] Whatiseconomics.org, "What is economics?" (no date): http://www.whatiseconomics.org/economic-development;
For a discussion of all three phases refer to Dickinson, Brock, "The Three Ages of Economic Development," Municipal World, (February 2015); pp.27-29; Canadian CED Network, "What is CED?" (no date): https://ccednet-rcdec.ca/en/what_is_ced

Workforce Development

Workforce development, as a function area, has evolved from human resource development and workforce planning into a "broad range of policies and programs which increase the capacity of individuals to participate effectively in the workforce throughout their working life".[9] This has expanded workforce development beyond policies to include activities in economic development, immigration, human capital, social security, education, and training.[10]

In practice, this generally translates into the following types of activities in the community:

- Employment and Training Services
- Policy Directions for Employment and Training
- Labor Market Research and Planning
- Employer Engagement and Resourcing
- Skills Development and Educational Alignment
- Employment, Skills, and Training Grants/Funding
- Intersects with Economic Development (on Talent Demand and Supply)

Each of workforce and economic development organizations carries out distinct services within their areas of function, yet there are clearly overlaps such as business engagement and employer engagement and resourcing, and skills development and educational alignment. In the United States, the interdependence and deep correlation between economic and workforce development has long been recognized, and is best summed in the following quote:

"Workforce development" is an essential component of (community) economic development in any economic climate…. Generally speaking, the term has come to describe a relatively wide range of activities, policies and programs employed by geographies to create, sustain and retain a viable workforce that can support current and future business and industry.[11]

[9] Bramwell, Allison – MOWAT Centre EI Task Force. 2011. "Training Policy for the 21st Century: Decentralization and Workforce Development Programs for Unemployed Working-Age Adults in Canada". 2011 Mowat Centre for Policy Innovation;

[10] Wood, Donna E. and Thomas R. Klassen. 2009. "Bilateral Federalism and Workforce Development Policy in Canada." Canadian Public Administration 52.2

[11] Lyn E. Haralson - Federal Reserve Bank of St. Louis, https://www.stlouisfed.org › Publications › Bridges › Spring 2010

7.3 Strategic Action Plan

Recommendation N°. 1 | CONNECT

Action 1: Engage with educational institutions (leadership, teachers, and students) to develop a greater understanding of current work opportunities in the Lehigh Valley and the skills, education levels, and knowledge needed to succeed.

Tactics

1. Continue to create opportunities for employers to come together to explore opportunities for training coordination to provide specific skills training for employees. This may be across internal departments, through an external consortium, and/or with educational institutions.
2. Create a Speakers Bureau with representatives from local employers who are supportive of engaging with local educational institutions and sharing their existing career stories or business approach to hiring.
3. Conduct an annual "familiarization tour" of local businesses, inviting faculty members, career counselors, and administration from local educational institutions to experience local workplaces. This may be held annually, promoted as the Lehigh Valley Business Education Day and focused on getting educators into local workplace environments.
4. Engage with educational institutions to ensure that relevant workforce information is shared, and that decision-making bodies are informed on matters related to future job development including academic, technical, and employability skills.

Action 2: Continue to advocate for greater awareness of the importance of employability skills.

Tactics

1. Advocate for employability skills training programs (e.g., Skillsoft) across institutions to improve job retention and career growth.
2. Develop a mentorship program connecting talent with existing leaders in targeted sector areas, exposing talent to the realities of the workplace, and the types of skills needed for success.
3. Create a network to help semi-retired and retired individuals access employment opportunities to fill employment gaps and provide mentorship.

Action 3: Support the continued development of an employer-driven, competency-based career pathways system.

Tactics

1. Through sector specific training that has been endorsed by the sector, create a career laddering platform that supports lower-skilled workers to make an immediate contribution, and explore opportunities for workplace advancement.
2. Develop and clarify high priority career pathways to demonstrate career progression from entry level to highly skilled opportunities.

Recommendation N°. 1 | CONNECT
Action 4: Promote STEM education to create a regional competitive advantage.
Tactics
1. Strengthen student access and exposure to STEM through the introduction of pathways that move from exploration to hands-on learning. This may involve research, or creation of and increased access to a Maker Space, a Breaker Space, a Coding Space, etc.
2. Increase K-12 involvement in Talent Supply Work, through direct outreach and engagement that supports information sharing, and conversations about the economy and how it influences work availability. Such information supports career guidance initiatives that are held at the schools.

Recommendation N°. 2 | CREATE
Action 1: Promote awareness of ongoing training services and initiatives.
Tactics
1. Create a regional database of workforce and professional training opportunities for employees and employers to access. This could be presented in the form of a training calendar with links to local providers to promote what is available locally and regionally.
2. Encourage local business owners to seek experiential work term opportunities (internships, co-ops, apprenticeships) for local secondary and postsecondary students.
3. Document and share best and promising practices for employers to showcase tangible approaches to creating and adapting to a flexible workplace.
4. Convene an annual or bi-annual forum with economic development, employment agencies, chambers and other intermediary groups, employers and postsecondary institutions to evaluate skill and occupation needs in the region and match those needs with available training programs. This event may support an Employer/Recruitment panel to share insight into hiring practices, hiring preferences, and challenge recruitment and retention issues.
Action 2: Improve flexibility in learning and knowledge exchange to encourage broader participation, especially for learners who have barriers to access.
Tactics
1. Encourage the development of more online, part-time and modular programming to increase access.
2. Encourage businesses to use mentorship as both a recruitment and retention practice.
Action 3: Promote Cultural Diversity Training and multi-generational awareness.
Tactics
1. Offer easy-to-access training for employers to increase awareness and share strategies for managing diverse and multi-generational workplaces.
Action 4: Promote exploration of technical and applied skills needed in high-demand sectors.
Tactics
1. Integrate a Career and Technical Education Introduction in the classroom as part of the career exploration curriculum.

Recommendation N°. 3 | REBRAND
Action 1: Improve perceptions about and understanding of modern manufacturing jobs.
Tactics
1. Develop a program of business tours, seminars, and hands-on learning opportunities for students to demonstrate the new image of targeted sectors. 2. Expand and increase access by students and the community to targeted job profiles to increase student awareness of local opportunities. 3. Share employee experiences living and/or working in the Lehigh Valley via a social media campaign utilizing relevant platforms that are popular among target audiences such as K-12, parents, postsecondary students, career practitioners, etc.
Action 2: Encourage employers to undertake a workplace skills inventory to support promotion from within.
Tactics
1. Support businesses to carry out workplace skills assessments, resulting in an evidence-based analysis of in-house skills, knowledge, and competencies. This will support employer's promoting employees from within, and then backfilling the lesser skilled positions through external recruitment; this also demonstrates employer commitment to employee advancement.
Action 3: Increase awareness of the assets of the Lehigh Valley to promote it as a "place of choice" to work, live, and raise a family.
Tactics
1. Encourage businesses to promote their corporate culture beyond salary as candidates are considering workplace culture, personal alignment with corporate values, quality of life and place, and opportunities for advancement.

Recommendation N°. 4 | PROMOTE
Action 1: Promote the Lehigh Valley as a great place to live, work, and raise a family.
Tactics
1. Develop an information resource that highlights information on housing, education, lifestyle, affordability, etc. in the Lehigh Valley. This can be used across organizations, local businesses and stakeholder groups to promote the Valley with a common message to strengthen and consistently reflect the local brand. 2. Host a job fair of local employers for community college and career and technical students similar to the Lehigh Valley Collegiate Career Expo. 3. Coordinate with academia to reach alumni who have left the region and promote employment opportunities and attract alumni back; gather insights into their reasons for leaving. 4. Promote local industry associations / business associations as key stakeholders supporting business and talent attraction, retention and expansion.
Action 2: Community Asset Mapping.
Tactics
1. Map existing community assets to showcase a detailed and clear lifestyle value proposition; promote this within and outside of the region.
Action 3: Promote Buy Local Activities.
Tactics
1. Promote buy local to showcase the amenities of the region and encourage a deeper connection and sense of place.
Action 4: Attract High Value Jobs through Business Attraction and Retention.
Tactics
1. Strategically target high value business services employers to increase local job opportunities in higher-skilled, higher wage occupations.

Recommendation N°. 5 | INFORM
Action 1: Maintain a current view of the labor market demand, as informed by employers.
Tactics
1. Convene targeted sector working tables to ensure current, relevant, and validated identification of current and future talent demand. 2. Conduct an annual Employer Survey to ensure a current and reflective profile of employer job demand, occupation vacancies, and labor market challenges.
Action 2: Monitor available labor market information to accurately reflect labor force activity.
Tactics
1. Uncover migratory patterns of the Lehigh Valley residents who leave for postsecondary. Track where they go, what programming they complete, and if/when they return. 2. Research skills, occupations and zip codes of the Lehigh Valley residents who leave for employment outside of the Lehigh Valley (commuters). 3. Continue to utilize existing data sources to remain current on labor market trends, training and postsecondary preferences of students, and the emergence of new jobs as a result of technology and economic shifts.

8. Conclusion

The Lehigh Valley has recognized the necessity to be proactive and forward-thinking in the response to business needs for a skilled and talented labor force. In this ever-changing global environment, competition for talent is no longer constrained by distance, rather communities on either side of the globe are linked through ease of mobility and transformational technologies. Economic activity on a global scale is fueling a battle for talent and those regions that ensure a reliable, current and evidence-based understanding of their local labor market will be best positioned to win this battle.

Workforce and economic development organizations carry out distinct services within their areas of function, yet there are clearly overlaps such as business engagement and employer engagement and resourcing, and skills development and educational alignment. The convergence of workforce and economic development is at the point at which the local labor force can meet industry's skills and knowledge needs. This is driving the necessity for these two core functions (economic and workforce development) to work cohesively and in-step with a common agenda to drive competitiveness in the attraction and retention of businesses and a skilled talent pool.

This commitment to collaboration and cooperation is clearly evident in the Lehigh Valley with local economic development organizations, Lehigh Valley Economic Development, Workforce Board Lehigh Valley, educational institutions, and other key stakeholder groups coming together with a common agenda. In short, this initiative strives to strengthen the alignment of talent supply and demand, with consideration of future requirements across targeted economic sectors. It is about influencing skills development to support labor demand today and being responsive to labor demand as industry and businesses transform in the 21st-century economy.

The Lehigh Valley

Talent Supply and Industry Sector Analysis

And

Strategic Action Plan

APPENDIX A – TECHNICAL REPORT

JUNE 2018

LEHIGH VALLEY economic development

MDB INSIGHT

WorkforceBoard Lehigh Valley

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1. Notes For The Reader

1.1 Talent Supply and Demand Data Collection

All the data discussed or shown in graphs and charts throughout the report are compiled from the following sources:

- United States Census Bureau American Community Survey Estimates
- United States Census Bureau County Business Patterns
- United States Census Bureau Longitudinal Employer-Household Dynamics Statistics
- United States Census Bureau of Labor Statistics Occupational Employment Survey Estimates
- The Lehigh Valley Planning Commission Forecast Estimates
- Chmura JobsEQ® Platform Industry and Occupation Snapshot Estimates
- Integrated Postsecondary Education Data System Graduate Estimates
- Lehigh Valley Economic Development Corporation Postsecondary and Technical School Surveys

The above information (where applicable) was collected for the following geographic descriptions:

- United States
- Pennsylvania
- Lehigh County
- Northampton County
- Cities of Allentown, Bethlehem, Easton
- 62 distinct boroughs and townships in the area

1.2 Industry Sector Selection

LVEDC's Sustainable Economic Development Strategy highlights five optimal target industry sectors for the Lehigh Valley based on the site-specific characteristics of the regional economy. These five target sectors best match the unique competitive advantages in the area, as well as the needs of particular industry sectors. The five industry sectors of focus in this strategy include:

- Advanced Manufacturing and Food and Beverage Manufacturing
- High Value Business Services
- Transportation, Logistics, Warehousing and Wholesale
- Health Care Services
- Life Science Research and Manufacturing

The definition breakdown for each industry sector is available in the *Industry Sector Definition Report (Appendix B)*.

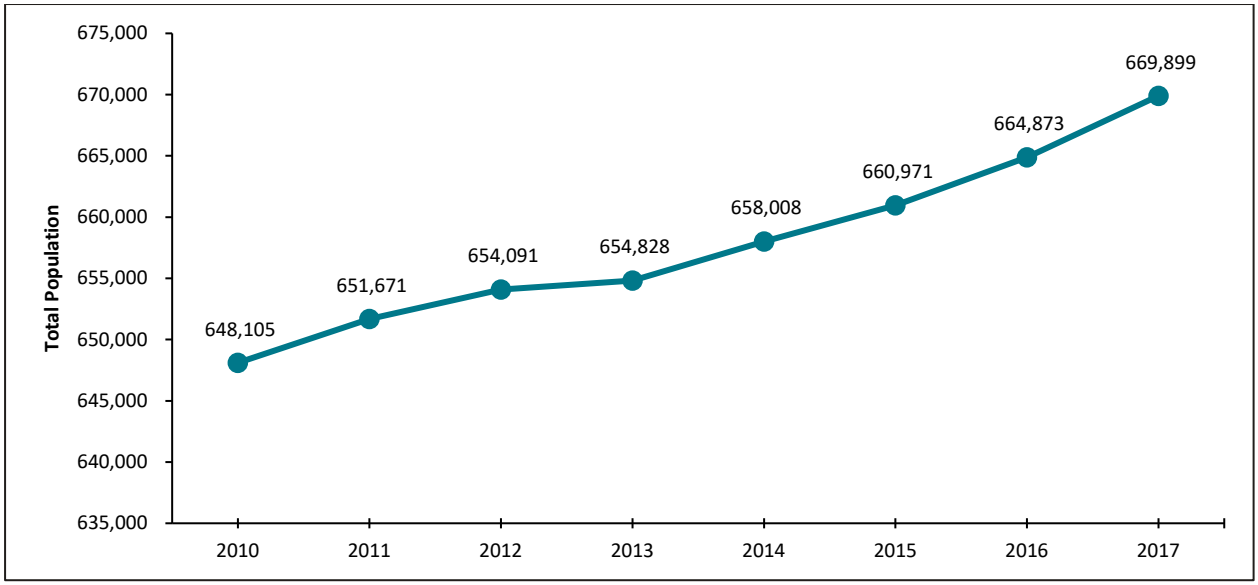
2. General Population Characteristics

The Lehigh Valley is the 65th largest regional economy in the United States, with a $39 billion private sector GDP.[1] It is located in eastern Pennsylvania and is a two-county region of Lehigh County and Northampton County. Within the counties are 62 distinct municipalities, including three cities, namely, Allentown, Bethlehem, and Easton. The area is part of the Allentown–Bethlehem–Easton, PA–NJ Metropolitan Statistical Area, which also includes the neighboring counties of Carbon (PA) and Warren (NJ).

In 2017, the population of the Lehigh Valley was 669,899 and represented 5% of Pennsylvania's total population of 12.8 million. The population in the Lehigh Valley has grown by 3% from 2010 to 2017, a total of 21,794 people. Figure 1 shows the population estimates for the Lehigh Valley from 2010 to 2017. Population projections from 2020 to 2040, produced by the Lehigh Valley Planning Commission are shown in Figure 2. The aggregate 2017 to 2040 forecast for the Lehigh Valley shows a population growth of 204,055 persons, representing a 30% increase in population (Table 1).

Although the Lehigh Valley only represents 5% of Pennsylvania's total population, the region is seeing continued growth in its major cities, namely Allentown, Bethlehem and Easton. In 2016, the three cities represented 18%, 11% and 4% of the Lehigh Valley's population and as per the population projections for 2040 will grow by 19,993, 14,435 and 6,844 people respectively from 2016 to 2040 (Figure 3, Figure 4, Table 2). The growing population indicates that the Lehigh Valley is a region that is actively growing, attracting and retaining its population and is poised for future growth and investment.

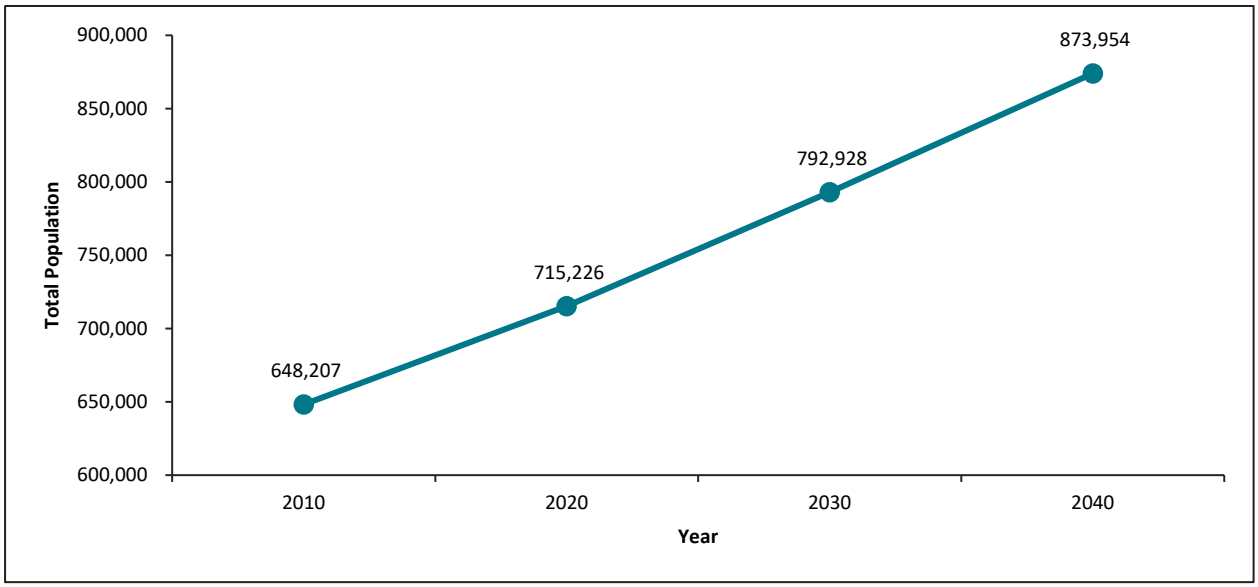
Figure 1: Population estimates for the Lehigh Valley (as of July 1) from 2010 to 2017



Source: Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2017

[1] http://lehighvalley.org/lehigh-valley-gdp-continues-grow-reaches-record-high-39-billion/

Figure 2: Population projections for the Lehigh Valley from 2010 to 2040

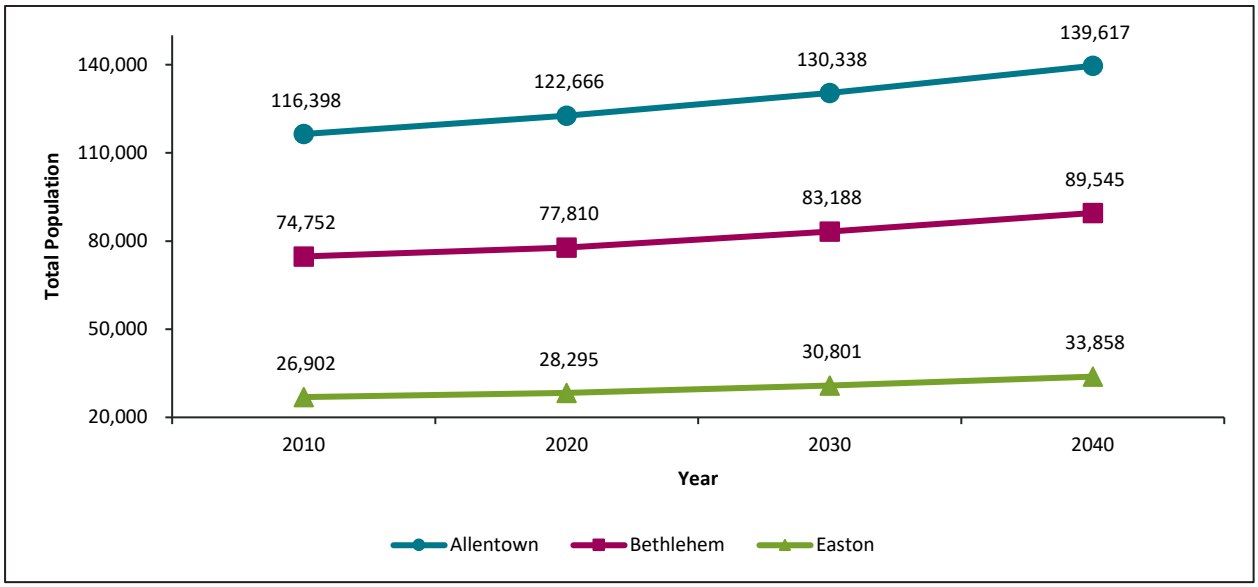


Source: The Lehigh Valley Planning Commission population projection 2020-2040

Figure 3: Population estimates for Allentown, Bethlehem and Easton (as of July 1) from 2010 to 2016

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Figure 4: Population projections for Allentown, Bethlehem and Easton (as of July 1) from 2010 to 2040



Source: The Lehigh Valley Planning Commission population projection 2020-2040

Table 1: Population growth in the Lehigh Valley and major cities, 2010 to 2040

Region	Population Growth		% of Pennsylvania's population		% of Lehigh Valley's population	
	2010 to 2017	2017 to 2040	2010	2017	2010	2017
Lehigh Valley	3%	30%	5%	5%	-	-

Source: Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2017; The Lehigh Valley Planning Commission population projection 2020-2040

Table 2: Population growth in major cities in the Lehigh Valley, 2010 to 2040

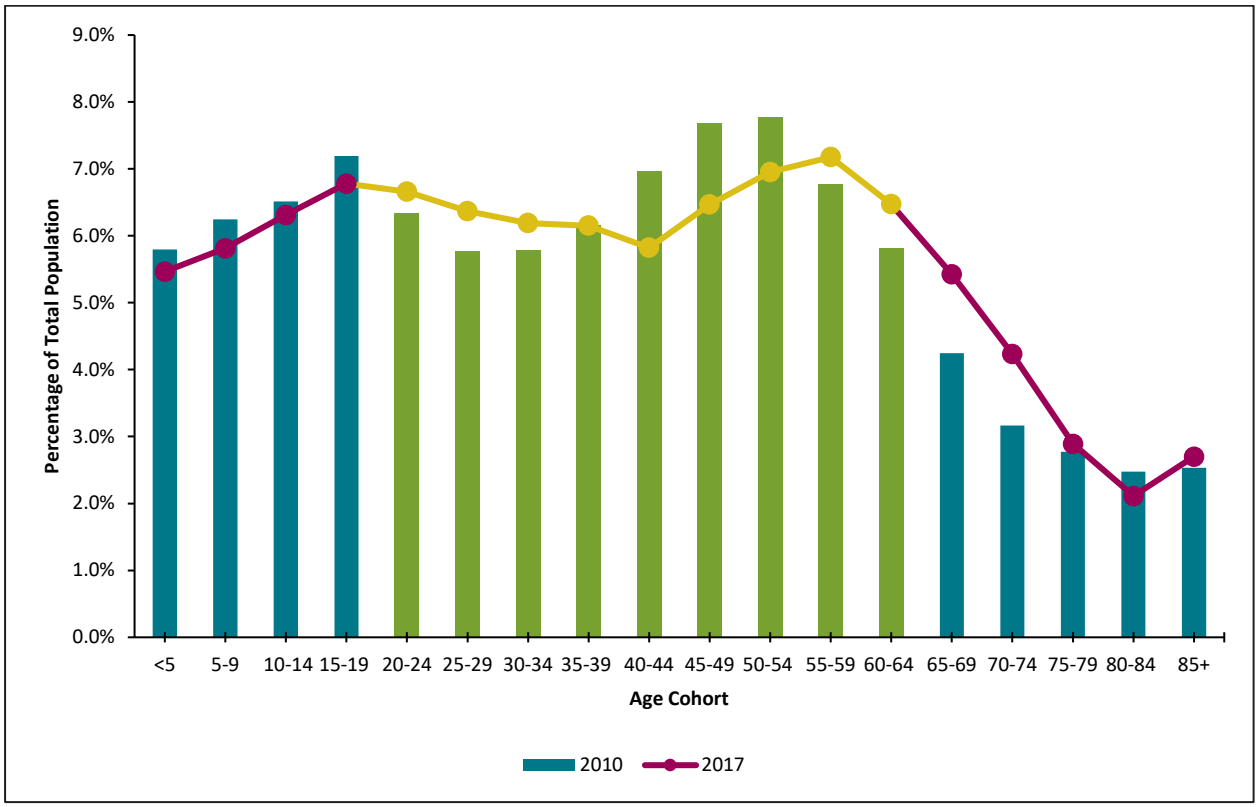
Region	Population Growth		% of Pennsylvania's population		% of Lehigh Valley's population	
	2010 to 2016	2016 to 2040	2010	2016	2010	2016
Allentown	3%	17%	1%	1%	18%	18%
Bethlehem	0.5%	19%	1%	1%	12%	11%
Easton	0.4%	25%	0.2%	0.2%	4%	4%

Source: Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates; The Lehigh Valley Planning Commission population projection 2020-2040

The total general population by age (Figure 5) shows that in 2017, 24% of the Lehigh Valley population was between the ages of 0 to 19 years, while 17% of the population was made up of seniors aged 65 and over. The working-age populations between 20-34 years and 35-49 years represented 19% and 18% of

the total population, respectively, while 21% of the population were between 50-64 years of age. The population breakdown by age also shows that the Lehigh Valley has a higher proportion of population from 20 to 34 years compared to 2010. However, the proportion of population from 35 to 49 years is lower than the proportion of population in 2010. The population shows an aging trend with a higher proportion of population 50 years and above compared to 2010. The median age of the Lehigh Valley is 40.4, which is comparable to the median age of Pennsylvania with a median age of 40.7.

Figure 5: Population of the Lehigh Valley by Age, 2010 and 2017

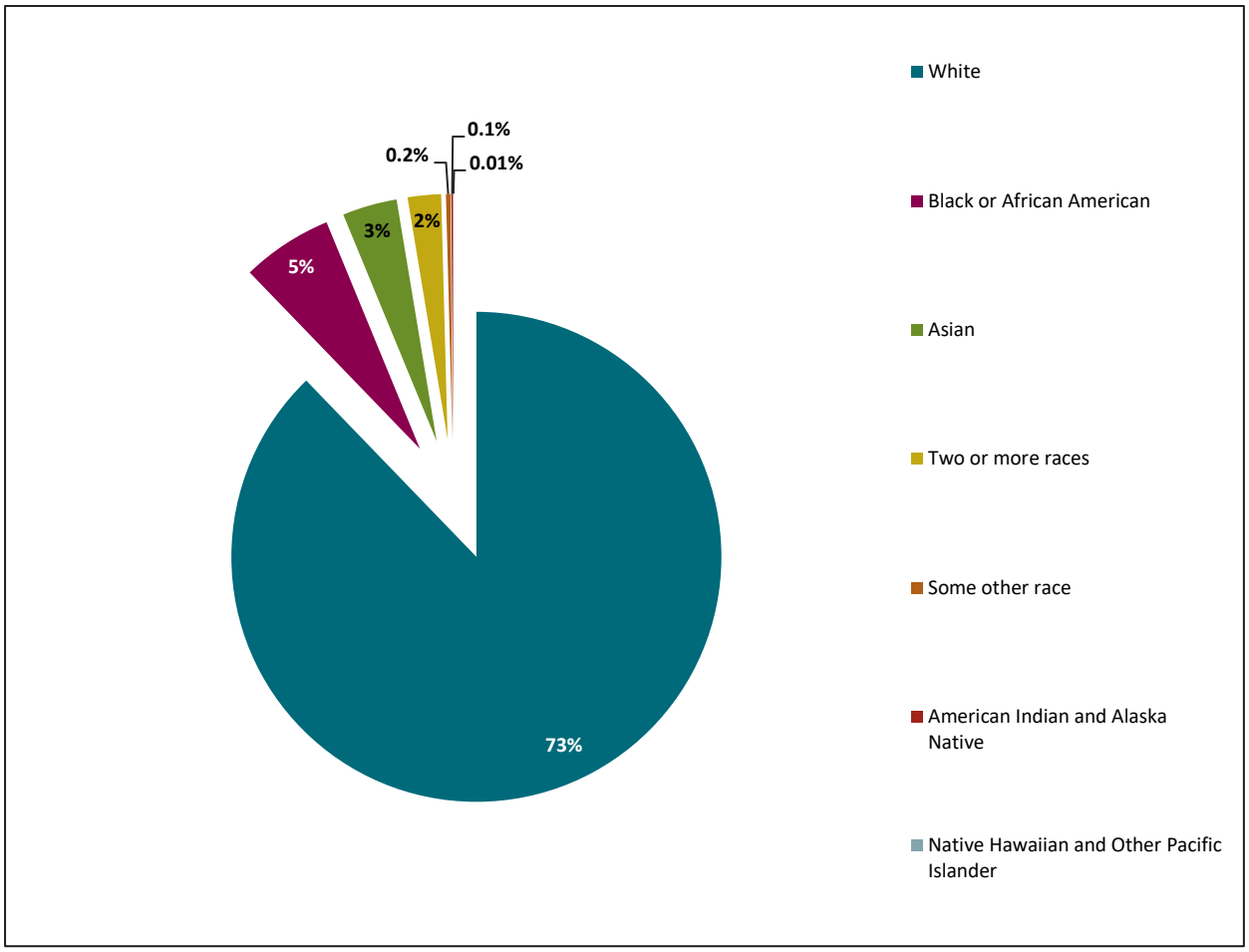


Source: Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2017

Note: Green bars indicate prime talent age

The racial composition of a community is an important social characteristic to identify the diverse needs of its population. On analyzing the ethnic origin of the population, it was determined that 17% of the population were Hispanic or Latino while the remaining 83% were not Hispanic or Latino. Figure 6 shows the detailed breakdown of the not Hispanic or Latino population. It can be seen that 73% were White, 5% Black or African American and 3% Asian. The remaining 2% comprised of the following: two or more races, some other race, American Indian and Alaskan Native and Native Hawaiian or other Pacific Islander.

Figure 6: Share of the total population in the Lehigh Valley by detailed race, 2016



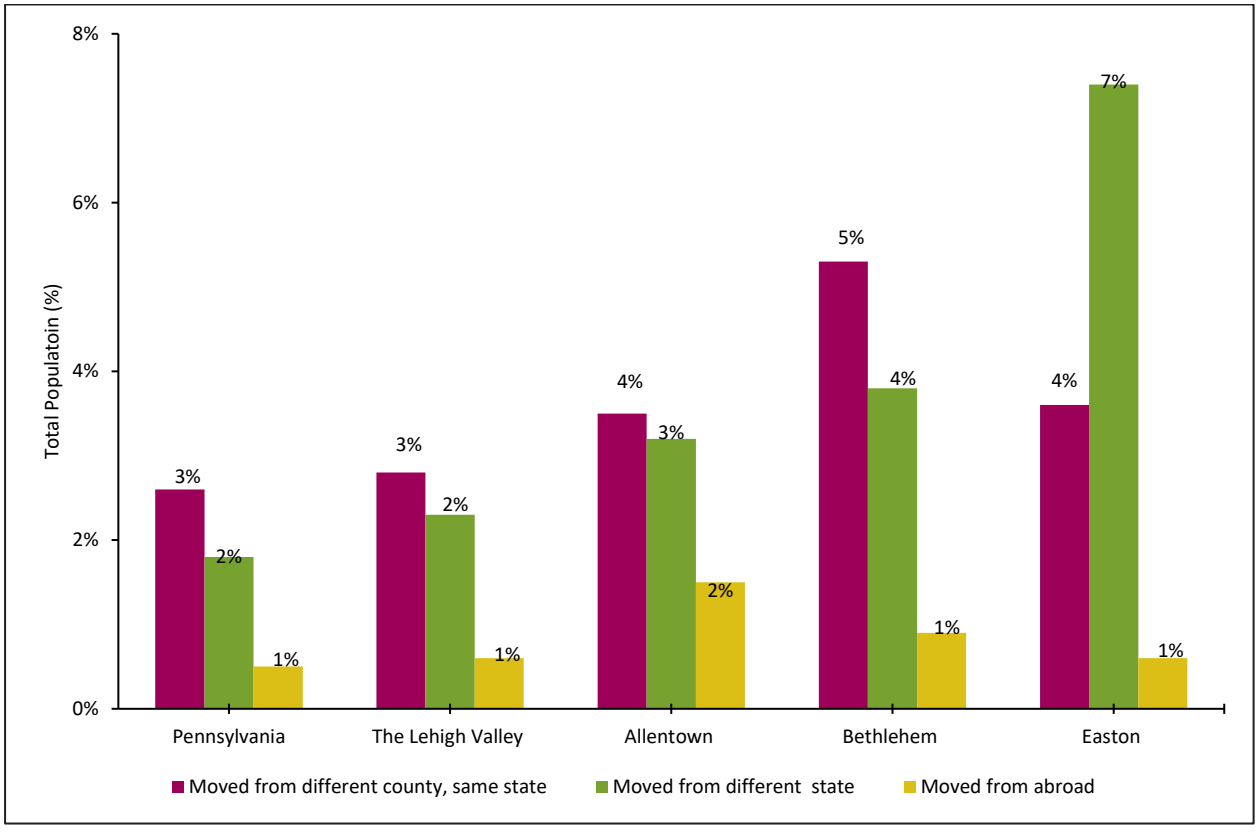
Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

3. Migration Patterns

Understanding the immigrant profile and migration patterns of an area are central to bridging the labor supply and demand gap. A per data released by The Migration Policy Institute, Pennsylvania accounts for 1.9% of the total immigrant population in the United States. Lehigh County is ranked 7th in terms of immigrant population (5%), and Northampton County occupies the 10th position with 3% of Pennsylvania's total immigrant population.

On analyzing the migration profile of the Lehigh Valley and the cities of Allentown, Bethlehem and Easton (Figure 7), it is clear that the Lehigh Valley is a destination for people to live. Whether it be relocating within the region (likely from rural to urban settings) or attracting people from outside and inside Pennsylvania, the Lehigh Valley and its main urban areas are experiencing higher rates of in-migration than the State averages. It is also interesting to note the higher rates of in-migration from those who come from abroad to Allentown relative to the other areas in the Lehigh Valley.

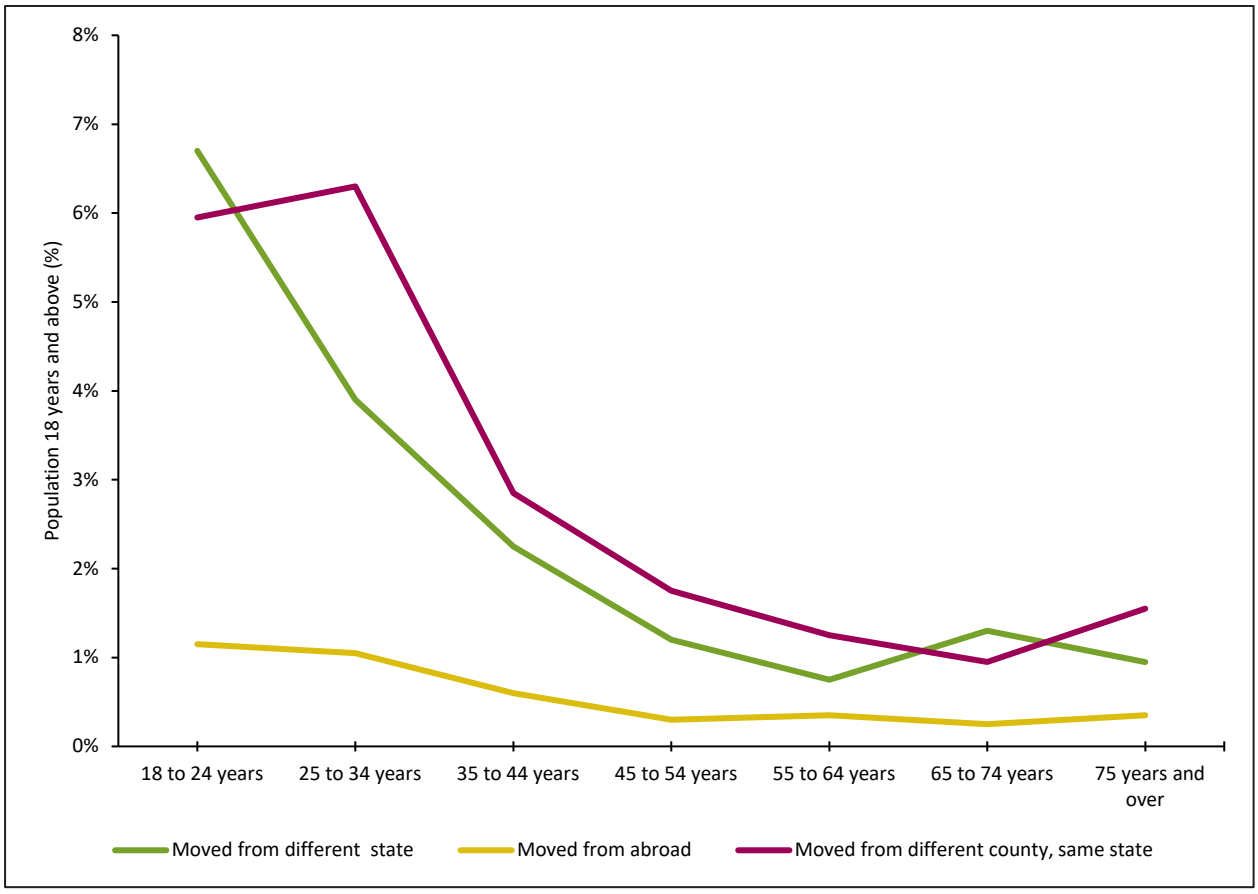
Figure 7: Migration Patterns, 2016



Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Figure 8 shows the migration patterns in the Lehigh Valley by age group. In-migration is the highest in the 18 to 24 year age group, moving from other counties in Pennsylvania, from different states and from abroad, likely related to educational offerings in the Lehigh Valley.

Figure 8: Migration Patterns for the Lehigh Valley by Age, 2016



Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

4. Household income

The median household income of the Lehigh Valley in 2016 was $60,219. This is comparatively higher than the median household income of Pennsylvania at $54,895 and the national median household income at $55,322.

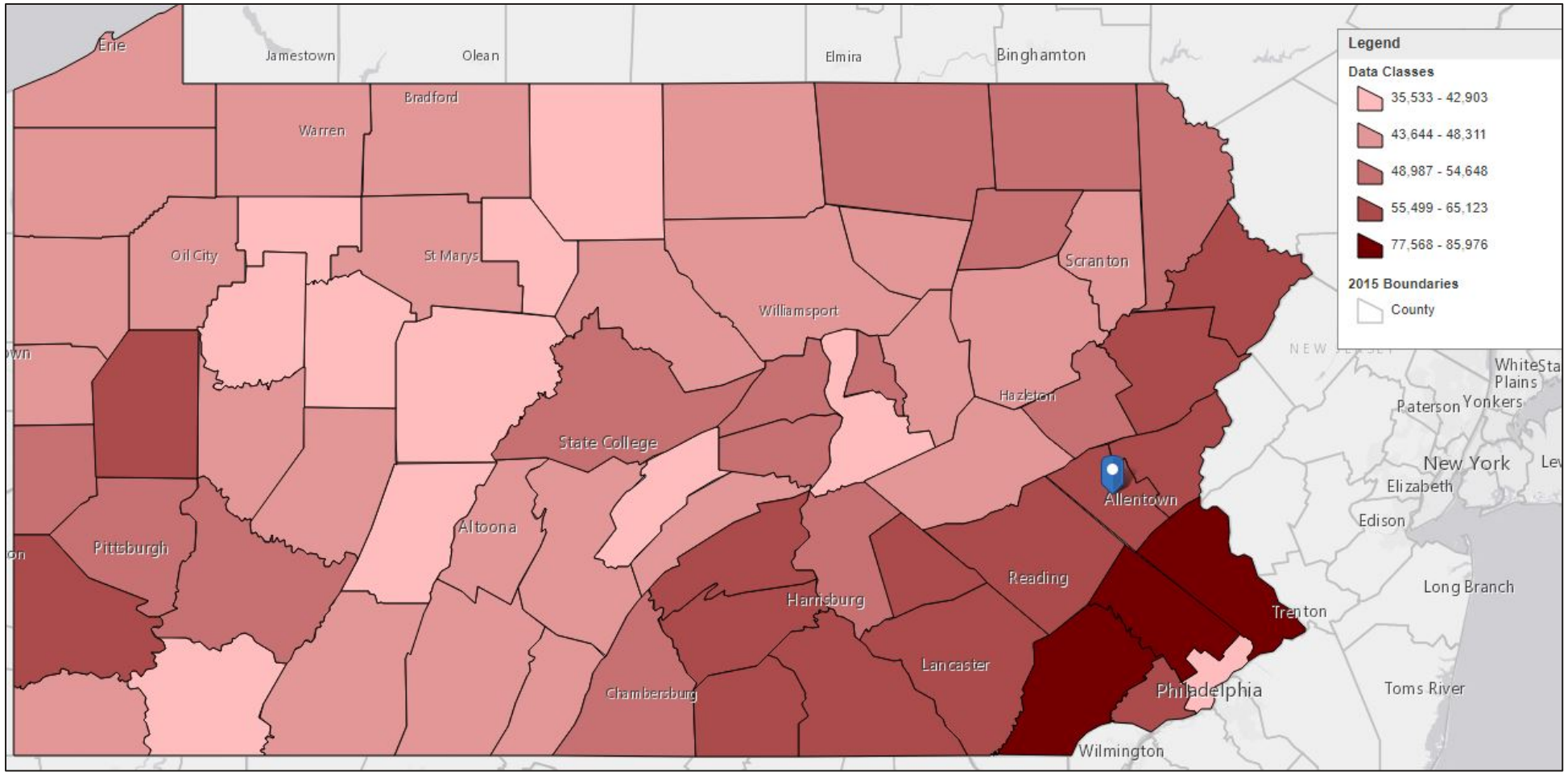
In 2016, the majority of households in the Lehigh Valley (approximately 19%) had a household median income from $50,000 to $74,999 (Figure 9). Furthermore, the proportion of households with less than $10,000 decreased from 5.4% in 2010 to 4.9% in 2016 while the proportion of the population with median household incomes of $100,000 and higher increased from 22% in 2010 to 26% in 2016.

These household income statistics are a good indicator of the wellbeing of the community. These increases in income at the higher levels suggests that households in the Lehigh Valley have a growing amount of disposable income relative to surrounding counties (as seen in Figure 10)

Figure 9: Proportion of population by Household Income (inflation-adjusted dollars) in 2010 and 2016

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Figure 10: Thematic Map of Households; Estimate; Median income (dollars) by County, 2015



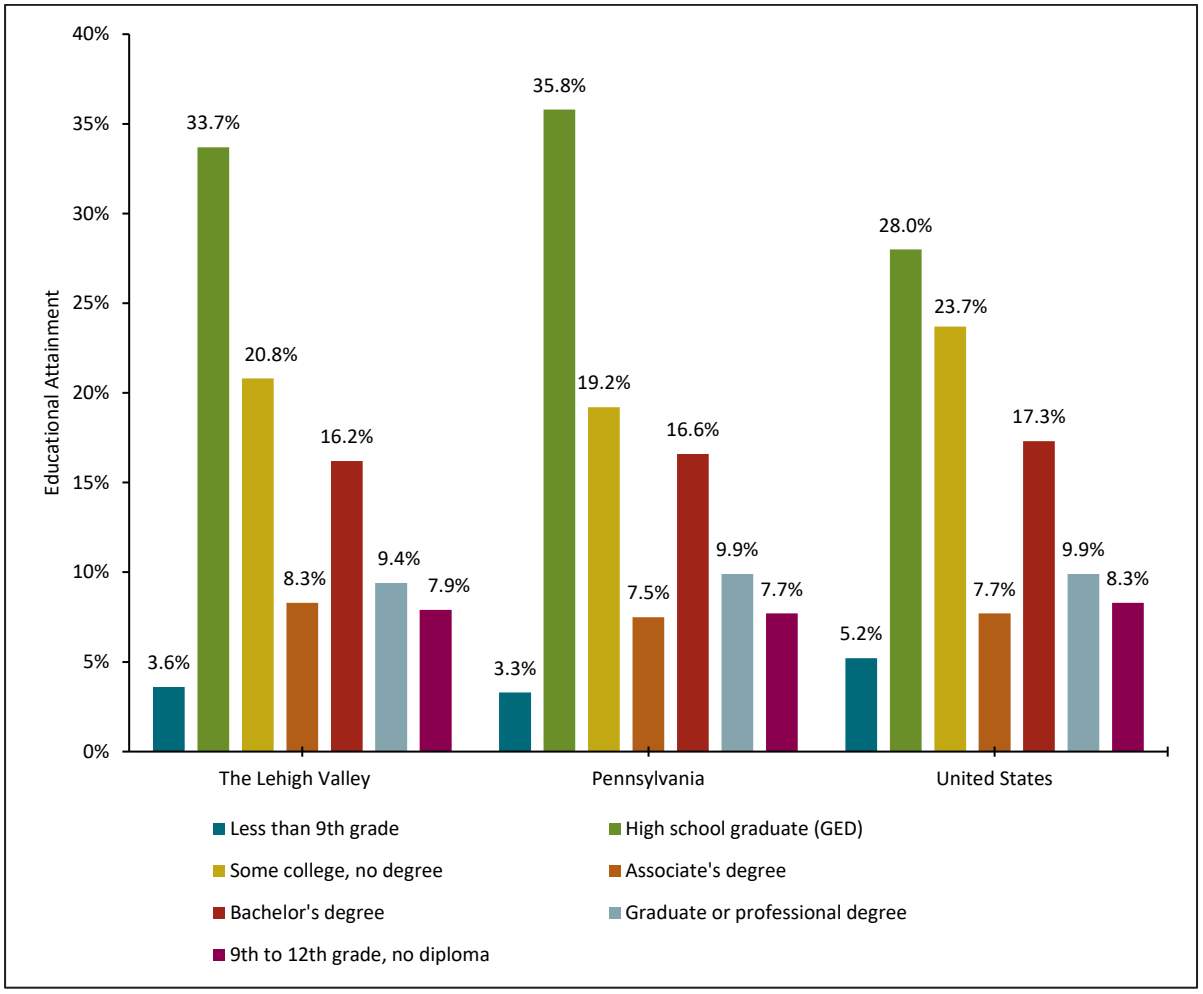
Source: U.S. Census Bureau, American Community Survey

5. Education Profile

5.1 Population by Educational Attainment

It is estimated that nearly 12% of the Lehigh Valley's population 18 and over do not have a high school diploma compared to 11% in Pennsylvania and 13% in the United States in 2016. An average of 26% of the Lehigh Valley residents hold a Bachelor's Degree or higher closely mirroring the 27% estimated for both Pennsylvania and the United States[2].

Figure 11: Lehigh Valley Educational Attainment for the Population 18 Years and Over



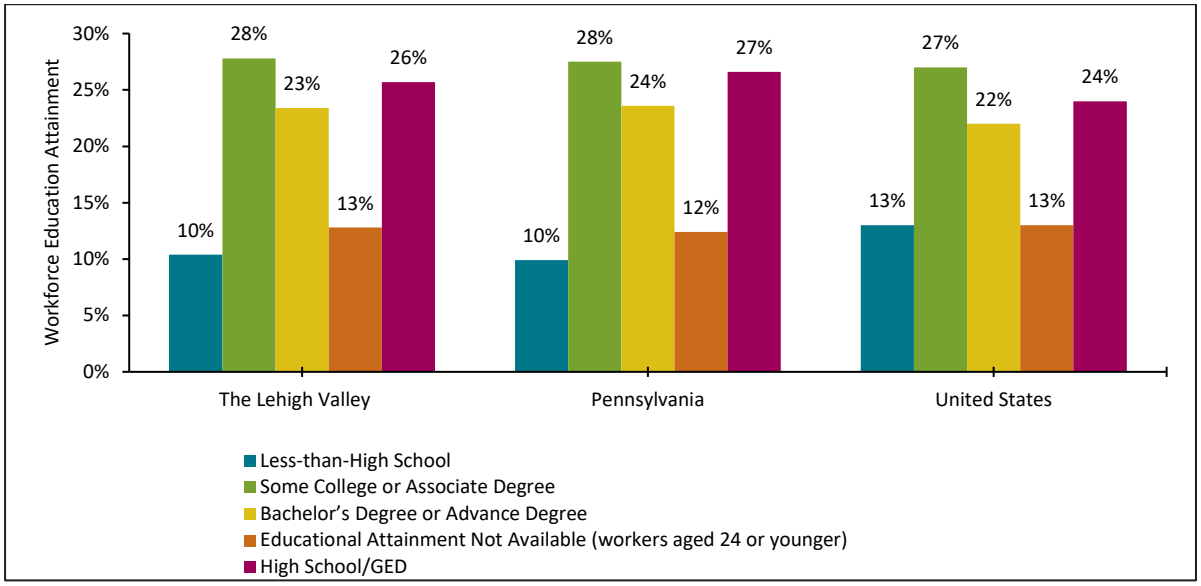
Source: Lehigh Valley Workforce Development Local Area PY2017-2019 WIOA Multi-Year Local Plan

[2] Lehigh Valley Workforce Development Local Area PY2017-2019 WIOA Multi-Year Local Plan

5.2 Population by Educational and Skill Levels

In 2016, about 10% of the Lehigh Valley's current workforce does not have a high school diploma compared to 10% in Pennsylvania and 13% in the United States. An average of 23% workers hold a Bachelor's Degree or higher closely mirroring the 24% in Pennsylvania and 22% in the United States[3].

Figure 12: Workforce by Educational Attainment



Source: Lehigh Valley Workforce Development Local Area PY2017-2019 WIOA Multi-Year Local Plan

5.3 Population by Type of Bachelor Degree

Table 3 shows a 7% (7,950 people) increase in the population 25 years and over with a Bachelor's degree from 2010 to 2016. Business and science and engineering related fields saw the largest growth of 25% and 11% respectively while science and engineering degrees saw minimal growth of 2%.

In 2016, 35% (44,817 people) had a bachelor's degree in science and engineering[4]. 20% of the population had a bachelor's degree in arts and humanities[5]. Business and education degrees were the other top bachelor degree fields accounting for 20% and 16% of the population, respectively.

[3] ibid

[4] This includes degrees in computers, mathematics and statistics, biological, agricultural, and environmental sciences, physical and related sciences, psychology, social sciences, engineering and multidisciplinary studies.

