

Identifying Regional Skill Shortages

Dayton Metropolitan Statistical Area



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Metropolitan Statistical Area

Preface

On Definition

The concept of skill shortages is not easily defined. It is fraught with differing images and perspectives depending on your role and activity within the workforce and economic development system. It is also one thing to define skill shortages in academic terms and quite another to act upon skill shortages, from a policy perspective and program initiatives. If nothing else, policy and program initiatives require a shared or community definition and alignment of resources to realistically address a skill shortage problem.

The classical economic definition is one of economic growth accompanied by increased demand for employment in certain occupations, driving up wages in search of the relevant labor skills. From a macro perspective, the resulting supply/demand imbalance will rectify itself over time as players in the workforce react in their self interest to the relative demand/supply circumstances. Supply and demand for those skills, as allocated by wages, will reach an equilibrium.

However, theory may be somewhat removed from the nitty-gritty of real life. Below are a few examples of the complexity of identifying skill shortages and framing policy to address them, particularly at a regional level.

Comparative Mix

The regional mix of industries, demographics, population and institutional, physical and knowledge infrastructures may place you in a more or less competitive advantage to other regions relative to macro economic changes. In a sense, your challenges may lie outside your region. To the extent that these relate to skill shortage issues, what is your relative comparative position? Can you overcome any issues of workforce competitive disadvantage? Will you be on the positive receiving end of the macro economic changes?

Wage Restrictions

Given a national and global economy, there may be an upward limit on what an industry sector at a regional level can pay to attract workers and yet remain competitive. Can you reduce the training or other costs to workers to enter the field? Are there other attractions of the career field to market? Do you transition to higher skill sectors of the business? Do you compete by focusing on increased productivity through skills associated with advanced processes or technology?

Skill Inflation

A criticism of our educational system is that it was designed to meet the needs of an industrial and fundamentally different economic era. Whether true or not, the base level and types of skills required for economic success are higher than in past history. This is due to technological advances, computerization, new knowledge-based services and products, and new alignments of business and industry on a national and global scale. If

the current education system is not meeting these skill demands or, more importantly, the incumbent workforce is not keeping pace, the skill shortage issue may be a question of skill transition and a form of remedial education. Are there new models of education that can meet these needs? Compared to other regions, can you do this efficiently and at a cost attractive to both business and workers?

Regional vs. National/Global

There are two types of economy. One based on the underlying populations and to some extent the existing business base. Generally these are service industries that by the nature of their work are linked to the regional setting. Many personal services are of this nature. Some examples include much of education, local government, social services, healthcare services, and maintenance and repair. Often this economy is associated with quality of life and infrastructural supports. The advantage of focusing on skill shortages in this economy is that there is a more direct and assured link with the regional community. The other economy is based on exporting products and services and is more directly linked to state, national and/or global markets. The advantage of focusing on skill shortages in this economy is that it brings additional wealth into the community as opposed to just circulating the same dollars. The investment risks are generally higher in this economy because both the workers and businesses are potentially more mobile depending on the comparative advantage of the region to other areas.

A Starting Point

It is said of science and analysis that what question you ask and what you decide to observe frames, at least to some extent, what you will find. As was said at the beginning of this preface, the topic of skill shortages is fraught with differing images and perspectives depending on your role and activity within the workforce and economic development system. Therefore, the report that follows is not a definitive or final statement on the topic. Rather it is primarily a statistical approach, with its own cutoff criteria of what occupations to look at and it generally follows the classical economic approach to skill shortages. It has the advantages of reviewing the definitions of skill shortages, offering models for reviewing data and approaches to analysis and providing some occupational supply and demand criteria.

Data and analysis are critical to understanding and framing the issue and should foster more rational and practical decisions. However, at some point policy decisions and design and implementation involve value judgments on current circumstances and what will work best for your regional community. Data and analysis should drive your decisions, but only the regional community can judge what resources and alignments they can bring to bear for sustainable solutions to the issue of skill shortages.

