



CHANGES IN ENTRY-LEVEL JOBS OVER THE PAST DECADE

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SEATTLE JOBS INITIATIVE

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MAY 2012

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The Northwest Social Research Group (NSRG) is based in Seattle. Founded in 2010, we provide high-quality research consulting to non-profit organizations, government agencies and private firms.

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Seattle Jobs Initiative creates opportunities for students, workers and business to succeed by helping education and job training programs meet the demands of a new economy. We find and apply solutions for people to gain the skills they need for good jobs that create prosperity for all in today's marketplace.

Special Thanks

Supported by the City of Seattle Office of Economic Development

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INTRODUCTION

Higher-level skills and training are consistently valued in the labor market, and public consensus supports the development of worker skills, especially among the least educated workers (Holzer & Lerman, 2007). Additionally, over the past 40 years, workers with higher educational attainment have earned significantly higher salaries (Carnevale, Smith, & Strohl, 2010). Workers with some college education are expected to earn nearly half a million dollars more over their lifetime than workers with only a high school diploma; similarly, workers with a bachelor's degree or higher can expect to earn more than double the income, on average, of workers with a high school diploma over a lifetime (Carnevale et al., 2010). Furthermore, unemployment levels are much higher for less educated workers, with the unemployment rate at 9.4 percent for workers with a high school diploma, 8.7 percent for workers with some college education, 6.8 percent for workers with an associate's degree, and less than 5 percent for workers with a bachelor's degree or higher (Bureau of Labor Statistics, 2012b).

In the coming decade, workers with higher skills and training will be better positioned for higher-wage jobs, as occupations with higher skill requirements are projected to grow much faster than jobs requiring less education (Executive Office of the President Council of Economic Advisors, 2009). Anecdotal evidence suggests that the skills and training required for most entry-level positions in the greater Seattle area have increased over the past decade, with employers expecting levels of educational attainment beyond a high school degree. If true, new labor market participants lacking these advanced credentials may experience difficulty in the local economy. Further, economically disadvantaged individuals may be affected to a greater degree, as they are less likely to have secured postsecondary educational credentials. This is especially critical as Washington is projected to be among the top five states in the U.S. over the next decade in job openings that require at least some training beyond a high school degree (Carnevale et al., 2010).

In this report, we examine whether the skill requirements for entry-level jobs have changed over the past decade in the greater Seattle area. In so doing, we focus on occupations within the professional and business services, logistics, healthcare, and manufacturing industries. Identifying these occupations presents a challenge, as there is not a standard definition for what constitutes *entry-level* employment. For example, some definitions suggest entry-level jobs are defined as non-supervisory, non-managerial, non-professional positions that are either unskilled or where job-specific skills can be learned on the job (National Work Readiness Council, 2012). Other definitions of entry-level occupations formalize these requirements, using BLS data, to include occupations with short-term or medium-term training requirements, or those

that require non-bachelor's degree/vocational preparation (Kusmin & Gibbs, 2000).

Consistent with the latter definition, and the methodology used in the Middle-Wage Jobs Report (Seattle Jobs Initiative, 2011), we also rely on national-level BLS occupational training requirements to determine entry-level occupations. This task has been made more difficult due to the revised classification system that the BLS instituted in 2010, which separates degree and job training requirements rather than combining them as previously done. We define entry-level occupations as such:

***Entry-level jobs* require no more than an associate's degree. These jobs require little to no previous work experience in a related area and typically require some level of on-the-job training.**

***In contrast, middle-wage jobs* (Seattle Jobs Initiative, 2011c) require some education and training beyond high school but not necessarily a four-year degree, and pay a living wage (See Appendix A for more thorough comparison of entry-level and middle-wage jobs).**

We identified approximately 20 entry-level occupations within each of the four industries (See Appendix B for additional information on how these occupations were selected).¹ Using this list of occupations, we then examined the training requirements, and any shifts therein, over the last decade for entry-level employment (See Appendix C for details on how the BLS collects education and training data, how it defines education and training requirements, and how these definitions have shifted over time). Additionally, we gathered information on the median annual wages—we also provided entry-level and experienced wages for selected occupations, as full data was not available—and projected growth or decline within each occupation over the next decade.²

1. To identify occupations within industries, we utilized the North American Industrial Classification System (NAICS) codes. For the professional and business services sector, we included occupations with NAICS codes 54-56; the logistics sector included occupations with NAICS codes 22, 42, 44-45, and 48-49; the healthcare sector included occupations with NAICS code 62; and, the manufacturing sector included occupations with NAICS codes 31-33.

