

August 2020

Labor Market Analysis

Cloud Computing



Prepared by the Central Valley/Mother Lode Center of Excellence

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COVID-19 Statement: This report includes employment projection data by EMSI. EMSI’s projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

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Summary

Please note the COVID-19 statement on page 2 when considering this report's findings.

This study conducted by the Central Valley/Mother Lode Center of Excellence examines labor market demand, wages, skills, and postsecondary supply for cloud computing. Four occupations related to cloud computing were identified for Cerro Coso:

- 15-1299, Computer Occupations, All Other
- 15-1244, Network and Computer Systems Administrators
- 15-1231, Computer Network Support Specialists
- 15-1241, Computer Network Architects

Key findings:

- **Occupational demand** — Nearly 3,800 workers were employed in jobs related to cloud computing in 2019 in the South Central Valley/Southern Mother Lode (SCV/SML) subregion. The largest occupation is computer occupations, all other, with 2,068 workers in 2019, a projected growth rate of 4% over the next five years, and 182 annual openings.
- **Wages** — Network and computer systems administrators earn the highest entry-level wages, \$33.06/hour in the subregion and \$32.05/hour in the region.
- **Employers** — Employers with the most job postings in the subregion are Anthem Blue Cross, Lockheed Martin Corporation, and Northrop Grumman.
- **Occupational titles** — The most common occupational title in job postings in the subregion is network and computer systems administrators. The most common job title is systems administrator.
- **Skills and certifications** — The top baseline skill is communication, the top specialized skill is project management, and the top software skill is SQL. The most in-demand certification is a security clearance.
- **Education** — A bachelor's degree is typically required for three of the four occupations— computer network architects, network and computer systems administrators, and computer occupations, all other. An associate degree is typically required for computer network support specialists.
- **Supply** — Analysis of postsecondary completions in the region shows that on average 147 awards were conferred in the Central Valley/Mother Lode region each year.

Based on a comparison of occupational demand and supply, there is an undersupply of 211 trained workers in the subregion and 361 workers in the region. The Center of Excellence recommends that Cerro Coso work with the ICT/DM Regional Director, the college's advisory board, and local industry in the expansion of programs to address the shortage of cloud computing workers in the region.

Introduction

The Central Valley/Mother Lode Center of Excellence was asked by Cerro Coso to provide labor market information for cloud computing. Review of the Taxonomy of Programs (TOP) and Classification of Instructional Programs (CIP) found the following programs are appropriate for this analysis:

- TOP 070100 - Information Technology, General
- TOP 070200 - Computer Information Systems
- CIP 11.0101 - Computer and Information Sciences, General
- CIP 11.0103 - Information Technology

The geographical focus for this report is the South Central Valley/Southern Mother Lode (SCV/SML) subregion, but regional demand and supply data has been included for broader applicability and use. The average living wage for a single adult in the South Central Valley/Southern Mother Lode (SCV/SML) subregion is \$10.30/hour.¹ Analysis of the program and occupational data related to cloud computing resulted in the identification of applicable occupations. The Standard Occupational Classification (SOC) System codes and titles used in this report are:

- 15-1299, Computer Occupations, All Other
- 15-1244, Network and Computer Systems Administrators
- 15-1231, Computer Network Support Specialists
- 15-1241, Computer Network Architects

The occupational titles, job descriptions, sample job titles, and knowledge and skills from the Bureau of Labor Statistics and O*NET OnLine are shown below. O*NET data was not available for Computer Occupations, All Other.

Network and Computer Systems Administrators

Job Description: Install, configure, and support an organization's local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. Monitor network to ensure network availability to all system users and may perform necessary maintenance to support network availability. May monitor and test Web site performance to ensure Web sites operate correctly and without interruption. May assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software. May supervise computer user support specialists and computer network support specialists. May administer network security measures.

Knowledge: Computers and Electronics, English Language, Customer and Personal Service, Engineering and Technology, Mathematics

Skills: Critical Thinking, Judgment and Decision Making, Reading Comprehension, Systems Analysis, Active Listening

Computer Network Support Specialists

Job Description: Analyze, test, troubleshoot, and evaluate existing network systems, such as local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. Perform network maintenance to ensure networks operate correctly with minimal interruption.