[5] This includes degrees in literature and languages, liberal arts and history, visual and performing arts and communications.

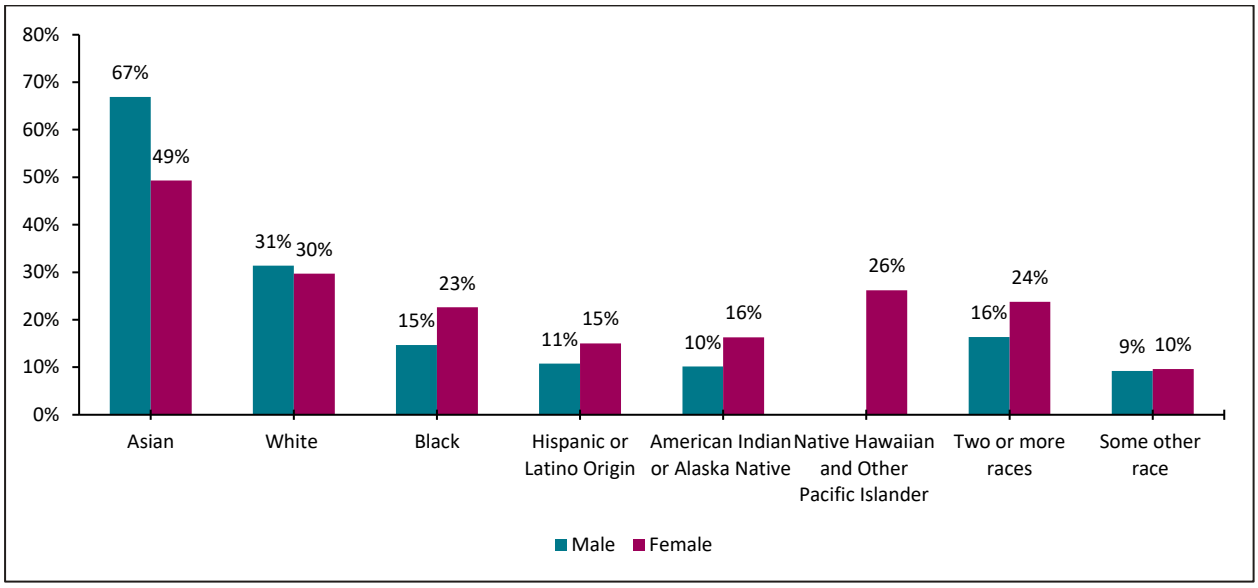
Table 3: Population 25 years and over with a Bachelor's degree or higher attainment, 2010 and 2016

Bachelor's degree or higher for population 25 years and over	Pennsylvania		The Lehigh Valley		Net change 2010-2016		% of total by field of study in the Lehigh Valley	
	2010	2016	2010	2016	PA	LV	2010	2016
Total	2,343,485	2,595,950	120,633	128,583	11%	7%		
Science and Engineering	799,674	862,159	44,016	44,817	8%	2%	36%	35%
Arts, Humanities and Others	491,242	554,337	24,541	25,245	13%	3%	20%	20%
Business	448,130	514,928	20,727	25,861	15%	25%	17%	20%
Education	377,067	398,680	20,040	20,069	6%	0%	17%	16%
Science and Engineering Related Fields	227,372	265,846	11,309	12,591	17%	11%	9%	10%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Figure 13 shows the percentage of the population with a bachelor's degree by race and sex in the Lehigh Valley in 2016. 67% of Asian males (M) have a Bachelor's degree compared to 49% Asian females (F). 31% (M) and 30% (F) of the white population, 15% (M) and 23% (F) Black or African American population and 11% (M) and 15% (F) of the Hispanic or Latino population have a bachelor's degree.

Figure 13: Share of the population with a Bachelor's Degree by Race and Sex, 2016



Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

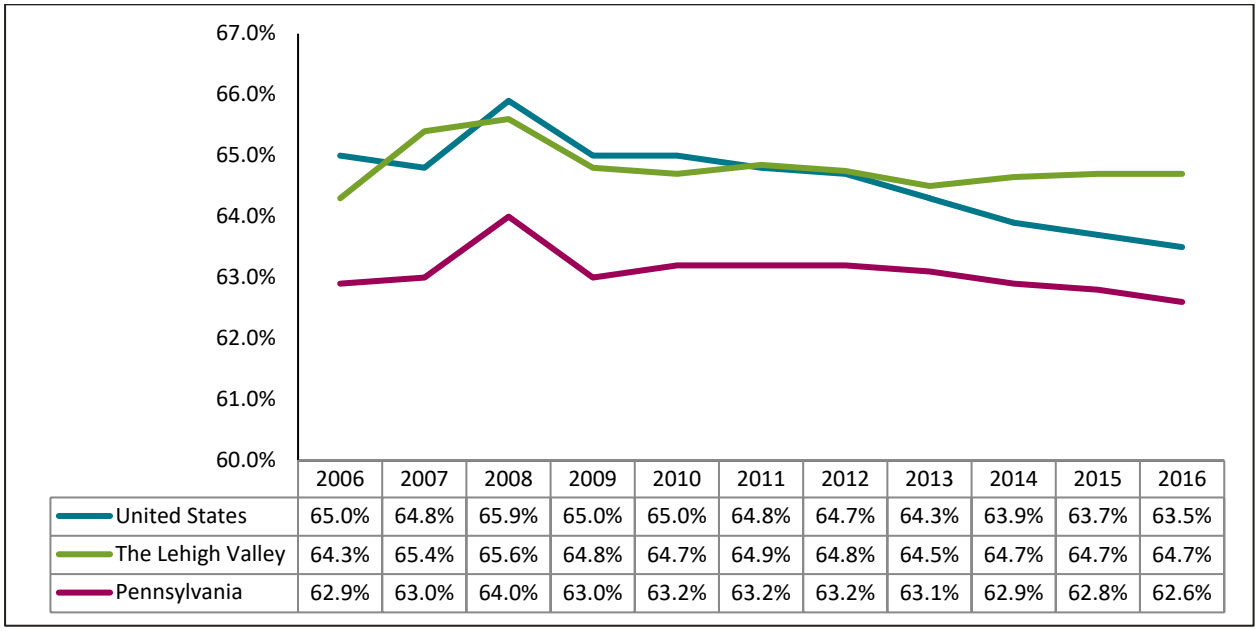
6. Labor Force Characteristics

The labor force data identifies the current state of a region's labor market by studying its participation, employment and unemployment rates compared to regional and national rates. The analysis provides information regarding education, job creation, business support and income among others.

6.1 Participation rate

The labor force participation rate is defined as the labor force as a percent of the civilian non-institutional population[6]. The labor participation rate of the Lehigh Valley is higher than the participation rate of Pennsylvania (Figure 14).

Figure 14: Labor force participation rate, 2006 to 2016



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
United States	65.0%	64.8%	65.9%	65.0%	65.0%	64.8%	64.7%	64.3%	63.9%	63.7%	63.5%
The Lehigh Valley	64.3%	65.4%	65.6%	64.8%	64.7%	64.9%	64.8%	64.5%	64.7%	64.7%	64.7%
Pennsylvania	62.9%	63.0%	64.0%	63.0%	63.2%	63.2%	63.2%	63.1%	62.9%	62.8%	62.6%

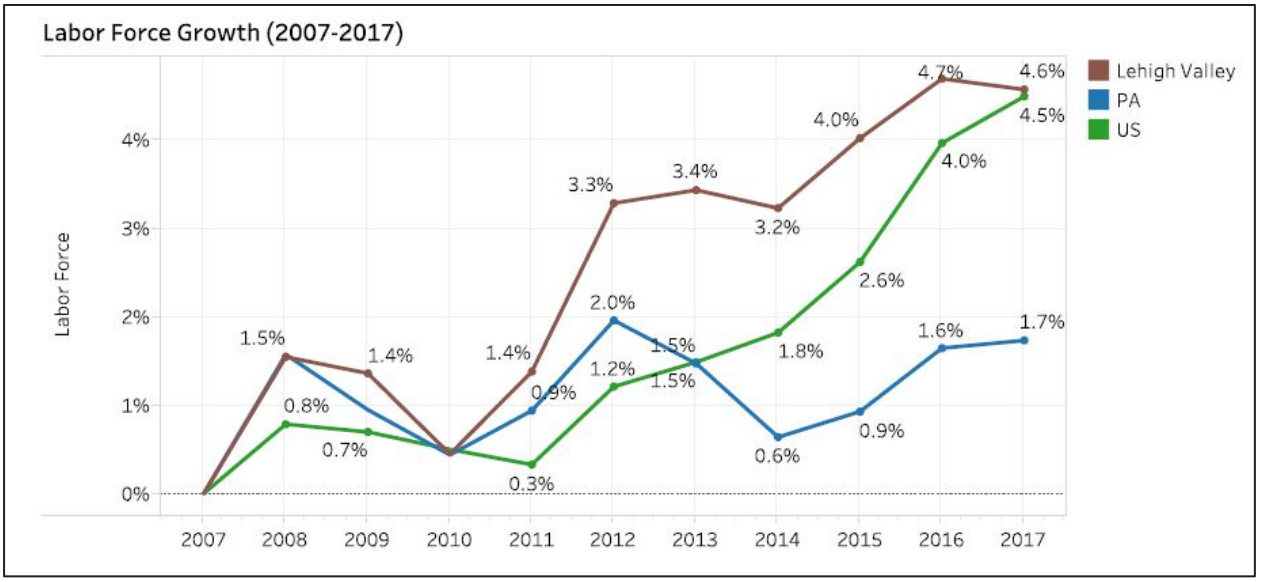
Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Long-term projections estimate that the Lehigh Valley will add 17,080 jobs (5.6%) by the year 2024. This growth is in line with the Commonwealth's 2014-2024 long-term projection forecasts of 5.7% growth[7].

[6] https://www.bls.gov/cps/lfcharacteristics.htm

[7] Lehigh Valley Workforce Development Local Area PY2017-2019 WIOA Multi-Year Local Plan

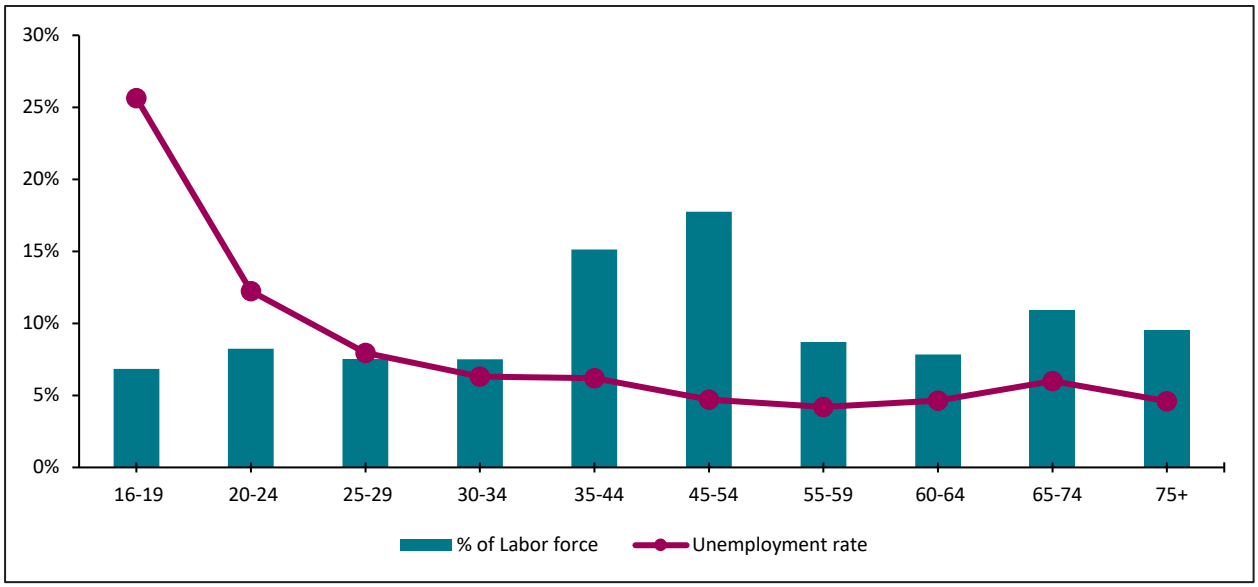
Figure 15: Historical Labor Force Growth



Source: Lehigh Valley Workforce Development Local Area PY2017-2019 WIOA Multi-Year Local Plan

Figure 16 shows the percentage of the population in the labor force by age and the corresponding unemployment rates. The age group with the highest participation in the labor force is between the 45 to 54 age group. Unemployment rates for this age group are at 5%. The senior population is also actively looking for jobs; approximately 21% of the population between 65 to 74 years are in the labor force (unemployment rate of 11%). Although less than 7% of the total population between the ages of 16-19 years of age participate in the labor force, the unemployment rates are very high at 26%. This reflects an opportunity for the Lehigh Valley to provide more opportunities for youth to participate in the labor force.

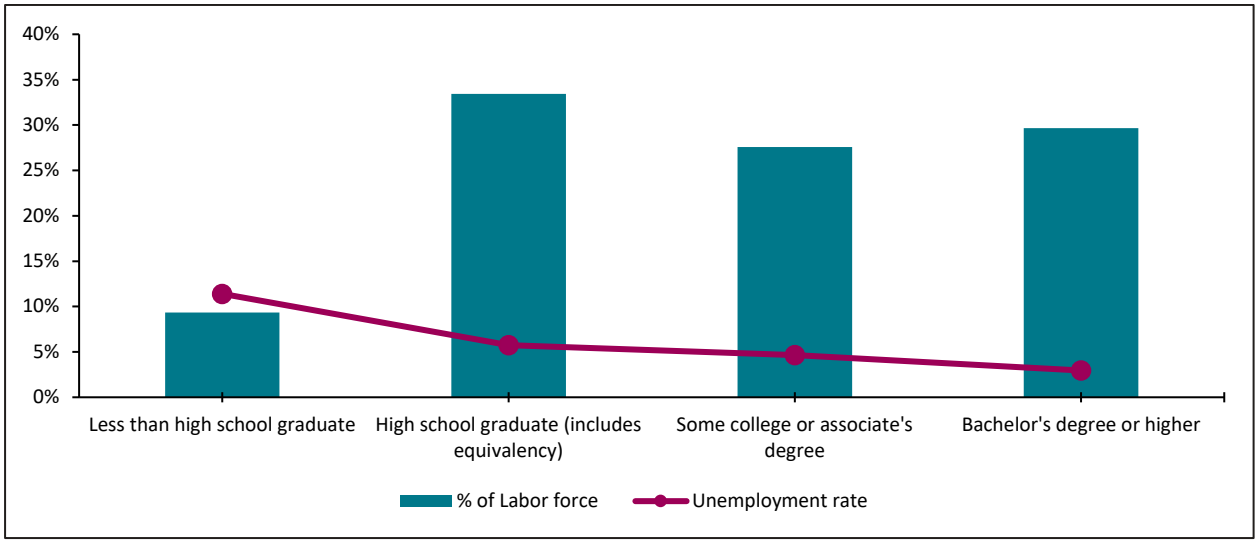
Figure 16: Percentage of labor force and Unemployment rate by age, 2016



Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

On analyzing the labor force participation and unemployment rates by education attainment in the Lehigh Valley, it was seen that 9% of the region's total talent supply has not graduated high school (Figure 17). The unemployment rates are highest for this sector of the population (11%). The majority of the population in the labor force are high school graduates (33%) while 30% of the labor force has at least a bachelor's degree (population 25 and older).

Figure 17: Percentage of labor force and Unemployment rate by educational attainment, 2016



Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

6.2 Employment by Industry

Table 4 illustrates the total employment percentage by industry for the Lehigh Valley, compared to Pennsylvania. The top employing industry sectors in the Lehigh Valley are health care and social assistance (16%), manufacturing (15%), retail trade (12%) and educational services industry (9%). The proportion of industry employment for all industries is similar to the employment percentage seen in Pennsylvania.

Table 4: Percentage of labor force by industry, 2016 (Industries within the Target Sectors Highlighted)

Industry (NAICS)	Pennsylvania		Lehigh Valley	
	2016	% of total	2016	% of total
Total	**6,043,693**	labor force	**319,644**	labor force
Health care and social assistance	997,731	16.5%	51,348	16.1%
Manufacturing	727,257	12.0%	47,524	14.9%
Retail trade	704,684	11.7%	37,756	11.8%
Educational services	566,287	9.4%	29,578	9.3%
Accommodation and food services	401,314	6.6%	20,703	6.5%
Construction	343,108	5.7%	16,399	5.1%
Professional, scientific, and technical services	377,603	6.2%	16,029	5.0%
Transportation and warehousing	257,140	4.3%	15,181	4.7%
Administrative and support and waste management services	220,843	3.7%	14,606	4.6%
Finance and insurance	301,538	5.0%	14,250	4.5%
Other services, except public administration	280,616	4.6%	13,649	4.3%
Wholesale trade	168,855	2.8%	10,599	3.3%
Public administration	245,222	4.1%	9,305	2.9%
Arts, entertainment, and recreation	111,502	1.8%	6,914	2.2%
Information	102,782	1.7%	5,757	1.8%
Real estate and rental and leasing	86,918	1.4%	4,351	1.4%
Utilities	57,511	1.0%	3,295	1.0%
Agriculture, forestry, fishing and hunting	55,377	0.9%	1,500	0.5%
Mining, quarrying, and oil and gas extraction	32,359	0.5%	472	0.1%
Management of companies and enterprises	5,046	0.1%	428	0.1%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

The employment trends by industry (Table 5) for the Lehigh Valley show that the majority of growth was in the health care and social assistance which grew by 9% (4,044 employees). The target sectors such as transportation and warehousing, professional, scientific, and technical services and educational services saw growth of 1677, 887 and 411 employees, respectively. The finance and insurance and manufacturing sectors saw a decline of 431 and 240 employees.

Table 5: Employment net change by industry for the Lehigh Valley, 2010 and 2016 (Industries within the Target Sectors Highlighted)

Industry (NAICS)	Lehigh Valley		2010-2016	
	2010	2016	Net Change	% Change
Total	**306,224**	**319,644**	**13,420**	**4%**
Health care and social assistance	47,304	51,348	4,044	9%
Manufacturing	47,764	47,524	-240	-1%
Retail trade	35,144	37,756	2,612	7%
Educational services	29,167	29,578	411	1%
Accommodation and food services	17,448	20,703	3,255	19%
Construction	17,478	16,399	-1,079	-6%
Professional, scientific, and technical services	15,142	16,029	887	6%
Transportation and warehousing	13,504	15,181	1,677	12%
Administrative and support and waste management services	13,813	14,606	793	6%
Finance and insurance	14,681	14,250	-431	-3%
Other services, except public administration	13,535	13,649	114	1%
Wholesale trade	10,522	10,599	77	1%
Public administration	7,606	9,305	1,699	22%
Arts, entertainment, and recreation	4,852	6,914	2,062	42%
Information	8,093	5,757	-2,336	-29%
Real estate and rental and leasing	4,762	4,351	-411	-9%
Utilities	3,796	3,295	-501	-13%
Agriculture, forestry, fishing and hunting	967	1,500	533	55%
Mining, quarrying, and oil and gas extraction	228	472	244	107%
Management of companies and enterprises	418	428	10	2%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Table 6 shows the Location Quotients (LQ) for employment by Industry in the Lehigh Valley. The Location Quotients provide a good representation of the local economy and specialized industries in the region. If the LQ for employment in a particular industry is 1.25 or higher, the industry is specialized with a higher employment rate compared to other industries. If the LQ is below 0.75, it shows the industry has low growth and insufficient opportunities for employment. If the LQ is between 0.75 and 1.25, it shows that the industry employs people on par with state employment. LQ of 1.0 represents perfect parity (i.e. neither lagging nor leading).

The LQ for manufacturing and wholesale trade in 2016 are 1.24 and 1.19 respectively, indicating that they are specialized in the region compared to other industries. Transportation and warehousing shows an LQ of 1.12 and educational services with an LQ of 0.99 show employment on par with Pennsylvania. Professional, scientific, and technical with an LQ of 0.8 shows that employment is low compared to employment in Pennsylvania.

Table 6: Location Quotients (LQ) by industry for the Lehigh Valley, 2010 and 2016 (Industries within the Target Sectors Highlighted)

Industry (NAICS)	LQ	
	2010	2016
Management of companies and enterprises	1.20	1.60
Administrative and support and waste management services	1.26	1.25
Manufacturing	1.20	1.24
Wholesale trade	1.11	1.19
Arts, entertainment, and recreation	0.97	1.17
Transportation and warehousing	1.01	1.12
Utilities	1.35	1.08
Information	1.29	1.06
Retail trade	0.98	1.01
Educational services	1.00	0.99
Accommodation and food services	0.93	0.98
Health care and social assistance	1.01	0.97
Real estate and rental and leasing	1.01	0.95
Other services, except public administration	0.95	0.92
Construction	0.92	0.90
Finance and insurance	0.95	0.89
Professional, scientific, and technical services	0.85	0.80
Public administration	0.60	0.72
Agriculture, forestry, fishing and hunting	0.36	0.51
Mining, quarrying, and oil and gas extraction	0.20	0.28

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

6.3 Employment by Occupation

The highest employing occupations in the Lehigh Valley are management, business, science, and arts occupations, accounting for 35% of total employment (Table 7). Employment in sales and office occupations are the second highest followed by service occupations. Employment in production, transportation, and material moving occupations are high compared to the state and the nation.

Table 7: Percentage of employed population 16 years and over, 2016, Standard Occupation Codes (SOC)

Occupations (SOC)	United States	Pennsylvania	The Lehigh Valley
Management, business, science, and arts occupations	37%	37%	35%
Sales and office occupations	24%	24%	25%
Service occupations	18%	18%	17%
Production, transportation, and material moving occupations	12%	13%	15%
Natural resources, construction, and maintenance occupations	9%	8%	8%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Table 8 shows the employment percentages in the Lehigh Valley by detailed occupations in 2016. The majority of the population in the Lehigh Valley were employed in office and administrative support occupations (14%) followed by sales and related occupations (10%), management occupations (9%), production occupations (7%) and education, training, and library occupations (6%).

Table 8: Percentage of labor force by Occupations, the Lehigh Valley, 2016

Occupations (SOC)	The Lehigh Valley 2016	% of Total Occupations
Total	**319,644**	
Office and administrative support occupations	46,171	14%
Sales and related occupations	33,176	10%
Management occupations	28,184	9%
Production occupations	22,424	7%
Education, training, and library occupations	18,772	6%
Food preparation and serving related occupations	17,396	5%
Material moving occupations	14,708	5%
Business and financial operations occupations	13,811	4%
Health diagnosing and treating practitioners and other technical occupations	13,189	4%
Construction and extraction occupations	12,718	4%
Transportation occupations	12,320	4%
Building and grounds cleaning and maintenance occupations	11,794	4%
Personal care and service occupations	11,675	4%
Installation, maintenance, and repair occupations	10,491	3%
Healthcare support occupations	9,197	3%
Computer and mathematical occupations	7,254	2%
Health technologists and technicians	6,907	2%
Architecture and engineering occupations	6,767	2%
Community and social services occupations	6,490	2%
Arts, design, entertainment, sports, and media occupations	5,015	2%
Life, physical, and social science occupations	2,832	1%
Firefighting and prevention, and other protective service workers including supervisors	2,752	1%
Law enforcement workers including supervisors	2,418	1%
Legal occupations	2,280	1%
Farming, fishing, and forestry occupations	903	0.3%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

On analyzing occupation growth and decline from 2010 to 2016, the following observations can be made.

- The largest growth in occupation number was in material moving occupations (2,811) followed by food preparation and serving related occupations (2,099). For the same time period, transportation increased by 1,263 occupations while business and financial operations increased by 868 occupations. Health technologists and technicians and healthcare support occupations grew by

1,519 and 798 occupations, respectively. Computer and mathematical occupations saw a growth of 610 occupations

- Construction and extraction occupations and installation, maintenance, and repair occupations saw the largest decline. Other key occupations including education, training, and library occupations and health diagnosing and treating practitioners and other technical occupations declined by 402 and 448 occupations, respectively

Table 9: Employment net change by Occupation for the Lehigh Valley, 2010 and 2016

Occupations (SOC)	Lehigh Valley		2010-2016	
	2010	2016	Net Change	% Change
Office and administrative support occupations	46,599	46,171	-428	-1%
Sales and related occupations	33,274	33,176	-98	0%
Management occupations	27,145	28,184	1,039	4%
Production occupations	21,733	22,424	691	3%
Education, training, and library occupations	19,174	18,772	-402	-2%
Food preparation and serving related occupations	15,297	17,396	2,099	14%
Material moving occupations	11,897	14,708	2,811	24%
Business and financial operations occupations	12,943	13,811	868	7%
Health diagnosing and treating practitioners and other technical occupations	13,637	13,189	-448	-3%
Construction and extraction occupations	14,028	12,718	-1,310	-9%
Transportation occupations	11,057	12,320	1,263	11%
Building and grounds cleaning and maintenance occupations	10,999	11,794	795	7%
Personal care and service occupations	8,415	11,675	3,260	39%
Installation, maintenance, and repair occupations	11,670	10,491	-1,179	-10%
Healthcare support occupations	8,399	9,197	798	10%
Computer and mathematical occupations	6,644	7,254	610	9%
Health technologists and technicians	5,388	6,907	1,519	28%
Architecture and engineering occupations	7,048	6,767	-281	-4%
Community and social services occupations	5,740	6,490	750	13%
Arts, design, entertainment, sports, and media occupations	4,928	5,015	87	2%
Life, physical, and social science occupations	2,885	2,832	-53	-2%
Firefighting and prevention, and other protective service workers including supervisors	2,651	2,752	101	4%
Law enforcement workers including supervisors	2,136	2,418	282	13%
Legal occupations	2,008	2,280	272	14%
Farming, fishing, and forestry occupations	529	903	374	71%

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

6.4 Wages by Occupation

The mean hourly wage and annual median wage by occupations in the MSA is presented in Table 10. The annual median wage for all occupations in the MSA is $35,650. Management occupations have the highest median wage of $102,710. The lowest median wage is for the food preparation and serving related occupations ($19,920) in the MSA.

Table 10: Wages by Occupation in Allentown-Bethlehem-Easton MSA, 2016

Occupations	Total employment	Mean hourly wage	Annual median wage
All Occupations	354,700	$ 22.40	$ 35,650
Management Occupations	12,820	$ 56.76	$ 102,710
Business and Financial Operations Occupations	13090	$ 33.56	$ 62,730
Computer and Mathematical Occupations	6,850	$ 38.79	$ 73,820
Architecture and Engineering Occupations	6,370	$ 40.01	$ 76,170
Life, Physical, and Social Science Occupations	1,840	$ 36.29	$ 63,620
Community and Social Service Occupations	5,710	$ 21.13	$ 39,430
Legal Occupations	1,460	$ 46.24	$ 65,600
Education, Training, and Library Occupations	21,150	$ 27.80	$ 53,800
Arts, Design, Entertainment, Sports, and Media Occupations	3,310	$ 21.23	$ 39,180
Healthcare Practitioners and Technical Occupations	26,760	$ 39.66	$ 64,760
Healthcare Support Occupations	12,260	$ 14.75	$ 29,370
Protective Service Occupations	6,840	$ 20.13	$ 32,460
Food Preparation and Serving Related Occupations	31,020	$ 10.93	$ 19,920
Building and Grounds Cleaning and Maintenance Occupations	11,000	$ 13.58	$ 25,350
Personal Care and Service Occupations	14,650	$ 12.17	$ 22,390
Sales and Related Occupations	34,050	$ 18.65	$ 26,100
Office and Administrative Support Occupations	57,750	$ 17.16	$ 32,950
Farming, Fishing, and Forestry Occupations	280	$ 14.58	$ 25,360
Construction and Extraction Occupations	11,450	$ 23.93	$ 44,800
Installation, Maintenance, and Repair Occupations	13,900	$ 22.01	$ 43,700
Production Occupations	26,730	$ 18.64	$ 35,920
Transportation and Material Moving Occupations	35,410	$ 16.61	$ 31,420

Source: Occupational Employment Statistics Data

Note: Data is only available for the MSA region and not the County level

7. Business Patterns Assessment

The County Business Patterns data provides information on the number of establishments and establishment size by a number of employees (Table 11Table 11). There were a total of 14,711 business establishments in the Lehigh Valley in 2015. There are 14 businesses employing more than 1,000 people in the region of which 4 businesses are in health care and social assistance followed by 3 businesses in manufacturing and 2 businesses in educational services. Approximately 50.6% of business establishments are small, employing 1 to 4 employees. Key observations include:

- The majority of business establishments are in retail trade industry (14.5%) followed by health care and social assistance with 12.8% and other services (except public administration) accounting for 11.8% of all business establishments.
- 32.7% of businesses in manufacturing employ between 1 to 4 employees while 18.4% employ between 20 to 49 employees.
- 70% of business in professional, scientific, and management, and administrative and waste management services employ between 1 to 4 employees.
- 73% of businesses in transportation and warehousing and utilities employ between 1 to 19 employees.

Table 11: Business Patterns Data, Business Establishments by Employee Type, the Lehigh Valley, 2015

Industry (NAICS)	All establishments	Number of Employees								
		1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000 +
Total for all sectors	14,711	7,446	2,818	2,040	1,479	497	311	69	37	14
11 Agriculture, forestry, fishing and hunting	5	5	0	0	0	0	0	0	0	0
21 Mining, quarrying, and oil and gas extraction	11	7	1	2	1	0	0	0	0	0
22 Utilities	40	9	6	7	6	5	4	2	1	0
23 Construction	1,234	821	203	115	61	23	9	2	0	0
31-33 Manufacturing	686	224	109	99	126	65	42	13	5	3
42 Wholesale trade	781	370	142	120	93	28	14	7	6	1
44-45 Retail trade	2,129	868	500	406	214	69	63	7	2	0
48-49 Transportation and warehousing	449	221	54	55	59	27	26	5	1	1
51 Information	239	114	41	34	35	7	5	3	0	0
52 Finance and insurance	819	408	231	110	45	6	13	4	1	1
53 Real estate and rental and leasing	500	333	105	38	21	2	1	0	0	0
54 Professional, scientific, and technical services	1,354	930	170	141	80	21	9	3	0	0
55 Management of companies and enterprises	135	60	22	9	20	4	13	2	4	1
56 Administrative and support and waste management and remediation services	842	512	112	83	56	33	33	7	6	0
61 Educational services	195	87	35	18	34	12	3	1	3	2
62 Health care and social assistance	1,889	716	443	345	226	90	47	11	7	4
71 Arts, entertainment, and recreation	222	117	26	34	27	13	4	0	1	0
72 Accommodation and food services	1,426	576	220	243	295	72	17	2	0	1
81 Other services (except public administration)	1,732	1,047	397	180	80	20	8	0	0	0
99 Industries not classified	23	21	1	1	0	0	0	0	0	0

Source: U.S. Census Bureau, 2015 County Business Patterns

8. Employment Characteristics

8.1 Job Flows

The employment characteristics of industries in the Lehigh Valley in terms of job flows and earnings are presented in Table 12.

The employment characteristics of selected industries show that:

- The number of workers who started a new job (new hires) has increased from 2006 to 2016 by 9%.
- The number of workers who returned to the same employer where they had worked within the previous year (hire recalls) has decreased by 298 jobs in 2016 compared to rates in 2010.
- Transportation and warehousing in the Lehigh Valley increased its new hires from 2,380 in 2010 to 5,478 in 2016.
- In 2016, 654 jobs were gained in manufacturing in Lehigh County in 2016 whereas 587 jobs were lost resulting in a net change of 67 jobs.
- Accommodation and food services and retail trade saw a decrease of 440 and 242 jobs respectively in 2016 (job gain – job losses).

Table 12: Employment Characteristics by Industries, 3rd Quarter, the Lehigh Valley, 2006-2016

Industry (NAICS)	Full-Quarter Employment		New Hires		Hires Recalls		Firm Job Gains		Firm Job Loss		Net Job Change	
	2006	2016	2006	2016	2006	2016	2006	2016	2006	2016	2006	2016
All Industries	245361	265315	47951	52291	7198	6900	11097	12313	8408	9206	2690	3107
11 Agriculture, forestry, fishing and hunting	343	495	99	211	40	141	110	93	14	13	96	79
21 Mining, quarrying, and oil and gas extraction	514	241	23	15	3	0	10	13	1	2	8	12
22 Utilities	1179	1256	28	41	8	12	143	10	13	43	129	-33
23 Construction	11975	9951	2439	2139	485	363	952	917	485	433	467	484
31-33 Manufacturing	30262	28469	2838	2230	289	236	1123	654	721	587	402	67
42 Wholesale trade	11932	12505	1297	1186	168	96	756	430	339	282	417	148
44-45 Retail trade	28381	28962	6942	6186	726	1018	1156	776	1024	1017	132	-242
48-49 Transportation and warehousing	11833	20847	2380	5478	257	402	434	1238	390	431	44	807
51 Information	5692	4056	533	296	111	30	87	129	125	229	-38	-99
52 Finance and insurance	12706	9232	966	665	97	32	275	275	283	305	-9	-29
53 Real estate and rental and leasing	2113	2443	389	302	53	25	120	145	129	118	-9	28
54 Professional, scientific, and technical services	10061	11308	1282	972	229	164	613	738	350	433	264	305
55 Management of companies and enterprises	9879	9005	421	458	51	122	93	135	155	110	-62	25
56 Administrative and support and waste management and remediation services	13576	17748	11003	13007	1653	1388	898	1181	519	1116	379	66
61 Educational services	18448	18951	2480	2078	802	698	69	389	507	444	-439	-54
62 Health care and social assistance	40230	50412	4936	6305	669	536	865	1907	1320	1733	-455	174
71 Arts, entertainment, and recreation	4143	4881	1065	1516	374	652	1773	1770	116	131	1657	1638
72 Accommodation and food services	15259	19742	6618	7513	657	587	827	932	1356	1372	-529	-440
81 Other services (except public administration)	8182	7934	1572	1256	287	244	476	349	437	375	39	-25
99 Industries not classified	8652	6876	643	435	237	150	201	183	121	34	80	149

Source: Longitudinal Employer-Household Dynamics LED Extraction Tool, Quarterly Workforce Indicators

8.2 Commuting Patterns

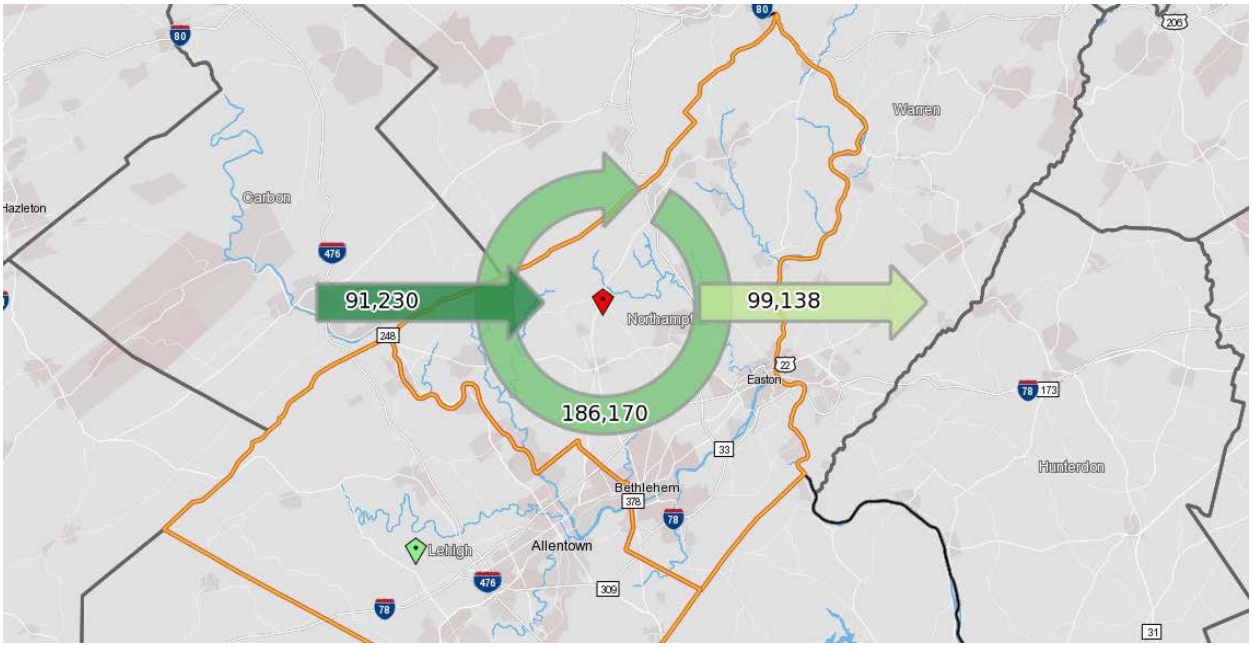
The Commuter flow patterns are presented below for the counties by studying two factors, namely, where do residents in the counties 'commute to' for work? And where do people who work in the counties 'commute from'?

The Inflow-Outflow Job Counts (Primary Jobs), the Lehigh Valley, 2015 data shows that:

- 91,320 people employed in the Lehigh Valley, live outside the region
- 99,138 residents of the Lehigh Valley commute outside the area to work
- 186,170 people live and work in the Lehigh Valley

The data shows that although the Lehigh Valley attracts 91,320 people from outside the region to work, while approximately 99,138 residents travel outside to work. Thus, taking into account the employment attraction, the Lehigh Valley is still losing approximately 7,818 residents to other communities for work.

Figure 18: Inflow Outflow Job Counts (Primary Jobs), the Lehigh Valley, 2015



Source: U.S. Census Bureau, Center for Economic Studies

Where do people who work in the Lehigh Valley 'live' or 'commute from'?

Commuter flows for people who work in the Lehigh Valley is shown in Table 13. The region attracts 4% of its workforce from Berks County, 4% from Bucks County, 3% from Montgomery County and 3% from Monroe County.

Table 13: Jobs Counts for people who work in the Lehigh Valley, 2015

Region	Count	Share
Lehigh County, PA	104,195	38%
Northampton County, PA	81,975	30%
Berks County, PA	11,887	4%
Bucks County, PA	10,382	4%
Montgomery County, PA	7,550	3%
Monroe County, PA	7,547	3%
Carbon County, PA	7,276	3%
Philadelphia County, PA	4,419	2%
Luzerne County, PA	3,767	1%
Schuylkill County, PA	3,608	1%
All Other Locations	34,794	13%

Source: U.S. Census Bureau, Center for Economic Studies

All Other Locations include Warren County, NJ, Chester County, PA, Lancaster County, PA, Delaware County, PA and Lackawanna County, PA

Where do residents in the counties 'commute to' for work?

Commuter flows for the Lehigh Valley residents by place of work is shown in Table 14. Approximately 5% of the Lehigh Valley residents travel to Montgomery County to work followed by 3% in Bucks County. 2% of the population travel to Warren County in New Jersey to work.

Table 14: Jobs Counts for the Lehigh Valley residents by place of work, 2015

Region	Count	Share
Lehigh County, PA	115,856	41%
Northampton County, PA	70,314	25%
Montgomery County, PA	13,622	5%
Bucks County, PA	9,709	3%
Berks County, PA	6,987	2%
Philadelphia County, PA	6,637	2%
Warren County, NJ	5,175	2%
Monroe County, PA	4,282	2%
Chester County, PA	3,801	1%
Luzerne County, PA	3,362	1%
All Other Locations	45,563	16%

Source: U.S. Census Bureau, Center for Economic Studies

All Other Locations include Somerset County, NJ, Dauphin County, PA and Lancaster County, PA

9. Sector Focus

This project centers on supporting industries in the attraction of talent. To validate the industry selection, a combination of qualitative and quantitative research was carried out on the five identified target sectors.

- Advanced Manufacturing and Food and Beverage Manufacturing
- High Value Business Services
- Transportation, Logistics, Warehousing and Wholesale
- Health Care Services
- Life Science Research and Manufacturing

Talent supply and demand are seen as two elements that make up the labor market equation. However, experience has clearly demonstrated that it is not as simple as looking at the numbers in isolation, rather it is necessary to keep several key points top of mind when considering talent supply and demand and its alignment to fill vacancies.

Data Availability

The Lehigh Valley data consists of the combined data for Lehigh County and Northampton County. The data was sourced from the U.S. Census Bureau, specifically the 2015 County Business Patterns series, which includes the number of establishments, employment, first quarter payroll, and annual payroll for each county. The data was analyzed using the North American Industry Classification System (NAICS) at the industry group level (4-digit codes). The Occupation data from the Bureau of Labor Statistics is provided at the Allentown-Bethlehem-Easton, PA-NJ MSA which is a metropolitan region officially consisting of Carbon, Lehigh and Northampton counties in eastern Pennsylvania and Warren County in New Jersey.

9.1 Advanced Manufacturing and Food and Beverage Manufacturing

9.1.1 National and State Context

The National Science and Technology Council promotes the major role of manufacturing in the United States economy with the greatest economic multiplier of any other sector and creating four additional jobs for every one job in manufacturing.[8]

The impact of manufacturing is expected to grow with the development of new technology and processes. This development will require a large number of highly skilled workers with a projected 3.5 million new manufacturing jobs to be created in the next decade although 2 million of these positions

[8] NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, 2016 https://www.whitehouse.gov/sites/whitehouse.gov/files/images/Blog/NSTC%20SAM%20technology%20areas%20snapshot.pdf

may remain unfilled due to a skills gap. 80 percent of manufacturers currently report a moderate or serious shortage of qualified applicants for skilled and highly-skilled production positions[9].

9.1.2 Top Employers by Number of Employees

According to the Pennsylvania Center for Workforce Information and Analysis the top employers in the Advanced Manufacturing and Food and Beverage Manufacturing sector are:

Business	County
Air Products and Chemicals Inc	Lehigh
Mack Trucks Inc	Lehigh
Crayola LLC	Northampton
Lutron Electronics Co Inc	Lehigh
Victaulic Company	Northampton
Nestle Waters North America Inc	Lehigh
Olympus Corporation of the Americas	Lehigh
Follett LLC	Northampton
Dixie Consumer Products LLC	Northampton

Source: Center for Workforce Information & Analysis: Top 50 Employers Lehigh County, Top 50 Employers Northampton County

9.1.3 Business Establishments in the Advanced Manufacturing and Food and Beverage Manufacturing

The United States Census Bureau's latest 2015 County Business Patterns data recorded 131,250 Advanced Manufacturing and Food and Beverage Manufacturing Sector by the Lehigh Valley definition. Pennsylvania has 5,744 or 4% of these businesses. The Lehigh Valley has 317 or 5.5% of the state total.

Table 15 indicates the distribution of the business establishments by industry classification at the national, state and the Lehigh Valley levels. The Lehigh Valley is fairly consistent with the state and nation in terms of distribution of establishments being flatly distributed in each sub-sector. The top three subsectors by establishments nationally and in the Lehigh Valley are: Medical equipment and supplies manufacturing, other miscellaneous manufacturing, bakeries and tortilla manufacturing with the Lehigh Valley also showing strength in beverage manufacturing relative to the national level. Other miscellaneous manufacturing reflects the presence of major employers in toy manufacturing (Crayola) and musical manufacturing (Martin Guitar).

[9] NATIONAL SCIENCE AND TECHNOLOGY COUNCIL, 2016 https://www.whitehouse.gov/sites/whitehouse.gov/files/images/Blog/NSTC%20SAM%20technology%20areas%20snapshot.pdf

Table 15: Business Establishments in Advanced Manufacturing and Food and Beverage Manufacturing, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	Advanced Manufacturing and Food and Beverage Manufacturing	United States	Pennsylvania	The Lehigh Valley
3111	Animal food manufacturing	1774	101	4
3112	Grain and oilseed milling	858	25	2
3113	Sugar and confectionery product manufacturing	1935	147	5
3114	Fruit and vegetable preserving and specialty food manufacturing	1835	64	*
3115	Dairy product manufacturing	1720	85	3
3116	Animal slaughtering and processing	3593	140	2
3117	Seafood product preparation and packaging	618	4	*
3118	Bakeries and tortilla manufacturing	10797	503	25
3119	Other food manufacturing	3689	150	8
3121	Beverage manufacturing	7842	270	22
3251	Basic chemical manufacturing	2415	102	11
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	1414	61	8
3253	Pesticide, fertilizer, and other agricultural chemical manufacturing	928	35	*
3259	Other chemical product and preparation manufacturing	2267	121	9
3271	Clay product and refractory manufacturing	1145	76	5
3279	Other non-metallic mineral product manufacturing	3099	164	16
3311	Iron and steel mills and ferroalloy manufacturing	603	62	1
3313	Alumina and aluminum production and processing	529	19	2
3315	Foundries	1770	129	6
3322	Cutlery and hand tool manufacturing	1194	64	2
3329	Other fabricated metal product manufacturing	6612	394	23
3331	Agriculture, construction, and mining machinery manufacturing	3094	117	2
3332	Industrial machinery manufacturing	3262	155	16
3333	Commercial and service industry machinery manufacturing	2014	86	4
3336	Engine, turbine, and power transmission equipment manufacturing	1073	41	5
3339	Other general purpose machinery manufacturing	6048	309	12
3341	Computer and peripheral equipment manufacturing	1091	38	4
3342	Communications equipment manufacturing	1369	47	4
3343	Audio and video equipment manufacturing	486	8	*
3344	Semiconductor and other electronic component manufacturing	3979	192	13
3346	Manufacturing and reproducing magnetic and optical media	521	16	*
3351	Electric lighting equipment manufacturing	1104	52	1
3352	Household appliance manufacturing	303	8	*
3353	Electrical equipment manufacturing	2124	115	7
3359	Other electrical equipment and component manufacturing	2140	107	4

2012 NAICS code	Advanced Manufacturing and Food and Beverage Manufacturing	United States	Pennsylvania	The Lehigh Valley
3361	Motor vehicle manufacturing	340	6	2
3362	Motor vehicle body and trailer manufacturing	1917	97	*
3363	Motor vehicle parts manufacturing	5088	133	8
3364	Aerospace product and parts manufacturing	1811	38	2
3365	Railroad rolling stock manufacturing	243	38	*
3366	Ship and boat building	1541	10	*
3369	Other transportation equipment manufacturing	940	35	2
3399	Other miscellaneous manufacturing	15847	628	35

Source: United States Census Bureau County Business Patterns 2015 (* Denotes unavailable data)

9.1.4 Employees in the Advanced Manufacturing and Food and Beverage Manufacturing

The United States Census Bureau's latest 2015 County Business Patterns data recorded 6,923,770 Advanced Manufacturing and Food and Beverage Manufacturing Sector employees. Pennsylvania has 296,619 or 4% of these employees. The Lehigh Valley has 10,174 or 3.4% of the state total – however it should be noted that some data at the county level is unavailable, making the figure for the Lehigh Valley lower than it is in actuality. The Lehigh Valley has significantly higher proportions of employees in the following subsectors combining to 54% of the employees in the sector:

- Beverage manufacturing (24%) 22% higher than the national rate
- Other fabricated metal product manufacturing (16%) 12% higher than the national rate
- Other miscellaneous manufacturing (14%) 10% higher than the national rate

These trends are consistent at the state level highlighting the key role these subsectors have in the Lehigh Valley compared to the state and nation. Table 16 indicates the distribution of employees by industry classification.

Table 16: Employees in Advanced Manufacturing and Food and Beverage Manufacturing, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	Advanced Manufacturing and Food and Beverage Manufacturing	United States	Pennsylvania	The Lehigh Valley
3111	Animal food manufacturing	55178	3266	*
3112	Grain and oilseed milling	57831	1182	*
3113	Sugar and confectionery product manufacturing	75986	9121	*
3114	Fruit and vegetable preserving and specialty food manufacturing	157408	5951	*
3115	Dairy product manufacturing	141246	6869	*
3116	Animal slaughtering and processing	485885	15740	*
3117	Seafood product preparation and packaging	30708	36	*
3118	Bakeries and tortilla manufacturing	290839	15010	262
3119	Other food manufacturing	190575	10593	731
3121	Beverage manufacturing	170628	7991	2427
3251	Basic chemical manufacturing	160234	4631	346
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	93499	3242	301
3253	Pesticide, fertilizer, and other agricultural chemical manufacturing	28849	603	*
3259	Other chemical product and preparation manufacturing	79414	3342	269
3271	Clay product and refractory manufacturing	33632	3000	*
3279	Other non-metallic mineral product manufacturing	74917	3335	304
3311	Iron and steel mills and ferroalloy manufacturing	103853	17145	*
3313	Alumina and aluminum production and processing	58785	3115	*
3315	Foundries	126512	8086	321
3322	Cutlery and hand tool manufacturing	37025	2462	*
3329	Other fabricated metal product manufacturing	270382	12270	1598
3331	Agriculture, construction, and mining machinery manufacturing	216228	7711	*
3332	Industrial machinery manufacturing	105368	5346	300
3333	Commercial and service industry machinery manufacturing	77229	3590	*
3336	Engine, turbine, and power transmission equipment manufacturing	103629	2700	161
3339	Other general purpose machinery manufacturing	298903	15093	447
3341	Computer and peripheral equipment manufacturing	42245	1258	*
3342	Communications equipment manufacturing	92978	3951	*
3343	Audio and video equipment manufacturing	9265	124	378
3344	Semiconductor and other electronic component manufacturing	258620	8888	*
3346	Manufacturing and reproducing magnetic and optical media	9631	392	*
3351	Electric lighting equipment manufacturing	43036	2908	*
3352	Household appliance manufacturing	47536	715	*
3353	Electrical equipment manufacturing	120584	4924	31
3359	Other electrical equipment and component manufacturing	133579	15587	*
3361	Motor vehicle manufacturing	187311	*	*

2012 NAICS code	Advanced Manufacturing and Food and Beverage Manufacturing	United States	Pennsylvania	The Lehigh Valley
3362	Motor vehicle body and trailer manufacturing	136864	6248	110
3363	Motor vehicle parts manufacturing	541462	8809	*
3364	Aerospace product and parts manufacturing	404321	7434	*
3365	Railroad rolling stock manufacturing	32745	6448	*
3366	Ship and boat building	143287	1404	*
3369	Other transportation equipment manufacturing	31621	3203	*
3399	Other miscellaneous manufacturing	260737	10774	1473

Source: United States Census Bureau County Business Patterns 2015 (* Denotes unavailable data)

Note: Due to unavailability of data, numbers are incomplete for other food manufacturing; resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing; pharmaceutical and medicine manufacturing; foundries; engine, turbine, and power transmission equipment manufacturing; electrical equipment manufacturing; motor vehicle parts manufacturing; and medical equipment and supplies manufacturing.