2. The Washington State Employment Security Department does not make complete wage data available for all occupations. Thus, we are only able to provide entry-level and experienced wage data for select occupations. We define entry-level and experienced wages at the 25th and 75th percentile of annual wages (Rhode Island Department of Labor and Training, 2012).

PROFESSIONAL AND BUSINESS SERVICES

Employment in professional and business services has steadily comprised a greater share of the labor force over the past 50 years, making up an estimated seven percent of the labor market in 1960 and around 13 percent today (Holzer & Lerman, 2007). Furthermore, employment in this industry is projected to grow from 13.4 percent of the labor market in 2008 to 14.3 percent by 2018 (Carnevale et al., 2010).

In 1983, only 43 percent of professional and business services workers had at least some college education; this number has steadily increased to 59 percent in 1992, 71 percent in 2008, and is projected to reach 81 percent by 2018. The increased demand for workers with higher education is especially noteworthy in this industry, as it is projected to be one of the highest long-term growth industries (Carnevale et al., 2010). In the coming years, less than 20 percent of the demand in the professional and business services industry will be for workers with a high school diploma or less.

The professional and business services sector consists of a wide range of jobs that exist in other industries, as many occupations span multiple industries. Secretaries and office clerks, for example, exist in the healthcare, logistics, or manufacturing industries.

Table 1 depicts entry-level occupations in the professional and business services sector.³ Overall, these occupations have a projected annual growth of 1.4 percent in King County between 2014-2019, which is a higher rate of growth than the logistics and manufacturing sector, but not as high as the healthcare sector.⁴ The vast majority of the entry-level occupations we identify in professional and business services are in demand in King County.⁵ Only one occupation, New Accounts Clerks, is considered not in demand. This occupation is among the bottom 25 occupations in King County in terms of projected annual long-term growth, with an average annual growth rate of -0.9 percent.

3. For data presented in tables 1, 5, 9 and 13, Washington State Employment Security Department (ESD) provided information on wages and occupational growth in King County. The Bureau of Labor Statistics (BLS) was the source for information on education/training requirements at the national-level from 2000 to 2010.

4. Projected annual growth rate for all occupations (from Table 1) was weighted based on the number of jobs available within each occupation.

5. Washington State Employment Security Department considers occupations in-demand if trends in employment within a given occupation are considered to be creating more job opportunities, as opposed to opportunities remaining unchanged or declining.

TABLE 1. Training Requirements, Education Requirements, Wages, and Growth for 20 Selected Entry-Level Occupations in Professional and Business Services

| SOC Code | Occupation | On-the-job training required (2010) ^a | Education required (2010) ^a | Training or education shift (2000-2010) ^a | Median annual wage (2011) ^b | Occupation is "in-demand" (2010) ^b | Avg. annual growth (2014-2019) (%) ^b |
|----------|---|--|--|--|--|---|---|
| 29-2071 | Medical Records and Health Information Technicians | None | Postsecondary non-degree award | ↓ | \$42,053 | Yes | 1.9 |
| 43-2011 | Switchboard Operators, Including Answering Service | Short | H.S. diploma/GED | ↔ | \$34,466 | Yes | 1.4 |
| 43-3011 | Bill and Account Collectors | Moderate | H.S. diploma/GED | ↑ | \$36,306 | Yes | 1.8 |
| 43-3021 | Billing and Posting Clerks | Short | H.S. diploma/GED | ↓ | \$39,378 | Yes | 1.9 |
| 43-3031 | Bookkeeping, Accounting, and Auditing Clerks | Moderate | H.S. diploma/GED | ↔ | \$40,655 | Yes | 1.2 |
| 43-3051 | Payroll and Timekeeping Clerks | