

Middle-Skilled Jobs Analysis: Appendix C

Description of Jobs-Skills Relationship Map

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Section 1 - Introduction

This appendix describes the Job-Skills Relationship Map (JSRM) from The *Middle Skilled Jobs Analysis* in greater detail. While images of the map are included in this document it is recommended that the higher quality image of the map is accessed from the project website at:

<https://www.pacificcbpr.org/workforce/msjr/>

The map, which is listed as Appendix B can be view interactively on the site or a detailed copy of the map can be downloaded. While extremely detailed, the JSRM described in the *Middle Skilled Jobs Analysis* and available as Appendix B is a partial summary of the job-skills relationship mapping that went into identification of middle-skilled pathways. Rather than a single analysis, job-skills relationship mapping is a process and resource to build career pathways and support their relevance.

In that context, while a central component of the *Middle Skilled Jobs Analysis*, it is one of several tools and processes needed to direct and coordinate resources to build better job opportunities. It is a tool that we envision being customized to the needs of different users. A workforce planning professional may want all the JSRM's features while an individual looking to explore pathways from their current job may just be interested in a few. Given that context, this paper describes the information contained in the JSRM.

Section 2 - Skills Relationship Map

A feature of the JSRM is its representation of relationship between the skills of specific occupations. Beginning with forty occupations identified through analysis of their growth and stakeholder representation in the community, information on their related jobs was compiled from the Burning Glass Labor Insights Related Jobs analytical tool. This tool creates a list of occupations with similar skill and education requirements to the selected occupation. Those key occupations were then linked to each other as well as other identified occupations. Identifying other occupations was based on a process where several factors were used to determine inclusion. These factors are: 1) number of job postings (occupations with robust growth being preferred), 2) projected growth (occupations with growth being preferred), and 3) median salary (occupations with higher salary, and by implication higher skills, being preferred).

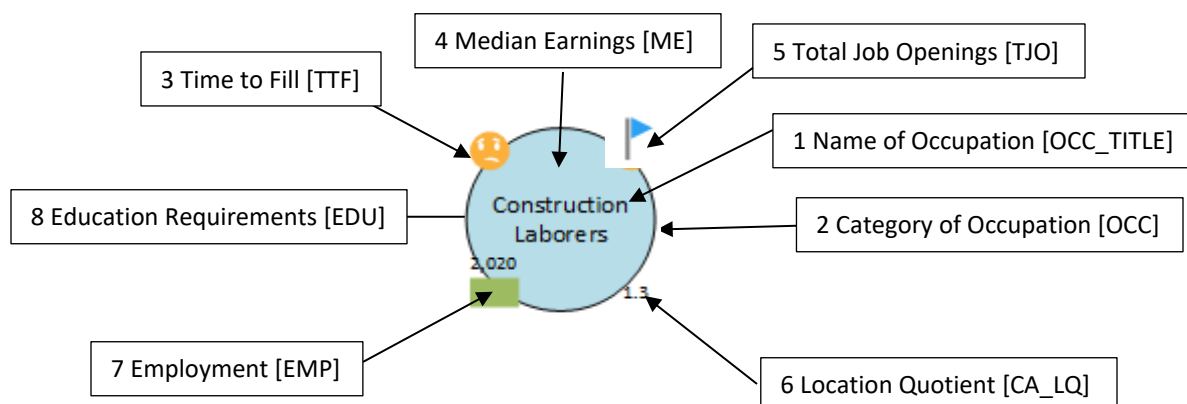
That process led to identification of an additional 95 directly related occupations. With eight occupation-specific component data fields for each occupation, these central and related occupations were mapped using the Microsoft Visio diagramming software. After mapping all 135 occupations manufacturing and goods movement occupations were shown to have particularly limited higher skilled/earning occupations. Therefore, an additional 26 indirect occupations were identified with connections to the related occupations. Three distinct categories of

occupations are thereby mapped by their skills relationship: First, central occupation (1st Degree); Second, Related occupations (2nd Degree), and Third, Indirectly Related Occupations (3rd Degree).

