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APPENDIXES
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Supply and Demand for Middle-Skill Occupations in Rural California in 2018–20

See https://go.usa.gov/x78gq for the full report.

Appendix A. Key terms, data sources, analysis methods, and limitations

This appendix presents expanded key terms and detailed information on the study's data sources, analysis methods, and limitations.

Key terms

Rural regions. To identify the rural regions, the study team first applied the Office of Management and Budget (OMB)'s rural classification criteria[1] at the county level. Although the study included middle-skill credentials from all postsecondary institutions that award such credentials, the majority of middle-skill credentials were awarded by California community colleges. Thus, supply data (credentials awarded) for each rural county were aggregated by community college district service area, using the community college district service areas established by the Foundation for California Community Colleges.[2] The district service areas do not map exactly to county boundaries. For districts that spill over into a nonrural county, the study team recategorized that county as part of a rural region. This process expanded the original number of rural counties.

Demand data were organized according to the economic subregions used by the Doing What Matters for the Economy Framework of the California Community Colleges Chancellor's Office (which has since ended). Although the subregions do not align perfectly with community college district service areas, the study team was able to match the subregions to the expanded list of rural counties. Four rural counties map to a subregion called the Northern Coastal region. Ten counties map to a subregion called the Northern Inland region. Fifteen rural counties

[1] Rural areas, according to OMB, are all areas that are not classified as a core urban area (population of 50,000 or more; Housing Assistance Council, 2013).

[2] See Foundation for California Community Colleges (2019).

map to a subregion called the Central Valley and Mother Lode region. But that region had eight times the population in 2017 of the next closest rural region (4,443,681 compared with 574,717 in the Northern Inland region; California Department of Finance, 2018) and six times the number of jobs of the next closest rural region (600,551 compared with 92,498 in the Northern Inland region; Economic Modeling Specialists International, 2019b). To accommodate both the geographic and economic characteristics of the Central Valley and Mother Lode region, the study team divided it into two regions: Central Valley and Mother Lode North (CVML-N) and Central Valley and Mother Lode South (CVML-S). The northern edge of Fresno and Madera counties constitute the border between CVML-N and CVML-S. Both counties are included in the CVML-S region due to commuting patterns in 2009–13, which indicate that a large portion of the workforce in those counties reside in and commute from communities within the CVML-S region (U.S. Census Bureau, 2018). Table A1 lists the counties in each region.

Table A1. The four rural California regions, and the counties served in each region

Rural region	Counties served
Central Valley and Mother Lode North	Alpine Amador Calaveras Mariposa Merced San Joaquin Stanislaus Tuolumne
Central Valley and Mother Lode South	Fresno Inyo Kern Kings Madera Mono Tulare
Northern Coastal	Del Norte Humboldt Lake Mendocino
Northern Inland	Butte Glenn Lassen Modoc Plumas Shasta Sierra Siskiyou Tehama Trinity

Source: Authors' analysis of data from the California Community Colleges Chancellor's Office and the Foundation for California Community Colleges.

Middle-skill occupations. Middle-skill occupations are those that generally require an entry-level education greater than a high school diploma but less than a bachelor's degree (Holzer & Lerman, 2009; Unruh & Mayo, 2011). The study considered occupations middle-skill if they typically require one of three entry-level education levels (Bureau of Labor Statistics, 2019):

- *Some college, no degree.* This level signifies the achievement of a high school diploma or equivalent plus the completion of one or more postsecondary courses that did not result in a degree or award. Although these occupations typically require some college, no degrees are counted in measures of job openings in middle-skill occupations (see definition of credential below).

- *Postsecondary nondegree award.* This level signifies completion of an education program that led to a certificate or other award but not to a degree. A certificate is awarded by the education institution and is the result of completing formal postsecondary schooling. Professional certifications and occupational licenses, issued by professional organizations or certifying bodies, are not included in this category. Some postsecondary nondegree award programs last only a few weeks, while others last up to two years.
- *Associate degree.* Completion of an associate degree usually requires at least two years, but generally not more than four years, of full-time academic study beyond high school.

Some occupations that did not require one of the three entry-level education levels listed above were included as middle-skill. These include:

- Occupations that typically require a high school diploma and California state licensing or certification as conditions of employment (for example, police and sheriff's patrol officers, which usually require peace officer basic training, and insurance sales agents, which require various licenses, depending on the type of insurance being sold).
- Occupations with recognized training programs beyond high school, according to the California Labor Market Information Division (2018).
- Supervisorial and managerial occupations where all the positions that the manager oversees are middle-skill or below. Sample supervisor occupations include first-line supervisors of food preparation and serving workers and first-line supervisors of office and administrative support workers.[3]

Registered nurses—an occupation that typically requires a bachelor's degree for entry, according to BLS—were also included as a middle-skill occupation (Bureau of Labor Statistics, 2018a). In California, students can apply for registered nursing licensure after completing one of three types of pre-licensure nursing programs or can apply through two alternative routes. One of the pre-licensing options is to obtain an associate degree in nursing, and the two alternative routes do not require a bachelor's degree or higher (California Board of Registered Nursing, 2019).

Total jobs. The study defined a job as any position in which a worker provides labor in exchange for monetary compensation (Economic Modeling Specialists International, 2019a). Job estimates are reported as annual averages. These annual averages represent jobs, not workers, because one person may hold multiple jobs. The job counts that California employers provide to the state do not distinguish between part-time and full-time jobs. Therefore, both part-time and full-time jobs are included and counted equally in the Economic Modeling Specialists International (EMSI) dataset. Jobs are always counted and reported by the geographic place of work rather than the worker's place of residence.

Projected job openings. Projected job openings are the estimated number of employment opportunities that will be available for workers entering an occupation. The higher the number of openings, the more positions available for a skilled workforce to fill. EMSI calculates the number of job openings by adding job growth and replacement needs (including retirements, career changes, and workers leaving an occupation without intending to return). It then calculates the number of annual openings by dividing the total openings by the number of years in the selected timeframe, rounded to the nearest whole number.

- *Job growth.* Job growth occurs when an employer experiences a greater demand for its goods and services and hires new employees to increase production. If job growth is zero or negative, job openings are due to replacement needs.

[3] O*NET OnLine (https://www.onetonline.org/help/online/zones).

- *Replacement needs.* Replacement needs are the number of job openings from positions that become available to replace workers who permanently leave an occupation due to retirement or transferring to different occupations. BLS refers to these as "labor force exits" and "occupation transfers," respectively (Economic Modeling Specialists International, 2019a).

Projected change in job openings. While job openings include new jobs and replacement jobs, the projected change in job openings is the percentage change in job openings for an occupation that is due to new job growth (Bureau of Labor Statistics, 2017). A rapidly growing occupation may indicate favorable prospects for employment. However, even modest job growth in an occupation that has a large total number of jobs can result in more job openings than would result from rapid job growth in an occupation that has a small total number of jobs. For this study, occupations adding at least one job due to job growth in 2018–20 are considered growing.

Hourly wage ranges. The study included three hourly wage estimates—the 25th percentile, the median (50th percentile), and the 75th percentile—to provide estimates of the wages that workers in each occupation can expect to earn, taking into account variation across employers. The 25th percentile wage for an occupation in a region indicates that 25 percent of the workers in that occupation in that region earn less than the 25th percentile wage (Economic Modeling Specialists International, 2019a). The study uses the 25th percentile wage as a proxy for an entry-level wage. It is consistent with starting pay, meaning the wage that an employee can expect to earn with the right qualifications but with little or no experience in an occupation. The 75th percentile wage for an occupation in a region means that 75 percent of workers in that occupation in that region earn less than the 75th percentile wage. The study uses the 75th percentile wage as a proxy for an experienced-level wage and assumes that as a worker gains experience, his or her wage will also increase. The median wage represents the value between the highest paid 50 percent and the lowest paid 50 percent of workers in an occupation. Half the workers in a given occupation earn more than the median wage, and half earn less.

Using the registered nurses occupation in the CVML-S region as an example, the study found that the 25th percentile hourly wage was $35.28, meaning that 25 percent of registered nurses in the region earned less than $35.28 per hour. The median hourly wage was $42.54, meaning that 50 percent of registered nurses in the region earned more than $42.54 per hour and 50 percent earned less. And the 75th percentile hourly wage was $50.53, meaning that 75 percent of registered nurses in the region earned less than $50.53 per hour.

Living wage. The living wage is defined as the hourly wage that allows a single adult resident to meet the economic self-sufficiency standard, assuming full-time employment, or 2,080 hours of work per year (Glasmeier, 2019). The living wage threshold for each region is the living wage for the county with the highest living wage in the region. This is based on the assumption that if a worker could maintain an adequate standard of living in the most expensive county, he or she could do so in any county in that region. The Massachusetts Institute of Technology (MIT) Living Wage Calculator provides the living wage for other family sizes and structures, including one adult and one child, two adults and one child, two adults (one working) and two children, and so on (Glasmeier, 2019).

Classification of Instructional Programs. The Classification of Instructional Programs (CIP) is the taxonomy for classifying postsecondary programs of study developed by the National Center for Education Statistics (2019a). Programs of study are classified by a six-digit code at the most detailed level.

Education supply. A region's education supply is the size of its skilled force, proxied by the average annual number of subbaccalaureate credentials awarded. The total number of credentials represents the combined number of degrees and certificates issued; it does not represent the number of students who earned a degree or certificate. Therefore, a credential is not always equivalent to a single person in search of a job opening, because a student can earn more than one credential, such as an associate degree in addition to a certificate.

Middle-skill credential. A middle-skill credential is any associate degree or certificate issued by a postsecondary education institution that is less than a bachelor's degree. Although Integrated Postsecondary Education Data System (IPEDS) uses the term "award" instead of credential, the study team opted to use the term "credential" to describe all types of postsecondary awards included in the study. Further, the Career and Technical Education Statistics unit of the National Center for Education Statistics uses the two terms interchangeably (National Center for Education Statistics, 2019b). The study included four types of subbaccalaureate credentials, for which data were retrieved from IPEDS (National Center for Education Statistics, 2019d):

- *Associate degree.* An award that normally requires at least two but less than four years of full-time equivalent college work.
- *Postsecondary award, certificate, or diploma (at least one but less than two academic years)*. An award that requires completion of an organized program of study at the postsecondary level (below the baccalaureate degree) in at least one but less than two full-time equivalent academic years or that is designed for completion in at least 30 but less than 60 semester or trimester credit hours, in at least 45 but less than 90 quarter credit hours, or in at least 900 but less than 1,800 contact or clock hours.
- *Postsecondary award, certificate, or diploma (at least two but less than four academic years)*. An award that requires completion of an organized program of study at the postsecondary level (below the baccalaureate degree) in at least two but less than four full-time equivalent academic years or that is designed for completion in at least 60 but less than 120 semester or trimester credit hours, in at least 90 but less than 180 quarter credit hours, or in at least 1,800 but less than 3,600 contact or clock hours.
- *Postsecondary award, certificate, or diploma (less than one academic year)*. An award that requires completion of an organized program of study at the postsecondary level (below the baccalaureate degree) in less than one academic year (two semesters or three quarters) or that is designed for completion in less than 30 semester or trimester credit hours, in less than 45 quarter credit hours, or in less than 900 contact or clock hours.

Data sources

The study team obtained the most recent federal data available at the time of analysis from each data source (table A2). The EMSI dataset provides occupational data for the four rural regions and uses BLS's Standard Occupational Classification (SOC) system to classify the occupations in each region. Data on the living wage for each region are from the MIT Living Wage Calculator. And data on middle-skill credentials awarded are from IPEDS.

Table A2. Summary of data sources

Data	Source	Related research questions
Occupational demand data (2017–20), including middle-skill occupations, projected job openings, projected change in job openings, hourly wage ranges	Economic Modeling Specialists International (EMSI) data system (Economic Modeling Specialists International, 2019b). The EMSI data system is a composite dataset that integrates more than 90 federal and state labor market data sources, replacing suppressed data with mathematically educated estimates. EMSI connects 1,100 detailed industries for every county and zip code in the United States to more than 800 occupations. The California state agency that provides occupational data to EMSI is the Employment Projections Unit in the Labor Market Information Division of California's Employment Development Department (2019). EMSI uses the detailed (six-digit) occupational code in the Standard Occupational Classification system developed by the Bureau of Labor Statistics (BLS) (2018b) to classify occupations based on the activities and tasks that workers perform, independent of the industry in which they work (Bureau of Labor Statistics, 2016, 2018a). The BLS assigns all occupations to one of eight education levels based on the typical level of education that most workers need in order to enter each occupation. Wage estimates are obtained directly from the EMSI data system. EMSI's wage data are based on surveys administered to employers and employees by the BLS and the U.S. Census Bureau. EMSI uses this information in conjunction with county-level earnings by industry to calculate all wage estimates for a given region.	1, 2, 3, and 4
Living wage thresholds (2018)	Massachusetts Institute of Technology Living Wage Calculator (Glasmeier, 2019). Basic expenses are estimated average local costs that include housing, food, healthcare, transportation, and other necessities (for example, clothing, personal care items).	2 and 4
Education supply data (2014/15–2016/17), including average annual number of middle-skill credentials awarded	Integrated Postsecondary Education Data System (IPEDS) (National Center for Education Statistics, n.d.). IPEDS is a system of interrelated surveys conducted annually by the National Center for Education Statistics. IPEDS provides data on enrollment, program completions, graduation rates, faculty and staff, finances, institutional prices, and financial aid for every college, university, and technical and vocational institution that participates in the federal student financial aid programs. All education supply information was collected from final release data from the Integrated Postsecondary Education Data System (IPEDS) for 2015 and 2016 and provisional release data for 2017 (which correspond to the academic years 2014/15, 2015/16, and 2016/17). Provisional data have undergone full quality control procedures, and IPEDS provides education institutions with the opportunity to revise provisional data if discrepancies are found. Nationwide, only 1–7 percent of reporting institutions revise their preliminary data (National Center for Education Statistics, 2019c). The study included all institutions that award middle-skill credentials and report to IPEDS (those that participate in or hope to participate in the federal student financial aid program) in each region.	3 and 4

Source: Authors' compilation.