Background

This report identifies possible occupational skill shortages in the Dayton Metropolitan Statistical Area.¹ A lack of workers with essential occupational skills can be an obstacle to economic expansion for both employers and regions. Similarly, a lack of skilled workers may make it difficult to maintain staffing levels if retiring or exiting workers can't be replaced. The emphasis on occupational skills and skilled workers is important. A skill is the ability to perform a particular task at a certain level of competence.² Occupational skills are the technical skills needed for an occupation or occupational group. These skills can be transferred across employers.² A high level of skills in the workforce contributes to generally higher levels of income and higher rates of growth.³ Skilled workers make the adoption of new technologies easier and cheaper, which drives overall economic growth. Occupational skill shortages represent potential training investment opportunities and tend to provide the greatest economic returns to human capital investments in terms of post-training job placement rates, employment stability, and wage levels.

Skill Shortages Key Concepts

When economists and employers talk about labor or skill shortages they aren't necessarily talking about the same conditions. When economists talk about labor or skill shortages, they mean there aren't enough workers with the appropriate skills to fill positions at existing labor market conditions, especially at prevailing wages.^{2,3} Employers may mean they aren't finding enough qualified workers at the wages the employers want to pay or that job applicants don't have all the qualities employers desire.² Sometimes the supply of skilled workers may be adequate, but some employers may have difficulty in attracting and recruiting qualified employees because of characteristics of the occupation, industry or employer, such as poor working conditions or working hours, or because of inadequate recruitment efforts.⁴

Skill shortages can occur for several reasons.

- Slowness in the adjustment of wages.^{2,3} Wage increases are a way to attract workers with essential skills and are an incentive for other workers to acquire essential skills. Employers may be slow to recognize the need to increase wages or other factors may make it difficult to increase wages. For example, wages in the health care industry are influenced by government payments for care.⁵
- Slowness in the adjustment of the supply of skilled individuals.^{2,3} This may take the form of underinvestment in training programs or weakness in the system such as the time lag in starting a program.³
- Lack of information about the labor market.² For example, workers may not be aware of new job opportunities and training programs.
- Demand for skills increases because of rapid structural changes in industries or because of cyclical surges in employment.³ Under some conditions demand for skills continually grows faster than supply, resulting in an ongoing skill shortage.⁶

Skill shortages can be classified into at least four types.³

- a. **Type 1** - There are few people with essential skills who are available to work and skills training either takes a long time or the training system is at full capacity. Type 1 skill shortages pose the most severe obstacle for economic expansion.³ Type 1 skill shortages may be obstacles to maintaining staffing levels because of an inability to keep up with replacement needs as workers retire or leave for other jobs.
- b. **Type 2** - There are few people with essential skills who are available to work, but skills training does not take long or the capacity of the training system can be easily expanded.
- c. **Type 3** – A skills mismatch occurs when there are enough people with essential skills, but they do not apply for openings under current market conditions. These conditions may include the wages being offered, the working conditions, or the job location.
- d. **Type 4** - A quality gap occurs when there are enough people with essential skills who are available to work and willing to apply for positions, but lack other qualities that employers desire.

Methodology Overview

Identifying skill shortages is difficult. There is no single, definitive measure of a skills shortage.⁶ Instead, analysts must examine a variety of labor market data for indications of shortages. Occupations or skill groups must be examined separately because each responds differently to changes in supply and demand.³ For example, training for some occupations is fairly brief, and so employers may quickly meet increased demand. Training for other occupations may take several years, making it harder to meet increased demand.

A variety of potential indicators have been used to identify skill shortages. These include occupational employment growth rates, occupational wage growth rates, occupational unemployment rates, job vacancy surveys, and anecdotal reports from employers.^{2, 3, 4, 6} New technologies used to recruit workers can also be used to assess labor supply and demand. For example, web ‘spidering’ technology can be used to retrieve online job orders from multiple web sites for estimating labor supply and demand ratios.⁷ The number of unduplicated online job orders represents demand, and the number of unemployed individuals in an area represents the supply. A similar analysis can be applied to occupational groups.

Much of the research on skill shortages has examined only national level supply and demand. This research project uses a combination of national, state, and local labor market information in several models to identify possible occupational skill shortages in the Dayton labor market. Differences among the models and data may lead to different, even conflicting, pictures of the supply and demand forces for an occupational labor market, so the models should be considered as a group rather than individually.