¹ The term "living wage" in Center of Excellence reports is calculated by averaging the self-sufficiency wages from the Insight Center's California Family Needs Calculator for each county in the subregion: <https://insightccd.org/tools-metrics/self-sufficiency-standard-tool-for-california/>.

Knowledge: Computers and Electronics, Telecommunications, Customer and Personal Service, Engineering and Technology, English Language

Skills: Critical Thinking, Active Listening, Judgment and Decision Making, Reading Comprehension, Active Learning

Computer Network Architects

Job Description: Design and implement computer and information networks, such as local area networks (LAN), wide area networks (WAN), intranets, extranets, and other data communications networks. Perform network modeling, analysis, and planning. May also design network and computer security measures. May research and recommend network and data communications hardware and software.

Knowledge: Computers and Electronics, Telecommunications, Engineering and Technology, English Language, Design

Skills: Critical Thinking, Active Listening, Complex Problem Solving, Reading Comprehension, Judgment and Decision Making,

Occupational Demand

The South Central Valley/Southern Mother Lode subregion employed 3,785 workers in cloud computing occupations in 2019 (Exhibit 1). The largest occupation is computer occupations, all other, with 2,068 workers in 2019. This occupation is projected to grow by 4% over the next five years and has the greatest number of projected annual openings, 182.

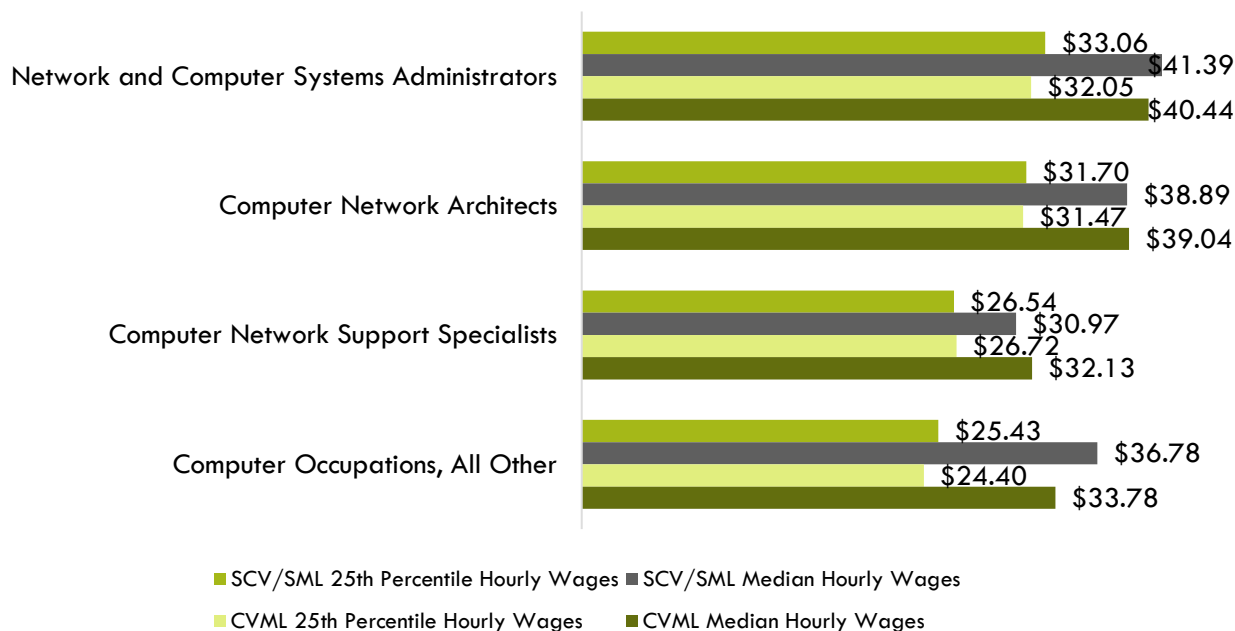
Exhibit 1. Cloud computing employment and occupational projections in the SCV/SML subregion

Occupation	2019 Jobs	2024 Jobs	5-Year Change	5-Year % Change	Annual Openings
Computer Occupations, All Other	2,068	2,141	73	4%	182
Network and Computer Systems Administrators	868	925	57	7%	74
Computer Network Support Specialists	623	664	41	7%	62
Computer Network Architects	226	238	12	5%	19
Total	3,785	3,968	183	5%	337

Wages

Exhibit 2 compares the entry-level and experienced wages of the cloud computing occupations. Network and computer systems administrators earn the highest entry-level wages, \$33.06/hour in the subregion and \$32.05/hour in the region.