Analysis methods

The education credential and occupational data included in this study were initially matched by county and aggregated by county and then by region. The main report aggregates the data across all four rural regions, and each region is described in detail in its respective appendix. Descriptive statistics were then calculated to address each research question.

Occupational demand. The methods summarized in the following paragraphs describe how labor market demand was calculated for each occupation.

Projecting middle-skill job occupational demand. To estimate the future middle-skill occupational demand in each of the four rural regions, the study team consulted the EMSI data system to identify the average annual number of job openings and job growth as measured by percentage change in new jobs for each occupation over a three-year period (2017–20). Occupations that added at least one job due to new job growth were considered growing. EMSI calculates the number of job openings by adding job growth and replacement needs. EMSI calculates the average annual number of job openings by dividing the total number of job openings by the number of years in the selected timeframe and rounds them to the nearest whole number.

Calculating hourly wage. The study team obtained hourly wage data directly from the EMSI data system. EMSI's occupational earnings, reported as hourly wages, are derived primarily from occupational earnings reported in the BLS's Occupational Employment Statistics program (Bureau of Labor Statistics, 2019), which receives data from the Employment Projections Unit in the Labor Market Information Division of California's Employment Development Department.

Calculating living wage. The study team used the MIT Living Wage Calculator to determine the living wage in each region, based on an economic self-sufficiency standard for each region. In each region the county with the highest living wage for a single adult was used as the threshold indicator for an entry-level living wage in the entire region. Occupations for which the 25th percentile hourly wage met or exceeded the living wage threshold for a single adult in each region were those that met the self-sufficiency standard. For the combined analysis the county with the highest living wage for a single adult across all four regions was used.

Education supply and alignment with occupational demand. The methods summarized in the following paragraphs describe how education supply was calculated and aligned with occupational demand.

Calculating middle-skill labor supply. To estimate middle-skill labor supply, the study team used the number of credentials awarded in each region. The study team consulted IPEDS to determine the average number of credentials awarded by all institutions that award middle-skill credentials in each region over three academic years (2014/15, 2015/16, and 2016/17), the most recent data available from IPEDS. The study team averaged the number of credentials over the three-year period to minimize the effects of atypical variation in a single year. The analysis in the main report includes all credentials awarded in all four rural regions.

Matching credentials to occupations. Drawing on the CIP and the SOC system, the study team matched middle-skill credentials with the middle-skill occupations projected to be most in demand, meaning those with the highest average annual number of job openings in 2018–20, using the 2010 CIP-to-SOC crosswalk developed by the National Center for Education Statistics (2011).

A CIP–SOC relationship indicates that "programs classified in the CIP category prepare individuals directly for jobs classified in the SOC category" (National Center for Education Statistics, 2011, p. 1). There must be a direct relationship—that is, programs in the CIP category prepare students directly for entry into and performance in jobs in the SOC category. The programs satisfy requirements for entry and prepare individuals to meet licensure or certification requirements to work in the occupation. SOC codes tend to be more specific than CIP codes, partly because the CIP codes describe instructional programs that often provide training that leads to multiple occupations. The guiding principles that drove these matches are discussed in detail in National Center for Education Statistics (2011).

The SOC codes for most middle-skill occupations are matched to a single CIP code, meaning that programs of study in one CIP code prepare students for one specific occupation (registered nurses or police and sheriff's patrol officers, for example). In some cases SOC codes for more than one occupation are matched to programs in a single

CIP code (for example, programs in one CIP code prepare students for two occupations: the secretaries and administrative assistants, except legal, medical, and executive, occupation and the executive secretaries and executive administrative assistants occupation). In other cases the SOC code from a single occupation is matched to programs in more than one CIP code. For example, a program in one CIP code prepares students specifically for the medical assistants occupation, and programs in other CIP codes prepare students for the medical assistants occupation as well as occupations in other SOC codes.

Calculating local credential surplus or deficit. To calculate the local credential surplus or deficit for a given occupation, the study team identified the middle-skill occupations projected to be most in demand and used the NCES crosswalk (National Center for Education Statistics, 2011) to compare the occupation (classified according to SOC codes) to the related education program (classified according to CIP codes). The average annual number of job openings was linked with the average annual number of credentials awarded at the occupation level to determine whether a local credential surplus or deficit existed for each occupation. The surplus or deficit was calculated by subtracting the average annual number of projected job openings in 2018–20 from the average annual number of credentials awarded for each occupation in 2014/15–2016/17. A negative value indicates a credential deficit (more job openings than credentials awarded for a given occupation), and a positive value indicates a credential surplus (more credentials awarded than job openings for a given occupation).

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Appendix B. Detailed findings on supply and demand for middle-skill occupations in the Central Valley and Mother Lode North region of California

This appendix presents findings on the middle-skill labor market, including the alignment of middle-skill workforce supply (as measured by middle-skill credentials awarded) and occupational demand for the Central Valley and Mother Lode North (CVML-N) region of California. See box 1 in the main report for definitions of key terms. See box 2 in the main report for a summary of the data sources, sample, and methods and appendix A for more details.

Key findings for the CVML-N region include:

- In 2018–20 employers were projected to need to hire an average of 26,241 middle-skill workers each year to fill new jobs and meet replacement needs due to retirements, career changes, and workers leaving an occupation without intending to return. Job growth was projected in 79 percent of middle-skill occupations.
- About 94 percent of middle-skill occupations paid a living wage at entry level.
- Local education institutions were not awarding enough middle-skill credentials to meet employer demand. Each year in 2014/15–2016/17 postsecondary institutions in the region awarded an average of 4,677 middle-skill credentials. The overall projected local credential deficit each year in 2018–20 was 21,564, or 82 percent of projected job openings each year in the 294 middle-skill occupations in the region.
- A local credential surplus of 262 was projected for 2 of the 50 middle-skill occupations projected to be most in demand in 2018–20. A local credential deficit was projected for the other 48.

About the region

California's CVML-N region encompasses eight counties: Alpine, Amador, Calaveras, Mariposa, Merced, San Joaquin, Stanislaus, and Tuolumne. These counties were home to 1,731,730 people in 2017, or 4.4 percent of California's population (California Department of Finance, 2018). In 2018–20 the population was projected to grow by 3.8 percent, or 65,305 people.

The CVML-N region contains four community colleges and 15 private for-profit institutions that participate in federal student financial aid programs (National Center for Education Statistics, 2019). In the fall 2016 semester these institutions enrolled 51,656 students (48,956 in public institutions and 2,700 in private for-profit institutions).

What the study found in the region

More than 26,200 job openings in middle-skill occupations were projected for each year in 2018–20. In 2017 jobs in middle-skill occupations accounted for 36 percent of overall employment in the CVML-N region and were projected to grow by 4 percent in 2018–20. In 2018–20 employers in the region were projected to need to hire an average of 26,241 middle-skill workers each year to fill new jobs and meet replacement needs due to retirements, career changes, and workers leaving an occupation without intending to return (table B1).

Table B1. Total jobs in 2017 and projected job openings and job growth in 2018–20, by skill level, Central Valley Mother Lode North region

Occupation skill level	Total jobs, 2017	Share of total jobs, 2017 (percent[a])	Average annual number of projected job openings, 2018–20	Percent change[a] in projected number of new jobs, 2018–20
Above middle-skill	109,227	18	10,933	5
Middle-skill	226,321	36	26,241	4
Below middle-skill	288,482	46	45,650	5
Total	624,030	100	82,824	5

a. Rounded to the nearest whole number.
Source: Authors' analysis of data from Economic Modeling Specialists International (2019).

The number of job openings was projected to grow in 2018–20 in more than three-quarters of middle-skill occupations. Of the 294 middle-skill occupations examined in the CVML-N region, 231 (79 percent) were projected to experience an increase in job openings in 2018–20, 38 (13 percent) were projected to experience a decrease, and 25 (8 percent) were projected to experience no change.

Among the 50 middle-skill occupations projected to be most in demand in the CVML-N region, heavy and tractor-trailer truck drivers were projected to have the largest average annual number of job openings (1,777) in 2018–20, followed by general office clerks (1,453; table B2). Pharmacy technicians were projected to have the smallest average annual number of job openings (133).

The 50 middle-skill occupations projected to be most in demand accounted for 77 percent of all jobs in middle-skill occupations in the CVML-N region in 2018 (173,587 out of 226,321) and 78 percent of the average annual number of projected job openings in middle-skill occupations in 2018–20 in the region (20,409 out of 26,241; see table B2). The remaining jobs and job openings in middle-skill occupations were distributed among 244 other occupations.

The majority of middle-skill occupations paid a living wage at entry level. For 94 percent of middle-skill occupations in the CVML-N region (275 occupations) the entry-level hourly wage in 2017 met or exceeded the regional threshold for a living wage ($11.65 per hour; see table B2). The entry-level hourly wage for the other 6 percent of middle-skill occupations in the region (19 occupations) were below the threshold. But for 15 of those 19 occupations the median wage met or exceeded the threshold, meaning that an employee's wage would likely meet or exceed the living wage threshold for the region after the employee gained sufficient work experience.

Table B2. Total jobs in 2017, projected job growth and job openings in 2018–20, hourly wage range and median hourly wage in 2017 for the 50 middle-skill occupations projected to be most in demand in 2018–20, Central Valley Mother Lode North region

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($11.65 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
1	Heavy and tractor-trailer truck drivers	14,523	5	1,777	Yes	15.96	18.56	23.10
2	Office clerks, general	11,581	2	1,453	No	11.58	15.01	19.00
3	Secretaries and administrative assistants, except legal, medical, and executive	8,559	1	954	Yes	14.33	18.01	22.20
4	Customer service representatives	6,357	4	892	Yes	13.01	17.67	23.61
5	Teacher assistants	7,410	5	877	Yes	13.14	15.98	18.63
6	Childcare workers	5,048	–5	723	No	7.54	10.50	12.37
7	Bookkeeping, accounting, and auditing clerks	6,249	1	720	Yes	15.41	19.04	23.33
8	Registered nurses	10,173	5	705	Yes	42.46	51.44	60.42
9	Maintenance and repair workers, general	5,916	5	675	Yes	14.54	19.64	25.85
10	First-line supervisors of retail sales workers	5,915	1	673	Yes	13.52	16.56	21.70
11	First-line supervisors of office and administrative support workers	5,416	3	588	Yes	20.56	25.71	31.07
12	Nursing assistants	4,221	6	566	Yes	13.09	15.27	18.61
13	Medical assistants	3,862	8	525	Yes	13.59	15.97	18.32
14	First-line supervisors of food preparation and serving workers	3,045	6	499	Yes	12.57	14.75	20.38
15	Receptionists and information clerks	3,396	5	496	No	11.46	13.41	16.49
16	Sales representatives, wholesale and manufacturing, except technical and scientific products	4,192	4	489	Yes	18.93	26.44	38.03

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($11.65 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
17	Carpenters	4,158	3	445	Yes	14.02	17.49	26.50
18	Hairdressers, hairstylists, and cosmetologists	2,672	8	388	Yes	11.67	11.89	12.20
19	Medical secretaries	2,569	7	337	Yes	14.52	18.07	21.84
20	First-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors	2,352	11	332	Yes	21.57	27.55	33.39
21	Insurance sales agents	2,558	8	317	Yes	16.34	21.37	31.72
22	Sales representatives, services, all other	2,230	6	316	Yes	16.04	20.82	28.71
23	Automotive service technicians and mechanics	2,922	4	309	No	11.42	15.63	22.33
24	Correctional officers and jailers	3,405	2	307	Yes	27.64	35.33	40.98
25	Social and human service assistants	1,888	10	290	Yes	15.13	18.58	22.51
26	First-line supervisors of production and operating workers	2,469	3	267	Yes	20.49	28.24	37.46
27	Dental assistants	1,995	5	255	Yes	14.45	17.10	20.26
28	Licensed practical and licensed vocational nurses	2,890	5	255	Yes	21.97	25.82	28.56
29	Inspectors, testers, sorters, samplers, and weighers	1,973	1	245	Yes	14.16	18.70	25.06
30	First-line supervisors of construction trades and extraction workers	2,009	5	242	Yes	19.62	28.06	36.84
31	Welders, cutters, solderers, and brazers	1,958	4	233	Yes	16.03	18.84	23.58
32	Electricians	1,926	2	231	Yes	18.14	27.84	36.09

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($11.65 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
33	Industrial machinery mechanics	2,199	4	224	Yes	20.41	25.85	29.76
34	Manicurists and pedicurists	1,641	6	216	No	10.52	11.16	12.23
35	Police and sheriff's patrol officers	2,559	5	208	Yes	28.78	38.32	52.06
36	Plumbers, pipefitters, and steamfitters	1,445	8	190	Yes	15.93	19.05	28.36
37	First-line supervisors of farming, fishing, and forestry workers	1,333	3	188	Yes	14.33	17.26	23.85
38	Preschool teachers, except special education	1,767	1	184	Yes	11.85	15.62	22.54
39	Bus and truck mechanics and diesel engine specialists	1,678	5	181	Yes	18.27	23.33	28.05
40	Operating engineers and other construction equipment operators	1,193	9	169	Yes	20.47	24.58	30.91
41	First-line supervisors of mechanics, installers, and repairers	1,553	6	162	Yes	26.35	33.32	40.58
42	Production workers, all other	1,295	3	161	No	11.11	12.53	18.26
43	Executive secretaries and executive administrative assistants	1,479	–2	159	Yes	21.73	27.48	33.35
44	Production, planning, and expediting clerks	1,251	7	155	Yes	16.60	21.84	27.66
45	Heating, air conditioning, and refrigeration mechanics and installers	1,220	7	147	Yes	15.37	21.93	28.26

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($11.65 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
46	Self-enrichment education teachers	1,143	5	145	Yes	14.87	19.45	22.94
47	Firefighters	1,740	4	137	Yes	21.41	27.45	34.70
48	Insurance claims and policy processing clerks	1,203	3	135	Yes	14.39	17.30	20.56
49	Real estate sales agents	1,458	–2	135	Yes	17.90	19.20	21.20
50	Pharmacy technicians	1,592	1	133	Yes	14.81	18.16	22.69
	Subtotal, 50 middle-skill occupations projected to be most in demand	173,587	4 (average)	20,409	Yes = 44 (88 percent)	na	na	na
	Subtotal, 244 other middle-skill occupations	52,734	4 (average)	5,832	Yes = 231 (95 percent)	na	na	na
	Total, all 294 middle-skill occupations	226,321	4 (average)	26,241	Yes = 275 (94 percent)	na	na	na

na is not applicable.
Note: Values may not sum to totals because of rounding.
a. Rounded to the nearest whole number.
b. The 25th percentile wage in the region was used as a proxy for an entry-level wage in this study and is consistent with starting pay, or the wage that a worker can expect to earn when he or she meets the credential requirements for an occupation but has little to no experience in it.
c. The 75th percentile wage in the region was used as a proxy for an experienced-level wage and is consistent with the wage that a worker can expect to earn after gaining experience in an occupation.
Source: Authors' analysis of data (including 25th percentile, median, and 75 percentile values) from Economic Modeling Specialists International (2019).