High-Employment Prospects. Skill shortages are more likely to occur when occupations are in high demand. Not all high-demand occupations may be considered worthy of skills training. We identified occupations that would be attractive to workers considering skills training or to those investing in training and education programs. The analysis started with a list of occupations in the Dayton MSA that were considered high-employment prospects. High-employment prospect occupations were those that paid at least \$12.00 per hour in 2004 and were projected to have at least 25 annual openings through 2014. We focused upon sub-baccalaureate occupations requiring at least moderate on-the-job training (one to twelve months combined experience and training). Baccalaureate and above occupations were excluded from this analysis because they are generally not covered by publicly-funded employment programs and because graduates of these programs tend to be more geographically mobile. From this reduced list of high-employment prospects, we then selected occupations that paid above average wages for their education or training level and were projected to have employment growth above the state average of 7.3 percent. Twelve high-growth, high-paying occupations were identified. These occupations are highlighted in the table at the end of this section.

The Human Resource Accounting Model. This approach compares occupational demand, as measured by projected annual job openings, to recent supply, as measured by completers of structured training programs and occupational licensing data. Skill shortages are possible when the demand for skills exceeds the supply from training programs and occupational licensing. For many occupations, training programs are only one source of workers. This model may be most effective in predicting shortages for occupations that require postsecondary training or education. A full discussion of this model is available from the Occupational Supply and Demand System (OSDS) at http://www.occsupplydemand.org/OSD_PlanningModels.htm.

For this analysis, national and state occupational employment projections were obtained from <http://www.occsupplydemand.org>. For local employment projections see <http://lmi.state.oh.us/proj/Ohio JobOutlook.htm> and for occupational licensing data see <http://lmi.state.oh.us/jobs/careers.htm>.

The Longitudinal Wage Information Model. Rapidly rising wages may indicate skill shortages where the labor supply has not been restricted. The longitudinal wage model compares changes in occupational wages to changes in the Consumer Price Index (CPI) over the same time period. Changes in wages that are significantly larger than changes in the CPI over the same time period may indicate skill shortages, but these comparisons should be made cautiously due to the nature of the wage data that is available. A full discussion of this model is available from the Occupational Supply and Demand System at http://www.occsupplydemand.org/OSD_PlanningModels.htm.

Occupational wage data originated from two U.S. Bureau of Labor Statistics (BLS) sources. State-level occupational wage data originated from the Occupational Employment Statistics (OES) program. Local-level wage data originated from the National Compensation Surveys (NCS). There are technical differences in the data collection for these programs, so they do not provide exactly the same information. OES data for this analysis were obtained from the Occupational Supply and Demand System, <http://www.occsupplydemand.org>. NCS data were obtained from the BLS at

<http://www.bls.gov/ncs/home.htm>. CPI data were obtained from <http://www.bls.gov/cpi/home.htm>.

Hard-to-Fill Job Vacancies. A common indicator of skill shortages is a high proportion of unfilled or hard-to-fill job vacancies.^{1,3} For this analysis, we used transactional data on job orders from Ohio employers, which were obtained from Ohio's Job Matching System, http://scoti.ohio.gov/scoti_lexs/. We assumed that the higher the percentage of job orders open for 62 days or more, the harder it is to find qualified applicants. Job orders may be hard to fill for reasons other than labor or skill shortages, such as low wages or poor working conditions. To compensate for this, we focused on high-quality job orders by excluding job orders paying wages less than the 25th percentile for the occupation or potentially unattractive working conditions, such as at prisons. We also excluded job orders posted for exactly 90 days because the duration of these orders was due to a computer default rather than labor market conditions.

Keyword Analysis. This analysis uses a second source of transactional data. Keyword analysis of job orders and resumes from America's Job Bank, conducted for the Ohio Bureau of Labor Market Information by Caldwell Economic Information Services, examined the ratio of job orders to resumes that contained the same keywords. A high proportion of job orders to resumes was considered indicative of imbalances in a labor market, possibly due to skill shortages. A second indicator of employer demand was the percentage of resumes viewed by employers within the occupational sector. This keyword analysis is available at <http://lmi.state.oh.us/research/research.htm>.