The JSRM thereby consists of 161 occupations. These are grouped by their occupational cluster and connected via identified skills relationships which we described above. Connections between occupations are differentiated by those with a similar skills level and those with higher or lower skills by the position of the connections. Connections to related occupations with higher or lower levels of educational requirements are illustrated by originating-on/terminating-on the horizontal or vertical axis. While related occupations with the same level of educational requirements connections originate off the vertical and horizontal axis. Upward occupational pathways can thereby be more readily traced by following the on-axis connections. If a connection is between occupations within the same occupational cluster it is represented with a solid line. Connections between four major occupations that were central to the initial analysis: 1) construction, 2) goods movement, 3) health care, and 4) manufacturing; are shown with a dashed line. Lastly, connections to other occupations outside the four initial cluster are represented with a dotted line.

Several pieces of information were compiled about each occupation to identify the greatest opportunities for middle-skilled job growth. This consisted of a range of data about the scale and prospects for the occupation to support middle-skilled jobs. Currently, eight data points are used to profile each of the occupations. Details of these component fields and their source is described below following their illustration on a sample occupation in Figure 1.




Figure 1 Occupational Components in Skills Map



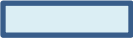



(1) Name of Occupation [OCC TITLE]: These are names are based on the detailed occupations defined in the U.S. Bureau of Labor Statistics 2018 Standard Occupational Classification (SOC) structure.¹

(2) Category of Occupation [OCC]: This defines the nature of the occupation. Priority occupations / occupational clusters from the analysis are represent with a circle while other skills related occupations are represented with a 16-point star. The color of the shapes' outline provides further information about the occupation with black denoting the central occupations identified by the analysis (by definition these are all circles). [L1], Red denotes occupations with skills linking directly to the central occupations (2nd Degree connections) [L2], and green denoting occupations that are linked to the central occupation indirectly through 2nd Degree/ red occupations (3rd Degree connections) [L3]. Those colors are also used to represent the connections between occupations, with black line representing connections with at least one central occupation, red lines representing connections with at least one 2nd Degree occupation, and green lines represent connections between 3rd Degree occupations. (Note: The introduction to this section defines the nature of the types of lines: solid/dashed/dotted).


(3) Time to Fill [TTF]: This measure is taken from the Burning Glass report on hard to fill jobs for San Joaquin County during the year to date (1/1/2019 – 10/20/2019). It is reported across three levels, represented by icons:

- Similar [T1] 
- Harder [T2] 
- Much Harder [T3] 






(4) Median Earning [ME]: This measure is from the U.S. Bureau of Labor Statistics Occupational Employment Survey (May 2018). Using state-wide Median Annual Earning data for 782 distinct occupations, earning were divided into five categories with shading of the shape used to indicate the category:

- Bottom 20% (<\$34,425) [M1] 
- 4th 20% (\$34,425-\$45,395) [M2] 
- Middle 20% (\$45,395-\$61,800) [M3] 
- 2nd 20% (\$61,800-\$89,700) [M4] 

¹ Published November 2017 for reference year January 2018.

Top 20% (>\$89,700) [M5] 

(3) Total Job Openings [TJO]: This measure is taken from the California Employment Development Department, Labor Market Information Division, California Occupational Employment Projections for 2016 – 2016.² Using state-wide Total Job Openings data for 677 distinct occupations, total job openings were divided into five levels using icons:






- Bottom 20% [O1] 
- 4th 20% [O2] 
- Middle 20% [O3] 
- 2nd 20% [O4] 
- Top 20% [O5] 

(6) Location Quotient [LQ]: This measure is derived from the U.S. Bureau of Labor Statistics Occupational Employment Survey (May 2018) for California and San Joaquin County. The location quotient is calculated using the ratio of an occupation’s percentile in the County to the state-wide percentile. Hence, numbers greater than one indicate a relatively higher concentration of employment in that occupation than “normal” for the state and may suggest local occupational competitiveness. When a location quotient is not listed data for local employment in the occupation was not available and the state proportion instead was used to generate a local employment estimate rather than actual local employment, see Employment (7).