9.1.5 Annual Payroll in the Advanced Manufacturing and Food and Beverage Manufacturing

The United States Census Bureau's latest 2015 County Business Patterns data recorded an annual payroll of $424,454,913 ($1,000) in the Advanced Manufacturing and Food and Beverage Manufacturing Sector. Pennsylvania has $17,965,465 or 4% of this annual payroll. The Lehigh Valley employees take in $ 638,470 or 3.6% of the state total – however it should be noted that some data at the county level is unavailable, making the figure for the Lehigh Valley lower than it is in actuality.

The Lehigh Valley has significantly higher payroll distributions compared to the state and nation within the flowing sub-sectors which combine to 63% of the industry payroll:

- Beverage manufacturing (24%) - 22% higher than the national rate
- Other miscellaneous manufacturing (14%) - 11% higher than the national rate
- Other fabricated metal product manufacturing (14%) - 10% higher than the national rate
- Other food product manufacturing (11%) - 9% higher than the national rate

These trends are consistent at the state level highlighting the key role these subsectors have in the Lehigh Valley compared to the state and nation. Table 17 indicates the distribution of annual payroll by industry classification.

Table 17: Annual Payroll in Advanced Manufacturing and Food and Beverage Manufacturing, United States, Pennsylvania and the Lehigh Valley ($1,000s)

2012 NAICS code	Advanced Manufacturing and Food and Beverage Manufacturing	United States	Pennsylvania	The Lehigh Valley
3111	Animal food manufacturing	$1,774	$101	*
3112	Grain and oilseed milling	$858	$25	*
3113	Sugar and confectionery product manufacturing	$1,935	$147	*
3114	Fruit and vegetable preserving and specialty food manufacturing	$1,835	$64	*
3115	Dairy product manufacturing	$1,720	$85	*
3116	Animal slaughtering and processing	$3,593	$140	*
3117	Seafood product preparation and packaging	$618	$4	*
3118	Bakeries and tortilla manufacturing	10,797	$503	$7,654
3119	Other food manufacturing	$3,689	$150	$71,023
3121	Beverage manufacturing	$7,842	$270	152,853
3251	Basic chemical manufacturing	$2,415	$102	$22,461
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	$1,414	$61	$22,166
3253	Pesticide, fertilizer, and other agricultural chemical manufacturing	$928	$35	*
3259	Other chemical product and preparation manufacturing	$2,267	$121	$15,596
3271	Clay product and refractory manufacturing	$1,145	$76	*
3279	Other non-metallic mineral product manufacturing	$3,099	$164	$15,414
3311	Iron and steel mills and ferroalloy manufacturing	$603	$62	*
3313	Alumina and aluminum production and processing	$529	$19	*
3315	Foundries	$1,770	$129	$15,382
3322	Cutlery and hand tool manufacturing	$1,194	$64	*
3329	Other fabricated metal product manufacturing	$1,774	$101	*
3331	Agriculture, construction, and mining machinery manufacturing	$858	$25	*
3332	Industrial machinery manufacturing	$1,935	$147	*
3333	Commercial and service industry machinery manufacturing	$1,835	$64	*
3336	Engine, turbine, and power transmission equipment manufacturing	$1,720	$85	*
3339	Other general-purpose machinery manufacturing	$3,593	$140	*
3341	Computer and peripheral equipment manufacturing	$618	$4	*
3342	Communications equipment manufacturing	$10,797	$503	$7,654
3343	Audio and video equipment manufacturing	$3,689	$150	$71,023
3344	Semiconductor and other electronic component manufacturing	$7,842	$270	$152,853
3346	Manufacturing and reproducing magnetic and optical media	$1,414	$61	$22,166
3351	Electric lighting equipment manufacturing	$928	$35	*
3352	Household appliance manufacturing	$2,280	$90	$8,325
3353	Electrical equipment manufacturing	$2,267	$121	$15,596
3359	Other electrical equipment and component manufacturing	$1,145	$76	*
3361	Motor vehicle manufacturing	$3,099	$164	$15,414

2012 NAICS code	Advanced Manufacturing and Food and Beverage Manufacturing	United States	Pennsylvania	The Lehigh Valley
3362	Motor vehicle body and trailer manufacturing	$603	$62	*
3363	Motor vehicle parts manufacturing	$529	$19	*
3364	Aerospace product and parts manufacturing	$1,770	$129	$15,382
3365	Railroad rolling stock manufacturing	$1,194	$64	*
3366	Ship and boat building	$1,774	$101	*
3369	Other transportation equipment manufacturing	$858	$25	*
3399	Other miscellaneous manufacturing	$1,835	$64	*

Source: United States Census Bureau County Business Patterns 2015 (* Denotes unavailable data)

Note: Due to unavailability of data, numbers are incomplete for other food manufacturing; resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing; pharmaceutical and medicine manufacturing; foundries; engine, turbine, and power transmission equipment manufacturing; electrical equipment manufacturing; motor vehicle parts manufacturing; and medical equipment and supplies manufacturing.

9.1.6 Advanced Manufacturing and Food and Beverage Manufacturing Occupations

The Lehigh Valley has 26,730 people working in the Lehigh Valley Advanced Manufacturing and Food and Beverage Manufacturing Sector Occupations or 7.5% of the total labor force as of the latest 2016 Bureau of Labor Statistics data May 2016.

The top five occupations making up 38% of the workforce in the sector are:

- Team Assemblers 3,080 (12%)
- Inspectors, Testers, Sorters, Samplers, and Weighers 2,060 (8%)
- First-Line Supervisors of Production and Operating Workers 1,990 (7%)
- Packaging and Filling Machine Operators and Tenders 1,980 (7%)
- Helpers--Production Workers 1,180 (4%)

All of these occupations except First-Line Supervisors of Production and Operating Workers have annual mean incomes lower than the Lehigh Valley average of $46,590.

The Top Five Occupations by Location Quotient are:

- Pourers and Casters, Metal 3.46
- Photographic Process Workers and Processing Machine Operators 2.54
- Painters, Transportation Equipment 2.51
- Chemical Equipment Operators and Tenders 2.36
- Computer-Controlled Machine Tool Operators, Metal and Plastic 2.3

Table 18: Advanced Manufacturing and Food and Beverage Manufacturing Occupations, Allentown-Bethlehem-Easton, PA-NJ MSA

Occupation code	Advanced Manufacturing and Food and Beverage Manufacturing Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
51-0000	Production Occupations	26,730	75.348	1.16	$18.64	$38,770
51-1011	First-Line Supervisors of Production and Operating Workers	1,990	5.602	1.29	$30.26	$62,940
51-2022	Electrical and Electronic Equipment Assemblers	1,170	3.303	2.12	$16.43	$34,170
51-2023	Electromechanical Equipment Assemblers	150	0.423	1.3	$16.63	$34,590
51-2031	Engine and Other Machine Assemblers	50	0.131	0.48	$22.17	$46,120
51-2041	Structural Metal Fabricators and Fitters	350	0.995	1.81	$18.97	$39,460
51-2092	Team Assemblers	3,080	8.693	1.1	$16.72	$34,780
51-2099	Assemblers and Fabricators, All Other	540	1.531	0.93	$14.02	$29,160
51-3011	Bakers	570	1.593	1.24	$12.62	$26,250
51-3021	Butchers and Meat Cutters	280	0.802	0.84	$15.30	$31,820
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	70	0.195	0.18	$13.85	$28,810
51-3092	Food Batchmakers	400	1.129	1.07	$18.13	$37,720
51-3093	Food Cooking Machine Operators and Tenders	80	0.217	0.83	$16.87	$35,080
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	850	2.395	2.3	$18.12	$37,680
51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic	90	0.252	1.41	$26.71	$55,560
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	240	0.688	1.34	$15.05	$31,310
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	350	0.981	0.71	$15.72	$32,690
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	180	0.513	0.97	$19.03	$39,580
51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	60	0.162	0.67	$20.44	$42,520
51-4041	Machinists	730	2.057	0.74	$20.24	$42,100
51-4051	Metal-Refining Furnace Operators and Tenders	50	0.142	1.13	$19.17	$39,870
51-4052	Pourers and Casters, Metal	70	0.211	3.46	$18.60	$38,690
51-4071	Foundry Mold and Coremakers	50	0.128	1.4	$20.86	$43,390
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	720	2.031	1.96	$20.71	$43,080
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	500	1.401	1.68	$18.34	$38,150
51-4111	Tool and Die Makers	230	0.643	1.25	$26.48	$55,070
51-4121	Welders, Cutters, Solderers, and Brazers	820	2.323	0.85	$21.13	$43,950
51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	60	0.177	1.26	$15.21	$31,640
51-4199	Metal Workers and Plastic Workers, All Other	80	0.233	1.43	$17.48	$36,360
51-5111	Prepress Technicians and Workers	80	0.232	0.98	$18.95	$39,410
51-5112	Printing Press Operators	440	1.233	1.02	$16.59	$34,500

Occupation code	Advanced Manufacturing and Food and Beverage Manufacturing Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
51-5113	Print Binding and Finishing Workers	70	0.193	0.51	$15.62	$32,490
51-6011	Laundry and Dry-Cleaning Workers	660	1.847	1.25	$14.03	$29,180
51-6021	Pressers, Textile, Garment, and Related Materials	80	0.239	0.74	$12.26	$25,500
51-6031	Sewing Machine Operators	720	2.027	2.04	$11.04	$22,970
51-6062	Textile Cutting Machine Setters, Operators, and Tenders	50	0.141	1.31	$13.67	$28,430
51-6093	Upholsterers	30	0.09	0.39	$14.83	$30,840
51-7011	Cabinetmakers and Bench Carpenters	330	0.919	1.32	$18.15	$37,750
51-7021	Furniture Finishers	60	0.157	1.27	$14.28	$29,710
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	80	0.232	0.64	$13.43	$27,930
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	200	0.56	1.03	$16.03	$33,340
51-8021	Stationary Engineers and Boiler Operators	150	0.425	1.77	$25.29	$52,600
51-8031	Water and Wastewater Treatment Plant and System Operators	320	0.905	1.1	$22.92	$47,670
51-8091	Chemical Plant and System Operators	*	*	*	$33.51	$69,690
51-8092	Gas Plant Operators	*	*	*	$28.21	$58,680
51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	110	0.307	1.04	$30.22	$62,870
51-9011	Chemical Equipment Operators and Tenders	440	1.243	2.36	$21.98	$45,710
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	70	0.204	0.61	$19.48	$40,530
51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	120	0.343	1.61	$18.10	$37,650
51-9022	Grinding and Polishing Workers, Hand	60	0.182	0.96	$17.85	$37,120
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	460	1.283	1.38	$21.52	$44,760
51-9031	Cutters and Trimmers, Hand	40	0.114	1.12	$13.60	$28,290
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	130	0.361	0.83	$18.43	$38,340
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	110	0.315	0.62	$16.40	$34,120
51-9051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	30	0.098	0.71	$18.91	$39,340
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	2,060	5.813	1.57	$19.46	$40,470
51-9081	Dental Laboratory Technicians	70	0.185	0.7	$16.91	$35,160
51-9082	Medical Appliance Technicians	*	*	*	$17.55	$36,500
51-9083	Ophthalmic Laboratory Technicians	60	0.159	0.78	$15.29	$31,800
51-9111	Packaging and Filling Machine Operators and Tenders	1,980	5.582	2.03	$16.15	$33,590
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	140	0.393	0.64	$15.31	$31,840

Occupation code	Advanced Manufacturing and Food and Beverage Manufacturing Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
51-9122	Painters, Transportation Equipment	350	0.981	2.51	$18.20	$37,860
51-9123	Painting, Coating, and Decorating Workers	*	*	*	$12.03	$25,020
51-9151	Photographic Process Workers and Processing Machine Operators	170	0.478	2.54	$12.89	$26,820
51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	60	0.173	1.36	$16.83	$35,000
51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	130	0.38	1.35	$17.19	$35,760
51-9196	Paper Goods Machine Setters, Operators, and Tenders	300	0.854	1.29	$18.30	$38,070
51-9198	Helpers--Production Workers	1,180	3.337	1.09	$13.62	$28,320
51-9199	Production Workers, All Other	200	0.562	0.31	$20.57	$42,790

Source: Bureau of Labor Statistics May 2016 (* Denotes unavailable data)

Table 19: Educational Requirements and Projected Growth, Advanced Manufacturing and Food and Beverage Manufacturing Occupations, National 2016-2026

Occupation code	Advanced Manufacturing and Food and Beverage Manufacturing Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
51-1011	First-Line Supervisors of Production and Operating Workers	Bachelor's degree	None	1,000 to 4,999	As fast as average
51-2022	Electrical and Electronic Equipment Assemblers	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-2023	Electromechanical Equipment Assemblers	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-2031	Engine and Other Machine Assemblers	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-2041	Structural Metal Fabricators and Fitters	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-2092	Team Assemblers	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-2099	Assemblers and Fabricators, All Other	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-3011	Bakers	No formal educational credential	Long-term on-the-job training	10,000 to 49,999	As fast as average
51-3021	Butchers and Meat Cutters	No formal educational credential	Long-term on-the-job training	5,000 to 9,999	As fast as average
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	No formal educational credential	Short-term on-the-job training	1,000 to 4,999	Little or no change
51-3092	Food Batchmakers	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Little or no change

Occupation code	Advanced Manufacturing and Food and Beverage Manufacturing Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
51-3093	Food Cooking Machine Operators and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Slower than average
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Little or no change
51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic	Postsecondary nondegree award	Moderate-term on-the-job training	1,000 to 4,999	Much faster than average
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4041	Machinists	High school diploma or equivalent	Long-term on-the-job training	5,000 to 9,999	Slower than average
51-4051	Metal-Refining Furnace Operators and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4052	Pourers and Casters, Metal	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4071	Foundry Mold and Coremakers	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4111	Tool and Die Makers	Postsecondary nondegree award	Long-term on-the-job training	Declining	Decline
51-4121	Welders, Cutters, Solderers, and Brazers	High school diploma or equivalent	Moderate-term on-the-job training	10,000 to 49,999	As fast as average
51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-4199	Metal Workers and Plastic Workers, All Other	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-5111	Prepress Technicians and Workers	Postsecondary nondegree award	None	Declining	Decline

Occupation code	Advanced Manufacturing and Food and Beverage Manufacturing Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
51-5112	Printing Press Operators	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-5113	Print Binding and Finishing Workers	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-6011	Laundry and Dry-Cleaning Workers	No formal educational credential	Short-term on-the-job training	Declining	Little or no change
51-6021	Pressers, Textile, Garment, and Related Materials	No formal educational credential	Short-term on-the-job training	Declining	Decline
51-6031	Sewing Machine Operators	No formal educational credential	Short-term on-the-job training	Declining	Decline
51-6062	Textile Cutting Machine Setters, Operators, and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-6093	Upholsterers	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Slower than average
51-7011	Cabinetmakers and Bench Carpenters	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Slower than average
51-7021	Furniture Finishers	High school diploma or equivalent	Short-term on-the-job training	0 to 999	Slower than average
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	High school diploma or equivalent	Moderate-term on-the-job training	0 to 999	Little or no change
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	High school diploma or equivalent	Moderate-term on-the-job training	0 to 999	Little or no change
51-8021	Stationary Engineers and Boiler Operators	High school diploma or equivalent	Long-term on-the-job training	1,000 to 4,999	As fast as average
51-8031	Water and Wastewater Treatment Plant and System Operators	High school diploma or equivalent	Long-term on-the-job training	Declining	Decline
51-8091	Chemical Plant and System Operators	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-8092	Gas Plant Operators	High school diploma or equivalent	Long-term on-the-job training	0 to 999	Little or no change
51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Slower than average
51-9011	Chemical Equipment Operators and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	0 to 999	Little or no change
51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline

Occupation code	Advanced Manufacturing and Food and Beverage Manufacturing Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
51-9022	Grinding and Polishing Workers, Hand	No formal educational credential	Moderate-term on-the-job training	Declining	Decline
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-9031	Cutters and Trimmers, Hand	No formal educational credential	Short-term on-the-job training	Declining	Decline
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-9051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-9081	Dental Laboratory Technicians	High school diploma or equivalent	Moderate-term on-the-job training	5,000 to 9,999	Much faster than average
51-9082	Medical Appliance Technicians	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Faster than average
51-9083	Ophthalmic Laboratory Technicians	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Faster than average
51-9111	Packaging and Filling Machine Operators and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	5,000 to 9,999	Slower than average
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	0 to 999	Little or no change
51-9122	Painters, Transportation Equipment	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	As fast as average
51-9123	Painting, Coating, and Decorating Workers	No formal educational credential	Moderate-term on-the-job training	0 to 999	Little or no change
51-9151	Photographic Process Workers and Processing Machine Operators	High school diploma or equivalent	Short-term on-the-job training	Declining	Decline
51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	0 to 999	Little or no change
51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	High school diploma or equivalent	Long-term on-the-job training	Declining	Little or no change
51-9196	Paper Goods Machine Setters, Operators, and Tenders	High school diploma or equivalent	Moderate-term on-the-job training	Declining	Decline
51-9198	Helpers--Production Workers	High school diploma or equivalent	Short-term on-the-job training	10,000 to 49,999	Faster than average
51-9199	Production Workers, All Other	High school diploma or equivalent	Moderate-term on-the-job training	10,000 to 49,999	As fast as average

Source: Bureau of Labor Statistics October 24, 2017

9.1.7 Advanced Manufacturing and Food and Beverage Manufacturing Talent Demand Assessment

Advanced Manufacturing and Food and Beverage Manufacturing is an important sector to the Lehigh Valley. Accounting for 1.74 Billion in wages paid in the region in 2017, this sector is in the midst of a significant upheaval. As customer demands change, numerous new subsector opportunities have arisen with this target sector. The Lehigh Valley is well positioned to continue advancing activity within this industry. Currently, Lehigh County boasts the highest concentration of beverage processing activity when compared to other Pennsylvania counties.

Table 20: Employment Characteristics, Advanced Manufacturing and Food and Beverage Processing, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
24,764	2,564	8% ↑	$70,302 (annual)	$1.74 Billion (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

The Lehigh Valley boasts a unique mix of assets to accommodate this fast-changing industry. When examining the industry's forecasted demand scenario (Table 21), it can be seen that the industry will need to replace nearly 12,000 workers in the next five years. Approximately 4,685 workers are anticipated to exit the workforce in the next five years, with another 8,074 workers transferring to another industry.

Table 21: Industry Snapshot of Employment Demand, Advanced Manufacturing and Food and Beverage Manufacturing, the Lehigh Valley

Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exits (2017-2022)	Anticipated Transfers (2017-2022)
23,955	- 809 ↓	11,956	4,685	8,074

Source: Chmura JobsEQ® Platform, Q4 2017

9.1.8 Advanced Manufacturing and Food and Beverage Manufacturing Talent Supply Assessment

Analyzing occupational figures that are best aligned with the Advanced Manufacturing and Food and Beverage Manufacturing target sector (Table 22), it is anticipated that the current supply of talent in 2017 is higher than the anticipated supply in 2022. This suggest that the focus of the Advanced Manufacturing and Food and Beverage Manufacturing target sector will be on the retention of existing talent and a focus on replacing any exiting (retiring) talent. Occupations within this sector that are anticipated to continue being in demand and may have a potential supply shortage include production workers and machine operators, which is consistent with the responses received through the employer survey.

Table 22: Advanced Manufacturing and Food and Beverage Manufacturing Occupations and Supply Outlook

Advanced Manufacturing and Food and Beverage Manufacturing Occupations	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Team Assemblers	3,264	531	3,074	-190
First-Line Supervisors of Production and Operating Workers	1,657	122	1,640	-17
Inspectors, Testers, Sorters, Samplers, and Weighers	1,611	218	1,522	-89
Packaging and Filling Machine Operators and Tenders	1,540	313	1,564	24
Helpers--Production Workers	1,103	181	1,182	79
Electrical and Electronic Equipment Assemblers	862	97	766	-96
Welders, Cutters, Solderers, and Brazers	719	21	725	6
Machinists	714	25	712	-2
Assemblers and Fabricators, All Other	590	91	541	-49
Laundry and Dry-Cleaning Workers	587	36	579	-8
Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	563	23	509	-54
Sewing Machine Operators	554	-196	489	-65
Computer-Controlled Machine Tool Operators, Metal and Plastic	507	18	500	-7
All other advanced manufacturing occupations	9,413	741	9,131	-282
Total Occupations	23,684	2,221	22,934	-750

Source: Chmura JobsEQ® Platform, Q4 2017

In 2017, the McKinsey Global Institute (MGI) released a research study focused on the impact of automation and the future of work. In the MGI report, manufacturing was noted to be profoundly impacted by automation. The report notes that occupations in this sector are under automation stress due to the occupation's repetitive duties. Technological advancement will replace these skills in the future and sway Advanced Manufacturing and Food and Beverage Manufacturing businesses to attract middle- and higher-skilled employees with more technological experience.

The Lehigh Valley is well positioned to compete in that technological advanced work pool for the manufacturing sector as the talent pipeline from the postsecondary institutions have technology-related degrees in deeply rooted manufacturing type products such as systems engineering.

On analyzing the degrees, it can be determined that approximately 1,600 graduates with specific knowledge in these industries emerge from educational institutions in the Lehigh Valley (Table 23). These include individuals with degrees related to manufacturing including production and engineering degrees. These also include certification, diploma, undergraduate and graduate programs that support the manufacturing industry such as a Line Worker Diploma Program, Welding and Fabrication Program,

Machine Tool Technology and Auto Body/Collision Repair Technology. The availability of a relevant talent pool serves to support the attraction of businesses looking for that talent.

Table 23: Graduates with Degrees related to Advanced Manufacturing and Food and Beverage Manufacturing, 2015 to 2017

Advanced Manufacturing and Food and Beverage Manufacturing Related Programs/Degrees	2015	2016	2017
Automotive Technology	107	119	119
Civil Engineering	75	63	68
Electrical and Electronics Engineering/Technology	171	192	214
Engineering	362	337	273
Industrial Systems Engineering	92	82	89
Manufacturing Degrees	87	112	120
Materials Sci. & Engineering	394	374	376
Mechanical Engineering and Technology	314	320	341
Total Graduates	**1,602**	**1,599**	**1,600**

Source: LVEDC Educational Survey, 2018

Based on the data analyzed, the Lehigh Valley does seem to have a healthy pool of qualified candidates capable of participating in the labor force today and in the future in the Advanced Manufacturing and Food and Beverage Manufacturing sector.

9.2 Life Sciences Research and Manufacturing

9.2.1 National and State Context

The Life Science Research and Manufacturing sector is on the rise nationally in tandem with health services with increasing demand for services worldwide. Pennsylvania is a national leader in the Life Science industry. According to Life Sciences Pennsylvania (LSPA) which represents the industry in the state over half of the industry establishments are comprised of fewer than 10 employees and sector as a whole contributed a total (direct and indirect) state economic output of $88.5 billion, comprised of a direct economic impact of $48.8 billion and indirect economic impact.[10] "Between 2011 and 2016, Pennsylvania experienced modest Life Science Research and Manufacturing employment growth in comparison to peer states. This is primarily due to a decline in pharmaceutical manufacturing in the Commonwealth and concurrent gains in research, testing and medical laboratories.[11]" The industry also directly employed 112,000 people during 2016.

[10] 2017 Pennsylvania Life Sciences Industry Economic Impact Report http://www.lifesciencespa.org

[11] 2017 Pennsylvania Life Sciences Industry Economic Impact Report http://www.lifesciencespa.org

9.2.2 Top Employers by Number of Employees

Business	County
Lehigh University	Northampton
B Braun Medical Inc.	Lehigh
Lafayette College	Northampton
Fisher Clinical Services Inc	Lehigh
Health Network Laboratories	Lehigh
Northampton County Area Community College	Northampton
Versum Materials US LLC	Lehigh
Lehigh Carbon Community College	Lehigh
Moravian College	Northampton
Crothall Healthcare Inc	Lehigh
OraSure Technologies, Inc	Lehigh
Aesculap	Lehigh

Source: Center for Workforce Information & Analysis: Top 50 Employers Lehigh County, Top 50 Employers Northampton County

9.2.3 Business Establishments in the Life Sciences Research and Manufacturing

The United States Census Bureau's latest 2015 County Business Patterns data recorded 59,325 Life Science Research and Manufacturing businesses by the Lehigh Valley definition. Pennsylvania has 2,368 or 4% of these businesses. The Lehigh Valley has 108 or 4.6% of the state total.

Table 24 indicates the distribution of the business establishments by industry classification at the national, state and the Lehigh Valley levels.

The Lehigh Valley is fairly consistent with the state and nation with the top three classifications: medical equipment and supplies manufacturing, scientific research and development services and medical and diagnostic laboratories remaining the same at all three levels combining to take up three-quarters of all Life Sciences Research and Manufacturing Sector establishments.

Table 24: Business Establishments in Life Sciences Research and Manufacturing, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	Life Sciences Research and Manufacturing	United States	Pennsylvania	The Lehigh Valley
3254	Pharmaceutical and medicine manufacturing	2280	90	8
3345	Navigational, measuring, electromedical, and control instruments manufacturing	5231	261	16
3391	Medical equipment and supplies manufacturing	10767	401	18
5417	Scientific research and development services	18994	710	23
6113	Colleges, universities, and professional schools	4788	199	10
6215	Medical and diagnostic laboratories	17265	707	33

Source: United States Census Bureau County Business Patterns 2015

9.2.4 Employees in the Life Sciences Research and Manufacturing

The United States Census Bureau's latest 2015 County Business Patterns data recorded 3,771,852 Life Sciences Research and Manufacturing Sector employees. Pennsylvania has 265,315 or 7% of these employees. The Lehigh Valley has 10,738 or 4% of the state total. The Lehigh Valley is somewhat unique in the distribution of employees with the top two classifications combining to 91% of the total:

- Colleges, universities, and professional schools (75%)
- Medical and diagnostic laboratories (16%)

The following figure indicates the distribution of employees by industry classification.

Table 25: Employees in the Life Sciences Research and Manufacturing, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	Life Sciences Research and Manufacturing	United States	Pennsylvania	The Lehigh Valley
3254	Pharmaceutical and medicine manufacturing	242329	12886	163
3345	Navigational, measuring, electromedical, and control instruments manufacturing	382955	17057	288
3391	Medical equipment and supplies manufacturing	277921	12179	263
5417	Scientific research and development services	710059	28222	247
6113	Colleges, universities, and professional schools	1879011	182468	8047
6215	Medical and diagnostic laboratories	279577	12503	1730

Source: United States Census Bureau County Business Patterns 2015

Note: Due to unavailability of data, numbers are incomplete for pharmaceutical and medicine manufacturing and medical equipment and supplies manufacturing.

9.2.5 Annual Payroll in the Life Sciences Research and Manufacturing

The United States Census Bureau's latest 2015 County Business Patterns data recorded an annual payroll of $ 251,849,815 in the Life Sciences Research and Manufacturing Sector. Pennsylvania has $15,227,874 or 6% of these annual payroll employees. The Lehigh Valley employees take in $454,670 or 3% of the state total. The Lehigh Valley is slightly higher than the state and nation with the top two highest paid industry classifications: colleges, universities, and professional schools and medical and diagnostic laboratories combining to take up 83% of all Life Sciences Research and Manufacturing Sector annual payroll. Table 26 indicates the distribution of annual payroll by industry classification.

Table 26: Annual Payroll in the Life Sciences Research and Manufacturing, United States, Pennsylvania and the Lehigh Valley ($1,000s)

2012 NAICS code	Life Sciences Research and Manufacturing	United States	Pennsylvania	The Lehigh Valley
3254	Pharmaceutical and medicine manufacturing	$ 23,173,563	$ 1,343,993	$ 8,325
3345	Navigational, measuring, electromedical, and control instruments manufacturing	$ 33,471,834	$ 1,354,722	$ 21,002
3391	Medical equipment and supplies manufacturing	$ 17,829,777	$ 663,135	$ 11,796
5417	Scientific research and development services	$ 84,475,645	$ 3,265,704	$ 32,289
6113	Colleges, universities, and professional schools	$ 75,499,071	$ 7,818,569	$ 315,341
6215	Medical and diagnostic laboratories	$ 17,399,925	$ 781,751	$ 65,917

Source: United States Census Bureau County Business Patterns 2015

Note: Due to unavailability of data, numbers are incomplete for pharmaceutical and medicine manufacturing and medical equipment and supplies manufacturing.

9.2.6 Life Sciences Research and Manufacturing Occupations

Approximately 1,050 occupations are in the Life Sciences Research and Manufacturing Sector. The top employing occupations are chemical technicians and chemists, accounting for 350 and 290 occupations, respectively.

The Top Occupations by Location Quotient are:

- Chemical Technicians 2.09
- Food Scientists and Technologists 1.56
- Chemists 1.35

Table 27: Life Sciences Research and Manufacturing Occupations, Allentown-Bethlehem-Easton, PA-NJ MSA

Occupation code	Life Sciences Research and Manufacturing Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
17-2031	Biomedical Engineers	90	0.248	1.76	$ 43.41	$ 90,280
17-2041	Chemical Engineers	*	*	*	*	*
19-1021	Biochemists and Biophysicists	40	0.104	0.54	$ 36.72	$ 76,370
19-1022	Microbiologists	*	*	*	*	*
19-1029	Biological Scientists, All Other	*	*	*	*	*
19-1041	Epidemiologists	*	*	*	*	*
19-1042	Medical Scientists, Except Epidemiologists	*	*	*	*	*
19-1099	Life Scientists, All Other	*	*	*	*	*
19-2031	Chemists	310	0.851	1.44	$ 35.90	$ 74,680
19-2041	Environmental Scientists and Specialists, Including Health	40	0.114	0.20	$ 38.56	$ 80,210
19-4099	Life, Physical, and Social Science Technicians, All Other	70	0.19	0.39	$21.36	$44,420
29-2011 & 29-2012	Medical and Clinical Laboratory Technologists and Technicians	1130	3.146	1.39	$ 25.63	$ 53,320
31-9093	Medical Equipment Preparers	150	0.412	1.09	$ 16.19	$ 33,670
31-9097	Phlebotomists	570	1.589	1.85	$ 16.75	$ 34,840

Source: Bureau of Labor Statistics May 2017 (* Denotes unavailable data)

Table 28: Educational Requirements and Projected Growth, Life Sciences Research and Manufacturing Occupations, National 2016-2026

Occupation Code	Life Sciences Research and Manufacturing Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
19-1012	Food Scientists and Technologists	Bachelor's degree	None	1,000 to 4,999	As fast as average
19-1021	Biochemists and Biophysicists	Doctoral or professional degree	None	1,000 to 4,999	Faster than average
19-2031	Chemists	Bachelor's degree	None	5,000 to 9,999	As fast as average
19-2041	Environmental Scientists and Specialists, Including Health	Bachelor's degree	None	5,000 to 9,999	Faster than average
19-3031	Clinical, Counseling, and School Psychologists	Doctoral or professional degree	Internship /residency	10,000 to 49,999	Faster than average
19-3051	Urban and Regional Planners	Master's degree	None	1,000 to 4,999	Faster than average
19-4021	Biological Technicians	Bachelor's degree	None	5,000 to 9,999	Faster than average

Occupation Code	Life Sciences Research and Manufacturing Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
19-4031	Chemical Technicians	Associate's degree	Moderate-term on-the-job training	1,000 to 4,999	Slower than average
19-4061	Social Science Research Assistants	Bachelor's degree	None	1,000 to 4,999	Slower than average
19-4091	Environmental Science and Protection Technicians, Including Health	Associate's degree	None	1,000 to 4,999	Faster than average
19-4099	Life, Physical, and Social Science Technicians, All Other	Associate's degree	None	5,000 to 9,999	Faster than average

Source: Bureau of Labor Statistics October 24, 2017

9.2.7 Life Science Research and Manufacturing Talent Demand Assessment

Life Science Research and Manufacturing industry has boasted many success stories in the Lehigh Valley. Over the last five years, this $898 Million (in wages) industry was at the forefront of combatting viruses such as Ebola. A specialized industry, life science research and manufacturing activities remain a critical sector for local post-secondary institutions. A strong growth in the health care services industry also complements the importance of this target sector.

Table 29: Employment Characteristics, Life Science Research and Manufacturing, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
10,388	214	-1% ↓	$86,441(annual)	$898 Million (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

When examining the industry's forecasted demand scenario (Table 30), it can be seen that the industry will need to replace nearly half of its existing workers in the next five years. Approximately 1,999 workers within this industry are anticipated to exit the workforce in the next five years, with another 2,789 workers transferring to another industry. The industry is also forecasted to add another 565 workers.

Table 30: Industry Snapshot of Employment Demand, Life Science Research and Manufacturing, the Lehigh Valley

Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exists (2017-2022)	Anticipated Transfers (2017-2022)
10,953	565 ↑	5,354	1,999	2,789

Source: Chmura JobsEQ® Platform, Q4 2017

9.2.8 Life Science Research and Manufacturing Talent Supply Assessment

Analyzing occupational figures that are best aligned with the life science research and manufacturing target sector (Table 31), it is anticipated that the current supply of talent in 2017 is lower than the anticipated supply in 2022. This suggests that the focus of the life science research and manufacturing target sector will be on the attraction and retention of new and existing talent. Occupations within this sector that are anticipated to be in high demand and may have a potential supply shortage include phlebotomists, medical technologists and technicians.

Table 31: Life Science Research and Manufacturing Occupations and Supply Outlook

Life Sciences Research and Manufacturing Occupations	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Medical and Clinical Laboratory Technologists	498	40	524	26
Phlebotomists	453	23	503	50
Medical and Clinical Laboratory Technicians	411	30	436	25
Medical Scientists, Except Epidemiologists	232	8	246	14
Chemists	229	0	234	5
Medical Equipment Preparers	135	13	140	5
Life, Physical, and Social Science Technicians, All Other	97	11	101	4
Chemical Engineers	81	7	84	3
Environmental Scientists and Specialists, Including Health	76	-8	79	3
Biomedical Engineers	64	0	66	2
Biochemists and Biophysicists	54	-2	56	2
Microbiologists	41	-1	42	1
Biological Scientists, All Other	36	0	38	2
Life Scientists, All Other	15	1	16	1
Epidemiologists	8	0	8	0
Total Life Science Research and Manufacturing Occupations	**2,430**	**122**	**2,573**	**143**

Source: Chmura JobsEQ® Platform, Q4 2017

Occupations in life sciences have a lower proportion of automation potential. These knowledge based occupations are reliant on a growing graduate base to backfill support positions as individual's progress in their careers. In analyzing degrees, it was determined that there were 1,031 life science research and manufacturing graduates in 2017 (Table 32).

Table 32: Graduates with Degrees related to Life Science Research and Manufacturing, 2015 to 2017

Life Sciences Research and Manufacturing Related Programs/Degrees	2015	2016	2017
Behavioral Neuroscience	29	48	28
Biochemistry	45	34	45
Bioengineering	43	57	48
Biology	229	256	248
Biotechnology	73	81	101
General Biolife Sciences	129	118	128
Information Technology	414	432	433
Total Graduates without IT	**548**	**594**	**598**
Total Graduates with IT	**962**	**1,026**	**1,031**

Source: LVEDC Educational Survey, 2018

These degrees include basic biology and life science programs and core biotechnology programs including biochemistry, molecular biology, genetic engineering, and nanotechnology. Mechanics related to bioscience are involved in developing mechanical controls and manufacturing products for use in molecular processes. A high number of graduates in chemistry also indicate that the region is well positioned to provide chemical analysts to meet business needs.

However, degrees in Bio-mechanics and Bio-engineering are currently unavailable in the Lehigh Valley colleges and universities, resulting in an out of region recruitment process for local businesses seeking those skillsets and could be considered a talent gap.

9.3 High Value Business Services

9.3.1 National and State Context

The High Value Business Services sector responds to the demands of corporations that are seeking to adapt to rapid changes in customer expectations (increased online commercial operations, cloud computing, debit/credit card use, and smart phone transactions) while desiring to maintain focus on their core business activities. Demand is driven by new business growth, job growth, increasing corporate involvement, and increasing disposable income. While large companies may operate globally or within a specific region, many business services firms serve smaller geographic areas near their headquarters.[12] As the US economy continues to transition towards service industries these sectors will continue to grow. Pennsylvania has maintained establishments, payroll and employment rates that correspond to the national average.

[12] Hoovers http://www.firstresearch.com/Industry-Research/Business-Services-Sector.html

9.3.2 Top Employers by Number of Employees

According to the Pennsylvania Center for Workforce Information and Analysis, the top five employers in High Value Business Services are:

Business	County
Guardian Life Insurance Company of America	Northampton
Integrity Staffing Solutions Inc	Lehigh
Coworx Resources Inc	Northampton
MVP Staffing	Northampton
Aerotek Inc	Northampton

Source: Center for Workforce Information & Analysis: Top 50 Employers Lehigh County, Top 50 Employers Northampton County

9.3.3 Business Establishments in the High Value Business Services

The United States Census Bureau's latest 2015 County Business Patterns data recorded 1,642,081 High Value Business Services by the Lehigh Valley definition. Pennsylvania has 59,841 or 4% of these businesses. The Lehigh Valley has 2,853 or 4.8% of the state total.

Table 33 indicates the distribution of the business establishments by industry classification at the national, state and the Lehigh Valley levels.

The Lehigh Valley is fairly consistent with the state and nation with the top three classifications: services to buildings and dwellings, legal services and management, scientific, and technical consulting services remaining the same at all three levels combining to take up a third of all High Value Business Services Sector establishments.

Table 33: Business Establishments in the High Value Business Services, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	High Value Business Services	United States	Pennsylvania	The Lehigh Valley
5182	Data processing, hosting, and related services	13599	447	21
5221	Depository credit intermediation	119409	5589	248
5241	Insurance carriers	32772	1526	71
5242	Agencies, brokerages, and other insurance related activities	145925	5632	242
5411	Legal services	186216	6541	318

2012 NAICS code	High Value Business Services	United States	Pennsylvania	The Lehigh Valley
5412	Accounting, tax preparation, bookkeeping, and payroll services	132903	4273	209
5413	Architectural, engineering, and related services	111556	3974	212
5414	Specialized design services	31473	831	32
5415	Computer systems design and related services	138775	4529	202
5416	Management, scientific, and technical consulting services	168804	5147	191
5417	Scientific research and development services	18994	710	23
5418	Advertising, public relations, and related services	37512	1289	52
5419	Other professional, scientific, and technical services	69793	2498	115
5511	Management of companies and enterprises	53943	2362	135
5611	Office administrative services	31372	900	34
5612	Facilities support services	6898	286	26
5613	Employment services	51479	1880	93
5614	Business support services	32786	1089	51
5615	Travel arrangement and reservation services	23417	921	65
5616	Investigation and security services	25690	820	41
5617	Services to buildings and dwellings	189115	7852	435
5619	Other support services	19650	745	37

Source: United States Census Bureau County Business Patterns 2015

9.3.4 Employees in the High Value Business Services

The United States Census Bureau's latest 2015 County Business Patterns data recorded 27,738,247 High Value Business Services Sector employees. Pennsylvania has 1,025,171 or 4% of these employees. The Lehigh Valley has 45,503 or 4.4% of the state total. The Lehigh Valley is fairly consistent with the state and nation sharing the top three classifications:

- Management of companies and enterprises (24%) - 14% higher than the national rate, due to the presence of corporate headquarters for companies such as Air Products and PPL Corporation
- Employment services (15%) - 7% lower than the national rate
- Services to buildings and dwellings (10%) - 3% higher than the national rate

Table 34: Employees in High Value Business Services, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	High Value Business Services	United States	Pennsylvania	The Lehigh Valley
5182	Data processing, hosting, and related services	13599	447	21
5221	Depository credit intermediation	119409	5589	248

2012 NAICS code	High Value Business Services	United States	Pennsylvania	The Lehigh Valley
5241	Insurance carriers	32772	1526	71
5242	Agencies, brokerages, and other insurance related activities	145925	5632	242
5411	Legal services	186216	6541	318
5412	Accounting, tax preparation, bookkeeping, and payroll services	132903	4273	209
5413	Architectural, engineering, and related services	111556	3974	212
5414	Specialized design services	31473	831	32
5415	Computer systems design and related services	138775	4529	202
5416	Management, scientific, and technical consulting services	168804	5147	191
5417	Scientific research and development services	18994	710	23
5418	Advertising, public relations, and related services	37512	1289	52
5419	Other professional, scientific, and technical services	69793	2498	115
5511	Management of companies and enterprises	53943	2362	135
5611	Office administrative services	31372	900	34
5612	Facilities support services	6898	286	26
5613	Employment services	51479	1880	93
5614	Business support services	32786	1089	51
5615	Travel arrangement and reservation services	23417	921	65
5616	Investigation and security services	25690	820	41
5617	Services to buildings and dwellings	189115	7852	435
5619	Other support services	19650	745	37

9.3.5 Annual Payroll in the High Value Business Services

The United States Census Bureau's latest 2015 County Business Patterns data recorded an annual payroll of $1,862,859,457 in the High Value Business Services Sector. Pennsylvania has $69,141,323 or 4% of the annual payroll. The Lehigh Valley employees take in $3,009,903 or 4.4% of the state total. The Lehigh Valley is slightly higher than the state and nation with the top highest paid industry classifications: Management of companies and enterprises takes up 42% of all High Value Business Services Sector annual payrolls, nearly double than the state and nation rate. Table 35 indicates the distribution of employees by industry classification.

Table 35: Annual Payroll in the High Value Business Services, United States, Pennsylvania and the Lehigh Valley ($1,000s)

2012 NAICS code	High Value Business Services	United States	Pennsylvania	Lehigh Valley
5182	Data processing, hosting, and related services	$ 50,920,946	$ 1,444,471	$ 59,552

2012 NAICS code	High Value Business Services	United States	Pennsylvania	Lehigh Valley
5221	Depository credit intermediation	$ 140,490,998	$ 4,790,835	$ 166,286
5241	Insurance carriers	$ 131,623,064	$ 7,012,791	$ 284,466
5242	Agencies, brokerages, and other insurance related activities	$ 61,369,975	$ 2,911,741	$ 90,608
5411	Legal services	$ 100,269,761	$ 4,441,719	$ 94,643
5412	Accounting, tax preparation, bookkeeping, and payroll services	$ 74,266,295	$ 2,650,424	$ 115,696
5413	Architectural, engineering, and related services	$ 119,522,911	$ 4,553,081	$ 179,976
5414	Specialized design services	$ 6,618,940	$ 173,700	$ 6,290
5415	Computer systems design and related services	$ 163,496,831	$ 4,536,307	$ 176,589
5416	Management, scientific, and technical consulting services	$ 95,569,873	$ 3,562,964	$ 74,242
5417	Scientific research and development services	$ 84,475,645	$ 3,265,704	$ 41,635
5418	Advertising, public relations, and related services	$ 32,525,005	$ 908,857	$ 25,780
5419	Other professional, scientific, and technical services	$ 27,644,849	$ 985,927	$ 48,499
5511	Management of companies and enterprises	$ 367,039,541	$ 17,570,733	$ 1,280,788
5611	Office administrative services	$ 28,623,493	$ 837,555	$ 57,256
5612	Facilities support services	$ 11,160,359	$ 510,367	$ 49,486
5613	Employment services	$ 240,594,072	$ 4,393,202	$ 190,118
5614	Business support services	$ 26,632,599	$ 905,590	$ 48,990
5615	Travel arrangement and reservation services	$ 12,721,099	$ 321,598	$ 16,430
5616	Investigation and security services	$ 25,994,784	$ 992,585	$ 57,890
5617	Services to buildings and dwellings	$ 49,830,306	$ 1,885,581	$ 139,477
5619	Other support services	$ 11,468,111	$ 485,591	$ 17,605

Source: United States Census Bureau County Business Patterns 2015

Note: Due to unavailability of data, numbers are incomplete for business support services.

9.3.6 High Value Business Services Occupations

The Lehigh Valley has 13,090 people working in High Value Business Services Occupations or 4% of the total labor force as of the latest 2016 Bureau of Labor Statistics data May 2016.

The top five occupations making up 55% of the workforce in the sector are:

- Accountants and Auditors 2,880 (22%)

- Market Research Analysts and Marketing Specialists 1,490 (11%)
- Human Resources Specialists 1,300 (10%)
- Purchasing Agents, Except Wholesale, Retail, and Farm Products 810 (6%)
- Business Operations Specialists, All Other 810 (6%)

All of these occupations have annual mean incomes higher than the Lehigh Valley average of $46,590.

The Top Five Occupations by Location Quotient are:

- Buyers and Purchasing Agents, Farm Products 2.44
- Labor Relations Specialists 1.18
- Purchasing Agents, Except Wholesale, Retail, and Farm Products 1.08
- Market Research Analysts and Marketing Specialists 1.06
- Compensation, Benefits, and Job Analysis Specialists 1.04

Table 36: High Value Business Services Occupations, Allentown-Bethlehem-Easton, PA-NJ MSA

Occupation code	High Value Business Services Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
11-3021	Computer and Information Systems Managers	550	1.52	0.59	$66.66	$138,660
13-1011	Agents and Business Managers of Artists, Performers, and Athletes	*	*	*	*	*
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	820	2.29	0.79	$30.37	$63,170
13-1031	Claims Adjusters, Examiners, and Investigators	490	1.36	0.69	$34.38	$71,510
13-1041	Compliance Officers	430	1.20	0.60	$31.44	$65,390
13-1071	Human Resources Specialists	1460	4.08	1.05	$30.40	$63,230
13-1074	Farm Labor Contractors	*	*	*	*	*
13-1075	Labor Relations Specialists	200	0.55	0.99	$36.60	$76,120
13-1081	Logisticians	340	0.95	0.85	$32.79	$68,210
13-1111	Management Analysts	750	2.10	0.45	$43.95	$91,410
13-1121	Meeting, Convention, and Event Planners	170	0.48	0.67	$23.44	$48,740
13-1131	Fundraisers	190	0.54	1.06	$29.27	$60,880
13-1141	Compensation, Benefits, and Job Analysis Specialists	200	0.57	1.01	$34.81	$72,410

Occupation code	High Value Business Services Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
13-1151	Training and Development Specialists	610	1.71	0.87	$29.68	$61,730
13-1161	Market Research Analysts and Marketing Specialists	1430	3.97	0.95	$29.20	$60,730
13-1199	Business Operations Specialists, All Other	720	2.00	0.28	$35.63	$74,100
13-2011	Accountants and Auditors	2770	7.71	0.89	$37.01	$76,990
13-2021	Appraisers and Assessors of Real Estate	90	0.25	0.60	$36.07	$ 75,020
13-2031	Budget Analysts	80	0.23	0.59	$47.32	$98,420
13-2041	Credit Analysts	-	-	-	$37.52	$78,040
13-2051	Financial Analysts	400	1.11	0.54	$41.42	$86,140
13-2052	Personal Financial Advisors	250	0.70	0.49	$65.11	$135,430
13-2061	Financial Examiners	60	0.18	0.48	$32.58	$67,760
13-2071	Credit Counselors	80	0.22	0.86	$25.14	$52,290
13-2072	Loan Officers	480	1.34	0.62	$34.30	$71,340
13-2081	Tax Examiners and Collectors, and Revenue Agents	50	0.14	0.35	$27.83	$57,880
13-2082	Tax Preparers	80	0.21	0.43	$25.58	$53,200
15-1121	Computer Systems Analysts	750	2.10	0.51	$42.55	$88,500
15-1131	Computer Programmers	550	1.53	0.88	$33.02	$68,680
15-1133	Software Developers, Systems Software	300	0.84	0.30	$51.70	$107,540
15-1134	Web Developers	270	0.76	0.86	$28.44	$59,160
15-1142	Network and Computer Systems Administrators	710	1.99	0.76	$38.84	$80,780
15-1143	Computer Network Architects	240	0.66	0.59	$47.70	$99,220
15-1151	Computer User Support Specialists	1460	4.07	0.94	$25.17	$52,350
15-1152	Computer Network Support Specialists	400	1.12	0.86	$32.65	$67,910
15-1199	Computer Occupations, All Other	450	1.24	0.56	$38.04	$79,120

Occupation code	High Value Business Services Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
23-1011	Lawyers	740	2.05	0.47	$58.23	$121,120
23-1012	Judicial Law Clerks	60	0.18	1.65	$20.62	$42,890
23-1021	Administrative Law Judges, Adjudicators, and Hearing Officers	*	*	*	*	*
23-1022	Arbitrators, Mediators, and Conciliators	*	*	*	*	*
23-1023	Judges, Magistrate Judges, and Magistrates	*	*	*	*	*
23-2091	Court Reporters	30	0.09	0.82	$25.07	$52,140
23-2099	Legal Support Workers, All Other	30	0.09	0.28	$48.38	$100,630
43-1011	First-Line Supervisors of Office and Administrative Support Workers	3890	10.83	1.06	$28.16	$58,580
43-2011	Switchboard Operators, Including Answering Service	150	0.41	0.73	$13.33	$27,730
43-2021	Telephone Operators	*	*	*	*	*
43-3011	Bill and Account Collectors	960	2.67	1.40	$15.14	$31,490
43-3021	Billing and Posting Clerks	1350	3.76	1.13	$17.61	$36,630
43-3031	Bookkeeping, Accounting, and Auditing Clerks	3160	8.80	0.82	$18.26	$37,980
43-3041	Gaming Cage Workers	*	*	*	*	*
43-3051	Payroll and Timekeeping Clerks	440	1.22	1.13	$20.50	$42,640
43-3071	Tellers	1260	3.50	1.02	$14.16	$29,460
43-3099	Financial Clerks, All Other	*	*	*	*	*
43-4011	Brokerage Clerks	80	0.21	0.52	$22.86	$47,550
43-4021	Correspondence Clerks	-	-	-	$19.90	$41,400
43-4051	Customer Service Representatives	7980	22.25	1.15	$16.34	$34,000
43-4061	Eligibility Interviewers, Government Programs	290	0.81	0.82	$23.41	$48,690
43-4071	File Clerks	490	1.37	1.65	$14.48	$ 30,120
43-4131	Loan Interviewers and Clerks	300	0.82	0.52	$19.43	$40,410
43-4141	New Accounts Clerks	40	0.11	0.38	$15.09	$31,390

Occupation code	High Value Business Services Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
43-4151	Order Clerks	160	0.45	0.38	$18.63	$38,760
43-4171	Receptionists and Information Clerks	2910	8.12	1.14	$13.93	$ 28,980
43-5011	Cargo and Freight Agents	220	0.61	0.96	$22.13	$46,020
43-5021	Couriers and Messengers	190	0.53	0.99	$13.87	$ 28,850
43-5052	Postal Service Mail Carriers	950	2.64	1.12	$24.07	$50,060
43-5053	Postal Service Mail Sorters, Processors, and Processing Machine Operators	390	1.07	1.37	$24.12	$50,170
43-5061	Production, Planning, and Expediting Clerks	820	2.29	0.97	$23.01	$47,860
43-5071	Shipping, Receiving, and Traffic Clerks	1670	4.65	0.99	$17.32	$36,030
43-5081	Stock Clerks and Order Fillers	7150	19.92	1.39	$12.63	$26,270
43-6011	Executive Secretaries and Executive Administrative Assistants	890	2.47	0.59	$28.26	$58,770
43-6012	Legal Secretaries	280	0.77	0.59	$21.73	$45,200
43-6013	Medical Secretaries	1490	4.15	1.03	$16.04	$33,370
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	5730	15.98	1.01	$17.31	$36,000
43-9011	Computer Operators	50	0.14	0.49	$22.51	$46,820
43-9021	Data Entry Keyers	480	1.35	1.06	$15.57	$32,380
43-9022	Word Processors and Typists	220	0.60	1.32	$18.02	$37,490
43-9031	Desktop Publishers	*	*	*	*	*
43-9041	Insurance Claims and Policy Processing Clerks	770	2.13	1.10	$20.82	$43,300
43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	230	0.64	1.06	$13.55	$28,180
43-9071	Office Machine Operators, Except Computer	160	0.44	1.14	$13.72	$28,540
43-9081	Proofreaders and Copy Markers	*	*	*	*	*
43-9111	Statistical Assistants	*	*	*	*	*

Source: Bureau of Labor Statistics May 2017 (* Denotes unavailable data)

Table 37: Educational Requirements and Projected Growth, High Value Business Services Occupations, National 2016-2026

Occupation Code	Business and Financial Operations Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
13-2011	Accountants and Auditors	Bachelor's degree	None	50,000 or more	Faster than average
13-1161	Market Research Analysts and Marketing Specialists	Bachelor's degree	None	50,000 or more	Faster than average
13-1071	Human Resources Specialists	Bachelor's degree	None	10,000 to 49,999	As fast as average
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	Bachelor's degree	Moderate-term on-the-job training	Declining	Decline
13-1199	Business Operations Specialists, All Other	Bachelor's degree	None	50,000 or more	As fast as average
13-1111	Management Analysts	Bachelor's degree	None	50,000 or more	Faster than average
13-1151	Training and Development Specialists	Bachelor's degree	None	10,000 to 49,999	Faster than average
13-1051	Cost Estimators	Bachelor's degree	Moderate-term on-the-job training	10,000 to 49,999	Faster than average
13-1031	Claims Adjusters, Examiners, and Investigators	High school diploma or equivalent	Long-term on-the-job training	Declining	Little or no change
13-2072	Loan Officers	Bachelor's degree	Moderate-term on-the-job training	10,000 to 49,999	Faster than average
13-1041	Compliance Officers	Bachelor's degree	Moderate-term on-the-job training	10,000 to 49,999	As fast as average
13-2051	Financial Analysts	Bachelor's degree	None	10,000 to 49,999	Faster than average
13-1081	Logisticians	Bachelor's degree	None	10,000 to 49,999	As fast as average
13-2052	Personal Financial Advisors	Bachelor's degree	Long-term on-the-job training	10,000 to 49,999	Faster than average
13-1075	Labor Relations Specialists	Bachelor's degree	None	Declining	Decline
13-1141	Compensation, Benefits, and Job Analysis Specialists	Bachelor's degree	None	5,000 to 9,999	As fast as average
13-2099	Financial Specialists, All Other	Bachelor's degree	Moderate-term on-the-job training	10,000 to 49,999	As fast as average
13-1121	Meeting, Convention, and Event Planners	Bachelor's degree	None	10,000 to 49,999	Faster than average

Occupation Code	Business and Financial Operations Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
13-1131	Fundraisers	Bachelor's degree	None	10,000 to 49,999	Much faster than average
13-1022	Wholesale and Retail Buyers, Except Farm Products	Bachelor's degree	Moderate-term on-the-job training	Declining	Decline
13-2031	Budget Analysts	Bachelor's degree	None	1,000 to 4,999	As fast as average
13-2021	Appraisers and Assessors of Real Estate	Bachelor's degree	Long-term on-the-job training	10,000 to 49,999	Faster than average
13-2061	Financial Examiners	Bachelor's degree	Long-term on-the-job training	5,000 to 9,999	Faster than average
13-2082	Tax Preparers	High school diploma or equivalent	Moderate-term on-the-job training	10,000 to 49,999	Faster than average
13-1021	Buyers and Purchasing Agents, Farm Products	Bachelor's degree	Moderate-term on-the-job training	Declining	Decline
13-2071	Credit Counselors	Bachelor's degree	Moderate-term on-the-job training	5,000 to 9,999	Faster than average
13-2081	Tax Examiners and Collectors, and Revenue Agents	Bachelor's degree	Moderate-term on-the-job training	Declining	Little or no change
13-2041	Credit Analysts	Bachelor's degree	None	5,000 to 9,999	As fast as average

Source: Bureau of Labor Statistics October 24, 2017

9.3.7 High Value Business Services Talent Demand Assessment

The High Value Business Services industry has one of the largest employment among the target sectors in the Lehigh Valley. Valued as a $3.45 Billion (in wages) industry, the high value business services industry is well suited in the Lehigh Valley. The Lehigh Valley's central location puts companies in close proximity to the financial and insurance centers of the nation (New York and Philadelphia). A strong cluster of shared service and back office facilities already exist in the Lehigh Valley, which has supported the continued growth of this target sector industry.