In 2014/15–2016/17 an average of more than 4,600 middle-skill credentials were awarded each year. Each year in 2014/15–2016/17 postsecondary institutions in the CVML-N region awarded an average of 4,677 middle-skill credentials, and 3,617 of them were in the 50 middle-skill occupations projected to be most in demand in the region (table B3). Medical assistants were the occupation with the highest average number of middle-skill credentials awarded each year (497), and carpenters, first-line supervisors of construction trades and extraction workers, sales representatives for all other services, and first-line supervisors of retail sales workers were the occupations with the lowest (less than 1).

Table B3. Average annual number of middle-skill credentials in the 50 middle-skill occupations projected to be most in demand in 2018–2020 that postsecondary institutions in the Central Valley Mother Lode North region awarded in 2014/15–2016/17

Occupation[a]	Program of study	Average annual number of credentials awarded, 2014/15–2016/17
Office clerks, general; insurance claims and policy processing clerks	General office occupations and clerical services	66
Secretaries and administrative assistants, except legal, medical, and executive; executive secretaries and executive administrative assistants	Administrative assistant and secretarial science, general	100
Childcare workers	Child care provider/assistant	345
Bookkeeping, accounting, and auditing clerks	Accounting technology/technician and bookkeeping	171
Registered nurses	Registered nursing/registered nurse	256
First-line supervisors of retail sales workers	Floriculture/floristry operations and management; retail management	17
First-line supervisors of office and administrative support workers	Medical office management/administration; office management and supervision	38
Nursing assistants	Nursing assistant/aide and patient care assistant/aide	114
Medical assistants	Medical insurance coding specialist/coder; medical/clinical assistant	497
Medical assistants; medical secretaries	Medical office assistant/specialist; medical administrative/executive assistant and medical secretary	211
First-line supervisors of food preparation and serving workers	Cooking and related culinary arts, general; restaurant, culinary, and catering management/manager	73
Sales representatives, wholesale and manufacturing, except technical and scientific products	Sales, distribution, and marketing operations, general	9
Carpenters; first-line supervisors of construction trades and extraction workers	Carpentry/carpenter	1[b]
Hairdressers, hairstylists, and cosmetologists; manicurists and pedicurists	Cosmetology/cosmetologist, general; cosmetology, barber/styling, and nail instructor	479
Medical secretaries	Medical insurance specialist/medical biller	13
Sales representatives, services, all other; first-line supervisors of retail sales workers	Selling skills and sales operations	1[c]
Automotive service technicians and mechanics	Automobile/automotive mechanics technology/technician	138
Correctional officers and jailers	Corrections	18
Social and human service assistants	Human services, general	56
Dental assistants	Dental assisting/assistant	166
Licensed practical and licensed vocational nurses	Licensed practical/vocational nurse training	88
First-line supervisors of construction trades and extraction workers	Building/construction site management/manager	1
Welders, cutters, solderers, and brazers	Welding technology/welder	24
Electricians; first-line supervisors of construction trades and extraction workers	Electrician	27
Manicurists and pedicurists	Nail technician/specialist and manicurist	44
Police and sheriff's patrol officers	Criminal justice/police science	379

Occupation[a]	Program of study	Average annual number of credentials awarded, 2014/15–2016/17
First-line supervisors of farming, fishing, and forestry workers	Animal/livestock husbandry and production; crop production; dairy husbandry and production; horse husbandry/equine science and management; agricultural production operations, other	53
Preschool teachers, except special education	Child care and support services management	7
Bus and truck mechanics and diesel engine specialists	Diesel mechanics technology/technician	9
Heating, air conditioning, and refrigerator mechanics and installers	Heating, ventilation, air conditioning and refrigeration engineering technology/technician; heating, air conditioning, ventilation and refrigeration maintenance technology/technician	38
Firefighters	Fire prevention and safety technology/technician; fire science/firefighting	86
Real estate sales agents	Real estate	28
Pharmacy technicians	Pharmacy technician/assistant	63
Subtotal, 50 middle-skill occupations projected to be most in demand	na	3,617
Subtotal, 244 other middle-skill occupations	na	1,060
Total, all 294 middle-skill occupations	na	4,677

na is not applicable.
Note: The table does not list the 16 occupations among the 50 most in-demand for which no middle-skill credentials were awarded. Values may not sum to total because of rounding.
a. More than one occupation is listed in a single row when programs of study prepare students for more than one occupation.
b. One credential was issued for the carpentry/carpenter program in 2015.
c. One credential was issued for the selling skills and sales operations program in 2017.
Source: Authors' analysis of data from National Center for Education Statistics (2019).

No credentials were awarded in 16 of the 50 middle-skill occupations projected to be most in demand in the CVML-N region. The occupations with no credentials awarded and the number of projected job openings each year in 2018–20 are heavy and tractor-trailer truck drivers (1,777 job openings); customer service representatives (892 job openings); teacher assistants (877 job openings); general maintenance and repair workers (675 job openings); receptionists and information clerks (496 job openings); first-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors (332 job openings); insurance sales agents (317 job openings); first-line supervisors of production and operating workers (267 job openings); inspectors, testers, sorters, samplers, and weighers (245 job openings); industrial machinery mechanics (224 job openings); plumbers, pipefitters, and steamfitters (190 job openings); operating engineers and other construction equipment operators (169 job openings); first-line supervisors of mechanics, installers, and repairers (162 job openings); all other production workers (161 job openings); production, planning, and expediting clerks (155 job openings); and self-enrichment education teachers (145 job openings). Each year in 2018–20 an average of 7,421 job openings were projected in the 16 middle-skill occupations for which no credentials were awarded in 2014/15–2016/17.

A local credential deficit of more than 21,500 was projected for middle-skill occupations. With an average of 4,677 middle-skill credentials awarded each year and an average of 26,241 job openings each year in middle-skill occupations, the CVML-N region had a projected average annual credential deficit of 21,564, or 82 percent of projected job openings each year (table B4). The average annual credential deficit for the 50 middle-skill occupations projected to be most in demand ranged from 28 for medical assistants to 1,777 for heavy and tractor-

trailer truck drivers. Of the region's 50 middle-skill occupations projected to be most in demand, 48 were projected to have a local credential deficit.

A local credential surplus was projected for 2 of the 50 middle-skill occupations projected to be most in demand in the region. Two of the 50 middle-skill occupations projected to be most in demand in the CVML-N region were projected to have a combined local credential surplus of 262 each year in 2018–20 (see table B4). The larger surplus was for police and sheriff's patrol officers (171 per year); the smaller surplus was for hairdressers, hairstylists, and cosmetologists (91 per year).

Table B4. Projected local credential deficit or surplus for the 50 middle-skill occupations projected to be most in demand in 2018–20, Central Valley Mother Lode North region

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
1	Heavy and tractor-trailer truck drivers	1,777	0	(1,777)	Deficit
2	Office clerks, general[a]	1,453	66	(1,387)	Deficit
3	Secretaries and administrative assistants, except legal, medical, and executive[b]	954	100	(854)	Deficit
4	Customer service representatives	892	0	(892)	Deficit
5	Teacher assistants	877	0	(877)	Deficit
6	Childcare workers	723	345	(378)	Deficit
7	Bookkeeping, accounting, and auditing clerks	720	171	(549)	Deficit
8	Registered nurses	705	256	(449)	Deficit
9	Maintenance and repair workers, general	675	0	(675)	Deficit
10	First-line supervisors of retail sales workers[c]	673	17	(656)	Deficit
11	First-line supervisors of office and administrative support workers	588	38	(550)	Deficit
12	Nursing assistants	566	114	(452)	Deficit
13	Medical assistants[d]	525	497	(28)	Deficit
14	First-line supervisors of food preparation and serving workers	499	73	(426)	Deficit
15	Receptionists and information clerks	496	0	(496)	Deficit
16	Sales representatives, wholesale and manufacturing, except technical and scientific products	489	9	(480)	Deficit
17	Carpenters[e]	445	0	(445)	Deficit
18	Hairdressers, hairstylists, and cosmetologists[f]	388	479	91	Surplus
19	Medical secretaries[d]	337	224	(113)	Deficit
20	First-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors	332	0	(332)	Deficit
21	Insurance sales agents	317	0	(317)	Deficit
22	Sales representatives, services, all other[c]	316	0	(316)	Deficit

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
23	Automotive service technicians and mechanics	309	138	(170)	Deficit
24	Correctional officers and jailers	307	18	(289)	Deficit
25	Social and human service assistants	290	56	(234)	Deficit
26	First-line supervisors of production and operating workers	267	0	(267)	Deficit
27	Dental assistants	255	166	(89)	Deficit
28	Licensed practical and licensed vocational nurses	255	88	(166)	Deficit
29	Inspectors, testers, sorters, samplers, and weighers	245	0	(245)	Deficit
30	First-line supervisors of construction trades and extraction workers[e,g]	242	1	(241)	Deficit
31	Welders, cutters, solderers, and brazers	233	24	(209)	Deficit
32	Electricians[g]	231	27	(204)	Deficit
33	Industrial machinery mechanics	224	0	(224)	Deficit
34	Manicurists and pedicurists[f]	216	44	(173)	Deficit
35	Police and sheriff's patrol officers	208	379	171	Surplus
36	Plumbers, pipefitters, and steamfitters	190	0	(190)	Deficit
37	First-line supervisors of farming, fishing, and forestry workers	188	53	(135)	Deficit
38	Preschool teachers, except special education	184	7	(177)	Deficit
39	Bus and truck mechanics and diesel engine specialists	181	9	(172)	Deficit
40	Operating engineers and other construction equipment operators	169	0	(169)	Deficit
41	First-line supervisors of mechanics, installers, and repairers	162	0	(162)	Deficit
42	Production workers, all other	161	0	(161)	Deficit
43	Executive secretaries and executive administrative assistants[b]	159	0	(159)	Deficit
44	Production, planning, and expediting clerks	155	0	(155)	Deficit
45	Heating, air conditioning, and refrigeration mechanics and installers	147	38	(109)	Deficit
46	Self-enrichment education teachers	145	0	(145)	Deficit
47	Firefighters	137	86	(51)	Deficit
48	Insurance claims and policy processing clerks[a]	135	0	(135)	Deficit
49	Real estate sales agents	135	28	(107)	Deficit
50	Pharmacy technicians	133	63	(70)	Deficit
	Subtotal, 50 middle-skill occupations projected to be most in demand	20,409	3,617	(16,792)	Deficit
	Subtotal, 244 other middle-skill occupations	5,832	1,060	(4,772)	Deficit

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
	Total, all 294 middle-skill occupations	26,241	4,677	(21,564)	Deficit

Note: Values may not sum to total because of rounding.
a. Supply shared between general office clerks and insurance claims and policy processing clerks.
b. Supply shared between secretaries and administrative assistants, except legal, medical, and executive, and executive secretaries and executive administrative assistants.
c. Supply partially shared between first-line supervisors of retail sales workers and sales representatives for all other services.
d. Supply partially shared between medical assistants and medical secretaries.
e. Supply shared between carpenters and first-line supervisors of construction trades and extraction workers.
f. Supply shared between hairdressers, hairstylists, and cosmetologists and manicurists and pedicurists.
g. Supply partially shared between first-line supervisors of construction trades and extraction workers and electricians.
Source: Authors' analysis of data from Economic Modeling Specialists International (2019) and National Center for Education Statistics (2019).

Discussion and conclusion

A local credential deficit was projected for 48 of the 50 middle-skill occupations projected to be most in demand in the CVML-N region. This means that there might not have been enough trained workers to meet employer demand in the region. Of the 48 occupations projected to have a deficit, 42 paid an entry-level living wage for a single-adult household. This situation presents many opportunities for the region's postsecondary institutions to expand their programs or develop new ones to reduce the projected local credential deficits that employers in the region might face. Focusing on the 10 most in-demand occupations with a credential deficit that also pay a living wage might be an appropriate way to begin, as the educational programs linked to these occupations could be expanded without significant concern about oversaturating the market, while simultaneously providing a wage that allows for economic self-sufficiency among program completers .

As the major training providers of middle-skill workers, California community colleges and private institutions might consider strategies to guide both new and existing students to enroll in programs associated with the occupations that were projected to have a credential deficit and pay a living wage. These institutions might look to underemployed or unemployed adults in the region and to interested low-skilled workers who are not currently earning a living wage.

Local governments, workforce investment boards, and chambers of commerce can partner in efforts to align middle-skill supply and demand by identifying others to fill open jobs, including appropriately credentialed workers from other regions and workers with above-middle-skill credentials.