Labor Market Analysis. For its *Occupational Outlook Handbook (OOH)*, the U.S. Bureau of Labor Statistics (BLS) discussed the employment outlook for occupations based on employment projections. The BLS assessments of national labor market conditions for some occupations discuss the relationship between the number of job seekers and the number of job openings, indicating how competitive these labor markets were. The *OOH* is available at <http://www.bls.gov/oco/home.htm>.

Job Vacancy Survey. The Montgomery County Workforce Investment Board sponsored a job vacancy survey by researchers at Wright State University and the University of Dayton of the local labor market area in 2006. This survey collected information about occupational vacancies and their duration, as well as other labor market information. The report, *Job Vacancy Survey Report for the Greater Montgomery County Labor Market*, is available at <http://www.thejobcenter.org/pdf/jvsreport.pdf>.

Dayton MSA
Occupations with High Employment Prospects By Education/Training Level
(Occupations paying at least \$12.00 an hour and having at least 25 annual openings)

Occupational Title	Employment		Change in Employment		Total Annual Openings	Average Wage 2004
	2004 Annual	2014 Projected	2004 - 2014	Percent		
Occupations Requiring an Associate Degree						
Registered Nurses**	8,750	10,470	1,720	19.7%	355	\$23.67
Occupations Requiring Postsecondary Vocational Training						
Licensed Practical & Licensed Vocat. Nurses	3,100	3,470	370	11.9%	105	\$18.00
Automotive Service Technicians and Mechanics	2,380	2,700	320	13.4%	95	\$16.32
Occupations Requiring Work Experience in a Related Occupation						
Cost Estimators	720	810	90	12.5%	25	\$24.20
First-Line Sup/Mgrs of Con. Trades/Extract. Work	1,670	1,930	260	15.6%	54	\$23.98
Occupations Requiring Long-Term On-the-Job Training (twelve months or more combined experience/training)						
Electricians	2,020	2,290	270	13.4%	67	\$23.33
Police and Sheriff's Patrol Officers	1,270	1,540	270	21.3%	60	\$22.32
Plumbers, Pipefitters, and Steamfitters	1,320	1,470	150	11.4%	45	\$21.37
Occupations Requiring Moderate-Term On-the-Job Training (one to twelve months combined experience/training)						
Sales Rep., Wholesale & Mfg. Tech./Sci. Prod.	1,490	1,740	250	16.8%	64	\$37.40
Sales Rep., Wholesale/Mfg. Ex. Tech./Sci. Prod.	4,040	4,400	360	8.9%	142	\$25.65
Operating Engineers & Other Con. Equip. Op.	740	810	70	9.5%	26	\$18.79
Correctional Officers and Jailers	700	810	110	15.7%	26	\$16.75

**Training is met through a two-year associate degree; a three year diploma; or four year bachelor's program.

Source: Ohio Department of Job and Family Services, Bureau of Labor Market Information, February 2006.

Skill Shortage Analysis for the Dayton MSA

In this section, the analyses of each of the twelve high-growth, high-paying occupations are discussed. The occupations are grouped by education or training level. Each discussion begins with local employment outlook and wage information for the occupation. Models could not be applied to an occupation when there was insufficient data. A table summarizing the data appears in the conclusion.

Occupations Requiring An Associate Degree

Registered Nurses. There is a projected 19.7 percent increase in the number of registered nursing positions in the Dayton MSA by 2014. The average hourly wage for registered nurses in the Dayton MSA was \$23.67 in 2004. At the state level, the supply of newly trained registered nurses compared to the projected number of annual openings suggests a possible skills shortage. In the Dayton MSA, however, supply appears to exceed demand, although it is likely that some of these newly trained nurses will not remain in the Dayton labor market. Hourly wages for registered nurses have been rising more rapidly than the Consumer Price Index. Transactional data about job vacancies for registered nurses suggest that many positions are hard to fill. About 39.4 percent of high-quality job orders for registered nurses from Ohio's Job Matching System were open more than 62 days, which was the highest percentage of hard-to-fill job orders for the occupations examined. Additionally, America's Job Bank job orders containing the keyword *RN* outnumbered resumes by 177 to 1. Ninety percent of resumes containing *RN* were viewed by employers, the highest percentage for healthcare practitioner occupations. The Dayton area job

vacancy survey found that many employers indicated they were constantly recruiting registered nurses. Finally, analysts for the U.S. Bureau of Labor Statistics called the job outlook for registered nurses excellent, meaning there should be more job openings than job seekers through 2014.