Table 38: Employment Characteristics, High Value Business Services, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
53,126	1,358	2% ↑	$64,953 (annual)	$3.45 Billion (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

When examining the industry's forecasted demand scenario (Table 39), it can be seen that the industry will need to replace 28,952 workers in the next five years. Approximately 10,930 workers within this industry are anticipated to exit the workforce in the next five years, with another 16,313 workers transferring to another industry. Despite the industry being quite volatile (as occupations under this target sector are often transferable among other industries) is it still forecasted to add another 1,709 workers in the next five years.

Table 39: Industry Snapshot of Employment Demand, High Value Business Services, the Lehigh Valley

Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exits (2017-2022)	Anticipated Transfers (2017-2022)
54,835	1,709 ↑	28,952	10,930	16,313

Source: Chmura JobsEQ® Platform, Q4 2017

9.3.8 High Value Business Services Talent Supply Assessment

Analyzing occupational figures that are best aligned with the high value business services target sector (Table 40), it is anticipated that the current supply of talent in 2017 is lower than the anticipated supply in 2022. This suggests that the focus of the high value business services target sector will be on the attraction and retention of new and existing talent. Occupations within this sector that are anticipated to be in high demand and may have a potential supply shortage include secretaries and administrative assistants, market research analysts and information clerks. Examining information technology and computer systems related occupations, it can be assessed that there is also a potential small shortage of supply.

Table 40: High Value Business Service Occupations and Supply Outlook

High Value Business Service Occupations	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Office Clerks, General	6,585	442	6,509	-76
Customer Service Representatives	6,233	-7	6,273	40
Stock Clerks and Order Fillers	5,594	843	5,696	102
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	5,088	261	4,882	-206
First-Line Supervisors of Office and Administrative Support Workers	3,161	125	3,192	31
Bookkeeping, Accounting, and Auditing Clerks	3,111	101	3,054	-57
Accountants and Auditors	2,600	122	2,696	96

High Value Business Service Occupations	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Receptionists and Information Clerks	2,517	127	2,623	106
Shipping, Receiving, and Traffic Clerks	1,877	400	1,911	34
Medical Secretaries	1,470	51	1,608	138
Market Research Analysts and Marketing Specialists	1,203	-20	1,307	104
Billing and Posting Clerks	1,193	31	1,261	68
Information Technology Related Occupations	5,235	124	5,294	59
All other High Value Business Service Occupations	22,474	-41	22,561	87
Total High Value Business Service Occupations	**68,341**	**2,559**	**68,867**	**526**

Source: Chmura JobsEQ® Platform, Q4 2017

In terms of automation disruption in the high value business services sector, finance, sales, and administrative occupations are most subject to automation particularly in the data collection and processing activities. This includes bankers, tellers, secretaries, cashiers and sale representatives. The majority of graduates have accounting, finance, business, and information technology degrees with a smaller concentration of graduates with specialized business degrees (economics, human resources, marketing).

Table 41: Graduates with Degrees related to High Value Business Services, 2015 to 2017

High Value Business Service Related Programs/Degrees	2015	2016	2017
Accounting & Finance	519	525	518
Management and Business	255	268	301
Marketing	87	112	120
Economics & Statistics	48	61	49
Human Resource Management	21	25	28
Communication	28	29	22
Information Technology	414	432	433
Total Graduates	**958**	**1,020**	**1,038**

Source: LVEDC Educational Survey, 2018

9.4 Transportation, Logistics, Warehousing and Wholesale

9.4.1 National and State Context

The rise of e-commerce has increased the importance of the Transportation, Logistics, Warehousing and Wholesale Sector. The Lehigh Valley has been a focal point for growth in this sector due to its location and proximity to the largest East Coast markets. As the sector becomes more important there has been

a much-publicized driver shortage in trucking seen as part of a larger employee shortage problem facing the entire transportation industry, including the warehouse and logistics sectors.[13] This shortage of trained individuals to replace a rapidly aging workforce in trucking and warehousing will ultimately raise transport and storage costs for shippers. However other technology solutions are being touted as potential solutions to this issue with companies like Tesla developing self-driving tech for semi-trucks. [14]

9.4.2 Top Employers by Number of Employees

Business	County
Amazon.com DEDC LLC	Lehigh
United Parcel Service Inc	Northampton
FedEx Ground Package System Inc	Northampton
Wal-Mart Associates Inc	Northampton
C&S Wholesale Grocers Inc	Northampton
Uline Inc	Lehigh
Phillips Feed Service Inc	Northampton
NFI Interactive Logistics LLC	Northampton

Source: Center for Workforce Information & Analysis: Top 50 Employers Lehigh County, Top 50 Employers Northampton County

9.4.3 Business Establishments in the Transportation, Logistics, Warehousing and Wholesale

The United States Census Bureau's latest 2015 County Business Patterns data recorded 329,920 Transportation, Logistics, Warehousing and Wholesale establishments by the Lehigh Valley definition. Pennsylvania has 12,022 or 4% of these businesses. The Lehigh Valley has 698 or 5.8% of the state total. Table 42 indicates the distribution of the business establishments by industry classification at the national, state and the Lehigh Valley levels. The Lehigh Valley is fairly consistent with the state and nation with the top four industry classifications: General freight trucking, specialized freight trucking, Grocery and related product merchant wholesalers and Household appliances and electrical and electronic goods merchant wholesalers.

Table 42: Establishments in Transportation, Logistics, Warehousing and Wholesale, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	Transportation, Logistics, Warehousing and Wholesale	United States	Pennsylvania	The Lehigh Valley
4811	Scheduled air transportation	2516	60	6
4812	Nonscheduled air transportation	2361	67	4
4832	Inland water transportation	569	21	*
4841	General freight trucking	74098	2870	191

[13] Third Party Logistics Study www.3plstudy.com/3plindex.php

[14] Tesla Developing Self-Driving Semi-Truck www.reuters.com/article/us-tesla-truck-autonomous/exclusive-tesla-developing-self-driving-tech-for-semi-truck-wants-to-test-in-nevada-idUSKBN1AP2GD

2012 NAICS code	Transportation, Logistics, Warehousing and Wholesale	United States	Pennsylvania	The Lehigh Valley
4842	Specialized freight trucking	47555	1906	63
4861	Pipeline transportation of crude oil	796	1	*
4862	Pipeline transportation of natural gas	2179	116	4
4869	Other pipeline transportation	696	31	5
4881	Support activities for air transportation	5762	115	6
4882	Support activities for rail transportation	1403	54	2
4883	Support activities for water transportation	2556	40	1
4884	Support activities for road transportation	11497	431	22
4885	Freight transportation arrangement	20606	515	20
4889	Other support activities for transportation	1671	47	2
4921	Couriers and express delivery services	10402	388	21
4922	Local messengers and local delivery	4451	177	9
4931	Warehousing and storage	15130	664	63
4233	Lumber and other construction materials merchant wholesalers	16840	673	48
4234	Professional and commercial equipment and supplies merchant wholesalers	34136	1365	64
4236	Household appliances and electrical and electronic goods merchant wholesalers	29230	929	64
4242	Drugs and druggists' sundries merchant wholesalers	10129	338	17
4244	Grocery and related product merchant wholesalers	35337	1214	86

Source: United States Census Bureau County Business Patterns 2015 (* Denotes unavailable data)

9.4.4 Employees in the Transportation, Logistics, Warehousing and Wholesale

The United States Census Bureau's latest 2015 County Business Patterns data recorded 16,191,707 Transportation, Logistics, Warehousing and Wholesale Sector employees. Pennsylvania has 824,274 or 5% of these employees. The Lehigh Valley has 21,065 or 2.6% of the state total. Pennsylvania is fairly consistent with the national breakdown of sub-sectors by employment with three of the top four classifications: General freight trucking, Grocery and related product merchant wholesalers and Professional and commercial equipment and supplies merchant wholesalers. The one large outlier is Warehousing and storage which has an 8% higher proportion of employees indicating Pennsylvania's relative strength in the sub-sector. The Lehigh Valley distribution also highlights areas of strength specifically in Professional and commercial equipment and supplies merchant wholesalers with a 4% higher concentration compared to the state and nation. Warehousing and storage build on Pennsylvania's relative strength in the sub-sector with an additional 4% concentration.

Table 43: Employees in Transportation, Logistics, Warehousing and Wholesale, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	Transportation, Logistics, Warehousing and Wholesale	United States	Pennsylvania	The Lehigh Valley
4811	Scheduled air transportation	2516	60	41
4812	Nonscheduled air transportation	2361	67	50
4832	Inland water transportation	569	21	*
4841	General freight trucking	74098	2870	2804
4842	Specialized freight trucking	47555	1906	672
4861	Pipeline transportation of crude oil	796	1	*
4862	Pipeline transportation of natural gas	2179	116	*
4869	Other pipeline transportation	696	31	*
4881	Support activities for air transportation	5762	115	*
4882	Support activities for rail transportation	1403	54	*
4883	Support activities for water transportation	2556	40	*
4884	Support activities for road transportation	11497	431	565
4885	Freight transportation arrangement	20606	515	324
4889	Other support activities for transportation	1671	47	*
4921	Couriers and express delivery services	10402	388	1501
4922	Local messengers and local delivery	4451	177	22
4931	Warehousing and storage	15130	664	5652
4233	Lumber and other construction materials merchant wholesalers	16840	673	1033
4234	Professional and commercial equipment and supplies merchant wholesalers	34136	1365	2909
4236	Household appliances and electrical and electronic goods merchant wholesalers	29230	929	2115
4242	Drugs and druggists' sundries merchant wholesalers	10129	338	296
4244	Grocery and related product merchant wholesalers	35337	1214	3081

Source: United States Census Bureau County Business Patterns 2015 (* Denotes unavailable data)
Note: Due to unavailability of data, numbers are incomplete for scheduled air transportation, local messengers and local delivery and drugs and druggists' sundries merchant wholesalers.

9.4.5 Annual Payroll in the Transportation, Logistics, Warehousing and Wholesale

The United States Census Bureau's latest 2015 County Business Patterns data recorded an annual payroll of $413,646,124 in the Transportation, Logistics, Warehousing and Wholesale Sector. Pennsylvania has $18,281,107 or 4% of this annual payroll. The Lehigh Valley employees take in $1,452,229 or 8% of the state total. Table 44 indicates the distribution of employees by industry classification.

Table 44: Annual Payroll in Transportation, Logistics, Warehousing and Wholesale, USA, Pennsylvania and the Lehigh Valley ($1,000s)

2012 NAICS code	Transportation, Logistics, Warehousing and Wholesale	United States	Pennsylvania	The Lehigh Valley
4811	Scheduled air transportation	$ 29,444,335	$ 792,658	$ 2,362
4812	Nonscheduled air transportation	$ 3,169,967	$ 40,564	$ 3,678
4832	Inland water transportation	$ 1,706,259	$ 39,418	*
4841	General freight trucking	$ 45,046,405	$ 2,127,695	$ 145,541
4842	Specialized freight trucking	$ 22,993,371	$ 1,002,194	$ 32,567
4861	Pipeline transportation of crude oil	$ 1,614,003	*	*
4862	Pipeline transportation of natural gas	$ 3,376,127	$ 134,472	*
4869	Other pipeline transportation	$ 919,209	$ 92,899	*
4881	Support activities for air transportation	$ 7,595,609	$ 88,816	*
4882	Support activities for rail transportation	$ 2,026,194	$ 129,937	*
4883	Support activities for water transportation	$ 6,423,212	$ 78,600	*
4884	Support activities for road transportation	$ 3,087,127	$ 126,328	$ 22,938
4885	Freight transportation arrangement	$ 14,530,184	$ 482,054	$ 14,540
4889	Other support activities for transportation	$ 585,862	$ 29,025	*
4921	Couriers and express delivery services	$ 24,435,171	$ 1,040,516	$ 57,290
4922	Local messengers and local delivery	$ 1,226,301	$ 33,299	$ 993
4931	Warehousing and storage	$ 35,465,434	$ 2,359,614	$ 245,703
4233	Lumber and other construction materials merchant wholesalers	$ 12,530,054	$ 549,939	$ 55,330
4234	Professional and commercial equipment and supplies merchant wholesalers	$ 60,246,086	$ 2,634,125	$ 341,333
4236	Household appliances and electrical and electronic goods merchant wholesalers	$ 55,429,390	$ 1,497,482	$ 340,668
4242	Drugs and druggists' sundries merchant wholesalers	$ 38,644,969	$ 3,168,579	$ 20,610
4244	Grocery and related product merchant wholesalers	$ 43,150,855	$ 1,832,893	$ 168,676

Source: United States Census Bureau County Business Patterns 2015 (* Denotes unavailable data)
Note: Due to unavailability of data, numbers are incomplete for scheduled air transportation, local messengers and local delivery and drugs and druggists' sundries merchant wholesalers.

9.4.6 Transportation, Logistics, Warehousing and Wholesale Occupations

There are 35,410 people or 10% of the total workforce working in Transportation, Logistics, Warehousing and Wholesale Occupations in the Lehigh Valley.

The top five occupations by employment comprising 78% of the sector's workforce are:

- Laborers and Freight, Stock, and Material Movers, Hand 13,870 (39%)
- Heavy and Tractor-Trailer Truck Drivers 6,120 (17%)

- Industrial Truck and Tractor Operators 3,700 (10%)
- Packers and Packagers, Hand 2,090 (6%)
- Light Truck or Delivery Services Drivers 2,060 (6%)

All of these occupations have a lower median income than the Lehigh Valley as a whole.

The Top Five Occupations by Location Quotient

- Industrial Truck and Tractor Operators 2.7
- Conveyor Operators and Tenders 2.55
- Laborers and Freight, Stock, and Material Movers, Hand 2.12
- First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand 1.48
- Heavy and Tractor-Trailer Truck Drivers 1.42

Table 45: Transportation, Logistics, Warehousing and Wholesale Occupations, Allentown-Bethlehem-Easton, PA-NJ MSA

Occupation code	Transportation, Logistics, Warehousing and Wholesale Occupations	Employment	Employment per 1,000 jobs	Location quotient	Median hourly wage	Mean hourly wage	Annual mean wage
53-0000	Transportation and Material Moving Occupations	35410	99.835	1.44	$15	$17	$34,540
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	13870	39.097	2.12	$14	$14	$30,080
53-3032	Heavy and Tractor-Trailer Truck Drivers	6120	17.242	1.42	$21	$22	$45,730
53-7051	Industrial Truck and Tractor Operators	3700	10.421	2.7	$16	$17	$34,890
53-7064	Packers and Packagers, Hand	2090	5.898	1.17	$12	$13	$27,580
53-3033	Light Truck or Delivery Services Drivers	2060	5.799	0.95	$15	$17	$35,450
53-3022	Bus Drivers, School or Special Client	1670	4.695	1.28	$17	$17	$34,560
53-3031	Driver/Sales Workers	1300	3.659	1.21	$9	$12	$24,200
53-7061	Cleaners of Vehicles and Equipment	890	2.507	1.01	$11	$12	$24,100
53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	680	1.931	1.48	$27	$26	$53,660
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	580	1.627	1.13	$31	$32	$66,740
53-3041	Taxi Drivers and Chauffeurs	450	1.263	0.94	$11	$13	$27,070

Occupation code	Transportation, Logistics, Warehousing and Wholesale Occupations	Employment	Employment per 1,000 jobs	Location quotient	Median hourly wage	Mean hourly wage	Annual mean wage
53-3021	Bus Drivers, Transit and Intercity	350	0.981	0.81	$15	$16	$33,010
53-6021	Parking Lot Attendants	340	0.965	0.93	$11	$11	$22,140
53-6031	Automotive and Watercraft Service Attendants	320	0.915	1.17	$10	$10	$21,540
53-7063	Machine Feeders and Offbearers	250	0.696	1.11	$14	$15	$30,330
53-7081	Refuse and Recyclable Material Collectors	220	0.606	0.74	$14	$15	$31,490
53-7011	Conveyor Operators and Tenders	180	0.52	2.55	$14	$16	$32,290
53-7032	Excavating and Loading Machine and Dragline Operators	60	0.162	0.47	$21	$21	$44,710
53-7021	Crane and Tower Operators	40	0.105	0.33	$24	$24	$50,110
53-2012	Commercial Pilots	*	*	*	*	*	$79,430

Source: Bureau of Labor Statistics May 2016 (* Denotes unavailable data)

Table 46: Educational Requirements and Projected Growth, Transportation, Logistics, Warehousing and Wholesale Occupations, National 2016-2026

Occupation Codes	Transportation, Logistics, Warehousing and Wholesale Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	No formal educational credential	Short-term on-the-job training	50,000 or more	As fast as average
53-3032	Heavy and Tractor-Trailer Truck Drivers	Postsecondary nondegree award	Short-term on-the-job training	50,000 or more	As fast as average
53-7051	Industrial Truck and Tractor Operators	No formal educational credential	Short-term on-the-job training	10,000 to 49,999	As fast as average
53-7064	Packers and Packagers, Hand	No formal educational credential	Short-term on-the-job training	10,000 to 49,999	Slower than average
53-3033	Light Truck or Delivery Services Drivers	High school diploma or equivalent	Short-term on-the-job training	50,000 or more	As fast as average
53-3022	Bus Drivers, School or Special Client	High school diploma or equivalent	Short-term on-the-job training	10,000 to 49,999	As fast as average
53-3031	Driver/Sales Workers	High school diploma or equivalent	Short-term on-the-job training	Declining	Little or no change
53-7061	Cleaners of Vehicles and Equipment	No formal educational credential	Short-term on-the-job training	10,000 to 49,999	Faster than average
53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	High school diploma or equivalent	None	10,000 to 49,999	As fast as average
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	High school diploma or equivalent	None	10,000 to 49,999	As fast as average
53-3041	Taxi Drivers and Chauffeurs	No formal educational credential	Short-term on-the-job training	10,000 to 49,999	As fast as average

Occupation Codes	Transportation, Logistics, Warehousing and Wholesale Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
53-3021	Bus Drivers, Transit and Intercity	High school diploma or equivalent	Moderate-term on-the-job training	10,000 to 49,999	As fast as average
53-6021	Parking Lot Attendants	No formal educational credential	Short-term on-the-job training	5,000 to 9,999	As fast as average
53-6031	Automotive and Watercraft Service Attendants	No formal educational credential	Short-term on-the-job training	10,000 to 49,999	Faster than average
53-7063	Machine Feeders and Offbearers	No formal educational credential	Short-term on-the-job training	1,000 to 4,999	Slower than average
53-7081	Refuse and Recyclable Material Collectors	No formal educational credential	Short-term on-the-job training	10,000 to 49,999	Faster than average
53-7011	Conveyor Operators and Tenders	No formal educational credential	Short-term on-the-job training	Declining	Little or no change
53-7032	Excavating and Loading Machine and Dragline Operators	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	As fast as average
53-7021	Crane and Tower Operators	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	As fast as average
53-2012	Commercial Pilots	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Slower than average

Source: Bureau of Labor Statistics October 24, 2017

9.4.7 Transportation, Logistics, Warehousing and Wholesale Talent Demand Assessment

Employment in the Transportation, Logistics, Warehousing and Wholesale target sector is on the rise. Paying nearly $1.88 Billion in wages, companies such as Amazon.com and FedEx are assisting the Lehigh Valley in its reputation as a formidable location (compared to other Pennsylvania locations) for investment.

Table 47: Employment Characteristics, Transportation, Logistics, Warehousing and Wholesale, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
34,271	10,019	5% ↑	$54,743 (annual)	$1.88 Billion (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

When examining the industry's forecasted demand scenario (Table 48), it can be seen that the industry will need to replace 20,978 workers (over 60%) in the next five years. Approximately 7,825 workers within this industry are anticipated to exit the workforce in the next five years, with another 11,688 workers transferring to another industry. Similar to the high value business services, the Transportation, Logistics, Warehousing and Wholesale industry is volatile (as occupations under this target sector are often transferable among other industries) and is forecasted to add another 1,463 workers in the next five years.

Table 48: Industry Snapshot of Employment Demand, Transportation, Logistics, Warehousing and Wholesale, the Lehigh Valley

Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exits (2017-2022)	Anticipated Transfers (2017-2022)
35,734	1,463 ↑	20,978	7,825	11,688

Source: Chmura JobsEQ® Platform, Q4 2017

9.4.8 Transportation, Logistics, Warehousing and Wholesale Talent Supply Assessment

Analyzing occupational figures that are best aligned with the Transportation, Logistics, Warehousing and Wholesale target sector (Table 49), it is anticipated that the current supply of talent in 2017 is significantly lower than the anticipated supply in 2022. This suggests that the focus of the Transportation, Logistics, Warehousing and Wholesale target sector will be on the attraction and retention of new and existing talent. Occupations within this sector that are anticipated to be in high demand and may have a potential supply shortage include general laborers and truck drivers (both heavy and industrial operators), which is consistent with the responses received through the employer survey.

Table 49: Transportation, Logistics, Warehousing and Wholesale Occupations and Supply Outlook

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Laborers and Freight, Stock, and Material Movers, Hand	12,231	3,768	12,984	753
Heavy and Tractor-Trailer Truck Drivers	5,743	1,242	5,912	169
Industrial Truck and Tractor Operators	3,615	1,345	3,763	148
Packers and Packagers, Hand	2,424	668	2,514	90
Light Truck or Delivery Services Drivers	2,335	398	2,411	76
Bus Drivers, School or Special Client	1,250	-178	1,264	14
Driver/Sales Workers	1,145	103	1,137	-8
First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	796	269	853	57
Cleaners of Vehicles and Equipment	736	43	772	36
First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	600	123	614	14
Bus Drivers, Transit and Intercity	458	-24	471	13
Taxi Drivers and Chauffeurs	440	8	431	-9
Machine Feeders and Offbearers	354	114	376	22

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
All Other Transportation, Logistics, Warehousing and Wholesale	1,873	205	1,927	54
Total Transportation, Logistics, Warehousing and Wholesale Occupations	**34,000**	**8,084**	**35,429**	**1,429**

Source: Chmura JobsEQ® Platform, Q4 2017

In addition, the MGI report shows that 60% of the Transportation, Logistics, Warehousing and Wholesale sector will be affected by automation and unlike other primary sectors; this will affect all types of occupations including management, data collection and processing, driving and manual labor. The high potential of automation has already begun to impact the evolution of the trucking industry and its related training activities. The advents of autonomous and semi-autonomous trucks are changing how truck drivers drive. From 'smart cruise' applications to collision mitigation systems, truck drivers are quickly requiring new skills in technology sophistication.

The business survey s illustrates that driver positions in the Lehigh Valley are difficult to hire for. The LVEDC Educational Survey also shows that graduates in driver training have declined. With several businesses looking to hire 20+ employees in the next twelve months, there is a potential case for a talent gap in this industry.[15]

On analyzing degrees, the Lehigh Valley schools do have certificate programs in CDL Driver Training and Logistics & Forklift Safety along with other programs in the transportation and warehousing industry; however, with declining graduates over the past three years, there may be a need to educate the populous on the training opportunities associated with this industry and its increasing sophistication. The industry has evolved from offering occupations that do not require formalized education certificates.

Table 50: Graduates with Degrees related to Transportation, Logistics, Warehousing and Wholesale, 2015 to 2017

Transportation, Logistics, Warehousing and Wholesale Related Programs/Degrees	2015	2016	2017
CDL Truck & Bus Driver	95	94	80
CDL Truck Driver Training	270	255	184
Logistics and Supply Chain Management	135	104	65
Total Graduates	**500**	**453**	**329**

Source: LVEDC Educational Survey, 2018

[15] Figures do not include responses from proprietary schools (McCann, WTTI, Lincoln Tech, and Triangle Tech)

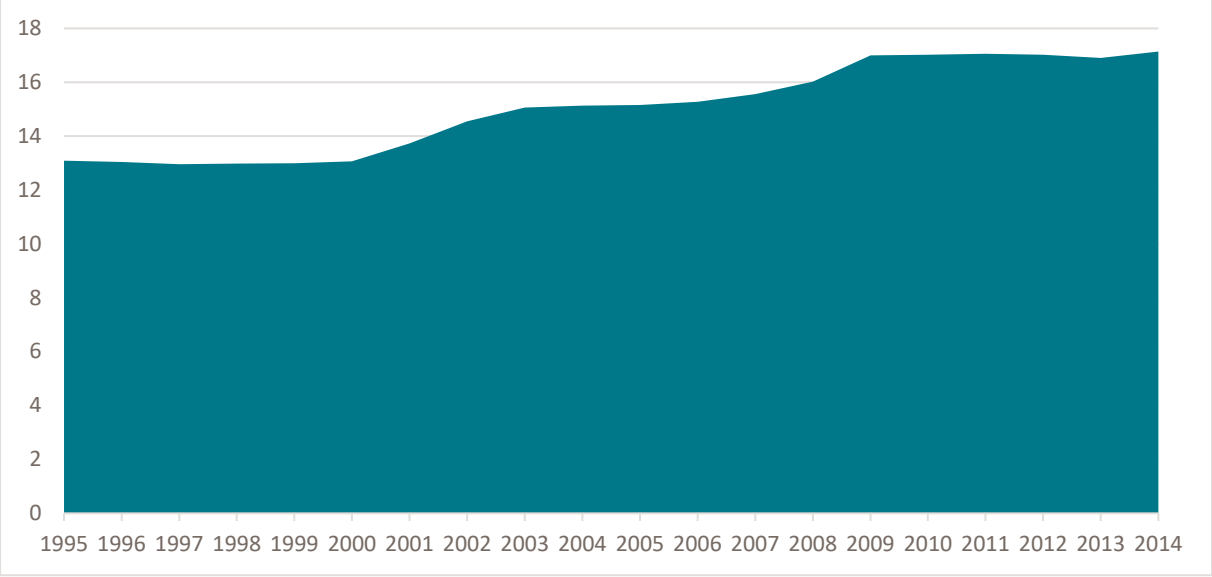
9.5 Health Care Services

9.5.1 National and State Context

Health Care Services is a significant contributor to the American economy, expenditure on health care has risen steadily from 13% of National GDP in 1995 to 17% in 2014. Several major demographic shifts in the USA have contributed to this industry expanding, with more growth projected in the future.

The number of Americans ages 65 and older is projected to more than double from 46 million today to over 98 million by 2060, and the 65-and-older age group's share of the total population will rise to nearly 24 percent from 15 percent.[16] Obesity rates among older adults have been increasing, standing at about 40 percent of 65-to-74-year-olds in 2009-2012[17]. The large share of elderly also means that Social Security and Medicare expenditures will increase from a combined 8 percent of gross domestic product today to 12 percent by 2050.[18]

Figure 19: United States of America Total expenditure on health % Gross domestic product (GDP)



Source: World Health Organization (WHO)

[16] The Population Reference Bureau report, "Aging in the United States," 2016

[17] ibid

[18] ibid

9.5.2 Top Employers by Number of Employees

Business	County
Lehigh Valley Hospital Network	Lehigh
Saint Luke's University Health Network	Northampton
Lehigh Valley Physician Group	Lehigh
Saint Luke's Physician Group Inc.	Northampton
Good Shepherd Rehab Network	Lehigh
Moravian Hall Square Retirement Community	Northampton
Crothall Healthcare Inc	Lehigh

Source: Center for Workforce Information & Analysis: Top 50 Employers Lehigh County, Top 50 Employers Northampton County

9.5.3 Business Establishments in the Health Care Services

The United States Census Bureau's latest 2015 County Business Patterns data recorded 697,227 Health Care Sector businesses by the Lehigh Valley definition. Pennsylvania has 29,188 or 4% of these businesses. The Lehigh Valley has 1,489 or 5.1% of the state total.

Table 51 indicates the distribution of the business establishments by industry classification at the national, state and the Lehigh Valley levels.

The Lehigh Valley is fairly consistent with the state and nation with the top three classifications: offices of physicians, offices of dentists and offices of other health practitioners remaining the same at all three levels combining to take up three-quarters of all Health Care sector establishments.

Table 51: Establishments in Health Care Services, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	Health Care Services	United States	Pennsylvania	The Lehigh Valley
6211	Offices of physicians	225095	9197	576
6212	Offices of dentists	134631	5098	292
6213	Offices of other health practitioners	146137	6179	272
6214	Outpatient care centers	39387	1750	63
6215	Medical and diagnostic laboratories	17265	707	33
6216	Home health care services	30981	1130	55
6219	Other ambulatory health care services	10059	730	33
6221	General medical and surgical hospitals	5361	216	9
6222	Psychiatric and substance abuse hospitals	635	34	1
6223	Specialty (except psychiatric and substance abuse) hospitals	1016	63	5
6231	Nursing care facilities (skilled nursing facilities)	17085	607	20
6232	Residential intellectual and developmental disability, mental health, and substance abuse facilities	40383	2276	69
6233	Continuing care retirement communities and assisted living facilities for the elderly	23929	961	50

2012 NAICS code	Health Care Services	United States	Pennsylvania	The Lehigh Valley
6239	Other residential care facilities	5256	240	11

Source: United States Census Bureau County Business Patterns 2015

9.5.4 Employees in the Health Care Services

The United States Census Bureau's latest 2015 County Business Patterns data recorded 16,191,707 Health Care Sector employees. Pennsylvania has 824,274 or 5% of these employees. The Lehigh Valley has 45,028 or 5.5% of the state total. The Lehigh Valley is fairly consistent with the state and nation with the top three classifications: general medical and surgical hospitals, offices of physicians and nursing care facilities (skilled nursing facilities) remaining the same at all three levels combining to take up over half of all Health Care Sector employees. The following figure indicates the distribution of employees by industry classification.

Table 52: Employees in Health Care Services, United States, Pennsylvania and the Lehigh Valley

2012 NAICS code	Health Care Services	United States	Pennsylvania	The Lehigh Valley
6211	Offices of physicians	2442684	123301	8930
6212	Offices of dentists	905401	35039	2106
6213	Offices of other health practitioners	822458	41012	1484
6214	Outpatient care centers	887232	45382	1445
6215	Medical and diagnostic laboratories	279577	12503	1730
6216	Home health care services	1377447	56059	2853
6219	Other ambulatory health care services	291825	21559	938
6221	General medical and surgical hospitals	5199364	243675	16464
6222	Psychiatric and substance abuse hospitals	227394	13592	*
6223	Specialty (except psychiatric and substance abuse) hospitals	291228	16692	*
6231	Nursing care facilities (skilled nursing facilities)	1676501	74371	2537
6232	Residential intellectual and developmental disability, mental health, and substance abuse facilities	748516	60364	2116
6233	Continuing care retirement communities and assisted living facilities for the elderly	909873	74014	4262
6239	Other residential care facilities	132207	6711	163

Source: Bureau of Labor Statistics May 2016 (* Denotes unavailable data)
Note: Due to unavailability of data, numbers are incomplete for general medical and surgical hospitals and other residential care facilities.

9.5.5 Annual Payroll in the Health Care Services

The United States Census Bureau's latest 2015 County Business Patterns data recorded an annual payroll of $838,144,353 in the Health Care Sector. Pennsylvania has $40,696,044 or 5% of this annual payroll. The Lehigh Valley employees take in $2,380,391 or 5.8% of the state total. The Lehigh Valley is slightly higher than the state and nation with the top two highest paid industry classifications: general medical and surgical hospitals, offices of physicians combining to take up 72% of all Health Care Sector annual payroll, 10% higher than the state and nation. Table 53 indicates the distribution of employees by industry classification.

Table 53: Annual Payroll in Health Care Services, United States, Pennsylvania and the Lehigh Valley ($1,000)

2012 NAICS code	Health Care Services	United States	Pennsylvania	The Lehigh Valley
6211	Offices of physicians	$ 210,025,723	$ 10,661,326	$ 828,891
6212	Offices of dentists	$ 43,802,048	$ 1,572,273	$ 94,044
6213	Offices of other health practitioners	$ 31,995,168	$ 1,556,010	$ 57,278
6214	Outpatient care centers	$ 46,330,522	$ 2,281,940	$ 58,681
6215	Medical and diagnostic laboratories	$ 17,399,925	$ 781,751	$ 65,917
6216	Home health care services	$ 37,785,492	$ 1,853,191	$ 84,131
6219	Other ambulatory health care services	$ 11,803,577	$ 797,368	$ 29,316
6221	General medical and surgical hospitals	$ 313,912,868	$ 13,374,154	$ 896,043
6222	Psychiatric and substance abuse hospitals	$ 11,831,755	$ 687,448	*
6223	Specialty (except psychiatric and substance abuse) hospitals	$ 17,421,820	$ 837,135	*
6231	Nursing care facilities (skilled nursing facilities)	$ 50,476,380	$ 2,403,748	$ 84,776
6232	Residential intellectual and developmental disability, mental health, and substance abuse facilities	$ 19,171,848	$ 1,734,288	$ 63,499
6233	Continuing care retirement communities and assisted living facilities for the elderly	$ 22,163,980	$ 1,948,696	$ 113,692
6239	Other residential care facilities	$ 4,023,247	$ 206,716	$ 4,123

Source: United States Census Bureau County Business Patterns 2015 (* Denotes unavailable data)
Note: Due to unavailability of data, numbers are incomplete for general medical and surgical hospitals and other residential care facilities.

9.5.6 Health Care Services Occupations

Occupations within the Health care sector are split between two major occupation groups, namely, Health Care Services Support Occupations and Health Care Services Practitioners and Technical Occupations. These are split by the Bureau of Labor Statistics due to major gaps in responsibilities, pay and educational requirements.

Top Health Care Services Support Occupations in the Lehigh Valley

The Lehigh Valley has 12,260 people working in Health Care Services Support Occupations or 3% of the total labor force as of the latest 2016 Bureau of Labor Statistics data May 2016.

The top five occupations making up 86% of the workforce in the sector are:

- Nursing Assistants 5,490 (44%)
- Medical Assistants 2,100 (17%)
- Home Health Aides 1,750 (14%)
- Dental Assistants 860 (7%)
- Phlebotomists 540 (4%)

All of these occupations are reporting annual mean incomes lower than the Lehigh Valley average of $46,590.

The Top Five Occupations by Location Quotient are:

- Orderlies 2.16
- Occupational Therapy Assistants 1.61
- Phlebotomists 1.78
- Medical Assistants 1.33
- Nursing Assistants 1.5

Table 54: Health Care Services Support Occupations in Allentown-Bethlehem-Easton, PA-NJ MSA

Occupation code	Health Care Services Support Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
31-0000	Health care Support Occupations	12,260	34.556	1.2	$14.75	$30,680
31-1014	Nursing Assistants	5,490	15.47	1.5	$14.59	$30,350
31-9092	Medical Assistants	2,100	5.914	1.33	$15.21	$31,640
31-1011	Home Health Aides	1,750	4.93	0.85	$10.99	$22,870
31-9091	Dental Assistants	860	2.435	1.04	$16.87	$35,080
31-9097	Phlebotomists	540	1.531	1.78	$15.99	$33,250
31-1015	Orderlies	290	0.816	2.16	$13.64	$28,380
31-2021	Physical Therapist Assistants	210	0.597	0.98	$27.29	$56,760
31-9096	Veterinary Assistants and Laboratory Animal Caretakers	200	0.572	1	$10.70	$22,250
31-2011	Occupational Therapy Assistants	160	0.439	1.61	$25.68	$53,420
31-9011	Massage Therapists	150	0.434	0.64	$16.48	$34,280

Occupation code	Health Care Services Support Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
31-9093	Medical Equipment Preparers	130	0.376	1	$16.15	$33,580
31-9099	Healthcare Support Workers, All Other	110	0.302	0.45	$17.93	$37,290
31-9094	Medical Transcriptionists	100	0.271	0.71	$18.37	$38,220
31-2022	Physical Therapist Aides	70	0.198	0.55	$12.30	$25,580
31-9095	Pharmacy Aides	*	*	*	$10.85	$22,580

Source: Bureau of Labor Statistics May 2016 (* Denotes unavailable data)

Table 55: Educational Requirements and Projected Growth, Health Care Services Support Occupations, National 2016-2026

Occupation Code	Health Care Services Support Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
31-1014	Nursing Assistants	Postsecondary nondegree award	None	50,000 or more	Faster than average
31-9092	Medical Assistants	Postsecondary nondegree award	None	50,000 or more	Much faster than average
31-1011	Home Health Aides	High school diploma or equivalent	Short-term on-the-job training	50,000 or more	Much faster than average
31-9091	Dental Assistants	Postsecondary nondegree award	None	50,000 or more	Much faster than average
31-9097	Phlebotomists	Postsecondary nondegree award	None	10,000 to 49,999	Much faster than average
31-1015	Orderlies	High school diploma or equivalent	Short-term on-the-job training	1,000 to 4,999	As fast as average
31-2021	Physical Therapist Assistants	Associate's degree	None	10,000 to 49,999	Much faster than average
31-9096	Veterinary Assistants and Laboratory Animal Caretakers	High school diploma or equivalent	Short-term on-the-job training	10,000 to 49,999	Much faster than average
31-2011	Occupational Therapy Assistants	Associate's degree	None	10,000 to 49,999	Much faster than average
31-9011	Massage Therapists	Postsecondary nondegree award	None	10,000 to 49,999	Much faster than average
31-9093	Medical Equipment Preparers	High school diploma or equivalent	Moderate-term on-the-job training	5,000 to 9,999	Faster than average
31-9099	Healthcare Support Workers, All Other	High school diploma or equivalent	None	10,000 to 49,999	Faster than average
31-9094	Medical Transcriptionists	Postsecondary nondegree award	None	Declining	Decline

Occupation Code	Health Care Services Support Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
31-2022	Physical Therapist Aides	High school diploma or equivalent	Short-term on-the-job training	10,000 to 49,999	Much faster than average
31-9095	Pharmacy Aides	High school diploma or equivalent	Short-term on-the-job training	Declining	Decline

Source: Bureau of Labor Statistics October 24, 2017

9.5.7 Top Health Care Services Practitioners and Technical Occupations

There are 26,760 people or 8% of the total workforce working in Health Care Services Practitioners and Technical Occupations in the Lehigh Valley.

The top five occupations by employment comprising 57% of the sector are:

- Registered Nurses 9,410 (35%)
- Licensed Practical and Licensed Vocational Nurses 2,110 (8%)
- Physicians and Surgeons, All Other 1,730 (6%)
- Emergency Medical Technicians and Paramedics 1,040 (4%)
- Pharmacists 1,010 (4%)

Of these occupations only, Emergency Medical Technicians and Paramedics have a lower median income than Lehigh Valley as a whole while Physicians and Surgeons annual income is $215,950, four and a half times the Lehigh valley median.

The Top Five Occupations by Location Quotient are:

- Nurse Anesthetists 5.04
- Podiatrists 2.27
- Diagnostic Medical Sonographers 2.19
- Physicians and Surgeons, All Other 2.02
- Physician Assistants 1.91

Table 56: Health Care Services Practitioners and Technical Occupations, Allentown-Bethlehem-Easton, PA-NJ MSA

Occupation code	Health Care Services Practitioners and Technical Occupations	Employment	Employment per 1,000 jobs	Location quotient	Mean hourly wage	Annual mean wage
29-0000	Healthcare Practitioners and Technical Occupations	26760	75.457	1.27	$40	$82,490
29-1141	Registered Nurses	9410	26.54	1.3	$32	$67,190
29-2061	Licensed Practical and Licensed Vocational Nurses	2110	5.945	1.19	$23	$46,860
29-1069	Physicians and Surgeons, All Other	1730	4.874	2.02	$104	$215,950
29-2041	Emergency Medical Technicians and Paramedics	1040	2.935	1.68	$19	$39,510
29-1051	Pharmacists	1010	2.835	1.3	$56	$116,220
29-2052	Pharmacy Technicians	880	2.477	0.87	$13	$28,000
29-2021	Dental Hygienists	770	2.167	1.48	$33	$68,000
29-2034	Radiologic Technologists	770	2.168	1.52	$29	$60,980
29-1123	Physical Therapists	580	1.626	1.05	$43	$89,310
29-2011	Medical and Clinical Laboratory Technologists	520	1.464	1.23	$28	$58,690
29-2071	Medical Records and Health Information Technicians	520	1.474	1.03	$18	$37,350
29-1151	Nurse Anesthetists	510	1.432	5.04	$71	$147,700
29-1071	Physician Assistants	500	1.413	1.91	$46	$94,820
29-1127	Speech-Language Pathologists	500	1.401	1.45	$40	$83,710
29-1126	Respiratory Therapists	480	1.358	1.5	$29	$60,280
29-1122	Occupational Therapists	460	1.285	1.53	$39	$81,940
29-2012	Medical and Clinical Laboratory Technicians	360	1.003	0.88	$22	$44,950
29-2032	Diagnostic Medical Sonographers	360	1.026	2.19	$32	$65,960
29-2055	Surgical Technologists	350	0.995	1.32	$22	$45,460
29-1171	Nurse Practitioners	330	0.937	0.88	$47	$97,870
29-1021	Dentists, General	240	0.678	0.9	$95	$198,320
29-2056	Veterinary Technologists and Technicians	240	0.672	0.95	$16	$32,800
29-1131	Veterinarians	230	0.65	1.35	$33	$68,000
29-1031	Dietitians and Nutritionists	200	0.57	1.3	$30	$62,140
29-2031	Cardiovascular Technologists and Technicians	200	0.564	1.47	$27	$55,960
29-2081	Opticians, Dispensing	190	0.53	0.99	$18	$37,470
29-2099	Health Technologists and Technicians, All Other	170	0.49	0.56	$26	$53,600
29-1062	Family and General Practitioners	150	0.421	0.48	$106	$220,600
29-2035	Magnetic Resonance Imaging Technologists	150	0.432	1.69	$33	$68,610
29-2051	Dietetic Technicians	150	0.42	1.83	$13	$27,420

29-9011	Occupational Health and Safety Specialists	150	0.412	0.76	$37	$76,220
29-1041	Optometrists	100	0.277	1.07	$60	$124,760
29-1066	Psychiatrists	70	0.188	1.07	$98	$203,300
29-2033	Nuclear Medicine Technologists	70	0.188	1.35	$36	$74,640
29-1081	Podiatrists	60	0.158	2.27	$94	$196,450
29-1125	Recreational Therapists	60	0.158	1.23	$19	$40,350
29-1124	Radiation Therapists	50	0.129	1.04	$37	$77,600
29-1023	Orthodontists	40	0.104	2.8	*	*
29-9012	Occupational Health and Safety Technicians	40	0.106	0.9	$23	$48,690
29-9091	Athletic Trainers	40	0.119	0.69	*	$56,160
29-1181	Audiologists	30	0.092	1.05	$40	$82,210
29-1011	Chiropractors	*	*	*	$32	$65,550
29-1029	Dentists, All Other Specialists	*	*	*	$67	$138,490
29-1061	Anesthesiologists	*	*	*	$132	$274,530
29-1063	Internists, General	*	*	*	$86	$178,070
29-1064	Obstetricians and Gynecologists	*	*	*	$89	$185,670
29-1128	Exercise Physiologists	*	*	*	$20	$42,530
29-2057	Ophthalmic Medical Technicians	*	*	*	$16	$33,110

Source: Bureau of Labor Statistics May 2016 (* Denotes unavailable data)

Table 57: Educational Requirements and Projected Growth, Health Care Services Practitioners and Technical Occupations, National 2016-2026

Occupation Code	Health Care Services Practitioners and Technical Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
29-1141	Registered Nurses	Bachelor's degree	None	50,000 or more	Much faster than average
29-2061	Licensed Practical and Licensed Vocational Nurses	Postsecondary nondegree award	None	50,000 or more	Faster than average
29-1069	Physicians and Surgeons, All Other	Doctoral or professional degree	Internship/ residency	10,000 to 49,999	Faster than average
29-2041	Emergency Medical Technicians and Paramedics	Postsecondary nondegree award	None	10,000 to 49,999	Much faster than average
29-1051	Pharmacists	Doctoral or professional degree	None	10,000 to 49,999	As fast as average
29-2052	Pharmacy Technicians	High school diploma or equivalent	Moderate-term on-the-job training	10,000 to 49,999	Faster than average
29-2021	Dental Hygienists	Associate's degree	None	10,000 to 49,999	Much faster than average

Occupation Code	Health Care Services Practitioners and Technical Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
29-2034	Radiologic Technologists	Associate's degree	None	10,000 to 49,999	Faster than average
29-1123	Physical Therapists	Doctoral or professional degree	None	50,000 or more	Much faster than average
29-2011	Medical and Clinical Laboratory Technologists	Bachelor's degree	None	10,000 to 49,999	Faster than average
29-2071	Medical Records and Health Information Technicians	Postsecondary nondegree award	None	10,000 to 49,999	Faster than average
29-1151	Nurse Anesthetists	Master's degree	None	5,000 to 9,999	Much faster than average
29-1071	Physician Assistants	Master's degree	None	10,000 to 49,999	Much faster than average
29-1127	Speech-Language Pathologists	Master's degree	Internship/ residency	10,000 to 49,999	Much faster than average
29-1126	Respiratory Therapists	Associate's degree	None	10,000 to 49,999	Much faster than average
29-1122	Occupational Therapists	Master's degree	None	10,000 to 49,999	Much faster than average
29-2012	Medical and Clinical Laboratory Technicians	Associate's degree	None	10,000 to 49,999	Faster than average
29-2032	Diagnostic Medical Sonographers	Associate's degree	None	10,000 to 49,999	Much faster than average
29-2055	Surgical Technologists	Postsecondary nondegree award	None	10,000 to 49,999	Faster than average
29-1171	Nurse Practitioners	Master's degree	None	50,000 or more	Much faster than average
29-1021	Dentists, General	Doctoral or professional degree	None	10,000 to 49,999	Much faster than average
29-2056	Veterinary Technologists and Technicians	Associate's degree	None	10,000 to 49,999	Much faster than average
29-1131	Veterinarians	Doctoral or professional degree	None	10,000 to 49,999	Much faster than average
29-1031	Dietitians and Nutritionists	Bachelor's degree	Internship/ residency	5,000 to 9,999	Faster than average
29-2031	Cardiovascular Technologists and Technicians	Associate's degree	None	5,000 to 9,999	Faster than average
29-2081	Opticians, Dispensing	High school diploma or equivalent	Long-term on-the-job training	10,000 to 49,999	Much faster than average
29-2099	Health Technologists and Technicians, All Other	Postsecondary nondegree award	None	10,000 to 49,999	Much faster than average

Occupation Code	Health Care Services Practitioners and Technical Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
29-1062	Family and General Practitioners	Doctoral or professional degree	Internship/ residency	10,000 to 49,999	Much faster than average
29-2035	Magnetic Resonance Imaging Technologists	Associate's degree	None	5,000 to 9,999	Faster than average
29-2051	Dietetic Technicians	Associate's degree	None	1,000 to 4,999	As fast as average
29-9011	Occupational Health and Safety Specialists	Bachelor's degree	None	5,000 to 9,999	As fast as average
29-1041	Optometrists	Doctoral or professional degree	None	5,000 to 9,999	Much faster than average
29-1066	Psychiatrists	Doctoral or professional degree	Internship/ residency	1,000 to 4,999	Faster than average
29-2033	Nuclear Medicine Technologists	Associate's degree	None	1,000 to 4,999	Faster than average
29-1081	Podiatrists	Doctoral or professional degree	Internship/ residency	1,000 to 4,999	Faster than average
29-1125	Recreational Therapists	Bachelor's degree	None	1,000 to 4,999	As fast as average
29-1124	Radiation Therapists	Associate's degree	None	1,000 to 4,999	Faster than average
29-1023	Orthodontists	Doctoral or professional degree	Internship/ residency	1,000 to 4,999	Much faster than average
29-9012	Occupational Health and Safety Technicians	High school diploma or equivalent	Moderate-term on-the-job training	1,000 to 4,999	Faster than average
29-9091	Athletic Trainers	Bachelor's degree	None	5,000 to 9,999	Much faster than average
29-1181	Audiologists	Doctoral or professional degree	None	1,000 to 4,999	Much faster than average
29-1011	Chiropractors	Doctoral or professional degree	None	5,000 to 9,999	Faster than average
29-1029	Dentists, All Other Specialists	Doctoral or professional degree	Internship/ residency	0 to 999	Faster than average
29-1061	Anesthesiologists	Doctoral or professional degree	Internship/ residency	5,000 to 9,999	Much faster than average
29-1063	Internists, General	Doctoral or professional degree	Internship/ residency	5,000 to 9,999	Much faster than average

Occupation Code	Health Care Services Practitioners and Technical Occupations	Entry-Level Education	On-The-Job Training	Projected Number of New Jobs	Projected Growth Rate
29-1064	Obstetricians and Gynecologists	Doctoral or professional degree	Internship/ residency	1,000 to 4,999	Much faster than average
29-1128	Exercise Physiologists	Bachelor's degree	None	1,000 to 4,999	Faster than average
29-2057	Ophthalmic Medical Technicians	Postsecondary nondegree award	None	5,000 to 9,999	Much faster than average

Source: Bureau of Labor Statistics October 24, 2017

9.5.8 Health Care Services Talent Demand Assessment

Over the past five years, the health care service industry has continued to be one of the largest industry sectors in the Lehigh Valley. Accounting for $2.46 Billion in wages paid in the region, this sector can be found throughout the Lehigh Valley, from the populated urban centers to more rural communities.