Exhibit 2. Entry-level and experienced wage comparison in the SCV/SML subregion and region



Job Postings

There were 1,386 job postings for the four occupations in the SCV/SML subregion from February to July 2020. The employers with the most job postings are listed in Exhibit 3.

Exhibit 3. Top employers for cloud computing by number of job postings

Employer	Job Postings	% of Job Postings
Anthem Blue Cross	133	12%
Lockheed Martin Corporation	36	3%
Northrop Grumman	28	3%
Dcs Corporation	18	2%
Amentum	17	2%
The Boeing Company	15	1%
The Save Mart Companies	14	1%
American Consumer Panels	12	1%
Crowdstrike	12	1%
Copy of The Save Mart Companies	11	1%

Exhibit 4 shows how job postings for the targeted occupations in the SCV/SML subregion are distributed across 10 O*NET OnLine occupations. The occupational title network and computer systems administrators

is listed in 271 job postings. Note how a higher proportion of job postings are for network and computer systems administrators and information technology project managers. Common job titles in postings include systems administrator, 90 job postings, systems engineer, 73 job postings, and network administrator, 48 job postings.

Exhibit 4. Top occupational titles in job postings for cloud computing

Occupational Title	Job Postings	% of Job Postings
Network and Computer Systems Administrators	271	20%
Information Technology Project Managers	240	17%
Computer Systems Engineers/Architects	216	16%
Business Intelligence Analysts	168	12%
Software Quality Assurance Engineers and Testers	95	7%
Computer Network Architects	77	6%
Database Architects	73	5%
Computer Network Support Specialists	61	4%
Document Management Specialists	53	4%
Network and Computer Systems Administrators	271	20%

Salaries

Exhibit 5 shows the “Market Salaries” for cloud computing occupations that are calculated by Burning Glass which uses a machine learning model built off of millions of job postings every year, and accounts for adjustments based on locations, industry, skills, experience, education requirements, among other variables.

Exhibit 5. Salaries for cloud computing

Market Salary Percentile	Salary Amount
10th Percentile	\$41,603
25th Percentile	\$57,376
50th Percentile	\$76,970
75th Percentile	\$96,891
90th Percentile	\$115,028

Education

Of the 1,386 job postings, 920 listed an education level preferred for the positions being filled. Of those, 81% requested a bachelor’s degree, 25% requested high school or vocational training, and 21% requested a master’s degree (Exhibit 6).