Occupations Requiring Postsecondary Vocational Training

Licensed Practical and Licensed Vocational Nurses. There is projected to be an 11.9 percent increase in the number of positions for licensed practical nurses in the Dayton MSA by 2014. The average hourly wage for LPNs in the Dayton MSA was \$18.00 in 2004. The current supply of newly trained LPNs appears to exceed the projected demand for Ohio and the Dayton MSA. These employment projection, licensing, and training data suggest competitive labor market conditions for LPNs in Ohio and the Dayton area. This is reflected in the small statewide OES wage increases for LPNs relative to increases in the Consumer Price Index for the Cincinnati-Hamilton area. Transactional data about job vacancies for LPNs suggest that many positions are hard to fill. Approximately 39.0 percent of high-quality job orders for LPNs on Ohio's Job Matching System were open more than 62 days, which was the second highest percentage of hard-to-fill job orders for the occupations examined in this report. Additionally, America's Job Bank (AJB) job orders containing the key word *LPN* outnumbered resumes by about 21 to 1. Approximately 79 percent of AJB resumes containing *LPN* were viewed by employers. The Dayton area job vacancy survey found that many LPN positions were fairly hard to fill, taking 30 to 59 days to fill. Analysts for the U.S. Bureau of Labor Statistics did not assess the job opportunities (i.e., supply and demand comparison and degree of competition) for licensed practical nurses. In the 3 years, FY 2004-FY 2006 statewide, graduates from LPN training programs increased by 49%, to a level 2-3 times greater than the number of projected, total annual LPN job openings.

Automotive Service Technicians and Mechanics. There is projected to be a 13.4 percent increase in the number of job openings for automotive technicians and mechanics in the Dayton MSA by 2014. The average hourly wage for automotive technicians and mechanics in the Dayton MSA was \$16.32 in 2004. Statewide postsecondary training programs for auto technicians and mechanics alone have not been producing enough graduates to meet projected demand; other sources of auto technicians and mechanics must be considered. Training programs in the Dayton MSA appear to be producing graduates above the projected demand for the area. Hourly wages for auto mechanics in the Dayton MSA have been increasing slower than the Consumer Price Index. Analysis of transactional data from Ohio's Job Matching System and the keyword analysis of America's Job Bank data did not find that openings for auto mechanics are hard to fill. The Dayton area job vacancy survey did not find that auto technicians and mechanics positions were hard to fill. Analysts for the U.S. Bureau of Labor Statistics called the job outlook for auto technicians and mechanics very good, meaning that there would be more job openings than job seekers through 2014.

Occupations Requiring Work Experience in a Related Occupation

Cost Estimators. An increase of 12.5 percent in the number of job openings for cost estimators is projected for the Dayton MSA by 2014. In 2004, the average hourly wage for cost estimators in the Dayton area was \$24.20. Because entry into this occupation is based upon on-the-job experience or crossover from related fields, there is no supply information from structured training programs to compare to demand. Hourly wages for cost estimators in Ohio have risen faster than the Consumer Price Index. The Dayton area job vacancy survey did not find that cost estimator positions were hard to fill. There were insufficient job bank data for an analysis of Ohio job vacancies. The keyword analysis of America's Job Bank indicated a rough balance in this occupational labor market. Analysts for the U.S. Bureau of Labor Statistics did not assess the job opportunities (that is, supply and demand and job competition) for cost estimators.

First-Line Supervisors and Managers of Construction Trades and Extraction Workers. The number of openings for first-line supervisors and managers of construction and extraction workers is projected to increase by 15.6 percent in the Dayton MSA by 2014. Average hourly wages for the occupation in the Dayton MSA were \$23.98 in 2004. Because entry into this occupation is based upon on-the-job experience and training, there is no supply information from structured training programs to compare to demand. Hourly wages for line supervisors of construction and extraction workers in Ohio have risen faster than the Consumer Price Index. There were insufficient job bank data for an analysis of Ohio job vacancies. The keyword analysis of America's Job Bank indicated a rough balance in this occupational labor market. The Dayton area job vacancy survey did not find that line supervisors of construction and extraction workers positions were hard to fill. Analysts for the U.S. Bureau of Labor Statistics did not assess the job opportunities (competition for jobs) for first-line supervisors and managers of construction and extraction workers.