Table 58: Employment Characteristics, Health Care Services, the Lehigh Valley

Employed (2017)	Employment Change (2012-2017)	Average Annual Growth Rate	Average Compensation	Total Wages
53,056	4,060	2% ↑	$46,452 (annual)	$2.46 Billion (in 2017)

Source: Chmura JobsEQ® Platform, Q4 2017

Forecasted Talent Demand

When examining the industry's forecasted demand scenario (Table 59), it can be seen that the industry will need to replace 29,586 workers in the next five years. Approximately 12,330 workers within this industry are anticipated to exit the workforce in the next five years, with another 12,911 workers transferring to another industry. Perhaps unique to this target sector is the amount of anticipated new employment is needed with approximately 4,339 workers added to the total employment demand.

Table 59: Industry Snapshot of Employment Demand, Health Care Services, the Lehigh Valley

Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand	Anticipated Exits (2017-2022)	Anticipated Transfers (2017-2022)
57,395	4,339 ↑	29,586	12,330	12,911

Source: Chmura JobsEQ® Platform, Q4 2017

9.5.9 Health Care Services Talent Supply Assessment

Analyzing occupational figures that are best aligned with the health care service target sector (Table 60), it is anticipated that the current supply of talent in 2017 is significantly lower than the anticipated supply in 2022 both for practitioners and support services providers. This suggests that the focus of the health care services sector will be on the attraction and new and existing talent. Occupations within this sector that are anticipated to be in high demand and may have a potential supply shortage include registered nurses, nursing assistants, home health aides, and medical assistants, each consistent with the occupational challenges employers identified.

Table 60: Health Care Service Occupations and Supply Outlook

Health Care Service Occupations	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Registered Nurses	8,047	680	8,523	476
Nursing Assistants	4,341	17	4,559	218
Home Health Aides	1,858	407	2,223	365
Medical Assistants	1,804	39	2,030	226
Licensed Practical and Licensed Vocational Nurses	1,794	27	1,889	95
Physicians and Surgeons, All Other	1,250	14	1,327	77
Pharmacy Technicians	823	17	860	37
Pharmacists	791	24	803	12
Dental Assistants	693	33	753	60
Radiologic Technologists	649	49	681	32
Emergency Medical Technicians and Paramedics	631	-94	675	44
Physical Therapists	537	0	590	53
Dental Hygienists	524	26	569	45
Medical and Clinical Laboratory Technologists	498	40	524	26
All other Health care Service Occupations	9,402	526	10,118	716
Total Health care Service Occupations	33,642	1,805	36,124	2,482

Source: JobsEQ, Occupational Snapshot, Q4 2017

Similar to the life sciences research and manufacturing industry, occupations in health care services have a lower proportion of automation potential. There is an increasing role in the use of technology (ex. point of care technology, digitized health records, patient and staff identification systems) in the field which is leading to new desired skills in traditional occupations such as nursing and medical assistance (skills that are now part of today's college programs in these fields).

In analyzing degrees, graduates in nursing and nursing related programs are the third highest in the region compared to other post-secondary degrees. That being said, health related degrees in general in the Lehigh Valley have decreased slightly from 1,402 graduates in 2015 to 1,322 graduates in 2017 (Table 61).

Table 61: Graduates with Degrees related to Health Care Services, 2015 to 2017

Health Care Services Related Programs/Degrees	2015	2016	2017
Health-Related Degrees	613	543	556
Medical Degrees	163	173	148
Nursing	626	629	618
Total Graduates	1,402	1,345	1,322

Source: LVEDC Educational Survey, 2018

The number of graduates has decreased over the years, indicating that the competitiveness of the sector might be affected in the short term. These numbers need to be monitored to assess if the declining trend continues over the longer term. Efforts should be focussed on improving awareness and increasing enrollment to meet employment opportunities.

10. Talent Pipeline Assessment

10.1 Talent Demand Assessment

As of 2017, the Lehigh Valley's target sector industries employed over 175,000 individuals. Together, the five target sector industries saw a collective growth of 18,215 workers over the last 5 years (2012-2017) or about an annual 2% increase in its total employment. Looking outwards, the next five years forecast that the target sector industries have an anticipated net employment growth of 7,267 workers. The five year forecast also predicts that the target sectors will see approximately 37,700 workers leave these industries as retirees and 51,775 workers transfer out of these industries and into other industries. Taking into account all three figures, the target sector industries have an anticipated replacement demand of 96,826 workers. Table 62 provides a detailed outlook at each target sector industry.

Table 62: Industry Snapshot of Current and Forecasted Employment, the Lehigh Valley

Target Sector	Employment in 2017	Total Employment Change (2012-2017)	Average Annual Growth Rate (2012-2017)	Forecasted Employment in 2022	Anticipated Employment Growth Change (2017-2022)	Total Replacement Demand±
Advanced Manufacturing and Food and Beverage Manufacturing	24,764	2,564	8%	23,955	-809	11,956
Life Science Research and Manufacturing	10,388	214	-1%	10,953	565	5,354
High Value Business Services	53,126	1,358	2%	54,835	1,709	28,952
Transportation, Logistics, Warehousing and Wholesale	34,271	10,019	5%	35,734	1,463	20,978
Health Care Services	53,056	4,060	2%	57,395	4,339	29,586
Total	**175,605**	**18,215**	**2%**	**182,872**	**7,267**	**96,826**

Source: Chmura JobsEQ® Platform, Q4 2017

± Total Replacement Demand = Number of workers transferring (moving to another industry) and exiting the industry (retiring) + the anticipated employment growth change)

10.2 Talent Supply Assessment

To gain an understanding of the talent supply needs in the Lehigh Valley, a combination of occupational data and primary research was examined. The occupational data examined existing supply and forecasted occupational growth and the primary research examined survey findings from an educational survey conducted by LVEDC in early 2018 with the Lehigh Valley's colleges, universities and career and technical schools.

10.2.1 Occupational Outlook

In 2017 there were a total of 320,516 jobs in the Lehigh Valley. Examining each occupation, the following top ten occupations were identified as the top growing (Table 63) and top declining (Table 64) as related to the target sectors.

Table 63: Top Ten Growing Occupations in the Lehigh Valley (2017)

Occupation	Annual Percent Change, Projected Demand 2017-2022	Current Demand	Forecasted Demand	Forecasted Needed Employment
Home Health Aides	3.6%	1,858	2,223	365
Personal Care Aides	3.2%	4,585	5,373	788
Medical Assistants	2.4%	1,803	2,029	226
Software Developers, Applications	2.2%	1,056	1,180	124
Phlebotomists	2.1%	453	503	50
Mental Health and Substance Abuse Social Workers	2.0%	404	445	41
Mental Health Counselors	2.0%	387	427	40
Social and Human Service Assistants	1.9%	791	868	77
Medical Secretaries	1.8%	1,471	1,609	138
Nonfarm Animal Caretakers	1.8%	504	551	47
Total - All Occupations	**0.6%**	**320,516**	**329,861**	**9,345**

Source: Chmura JobsEQ® Platform, Q4 2017

Table 64: Top Ten Declining Occupations in the Lehigh Valley (2017)

Occupation	Annual Percent Change, Projected Demand 2017-2022	Current Demand	Forecasted Demand	Forecasted Needed Employment
Sewing Machine Operators	-2.5%	554	489	-65
Electrical and Electronic Equipment Assemblers	-2.3%	861	765	-96

Occupation	Annual Percent Change, Projected Demand 2017-2022	Current Demand	Forecasted Demand	Forecasted Needed Employment
Legal Secretaries	-2.2%	268	240	-28
Executive Secretaries and Executive Administrative Assistants	-2.0%	1,124	1,014	-110
Postal Service Mail Sorters, Processors, and Processing Machine Operators	-1.9%	325	295	-30
Assemblers and Fabricators, All Other	-1.7%	589	540	-49
Photographers	-1.3%	254	238	-16
Team Assemblers	-1.2%	3,264	3,074	-190
Inspectors, Testers, Sorters, Samplers, and Weighers	-1.1%	1,611	1,522	-89
Cutting, Punching, and Press Machine Setters, Operators, and Tenders	-1.1%	378	357	-21
Total - All Occupations	**0.6%**	**320,516**	**329,861**	**9,345**

Source: Chmura JobsEQ® Platform, Q4 2017

Both figures indicate a shift towards health care services and IT/computer system applications and a move away from occupations that have been impacted by the advancement of technology in the workplace that has led to the automation of certain skills (ex. package processing).

10.2.2 Occupational Outlook by Target Sector

Common Occupations Across All Industry Sectors

In examining common occupational titles (ranging from middle-skilled to high-skilled talent) across all industry sectors, a total of 26,592 jobs are potentially being shared. The common occupations, for the majority, have historically illustrated significant growth (approximately 4,151 from 2012). However, looking out five years, it is anticipated that the supply will continue to grow but at a slower pace. This trend might be a reflection on the impact of workplace dynamics. As technology advancements emerge within workplaces, so does the risk of automation and efficiencies. Traditional occupations across all industries such as general labor, are being replaced by machines or new assembly line processes. However, technology advancements can also support the creation of new occupations. Occupations focused on technology support or security such as computer system analysts or information security analysts are forecasted to grow naturally in the Lehigh Valley. This indicates an anticipated growing demand for these occupations.

Table 65: Common Occupations and Supply Outlook

Occupation	Current Supply (2017)	Historic Supply Growth (2012-2017)	Anticipated Supply (2022)	Forecasted Supply Growth (2017-2022)
Laborers and Freight, Stock, and Material Movers, Hand	12,231	3,768	12,984	753
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	4,738	-20	4,911	173
General and Operations Managers	3,457	140	3,568	111
Security Guards	2,324	309	2,385	61
Financial Managers	857	-45	926	69
Computer Systems Analysts	840	-11	863	23
Network and Computer Systems Administrators	679	12	690	11
Chief Executives	434	1	420	-14
Human Resources Managers	250	-4	259	9
Computer Network Architects	232	3	236	4
Database Administrators	223	5	233	10
Purchasing Managers	151	-2	154	3
Information Security Analysts	115	-1	129	14
Training and Development Managers	61	-4	63	2
Total Common Occupations	**26,592**	**4,151**	**27,821**	**1,229**

Source: Chmura JobsEQ® Platform, Q4 2017

10.3 Talent Gap Assessment

The talent demand and supply analysis shows that the Lehigh Valley has a fairly robust talent pool (both existing and emerging as graduates), capable of participating in the labor force. The area is well positioned to compete in technology advancement as graduates in technology and related degrees are continuously increasing. Furthermore, the growth of workplace opportunities will enable the current and incoming talent pipeline to fully participate in the labor market and develop skills to meet the needs of employers.

In terms of Industry needs, the Lehigh Valley needs to focus on developing programs that are individual to the sector. Key assessment outcomes are listed below:

- While the low-skill occupations including machine operators, truck drivers and packagers might be replaced by automation, the Lehigh Valley is well positioned in terms of technology advancement in the Advanced Manufacturing and Food and Beverage Manufacturing and Transportation, Logistics, Warehousing and Wholesale sectors. As such employers will need to continue attracting, but more importantly retain middle- to high-skilled talent to ensure supply is maintained.

- The region is also well positioned to compete in the economy in terms of management and high-skills jobs in High Value Business Services, Health Care Services and Life Science Research and Manufacturing. As these sectors are less affected by automation, there will need to be a concerted effort in continuing to grow these skillsets through higher education or attraction efforts.

11. Best and Promising Practices

The following section presents a series of best and promising practices researched from throughout the world. The themes included below were selected based on the findings from the project research and engagement in order to present ideas and relevant examples to help address barriers/challenges experienced in the Lehigh Valley.

Career Planning in the Classroom with Career and Technical Education

Career and Technical Education (CTE) focuses on teaching the technical and applied skills needed in high-demand sectors such as information and communication technology, health science, manufacturing, and transportation, distribution and logistics. CTE programs focus on building career pathways for students and introduce them to the potential of technical careers – something students may never seek out on their own due to preconceptions of what technical schooling and technical careers may entail.

CTE Programming in Middle/Junior High School in Utah

In the state of Utah, students in middle/junior high school must take a year-long, exploratory Career and Technical Education Introduction course as part of their core curriculum requirement. The purpose of this course is to allow students to be involved in activity-centered lessons, which utilize technology and develop basic workforce skills. The course provides students with direction, decision-making, and planning activities to explore more than 60 CTE college and career pathways.

An introductory career exploration course has been offered in Utah since 1986 and has been a mandatory requirement since 1999. The CTE Introduction course grew out of research that suggests career interventions are most effective in middle school. The CTE Introduction course was pilot tested with 63 schools in 1999 and implemented statewide in 2000. The current CTE Introduction course was revised in 2008 to reflect technical changes and new career opportunities.

The CTE Intro course has three major objectives:

- **Self-Knowledge**
  - Assessing the individual's interest and abilities
- **Education and Occupation Exploration**
  - Exploring the nature of work and changing world of work
  - Exploring non-traditional as well as traditional roles
  - Examining high-growth and emerging occupations (and their potential earnings)
- **Career Pathways Planning**
  - Understanding the importance of education and occupation decision making
  - Examining education and training that are necessary for various careers
  - Planning the future for each student with parents, counselors and educators

- Work-based learning activities, such as career fairs, field studies, job shadowing and guest speakers

In terms of impacts, the Utah Board of Education has found that:

- CTE graduates find employment 2.2 times faster than general education graduates
- High school students who graduate with a Career and Technical Education concentration are 2.5 times more likely to be employed while pursuing postsecondary education
- Students who participate in work-based learning activities such as internships, job shadowing, field studies, and career fairs are 30 percent less likely to drop out of high school

Key Insights for the Lehigh Valley

- Creating more opportunities for students in middle and high school to think about and be taught about career planning was an important finding from the stakeholder engagement.
- Creating a mandatory curriculum-based approach to ensuring students are learning about a wide variety of career options is critical in fighting against persistent misperceptions students (and parents) have of certain industries. Fighting these misperceptions would help to encourage more young people to pursue careers in those industries.

Youth Apprenticeship

Youth Apprenticeships gives students the opportunity to prepare for and explore an occupation before committing to a full apprenticeship. Participants are exposed to a skilled trade of their choosing and provided opportunity to earn apprenticeship hours, and school credit. These programs help participants learn various workplace skills, including employability skills such as teamwork and communication, and may enable employers to better gauge participant interest and aptitude.

High School Apprenticeship with CenterLine Limited

CenterLine Limited is a manufacturing company based in the City of Windsor, Canada (on the USA border near Detroit) that specializes in designing and building advanced automation machinery and products that satisfy resistance welding, metal forming, and cold spray application needs. CenterLine started as a small family-run company that has grown into a company with over 500 employees and a client base throughout the world that operates largely within the automotive, mass transit, aerospace, and defense industries.

CenterLine's approach to hiring employees is to "get 'em young and train 'em." The company develops many of its employees through high-school co-op and apprenticeship programs, hiring largely for attitude and providing the skills training and cross-training needed to turn young workers into experienced problem-solving professionals. As a result, the company generally starts new employees on the plant floor to learn about the company culture and processes, and once comfortable in that role, helps employees find their passion within other roles in the company (ranging from die-making, electrical, engineering, or design). CenterLine's approach focuses on people that have a "go-getter" attitude and a desire to learn new skills, and not necessarily their technical background.

In general, CenterLine runs co-op and apprenticeship programs in partnership with local high schools, St. Clair College, and the Ontario Youth Apprenticeship Program. These placements create opportunities for promising Grade 11 students, offering them work for a year while earning high-school credits and a full wage. After a year, the best of those students are offered full-time jobs and some are invited to enter the four-year apprenticeship program.

With a 90% employee retention rate and a history of accepting five to ten new apprentices a year, CenterLine has a healthy talent pipeline of trained professionals that it can draw on to help the company grow into the future.

Key Insights for the Lehigh Valley

- CenterLine has invested its future success in being able to attract and retain young people to the company. By working with youth still in high school, the company has been able to secure and train the workforce it needs to grow the company world-wide.
- Hiring based on fit and attitude, and training for technical skills is a critical component of CenterLine's successful approach.

Developing Employability Skills and a Good Work Ethic

There is a growing skills gap between what employers need and what young workers know and can provide. According to a report by the U.S. Chamber of Commerce Foundation, called *Learning to Work Working to Learn*, "only 35% of students say they are prepared for a job…and among the general public, just 16% think that a four-year degree prepares students for a well-paying job in today's economy." One of the biggest reasons for the growing skills gap is the lack of employability skills development provided in the education system. Employability skills such as attitude, basic problem solving, teamwork, and communication, are highly sought by employers since they enable workers to function and thrive in a workplace.

In a world where competition for skilled talent is fierce, companies are increasingly finding that they are better off to develop their talent pipelines based on fit to the company culture and employability skills that new hires bring with them. These elements are playing larger roles in the hiring process, with technical skills being taught through on-the-job training.

Bring Your "A" Game to Work – The Center for Work Ethic Development

The Center for Work Ethic Development (CWED)[19] is the only institution in the United States focused on teaching and improving the work ethic of today's workforce. CWED programming is designed to instill foundational workplace behaviors and values in the workforce, helping participants understand the long-term benefits of good work ethic to themselves and their employers.

The Bring Your "A" Game to Work program was developed by the CWED in direct response to a large CWED study in which 1,500 hiring managers throughout the United States were polled to determine the foundational work ethic behaviors that drive success for employees. Based on the results, the Bring Your "A" Game to Work program identified seven foundational behaviors of work ethic that managers' demand and that prevent behaviours that cause employees to be fired, including:

[19] www.workethic.org

- **Attendance** – Showing you're reliable in every phase of your life. Being on time, every time.
- **Appearance** – Being professional in the way you act and the way you look. Choosing to be a pro.
- **Attitude** – Staying positive in every situation. Taking control of the way you react.
- **Ambition** – Taking initiative and adding value. Doing more than the minimum.
- **Acceptance** – Having respect and following direction. Being coachable and playing by the rules.
- **Accountability** – Living honestly and having integrity with every decision you make.
- **Appreciation** – Demonstrating your gratitude towards others. Providing selfless service.

Each of these seven foundational areas incorporates three primary strategies of learning to help instill the foundational values:

- Experiential learning (e.g. using activities, exercises, and assignments)
- A peer-to-peer model (e.g. facilitating cohesive social learning such as think-pair-share and reciprocal teaching)
- A flexible and adaptable approach based on each participant's personal habits, life experiences, and motivations

All activities are adaptable to any industry and cultural context and are currently offered as specialized versions for youth, adults, and veterans incorporating unique approaches, language, and activities tailored to each of these three groups.

Having been implemented in over 550 organizations throughout the United States, Bring Your "A" Game to Work programming has led to a 40% increase in job retention by employers that have participated in the program. Also, twice as many employees received satisfactory ratings from employers after participating in the programming highlighting that work ethic can be trained and taught to a wide range of people.

Key Insights for the Lehigh Valley

- Employers see a need for career readiness education in the Lehigh Valley. The development of employability skills, such as communication and creativity were deemed essential in the workplace. Opportunities exist to host work ethic training for job seekers throughout the region.
- Innovative teaching approaches that tailor programs to each individual must be considered when training workers with low educational achievement that might not relate as easily to traditional forms of classroom teaching only.

Re-Integrating Displaced Workers in the Labor Force

Increasing competition in global markets, advancements in technology, and the growth of knowledge-intensive industries has resulted in a rapidly changing global economy. The reduced growth in primary production processes across the United States has given rise to many displaced and transitioning workers who are finding it increasingly difficult to participate in the new and growing knowledge-based economy.

In order to foster a more socially inclusive transition to the knowledge economy, it is vital that knowledge-based industries integrate the low-skilled workers in the labor force by providing training and recruitment. Community colleges that function as workforce intermediaries are central to this regard as they provide skills training and employment to displaced workers. Traditionally workforce intermediaries were considered the 'middlemen' – agencies that enable workers to find employment. However, in recent years, these agencies are leading the change, acting as regional labor market developers.

Biowork Program

The state of North Carolina was a transitioning economy in the 1990s, moving from traditional industries such as textile manufacturing and tobacco processing to the knowledge-oriented life science manufacturing industry. The declining primary industries in the state had resulted in many displaced workers. The Biowork Program was developed in 1998 to support these workers, providing skills training to those with some knowledge of manufacturing activities and connecting them to the mid-level skill medical device manufacturing firms in the state. State led workforce partnerships were the most crucial aspect of this development as it encouraged employers to ease formal education requirements and assist the state with industrial recruitment efforts. Partnerships with educational institutions helped to create viable employment opportunities for the less educated displaced workers.

The BioWork program is a 128-hour, semester-long certificate course that provides students with entry-level process technician skills for both bio-manufacturing and chemical-based pharmaceutical manufacturing. The program is a partnership between the North Carolina Biotechnology Center, the North Carolina Community College System (NCCCS) and firms in the state such as Novozymes. Novozymes, a biotech company, donated $250,000 to help build the first laboratory at the Vance Granville Community College in North Carolina in conjunction with the BioWork course. The curriculum development for the program is a public-private exchange between human resource managers of the life science firms and community college instructors.

From 2000 to 2003, approximately 378 students enrolled at the Vance-Granville Community College of which 62% were employed. By 2007, the BioWork expanded to 12 community colleges in the region. By 2011, the NCCCS had trained 4,656 students and provided assistance for 24 training projects for businesses throughout the state. Students participating in the BioWork program have increased exposure to job opportunities, a higher rate of hiring, and increased pay. For example, on completion of a three-month chemical operation certificate through the program, candidates were paid $5,000 more than the job-seeker without the BioWork credentials.

The success of the BioWork program is that high school diploma holders are able to engage and function in the life science industry due to continued interactions between the private and the public sector. By continually coordinating with human resources managers, the educational institutions have been able to track changes in skills requirements over time, assess future industry skill needs, and modify courses based on these needs. This co-dependent relationship that moves beyond the upskilling of employees to incremental training has resulted in lower turnover rates and a stable workforce in the state.

Key Insights for the Lehigh Valley

- The Lehigh Valley has experienced a decline in traditional manufacturing jobs, which has created significant job churn. Feedback from the engagement has highlighted a strong need to create more industry-education partnerships to inform on current and future skills needed.
- Building on the example of the BioWork Program, the Lehigh Valley can leverage its existing resources that include a robust labor force, a good network of educational institutions, and a strong business base to encourage more industry-led programming.

Promoting STEM Education to Create Competitive Advantage

Science, Technology, Engineering, and Math (STEM) disciplines are central to addressing labor force issues and improve competitiveness in science and technology. The creation and transfer of knowledge that drives innovation are critical for any economy looking to participate in technology-led growth. While investments in new technologies, research labs, scientific breakthroughs and the creation of new products and industries are advancing quickly, the current and future workforce is not adequately prepared to meet the industrial demand. Human capital is central to the success of STEM and preparing the STEM workforce is an immediate need throughout the world.

Illinois STEM Pathways

Illinois Pathways is a public-private education partnership to implement P-20 STEM programs of study in schools, educational institutions, and industry organizations in the state of Illinois.

A review conducted by the Georgetown University Center on Education and the Workforce estimated that by 2018 over 90% of jobs in the state will require postsecondary education or training. Thus, the state developed the STEM pathways, an offshoot of the larger Illinois Pathways program, focused on nurturing a workforce capable of competing in the STEM economy. The state aims to increase its STEM occupations by 20% from 2008 to 2018, translating to over 319,000 jobs.

The program has set up specific STEM Learning Exchanges for each field, namely, Agriculture, Food & Natural Resources, Architecture & Construction, Energy, Finance, Health Science, Information Technology, Manufacturing, Research and Development, and Transportation, Distribution & Logistics. Since 2013, the state has invested over $3 million in these pathways, which have been matched with over $5 million through public-private partnerships.

The pathway follows a bottom to top approach. Level 1 starts at middle school and introduces students to STEM. The Level 2 of the pathway is provided at the high school level where students have the option of branching out in their interested field through shared pathways. For example, a student interested in biomedical research and development also has the option of implementing research in the social or natural sciences. The third level of STEM pathways is postsecondary programs which include bridge programs, certificate programs, and associates, bachelors, and graduate degrees. Through each level of the STEM pathways, students gain work-based experiences through site visits and service learning along

with job fairs and other classroom support. Each level of the program has ACT-approved assessments to enable educators to evaluate the interest and skill level of a student and guide them in their career paths.

Since 2013, the Agriculture Food and Natural Resource Learning Exchange (AFNR) pathway has partnered with over 327 high schools across the state, engaging over 23,000 students. Over 41% of agricultural education students completed the work-learning experience model (Supervised Agricultural Experience-SAE). Furthermore, the program resulted in 57 high school agricultural education positions statewide and 11 college graduates with agriculture teaching licenses. Through the program, over 97 post-secondary agriculture teachers attended professional development workshops and/or graduate programs. Other successful initiatives include the 'Raspberry PI Student Challenge' through the IT STEM exchange, the Illinois Advanced Apprenticeship Consortium through the manufacturing STEM exchange and the Science Bowl academic competition through the Energy STEM exchange program.

Key Insights for the Lehigh Valley

- The Illinois STEM Pathways program is a good example of a hands-on regional approach that anticipates future skills demand and developed ways to meet that demand. The success of the approach is attributed to proactive partnerships of state and national development agencies with education boards and industry partners.
- An analysis of the Lehigh Valley's education profile shows that while growth has been seen in the Science and Engineering-Related Fields, declines in educational attainment in Biological, Agricultural, and Environmental Sciences, Physical and Related Sciences and Computers, Mathematics and Statistics occurred between 2010 and 2016. The Lehigh Valley is in a good position to leverage its engineering competencies while improving strengths in science, math and computers to effectively compete in the regional and global knowledge economy.

Supporting the Re-Entry of Mature Workers to the Workforce

Increasing competition in the workforce requires that workers continuously update their skills to remain competitive. Individuals looking to enter the labor force, change their current jobs, or re-enter the labor force after a period of unemployment often require new or improved skills. An added concern in the current workforce landscape is the retiring baby boomer generation which has resulted in the need for replacement workers. Talent management of an employee which includes hiring, training and replacement results in both time and monetary costs. Thus, it is important to develop effective recruiting, training and retention programs to reduce staff turnover, enable retirees to function in the workforce, and develop opportunities for second careers.

Midwifery Refresher Programme – Australia

The Midwifery Refresher Programme is a range of recruitment and retention strategies established in 2002 to mitigate the shortage of midwives in the Mater Mothers' Hospital in South Brisbane, Australia.

A 2002 countrywide review conducted by the Australian Medical Workforce Advisory Committee (AHWAC) identified that the Australian midwifery workforce faced a shortage of 1,847 positions. Reflecting the national trend, the Mater Mothers' Hospital also faced an acute shortage of skilled midwives. Thus, the hospital in collaboration with the Australian Catholic University developed the

Midwifery Refresher Programme, to recruit skilled midwives who had been out of the workforce for over five years for a variety of reasons and refresh their skills to help them gain back entry into the workforce.

The program content was developed by academic and clinical staff with expertise in maternity care and comprised of both theoretical and practical content. Graduates of the program received credits towards academic upgrading including postgraduate degrees. The program fee was also low and shared between the hospital and the university, placing a limited burden on the candidate. The program ran for a period of three years and was discontinued as the hospital reached its target. In each year that the program ran, 10 midwives graduated, 90% of whom were employed each year.

Results from the program showed three positive outcomes. Firstly, the hospital was able to address its staffing crisis and effectively meet that need. Secondly, the program resulted in lifelong partnerships with the Australian Catholic University, providing the opportunity for future programs. Thirdly, a high level of satisfaction was demonstrated by both participants and staff involved in the programme. Clinicians felt that because midwives had prior knowledge and the refresher skills, the orientation period was minimized. They required less supervision and had the capacity to take on additional work. Additionally, the prior experience in the hospital setting enabled them to settle and effectively contribute to the fast-paced aspect of the job. The opportunity to work again and help those in need gave the candidates a meaningful outcome.

Key Insights for the Lehigh Valley

- The success of the midwife program is mainly due to the public-private partnerships created and the ability to develop the talent pipeline.
- To help overcome a tight labor market and issues with the skills matching of job candidates to employer needs, it is important to create new opportunities for professionals with transferable skills to hone their experience to match the needs of employers. Helping professionals find their way back into the job market is essential in ensuring that employers in the Lehigh Valley capitalizes on all the talent available in the region.

The Lehigh Valley Best Practices

Local initiatives active in the Lehigh Valley are also identified as best practices designed to help address barriers and challenges experienced in the Lehigh Valley and increase the competitive profile of the region. The local initiatives include:

- The annual What's So Cool About Manufacturing?[20] video contest that raises awareness and change students' perceptions about manufacturing careers. The contest was created in 2013 by the Manufacturers Resource Center (MRC) in Allentown and includes sponsors and partners such as the Pennsylvania Department of Community & Economic Development, Workforce Board Lehigh Valley, Manufacturing Alliance of the Greater Philadelphia region and Workforce Solutions for North Central PA. Approximately 12 contests were held in Pennsylvania in 2017-2018 and involved

[20] https://www.whatssocool.org/

students from 39 of Pennsylvania's 67 counties. Funding for the Best of PA Contest is provided by the Appalachian Regional Commission (ARC). The contest format also has been adopted by groups in 11 additional states.

- The PA Dream Team[21] is a group of young professionals in the advanced manufacturing industry in Pennsylvania. The team makes classroom presentations that encourage students to explore manufacturing careers. The initiative is managed by the Manufacturers Resource Center (MRC) and presented by Bosch Rexroth.
- The SHINE program[22] developed by the Lehigh Carbon Community College (LCCC) and Schuylkill SHINE 21st Century After-School Program is a grassroots after-school program that supports students facing academic, and or social challenges in the Carbon and Schuylkill County. The programs are administered in partnership with local school districts, the technical school (CCTI) and collaborative members for middle school/high school students. In addition to increasing educational attainment and encouraging STEAM (Science, Technology, Engineering, Arts, and Technology) related skills, social programs such as preventing juvenile crime is provided.
- The Lehigh Valley Collegiate Career Expo (LVCCE)[23] has over 15 years of connecting employers with students from the member campuses. The expo targets new graduates and students for internship and volunteer opportunities, part-time employment and/or full-time employment. Any student currently enrolled in an Associate, Bachelors, Masters or Doctoral degree program (and recent alumni of such degree programs) at a college or university is welcome to attend. Member schools include Albright College, Cedar Crest College, DeSales University, Lehigh Carbon Community College, Lehigh University, Moravian College, Muhlenberg College and Northampton Community College. Employers in the expo include B. Braun Medical Inc., Aesculap, Inc., Brown & Brown of Lehigh Valley, Inc., Caron Treatment Centers, St. Luke's University Health Network and Penske Truck Leasing.

[21] https://www.whatssocool.org/dream-it-do-it-pa/pa-dream-team/

[22] http://shineafterschool.com/shinewordpress/about-shine/

[23] https://www.lvaic.org/for-students/career-fair-lvcce/

Lehigh Valley

Talent Supply and Industry Sector Analysis

And

Strategic Action Plan

APPENDIX B – INDUSTRY SECTOR DEFINITION REPORT

LEHIGH VALLEY economic development

MDB INSIGHT

WorkforceBoard Lehigh Valley

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1. Notes For The Reader

LVEDC's Talent Initiative highlights five optimal target industry sectors for the Lehigh Valley based on the site-specific characteristics of the regional economy. These five target sectors best match the unique competitive advantages in the area, as well as the needs of particular industry sectors. The five industry sectors of focus include:

- Advanced Manufacturing and Food and Beverage Manufacturing
- High Value Business Services
- Transportation, Logistics, Warehousing and Wholesale
- Health Care Services
- Life Science Research and Manufacturing

The sectors were defined using the North American Industry Classification System (NAICS) at the four digit level. Occupations were defined by the Standard Occupational Classification (SOC) system established by the U.S. Department of Labor. The definition breakdown for each industry sector is available in this report.

2. Industry Definitions

2.1 Advanced Manufacturing and Food and Beverage Manufacturing

2.1.1 Industry Definition (NAICS)

NAICS	Industry Description
3111	Animal food manufacturing
3112	Grain and oilseed milling
3113	Sugar and confectionery product manufacturing
3114	Fruit and vegetable preserving and specialty food manufacturing
3115	Dairy product manufacturing
3116	Animal slaughtering and processing
3117	Seafood product preparation and packaging
3118	Bakeries and tortilla manufacturing
3119	Other food manufacturing
3121	Beverage manufacturing
3222	Converted Paper Product Manufacturing
3241	Petroleum and Coal Products Manufacturing
3251	Basic chemical manufacturing
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing
3253	Pesticide, fertilizer, and other agricultural chemical manufacturing
3254	Pharmaceutical and medicine manufacturing
3259	Other chemical product and preparation manufacturing
3271	Clay product and refractory manufacturing
3279	Other non-metallic mineral product manufacturing
3311	Iron and steel mills and ferroalloy manufacturing
3313	Alumina and aluminum production and processing
3315	Foundries
3322	Cutlery and hand tool manufacturing
3329	Other fabricated metal product manufacturing
3331	Agriculture, construction, and mining machinery manufacturing
3332	Industrial machinery manufacturing
3333	Commercial and service industry machinery manufacturing
3336	Engine, turbine, and power transmission equipment manufacturing
3339	Other general purpose machinery manufacturing

NAICS	Industry Description
3341	Computer and peripheral equipment manufacturing
3342	Communications equipment manufacturing
3343	Audio and video equipment manufacturing
3344	Semiconductor and other electronic component manufacturing
3345	Navigational, measuring, electromedical, and control instruments manufacturing
3346	Manufacturing and reproducing magnetic and optical media
3351	Electric lighting equipment manufacturing
3352	Household appliance manufacturing
3353	Electrical equipment manufacturing
3359	Other electrical equipment and component manufacturing
3361	Motor vehicle manufacturing
3362	Motor vehicle body and trailer manufacturing
3363	Motor vehicle parts manufacturing
3364	Aerospace product and parts manufacturing
3365	Railroad rolling stock manufacturing
3366	Ship and boat building
3369	Other transportation equipment manufacturing
3391	Medical equipment and supplies manufacturing
3399	Other miscellaneous manufacturing

2.1.2 Occupational Definition (SOC)

SOC	Occupation Description
51-1011	First-Line Supervisors of Production and Operating Workers
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers
51-2021	Coil Winders, Tapers, and Finishers
51-2022	Electrical and Electronic Equipment Assemblers
51-2023	Electromechanical Equipment Assemblers
51-2031	Engine and Other Machine Assemblers
51-2041	Structural Metal Fabricators and Fitters
51-2091	Fiberglass Laminators and Fabricators
51-2092	Team Assemblers
51-2093	Timing Device Assemblers and Adjusters
51-2099	Assemblers and Fabricators, All Other
51-3011	Bakers
51-3021	Butchers and Meat Cutters
51-3022	Meat, Poultry, and Fish Cutters and Trimmers

SOC	Occupation Description
51-3023	Slaughterers and Meat Packers
51-3091	Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders
51-3092	Food Batchmakers
51-3093	Food Cooking Machine Operators and Tenders
51-3099	Food Processing Workers, All Other
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic
51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic
51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic
51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic
51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic
51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic
51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic
51-4041	Machinists
51-4051	Metal-Refining Furnace Operators and Tenders
51-4052	Pourers and Casters, Metal
51-4061	Model Makers, Metal and Plastic
51-4062	Patternmakers, Metal and Plastic
51-4071	Foundry Mold and Coremakers
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic
51-4111	Tool and Die Makers
51-4121	Welders, Cutters, Solderers, and Brazers
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic
51-4192	Layout Workers, Metal and Plastic
51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic
51-4194	Tool Grinders, Filers, and Sharpeners
51-4199	Metal Workers and Plastic Workers, All Other
51-5111	Prepress Technicians and Workers
51-5112	Printing Press Operators
51-5113	Print Binding and Finishing Workers
51-6011	Laundry and Dry-Cleaning Workers

SOC	Occupation Description
51-6021	Pressers, Textile, Garment, and Related Materials
51-6031	Sewing Machine Operators
51-6041	Shoe and Leather Workers and Repairers
51-6042	Shoe Machine Operators and Tenders
51-6051	Sewers, Hand
51-6052	Tailors, Dressmakers, and Custom Sewers
51-6061	Textile Bleaching and Dyeing Machine Operators and Tenders
51-6062	Textile Cutting Machine Setters, Operators, and Tenders
51-6063	Textile Knitting and Weaving Machine Setters, Operators, and Tenders
51-6064	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders
51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers
51-6092	Fabric and Apparel Patternmakers
51-6093	Upholsterers
51-6099	Textile, Apparel, and Furnishings Workers, All Other
51-7011	Cabinetmakers and Bench Carpenters
51-7021	Furniture Finishers
51-7031	Model Makers, Wood
51-7032	Patternmakers, Wood
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing
51-7099	Woodworkers, All Other
51-8011	Nuclear Power Reactor Operators
51-8012	Power Distributors and Dispatchers
51-8013	Power Plant Operators
51-8021	Stationary Engineers and Boiler Operators
51-8031	Water and Wastewater Treatment Plant and System Operators
51-8091	Chemical Plant and System Operators
51-8092	Gas Plant Operators
51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers
51-8099	Plant and System Operators, All Other
51-9011	Chemical Equipment Operators and Tenders
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders
51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders
51-9022	Grinding and Polishing Workers, Hand
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders
51-9031	Cutters and Trimmers, Hand

SOC	Occupation Description
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders
51-9051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers
51-9071	Jewelers and Precious Stone and Metal Workers
51-9081	Dental Laboratory Technicians
51-9082	Medical Appliance Technicians
51-9083	Ophthalmic Laboratory Technicians
51-9111	Packaging and Filling Machine Operators and Tenders
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders
51-9122	Painters, Transportation Equipment
51-9123	Painting, Coating, and Decorating Workers
51-9141	Semiconductor Processors
51-9151	Photographic Process Workers and Processing Machine Operators
51-9191	Adhesive Bonding Machine Operators and Tenders
51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders
51-9193	Cooling and Freezing Equipment Operators and Tenders
51-9194	Etchers and Engravers
51-9195	Molders, Shapers, and Casters, Except Metal and Plastic
51-9196	Paper Goods Machine Setters, Operators, and Tenders
51-9197	Tire Builders
51-9198	Helpers--Production Workers
51-9199	Production Workers, All Other

2.2 High Value Business Services

2.2.1 Industry Definition (NAICS)

NAICS	Industry Description
5112	Software Publishers
5182	Data processing, hosting, and related services
5221	Depository credit intermediation
5241	Insurance carriers
5242	Agencies, brokerages, and other insurance related activities
5411	Legal services
5412	Accounting, tax preparation, bookkeeping, and payroll services

NAICS	Industry Description
5413	Architectural, engineering, and related services
5414	Specialized design services
5415	Computer systems design and related services
5416	Management, scientific, and technical consulting services
5417	Scientific research and development services
5418	Advertising, public relations, and related services
5419	Other professional, scientific, and technical services
5511	Management of companies and enterprises
5611	Office administrative services
5612	Facilities support services
5613	Employment services
5614	Business support services
5615	Travel arrangement and reservation services
5616	Investigation and security services
5617	Services to buildings and dwellings
5619	Other support services

2.2.2 Occupational Definition (SOC)

SOC	Occupation Description
11-3021	Computer and Information Systems Managers
13-1011	Agents and Business Managers of Artists, Performers, and Athletes
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products
13-1031	Claims Adjusters, Examiners, and Investigators
13-1041	Compliance Officers
13-1071	Human Resources Specialists
13-1074	Farm Labor Contractors
13-1075	Labor Relations Specialists
13-1081	Logisticians
13-1111	Management Analysts
13-1121	Meeting, Convention, and Event Planners
13-1131	Fundraisers
13-1141	Compensation, Benefits, and Job Analysis Specialists
13-1151	Training and Development Specialists
13-1161	Market Research Analysts and Marketing Specialists
13-1199	Business Operations Specialists, All Other
13-2011	Accountants and Auditors

SOC	Occupation Description
13-2021	Appraisers and Assessors of Real Estate
13-2031	Budget Analysts
13-2041	Credit Analysts
13-2051	Financial Analysts
13-2052	Personal Financial Advisors
13-2061	Financial Examiners
13-2071	Credit Counselors
13-2072	Loan Officers
13-2081	Tax Examiners and Collectors, and Revenue Agents
13-2082	Tax Preparers
15-1121	Computer Systems Analysts
15-1131	Computer Programmers
15-1133	Software Developers, Systems Software
15-1134	Web Developers
15-1142	Network and Computer Systems Administrators
15-1143	Computer Network Architects
15-1151	Computer User Support Specialists
15-1152	Computer Network Support Specialists
15-1199	Computer Occupations, All Other
23-1011	Lawyers
23-1012	Judicial Law Clerks
23-1021	Administrative Law Judges, Adjudicators, and Hearing Officers
23-1022	Arbitrators, Mediators, and Conciliators
23-1023	Judges, Magistrate Judges, and Magistrates
23-2091	Court Reporters
23-2099	Legal Support Workers, All Other
43-1011	First-Line Supervisors of Office and Administrative Support Workers
43-2011	Switchboard Operators, Including Answering Service
43-2021	Telephone Operators
43-3011	Bill and Account Collectors
43-3021	Billing and Posting Clerks
43-3031	Bookkeeping, Accounting, and Auditing Clerks
43-3041	Gaming Cage Workers
43-3051	Payroll and Timekeeping Clerks
43-3071	Tellers
43-3099	Financial Clerks, All Other
43-4011	Brokerage Clerks

SOC	Occupation Description
43-4021	Correspondence Clerks
43-4051	Customer Service Representatives
43-4061	Eligibility Interviewers, Government Programs
43-4071	File Clerks
43-4131	Loan Interviewers and Clerks
43-4141	New Accounts Clerks
43-4151	Order Clerks
43-4171	Receptionists and Information Clerks
43-5011	Cargo and Freight Agents
43-5021	Couriers and Messengers
43-5052	Postal Service Mail Carriers
43-5053	Postal Service Mail Sorters, Processors, and Processing Machine Operators
43-5061	Production, Planning, and Expediting Clerks
43-5071	Shipping, Receiving, and Traffic Clerks
43-5081	Stock Clerks and Order Fillers
43-6011	Executive Secretaries and Executive Administrative Assistants
43-6012	Legal Secretaries
43-6013	Medical Secretaries
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive
43-9011	Computer Operators
43-9021	Data Entry Keyers
43-9022	Word Processors and Typists
43-9031	Desktop Publishers
43-9041	Insurance Claims and Policy Processing Clerks
43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service
43-9071	Office Machine Operators, Except Computer
43-9081	Proofreaders and Copy Markers
43-9111	Statistical Assistants

2.3 Transportation, Logistics, Warehousing and Wholesale

2.3.1 Industry Definition (NAICS)

NAICS	Industry Description
4233	Lumber and other construction materials merchant wholesalers
4234	Professional and commercial equipment and supplies merchant wholesalers
4236	Household appliances and electrical and electronic goods merchant wholesalers

NAICS	Industry Description
4242	Drugs and druggists' sundries merchant wholesalers
4244	Grocery and related product merchant wholesalers
4811	Scheduled air transportation
4812	Nonscheduled air transportation
4821	Rail Transportation
4831	Deep Sea, Coastal, and Great Lakes Water Transportation
4832	Inland water transportation
4841	General freight trucking
4842	Specialized freight trucking
4861	Pipeline transportation of crude oil
4862	Pipeline transportation of natural gas
4869	Other pipeline transportation
4881	Support activities for air transportation
4882	Support activities for rail transportation
4883	Support activities for water transportation
4884	Support activities for road transportation
4885	Freight transportation arrangement
4889	Other support activities for transportation
4911	Postal Service
4921	Couriers and express delivery services
4922	Local messengers and local delivery
4931	Warehousing and storage

2.3.2 Occupational Definition (SOC)

SOC	Occupation Description
53-1011	Aircraft Cargo Handling Supervisors
53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators
53-2011	Airline Pilots, Copilots, and Flight Engineers
53-2012	Commercial Pilots
53-2021	Air Traffic Controllers
53-2022	Airfield Operations Specialists
53-2031	Flight Attendants
53-3011	Ambulance Drivers and Attendants, Except Emergency Medical Technicians
53-3021	Bus Drivers, Transit and Intercity

SOC	Occupation Description
53-3022	Bus Drivers, School or Special Client
53-3031	Driver/Sales Workers
53-3031	Driver/Sales Workers
53-3032	Heavy and Tractor-Trailer Truck Drivers
53-3033	Light Truck or Delivery Services Drivers
53-3041	Taxi Drivers and Chauffeurs
53-3099	Motor Vehicle Operators, All Other
53-4011	Locomotive Engineers
53-4012	Locomotive Firers
53-4013	Rail Yard Engineers, Dinkey Operators, and Hostlers
53-4021	Railroad Brake, Signal, and Switch Operators
53-4031	Railroad Conductors and Yardmasters
53-4041	Subway and Streetcar Operators
53-4099	Rail Transportation Workers, All Other
53-5011	Sailors and Marine Oilers
53-5021	Captains, Mates, and Pilots of Water Vessels
53-5022	Motorboat Operators
53-5031	Ship Engineers
53-6011	Bridge and Lock Tenders
53-6021	Parking Lot Attendants
53-6031	Automotive and Watercraft Service Attendants
53-6041	Traffic Technicians
53-6051	Transportation Inspectors
53-6061	Transportation Attendants, Except Flight Attendants
53-6099	Transportation Workers, All Other
53-7011	Conveyor Operators and Tenders
53-7021	Crane and Tower Operators
53-7031	Dredge Operators
53-7032	Excavating and Loading Machine and Dragline Operators
53-7033	Loading Machine Operators, Underground Mining
53-7041	Hoist and Winch Operators
53-7051	Industrial Truck and Tractor Operators
53-7061	Cleaners of Vehicles and Equipment
53-7062	Laborers and Freight, Stock, and Material Movers, Hand
53-7063	Machine Feeders and Offbearers
53-7064	Packers and Packagers, Hand
53-7071	Gas Compressor and Gas Pumping Station Operators

SOC	Occupation Description
53-7072	Pump Operators, Except Wellhead Pumpers
53-7073	Wellhead Pumpers
53-7081	Refuse and Recyclable Material Collectors
53-7111	Mine Shuttle Car Operators
53-7121	Tank Car, Truck, and Ship Loaders
53-7199	Material Moving Workers, All Other

2.4 Health Care Services

2.4.1 Industry Definition (NAICS)

NAICS	Industry Description
6211	Offices of physicians
6212	Offices of dentists
6213	Offices of other health practitioners
6214	Outpatient care centers
6215	Medical and diagnostic laboratories
6216	Home health care services
6219	Other ambulatory health care services
6221	General medical and surgical hospitals
6222	Psychiatric and substance abuse hospitals
6223	Specialty (except psychiatric and substance abuse) hospitals
6231	Nursing care facilities (skilled nursing facilities)
6232	Residential intellectual and developmental disability, mental health, and substance abuse facilities
6233	Continuing care retirement communities and assisted living facilities for the elderly
6239	Other residential care facilities
6241	Individual and Family Services
6242	Community Food and Housing, and Emergency and Other Relief Services
6243	Vocational Rehabilitation Services

2.4.2 Occupational Definition (SOC)

SOC	Occupation Description
29-1011	Chiropractors
29-1021	Dentists, General
29-1022	Oral and Maxillofacial Surgeons

SOC	Occupation Description
29-1023	Orthodontists
29-1024	Prosthodontists
29-1029	Dentists, All Other Specialists
29-1031	Dietitians and Nutritionists
29-1041	Optometrists
29-1051	Pharmacists
29-1061	Anesthesiologists
29-1062	Family and General Practitioners
29-1063	Internists, General
29-1064	Obstetricians and Gynecologists
29-1065	Pediatricians, General
29-1066	Psychiatrists
29-1067	Surgeons
29-1069	Physicians and Surgeons, All Other
29-1071	Physician Assistants
29-1081	Podiatrists
29-1122	Occupational Therapists
29-1123	Physical Therapists
29-1124	Radiation Therapists
29-1125	Recreational Therapists
29-1126	Respiratory Therapists
29-1127	Speech-Language Pathologists
29-1128	Exercise Physiologists
29-1129	Therapists, All Other
29-1131	Veterinarians
29-1141	Registered Nurses
29-1151	Nurse Anesthetists
29-1161	Nurse Midwives
29-1171	Nurse Practitioners
29-1181	Audiologists
29-1199	Health Diagnosing and Treating Practitioners, All Other
29-2011	Medical and Clinical Laboratory Technologists
29-2012	Medical and Clinical Laboratory Technicians
29-2021	Dental Hygienists
29-2031	Cardiovascular Technologists and Technicians
29-2032	Diagnostic Medical Sonographers
29-2033	Nuclear Medicine Technologists

SOC	Occupation Description
29-2034	Radiologic Technologists
29-2035	Magnetic Resonance Imaging Technologists
29-2041	Emergency Medical Technicians and Paramedics
29-2051	Dietetic Technicians
29-2052	Pharmacy Technicians
29-2053	Psychiatric Technicians
29-2054	Respiratory Therapy Technicians
29-2055	Surgical Technologists
29-2056	Veterinary Technologists and Technicians
29-2057	Ophthalmic Medical Technicians
29-2061	Licensed Practical and Licensed Vocational Nurses
29-2071	Medical Records and Health Information Technicians
29-2081	Opticians, Dispensing
29-2091	Orthotists and Prosthetists
29-2092	Hearing Aid Specialists
29-2099	Health Technologists and Technicians, All Other
29-9011	Occupational Health and Safety Specialists
29-9012	Occupational Health and Safety Technicians
29-9091	Athletic Trainers
29-9092	Genetic Counselors
29-9099	Healthcare Practitioners and Technical Workers, All Other
31-1011	Home Health Aides
31-1013	Psychiatric Aides
31-1014	Nursing Assistants
31-1015	Orderlies
31-2011	Occupational Therapy Assistants
31-2012	Occupational Therapy Aides
31-2021	Physical Therapist Assistants
31-2022	Physical Therapist Aides
31-9011	Massage Therapists
31-9091	Dental Assistants
31-9092	Medical Assistants
31-9093	Medical Equipment Preparers
31-9094	Medical Transcriptionists
31-9095	Pharmacy Aides
31-9096	Veterinary Assistants and Laboratory Animal Caretakers
31-9097	Phlebotomists

SOC	Occupation Description
31-9099	Healthcare Support Workers, All Other

2.5 Life Science Research and Manufacturing

2.5.1 Industry Definition (NAICS)

NAICS	Industry Description
3254	Pharmaceutical and medicine manufacturing
3345	Navigational, measuring, electromedical, and control instruments manufacturing
3391	Medical equipment and supplies manufacturing
5417	Scientific research and development services
6113	Colleges, universities, and professional schools
6215	Medical and diagnostic laboratories

2.5.2 Occupational Definition (SOC)

SOC	Occupation Description
17-2031	Biomedical Engineers
17-2041	Chemical Engineers
19-1021	Biochemists and Biophysicists
19-1022	Microbiologists
19-1029	Biological Scientists, All Other
19-1041	Epidemiologists
19-1042	Medical Scientists, Except Epidemiologists
19-1099	Life Scientists, All Other
19-2031	Chemists
19-2041	Environmental Scientists and Specialists, Including Health
19-4099	Life, Physical, and Social Science Technicians, All Other
29-2011	Medical and Clinical Laboratory Technologists
29-2012	Medical and Clinical Laboratory Technicians
31-9093	Medical Equipment Preparers
31-9097	Phlebotomists

The Lehigh Valley

Talent Supply and Industry Sector Analysis

And

Strategic Action Plan

APPENDIX C – EMPLOYER SURVEY & CONSULTATION SUMMARY REPORT

JUNE 2018

LEHIGH VALLEY economic development

MDB INSIGHT

WorkforceBoard Lehigh Valley

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1. Notes for The Reader

Engagement and Consultation Activities

The primary research data gathering process included three types of engagement and consultation activities, each involving a range of stakeholders from throughout the Lehigh Valley and across the five target industry sectors. These consultations were designed to encourage participants to share their experiences and insights on the availability of skilled talent in the Lehigh Valley, workforce issues and challenges, and gaps and opportunities that would improve the region's positioning in having a strong pipeline of talent.