(7) Employment [EMP]: This measure is derived from the U.S. Bureau of Labor Statistics Occupational Employment Survey (May 2018) for San Joaquin County. The local area employment estimate is given both as a value and as a bar to make the relative size of the occupation more apparent in the skills relationship diagram. As noted in the description of the Location Quotient (6), in some cases employment data is not available for an occupation. This occurs for various reasons ranging from confidentiality to non-existence of an occupation. In order to provide an estimate of each occupation’s employment scale, state-wide employment ratios are used in these instances so that all occupations contain an employment value as potential skills ladders are being designed.

² Published July 2018.

(8) Education Requirements [EDU]: This measure is derived from the U.S. Department of Labor Occupational Information Network (O*NET) information for occupations' typical educational requirements. These nationally derived educational requirements for occupations are differentiated across five levels using dashed rectangular boxes with the occupational shapes location indicating the educational requirements as follows:

- Less than High School within [E1] 
- High School within [E2] 
- Vocational training within [E3] 
- Bachelor's degree (BA/BSc) within [E4] 
- Post graduate degree (BA/BSc) outside [E5] 

A sample of these eight fields are illustrated in Figure 3 and the complete details for all profiled occupations follow in Table 1 .

Section 3 - Conclusion

The JSRM illustrates a selection of skill-based connections among various occupations. Based on those connections as well as the information on each occupation's opportunities and challenges locally informed career pathways can be identified. The *Middle Skilled Jobs Analysis* describes several important pathways, but the JSRM and job-skills relationship mapping more generally suggest others. Building out the career ladders and lattices necessary to follow those pathways is a further process, but one that should be facilitated by the careful and systematic analysis conducted through job-skills relationship mapping.