Occupations Requiring Long-Term On-the-Job Training (twelve months or more combined experience/training)

Electricians. The number of openings for electricians is projected to increase by 13.4 percent in the Dayton MSA by 2014. In the Dayton MSA, the average hourly wage for electricians was \$23.33 in 2004. Because entry into this occupation is based upon on-the-job training or apprenticeship, there is no supply information from training programs to compare to demand. Hourly wages for electricians in Ohio have risen more slowly than the Consumer Price Index. There are no corresponding wage data for the Dayton area. The transactional data from Ohio's Job Matching System showed that 32.0 percent of high-quality job orders were open for more than 62 days, which suggests that job orders for electricians were somewhat hard to fill. The keyword analysis of America's Job Bank indicated a rough balance in this occupational labor market. The Dayton area job vacancy survey did not find that electrician positions were hard to fill. Analysts for the U.S. Bureau of Labor Statistics called the job outlook for electricians good, indicating a rough balance between supply and demand.

Police and Sheriff's Patrol Officers. The number of openings for police and sheriff's patrol officers is projected to increase by 21.3 percent in the Dayton MSA by 2014. In the Dayton area, average hourly wages for police and sheriff's patrol officers were \$22.32 in 2004. Law enforcement postsecondary training programs around Ohio and in the Dayton MSA appear to produce enough graduates to meet demand, but such training is not required and there will be additional sources of supply. Hourly wages for police and sheriff's patrol officers in Ohio and the Dayton MSA have risen at a similar rate to the Consumer Price Index. There were insufficient job bank data for an analysis of Ohio job vacancies. The keyword analysis of America's Job Bank indicated a rough balance in this occupational labor market. The Dayton area job vacancy survey did not find that police and sheriff's patrol officer openings were hard to fill. Analysts for the U.S. Bureau of Labor Statistics noted that the job outlook would be competitive for the most desirable positions, with an excess of applicants.

Plumbers, Pipefitters, and Steamfitters. The number of openings for plumbers, pipefitters, and steamfitters is projected to increase by 11.4 percent in the Dayton MSA by 2014. Hourly wages for the occupation were \$21.37 in 2004. Because entry into this occupation is based upon on-the-job training or apprenticeship, there is no supply information from structured training programs to compare to demand. Hourly wages for plumbers, pipefitters, and steamfitters in Ohio have risen more slowly than the Consumer Price Index. There were insufficient job bank data for an analysis of Ohio job vacancies. The keyword analysis of America's Job Bank indicated a rough balance in this occupational labor market. The Dayton area job vacancy survey did not find that plumber, pipefitter, and steamfitter openings were hard to fill. Analysts for the U.S. Bureau of Labor Statistics called the job outlook for plumbers, pipefitters, and steamfitters excellent, with demand expected to exceed supply.

Occupations Requiring Moderate-Term On-the-Job Training (one to twelve months combined experience/training)

Correctional Officers and Jailers. The number of openings for correctional officers and jailers is projected to increase by 15.7 percent in the Dayton MSA by 2014. Average hourly wages for correctional officers and jailers in the Dayton MSA were \$16.75 in 2004. These positions are not licensed and require only a high school education. Although postsecondary training is not required for these positions, training in 'corrections' is available. In the Dayton area, the number of graduates from these programs could probably meet the area's demand for correctional officers. Since these programs are not the sole source of supply, the labor market for correctional officers in the Dayton area is competitive. Hourly wages for correctional officers and jailers in Ohio have not risen as quickly as the Consumer Price Index. There were insufficient job bank data for an analysis of Ohio job vacancies. The keyword analysis of America's Job Bank indicated a rough balance in this occupational labor market. The Dayton area job vacancy survey did not find that correctional officers and jailers openings were hard to fill. Analysts for the U.S. Bureau of Labor Statistics called the national job outlook for correctional officers and

jailers excellent, meaning that there would be more job openings than job seekers through 2014.