Findings from CVML-N region are not generalizable to differences in other regions in California and the nation because of differences in education, economic, social, and commercial characteristics. But the methods used in this study could be employed to conduct similar analyses for other regions. See the main report for other limitations of the analysis.

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Appendix C. Detailed findings on supply and demand for middle-skill occupations in the Central Valley and Mother Lode South region of California

This appendix presents findings on the middle-skill labor market, including the alignment of middle-skill workforce supply (as measured by middle-skill credentials awarded) and occupational demand for the Central Valley and Mother Lode South (CVML-S) region of California. See box 1 in the main report for definitions of key terms. See box 2 in the main report for a summary of the data sources, sample, and methods and appendix A for more details.

Key findings for the CVML-S region include:

- In 2018–20 employers were projected to need to hire an average of 42,096 middle-skill workers each year to fill new jobs and meet replacement needs due to retirements, career changes, and workers leaving an occupation without intending to return. Job growth was projected in 75 percent of middle-skill occupations.
- About 88 percent of middle-skill occupations paid a living wage at entry level.
- Local education institutions were not awarding enough middle-skill credentials to meet employer demand. Each year in 2014/15–2016/17 postsecondary institutions in the region awarded an average of 12,524 middle-skill credentials. The overall projected local credential deficit each year in 2018–20 was 29,572, or 70 percent of projected job openings each year in the 294 middle-skill occupations in the region.
- A local credential surplus of 2,397 was projected for 5 of the 50 middle-skill occupations projected to be most in demand in 2018–20. A local credential deficit was projected for the other 45.

About the region

California's CVML-S region encompasses seven counties: Fresno, Inyo, Kern, Kings, Madera, Mono, and Tulare. These counties were home to 2,711,951 people in 2017, or 6.8 percent of California's population (California Department of Finance, 2018). The counties vary significantly in population: Fresno County (population 999,929) is more than 72 times as populous as Mono County (population 13,798; California Department of Finance, 2018). In 2018–20 the population of the seven counties combined was projected to grow by 3.3 percent, or just over 90,000 people.

The CVML-S region contains 10 community colleges and 17 private for-profit institutions that participate in federal student financial aid programs (National Center for Education Statistics, 2019). In the fall 2016 semester these institutions enrolled 103,585 students (98,047 in public institutions and 5,538 in private for-profit institutions).

What the study found in the region

Nearly 42,100 job openings in middle-skill occupations were projected for each year in 2018–20. In 2017 jobs in middle-skill occupations accounted for 34 percent of overall employment in the CVML-S region and were projected to grow by 3 percent in 2018–20. In 2018–20 employers in the region were projected to need to hire an average of 42,096 middle-skill workers each year to fill new jobs and meet replacement needs due to retirements, career changes, and workers leaving an occupation without intending to return (table C1).

Table C1. Total jobs in 2017 and projected job openings and job growth in 2018–20, by skill level, Central Valley Mother Lode North region, Central Valley Mother Lode South region

Occupation skill level	Total jobs, 2017	Share of total jobs, 2017 (percent[a])	Average annual number of projected job openings, 2018–20	Percent change[a] in projected number of new jobs, 2018–20
Above middle-skill	191,604	18	18,802	5
Middle-skill	370,863	34	42,096	3
Below middle-skill	515,427	48	79,974	3
Total	1,077,894	100	140,872	4

a. Rounded to the nearest whole number.
Source: Authors' analysis of data from Economic Modeling Specialists International (2019).

The number of job openings was projected to grow in 2018–20 in three-quarters of middle-skill occupations. Of the 294 middle-skill occupations examined in the CVML-S region, 220 (75 percent) were projected to experience an increase in job openings in 2018–20, 48 (16 percent) were projected to experience a decrease, and 26 (9 percent) were projected to experience no change.

Among the 50 middle-skill occupations projected to be most in demand in the CVML-S region, general office clerks were projected to have the largest average annual number of job openings (2,228) in 2018–20, followed by heavy and tractor-trailer truck drivers (2,059; table C2). Self-enrichment education teachers were projected to have the smallest average annual number of job openings (189).

The 50 middle-skill occupations projected to be most in demand accounted for 75 percent of all jobs in middle-skill occupations in the CVML-S region (278,901 out of 370,863) in 2018 and 76 percent of the average annual number of projected job openings in middle-skill occupations in 2018–20 in the region (32,197 out of 42,096; see table C2). The remaining jobs and job openings in middle-skill occupations were distributed among 244 other occupations.

The majority of middle-skill occupations paid a living wage at entry level. For 88 percent of middle-skill occupations in the CVML-S region (260 occupations) the entry-level hourly wage in 2017 met or exceeded the regional threshold for a living wage ($12.19 per hour; see table C2). The entry-level hourly wage for the other 12 percent of middle-skill occupations in the region (34 occupations) were below the threshold. But for 29 of those 34 occupations the median wage met or exceeded the threshold, meaning that an employee's wage would likely meet or exceed the living wage threshold for the region after the employee gained sufficient work experience.

Table C2. Total jobs in 2017, projected job growth and job openings in 2018–20, hourly wage range and median hourly wage in 2017 for the 50 middle-skill occupations projected to be most in demand in 2018–20, Central Valley Mother Lode South region

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($12.19 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
1	Office clerks, general	18,221	1	2,228	No	12.06	15.66	18.82
2	Heavy and tractor-trailer truck drivers	16,398	5	2,059	Yes	16.13	18.78	22.83
3	Teacher assistants	14,317	5	1,727	Yes	12.21	14.40	17.17
4	Secretaries and administrative assistants, except legal, medical, and executive	13,992	0	1,521	Yes	13.95	17.27	21.55
5	Childcare workers	9,415	–4	1,366	No	7.39	8.58	11.74
6	Customer service representatives	9,205	5	1,334	No	11.93	15.87	19.33
7	Registered nurses	17,786	6	1,302	Yes	35.28	42.54	50.53
8	Bookkeeping, accounting, and auditing clerks	10,892	0	1,228	Yes	15.89	19.07	23.41
9	Maintenance and repair workers, general	9,185	4	1,028	Yes	13.53	18.29	24.08
10	First-line supervisors of retail sales workers	8,869	1	1,014	Yes	13.00	15.76	21.09
11	First-line supervisors of office and administrative support workers	8,346	2	884	Yes	19.55	24.97	30.83
12	Nursing assistants	6,216	6	840	No	11.66	13.36	15.78
13	First-line supervisors of food preparation and serving workers	5,085	6	824	No	11.60	13.98	19.52
14	Correctional officers and jailers	9,382	1	800	Yes	32.36	40.99	42.68
15	Receptionists and information clerks	5,551	3	793	No	11.64	13.51	16.22
16	Medical assistants	6,008	7	786	Yes	12.43	14.12	16.60

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($12.19 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
17	Sales representatives, wholesale and manufacturing, except technical and scientific products	6,517	3	717	Yes	19.50	26.07	39.32
18	Sales representatives, services, all other	4,588	6	636	Yes	16.00	21.50	31.42
19	Automotive service technicians and mechanics	5,731	3	590	No	11.63	16.29	23.36
20	Carpenters	5,529	2	588	Yes	13.72	16.05	24.68
21	First-line supervisors of farming, fishing, and forestry workers	4,122	2	582	Yes	14.18	17.41	24.81
22	Hairdressers, hairstylists, and cosmetologists	4,026	6	559	No	11.65	11.89	12.19
23	Medical secretaries	4,072	6	526	Yes	13.55	16.33	19.34
24	Social and human service assistants	3,313	9	494	Yes	13.97	17.29	20.06
25	Electricians	3,817	0	466	Yes	22.09	29.93	40.10
26	First-line supervisors of construction trades and extraction workers	3,836	2	421	Yes	19.53	28.64	37.36
27	Insurance sales agents	3,743	4	419	Yes	14.35	20.98	31.14
28	First-line supervisors of production and operating workers	3,439	4	380	Yes	18.28	25.17	33.60
29	Inspectors, testers, sorters, samplers, and weighers	3,007	0	364	No	11.91	14.40	21.56
30	Dental assistants	2,878	5	361	Yes	13.50	16.61	21.60
31	Industrial machinery mechanics	3,459	4	344	Yes	19.62	24.86	30.11

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($12.19 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
32	First-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors	2,799	6	343	Yes	18.46	25.18	33.31
33	Preschool teachers, except special education	3,092	3	342	No	11.64	14.30	18.12
34	Police and sheriff's patrol officers	4,565	3	342	Yes	28.89	35.42	46.95
35	Licensed practical and licensed vocational nurses	3,895	4	337	Yes	21.43	24.80	27.35
36	Plumbers, pipefitters, and steamfitters	2,447	8	329	Yes	16.44	21.89	29.01
37	Welders, cutters, solderers, and brazers	2,574	4	309	Yes	15.26	18.61	24.94
38	First-line supervisors of mechanics, installers, and repairers	2,920	4	290	Yes	24.67	33.84	43.13
39	Operating engineers and other construction equipment operators	2,347	3	286	Yes	20.56	24.24	29.75
40	Eligibility interviewers, government programs	2,723	3	270	Yes	17.86	22.63	25.65
41	Executive secretaries and executive administrative assistants	2,489	-3	261	Yes	21.97	26.35	32.05
42	Insurance claims and policy processing clerks	2,287	1	249	Yes	13.54	16.74	20.81

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($12.19 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
43	Heating, air conditioning, and refrigeration mechanics and installers	1,994	7	244	Yes	15.43	20.14	27.57
44	Pharmacy technicians	2,544	3	225	Yes	14.47	17.49	21.61
45	Buyers and purchasing agents	2,286	0	220	Yes	19.95	25.29	34.19
46	Telecommunications equipment installers and repairers, except line installers	1,865	0	203	Yes	16.36	22.45	28.61
47	Real estate sales agents	2,045	1	195	Yes	18.07	19.43	22.17
48	Computer user support specialists	2,078	6	194	Yes	19.32	23.32	28.35
49	First-line supervisors of personal service workers	1,487	9	189	Yes	12.94	16.57	21.05
50	Self-enrichment education teachers	1,518	4	189	Yes	13.33	18.93	22.63
	Subtotal, 50 middle-skill occupations projected to be most in demand	278,901	3 (average)	32,197	Yes = 40 (80 percent)	na	na	na
	Subtotal, 244 other middle-skill occupations	91,962	3 (average)	9,899	Yes = 220 (90 percent)	na	na	na
	Total, all 294 middle-skill occupations	370,863	3 (average)	42,096	Yes = 260 (88 percent)	na	na	na

na is not applicable.
Note: Values may not sum to totals because of rounding.
a. Rounded to the nearest whole number.
b. The 25th percentile wage in the region was used as a proxy for an entry-level wage in this study and is consistent with starting pay, or the wage that a worker can expect to earn when he or she meets the credential requirements for an occupation but has little to no experience in it.
c. The 75th percentile wage in the region was used as a proxy for an experienced-level wage and is consistent with the wage that a worker can expect to earn after gaining experience in an occupation.
experience in an occupation.
Source: Authors' analysis of data (including 25th percentile, median, and 75 percentile values) from Economic Modeling Specialists International (2019).

In 2014/15–2016/17 an average of more than 12,500 middle-skill credentials were awarded each year. Each year in 2014/15–2016/17 postsecondary institutions in the CVML-S region awarded an average of 12,524 middle-skill credentials, and 10,002 of them were in the 50 most in-demand middle-skill occupation in the region (table C3). Medical assistants were the occupation with the highest average number of middle-skill credentials awarded each year (2,420 credentials, with an additional 443 split between this occupation and medical secretaries), followed

by childcare workers (1,179) and police and sheriff's patrol officers (699). Carpenters and first-line supervisors of construction trades and extraction workers were the occupations with the lowest (less than 1).

Table C3. Average annual number of middle-skill credentials in the 50 middle-skill occupations projected to be most in demand in 2018–2020 that postsecondary institutions in the Central Valley Mother Lode South region awarded in 2014/15–2016/17

Occupation[a]	Program of study	Average annual number of credentials awarded, 2014/15–2016/17
Office clerks, general; insurance claims and policy processing clerks	General office occupations and clerical services	330
Heavy and tractor-trailer truck drivers	Truck and bus driver/commercial vehicle operator and instructor	354
Teacher assistants	Teacher assistant/aide	33
Childcare workers	Child care provider/assistant	1,179
Registered nurses	Registered nursing/registered nurse	606
Bookkeeping, accounting, and auditing clerks	Accounting technology/technician and bookkeeping	142
First-line supervisors of retail sales workers	Retail management; floriculture/floristry operations and management	24
First-line supervisors of office and administrative support workers	Office management and supervision	17
Nursing assistants	Nursing assistant/aide and patient care assistant/aide	277
Nursing assistants; licensed practical and licensed vocational nurses	Practical nursing, vocational nursing and nursing assistants, other	93
First-line supervisors of food preparation and serving workers	Culinary arts/chef training; restaurant, culinary, and catering management/manager; cooking and related culinary arts, general; foodservice systems administration/management	218
Correctional officers and jailers	Corrections	242
Medical assistants	Medical insurance coding specialist/coder; medical/clinical assistant	2,420
Medical assistants; medical secretaries	Medical office assistant/specialist; medical administrative/executive assistant and medical secretary	443
Sales representatives, wholesale and manufacturing, except technical and scientific products; buyers and purchasing agents	Sales, distribution, and marketing operations, general	10
Automotive service technicians and mechanics	Automobile/automotive mechanics technology/technician	148
Carpenters; first-line supervisors of construction trades and extraction workers	Carpentry/carpenter	1
First-line supervisors of farming, fishing, and forestry workers	Crop production; animal/livestock husbandry and production; horse husbandry/equine science and management; agricultural production operations, other; dairy husbandry and production	62
Hairdressers, hairstylists, and cosmetologists	Cosmetology/cosmetologist, general	514
Medical secretaries	Medical insurance specialist/medical biller	5
Social and human service assistants	Human services, general	163
Electricians; first-line supervisors of construction trades and extraction workers	Electrician	43

Occupation[a]	Program of study	Average annual number of credentials awarded, 2014/15–2016/17
First-line supervisors of construction trades and extraction workers	Building/home/construction inspection/inspector; building construction technology	8
Dental assistants	Dental assisting/assistant	469
Industrial machinery mechanics	Industrial mechanics and maintenance technology	122
Preschool teachers, except special education	Child care and support services management; early childhood education and teaching	2
Police and sheriff's patrol officers	Criminal justice/police science	699
Licensed practical and licensed vocational nurses	Licensed practical/vocational nurse training	196
Plumbers, pipefitters, and steamfitters; first-line supervisors of construction trades and extraction workers	Plumbing technology/plumber	5
Welders, cutters, solderers, and brazers	Welding technology/welder	212
Operating engineers and other construction equipment operators	Construction/heavy equipment/earthmoving equipment operation	6
Executive secretaries and executive administrative assistants; secretaries and administrative assistants, except legal, medical, and executive	Administrative assistant and secretarial science, general	167
Heating, air conditioning, and refrigeration mechanics and installers	Heating, ventilation, air conditioning and refrigeration engineering technology/technician; heating, air conditioning, ventilation and refrigeration maintenance technology/technician	360
Pharmacy technicians	Pharmacy technician/assistant	407
Buyers and purchasing agents	Apparel and textile marketing management	7
Real estate sales agents	Real estate	2
Computer user support specialists	Computer support specialist	16
Subtotal, credentials from programs related to the top 50 middle-skill occupations	na	10,002
Subtotal, credentials from programs related to the other 244 middle-skill occupations	na	2,522
Total, all 294 middle-skill occupations	na	12,524

na is not applicable.
Note: The table does not list the 13 occupations among the 50 most in-demand for which no middle-skill credentials were awarded. Values may not sum to total because of rounding.
a. Occupations are combined in cases where programs of study prepare students for more than one occupation.
Source: Authors' analysis of data from National Center for Education Statistics (2019).