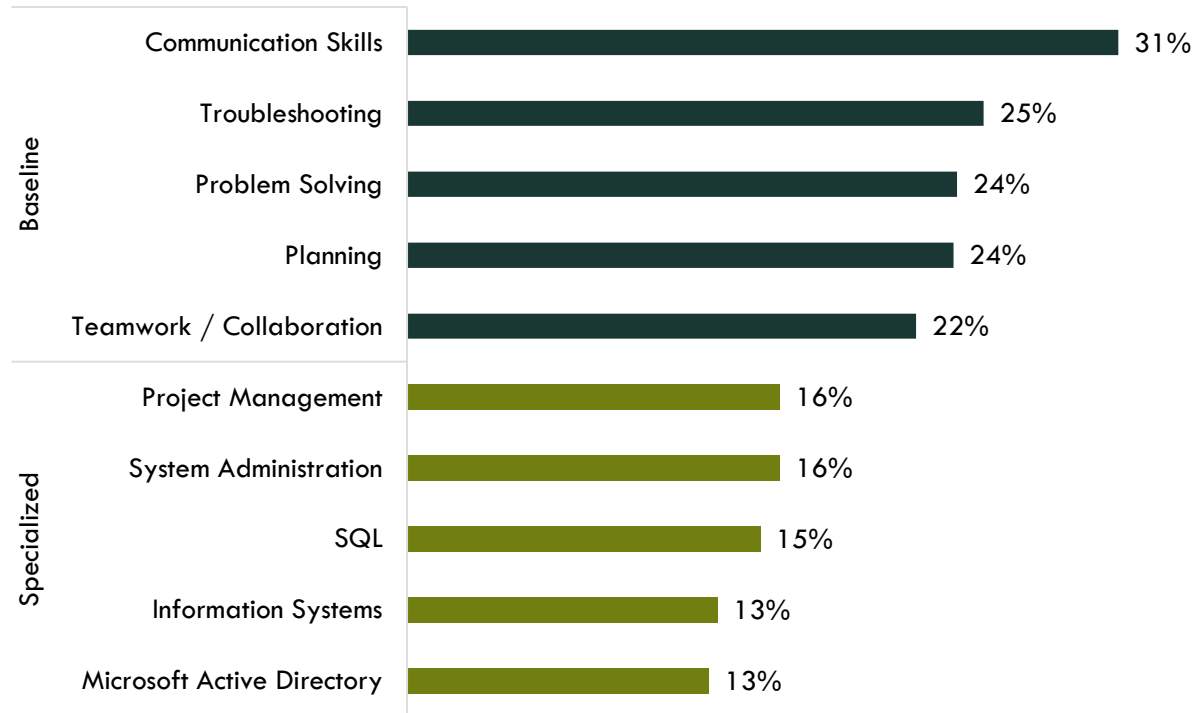
Exhibit 6. Education levels requested in job postings for cloud computing

Education level	Job Postings	% of Job Postings
Bachelor's degree	749	81%
High school or vocational training	232	25%
Master's degree	190	21%
Associate degree	95	10%
Doctoral degree	60	7%

Baseline and Specialized Skills

Exhibit 7 depicts the top baseline and specialized skills for the targeted occupations. The three most important baseline skills are communication, 31% of job postings, troubleshooting, 25%, and problem solving, 24%. The top three specialized skills are project management, 16% of job postings, system administration, 16%, and SQL, 15%.

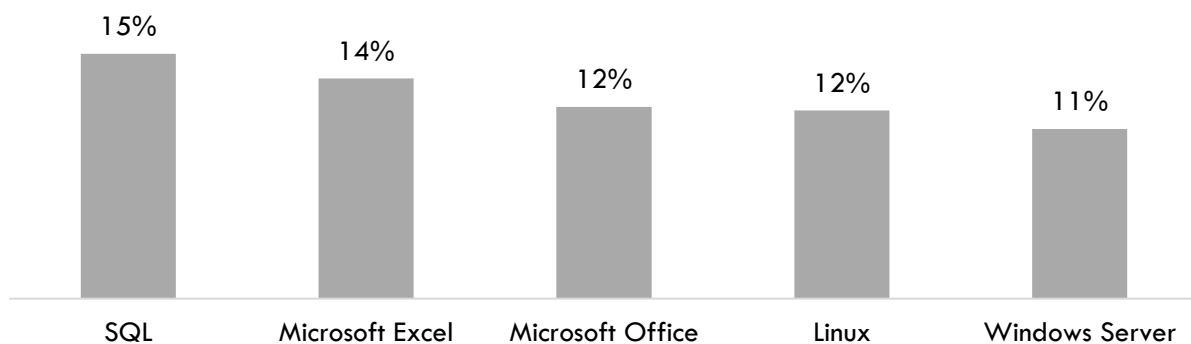
Exhibit 7. In-demand cloud computing baseline and specialized skills



Software Skills

Analysis also included the software skills most in demand by employers. SQL and Microsoft Excel rank first and second (Exhibit 8).