Operating Engineers and Other Construction Equipment Operators. The number of openings for operating engineers and other construction equipment operators is projected to increase by 9.5 percent in the Dayton MSA by 2014. Average hourly wages for operating engineers and other construction equipment operators in the Dayton area were \$18.79 in 2004. Because entry into this occupation is based upon on-the-job training and apprenticeship, there is no supply information from structured training programs to compare to demand. Hourly wages for operating engineers and other construction equipment operators in Ohio have risen more slowly than the Consumer Price Index. There were insufficient job bank data for an analysis of Ohio job vacancies. The keyword analysis of America's Job Bank indicated a rough balance in this occupational labor market. The Dayton area job vacancy survey did not find that operating engineers and other construction equipment operators openings were hard to fill. Analysts for the U.S. Bureau of Labor Statistics called the job outlook good, meaning that there would be a rough balance between job openings and job seekers.

Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products. The number of openings for wholesale and manufacturing sales representatives of technical and scientific products is projected to increase by 16.8 percent in the Dayton MSA by 2014. Average hourly wages for wholesale and manufacturing sales representatives of technical and scientific products in the Dayton MSA were \$37.40 in 2004. Because entry into this occupation is based upon on-the-job training, there is no supply information from structured training programs to compare to demand. Hourly wages for wholesale and manufacturing sales representatives of technical and scientific products in Ohio have increased faster than the Consumer Price Index. There were insufficient job bank data for an analysis of Ohio job vacancies. The keyword analysis of America's Job Bank indicates that demand for sales occupations may be outpacing supply nationally. The Dayton area job vacancy survey did not find that wholesale and manufacturing sales representatives of technical and scientific products openings were hard to fill. Analysts for the U.S. Bureau of Labor Statistics did not assess the employment opportunities and job competition for this occupation.

Sales Representatives, Wholesale and Manufacturing, except Technical and Scientific Products. The number of openings for wholesale and manufacturing sales representatives of products, except technical and scientific, is projected to increase by 8.9 percent in the Dayton MSA by 2014. The average hourly wages for wholesale and manufacturing sales representatives of products, except technical and scientific, in the Dayton MSA were \$25.65 in 2004. Because entry into this occupation is based upon on-the-job training, there is no supply information from structured training programs to compare to demand. Hourly wages for wholesale and manufacturing sales representatives of products, except technical and scientific, in Ohio have increased much faster than the Consumer Price Index. There were insufficient job bank data for an analysis of Ohio job vacancies. The keyword analysis of America's

Job Bank indicates that demand for sales occupations may be outpacing supply nationally. The Dayton area job vacancy survey found that openings for wholesale and manufacturing sales representatives of products, except technical and scientific, were hard to fill, often taking more than 60 days. Analysts for the U.S. Bureau of Labor Statistics did not assess the employment opportunities (that is, job competition) for this occupation.

Conclusion

The summary of potential occupational skill shortages in the Dayton metropolitan area are summarized in the table below.

Among the 12 selected occupations, registered nurses had the most indicators of a skill shortage. All but one of the nine national, state, and local level indicators suggested a skill shortage for registered nurses. Only the human resource accounting model for the Dayton area did not indicate a skill shortage.

For licensed practical nurses, five of eight indicators suggested a possible skill shortage. However, the human resource accounting models for Ohio and the Dayton MSA and the OES falling wage rate increases (relative to the CPI) indicate the development of a competitive labor market for LPNs.

Economic Indicators of Occupational Skill Shortages

Planning Models	RN's (29-1111)	LPN's (29-2061)	Auto. Techn. & Mech. (49-3023)	Cost Estimator (13-1051)	1st-Line S./Mgrs. Constr.Tr. (47-1011)	Electric. (47-2111)	Plumbers (47-2152)	Police Officers (33-3051)	Correct. Officers (33-3012)	Operating Engineers (47-2073)	Sales Rep. Tech./Sci. (41-4011)	Sales Rep. Except Tech./Sci. (41-4012)
High Employment Prospect Occup. (Dayton MSA, 2004-14)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Human Resource Accounting Dayton MSA (2005-2006)	No	No	No	NA	NA	NA	NA	No	No	NA	NA	NA
Ohio (2004-2005)	Yes	No	Yes	NA	NA	NA	NA	No	Indeterm.	NA	NA	NA
Longitudinal Occup. Wage Data Compared to CPI												
NCS Data (Dayton MSA, 2001-05)	Yes	Yes	NA	NA	NA	NA	NA	No	NA	NA	NA	NA
OES Data (Ohio, 2002-06)	Yes	No	No	Yes	Yes	No	No	No	No	No	Yes	Yes
SCOTI Job Bank Hard-To-Fill Job Order Statistics (Oh., 2006)	Yes	Yes	No	NA	NA	Yes	NA	NA	NA	NA	NA	NA
America's Job Bank (AJB) Keyword Analysis (U.S., 2004)	Yes	Yes	No	No	No	No	No	No	No	No	Yes	Yes
Job Vacancy Survey Dayton Area (Montgomery Cty., 2006)	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes
BLS Labor Market Analysts (OOH, & <i>Occup. Projections & Training Data, 2006-07 ed.</i> , (national))	Yes	NA	Yes	NA	NA	No*	Yes	No	Yes	No*	NA	NA