Figure 2 Sample Occupational Information on Skills Map without Relations

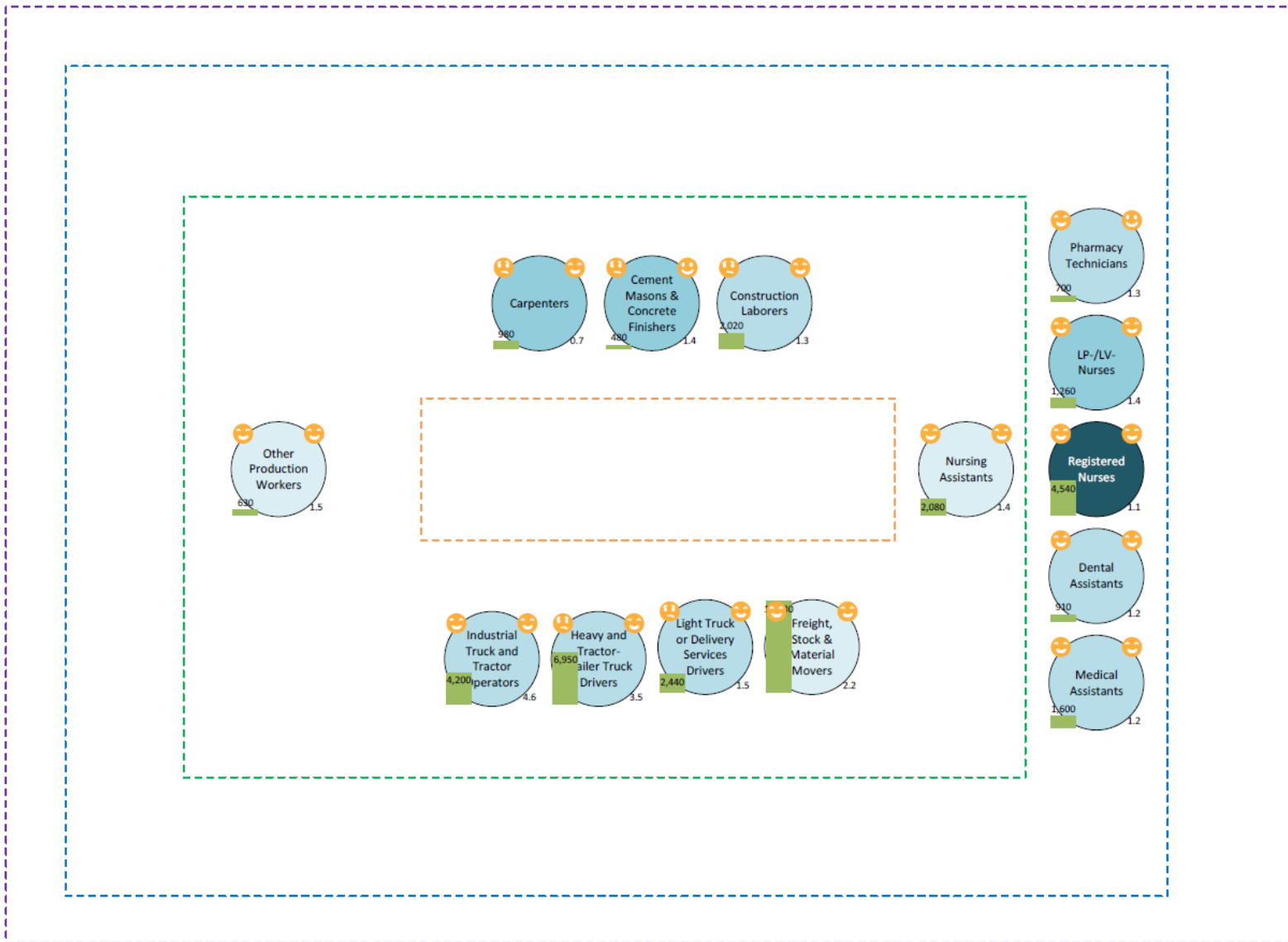


Figure 3 Job-Skills Relationship Map with Initial Key Major Occupational Groups

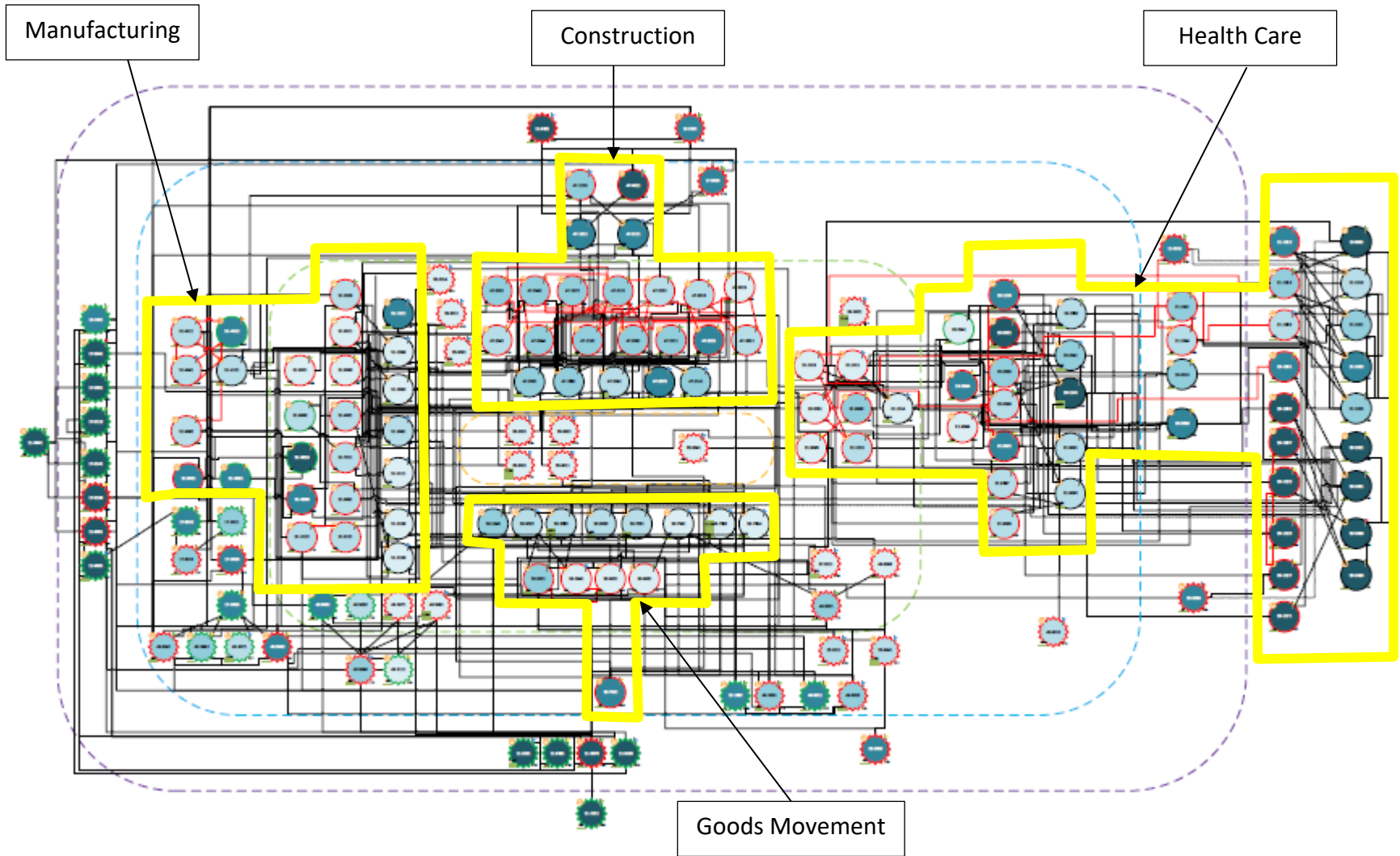


Table 1 Skills Map Occupational Profile Information

OCC_CODE	OCC_TITLE	OCC	TTF	ME	TJO	LQ	EMP	EDU
11-3031	Financial Managers	L3	T1	M5	O5	0.57	670	E4
11-3051	Industrial Production Managers	L2	T1	M5	O4	1.04	300	E4
11-3061	Purchasing Managers	L3	T1	M5	O3	4.46	510	E4
11-3070	Transportation, Storage, and Distribution Managers	L2	T1	M5	O4	1.85	510	E4
11-9021	Construction Managers	L2	T2	M5	O5	0.62	290	E4
11-9041	Architectural and Engineering Managers	L3	T1	M5	O4	0.31	140	E5
11-9151	Social and Community Service Managers	L2	T1	M4	O4		320	E4
11-9199	Other Managers	L3	T1	M5	O5	0.40	380	E4
11-1011	Chief Executives	L3	T1	M5	O4	0.64	280	E5
11-1021	General and Operations Managers	L3	T1	M5	O5	0.83	3,020	E4
13-1032	Insurance Appraisers, Auto Damage	L3	T1	M4	O4		40	E3
13-1051	Cost Estimators	L2	T2	M4	O4	1.42	590	E4
13-1081	Logisticians	L3	T1	M4	O4	0.66	200	E4
17-2041	Chemical Engineers	L3	T1	M5	O1		30	E4
17-2051	Civil Engineers	L3	T1	M5	O4	0.55	360	E4
17-2112	Industrial Engineers	L3	T1	M5	O4	0.47	180	E4
17-2141	Mechanical Engineers	L3	T1	M5	O4	0.40	160	E4
17-2199	Engineers, All Other	L2	T1	M5	O3	0.50	150	E4