Engagement and consultation activities included:

- **Focus Groups –** Eight focus groups were hosted in the Lehigh Valley with select groups including the Lehigh Valley Economic Development Corporation Board of Directors, educational stakeholders, the Education and Talent Supply Council, target sector employers, association and not-for-profit stakeholders, and the Lehigh Valley Professionals group (job seekers). Focus groups were held in November 2017 and April 2018 and were each two hours in length.
- **Stakeholder Interviews –** A total of 32 one-on-one telephone interviews were conducted with business, community, municipal and State leaders in the Lehigh Valley. These interviews were guided by open-ended questions to promote conversation, each averaging approximately 20-30 minutes in length.
- **Employer Telephone Survey –** A statistically valid survey of 315 randomly selected businesses in the five target industry sectors throughout the Lehigh Valley; companies contacted were also given the opportunity to answer the survey questions online if they preferred. The survey was open from October 20, 2017, through January 12, 2018.

Results from the employer survey and a consultation summary are available in this report.

2. Consultation Summary

2.1 Focus Groups

Eight focus groups were hosted in the Lehigh Valley with select groups including the Lehigh Valley Economic Development Corporation Board of Directors, educational stakeholders, the Education and Talent Supply Council, target sector employers, association and not-for-profit stakeholders, and the Lehigh Valley Professionals group (job seekers). Focus groups were held in November 2017 and April 2018 and were each two hours in length. The comments in this section reflect the views, perceptions, and opinions of focus group participants.

Summary findings from these discussions are presented below.

How would you describe the availability of local, skilled talent in the Lehigh Valley?

The labor market in the Lehigh Valley is seen to be very tight. With a low unemployment rate close to 5%, many employers are competing for the same talent. In some cases, this has led to poaching talent from each other and has also manifested itself as competition in high school and adult education classrooms as employers seek to find and secure the best candidates. Many employers feel they need to look outside of the Lehigh Valley to find talent.

What are the biggest workforce issues/challenges that employers face in the Lehigh Valley?

Big challenges identified include:

Challenges exist around employee training. Many companies, especially larger ones are willing but can be hesitant to train employees only to have them leave to a competitor for $1/hr more. Many smaller companies are not able to offer training despite needing trained employees. Therefore, they have to rely on the technical schools or other external sources to train their workforce.

- There is a need for more of a focus on building a good employer-employee relationship that values diversity/inclusion, corporate values and brand, distributed decision-making processes, and clear career pathways. These factors are becoming increasingly important as the millennial workforce enters the workplace, bringing expectations of what their employer can do for them. It has been challenging for many employers to find ways to integrate millennials.
- A strong need to connect retiring workers with millennial workers exists to ensure that knowledge dissemination occurs and is transmitted to the next generation of the workforce. Implementing and establishing more cross-generational relationships within companies should be a priority.
- Status and opportunities within specific industries such as manufacturing can be a challenge in the eyes of parents, key influencers in career pathways of youth. These industries are stereotyped to offer little potential for growth or promotion and be low paying jobs. These negative messages are being shared with youth as they consider career pathways.

    Many students are not interested in the technical jobs that employers are looking to fill because they think these jobs are boring.

- Transportation is a barrier to get students, especially from the inner city, to job opportunities.

- Young graduates want to leave the region to have a different experience (i.e., moving to Philadelphia or New York). They do not think about the quality of life factors in the Lehigh Valley; they do start thinking about this more after a few years of being away as they begin to think about starting a family.

What gaps and opportunities do you see in the way education and training in the region is delivered that would improve the region's positioning to ensure a strong talent pipeline?

A number of opportunities for new programming were discussed, including:

- Offering more noncredit programs, especially tying the outcomes of the program to industry accredited skills. It is about life-long learning and continual upskilling.
- Providing an opportunity to support the upskilling and discovery of better positions for underemployed people (i.e., who are working but for a low wage).
- Creating more adult career coaching supports to help adults know what the opportunities in the region are.
- Thinking about the skills and jobs of the future and better preparing people for those skills (i.e., 3D printing, internet of things, artificial intelligence).
- Working to build more relationships between companies and students. Companies need to be involved in the schools, be active, and have a presence. Schools need to bring students through the doors of companies and get them exposure and build a base of experience. The challenge is that many companies are not doing this and that students do not take those opportunities to go work when they are available.
    - Creating more immersive work/career experiences for students in 11th and 12th grades. More internship opportunities with the region's small and medium-sized companies would be great.
    - Increasing awareness on the differences and value (return on investment) between apprenticeships, co-ops, and internships. There is a need to figure out how to create the opportunities for employers to share with each other the values of these types of programs.
    - Getting students into the workforce early enough so they can know what it is like to work and build employability skills.
    - Fostering a better realization of what career opportunities exist and how students can best prepare (from kindergarten to grade 12). Employers need to talk to the students and their parents to highlight and present opportunities in compelling ways, as well as work with the teachers to provide company tours, summer internships, etc.

What key priorities would you want included to strengthen the success of talent attraction and retention?

- Do a better job of molding students early on to identify personal interests. Let students know what the jobs/careers are and help them to develop the skills needed, including academic, technical and employability skills.
- Create a unified approach and vision between companies, education providers, and other workforce stakeholders throughout the Lehigh Valley to understand what is needed to make the Lehigh Valley

prosperous. Take an innovative approach and do not dwell on what the community used to be, think about what it can become.

  - Take a collaborative, cross-industry approach to share best practices, provide mentoring, and tackle the issues together where everyone commits people, time, and money to overcome the challenges and have bigger companies share ideas and help the smaller ones.

- Create a network to help employ semi-retired and retired individuals who want to continue working and have the knowledge to pass on but do not want to do it on a full-time basis.
- Work with employers to understand that there needs to be a constant development of employee skills. This means constant training, and helping employees see what the career opportunities are and helping them get there.
- Work to build more relationships between companies and students, especially as it relates to experiential opportunities and learning.

2.1.1 LVEDC Board

What is your 10-year vision for the Lehigh Valley's local labor market?

- Having a balanced and available workforce in the region. The focus should be placed not only on vocational/technical training but also business services and health care sectors that need 4-year degree graduates.
- When companies assess if they want to come or stay in the Lehigh Valley, they are impressed by the talent pool available.
- Shorter turnover time to find the right employees.
- Faster name recognition of a place that people want to move their families. Overcome the challenge of attracting young people to the Lehigh Valley and keeping those young people here rather than losing them to the bigger nearby cities.
- Having an adaptable workforce that can adapt to the changing work conditions and business models and be successful. Start setting up the education system now to be ready for the significant changes needed in the next 10 years.
- Finding the right balance between encouraging more employers to provide training to their workforce and making sure that employees have the specific skills that are needed.
- Getting students in inner-city high schools to graduate and into the workforce in a significant way.
- Attracting employers that have a corporate culture that is consistent with the values in the community, providing higher paying jobs that keep talent in the Lehigh Valley, and value employees.

2.1.2 The Lehigh Valley Professionals Group

Challenges and Barriers

- Looking at a pay drop and a slight step back from the previous position in order to get the job. Many are open to this as they do not want to commute far or have to relocate out of the region.
- Having trouble getting recruiters to connect current skillsets with skillsets employers are posting for (has a good experience but not the 'perfect' experience). A lot of postings looking for technical skills that do not really fit an executive skill set well.
    - Job opportunities for executives are insufficient in the Lehigh Valley. Will have to look outside the region and potentially relocate.
    - Need to have a system where high skilled job seekers can connect with supports/recruiters that have links directly to the C-Suite executives of companies not just those in HR.
- Difficult to land a high-level job with the biosciences, pharma, fintech if you are not already active in those industries. They do not want to bring in an outsider that does not have the direct experience in the sector.
- Some age discrimination is happening. Some employers are biased against more experienced people because they see them as over-qualified and are fearful they might leave at the opportunity of a higher paying job.
    - Many companies that are young and innovative are hesitant to hire as they do not want to pay the high wages often demanded. They also do not necessarily trust that employees will be in it for the long term and will be loyal to the company.
- Many of the support programs or on-the-job training programs that help people disqualify some of the more experienced people because of their incomes or previous experiences (criteria of these programs are not great at making sure that people can retrain and get back in the workforce without getting to a vulnerable place where they have few other options).
- Many of the career fairs and networking events in the region are focused on low-skill and middle-skill jobs.

Quality of Employment Opportunities

- The five main sectors of growth in the Lehigh Valley are generally not great fits for executives looking for work as wage levels cap out much lower than expected.
    - The perception of group participants is that 80% of the jobs in the Lehigh Valley are lower paying (~$15-$19/hr), with only about 20% of the jobs for professionals.
    - Many employers are having trouble finding the workers but the workers needed are not the executive level people they are the truckers, machinists, etc.
- Jobs are either not in the region, or they are hidden and difficult to find (i.e., perceived 80% of jobs not posted).

From the Lehigh Valley Professionals group job-seeker perspective, the top priorities are:

- Working to eliminate the barrier between highly-skilled candidates and hiring managers.
- Creating a Lehigh Valley 'business champion' that can communicate what talent is available in the region (there is a perception that many large companies in the area looking to fill executive level jobs do not expect to be able to fill them locally).
- Working with employers to better recognize the value of 'transferable skills' and not only 'industry-specific skills.' It can be challenging to penetrate into a new industry even if a candidate has a lot of transferable skills because employers do not see them as the most valuable skill-set (even though you can learn industry-specific skills once in the job).
- Communicating to job-seekers how they can access support from educational institutions in the region to improve or hone their skills (i.e., alumni able to access webinars or low-cost undergraduate courses).
- Creating more supports targeting the mid-career professional. Majority of support programs in the region are directed towards lower/semi-skilled (lower paying) jobs or the millennial workforce looking to enter the workforce.

2.1.3 Educational Institutions

How do your students view career options and the job market in the Lehigh Valley?

The majority of students are unaware of opportunities that exist in the Lehigh Valley. There seems to be a limited exposure by high school students to what the types of jobs are and what opportunities they can lead to.

Generally, there are two streams of thought for high school students:

- A significant portion of high school students does not think about what the future brings. They are wrapped up in the everyday issues in front of them (college, poverty, housing issues, etc.).
- The other portion thinks about what their parents do and follow that pathway. The understanding that parents have about the job market heavily influences their children's understanding.

While there is work happening to help students look at career options, there is a sense that there needs to be a better job at exposing students in middle school to the concepts of career and getting them internships that can then lead to job opportunities.

In what ways are training/education institutions collaborating currently with each other and with the business community?

Educational institutions see themselves as reasonably well-connected with each other. This is happening through a number of different channels including working with each other to share job postings when they do not have programs to meet the job need, having a consortium arrangement where colleges accept each other's credits and collaborating between school districts and postsecondary institutions by aligning programs and courses to make sure they fit with each other. In addition, there is a general sense that guidance departments are working well with some postsecondary through dual enrollment credit programs, school tours and guiding students through the postsecondary entrance process.

As for collaboration with businesses, educational institutions see a need for more focus on linking with the mid-sized and small businesses rather than only engaging the same large companies. There is a need to make it easier for these smaller companies to engage with educational institutions. Some example initiatives could include creating joint job fairs, advisory boards, panels, on-campus recruiting, cross-partnership opportunities to bring diverse audiences together, virtual job fairs and conversations, and collaborating with the Chambers of Commerce, Business and Industry Education Councils, and industry associations, i.e., Society for Human Resource Management (SHRM).

2.2 Stakeholder Interviews

A total of 32 one-on-one telephone interviews were conducted with business (in each of the five priority sectors), community, municipal and State leaders in the Lehigh Valley. These interviews were guided by open-ended questions to promote conversation, each averaging approximately 20-30 minutes in length. The comments in this section reflect the views, perceptions, and opinions of those interviewed.

Summary results from the interview discussions are presented below.

2.2.1 Advanced Manufacturing and Food and Beverage Manufacturing and Life Science Research and Manufacturing

Availability of Talent

The current availability of skilled labor is identified as challenging while entry-level talent is much easier to find. In both the Advanced Manufacturing and Food and Beverage Manufacturing, and Life Science Research and Manufacturing sectors, specialized and technical roles require further training above and beyond that obtained through education. Many respondents felt that a large number of retirees are a major factor in this shift and that the current talent pipeline is not adequate.

Workforce Challenges

A skill mismatch is identified by the respondents as a significant workforce challenge, as the skills of the educated labor force do not meet the needs of the employers in the region. Also, the skills shortage is driving up wages, and companies have to recruit further afield.

Respondents also identified the retention of skilled talent, especially in the Life Science Research and Manufacturing sector is a challenge as experienced employees move to larger cities such as New York or Philadelphia. While internal leakage does occur within the Lehigh Valley as employees move from one company in the region to another, employers see it as part of a healthy ecosystem.

Respondents also noted that the Lehigh Valley has a mix of old and new cultures and has the means to cater to these experiences equally. However, unless people come to the Lehigh Valley, they are not aware of the advantages of the region. Thus, respondents suggest that the Lehigh Valley should position and market itself well outside the region, touting the positive environment.

Current State of Education and Training

Respondents felt the education institutions are providing value, but there is disconnect between the skills being taught in the universities and being job ready. It was seen to be a 70%-30% split with 70% of programming being aligned with employer needs, and a 30% gap, with some students lacking specific training. The respondents also felt educational institutions need to do more to connect students to local companies and encourage them to stay. The highest-profile partnerships for experiential learning are with companies outside of the Lehigh Valley.

Specific programs mentioned were electronic technicians, and engineering focused on hardware development, not software, while industry demands more software engineers. This highlights a disconnect between what skills people think are needed and what is being hired for.

The respondents also mentioned they require graduates who are able to analyze and synthesize the tasks given to them. It is not just about completing a task but having the applied skills such as critical thinking, creativity, personal expression, research, and problem-solving. Respondents also identified employability skills as critical for entry-level staff. The lack of customer service skills has also been noted by some Life Science Research and Manufacturing businesses.

Opportunities and Priorities

There are opportunities to develop programming that attracts interested learners to the Lehigh Valley and reduces the out-migration of youth. The prospect of establishing the Lehigh Valley as a technical hub for STEM careers should be prioritized. The region can benefit from promotion of its ethnic diversity, a factor often considered by those looking to relocate to a new community.

It was identified that several biomedical businesses are interested in improving the diversity of their workforces, but that the people in the education programs are mainly white males. There is a desire to see greater awareness building and promotion of Science, Technology, Engineering, and Math (STEM) development among minorities and women, so that enrollment will increase. Two employers specifically identified a need to expose students to STEM at young ages.

Employers need to improve internal talent management, focusing on skills development in response to the changing labor market. Promoting internships and launching recruitment programs including job fairs and talking directly to students will offer increased exposure of companies and careers in the Lehigh Valley. Collaboration and communication between and among businesses and educational institutions can spur programming that promotes greater labor supply and demand alignment.

2.2.2 High Value Business Services

Availability of Talent

Access to skilled labor is generally viewed as constrained for most companies. The supply of skilled and specialized labor is viewed as being lower than the demand for labor. Several factors were suggested by interview participants as affecting the demand, including the increased automation of roles that require a different skill set than some traditional roles. Highly technical or specialized roles require further training above and beyond that obtained through education (job-specific skills that may vary from company to company and cannot easily be taught broadly), and an impending wave of baby-boomer aged retirements are further increasing labor demand. Different positions are needed for different

sectors, for High Value Business Services they are related to administrative, directors, human resources, or communications.

A few participants noted a difference in labor availability during the financial crisis and recession and more recently in the years of improvement in the economy. During and immediately after the crisis, particularly in High Value Business Services, there was a larger talent pool of highly qualified people looking for work and less demand for employees while as the economy has begun to improve, there is a lack of qualified individuals, particularly with experience. Large waves of retirement-ready individuals are increasing anxiety among some large employers, not only for needed talent but also for managing the transfer of institutional knowledge.

Workforce Challenges

Several specific challenges were identified by different interview participants related to accessing skilled labor. The most common consideration was the need for greater experience in the sector prior to completing postsecondary programs. Employers want students to emerge from their studies already experienced in the area that companies are hiring. This kind of experience can usually only be gained through internships, apprenticeships, coops, summer employment, or previous work experience prior to the postsecondary career (for example, a person in their mid-thirties who has returned to school but already has some experience from previous employment).

Another challenge is the retention of skilled talent, as feedback indicates many young people leave the Lehigh Valley once they have gained enough work experience to acquire employment in a larger city such as New York or Philadelphia. While leakage does occur within the Lehigh Valley as employees move from one company in the region to another, employers see it as part of a healthy ecosystem. Employers understand the “give and take” associated with these changes and recognize it as a state of equilibrium between those leaving and those coming in. The deeper concern is leakage to other places outside of the Lehigh Valley.

A related challenge is the number of people who come to the region for education but do not stay in the area. Some businesses explained the dynamic as lacking sufficient quality of place and social networks to instill a sense of place for staying in the region. In other words, people sometimes do not feel an emotional attachment to the region and therefore do not consider it as a place to live long-term upon completing their studies.

Current State of Education and Training

Customer service skills are viewed as lacking in many business services but are viewed as essential even for people who do not typically deal with clients directly. Relatedly, it was also suggested that educators provide more training in specific client relationship management (CRM) software, most prominently in Salesforce. In fact, one interviewer identified there is no Salesforce Certification training program anywhere in the Lehigh Valley, and pointed to Monroe College in Long Island as an example of an institution that offers such specialized training.

Another area where skills gaps have been identified is in the area of employability skills development. Some participants suggested that employability skill development should be emphasized in high school because it would help people at all career levels.

Feedback on the curriculum, in general, has been generally positive, with many employers across all sectors indicating some form of working relationship with at least one local college or university and

curriculum development.

Opportunities and Priorities

Career Path Planning resources are needed to help young people visualize where they would like to go in their careers and the various steps to getting there, including education and work experience. It was suggested that some people lack role models in STEM industries, and therefore find it hard to move to senior roles. The challenge is that many high school students are not entirely sure what they like or do not like. Related anxiety of some businesses is that students sometimes do not have a realistic appreciation of how long it takes to move up in a company. The word "millennial" was regularly used to illustrate a shift in expectations, where current graduates expect to move up quickly and to receive validation and gratification for tasks. Some employers also said it is a responsibility of companies to understand that the workforce has changed and that businesses must also evolve in how they deal with employees, particularly in regard to rewarding good work. Not many people go into college thinking about careers in areas such as business services or human resources planning. Some participants indicated that the sectors appear less glamorous than others, such as engineering. As noted by one person, "nobody says I'm dying to work in insurance." People do not register these critical roles as career paths.

2.2.3 Transportation, Logistics, Warehousing and Wholesale

Availability of Talent

The transportation industry is facing a shortage of qualified drivers who are capable of handling the workload. Respondents feel that this is because the labor pool is limited for the industry, but the demand is high as the industry is expanding.

The skill level of the workforce also differs based on the type of trucking industry. While some trucking companies only accept experienced drivers, others are willing to hire an inexperienced worker and provide training.

Workforce Challenges

The region does not have the resources needed to fill the gaps. Finding good workers to do the job is the most prominent workforce challenge. The problem is not about the steps taken to address the challenge. There are driver training schools and programs available to train the workforce. The problem has to do more with attracting and retaining the drivers. Since the demand for talent is high, companies provide competitive pay packages, benefits and medical insurance for the workers. However, it is difficult to recruit and retain talent. For the trucking industry, the nature of the work itself is demanding. Being on the road, even in extreme weather conditions takes a toll both personally and family-wise.

Current State of Education and Training

The trucking and warehousing industry in particular benefits from the commercial driver's license (CDL) providers in the region. Furthermore, the companies themselves host job fairs and talk to guidance counselors in schools to attract drivers.

Opportunities and Priorities

The location of the region is cited as a massive boost for the industry. The region is located at the crossroads, with connections to New York, Philadelphia, Baltimore, Washington and Toronto. There are opportunities for the government to develop interstate CDL license that can be provided for high school graduates. Also, work up programs in schools can help train and lower the age needed to get the trucker's license. Trucking companies are also targeting veterans as they are already adapted to the trucking lifestyle, being exposed to harsh living and working conditions.

A key priority for the trucking industry is to develop a benefits package and marketing strategy to attract workers to the region.

2.2.4 Health Care Services

Availability of Talent

In the Health Care Services industry, almost all respondents felt that the labor market is strained in the region as hospitals face a high vacancy rate in both clinical and non-clinical positions. Based on the perspectives shared, the challenges are twofold, namely, the unavailability of skilled talent due to various reasons such as competition and out-migration and the gap in the labor market pool in terms of appropriate skills needed by the industry such as healthcare technicians.

A significant concern is the high-skilled migration witnessed in recent years, as youth move outside to study, especially in technology-related roles.

Workforce Challenges

Overall, the respondents feel that growth in the past ten years, in both the service and technology-based industries has resulted in high competition and made it hard to find qualified people. While some healthcare networks have residency and training programs to grow their own workforce, they are witnessing talent gaps. The respondents attributed this to three factors (listed in terms of rank); (i) the out-migration of trained workers, (ii) inability to attract outside talent to the region and (iii) high competition between the healthcare networks in the region.

Another perspective shared by one of the respondents involves the high supply and demand gap for low-skilled and low-wage workers. As more businesses come in, the competition for low-skilled and low-wage workers is increasing, and hospitals face a shortage of workers for environmental services and janitor roles, etc. While hospitals have in-house programs to train its skilled workforce, there are no programs to attract, train or retain low-skilled workers.

Current State of Education and Training

Respondents feel that the present state of education and training programs is quite good. The Lehigh Valley Health Network (LVHN) and St Luke's University Health Network have their own training and residency programs. Furthermore, they collaborate with other training institutions, workforce boards, community health centers and universities to develop training programs and organically grow the needed talent. Other programs mentioned include the Emerging Health Professionals Program, Penn State Lehigh Valley University online teleconferencing programs and summer programs at the East Stroudsburg University.

Opportunities and Priorities

The top priority mentioned by almost all the respondents is the need to increase marketing efforts in the region to attract talent. Advocating for the region and highlighting its affordability, providing affordable housing, capitalizing on the quality of life offerings and social connections is crucial to attracting talent to the region.

Respondents feel that more opportunities for collaboration between the public and private sector is moving in the right direction with possibility for improvement. In terms of educational offerings in the region, respondents feel the need to be more proactive in anticipating the current and future needs of the workforce. Programs such as those provided by the Emerging Health Professionals Program should be replicated. Furthermore, vocational/technical schools should be capitalized on to provide experiential learning, job shadowing, and co-op programs. Schools should educate students about the healthcare industry and career pathways related to healthcare.

2.2.5 Common Priorities Across Sectors

Participating businesses, regardless of the sector, regularly use at least one form of on-the-job student exposure to industry, either through internships, apprenticeships, or cooperative education programming. Indeed, several advanced manufacturers in Life Science Research and Manufacturing indicated using all three forms regularly. These programs are viewed as the critical means to provide students with stronger work-experience while in school. Businesses across all sectors identified having strong relationships with postsecondary institutions, with many reiterating the need to improve programming and opportunities for internships, apprenticeships, and co-ops.

Common priorities identified by interviewees fit within the following thematic areas:

- **School Relationships:** Participants identified a need to ensure strong networks are developed and maintained between schools and local businesses, and that efforts are required from both sides, as well as other local partners, to help them grow. Relationships with high schools were also identified as a place where STEM and career path awareness and capacity building can be started, including the identification of role models and mentors for people who show interest. Relatedly, there is interest in continuing to diversify the workforce so that more women and minorities have opportunities for STEM careers and are thinking about college options. Enhancing internship/apprenticeship/co-op opportunities remain the critical means of equipping students with an initial amount of work experience.
- **New Hires:** New hires are expected to learn that advancement and immediate gratification are not always fast, particularly in large organizations, but that good work does get noticed and is appreciated. Efforts need to be made in better preparing students for this reality, while also ensuring businesses are more empathetic to the needs of the incoming labor force. Businesses have opportunities to ensure that new hires gain a variety of experience by being placed in various entry-level roles at a company as part of their indoctrination processes. There is a desire to see businesses institute better rotational programming to expose new hires to the variety of roles and divisions in companies so that they can better understand what they would prefer to do over the long term and map out a career path. It was suggested by one person that temp agencies may be able to fill the gap of helping people gain more experience after they've completed their education while releasing

some pressure from area employers toward hiring fresh graduates. Another suggestion was to have businesses develop stronger relationships with specific school programs so that top students with good fits at companies can be prioritized for internships and potential talent pipelines.

- **Quality of Life:** Several comments can be reduced to the continued development of quality of life and quality of place assets, resources, and social networks that would instill an emotional bond in the Lehigh Valley as a place to live after schooling is complete. Quality of life was also suggested as a way to promote "boomerang" residents, who may leave as young adults to larger cities for early career development, but eventually return to the Lehigh Valley when they are ready to start families. From this perspective, some suggest that marketing the Lehigh Valley beyond the target workforce, but instead toward their families as well, may help to attract people back to the community. There were also suggestions that more be done to encourage cross-pollination between related businesses beyond work roles and encourage social and recreational activities, which would help to instill a stronger sense of community.

2.2.6 Workforce Intermediaries, Associations, State Agencies

Availability of Talent

Workforce Intermediaries feel that the skills available in the Lehigh Valley are not aligned with the skills needed by employers. This is because many graduates have an arts-related degree while employers require technology, technical and trade-related skills. The problem is further exacerbated by the retiring 'baby boomer' generation, resulting in a wider gap in the workforce. Respondents also cited cultural norms as a factor for the widening supply and demand gap. Parents and school career counselors encourage students to pursue a college degree instead of pursuing a skilled trade, resulting in a significant portion of college graduates lacking the skills sought by industry.

Workforce Challenges

In terms of issues faced by employees, key themes emerged. Physical travel to workplaces located in an area that lack transit services is problematic. Combine this with additional barriers such as low wages, immigrant or a single parent status or all of the above, and the issue becomes both economic and social. The second key theme is the lower wages paid to employees in the region compared to pay in cities such as New York and Philadelphia for the same position.

Also, the lack of awareness of the kinds of jobs available in the region is a major workforce challenge. Employers and the Human Resources teams in the region do not account for the diversifying labor market in the region. The online job postings and long drawn out hiring processes are often discouraging for an individual looking for employment. Limited communication between development agencies, lack of time management and work ethic demonstrated by some employees, and the issue of drug abuse further complicate the challenges.

Current State of Education and Training

Respondents felt that companies, workforce development agencies, and educational institutions in the region are addressing the challenges in the workforce; however, they feel the need for increased effort and collaboration. The community could be more hands-on in fulfilling the need.

Opportunities and Priorities

Much of the discussion focused on the need for a proactive approach that fulfills the current and future workforce demand. One of the promising trends seen in the region is the willingness of employers to recruit immigrants into the workforce. While language is seen as a barrier, employers are willing to provide training and develop the skills of the immigrant workers. Respondents feel that the region should place more emphasis on the STEM and build on the efforts of Lehigh Valley universities, MRC, Lehigh Career and Technical Institute, the on-the-job training (OJT) program and the micro-credential program among others.

The region needs to be more creative when targeting its workforce, develop innovative training and recruitment programs, and improve collaboration both locally and on a regional level.

3. Business Telephone Survey

A statistically valid telephone survey of 315 randomly selected businesses in the five priority sectors throughout the Lehigh Valley was conducted. Companies contacted were also given the opportunity to answer the survey questions online if they preferred.

Summary findings from the survey are presented below.

3.1 Survey Participant Profile

Which of the following best describes your companies industry?

	Frequency	Percent
Advanced Manufacturing and Food and Beverage Manufacturing	79	25.1
Life Science Research and Manufacturing	9	2.9
High Value Business Services	80	25.4
Transportation, Logistics, Warehousing and Wholesale	75	23.8
Health Care Services	55	17.5
Other	17	5.4
Total	315	100

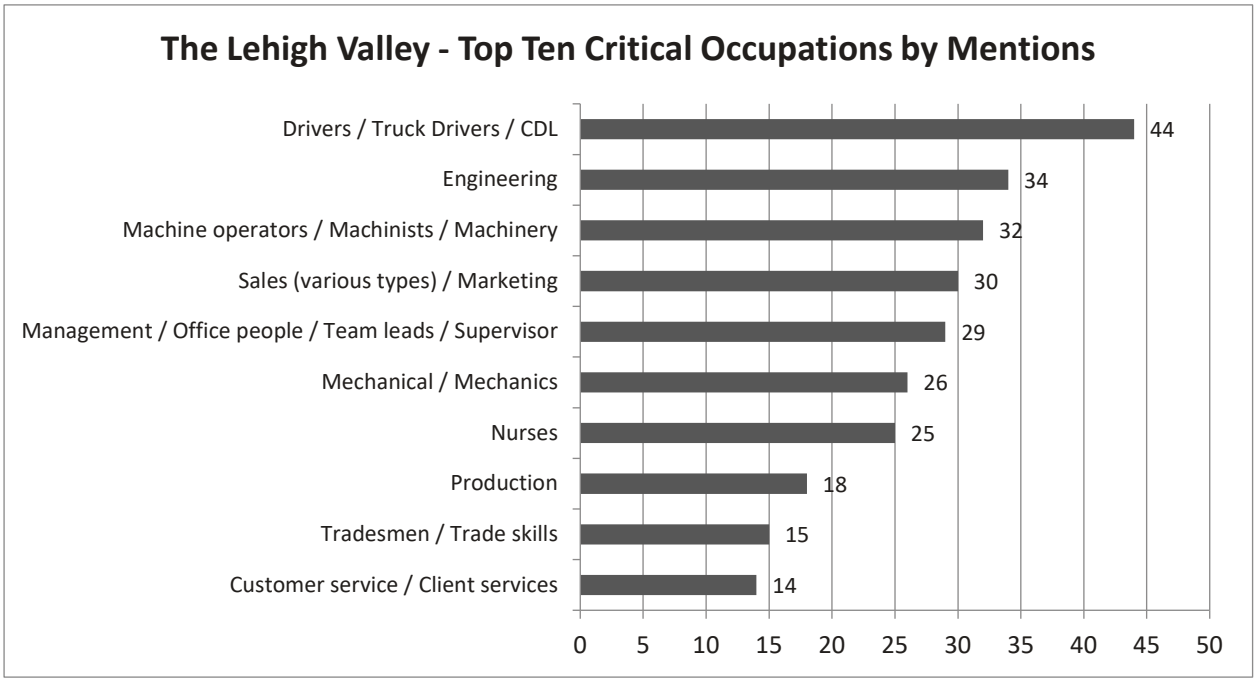
Roughly speaking, how many employees does your company employ?

	Frequency	Percent
1 to 10	34	20.4
11 to 20	16	9.6
21 to 100	49	29.3
101 to 1000	44	26.3
1001+	24	14.4
Total	167	100

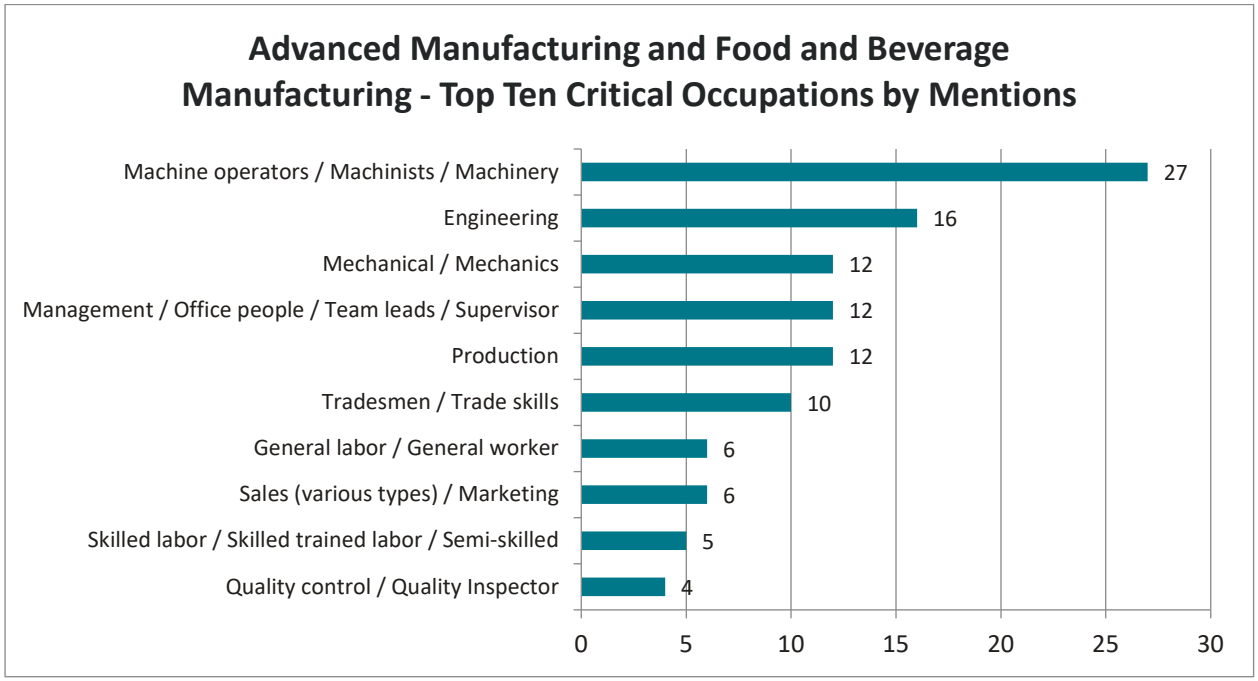
3.2 Survey Responses

Q1. How important is a skilled workforce to your operation in the Lehigh Valley? Would you say it is:

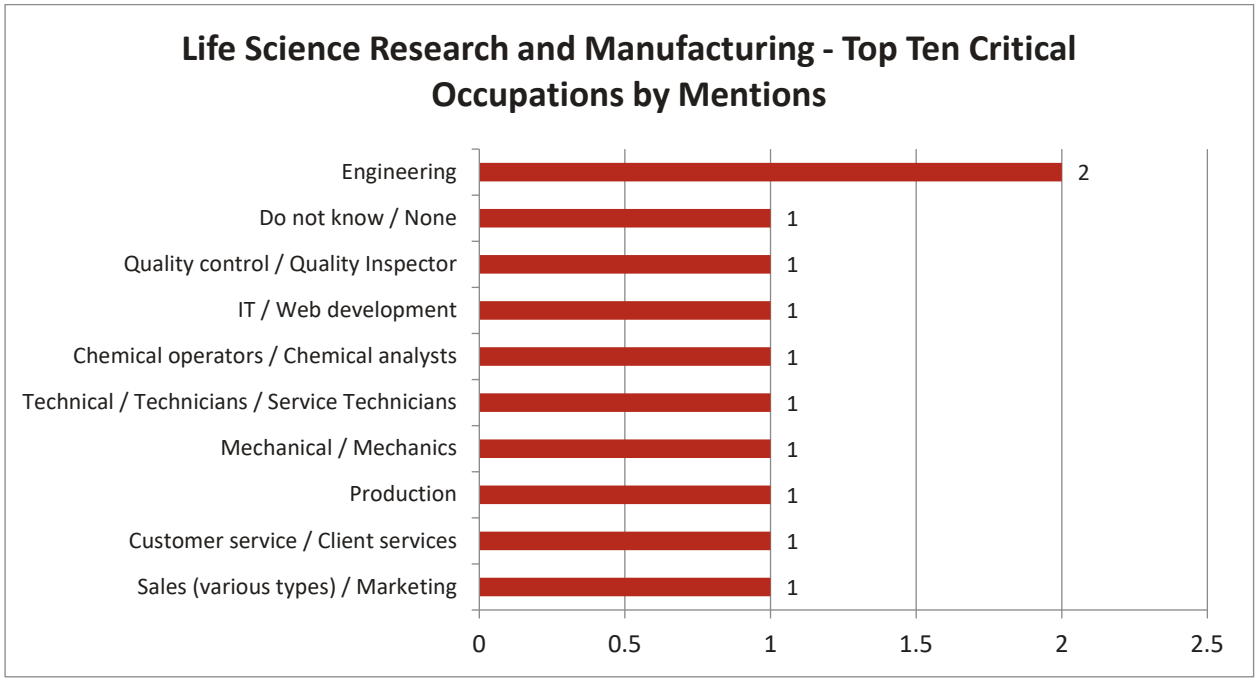
Q2. Which occupations are the most critical to your operation in the Lehigh Valley?

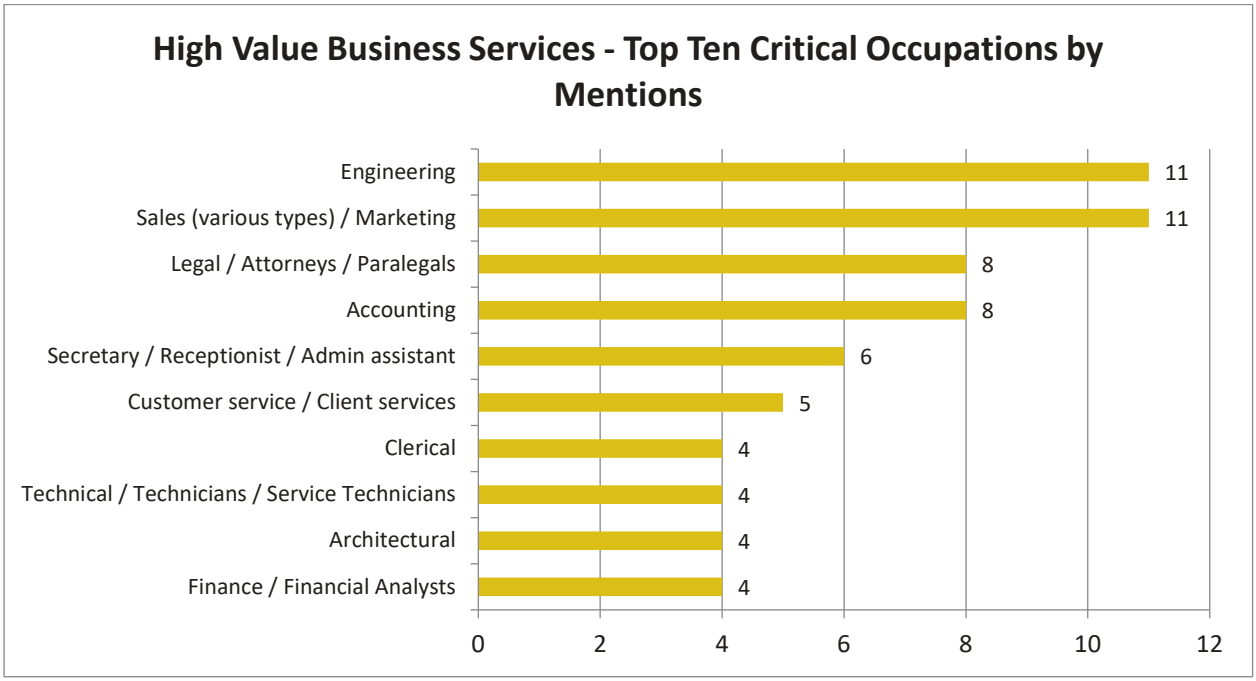


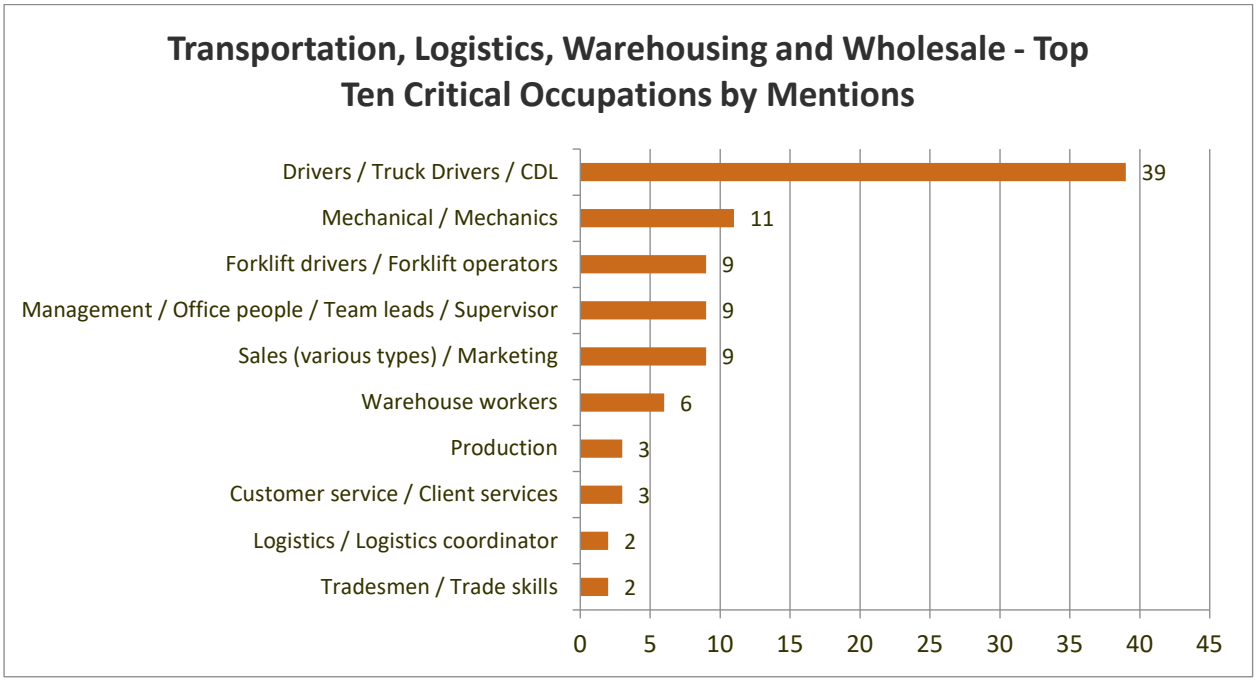
NOTE: Tradesmen / Trade skills include welders, plumbers



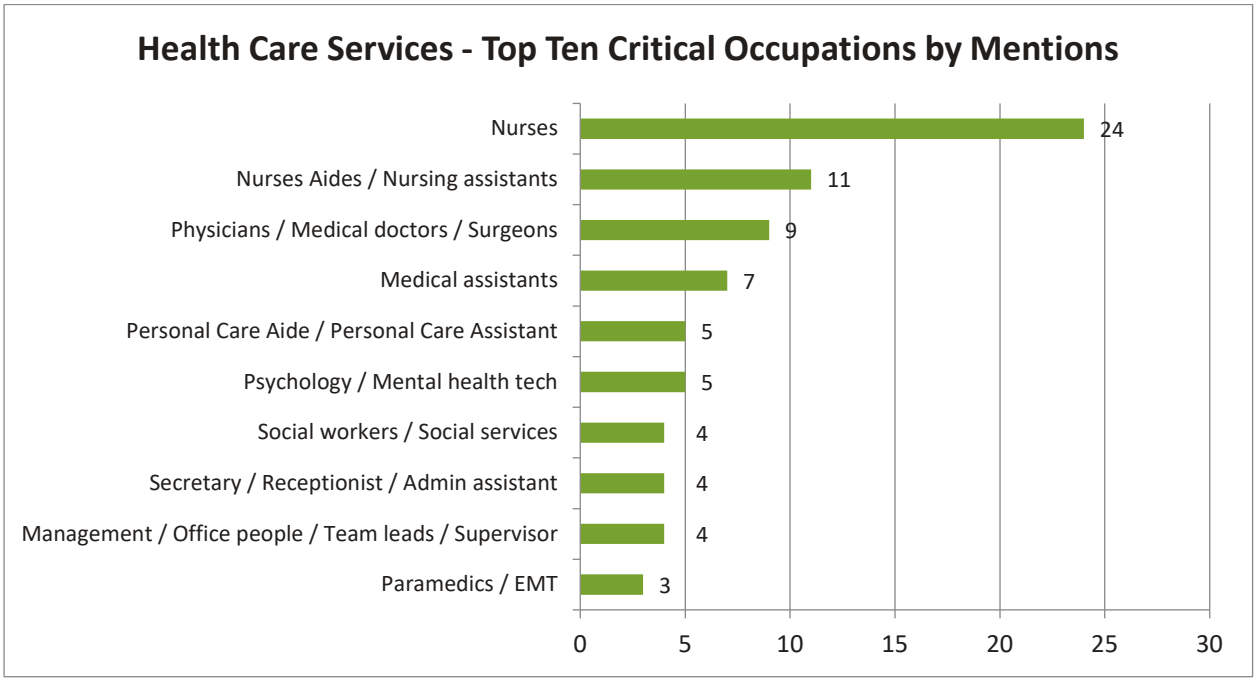
NOTE: Tradesmen / Trade skills include welders, plumbers



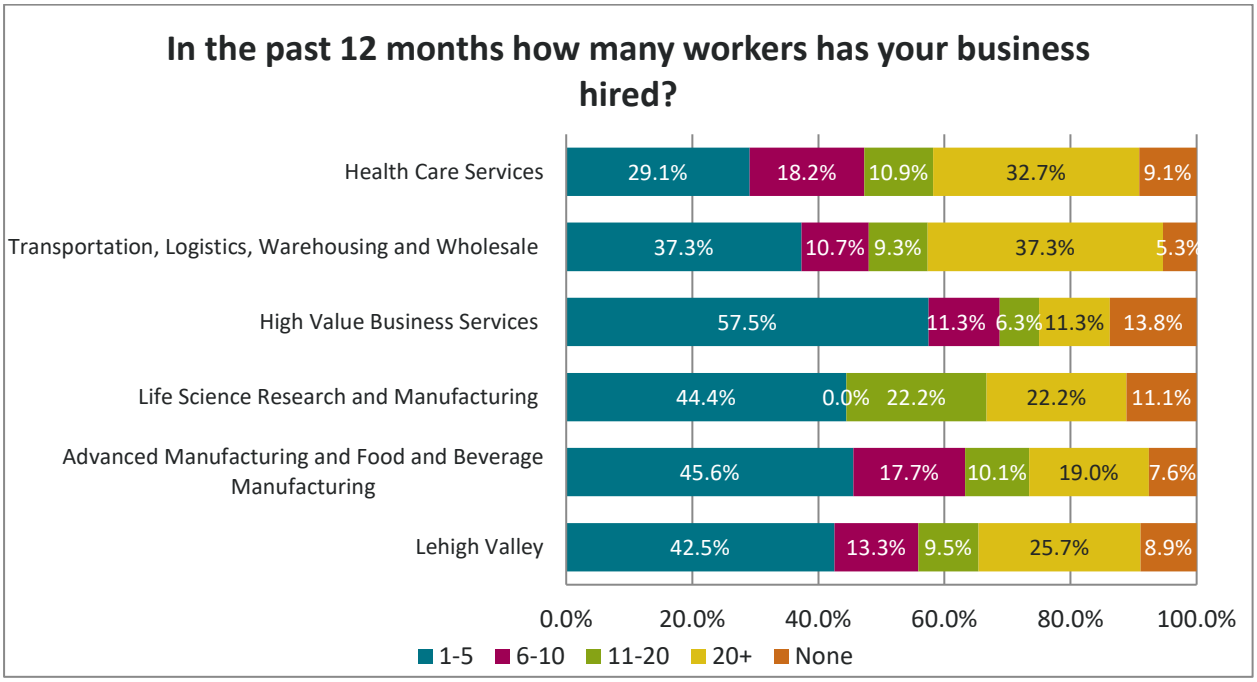




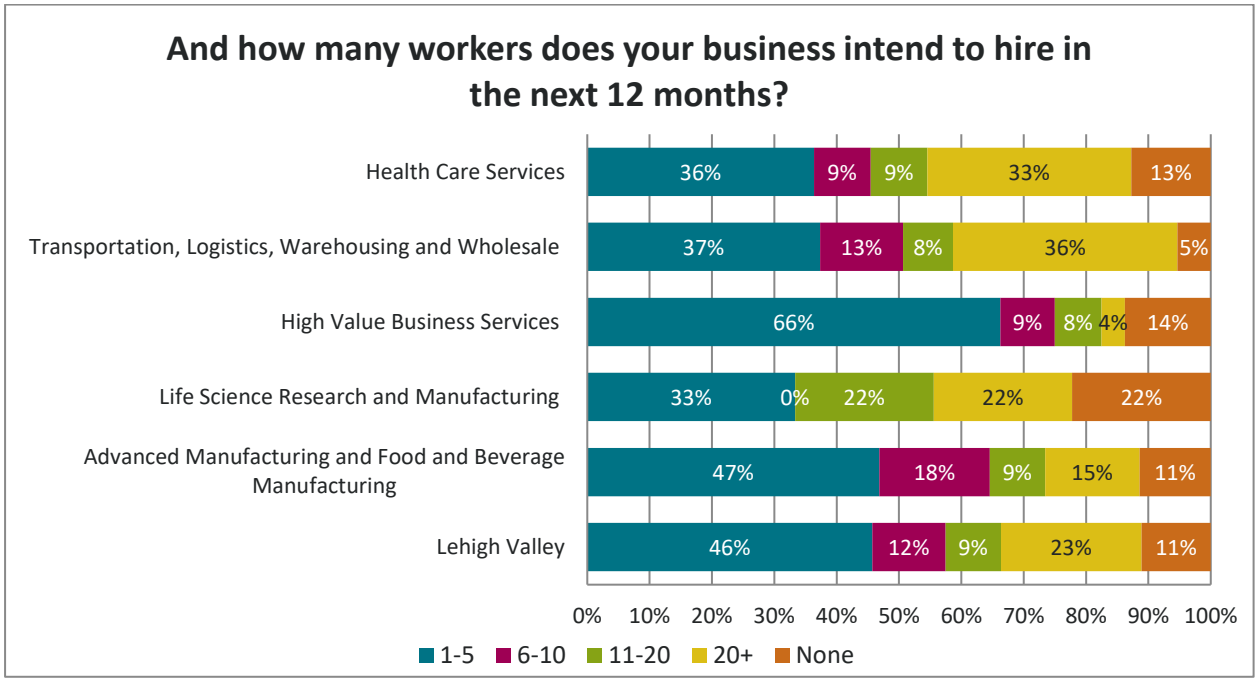
NOTE: Tradesmen / Trade skills include welders, plumbers



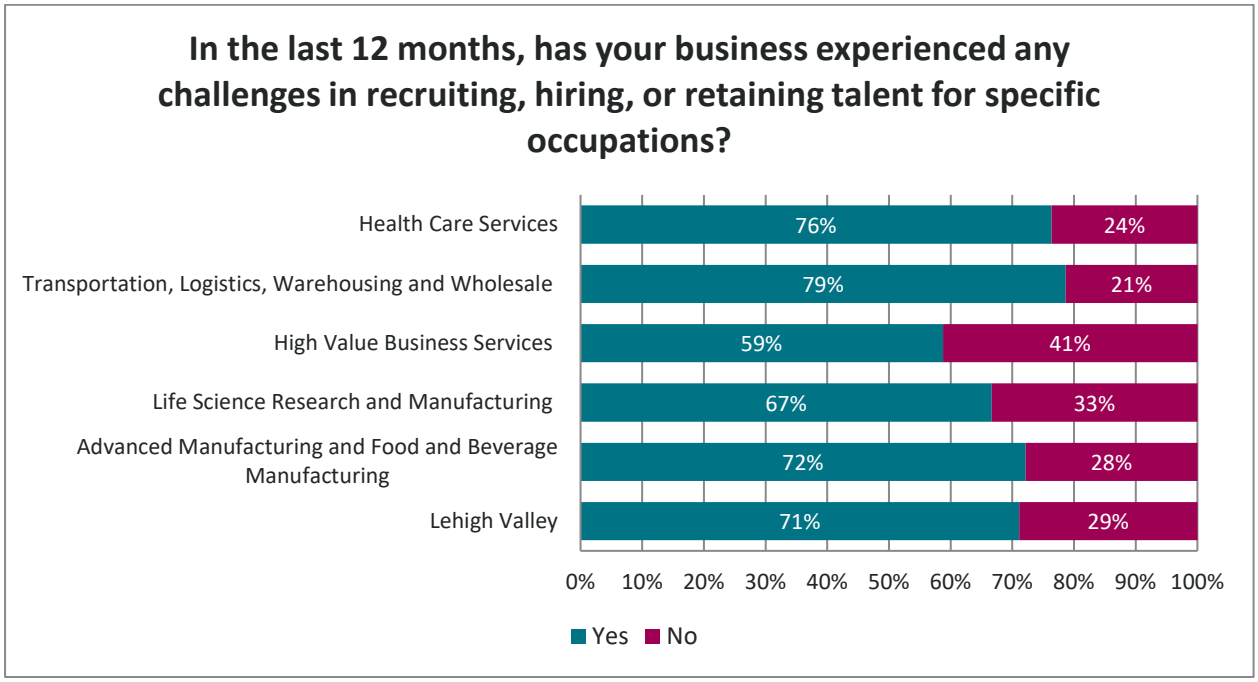
Q3. In the past 12 months how many workers has your business hired?



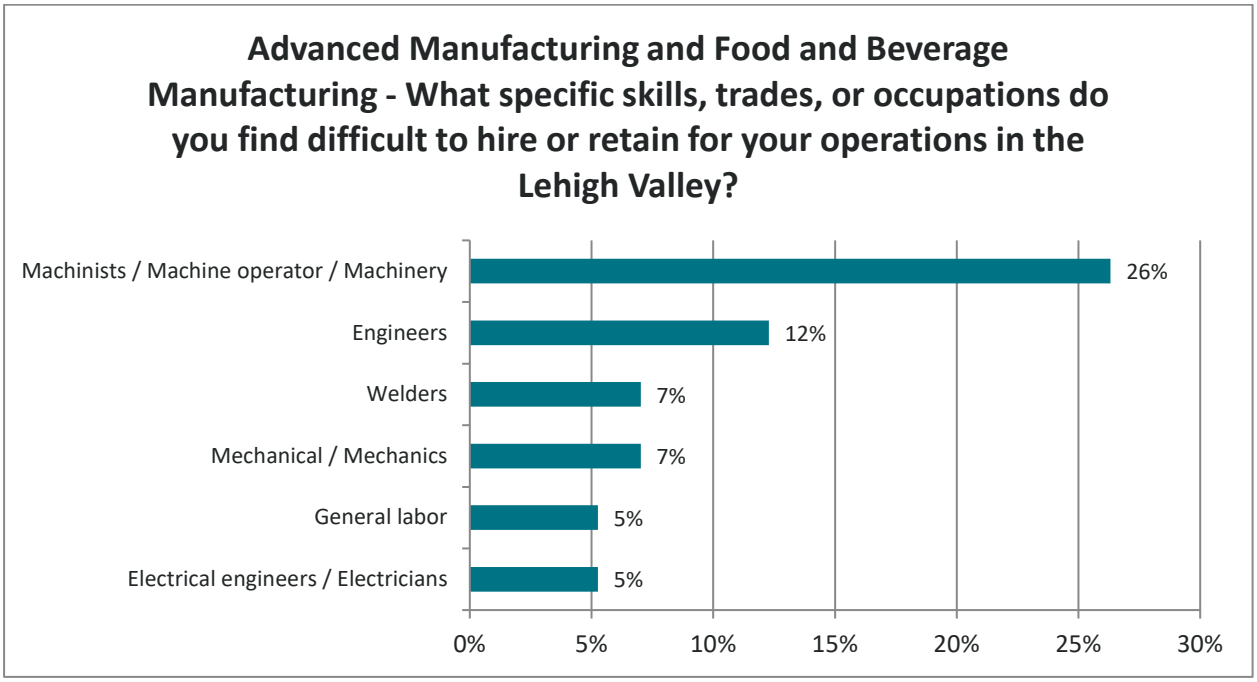
Q4. And how many workers does your business intend to hire in the next 12 months?

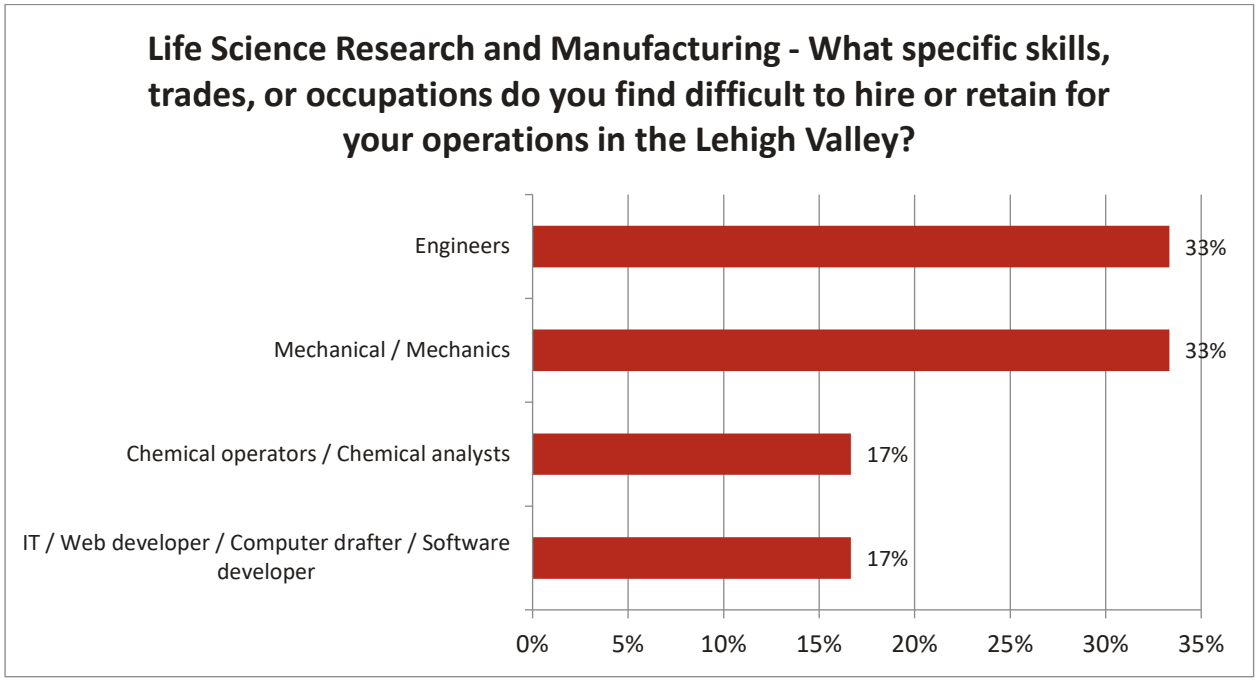


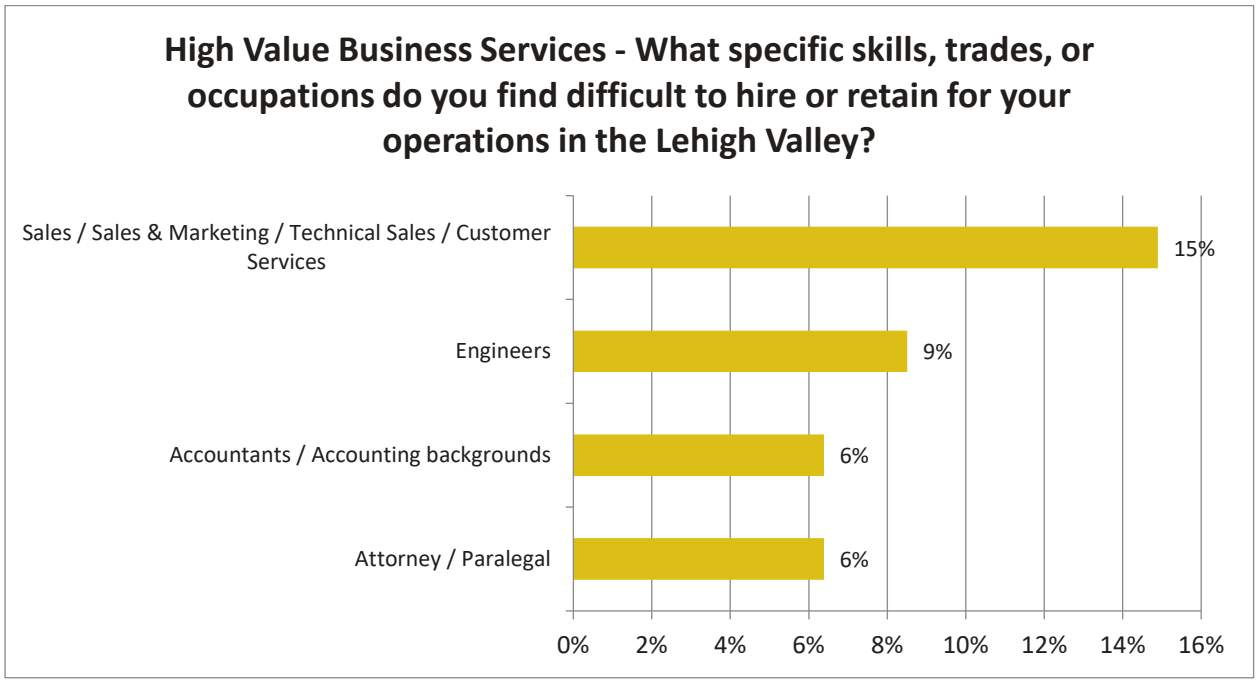
Q5. In the last 12 months, has your business experienced any challenges in recruiting, hiring or retaining talent for specific occupations?

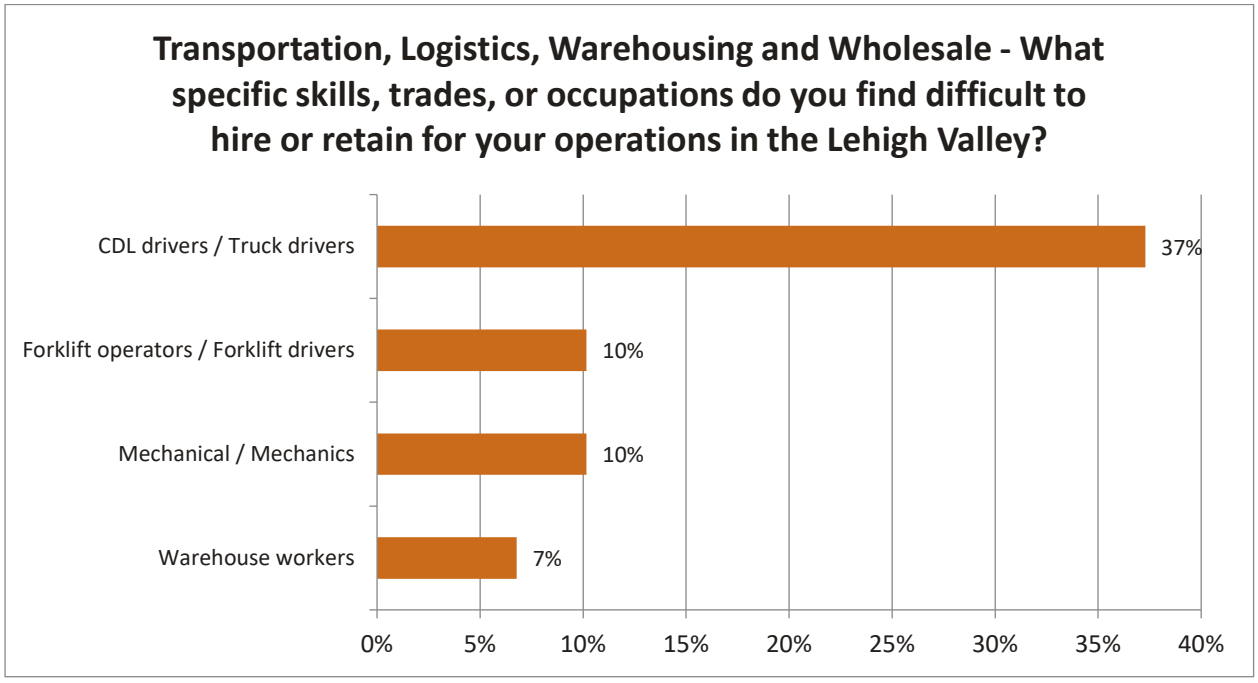


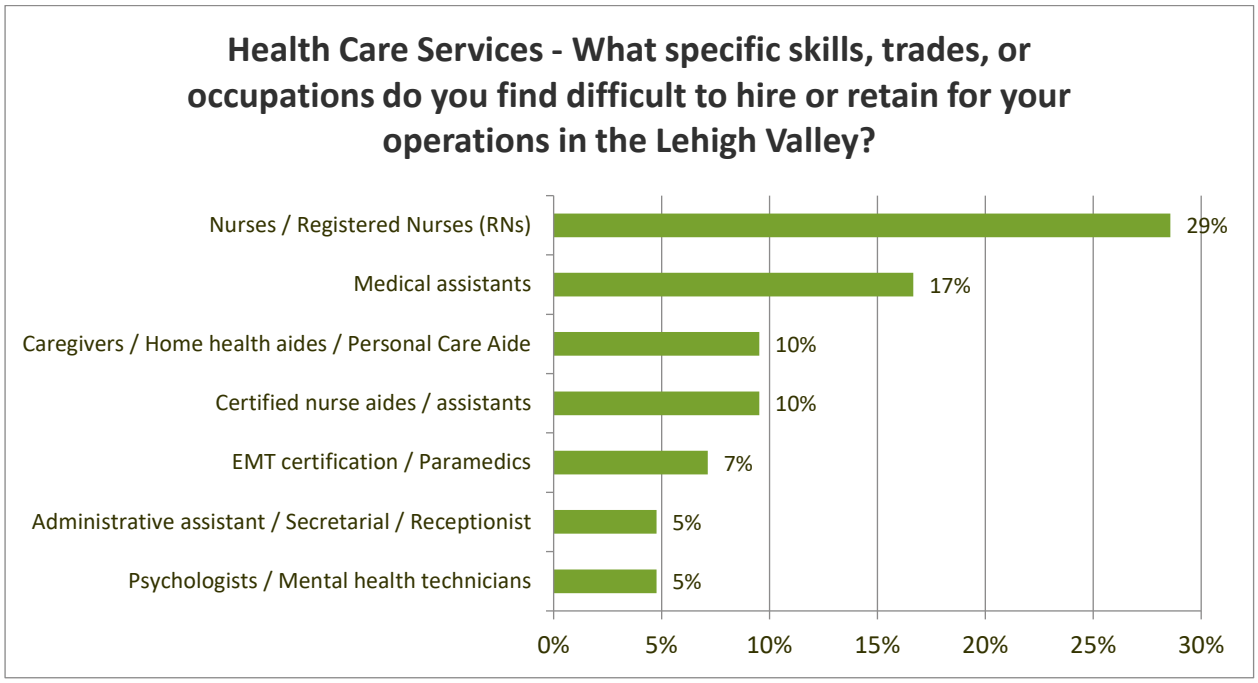
Q6. What specific skills, trades or occupations do you find difficult to hire or retain for your operations in the Lehigh Valley? (Top Mentions)




Life Science Research and Manufacturing - What specific skills, trades, or occupations do you find difficult to hire or retain for your operations in the Lehigh Valley?
Engineers
33%
Mechanical / Mechanics
33%
Chemical operators / Chemical analysts
17%
IT / Web developer / Computer drafter / Software developer
17%
0%
5%
10%
15%
20%
25%
30%
35%


High Value Business Services - What specific skills, trades, or occupations do you find difficult to hire or retain for your operations in the Lehigh Valley?
Sales / Sales & Marketing / Technical Sales / Customer Services
15%
Engineers
9%
Accountants / Accounting backgrounds
6%
Attorney / Paralegal
6%
0%
2%
4%
6%
8%
10%
12%
14%
16%


Transportation, Logistics, Warehousing and Wholesale - What specific skills, trades, or occupations do you find difficult to hire or retain for your operations in the Lehigh Valley?
CDL drivers / Truck drivers
37%
Forklift operators / Forklift drivers
10%
Mechanical / Mechanics
10%
Warehouse workers
7%
0%
5%
10%
15%
20%
25%
30%
35%
40%


Health Care Services - What specific skills, trades, or occupations do you find difficult to hire or retain for your operations in the Lehigh Valley?
Nurses / Registered Nurses (RNs)
29%
Medical assistants
17%
Caregivers / Home health aides / Personal Care Aide
10%
Certified nurse aides / assistants
10%
EMT certification / Paramedics
7%
Administrative assistant / Secretarial / Receptionist
5%
Psychologists / Mental health technicians
5%
0%
5%
10%
15%
20%
25%
30%

Q7. Thinking about the previous question, what level of education is required for that position?

	Frequency	Percent
Less than High School	23	5.6
High School diploma or equivalency	163	39.4
Postsecondary school certificate, occupational license, or occupational certificate	80	19.3
Some College	19	4.6
Associate's Degree	25	6
Bachelor's Degree	81	19.6
Graduate or professional Degree	23	5.6
Total	414	100

Q8. How important is a skilled workforce for the future growth of your operations in the Lehigh Valley? Would you say it is:

Q8. How important is a skilled workforce to the future growth of your operations in the Lehigh Valley? Would you say it is:							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Important	234	54	8	63	50	47	12
	74.3%	68.4%	88.9%	78.8%	66.7%	85.5%	70.6%
Important	56	18	1	11	18	6	2
	17.8%	22.8%	11.1%	13.8%	24.0%	10.9%	11.8%
Somewhat Important	22	6	0	5	7	2	2
	7.0%	7.6%	0.0%	6.3%	9.3%	3.6%	11.8%
Not Important at all	3	1	0	1	0	0	1
	1.0%	1.3%	0.0%	1.3%	0.0%	0.0%	5.9%

Q9. Overall, how satisfied are you with the availability of qualified workers in the Lehigh Valley for positions in your company? Would you say you are:

Q9. Overall, how satisfied are you with the availability of qualified workers in the Lehigh Valley for positions in your company? Would you say you are:							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	19	3	1	10	1	3	1
	6%	4%	11%	13%	1%	5%	6%
Satisfied	147	30	6	40	34	26	11
	47%	38%	67%	50%	45%	47%	65%
Dissatisfied	116	34	2	24	32	21	3
	37%	43%	22%	30%	43%	38%	18%
Very Dissatisfied	33	12	0	6	8	5	2
	10%	15%	0%	8%	11%	9%	12%

Q10. What is your satisfaction with the availability of the following to fill positions?

Q10A. Availability of workers with the right level of education to fill your positions?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	25	5	1	12	4	2	1
	8%	6%	11%	15%	5%	4%	6%
Satisfied	182	36	8	48	49	31	10
	58%	46%	89%	60%	65%	56%	59%
Dissatisfied	82	28	0	14	17	18	5
	26%	35%	0%	18%	23%	33%	29%
Very Dissatisfied	20	8	0	6	2	3	1
	6%	10%	0%	8%	3%	5%	6%
Not Applicable / Unsure	6	2	0	0	3	1	0
	2%	3%	0%	0%	4%	2%	0%

Q10B. Availability of workers with the right level of career experience to fill your positions?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total:	315	79	9	80	75	55	17
Very Satisfied	15	1	1	7	3	2	1
	5%	1%	11%	9%	4%	4%	6%
Satisfied	148	27	6	37	37	32	9
	47%	34%	67%	46%	49%	58%	53%
Dissatisfied	121	39	2	29	29	17	5
	38%	49%	22%	36%	39%	31%	29%
Very Dissatisfied	22	8	0	5	5	2	2
	7%	10%	0%	6%	7%	4%	12%
Not Applicable / Unsure	9	4	0	2	1	2	0
	3%	5%	0%	3%	1%	4%	0%

Q10C. Availability of workers with the right skills to fill your positions?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	17	1	1	8	3	3	1
	5%	1%	11%	10%	4%	5%	6%
Satisfied	141	30	6	36	33	27	9
	45%	38%	67%	45%	44%	49%	53%
Dissatisfied	129	41	2	29	31	22	4
	41%	52%	22%	36%	41%	40%	24%
Very Dissatisfied	23	6	0	7	6	1	3
	7%	8%	0%	9%	8%	2%	18%
Not Applicable / Unsure	5	1	0	0	2	2	0
	2%	1%	0%	0%	3%	4%	0%

Q10D. Availability of workers with the necessary 'employability' skills to fill your positions?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	13	0	1	7	2	2	1
	4%	0%	11%	9%	3%	4%	6%
Satisfied	135	25	6	40	32	23	9
	43%	32%	67%	50%	43%	42%	53%
Dissatisfied	131	41	2	27	32	25	4
	42%	52%	22%	34%	43%	45%	24%
Very Dissatisfied	32	12	0	5	9	3	3
	10%	15%	0%	6%	12%	5%	18%
Not Applicable / Unsure	4	1	0	1	0	2	0
	1%	1%	0%	1%	0%	4%	0%

Q10E. Availability of educational, certification, and training opportunities for your existing workforce?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	35	9	0	15	3	6	2
	11%	11%	0%	19%	4%	11%	12%
Satisfied	200	37	8	47	55	39	14
	63%	47%	89%	59%	73%	71%	82%
Dissatisfied	47	23	0	9	9	5	1
	15%	29%	0%	11%	12%	9%	6%
Very Dissatisfied	10	3	0	4	2	1	0
	3%	4%	0%	5%	3%	2%	0%
Not Applicable / Unsure	23	7	1	5	6	4	0
	7%	9%	11%	6%	8%	7%	0%

Q10F. Demographic diversity among candidates who apply for positions with your company in the Lehigh Valley?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	37	6	0	12	9	8	2
	12%	8%	0%	15%	12%	15%	12%
Satisfied	192	42	8	45	50	36	11
	61%	53%	89%	56%	67%	65%	65%
Dissatisfied	56	19	1	14	11	8	3
	18%	24%	11%	18%	15%	15%	18%
Very Dissatisfied	9	2	0	3	3	0	1
	3%	3%	0%	4%	4%	0%	6%
Not Applicable / Unsure	21	10	0	6	2	3	0
	7%	13%	0%	8%	3%	5%	0%

Q10G. State and local government support of workforce initiatives that benefit your company?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	13	5	0	2	6	0	0
	4%	6%	0%	3%	8%	0%	0%
Satisfied	138	36	4	39	29	21	9
	44%	46%	44%	49%	39%	38%	53%
Dissatisfied	76	20	2	16	17	15	6
	24%	25%	22%	20%	23%	27%	35%
Very Dissatisfied	17	5	0	2	5	3	2
	5%	6%	0%	3%	7%	5%	12%
Not Applicable / Unsure	71	13	3	21	18	16	0
	23%	16%	33%	26%	24%	29%	0%

Q10H. Staffing, employment and recruitment services and organizations that work with your company?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	17	4	0	7	4	1	1
	5%	5%	0%	9%	5%	2%	6%
Satisfied	172	44	4	38	43	30	13
	55%	56%	44%	48%	57%	55%	76%
Dissatisfied	44	11	2	8	12	8	3
	14%	14%	22%	10%	16%	15%	18%
Very Dissatisfied	8	2	0	4	1	1	0
	3%	3%	0%	5%	1%	2%	0%
Not Applicable / Unsure	74	18	3	23	15	15	0
	23%	23%	33%	29%	20%	27%	0%

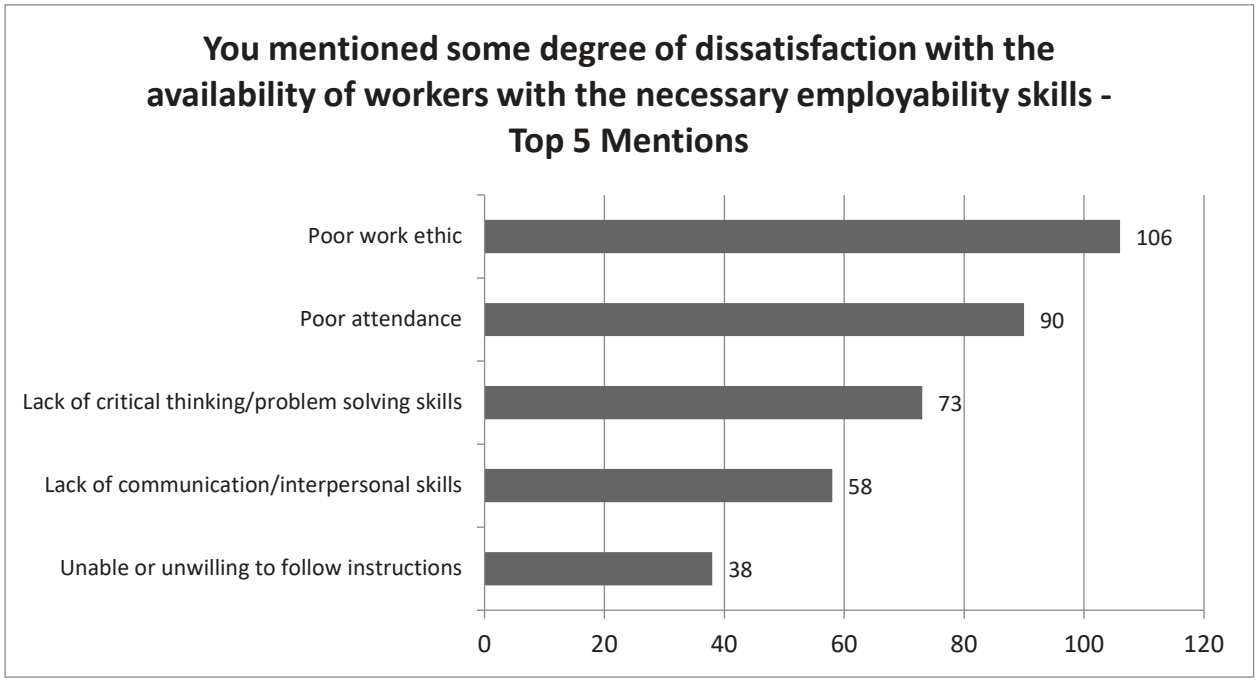
Q10I. Support from the Workforce Board Lehigh Valley and/or services from PA CareerLink® Lehigh Valley?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	15	4	0	3	4	2	2
	5%	5%	0%	4%	5%	4%	12%
Satisfied	144	36	3	38	32	24	11
	46%	46%	33%	48%	43%	44%	65%
Dissatisfied	44	11	2	4	13	10	4
	14%	14%	22%	5%	17%	18%	24%
Very Dissatisfied	8	2	0	4	2	0	0
	3%	3%	0%	5%	3%	0%	0%
Not Applicable / Unsure	104	26	4	31	24	19	0
	33%	33%	44%	39%	32%	35%	0%

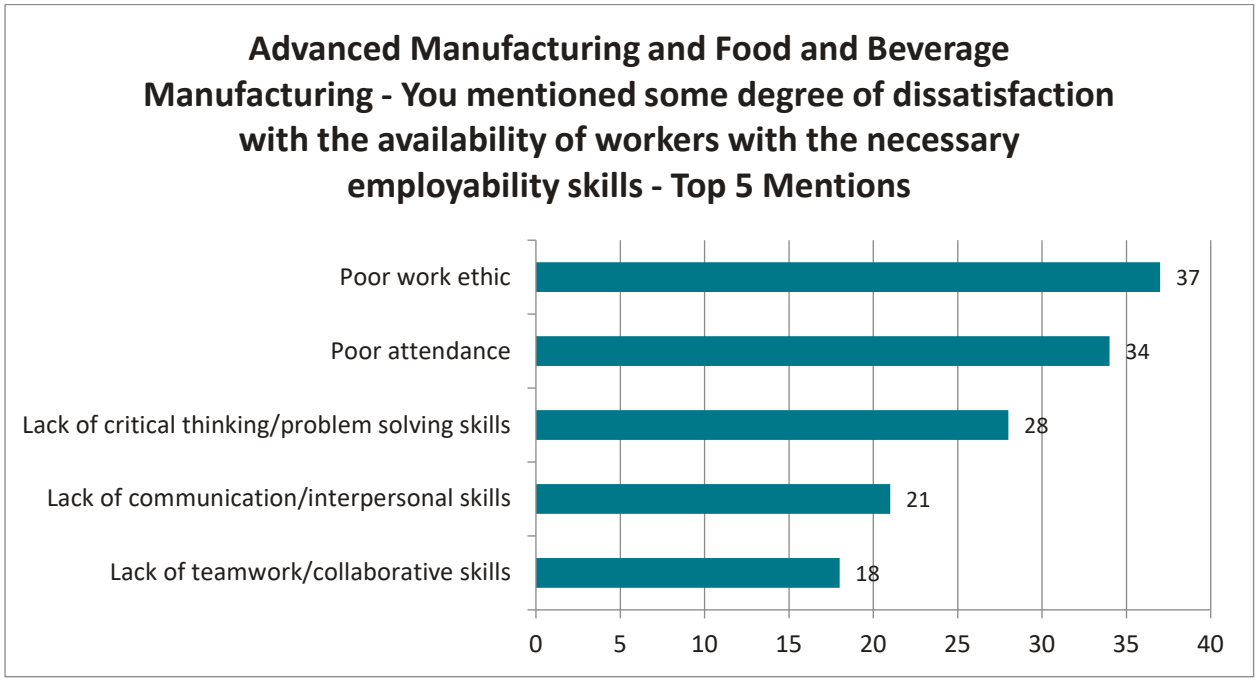
Q10J. Marketing efforts promoting the overall quality of life and the positive characteristics that distinguish the Lehigh Valley in the larger market place?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	21	3	0	10	3	4	1
	7%	4%	0%	13%	4%	7%	6%
Satisfied	203	51	3	47	50	38	14
	64%	65%	33%	59%	67%	69%	82%
Dissatisfied	33	7	2	9	9	4	2
	10%	9%	22%	11%	12%	7%	12%
Very Dissatisfied	8	2	0	1	4	1	0
	3%	3%	0%	1%	5%	2%	0%
Not Applicable / Unsure	50	16	4	13	9	8	0
	16%	20%	44%	16%	12%	15%	0%

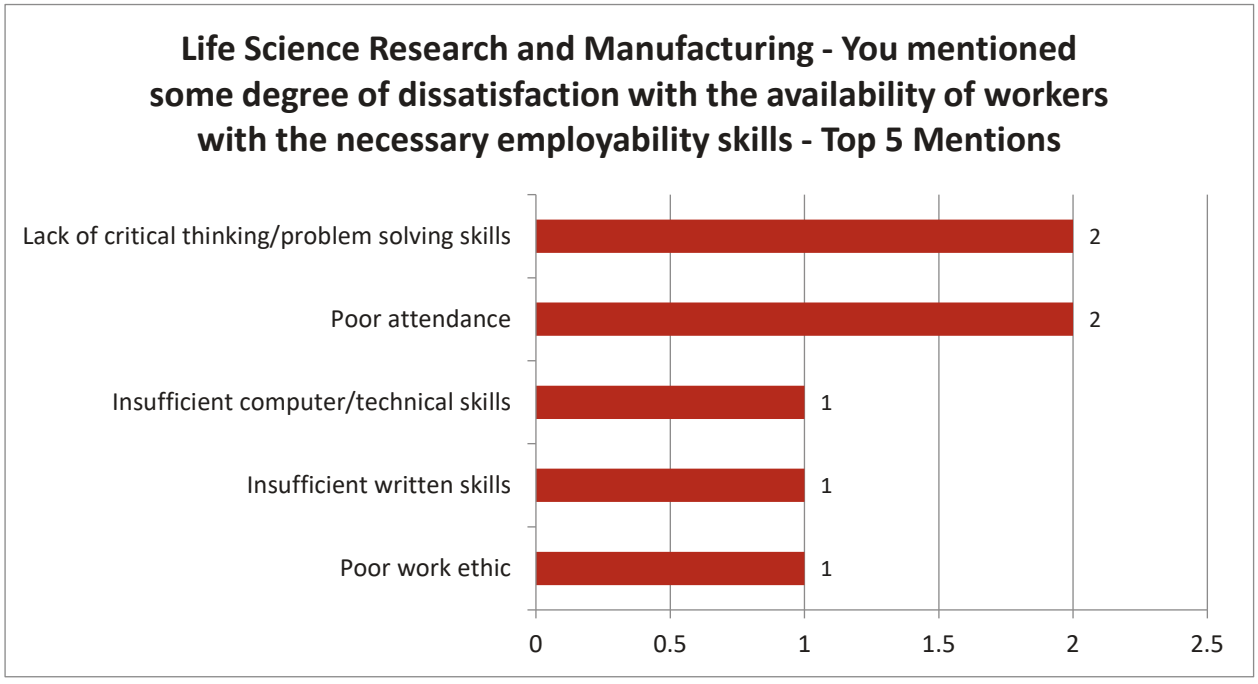
Q10K. Access to public transportation for your employees?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	23	6	0	5	5	7	0
	7%	8%	0%	6%	7%	13%	0%
Satisfied	131	28	2	34	33	22	12
	42%	35%	22%	43%	44%	40%	71%
Dissatisfied	72	20	1	18	16	14	3
	23%	25%	11%	23%	21%	25%	18%
Very Dissatisfied	26	8	1	3	8	4	2
	8%	10%	11%	4%	11%	7%	12%
Not Applicable / Unsure	63	17	5	20	13	8	0
	20%	22%	56%	25%	17%	15%	0%

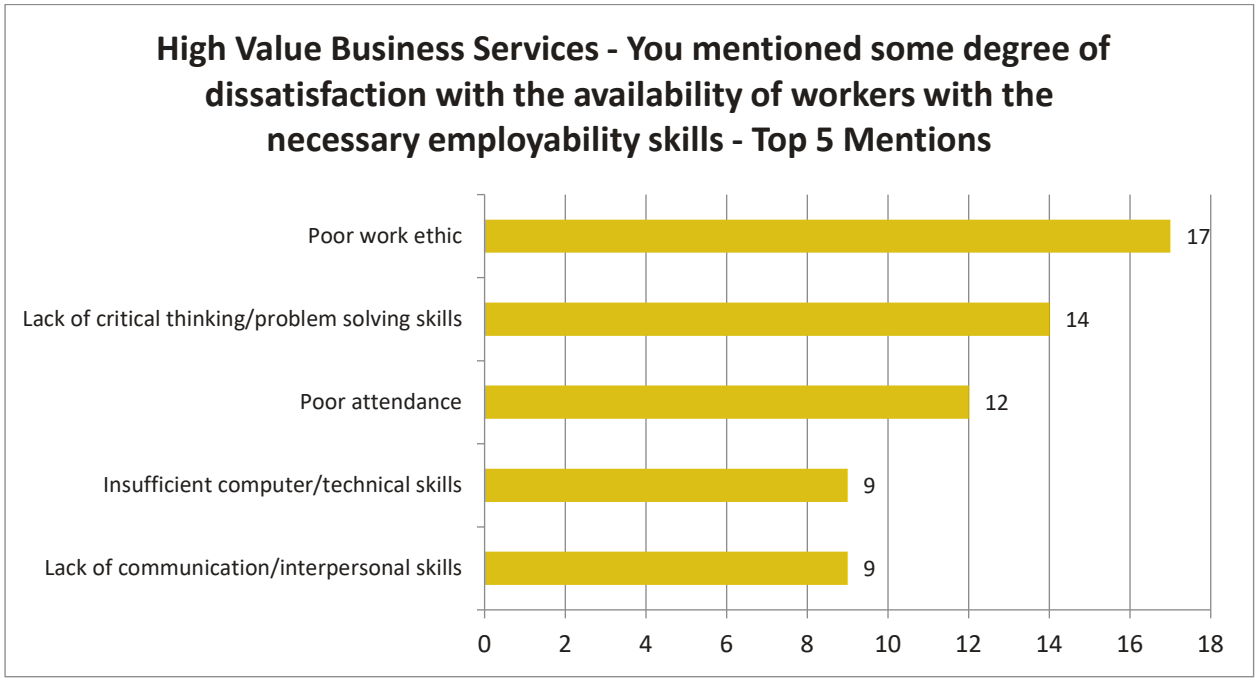
Q10L. The age distribution of your workforce and the potential effect of retirements on your operations in the Lehigh Valley within the next 3 to 5 years?							
	Total	Advanced Manufacturing and Food and Beverage Manufacturing	Life Science Research and Manufacturing	High Value Business Services	Transportation, Logistics, Warehousing and Wholesale	Health Care Services	Other, specify:
Total	315	79	9	80	75	55	17
Very Satisfied	15	3	1	4	4	2	1
	5%	4%	11%	5%	5%	4%	6%
Satisfied	202	44	6	51	47	40	14
	64%	56%	67%	64%	63%	73%	82%
Dissatisfied	60	23	2	11	17	5	2
	19%	29%	22%	14%	23%	9%	12%
Very Dissatisfied	7	1	0	1	4	1	0
	2%	1%	0%	1%	5%	2%	0%
Not Applicable / Unsure	31	8	0	13	3	7	0
	10%	10%	0%	16%	4%	13%	0%

Q11. You mentioned some degree of dissatisfaction with the availability of workers with the necessary employability skills. Please tell me which employability skills you feel are lacking from the available workers?