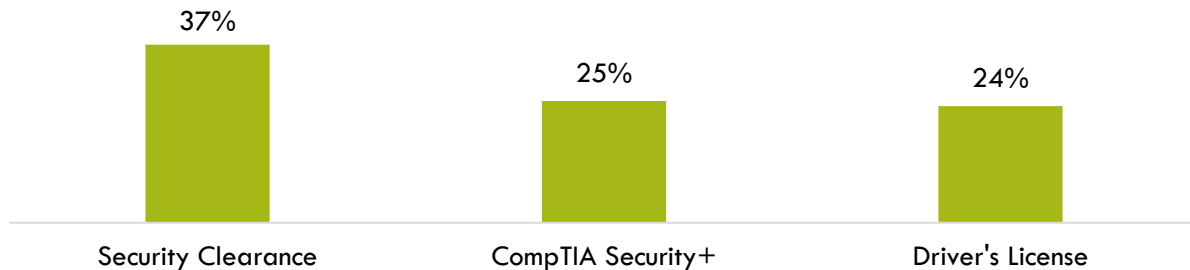
Exhibit 8. In-demand cloud computing software skills



Certifications

Of the 1,386 job postings, 487 contained certification data. Of those, 37% indicated a need for a security clearance. The next top certifications are CompTIA Security+ and driver's license (Exhibit 9). (Due to the low number of job postings with certifications listed, the chart below may not be representative of the full sample.)

Exhibit 9. Top cloud computing certifications requested in job postings



Education, Work Experience & Training

A bachelor's degree is typically required for three of the four occupations—computer network architects, network and computer systems administrators, and computer occupations, all other (Exhibit 10). An associate degree is typically required for computer network support specialists.

Exhibit 10. Education, work experience, training, and Current Population Survey results for cloud computing occupations²

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Computer Network Support Specialists	Associate degree	None	None	41.2%
Computer Network Architects	Bachelor's degree	5 years or more	None	37.0%
Network and Computer Systems Administrators	Bachelor's degree	None	None	36.5%
Computer Occupations, All Other	Bachelor's degree	None	Moderate-term	34.7%

Supply

Analysis of program data from the California Community Colleges Chancellor's Office Data Mart included the TOP and CIP codes: TOP 070100 - Information Technology, General; TOP 070200 - Computer Information Systems; CIP 11.0101 - Computer and Information Sciences, General; CIP 11.0103 - Information Technology. Analysis of the last three years of TOP code data shows that, on average, 147 awards were conferred in the Central Valley/Mother Lode region each year (Exhibit 11).

² "Labor Force Statistics from the Current Population Survey," Bureau of Labor Statistics, <https://www.bls.gov/cps/>.

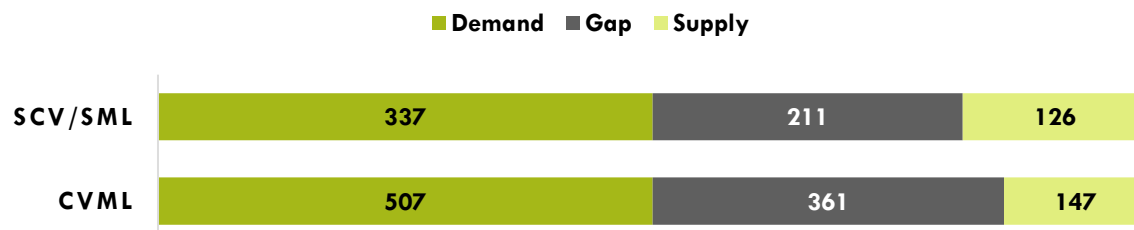
Exhibit 11. Postsecondary supply for cloud computing occupations in the region

TOP Title-Code	College	Associate Degree	Award 1<2 Academic Years	Cert. 12<18 Units	Cert. 18<30 Units	Cert. 30<60 Units	Cert. 6<18 Units	Subtotal
070100 - Information Technology, General	Modesto	1						1
	Porterville	1					3	3
	San Joaquin Delta					0		0
	Sequoias						0	0
070200 - Computer Information Systems	Bakersfield	2						2
	Cerro Coso	15			17	11		43
	Clovis				2			2
	Columbia	1						1
	Fresno City	6				0		6
	Merced	1						1
	Modesto	1						1
	Porterville	11					2	12
	Reedley College				14	8		22
	San Joaquin Delta	16						16
	Sequoias	6					3	8
	Taft							2
11.0101 - Computer and Information Sciences, General	Milan Institute-Visalia			5				5
	Santa Barbara Business College-Bakersfield	11						11
11.0103 - Information Technology	San Joaquin Valley College-Visalia	2		7				10
TOTAL		73	13	14	27	15	5	147

Gap Analysis

There is an undersupply of 211 cloud computing workers in the SCV/SML subregion and 361 workers in the region (Exhibit 12).