No credentials were awarded in 13 of the 50 middle-skill occupations projected to be most in demand in the CVML-S. The occupations with no credentials awarded and the number of projected job openings each year in 2018–20 are customer service representatives (1,334 job openings); general maintenance and repair workers (1,028 job openings); receptionists and information clerks (793 job openings); sales representatives for all other services (636 job openings); insurance sales agents (419 job openings); first-line supervisors of production and operating workers (380 job openings); inspectors, testers, sorters, samplers, and weighers (364 job openings); first-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors

(343 job openings); first-line supervisors of mechanics, installers, and repairers (290 job openings); eligibility interviewers, government programs (270 job openings); telecommunications equipment installers and repairers, except line installers (203 job openings); first-line supervisors of personal service workers (189 job openings); and self-enrichment education teachers (189 job openings). Each year in 2018–20 an average of 6,447 job openings were projected in the 13 middle-skill occupations for which no credentials were awarded in 2014/15–2016/17.

A local credential deficit of more than 29,500 was projected for middle-skill occupations. With an average of 12,524 middle-skill credentials awarded each year and an average of 42,096 job openings each year in middle-skill occupations, the CVML-S region had a projected average annual credential deficit of 29,572, or 70 percent of projected job openings each year (table C4). The average annual credential deficit for the 50 middle-skill occupations projected to be most in demand ranged from 45 for hairdressers, hairstylists, and cosmetologists to 1,898 for general office clerks. Of the region's 50 middle-skill occupations projected to be most in demand, 45 were projected to have a local credential deficit.

A local credential surplus was projected for 5 of the 50 middle-skill occupations projected to be most in demand in the region. Five of the 50 middle-skill occupations projected to be most in demand in the CVML-S region were projected to have a combined local credential surplus of 2,397 each year in 2018–20 (see table C4). Three of the five occupations with a surplus are in the health care field and collectively account for 80 percent of the total annual credential surplus. The largest surplus was for medical assistants (1,634 per year). The other occupations with a surplus are police and sheriff's patrol officers (357 per year), pharmacy technicians (182 per year), and dental assistants (108 per year).

Table C4. Projected local credential deficit or surplus for the 50 middle-skill occupations projected to be most in demand in 2018–20, Central Valley Mother Lode South region

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
1	Office clerks, general[a]	2,228	330	(1,898)	Deficit
2	Heavy and tractor-trailer truck drivers	2,059	354	(1,705)	Deficit
3	Teacher assistants	1,727	33	(1,694)	Deficit
4	Secretaries and administrative assistants, except legal, medical, and executive[b]	1,521	167	(1,354)	Deficit
5	Childcare workers	1,366	1,179	(187)	Deficit
6	Customer service representatives	1,334	0	(1,334)	Deficit
7	Registered nurses	1,302	606	(696)	Deficit
8	Bookkeeping, accounting, and auditing clerks	1,228	142	(1,086)	Deficit
9	Maintenance and repair workers, general	1,028	0	(1,028)	Deficit
10	First-line supervisors of retail sales workers	1,014	24	(990)	Deficit
11	First-line supervisors of office and administrative support workers	884	17	(867)	Deficit
12	Nursing assistants[c]	840	370	(470)	Deficit
13	First-line supervisors of food preparation and serving workers	824	218	(606)	Deficit
14	Correctional officers and jailers	800	242	(558)	Deficit
15	Receptionists and information clerks	793	0	(793)	Deficit

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
16	Medical assistants[d]	786	2,420	1,634	Surplus
17	Sales representatives, wholesale and manufacturing, except technical and scientific products[e]	717	10	(707)	Deficit
18	Sales representatives, services, all other	636	0	(636)	Deficit
19	Automotive service technicians and mechanics	590	148	(442)	Deficit
20	Carpenters[f]	588	1	(587)	Deficit
21	First-line supervisors of farming, fishing, and forestry workers	582	62	(520)	Deficit
22	Hairdressers, hairstylists, and cosmetologists	559	514	(45)	Deficit
23	Medical secretaries[d]	526	448	(78)	Deficit
24	Social and human service assistants	494	163	(331)	Deficit
25	Electricians[g]	466	43	(423)	Deficit
26	First-line supervisors of construction trades and extraction workers[f,g,h]	421	8	(413)	Deficit
27	Insurance sales agents	419	0	(419)	Deficit
28	First-line supervisors of production and operating workers	380	0	(380)	Deficit
29	Inspectors, testers, sorters, samplers, and weighers	364	0	(364)	Deficit
30	Dental assistants	361	469	108	Surplus
31	Industrial machinery mechanics	344	122	(222)	Deficit
32	First-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors	343	0	(343)	Deficit
33	Preschool teachers, except special education	342	2	(340)	Deficit
34	Police and sheriff's patrol officers	342	699	357	Surplus
35	Licensed practical and licensed vocational nurses[c]	337	196	(141)	Deficit
36	Plumbers, pipefitters, and steamfitters[h]	329	5	(324)	Deficit
37	Welders, cutters, solderers, and brazers	309	212	(97)	Deficit
38	First-line supervisors of mechanics, installers, and repairers	290	0	(290)	Deficit
39	Operating engineers and other construction equipment operators	286	6	(280)	Deficit
40	Eligibility interviewers, government programs	270	0	(270)	Deficit
41	Executive secretaries and executive administrative assistants[b]	261	0	(261)	Deficit
42	Insurance claims and policy processing clerks[a]	249	0	(249)	Deficit
43	Heating, air conditioning, and refrigeration mechanics and installers	244	360	116	Surplus
44	Pharmacy technicians	225	407	182	Surplus

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
45	Buyers and purchasing agents[e]	220	7	(213)	Deficit
46	Telecommunications equipment installers and repairers, except line installers	203	0	(203)	Deficit
47	Real estate sales agents	195	2	(193)	Deficit
48	Computer user support specialists	194	16	(178)	Deficit
49	First-line supervisors of personal service workers	189	0	(189)	Deficit
50	Self-enrichment education teachers	189	0	(189)	Deficit
	Subtotal, 50 middle-skill occupations projected to be most in demand	32,197	10,002	(22,196)	Deficit
	Subtotal, 244 other middle-skill occupations	9,899	2,522	(7,376)	Deficit
	Total, all 294 middle-skill occupations	42,096	12,524	(29,572)	Deficit

Note: Values may not sum to total because of rounding.
a. Supply shared between office clerks and insurance claims and policy processing clerks.
b. Supply shared between secretaries and administrative assistants, except legal, medical, and executive and executive secretaries and executive administrative assistants.
c. Supply partially shared between nursing assistants and licensed practical and licensed vocational nurses.
d. Supply partially shared between medical assistants and medical secretaries.
e. Supply shared between sales representatives for wholesale and manufacturing, except technical and scientific products, and buyers and purchasing agents.
f. Supply partially shared between carpenters and first-line supervisors of construction trades and extraction workers.
g. Supply partially shared between electricians and first-line supervisors of construction trades and extraction workers.
h. Supply partially shared between plumbers, pipefitters, and steamfitters and first-line supervisors of construction trades and extraction workers.
Source: Authors' analysis of data from Economic Modeling Specialists International (2019) and National Center for Education Statistics (2019).

Discussion and conclusion

A local credential deficit was projected for 45 of the 50 middle-skill occupations projected to be most in demand in the CVML-S region. This means that there might not have been enough trained workers to meet employer demand in the region. Of the 45 occupations projected to have a deficit, 35 paid an entry-level living wage for a single-adult household. This situation presents many opportunities for the region's postsecondary institutions to expand their programs or develop new ones to reduce the projected local credential deficits that employers in the region might face. Focusing on the 10 most in-demand occupations with a credential deficit that also pay a living wage might be an appropriate way to begin, as the educational programs linked to these occupations could be expanded without significant concern about oversaturating the market, while simultaneously providing a wage that allows for economic self-sufficiency among program completers.

As the major training providers of middle-skill workers, California community colleges and private institutions might consider strategies to guide both new and existing students to enroll in programs associated with the occupations that were projected to have a credential deficit and pay a living wage. These institutions might look to underemployed or unemployed adults in the region and to interested low-skilled workers who are not currently earning a living wage.

Local governments, workforce investment boards, and chambers of commerce can partner in efforts to align middle-skill supply and demand by identifying others to fill open jobs, including appropriately credentialed workers from other regions and workers with above-middle-skill credentials.

Findings from the CVML-S region are not generalizable to differences in other regions in California and the nation because of differences in education, economic, social, and commercial characteristics. However, the methods

used in this study could be employed to conduct similar analyses for other regions. See the main report for limitations related to the study's data and methodology.

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Appendix D. Detailed findings on supply and demand for middle-skill occupations in the Northern Coastal region of California

This appendix presents findings on the middle-skill labor market, including the alignment of middle-skill workforce supply (as measured by middle-skill credentials awarded) and occupational demand for the Northern Coastal region of California. See box 1 in the main report for definitions of key terms. See box 2 in the main report for a summary of the data sources, sample, and methods and appendix A for more details.

Key findings for the Northern Coastal region include:

- In 2018–20 employers were projected to need to hire an average of 4,985 middle-skill workers each year to fill new jobs and meet replacement needs due to retirements, career changes, and workers leaving an occupation without intending to return. Job growth was projected in 56 percent of middle-skill occupations.
- About 95 percent of middle-skill occupations paid a living wage at entry level.
- Local education institutions were not awarding enough middle-skill credentials to meet employer demand. Each year in 2014/15–2016/17 postsecondary institutions in the region awarded an average of 548 middle-skill credentials. The overall projected local credential deficit in 2018–20 was 4,437, or 89 percent of projected job openings each year in the 287 middle-skill occupations in the region.
- A local credential surplus of 20 was projected for 2 of the 50 middle-skill occupations projected to be most in demand in 2018–20. A local credential deficit was projected for the other 48.

About the region

California's Northern Coastal region encompasses four counties: Del Norte, Humboldt, Lake, and Mendocino. These counties were home to 317,074 people in 2017, or 0.8 percent of California's population (California Department of Finance, 2018). In 2018–20 the population was projected to grow by 1 percent, or 3,111 people.

The Northern Coastal region contains three community colleges and one private for-profit institution that participate in federal student financial aid programs (National Center for Education Statistics, 2019). In the fall 2016 semester these institutions enrolled 24,111 students (24,050 in public institutions and 61 in the private for-profit institution).

What the study found in the region

Nearly 5,000 job openings middle-skill occupations were projected for each year in 2018–20. In 2017 jobs in middle-skill occupations accounted for 37 percent of overall employment in the Northern Coastal region and were projected to grow by 2 percent in 2018–20. In 2018–20 employers in the region were projected to need to hire an average of 4,985 middle-skill workers each year to fill new jobs and meet replacement needs due to retirements, career changes, and workers leaving an occupation without intending to return (table D1).

Table D1. Total jobs in 2017 and projected job openings and job growth in 2018–20, by skill level, Northern Coastal region, 2018–20

Occupation skill level	Total jobs 2017	Share of total jobs, 2017 (percent[a])	Average annual projected number of job openings, 2018–20	Percent change[a] in projected number of new jobs, 2018–20
Above middle-skill	25,279	20	2,391	4
Middle-skill	45,381	37	4,985	2
Below middle-skill	53,066	43	8,206	3
Total	123,727	100	15,626	3

a. Rounded to the nearest whole number.
Source: Authors' analysis of data from Economic Modeling Specialists International (2019).

The number of job openings was projected to grow in 2018–20 in more than half of middle-skill occupations in the region. Of the 287 middle-skill occupations examined in the Northern Coastal region, 162 (56 percent) were projected to experience an increase in job openings in 2018–20, 38 (13 percent) were projected to experience a decrease, and 87 (30 percent) were projected to experience no change.