17-3011	Architectural and Civil Drafters	L3	T1	M3	O4	0.31	60	E3
17-3012	Electrical and Electronics Drafters	L3	T1	M4	O2		50	E3
17-3013	Mechanical Drafters	L2	T1	M3	O2	1.19	80	E3
17-3023	Electrical and Electronics Engineering Technicians	L2	T1	M4	O4	0.18	60	E3
17-3026	Industrial Engineering Technicians	L3	T1	M4	O2	0.68	40	E3
17-3029	Engineering Technicians, Except Drafters, All Other	L2	T1	M4	O3	1.34	220	E3
19-3031	Clinical, Counseling, and School Psychologists	L1	T1	M5	O4	1.51	380	E5
21-1012	Educational, Guidance, School, and Vocational Counselors	L2	T1	M4	O5	0.85	400	E5
21-1013	Marriage and Family Therapists	L2	T1	M3	O4		320	E5
21-1018	Substance Abuse, Behavioral Disorder, and Mental Health Counselors	L1	T3	M2	O4	1.01	460	E5
21-1021	Child, Family, and School Social Workers	L1	T3	M3	O5	0.53	240	E4
21-1022	Healthcare Social Workers	L1	T3	M4	O4	0.63	170	E5
21-1023	Mental Health and Substance Abuse Social Workers	L1	T3	M3	O4	1.30	280	E5
21-1091	Health Educators	L2	T1	M3	O3	0.97	110	E4
21-1093	Social and Human Service Assistants	L2	T1	M2	O5	0.57	420	E4
21-1094	Community Health Workers	L2	T1	M2	O3		90	E4
25-2011	Preschool Teachers	L2	T1	M2	O5	0.92	710	E3
25-2052	Special Education Teachers, Kindergarten and Elementary School	L2	T3	M4	O3	1.90	420	E4
25-2059	Special Education Teachers, All Other	L2	T3	M4	O1		40	E4
25-9041	Teacher Assistants	L2	T1	M2	O5	1.27	3,100	E3
29-1021	Dentists, General	L1	T1	M5	O3	0.88	220	E5
29-1031	Dietitians and Nutritionists	L2	T1	M4	O3	0.78	90	E5
29-1051	Pharmacists	L1	T1	M5	O4	0.94	420	E5
29-1062	Family and General Practitioners	L2	T1	M5	O3	0.58	100	E5
29-1066	Psychiatrists	L1	T1	M5	O1		50	E5
29-1067	Surgeons	L2	T1	M5	O1		50	E5
29-1069	Physicians and Surgeons, All Other	L1	T1	M5	O3	1.01	500	E5
29-1122	Occupational Therapists	L2	T1	M5	O3	0.79	110	E5
29-1123	Physical Therapists	L2	T1	M5	O4	0.84	250	E5
29-1126	Respiratory Therapist	L2	T1	M4	O3	0.80	200	E3
29-1127	Speech-Language Pathologists	L2	T1	M5	O3	1.56	300	E5
29-1141	Registered Nurses	L1	T1	M5	O5	1.06	4,540	E3
29-1171	Nurse Practitioners	L2	T1	M5	O3	0.67	130	E5
29-2010	Clinical Laboratory Technologists and Technicians	L1	T1	M3	O3	0.84	340	E4
29-2021	Dental Hygienists	L2	T1	M5	O4	0.87	280	E3
29-2034	Radiologic Technologists	L2	T1	M4	O3		250	E3
29-2041	Emergency Medical Technicians and Paramedics	L3	T1	M1	O4		310	E3
29-2051	Dietetic Technicians	L2	T1	M1	O2		80	E2
29-2052	Pharmacy Technicians	L1	T1	M2	O4	1.28	700	E3
29-2053	Psychiatric Technicians	L1	T1	M4	O3	3.02	390	E3
29-2055	Surgical Technologists	L2	T1	M3	O3	1.29	180	E3
29-2061	Licensed Practical and Licensed Vocational Nurses	L1	T1	M3	O5	1.36	1,260	E3

29-2099	Health Technologists and Technicians, All Other	L2	T1	M2	O4	1.01	330	E3
31-1011	Home Health Aides	L2	T1	M1	O5	0.67	240	E2
31-1013	Psychiatric Aides	L2	T1	M1	O2		30	E2
31-1014	Nursing Assistants	L1	T1	M1	O5	1.44	2,080	E2
31-1015	Orderlies	L2	T1	M2	O2	0.93	60	E2
31-2021	Physical Therapist Assistants	L2	T1	M4	O3	0.67	50	E3
31-9091	Dental Assistants	L1	T1	M2	O5	1.18	910	E3
31-9092	Medical Assistants	L1	T1	M2	O5	1.19	1,600	E3
31-9093	Medical Equipment Preparers	L2	T1	M3	O3	1.20	110	E2
31-9095	Pharmacy Aides	L2	T1	M1	O3		140	E2
31-9096	Veterinary Assistants and Laboratory Animal Caretakers	L2	T3	M1	O4		180	E3
31-9097	Phlebotomists	L2	T1	M2	O4	1.19	210	E3
31-9099	Healthcare Support Workers, All Other	L2	T1	M2	O4	0.65	120	E3
35-2014	Cooks, Restaurant	L2	T1	M1	O5	0.58	1,400	E2
35-2021	Food Preparation Workers	L2	T1	M1	O5	0.68	1,010	E1
35-3011	Bartenders	L2	T1	M1	O5	0.63	610	E2
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	L2	T1	M1	O5	1.32	7,780	E1
35-3031	Waiters and Waitresses	L2	T1	M1	O5	0.70	2,930	E2
35-3041	Food Servers, Nonrestaurant	L2	T1	M1	O5	1.27	430	E1
35-9011	Dining Room and Cafeteria Attendants and Bartender Helpers	L2	T1	M1	O5	0.72	830	E1
35-9021	Dishwashers	L2	T1	M1	O5	0.70	830	E1
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	L2	T1	M1	O5	0.90	3,010	E2
39-9021	Personal Care Aides	L2	T3	M1	O5	0.93	7,510	E2
43-5031	Police, Fire, and Ambulance Dispatchers	L3	T1	M4	O3	1.64	160	E2
43-5032	Dispatchers, Except Police, Fire, and Ambulance	L3	T1	M2	O4	2.18	670	E2
43-5060	Production, Planning, and Expediting Clerks	L2	T1	M3	O5	1.13	850	E3
43-5071	Shipping, Receiving, and Traffic Clerks	L2	T1	M1	O5	1.72	2,150	E2
43-5081	Stock Clerks and Order Fillers	L2	T1	M1	O5	1.53	5,360	E2
43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	L3	T1	M1	O3	1.54	280	E2
43-6013	Medical Secretaries	L2	T1	M2	O5	0.73	880	E3
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	L1	T2	M4	O5	1.02	830	E3
47-2021	Brickmasons and Blockmasons	L2	T2	M3	O3		50	E2
47-2031	Carpenters	L1	T2	M3	O5	0.67	980	E2
47-2041	Carpet Installers	L2	T2	M2	O3	1.83	160	E2
47-2042	Floor Layers, Except Carpet, Wood, and Hard Tiles	L2	T1	M3	O2		40	E2
47-2044	Tile and Marble Setters	L2	T1	M3	O4	1.75	180	E2
47-2051	Cement Masons and Concrete Finishers	L1	T2	M3	O4	1.36	480	E2
47-2061	Construction Laborers	L1	T2	M2	O5	1.34	2,020	E2
47-2071	Paving, Surfacing, and Tamping Equipment Operators	L2	T1	M3	O2		40	E2
47-2073	Operating Engineers and Other Construction Equipment Operators	L1	T2	M4	O5	1.18	480	E2
47-2081	Drywall and Ceiling Tile Installers	L2	T1	M3	O4	0.83	350	E2
47-2111	Electricians	L1	T2	M4	O5	1.13	1,090	E3
47-2121	Glaziers	L2	T2	M3	O3		90	E2
47-2141	Painters, Construction and Maintenance	L1	T2	M3	O5	1.13	610	E2
47-2152	Plumbers, Pipefitters, and Steamfitters	L2	T2	M3	O5	0.47	330	E3
47-2181	Roofers	L2	T2	M3	O4	1.12	300	E2
47-2211	Sheet Metal Workers	L2	T2	M3	O4	0.76	130	E2
47-2221	Structural Iron and Steel Workers	L2	T2	M4	O3	2.71	380	E2
47-2231	Solar Photovoltaic Installers	L2	T2	M2	O4		60	E2
47-3012	Helpers--Carpenters	L2	T2	M2	O2	2.58	100	E2
47-3013	Helpers--Electricians	L2	T2	M2	O3		60	E2
47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	L2	T2	M1	O2		40	E2
47-4011	Construction and Building Inspectors	L2	T2	M5	O4	0.47	70	E3
49-3011	Aircraft Mechanics and Service Technicians	L3	T1	M4	O3	0.37	70	E3
49-3021	Automotive Body and Related Repairers	L2	T1	M3	O4	1.12	230	E2
49-3023	Automotive Service Technicians and Mechanics	L2	T1	M3	O5	1.03	970	E3
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	L2	T1	M3	O4	3.20	990	E3
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	L2	T1	M4	O3	1.83	320	E3
49-3093	Tire Repairers and Changers	L2	T1	M1	O3	1.93	300	E2
49-9041	Industrial Machinery Mechanics	L2	T1	M3	O4	2.14	800	E3
49-9043	Maintenance Workers, Machinery	L3	T1	M3	O3	2.73	290	E3
49-9071	Maintenance and Repair Workers, General	L3	T1	M2	O5	1.17	2,190	E3
51-1011	First-Line Supervisors of Production and Operating Workers	L1	T1	M4	O5	1.36	980	E2

51-2028	Electrical, Electronic, and Electromechanical Assemblers	L2	T1	M2	O4	0.30	170	E2
51-2098	Assemblers and Fabricators, All Other, Including Team Assemblers	L1	T1	M1	O5	0.91	1,480	E2
51-3011	Bakers	L2	T1	M1	O5	0.95	340	E2
51-3021	Butchers and Meat Cutters	L2	T1	M1	O4		290	E2
51-3092	Food Batchmakers	L1	T1	M1	O4	1.58	410	E2
51-3093	Food Cooking Machine Operators and Tenders	L2	T1	M1	O3	1.98	150	E2
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	L2	T1	M2	O3	0.62	110	E3
51-4012	Computer Numerically Controlled Machine Tool Programmers	L3	T1	M4	O2		40	E3
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders	L2	T1	M2	O4	1.14	200	E2
51-4041	Machinists	L2	T1	M2	O5	0.64	340	E3
51-4121	Welders, Cutters, Solderers, and Brazers	L1	T2	M2	O5	1.66	650	E3
51-6093	Upholsterers	L3	T3	M2	O2		40	E2
51-7011	Cabinetmakers and Bench Carpenters	L2	T1	M2	O3	0.97	150	E2
51-8013	Power Plant Operators	L3	T1	M5	O2	0.75	40	E2
51-8021	Stationary Engineers and Boiler Operators	L2	T1	M4	O2	1.40	60	E3
51-8031	Water and Wastewater Treatment Plant and System Operators	L3	T1	M4	O3	0.86	150	E3
51-8099	Plant and System Operators, All Other	L2	T1	M4	O1		20	E2
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	L1	T1	M2	O5	0.96	790	E2
51-9081	Dental Laboratory Technicians	L2	T1	M2	O3	0.78	50	E2
51-9082	Medical Appliance Technicians	L2	T1	M2	O2		30	E3
51-9111	Packaging and Filling Machine Operators and Tenders	L1	T1	M1	O5	2.10	1,480	E2
51-9121	Coating, Painting, and Spraying Machine Setters, Operators, & Tenders	L2	T1	M2	O3	2.05	190	E2
51-9122	Painters, Transportation Equipment	L2	T1	M2	O3	1.33	130	E2
51-9198	Helpers--Production Workers	L1	T1	M1	O5	2.03	870	E2
51-9199	Production Workers, All Other	L1	T1	M1	O5	1.54	630	E2
53-1048	First-Line Supervisors of Transportation and Material Moving Workers	L1	T1	M3	O4	2.65	1,710	E2
53-3021	Bus Drivers, Transit and Intercity	L2	T2	M3	O4		400	E2
53-3022	Bus Drivers, School or Special Client	L1	T1	M2	O5	1.18	460	E2
53-3032	Heavy and Tractor-Trailer Truck Drivers	L1	T2	M2	O5	3.46	6,950	E2
53-3033	Light Truck or Delivery Services Drivers	L1	T2	M2	O5	1.51	2,440	E2
53-3041	Taxi Drivers and Chauffeurs	L2	T2	M1	O5	0.47	190	E2
53-6021	Parking Lot Attendants	L2	T2	M1	O5		350	E2
53-6031	Automotive and Watercraft Service Attendants	L2	T1	M1	O4	1.12	130	E2
53-7021	Crane and Tower Operators	L2	T2	M4	O2		50	E3
53-7051	Industrial Truck and Tractor Operators	L1	T1	M2	O5	4.63	4,200	E2
53-7061	Cleaners of Vehicles and Equipment	L1	T1	M1	O5	1.38	1,160	E2
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	L1	T1	M1	O5	2.19	12,130	E2
53-7064	Packers and Packagers, Hand	L1	T1	M1	O5	1.10	1,610	E2