Exhibit 12. Cloud computing workforce annual demand and supply in the SCV/SML subregion and region



Student Outcomes

Exhibit 13 summarizes employment and wage outcomes from the California Community College Chancellor’s Cal-PASS Plus LaunchBoard for the TOP codes related to cloud computing. Across the region, 96 computer information systems students received a degree/certificate or attained apprenticeship journey status, and 28 transferred. By comparison, 753 information technology, general, students transferred. A median change in earnings was reported by 39% of information technology students, and by 12% of computer information systems students.

Exhibit 13. Regional metrics for the TOP code related to cloud computing

Metric	Information Technology, General 070100	Computer Information Systems 070200
Students Who Got a Degree or Certificate or Attained Apprenticeship Journey Status	*	96
Number of Students Who Transferred	753	28
Job Closely Related to Field of Study	65%	40%
Median Change in Earnings	39%	12%
Attained a Living Wage	57%	74%
* denotes data not available.		

Conclusion

The entry-level wages of the four occupations exceed the SCV/SML subregion’s average living wage. There were 1,386 job postings in the past six months for occupations related to cloud computing in the subregion. Analysis of skills and certification requirements in job postings indicates:

- The top baseline skill is communication, and the top specialized skill is project management.
- The top software skill is SQL.
- The top certification is a security clearance.

There is an undersupply of trained workers, a shortage of 211 in the SCV/SML subregion and 361 in the region.

Recommendation

Based on these findings, it is recommended that Cerro Coso work with the ICT/DM Regional Director, the college’s advisory board, and local industry in the expansion of programs to address the shortage of cloud computing in the region.

Appendix A: Methodology & Data Sources

Data Sources

Labor market and educational supply data compiled in this report derive from a variety of sources. Data were drawn from external sources, including the Economic Modeling Specialists, Inc., the California Community Colleges Chancellor’s Office Management Information Systems Data Mart and the National Center for Educational Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS). Below is the summary of the data sources found in this study.

Data Type	Source
Labor Market Information/Population Estimates and Projections/Educational Attainment	Economic Modeling Specialists, Intl. (EMSI). EMSI occupational employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry: economicmodeling.com .
Typical Education Level and On-the-job Training	Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education and typical on-the-job training to each occupation for which BLS publishes projections data: https://www.bls.gov/emp/tables/educational-attainment.htm .
Labor Force, Employment and Unemployment Estimates	California Employment Development Department, Labor Market Information Division: labormarketinfo.edd.ca.gov .
Job Posting and Skills Data	Burning Glass: burning-glass.com/ .
Additional Education Requirements/ Employer Preferences	The O*NET Job Zone database includes over 900 occupations as well as information on skills, abilities, knowledge, work activities and interests associated with specific occupations: onetonline.org .

Key Terms and Concepts

Annual Job Openings: Annual openings are calculated by dividing the number of years in the projection period by total job openings.

Education Attainment Level: The highest education attainment level of workers age 25 years or older.

Employment Estimate: The total number of workers currently employed.

Employment Projections: Projections of employment are calculated by a proprietary Economic Modeling Specialists, Intl. (EMSI) formula that includes historical employment and economic indicators along with national, state and local trends.

Living Wage: The cost of living in a specific community or region for one adult and no children. The cost increases with the addition of children.

Occupation: An occupation is a grouping of job titles that have a similar set of activities or tasks that employees perform.

Percent Change: Rate of growth or decline in the occupation for the projected period; this does not factor in replacement openings.

Replacements: Estimate of job openings resulting from workers retiring or otherwise permanently leaving an occupation. Workers entering an occupation often need training. These replacement needs, added to job openings due to growth, may be used to assess the minimum number of workers who will need to be trained for an occupation.

Total Job Openings (New + Replacements): Sum of projected growth (new jobs) and replacement needs. When an occupation is expected to lose jobs, or retain the current employment level, number of openings will equal replacements.

Typical Education Requirement: represents the typical education level most workers need to enter an occupation.

Typical On-The-Job Training: indicates the typical on-the-job training needed to attain competency in the skills needed in the occupation.