Among the 50 middle-skill occupations projected to be most in demand in the Northern Coastal region, general office clerks were projected to have the largest average annual number of job openings (238) in 2018–20, followed by secretaries and administrative assistants, except legal, medical, and executive (230; table D2). Four occupations were projected to have the smallest average annual number of job openings (23): chefs and head cooks; first-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors; wood sawing machine setters, operators, and tenders; and first-line supervisors of nonretail sales workers.

The 50 middle-skill occupations projected to be most in demand accounted for 78 percent of all jobs in middle-skill occupations in the Northern Coastal region in 2018 (35,284 out of 45,381) and 78 percent of the average annual number of projected job openings in middle-skill occupations in 2018–20 in the region (3,890 out of 4,985; see table D2). The remaining jobs and job openings in middle-skill occupations were distributed among 237 other occupations.

The majority of middle-skill occupations paid a living wage at entry level. For 95 percent of middle-skill occupations in the Northern Coastal region (273 occupations) the entry-level hourly wage in 2017 met or exceeded the regional threshold for a living wage ($11.87 per hour; see table D2). The entry-level hourly wage for the other 5 percent of middle-skill occupations in the region (14 occupations) were below the threshold. But for 9 of those 14 occupations the median wage met or exceeded the threshold, meaning that an employee's wage would likely meet or exceed the living wage threshold for the region after the employee gained sufficient work experience.

Table D2. Total jobs in 2017, projected job growth and job openings in 2018–20, hourly wage range and median hourly wage in 2017 for the 50 middle-skill occupations projected to be most in demand in 2018–20, Northern Coastal region

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($11.87 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
1	Office clerks, general	1,928	2	238	Yes	12.65	16.22	19.36
2	Secretaries and administrative assistants, except legal, medical, and executive	2,153	–1	230	Yes	14.85	17.61	20.91
3	Bookkeeping, accounting, and auditing clerks	1,802	0	200	Yes	15.34	18.50	22.80
4	Teacher assistants	1,532	4	177	Yes	12.30	14.54	17.58
5	Maintenance and repair workers, general	1,558	3	166	Yes	13.47	16.62	19.31
6	Registered nurses	2,400	5	162	Yes	33.17	41.02	54.64
7	First-line supervisors of retail sales workers	1,345	1	150	Yes	13.15	15.62	19.84
8	Customer service representatives	1,008	3	140	Yes	16.02	20.92	25.35
9	Heavy and tractor-trailer truck drivers	1,196	2	139	Yes	17.48	20.24	23.03
10	Social and human service assistants	961	7	136	Yes	13.72	17.34	21.88
11	Carpenters	1,379	0	136	Yes	13.76	14.81	25.99
12	Childcare workers	952	–9	135	No	7.75	10.57	11.99
13	First-line supervisors of office and administrative support workers	1,070	1	110	Yes	18.51	23.52	28.95
14	Receptionists and information clerks	822	1	110	Yes	11.94	13.74	15.88
15	First-line supervisors of food preparation and serving workers	611	3	93	Yes	12.54	14.67	20.75
16	Automotive service technicians and mechanics	832	3	85	Yes	13.17	18.19	24.09
17	Nursing assistants	616	6	83	Yes	12.31	13.94	15.81
18	Medical secretaries	705	2	81	Yes	15.34	17.38	19.70

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($11.87 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
19	Correctional officers and jailers	883	–2	71	Yes	28.69	37.74	42.77
20	Medical assistants	572		69	Yes	15.05	16.79	18.51
21	Hairdressers, hairstylists, and cosmetologists	531	3	68	No	11.75	11.92	12.30
22	Operating engineers and other construction equipment operators	495	6	65	Yes	20.72	23.22	25.54
23	Sales representatives, wholesale and manufacturing, except technical and scientific products	542	4	61	Yes	19.33	25.62	32.08
24	Self-enrichment education teachers	476	2	57	Yes	14.56	17.15	19.45
25	Preschool teachers, except special education	530	0	54	Yes	12.51	14.27	16.79
26	Sales representatives, services, all other	382	6	53	Yes	13.63	20.92	29.86
27	First-line supervisors of construction trades and extraction workers	432	1	50	Yes	14.72	21.71	33.11
28	Forest and conservation technicians	405	–1	48	Yes	12.78	15.68	21.87
29	Police and sheriff's patrol officers	651	3	47	Yes	31.04	40.69	53.53
30	Electricians	362	4	46	Yes	16.33	25.51	31.55
31	Logging equipment operators	329	1	44	Yes	15.54	18.94	22.59
32	Executive secretaries and executive administrative assistants	419	–5	44	Yes	18.41	22.21	26.33
33	Dental assistants	384	–1	42	Yes	16.06	19.35	24.07

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($11.87 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
34	Insurance sales agents	374	2	41	Yes	19.86	24.97	33.52
35	Plumbers, pipefitters, and steamfitters	316	4	38	Yes	15.40	17.88	25.89
36	Firefighters	503	2	37	Yes	15.45	23.29	28.19
37	Licensed practical and licensed vocational nurses	428	4	36	Yes	20.61	24.39	27.33
38	First-line supervisors of production and operating workers	333	1	34	Yes	19.82	25.03	31.95
39	Real estate sales agents	340		32	Yes	18.46	20.00	24.59
40	First-line supervisors of mechanics, installers, and repairers	336	3	32	Yes	25.23	30.20	39.88
41	Heating, air conditioning, and refrigeration mechanics and installers	274	3	30	Yes	14.44	18.03	27.99
42	Bus and truck mechanics and diesel engine specialists	278	4	28	Yes	17.89	21.32	24.34
43	First-line supervisors of housekeeping and janitorial workers	206	3	25	Yes	12.77	14.67	18.65
44	Water and wastewater treatment plant and system operators	301	–1	25	Yes	17.47	21.27	28.66
45	First-line supervisors of landscaping, lawn service, and groundskeeping workers	228	4	25	Yes	14.29	16.08	20.50
46	Pharmacy technicians	281	2	24	Yes	16.43	20.02	22.80
47	Chefs and head cooks	180	1	23	Yes	13.73	17.83	24.90

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($11.87 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
48	First-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors	201	4	23	Yes	19.62	24.40	30.53
49	Sawing machine setters, operators, and tenders, wood	205	-19	23	Yes	11.90	13.83	16.76
50	First-line supervisors of nonretail sales workers	240	2	23	Yes	16.32	19.41	24.96
	Subtotal, 50 middle-skill occupations projected to be most in demand	35,284	2 (average)	3,890	Yes = 48 (96 percent)	na	na	na
	Subtotal, 237 other middle-skill occupations	10,097	3 (average)	1,095	Yes = 225 (95 percent)	na	na	na
	Total, all 287 middle-skill occupations	45,381	2 (average)	4,985	Yes = 273 (95 percent)	na	na	na

na is not applicable.
Note: Values may not sum to totals because of rounding.
a. Rounded to the nearest whole number.
b. The 25th percentile wage in the region was used as a proxy for an entry-level wage in this study and is consistent with starting pay, or the wage that a worker can expect to earn when he or she meets the credential requirements for an occupation but has little to no experience in it.
c. The 75th percentile wage in the region was used as a proxy for an experienced-level wage and is consistent with the wage that a worker can expect to earn after gaining experience in an occupation.
Source: Authors' analysis of data (including 25th percentile, median, and 75 percentile values) from Economic Modeling Specialists International (2019).

In 2014/15–2016/17 an average of nearly 550 middle-skill credentials were awarded each year. Each year in 2014/15–2016/17 postsecondary institutions in the Northern Coastal region awarded an average of 548 middle-skill credentials, and 459 of them were in the 50 middle-skill occupations projected to be most in demand in the region (table D3). Registered nurses were the occupation with the highest average number of middle-skill credentials awarded each year (70), and general office clerks, medical secretaries, medical assistants, and correctional officers and jailers were the occupations with the lowest (1).

Table D3. Average annual number of middle-skill credentials in the 50 middle-skill occupations projected to be most in demand in 2018–2020 that postsecondary institutions in the Northern Coastal region awarded in 2014/15–2016/17

Occupation[a]	Program of study	Average annual number of credentials awarded, 2014/15–2016/17
Office clerks, general	General office occupations and clerical services	1
Secretaries and administrative assistants, except legal, medical, and executive; executive secretaries and executive administrative assistants	Administrative assistant and secretarial science, general	5
Bookkeeping, accounting, and auditing clerks	Accounting technology/technician and bookkeeping	24
Registered nurses	Registered nursing/registered nurse	70
Social and human service assistants	Human services, general	25
Childcare workers	Child care provider/assistant	69
First-line supervisors of food preparation and serving workers	Restaurant, culinary, and catering management/manager	2
Automotive service technicians and mechanics	Automobile/automotive mechanics technology/technician	23
Nursing assistants; licensed practical and licensed vocational nurses	Practical nursing, vocational nursing and nursing assistants, other	22
Medical secretaries; medical assistants	Medical administrative/executive assistant and medical secretary	1
Correctional officers and jailers	Corrections	1
Medical assistants	Medical insurance coding specialist/coder; medical/clinical assistant	3
Hairdressers, hairstylists, and cosmetologists	Cosmetology/cosmetologist, general; cosmetology, barber/styling, and nail instructor	26
First-line supervisors of construction trades and extraction workers	Building construction technology	21
Police and sheriff's patrol officers	Criminal justice/police science	63
Electricians; first-line supervisors of construction trades and extraction workers	Electrician	2
Dental assistants	Dental assisting/assistant	28
Firefighters	Fire prevention and safety technology/technician	3
Licensed practical and licensed vocational nurses	Licensed practical/vocational nurse training	35
Real estate sales agents	Real estate	3
First-line supervisors of landscaping, lawn service, and groundskeeping workers	Applied horticulture/horticulture operations, general; Landscaping and groundskeeping; plant nursery operations and management	6
Sawing machine setters, operators, and tenders, wood	Cabinetmaking and millwork	27

Occupation[a]	Program of study	Average annual number of credentials awarded, 2014/15–2016/17
Subtotal, credentials from programs related to the top 50 middle-skill occupations	na	459
Subtotal, credentials from programs related to the other 237 middle-skill occupations	na	89
Total, all 287 middle-skill occupations	na	548

na is not applicable.
Note: The table does not list the 26 occupations among the 50 most in-demand for which no middle-skill credentials were awarded. Values may not sum to total because of rounding.
a. Occupations are combined in cases where programs of study prepare students for more than one occupation.
Source: Authors' analysis of data from National Center for Education Statistics (2019).

No credentials were awarded in 26 of the 50 middle-skill occupations projected to be most in demand. The occupations with no credentials awarded and the number of projected job openings each year in 2018–20 are teacher assistants (177 job openings); general maintenance and repair workers (166 job openings); first-line supervisors of retail sales workers (150 job openings); customer service representatives (140 job openings); heavy and tractor-trailer truck drivers (139 job openings); carpenters (136 job openings); first-line supervisors of office and administrative support workers (110 job openings); receptionists and information clerks (110 job openings); operating engineers and other construction equipment operators (65 job openings); sales representatives for wholesale and manufacturing, except technical and scientific products (61 job openings); self-enrichment education teachers (57 job openings); preschool teachers, except special education (54 job openings); sales representatives for all other services (53 job openings); forest and conservation technicians (48 job openings); logging equipment operators (44 job openings); insurance sales agents (41 job openings); plumbers, pipefitters, and steamfitters (38 job openings); first-line supervisors of production and operating workers (34 job openings); first-line supervisors of mechanics, installers, and repairers (32 job openings); heating, air conditioning, and refrigeration mechanics and installers (30 job openings); bus and truck mechanics and diesel engine specialists (28 job openings); first-line supervisors of housekeeping and janitorial workers (25 job openings); water and wastewater treatment plant and system operators (25 job openings); pharmacy technicians (24 job openings); first-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors (23 job openings); and first-line supervisors of nonretail sales workers (23 job openings). Each year in 2018–2020 an average of 1,835 job openings were projected in the 26 middle-skill occupations for which no credentials were awarded in 2014/15–2016/17.

A local credential deficit of more than 4,400 was projected for middle-skill occupations. With an average of 548 middle-skill credentials awarded each year and an average of 4,985 job openings each year in middle-skill occupations, the Northern Coastal region had a projected average annual credential deficit of 4,437, or 89 percent of projected job openings each year (table D4). The average annual credential deficit for the 50 middle-skill occupations projected to be most in demand ranged from 1 for licensed practical and licensed vocational nurses to 237 for general office clerks. Of the region's 50 middle-skill occupations projected to be most in demand, 48 were projected to have a local credential deficit.

A local credential surplus was projected for 2 of the 50 middle-skill occupations projected to be most in demand in the region. Two of the 50 middle-skill occupations projected to be most in demand in the Northern Coastal region were projected to have a combined local credential surplus of 20 each year in 2018–20 (see table D4). The larger surplus was for police and sheriff's patrol officers (16 per year); the smaller surplus was for wood sawing machine setters, operators, and tenders (4 per year).