*As reported in the 2006-07 edition of the OOH, the BLS analysts found "good employment opportunities" for electricians and operating engineers resulting from a rough balance in their respective labor markets, not occupational skill shortages.

MSA= Metropolitan Statistical Area

NCS=National Compensation Surveys

BLS=Bureau of Labor Statistics

NA=Not Addressed or

Not Available

CPI=Consumer Price Index

OES=Occupational Employment Statistics

OOH=Occupational Outlook Handbook

Indeterm.=Indeterminate

Wholesale and manufacturers sales representatives for other than technical and scientific products had four positive skill shortage indicators from among the four available for this occupation. In particular, employers responding to the Montgomery County job vacancy survey indicated that vacancies for this occupation had been hard to fill, taking 60 plus days. A similar occupation, wholesale and manufacturers sales representatives for technical and scientific products, had three positive skill shortage indicators from among the four available for this occupation.

The remaining occupations (automotive technicians and mechanics; cost estimators; first-line supervisors and managers of construction trades and extraction workers; electricians; plumbers, pipefitters, and steamfitters; police and sheriff's patrol officers; correctional officers and jailers; and operating engineers and other construction equipment operators) each had only few positive indicators, which suggests that these occupations are not experiencing skill shortages.

Footnotes

1. For a more detailed and technical discussion of this study, please see, Schaff, Mark, and Horner, Lewis, "Research Documentation. Identifying Regional Skill Shortages in the Dayton Metropolitan Statistical Area" (November, 2007) at <http://lmi.state.oh.us/research/Research.htm>.
2. Shah, C. & Burke, G. (2005), "Skill shortages: Concepts, measurement, and policy responses," *Australian Bulletin of Labour*, vol. 31, no.1, pp. 44-71.
3. Richardson, S. (2007), *What is a Skills Shortage?* National Centre for Vocational Education Research: Adelaide, AU.
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5. Goodman, William C. (June, 2006), "Employment in hospitals; unconventional patterns over time," *Monthly Labor Review*, pp. 3-14.
6. Veneri, C. M. (March, 1999), "Can occupational labor shortages be identified using available data?" *Monthly Labor Review*, pp. 15-21.
7. For an example, see The Conference Board at <http://www.conference-board.org/economics/helpwantedOnline.cfm>.

APPENDIX: Standard Occupational Classifications

Occupational titles used in this report are based on the Standard Occupational Classification (SOC) system and not employer job titles. In the SOC, occupations are combined in major and minor groups and broad occupations based on duties, skills, education, and experience. These codes are used to maintain comparability of descriptions and analyses across different systems.

Occupational Title	SOC Code
Registered Nurses	29-1111
Licensed Practical & Licensed Vocational Nurses	29-2061
Automotive Service Technicians and Mechanics	49-3031
Cost Estimators	13-1051
First-Line Supervisors & Managers of Construction Trades/Extraction Workers	47-1011
Electricians	47-2111
Police and Sheriff's Patrol Officers	33-3051
Plumbers, Pipefitters, and Steamfitters	47-2152
Sales Rep., Wholesale & Manufacturing, Technical and Scientific Products	41-4011
Sales Rep., Wholesale & Manufacturing, Except Technical & Scientific Products	41-4012
Operating Engineers & Other Construction Equipment Operators	47-2073
Correctional Officers and Jailers	33-3012

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