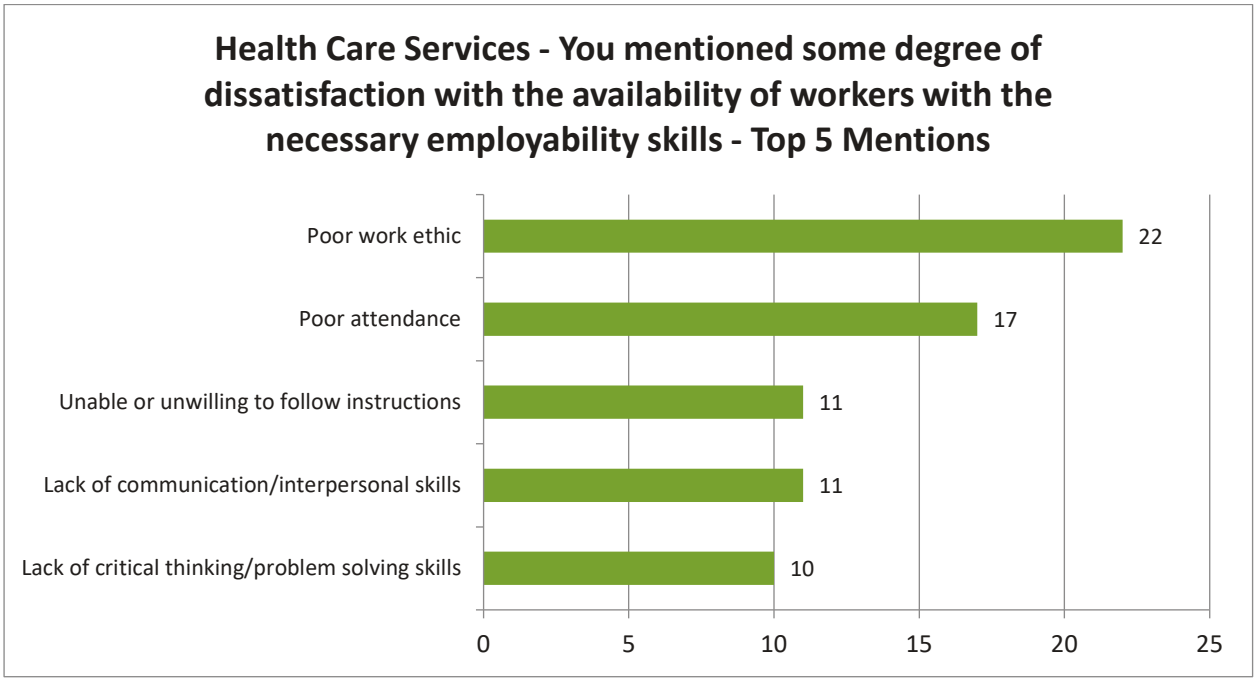



Advanced Manufacturing and Food and Beverage Manufacturing - You mentioned some degree of dissatisfaction with the availability of workers with the necessary employability skills - Top 5 Mentions
Poor work ethic
37
Poor attendance
34
Lack of critical thinking/problem solving skills
28
Lack of communication/interpersonal skills
21
Lack of teamwork/collaborative skills
18
0
5
10
15
20
25
30
35
40

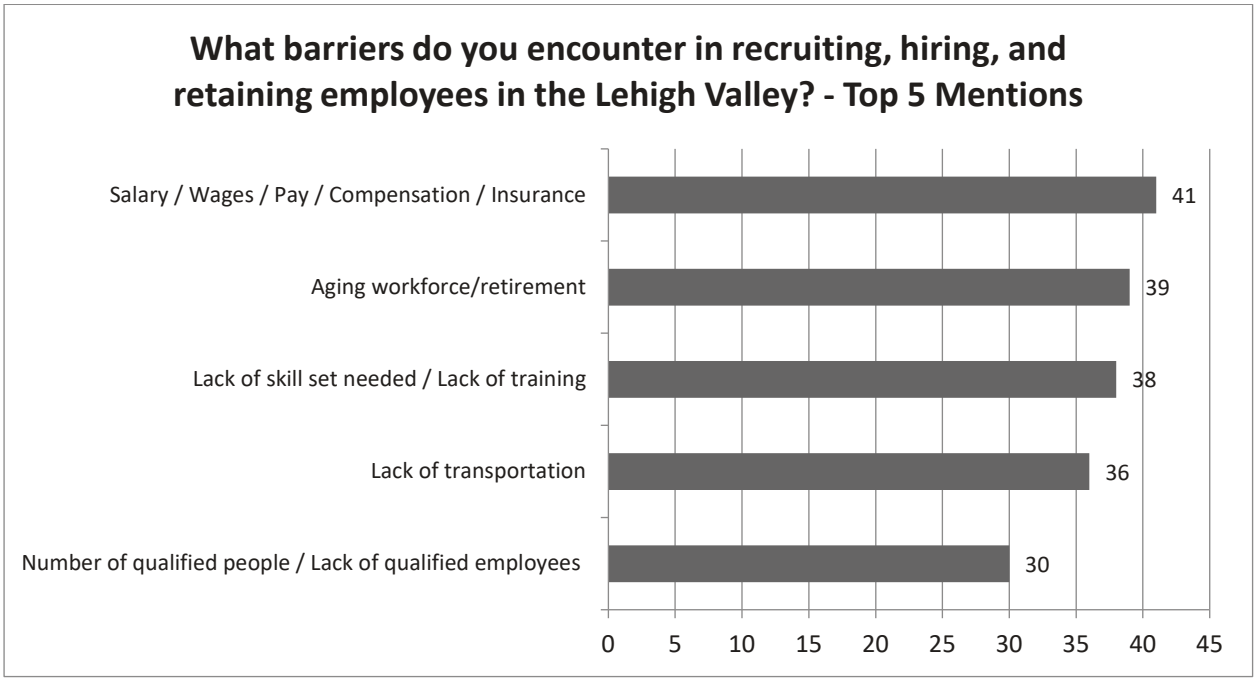

Life Science Research and Manufacturing - You mentioned some degree of dissatisfaction with the availability of workers with the necessary employability skills - Top 5 Mentions
Lack of critical thinking/problem solving skills
2
Poor attendance
2
Insufficient computer/technical skills
1
Insufficient written skills
1
Poor work ethic
1
0
0.5
1
1.5
2
2.5

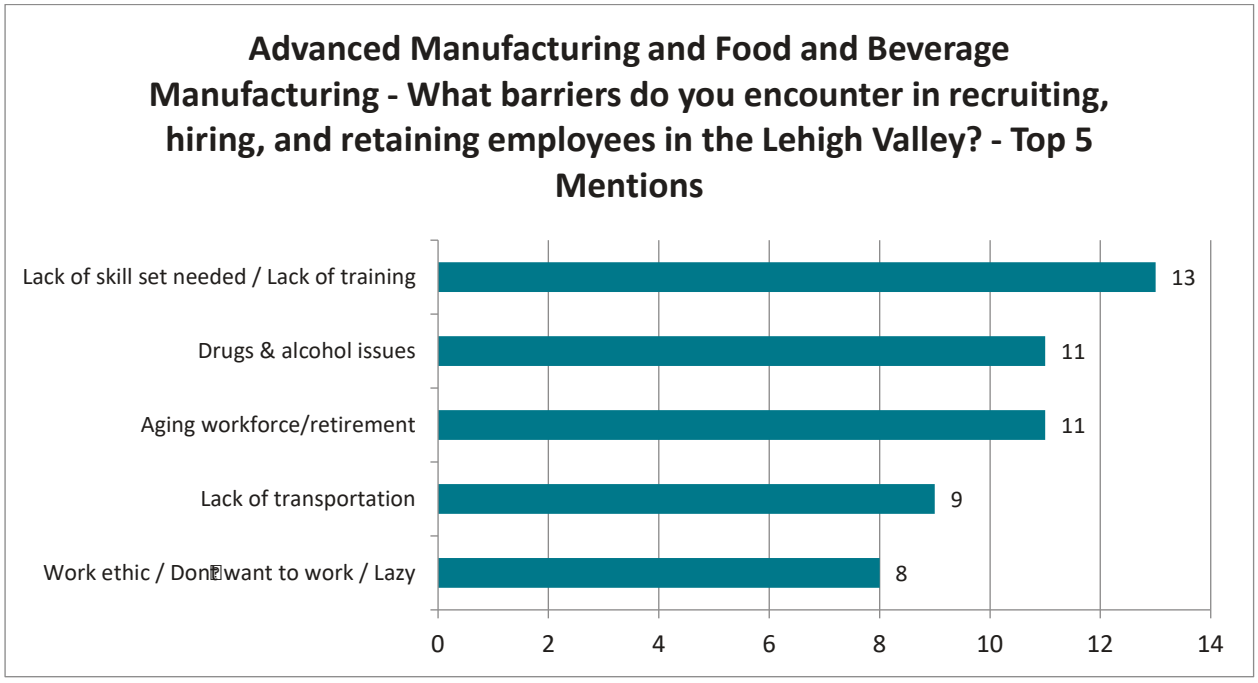

High Value Business Services - You mentioned some degree of dissatisfaction with the availability of workers with the necessary employability skills - Top 5 Mentions
Poor work ethic
17
Lack of critical thinking/problem solving skills
14
Poor attendance
12
Insufficient computer/technical skills
9
Lack of communication/interpersonal skills
9
0
2
4
6
8
10
12
14
16
18

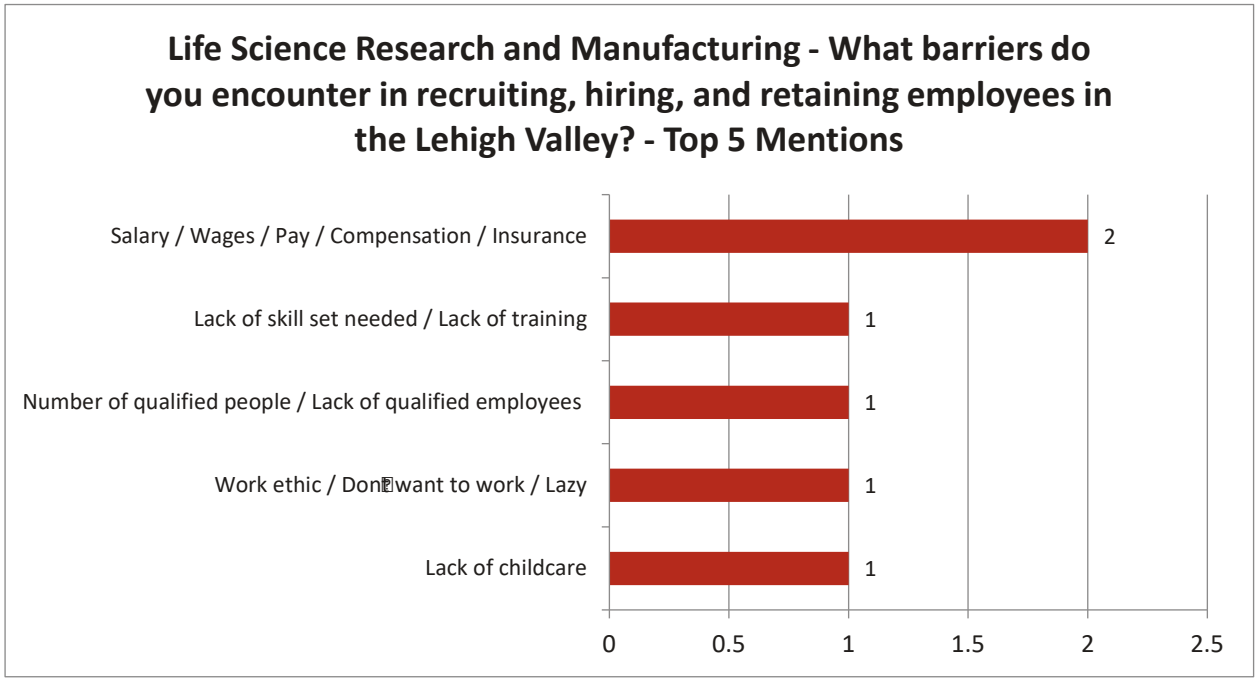

Transportation, Logistics, Warehousing and Wholesale - You mentioned some degree of dissatisfaction with the availability of workers with the necessary employability skills - Top 5 Mentions
Poor work ethic
25
Poor attendance
22
Lack of critical thinking/problem solving skills
15
Lack of communication/interpersonal skills
14
Unable or unwilling to follow instructions
12
0
5
10
15
20
25
30

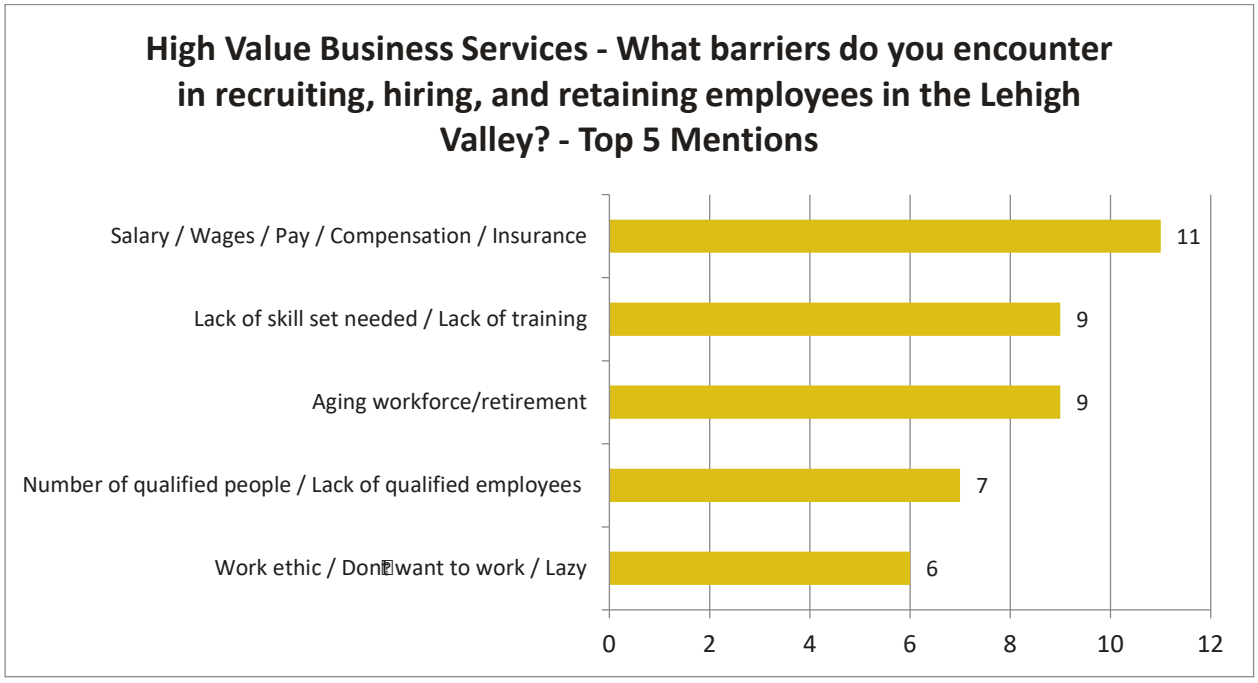


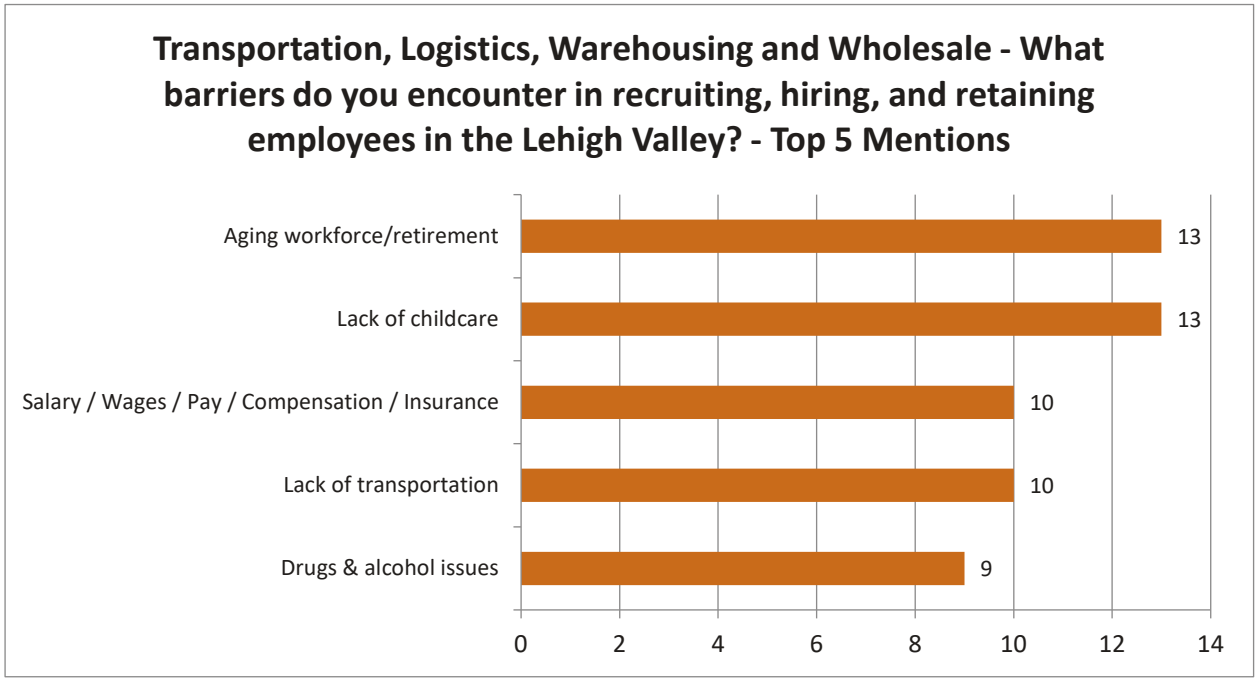
Q12. What barriers do you encounter in recruiting, hiring and retaining employees in the Lehigh Valley?

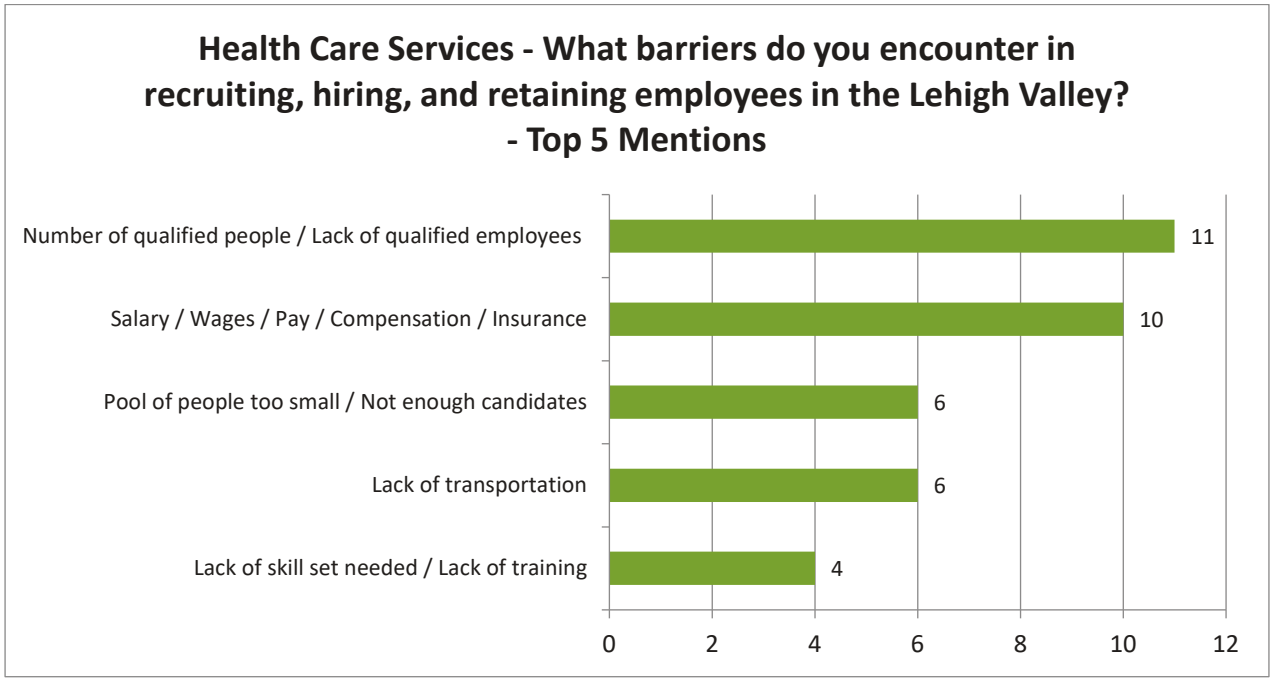



Advanced Manufacturing and Food and Beverage Manufacturing - What barriers do you encounter in recruiting, hiring, and retaining employees in the Lehigh Valley? - Top 5 Mentions
Lack of skill set needed / Lack of training
13
Drugs & alcohol issues
11
Aging workforce/retirement
11
Lack of transportation
9
Work ethic / Don't want to work / Lazy
8
0
2
4
6
8
10
12
14

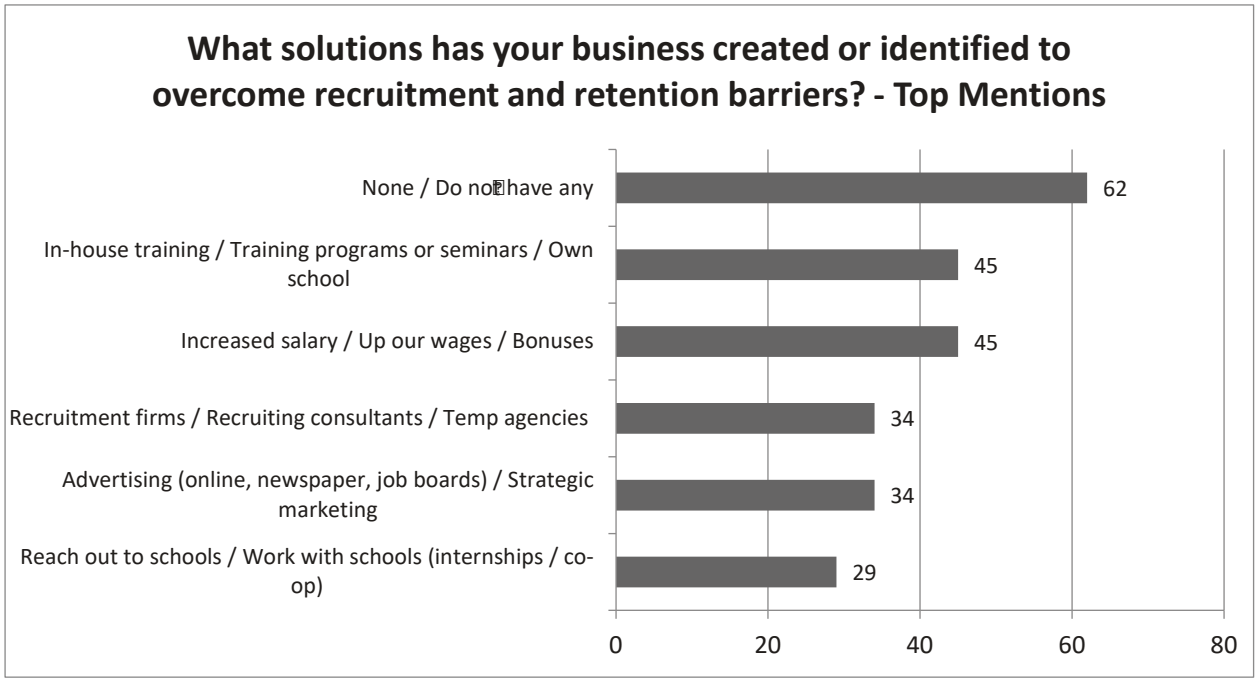

Life Science Research and Manufacturing - What barriers do you encounter in recruiting, hiring, and retaining employees in the Lehigh Valley? - Top 5 Mentions
Salary / Wages / Pay / Compensation / Insurance
2
Lack of skill set needed / Lack of training
1
Number of qualified people / Lack of qualified employees
1
Work ethic / Don't want to work / Lazy
1
Lack of childcare
1
0
0.5
1
1.5
2
2.5

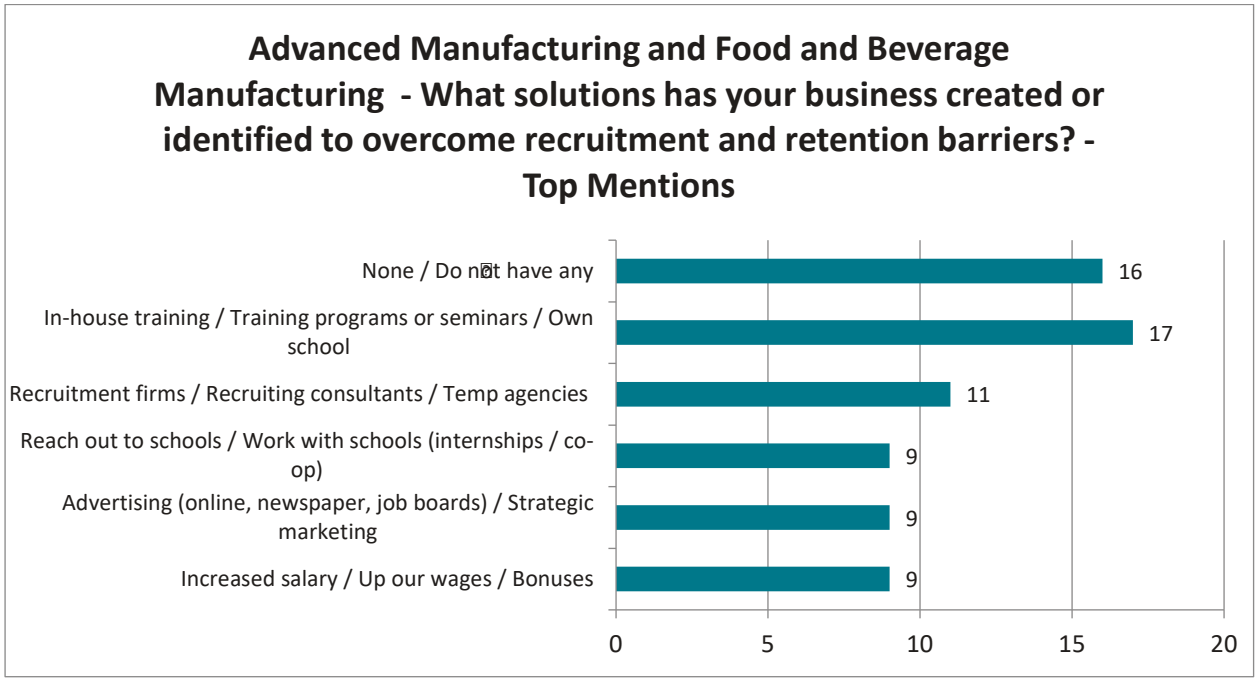

High Value Business Services - What barriers do you encounter in recruiting, hiring, and retaining employees in the Lehigh Valley? - Top 5 Mentions
Salary / Wages / Pay / Compensation / Insurance
11
Lack of skill set needed / Lack of training
9
Aging workforce/retirement
9
Number of qualified people / Lack of qualified employees
7
Work ethic / Don't want to work / Lazy
6
0
2
4
6
8
10
12

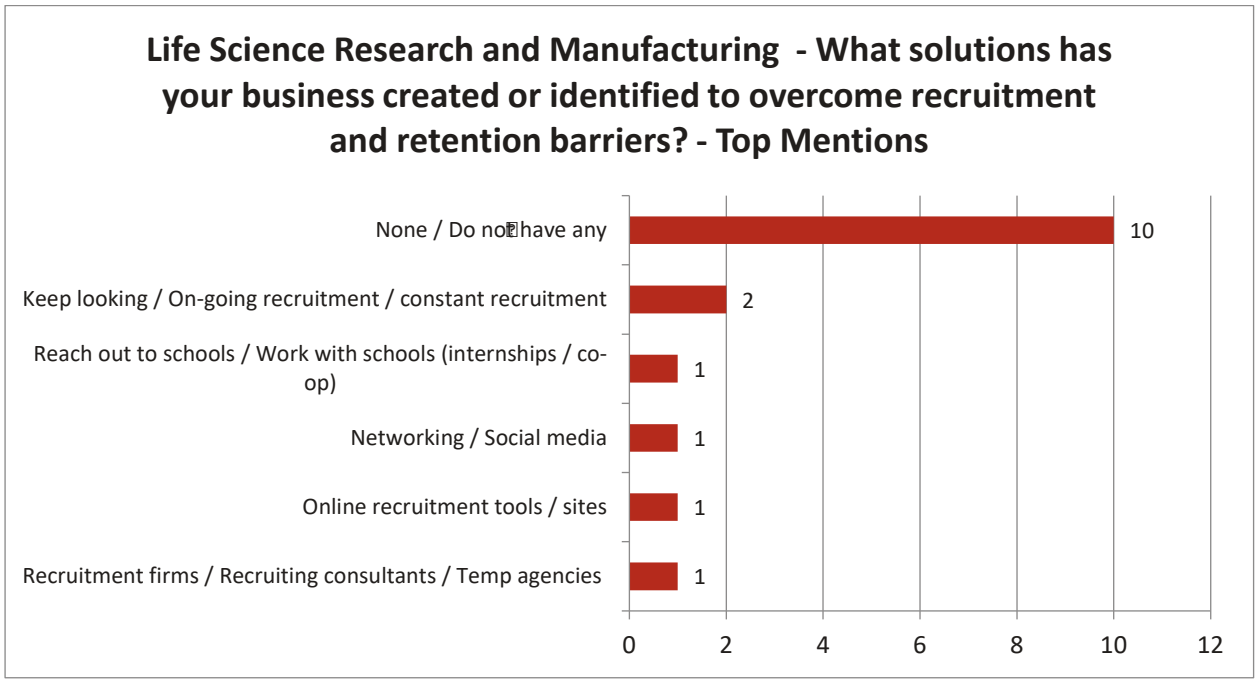

Transportation, Logistics, Warehousing and Wholesale - What barriers do you encounter in recruiting, hiring, and retaining employees in the Lehigh Valley? - Top 5 Mentions
Aging workforce/retirement
13
Lack of childcare
13
Salary / Wages / Pay / Compensation / Insurance
10
Lack of transportation
10
Drugs & alcohol issues
9
0
2
4
6
8
10
12
14

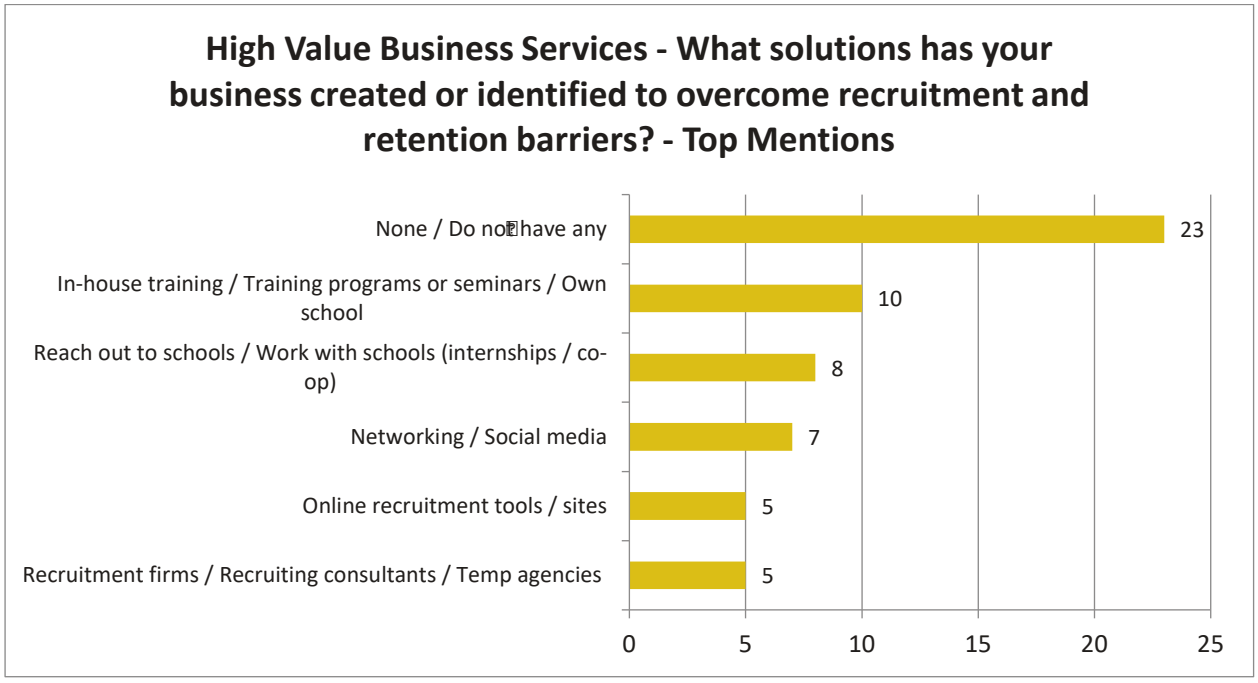


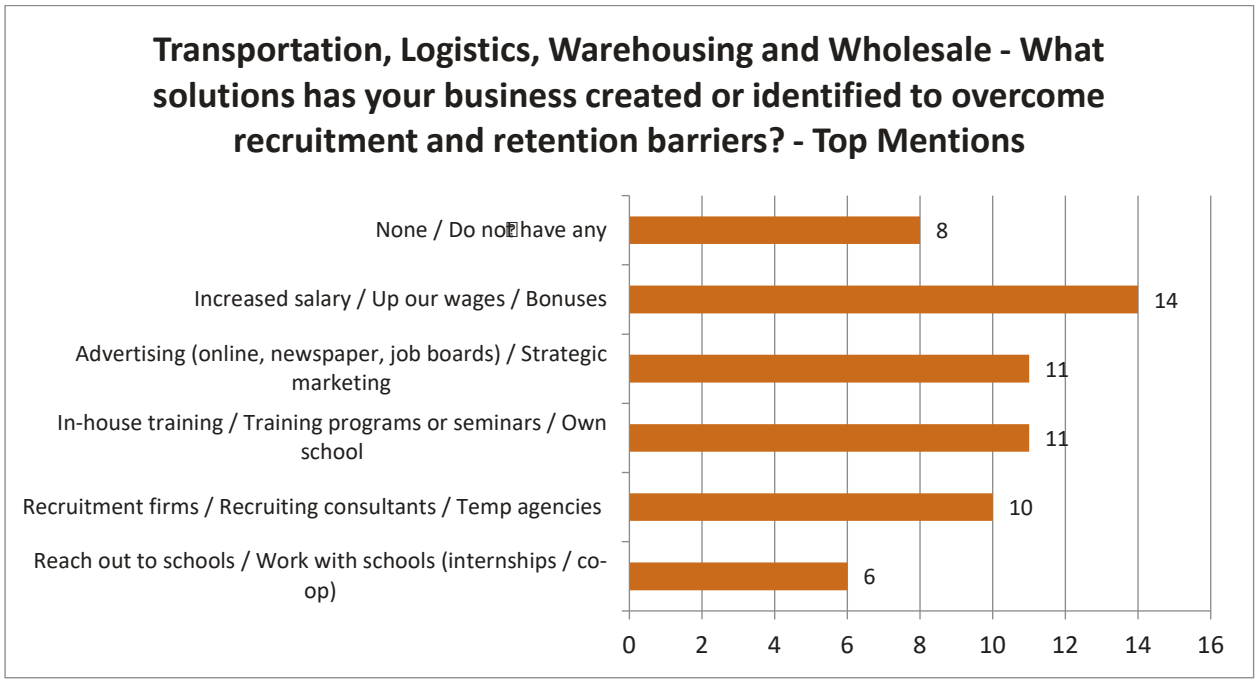
Q13. What solutions has your business created or identified to overcome recruitment and retention barriers?

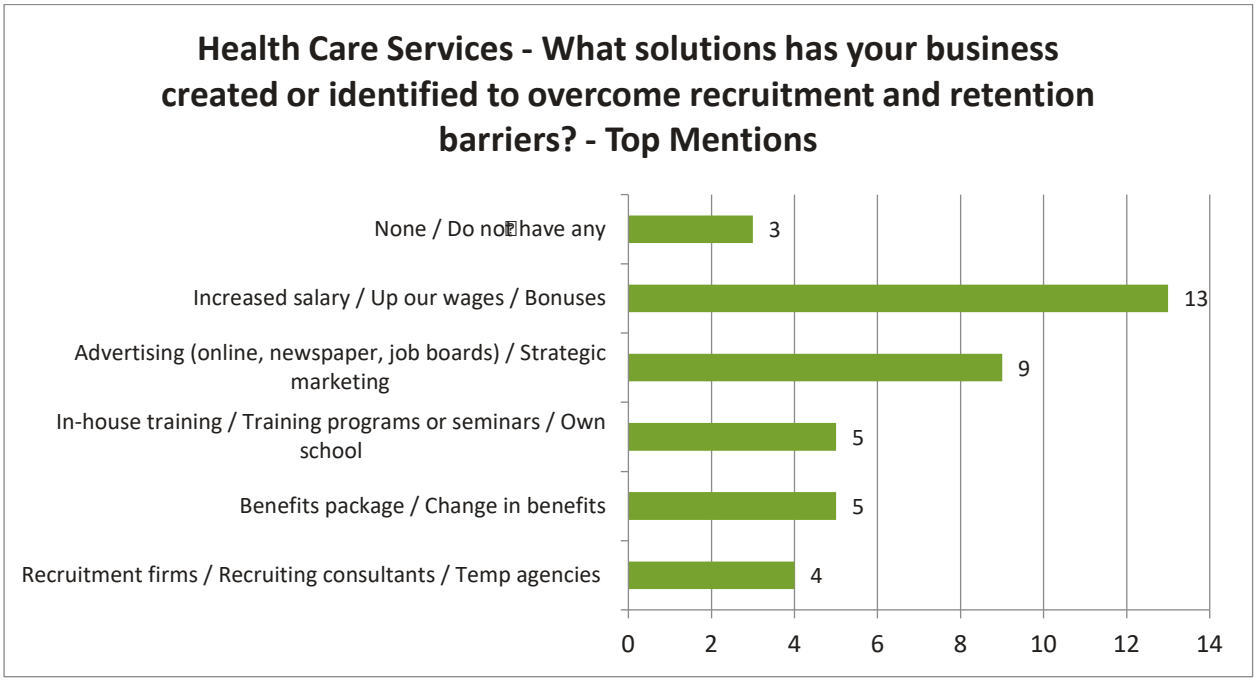



Advanced Manufacturing and Food and Beverage Manufacturing - What solutions has your business created or identified to overcome recruitment and retention barriers? - Top Mentions
None / Do not have any
16
In-house training / Training programs or seminars / Own school
17
Recruitment firms / Recruiting consultants / Temp agencies
11
Reach out to schools / Work with schools (internships / co-op)
9
Advertising (online, newspaper, job boards) / Strategic marketing
9
Increased salary / Up our wages / Bonuses
9
0
5
10
15
20

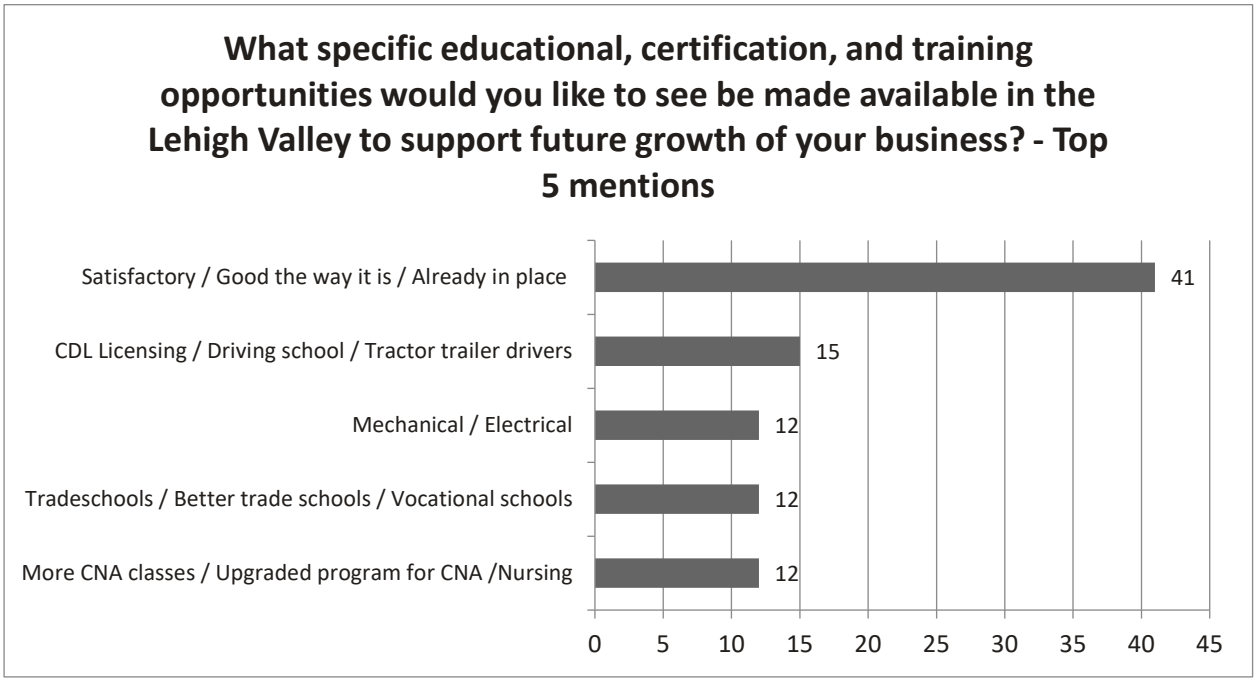

Life Science Research and Manufacturing - What solutions has your business created or identified to overcome recruitment and retention barriers? - Top Mentions
None / Do not have any
10
Keep looking / On-going recruitment / constant recruitment
2
Reach out to schools / Work with schools (internships / co-op)
1
Networking / Social media
1
Online recruitment tools / sites
1
Recruitment firms / Recruiting consultants / Temp agencies
1
0
2
4
6
8
10
12


High Value Business Services - What solutions has your business created or identified to overcome recruitment and retention barriers? - Top Mentions
None / Do not have any
23
In-house training / Training programs or seminars / Own school
10
Reach out to schools / Work with schools (internships / co-op)
8
Networking / Social media
7
Online recruitment tools / sites
5
Recruitment firms / Recruiting consultants / Temp agencies
5
0
5
10
15
20
25

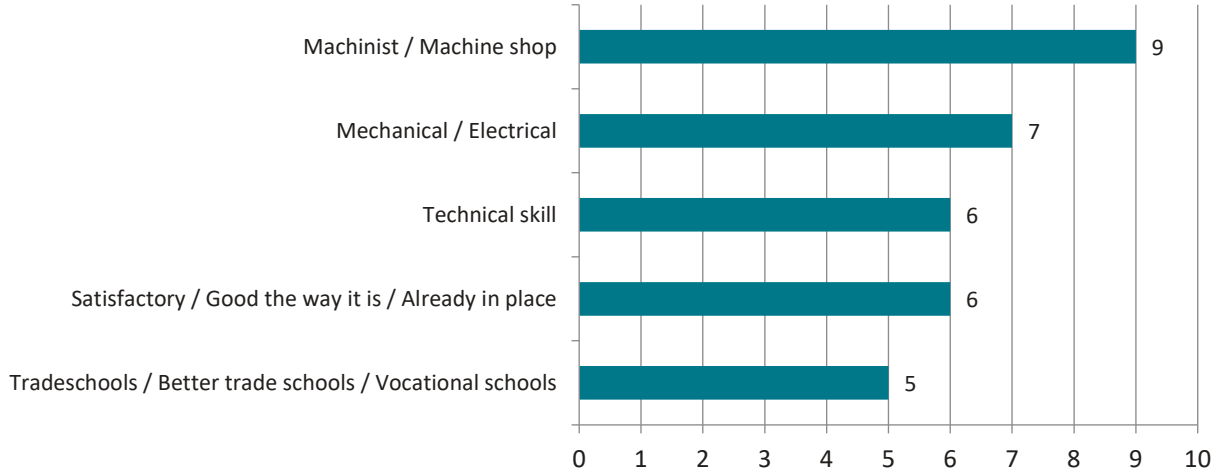

Transportation, Logistics, Warehousing and Wholesale - What solutions has your business created or identified to overcome recruitment and retention barriers? - Top Mentions
None / Do not have any
8
Increased salary / Up our wages / Bonuses
14
Advertising (online, newspaper, job boards) / Strategic marketing
11
In-house training / Training programs or seminars / Own school
11
Recruitment firms / Recruiting consultants / Temp agencies
10
Reach out to schools / Work with schools (internships / co-op)
6
0
2
4
6
8
10
12
14
16



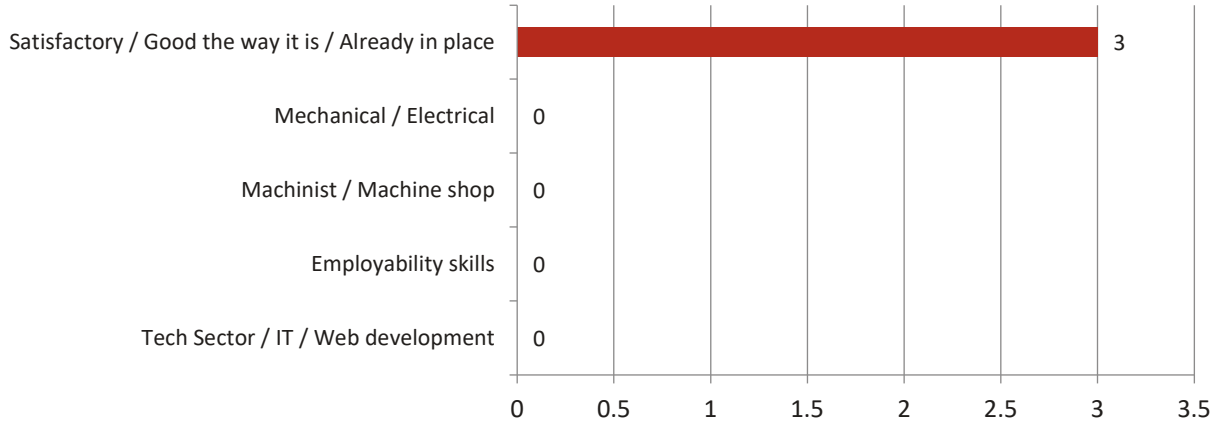
Q14. What specific educational, certification, and training opportunities would you like to see made available in the Lehigh Valley to support future growth of your business?

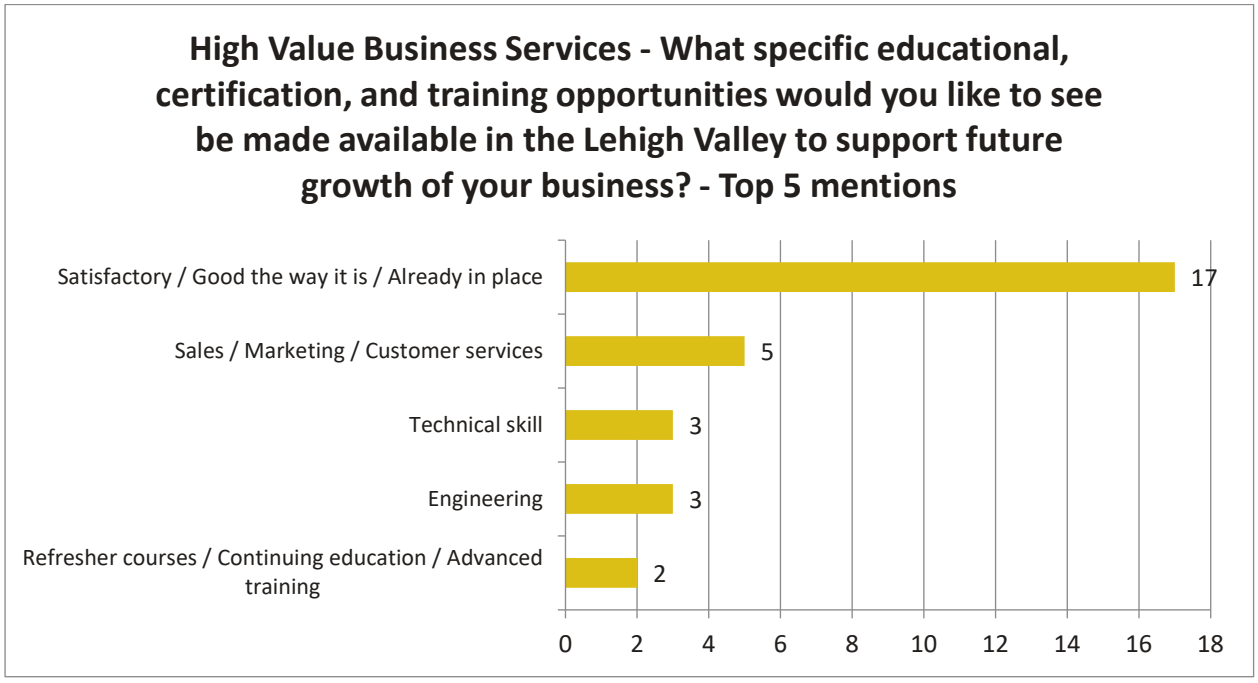


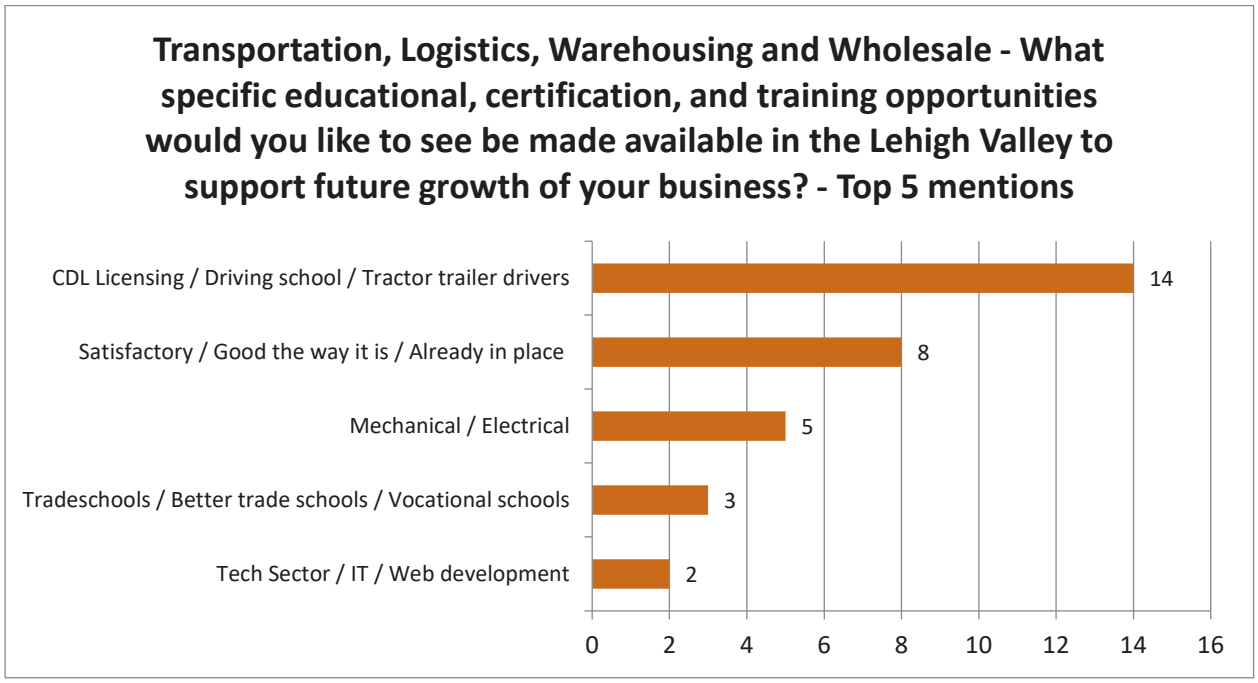
Advanced Manufacturing and Food and Beverage Manufacturing - What specific educational, certification, and training opportunities would you like to see be made available in the Lehigh Valley to support future growth of your business? - Top 5 mentions

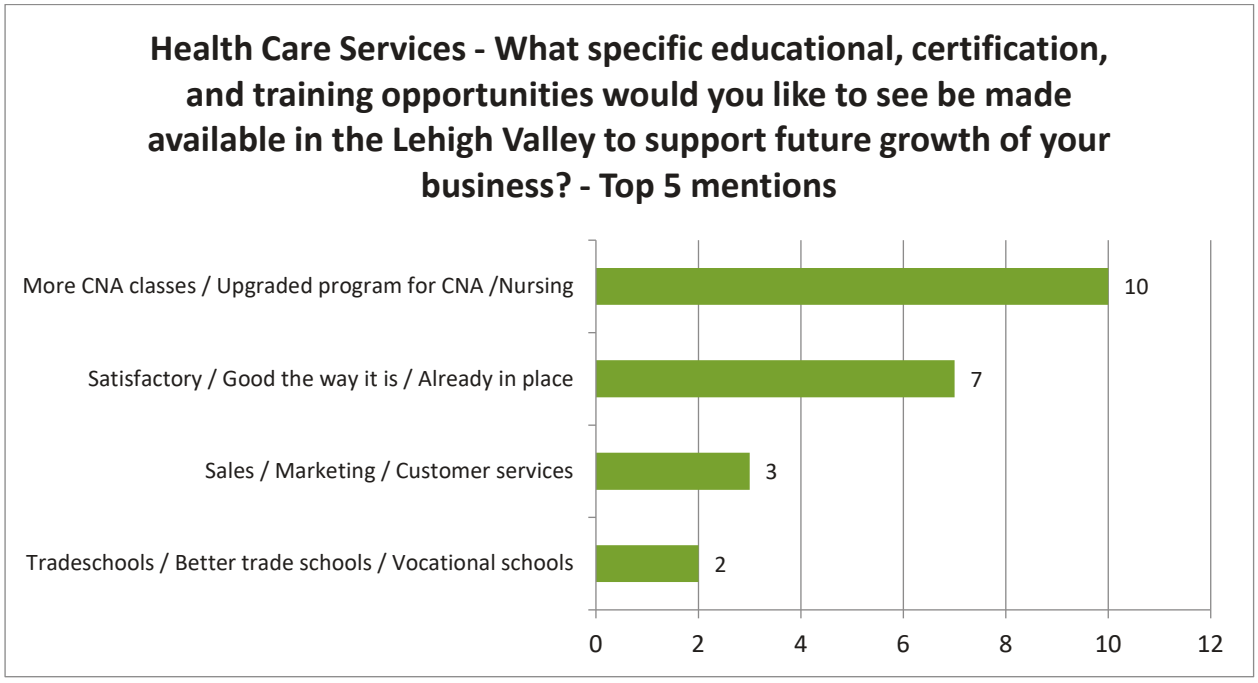


Life Science Research and Manufacturing - What specific educational, certification, and training opportunities would you like to see be made available in the Lehigh Valley to support future growth of your business? - Top 5 mentions




High Value Business Services - What specific educational, certification, and training opportunities would you like to see be made available in the Lehigh Valley to support future growth of your business? - Top 5 mentions
Satisfactory / Good the way it is / Already in place
17
Sales / Marketing / Customer services
5
Technical skill
3
Engineering
3
Refresher courses / Continuing education / Advanced training
2
0
2
4
6
8
10
12
14
16
18


Transportation, Logistics, Warehousing and Wholesale - What specific educational, certification, and training opportunities would you like to see be made available in the Lehigh Valley to support future growth of your business? - Top 5 mentions
CDL Licensing / Driving school / Tractor trailer drivers
14
Satisfactory / Good the way it is / Already in place
8
Mechanical / Electrical
5
Tradeschools / Better trade schools / Vocational schools
3
Tech Sector / IT / Web development
2
0
2
4
6
8
10
12
14
16


Health Care Services - What specific educational, certification, and training opportunities would you like to see be made available in the Lehigh Valley to support future growth of your business? - Top 5 mentions
More CNA classes / Upgraded program for CNA /Nursing
10
Satisfactory / Good the way it is / Already in place
7
Sales / Marketing / Customer services
3
Tradeschools / Better trade schools / Vocational schools
2
0
2
4
6
8
10
12