Table D4. Projected local credential deficit or surplus for the 50 middle-skill occupations projected to be most in demand in 2018–20, Northern Coastal region

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
1	Office clerks, general	238	1	(237)	Deficit
2	Secretaries and administrative assistants, except legal, medical, and executive[a]	230	5	(225)	Deficit
3	Bookkeeping, accounting, and auditing clerks	200	24	(176)	Deficit
4	Teacher assistants	177	0	(177)	Deficit
5	Maintenance and repair workers, general	166	0	(166)	Deficit
6	Registered nurses	162	70	(92)	Deficit
7	First-line supervisors of retail sales workers	150	0	(150)	Deficit
8	Customer service representatives	140	0	(140)	Deficit
9	Heavy and tractor-trailer truck drivers	139	0	(139)	Deficit
10	Social and human service assistants	136	25	(111)	Deficit
11	Carpenters	136	0	(136)	Deficit
12	Childcare workers	135	69	(66)	Deficit
13	First-line supervisors of office and administrative support workers	110	0	(110)	Deficit
14	Receptionists and information clerks	110	0	(110)	Deficit
15	First-line supervisors of food preparation and serving workers[b]	93	2	(91)	Deficit
16	Automotive service technicians and mechanics	85	23	(62)	Deficit
17	Nursing assistants[c]	83	22	(61)	Deficit
18	Medical secretaries[d]	81	1	(80)	Deficit
19	Correctional officers and jailers	71	1	(70)	Deficit
20	Medical assistants[d]	69	3	(66)	Deficit
21	Hairdressers, hairstylists, and cosmetologists	68	26	(42)	Deficit
22	Operating engineers and other construction equipment operators	65	0	(65)	Deficit
23	Sales representatives, wholesale and manufacturing, except technical and scientific products	61	0	(61)	Deficit
24	Self-enrichment education teachers	57	0	(57)	Deficit
25	Preschool teachers, except special education	54	0	(54)	Deficit
26	Sales representatives, services, all other	53	0	(53)	Deficit
27	First-line supervisors of construction trades and extraction workers[e]	50	21	(29)	Deficit
28	Forest and conservation technicians	48	0	(48)	Deficit
29	Police and sheriff's patrol officers	47	63	16	Surplus
30	Electricians[e]	46	2	(44)	Deficit

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
31	Logging equipment operators	44	0	(44)	Deficit
32	Executive secretaries and executive administrative assistants[a]	44	0	(44)	Deficit
33	Dental assistants	42	28	(14)	Deficit
34	Insurance sales agents	41	0	(41)	Deficit
35	Plumbers, pipefitters, and steamfitters	38	0	(38)	Deficit
36	Firefighters	37	3	(34)	Deficit
37	Licensed practical and licensed vocational nurses[c]	36	35	(1)	Deficit
38	First-line supervisors of production and operating workers	34	0	(34)	Deficit
39	Real estate sales agents	32	3	(29)	Deficit
40	First-line supervisors of mechanics, installers, and repairers	32	0	(32)	Deficit
41	Heating, air conditioning, and refrigeration mechanics and installers	30	0	(30)	Deficit
42	Bus and truck mechanics and diesel engine specialists	28	0	(28)	Deficit
43	First-line supervisors of housekeeping and janitorial workers	25	0	(25)	Deficit
44	Water and wastewater treatment plant and system operators	25	0	(25)	Deficit
45	First-line supervisors of landscaping, lawn service, and groundskeeping workers	25	6	(19)	Deficit
46	Pharmacy technicians	24	0	(24)	Deficit
47	Chefs and headcooks[b]	23	0	(23)	Deficit
48	First-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors	23	0	(23)	Deficit
49	Sawing machine setters, operators, and tenders, wood	23	27	4	Surplus
50	First-line supervisors of nonretail sales workers	23	0	(23)	Deficit
	Subtotal, 50 middle-skill occupations projected to be most in demand	3,890	459	(3,431)	Deficit
	Subtotal, 237 other middle-skill occupations	1,095	89	(1,006)	Deficit
	Total, all 287 middle-skill occupations	4,985	548	(4,437)	Deficit

Note: Values may not sum to total because of rounding.
a. Supply shared between secretaries and administrative assistants, except legal, medical, and executive and executive secretaries and executive administrative assistants.
b. Supply shared between first-line supervisors of food preparation and serving workers and chefs and head cooks.
c. Supply shared between nursing assistants and licensed practical and licensed vocational nurses.
d. Supply partially shared between medical assistants and medical secretaries.
e. Supply shared between electricians and first-line supervisors of construction trades and extraction workers.
Source: Authors' analysis of data from Economic Modeling Specialists International (2019) and National Center for Economic Statistics (2019).

Discussion and conclusion

A local credential deficit was projected for 48 of the 50 middle-skill occupations projected to be most in demand in the Northern Coastal region. This means that there might not have been enough trained workers to meet employer demand in the region. Of the 48 occupations projected to have a deficit, 46 paid an entry-level living wage for a single-adult household. This situation presents many opportunities for the region's postsecondary institutions to expand their programs or develop new ones to reduce the projected local credential deficits that employers in the region might face. Focusing on the 10 most in-demand occupations with a credential deficit that also pay a living wage might be an appropriate way to begin, as the educational programs linked to these occupations could be expanded without significant concern about oversaturating the market, while simultaneously providing a wage that allows for economic self-sufficiency among program completers.

As the major training providers of middle-skill workers, California community colleges and private institutions might consider strategies to guide both new and existing students to enroll in programs associated with the occupations that were projected to have a credential deficit and pay a living wage. These institutions might look to underemployed or unemployed adults in the region and to interested low-skilled workers who are not currently earning a living wage.

Local governments, workforce investment boards, and chambers of commerce can partner in efforts to align middle-skill supply and demand by identifying others to fill open jobs, including appropriately credentialed workers from other regions and workers with above-middle-skill credentials.

Findings from the Northern Coastal region are not generalizable to differences in other regions in California and the nation because of differences in education, economic, social, and commercial characteristics. However, the methods used in this study could be employed to conduct similar analyses for other regions. See the main report for limitations related to the study's data and methodology.

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Appendix E. Detailed findings on supply and demand for middle-skill occupations in the Northern Inland region of California

This appendix presents findings on the middle-skill labor market, including the alignment of middle-skill workforce supply (as measured by middle-skill credentials awarded) and occupational demand for the Northern Inland region of California. See box 1 in the main report for definitions of key terms. See box 2 in the main report for a summary of the data sources, sample, and methods and appendix A for more details.

Key findings for the Northern Inland region include:

- In 2018–20 employers were projected to need to hire an average of 10,434 middle-skill workers each year to fill new jobs and meet replacement needs due to retirements, career changes, and workers leaving an occupation without intending to return. Job growth was projected in 68 percent of middle-skill occupations.
- About 90 percent of middle-skill occupations paid a living wage at entry level.
- Local education institutions were not awarding enough middle-skill credentials to meet employer demand. Each year in 2014/15–2016/17 postsecondary institutions in the region awarded an average of 2,340 middle-skill credentials. The overall projected local credential deficit in 2018–20 was 8,094, or 78 percent of the projected job openings each year in the 293 middle-skill occupations in the region.
- A local credential surplus of 544 was projected for 4 of the 50 middle-skill occupations projected to be most in demand in 2018–20. A local credential deficit was projected for the other 46.

About the region

California's Northern Inland region encompasses 10 counties: Butte, Glenn, Lassen, Modoc, Plumas, Shasta, Sierra, Siskiyou, Tehama, and Trinity. These counties were home to 574,717 people in 2017, or 1.5 percent of California's population (California Department of Finance, 2018). In 2018–20 the population was projected to grow by 1.2 percent, or 6,932 people.

The Northern Inland region contains five community colleges and one private for-profit institution that participate in federal student financial aid programs (National Center for Education Statistics, 2019). In the fall 2016 semester these institutions enrolled 27,178 students (27,112 in public institutions and 66 in the private for-profit institution).

What the study found in the region

More than 10,400 job openings in middle-skill occupations were projected for each year in 2018–20. In 2017 jobs in middle-skill occupations accounted for 38 percent of overall employment in the Northern Inland region and were projected to grow by 3 percent in 2018–20. In 2018–20 employers in the region were projected to need to hire an average of 10,434 middle-skill workers each year to fill new jobs and meet replacement needs due to retirements, career changes, and workers leaving an occupation without intending to return (table E1).

Table E1. Total jobs in 2017 and projected job openings and job growth in 2018–20, by skill level, Northern Inland region, 2018–20

Occupation skill level	Total jobs, 2017	Share of total jobs, 2017 (percent[a])	Average annual number of projected job openings, 2018–20	Percent change[a] in projected number of new jobs, 2018–20
Above middle-skill	48,484	20	4,638	5
Middle-skill	92,147	38	10,434	3
Below middle-skill	99,876	42	15,754	5
Total	240,507	100	30,826	4

a. Rounded to the nearest whole number.
Source: Authors' analysis of data from Economic Modeling Specialists International (2019).

The number of job openings was projected to grow in 2018–20 in more than two-thirds of middle-skill occupations. Of the 293 middle-skill occupations examined in the Northern Inland region, 199 (68 percent) were projected to experience an increase in job openings in 2018–20, 43 (15 percent) were projected to experience a decrease, and 51 (17 percent) were projected to experience no change.

Among the 50 middle-skill occupations projected to be most in demand in the Northern Inland region, general office clerks were projected to have the largest average annual number of job openings (557) in 2018–20, followed by secretaries and administrative assistants, except legal, medical, and executive (421; table E2). Two occupations were projected to have the smallest average annual number of job openings (49): heating, air conditioning, and refrigeration mechanics and installers and real estate sales agents.

The 50 middle-skill occupations projected to be most in demand accounted for 76 percent of all jobs in middle-skill occupations in the Northern Inland region in 2018 (70,038 out of 92,147) and 77 percent of the average annual number of projected job openings in middle-skill occupations in 2018–20 in the region (7,993 out of 10,434; see table E2). The remaining jobs and job openings in middle-skill occupations were distributed among 243 other occupations.

The majority of middle-skill occupations paid a living wage at entry level. For 90 percent of middle-skill occupations in the Northern Inland region (264 occupations) the entry-level hourly wage in 2017 met or exceeded the threshold for a living wage in the region ($12.28 per hour; table E2). The entry-level hourly wage for the other 10 percent of middle-skill occupations in the region (29 occupations) were below the threshold. But for 20 of those 29 occupations the median wage met or exceeded the threshold, meaning that an employee's wage would likely meet or exceed the living wage threshold for the region after the employee gained sufficient work experience.

Table E2. Total jobs in 2017, projected job growth and job openings in 2018–20, hourly wage range and median hourly wage in 2017 for the 50 middle-skill occupations projected to be most in demand in 2018–20, Northern Inland region, 2018–20

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($12.28 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
1	Office clerks, general	4,509	1	557	No	12.09	15.29	18.50
2	Secretaries and administrative assistants, except legal, medical, and executive	3,887	–1	421	Yes	13.35	16.47	20.21
3	Teacher assistants	3,452	1	377	No	12.14	14.01	16.61
4	Registered nurses	5,063	7	371	Yes	34.12	42.53	50.44
5	Heavy and tractor-trailer truck drivers	2,741	1	321	Yes	16.24	18.64	23.04
6	Bookkeeping, accounting, and auditing clerks	2,769	0	315	Yes	14.23	17.76	22.06
7	Customer service representatives	2,066	6	308	Yes	14.06	16.68	19.05
8	Childcare workers	2,121	–7	299	No	7.99	10.74	12.87
9	First-line supervisors of retail sales workers	2,533	1	281	Yes	12.99	15.48	20.41
10	Maintenance and repair workers, general	2,300	4	258	Yes	13.72	17.44	22.69
11	Nursing assistants	1,847	7	252	Yes	12.90	14.57	16.95
12	First-line supervisors of office and administrative support workers	2,253	2	234	Yes	18.01	23.22	28.85
13	Social and human service assistants	1,574	5	211	No	12.27	16.16	19.59
14	Receptionists and information clerks	1,406	3	198	No	11.79	13.83	16.26
15	First-line supervisors of food preparation and serving workers	1,229	4	190	No	11.58	13.22	17.04
16	Carpenters	1,813	–1	180	Yes	13.73	14.98	22.98
17	Forest and conservation technicians	1,496	–1	176	Yes	13.84	16.67	21.83
18	Medical secretaries	1,390	4	170	Yes	13.43	15.88	19.53

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($12.28 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
19	Medical assistants	1,331	6	170	Yes	13.42	15.28	18.13
20	Insurance sales agents	1,178	13	169	Yes	17.65	22.17	27.26
21	Sales representatives, wholesale and manufacturing, except technical and scientific products	1,325	6	161	Yes	16.83	22.02	27.68
22	Hairdressers, hairstylists, and cosmetologists	1,158	2	146	No	11.66	11.91	12.29
23	Sales representatives, services, all other	974	6	137	Yes	13.69	19.47	26.72
24	Automotive service technicians and mechanics	1,335	–1	126	Yes	12.42	19.19	25.06
25	Correctional officers and jailers	1,506	0	125	Yes	26.30	36.00	40.39
26	Operating engineers and other construction equipment operators	898	5	116	Yes	21.11	23.54	28.78
27	Preschool teachers, except special education	915	2	99	No	11.21	12.64	15.76
28	Plumbers, pipefitters, and steamfitters	768	6	99	Yes	14.74	18.57	26.57
29	Police and sheriff's patrol officers	1,267	4	97	Yes	32.89	41.54	52.32
30	Dental assistants	809	0	93	Yes	15.18	18.05	21.56
31	Electricians	709	4	91	Yes	19.96	27.04	34.72
32	Executive secretaries and executive administrative assistants	863	–4	90	Yes	18.69	23.31	28.64
33	Licensed practical and licensed vocational nurses	1,033	4	87	Yes	21.48	24.46	28.03

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($12.28 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
34	First-line supervisors of construction trades and extraction workers	742	2	86	Yes	15.96	26.53	33.76
35	First-line supervisors of production and operating workers	677	6	80	Yes	20.12	25.75	33.75
36	Firefighters	997	3	76	Yes	18.16	23.61	27.93
37	First-line supervisors of farming, fishing, and forestry workers	423	7	67	Yes	17.53	24.77	30.78
38	Inspectors, testers, sorters, samplers, and weighers	529	1	67	Yes	13.09	17.54	23.65
39	First-line supervisors of personal service workers	591	4	65	Yes	13.04	15.78	21.99
40	Self-enrichment education teachers	507	5	64	Yes	14.86	18.58	21.84
41	Logging equipment operators	452	0	63	Yes	17.74	22.57	30.07
42	Computer user support specialists	715	3	62	Yes	16.29	20.33	25.83
43	First-line supervisors of mechanics, installers, and repairers	627	4	62	Yes	22.36	31.43	40.11
44	Insurance claims and policy processing clerks	472	5	60	No	12.08	15.69	19.04
45	Sawing machine setters, operators, and tenders, wood	395	6	55	Yes	13.02	16.22	20.68
46	Welders, cutters, solderers, and brazers	421	6	54	Yes	15.26	17.48	20.39

Demand rank	Occupation	Total jobs, 2017	Average annual change in projected number of total jobs, 2018–20 (percent[a])	Average annual number of projected job openings, 2018–20	Entry-level hourly wage meets or exceeds the threshold for a living wage for a single adult in the region ($12.28 per hour)	Hourly wage, 2017 ($)		
						Entry level[b] (25th percentile)	Median	Experienced level[c] (75th percentile)
47	First-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors	448	5	54	Yes	18.64	26.15	33.56
48	Pharmacy technicians	602	2	52	Yes	16.29	19.39	23.31
49	Heating, air conditioning, and refrigeration mechanics and installers	407	6	49	Yes	15.01	18.59	25.41
50	Real estate sales agents	515	–1	49	Yes	17.96	19.19	21.09
	Subtotal, 50 middle-skill occupations projected to be most in demand	70,038	3 (average)	7,993	Yes = 41 (82 percent)	na	na	na
	Subtotal, 243 other middle-skill occupations	22,109	4 (average)	2,441	Yes = 223 (92 percent)	na	na	na
	Total, all 293 middle-skill occupations	92,147	3 (average)	10,434	Yes = 264 (90 percent)	na	na	na

na is not applicable.
Note: Values may not sum to totals because of rounding.
a. Rounded to the nearest whole number.
b. The 25th percentile wage in the region was used as a proxy for an entry-level wage in this study and is consistent with starting pay, or the wage that a worker can expect to earn when he or she meets the credential requirements for an occupation but has little to no experience in it.
c. The 75th percentile wage in the region was used as a proxy for an experienced-level wage and is consistent with the wage that a worker can expect to earn after gaining experience in an occupation.
experience in an occupation.
Source: Authors' analysis of data (including 25th percentile, median, and 75 percentile values) from Economic Modeling Specialists International (2019).

In 2014/15–2016/17 an average of more than 2,300 middle-skill credentials were awarded each year. Each year in 2014/15–2016/17 postsecondary institutions in the Northern Inland region awarded an average of 2,340 middle-skill credentials, and 1,821 of them were in the 50 middle-skill occupations projected to be most in demand in the region (table E3). Police and sheriff's patrol officers were the occupation with the highest average number of middle-skill credentials awarded each year (243), and first-line supervisors of office and administrative support workers, first-line supervisors of retail sales workers, and sales representatives for wholesale and manufacturing (except technical and scientific products) were the occupations with the lowest (1).

Table E3. Average annual number of middle-skill credentials in the 50 middle-skill occupations projected to be most in demand in 2018–2020 that postsecondary institutions in the Northern Inland region awarded in 2014/15–2016/17

Occupation[a]	Program of study	Average annual number of credentials awarded, 2014/15–2016/17
Secretaries and administrative assistants, except legal, medical, and executive; executive secretaries and executive administrative assistants	Administrative assistant and secretarial science, general	79
Registered nurses	Registered nursing/registered nurse	173
Bookkeeping, accounting, and auditing clerks	Accounting technology/technician and bookkeeping	91
Childcare workers	Child care provider/assistant	177
First-line supervisors of retail sales workers	Floriculture/floristry operations and management	3
Nursing assistants	Nursing assistant/aide and patient care assistant/aide	47
First-line supervisors of office and administrative support workers; first-line supervisors of retail sales workers	E-Commerce/electronic commerce	1[b]
Social and human service assistants	Human services, general	7
First-line supervisors of food preparation and serving workers	Cooking and related culinary arts, general; foodservice systems administration/management	23
Medical secretaries; medical assistants	Medical office assistant/specialist; medical administrative/executive assistant and medical secretary	86
Sales representatives, wholesale and manufacturing, except technical and scientific products	Sales, distribution, and marketing operations, general	1
Hairdressers, hairstylists, and cosmetologists	Cosmetology/cosmetologist, general; cosmetology, barber/styling, and nail instructor	214
Automotive service technicians and mechanics	Automobile/automotive mechanics technology/technician	43
Correctional officers and jailers	Corrections; corrections and criminal justice, other	11
Operating engineers and other construction equipment operators; logging equipment operators	Construction/heavy equipment/earthmoving equipment operation	36
Police and sheriff's patrol officers	Criminal justice/police science	243
Dental assistants	Dental assisting/assistant	13
Licensed practical and licensed vocational nurses	Licensed practical/vocational nurse training	78
Firefighters	Fire prevention and safety technology/technician; fire science/firefighting; wildland/forest firefighting and investigation	222
First-line supervisors of farming, fishing, and forestry workers	Animal/livestock husbandry and production; crop production; horse husbandry/equine science and management; agricultural production operations, other	30
Welders, cutters, solderers, and brazers	Welding technology/welder	239
Real estate sales agents	Real estate	5
Subtotal, credentials from programs related to the top 50 middle-skill occupations	na	1,821

Occupation[a]	Program of study	Average annual number of credentials awarded, 2014/15–2016/17
Subtotal, credentials from programs related to the other 243 middle-skill occupations	na	519
Total, all 293 middle-skill occupations	na	2,340

na is not applicable.
Note: The table does not list the 25 occupations among the 50 most in-demand for which no middle-skill credentials were awarded. Values may not sum to total because of rounding.
a. Occupations are combined in cases where programs of study prepare students for more than one occupation.
b. One credential was awarded for the e-commerce/electronic commerce program in 2017.
Source: Authors' analysis of data from National Center for Education Statistics (2019).

No credentials were awarded in 25 of the 50 middle-skill occupations projected to be most in demand in the Northern Inland region. The occupations with no credentials awarded and the number of projected job openings each year in 2018–20 are general office clerks (557 job openings); teacher assistants (377 job openings); heavy and tractor-trailer truck drivers (321 job openings); customer service representatives (308 job openings); maintenance and repair workers, general (258 job openings); receptionists and information clerks (198 job openings); carpenters (180 job openings); forest and conservation technicians (176 job openings); insurance sales agents (169 job openings); sales representatives for all other services (137 job openings); preschool teachers, except special education (99 job openings); plumbers, pipefitters, and steamfitters (99 job openings); electricians (91 job openings); first-line supervisors of construction trades and extraction workers (86 job openings); first-line supervisors of production and operating workers (80 job openings); inspectors, testers, sorters, samplers, and weighers (67 job openings); first-line supervisors of personal service workers (65 job openings); self-enrichment education teachers (64 job openings); computer user support specialists (62 job openings); first-line supervisors of mechanics, installers, and repairers (62 job openings); insurance claims and policy processing clerks (60 job openings); wood sawing machine setters, operators, and tenders (55 job openings); first-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors (54 job openings); pharmacy technicians (52 job openings); and heating, air conditioning, and refrigeration mechanics and installers (49 job openings). Each year in 2018–20 an average of 3,726 job openings were projected in the 25 middle-skill occupations for which no credentials were awarded in 2014/15– 2016/17.

A local credential deficit of nearly 8,100 was projected in middle-skill occupations. With an average of 2,340 middle-skill credentials awarded each year and an average of 10,434 job openings each year in middle-skill occupations, the Northern Inland region had a projected average annual credential deficit of 8,094, or 78 percent of the projected job openings each year (table E4). The average annual credential deficit for the 50 middle-skill occupations projected to be most in demand ranged from 9 for licensed practical and licensed vocational nurses to 557 for general office clerks. Of the region's 50 middle-skill occupations projected to be most in demand, 46 were projected to have a local credential deficit.

A local credential surplus was projected for 4 of the 50 middle-skill occupations projected to be most in demand in the region. Four of the 50 middle-skill occupations projected to be most in demand were projected to have a combined local credential surplus of 544 each year in 2018–20 (see table E4). The largest surplus was for welders, cutters, solderers, and brazers (185 per year), followed by firefighters (146 per year).

Table E4. Projected local credential deficit or surplus for the 50 middle-skill occupations projected to be most in demand in 2018–20, Northern Inland region

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
1	Office clerks, general	557	0	(557)	Deficit
2	Secretaries and administrative assistants, except legal, medical, and executive[a]	421	79	(343)	Deficit
3	Teacher assistants	377	0	(377)	Deficit
4	Registered nurses	371	173	(198)	Deficit
5	Heavy and tractor-trailer truck drivers	321	0	(321)	Deficit
6	Bookkeeping, accounting, and auditing clerks	315	91	(224)	Deficit
7	Customer service representatives	308	0	(308)	Deficit
8	Childcare workers	299	177	(123)	Deficit
9	First-line supervisors of retail sales workers[b]	281	3	(278)	Deficit
10	Maintenance and repair workers, general	258	0	(258)	Deficit
11	Nursing assistants	252	47	(205)	Deficit
12	First-line supervisors of office and administrative support workers[b]	234	0	(234)	Deficit
13	Social and human service assistants	211	7	(204)	Deficit
14	Receptionists and information clerks	198	0	(198)	Deficit
15	First-line supervisors of food preparation and serving workers	190	23	(166)	Deficit
16	Carpenters	180	0	(180)	Deficit
17	Forest and conservation technicians	176	0	(176)	Deficit
18	Medical secretaries[c]	170	86	(84)	Deficit
19	Medical assistants[c]	170	0	(170)	Deficit
20	Insurance sales agents	169	0	(169)	Deficit
21	Sales representatives, wholesale and manufacturing, except technical and scientific products	161	1	(159)	Deficit
22	Hairdressers, hairstylists, and cosmetologists	146	214	68	Surplus
23	Sales representatives, services, all other	137	0	(137)	Deficit
24	Automotive service technicians and mechanics	126	43	(84)	Deficit
25	Correctional officers and jailers	125	11	(114)	Deficit
26	Operating engineers and other construction equipment operators[d]	116	36	(80)	Deficit
27	Preschool teachers, except special education	99	0	(99)	Deficit
28	Plumbers, pipefitters, and steamfitters	99	0	(99)	Deficit
29	Police and sheriff's patrol officers	97	243	145	Surplus
30	Dental assistants	93	13	(80)	Deficit

Demand rank	Occupation	Average annual number of projected job openings, 2018–20	Average annual number of credentials awarded, 2014/15–2016/17	Difference between job openings and credentials awarded	Local credential deficit or surplus
31	Electricians	91	0	(91)	Deficit
32	Executive secretaries and executive administrative assistants[a]	90	0	(90)	Deficit
33	Licensed practical and licensed vocational nurses	87	78	(9)	Deficit
34	First-line supervisors of construction trades and extraction workers	86	0	(86)	Deficit
35	First-line supervisors of production and operating workers	80	0	(80)	Deficit
36	Firefighters	76	222	146	Surplus
37	First-line supervisors of farming, fishing, and forestry workers	67	30	(37)	Deficit
38	Inspectors, testers, sorters, samplers, and weighers	67	0	(67)	Deficit
39	First-line supervisors of personal service workers	65	0	(65)	Deficit
40	Self-enrichment education teachers	64	0	(64)	Deficit
41	Logging equipment operators[d]	63	0	(63)	Deficit
42	Computer user support specialists	62	0	(62)	Deficit
43	First-line supervisors of mechanics, installers, and repairers	62	0	(62)	Deficit
44	Insurance claims and policy processing clerks	60	0	(60)	Deficit
45	Sawing machine setters, operators, and tenders, wood	55	0	(55)	Deficit
46	Welders, cutters, solderers, and brazers	54	239	185	Surplus
47	First-line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors	54	0	(54)	Deficit
48	Pharmacy technicians	52	0	(52)	Deficit
49	Heating, air conditioning, and refrigeration mechanics and installers	49	0	(49)	Deficit
50	Real estate sales agents	49	5	(44)	Deficit
	Subtotal, 50 middle-skill occupations projected to be most in demand	7,993	1,821	(6,171)	Deficit
	Subtotal, 243 other middle-skill occupations	2,441	519	(1,923)	Deficit
	Total, all 293 middle-skill occupations	10,434	2,340	(8,094)	Deficit

Note: Values may not sum to total because of rounding.

a. Supply shared between secretaries and administrative assistants, except legal, medical, and executive and executive secretaries and executive administrative assistants.

b. Supply shared between first-line supervisors of retail sales workers and first-line supervisors of office and administrative support workers.

c. Supply shared between medical secretaries and medical assistants.

d. Supply shared between operating engineers and other construction equipment operators and logging equipment operators.

Source: Authors' analysis of data from Economic Modeling Specialists International (2019) and National Center for Education Statistics (2019).

Discussion and conclusion

A local credential deficit was projected for 46 of the 50 middle-skill occupations projected to be most in demand in the Northern Inland region. This means that there might not have been enough trained workers to meet employer demand in the region. Of the 46 occupations projected to have a deficit, 38 paid an entry-level living wage for a single-adult household. This situation presents many opportunities for the region's postsecondary institutions to expand their programs or develop new ones to reduce the projected local credential deficits that employers in the region might face. Focusing on the 10 most in-demand occupations with a credential deficit that also pay a living wage might be an appropriate way to begin, as the educational programs linked to these occupations could be expanded without significant concern about oversaturating the market, while simultaneously providing a wage that allows for economic self-sufficiency among program completers.

As the major training providers of middle-skill workers, California community colleges and private institutions might consider strategies to guide both new and existing students to enroll in programs associated with the occupations that were projected to have credential deficits and pay a living wage in the region. These institutions might look to underemployed or unemployed adults in the region and to interested low-skilled workers who are not currently earning a living wage.

Local governments, workforce investment boards, and chambers of commerce can partner in efforts to align middle-skill supply and demand by identifying others to fill open jobs, including appropriately credentialed workers from other regions and workers with above-middle-skill credentials.

Findings from the Northern Inland region are not generalizable to differences in other regions in California and the nation because of differences in education, economic, social, and commercial characteristics. However, the methods used in this study could be employed to conduct similar analyses for other regions. See the main report for limitations related to the study's data and methodology.

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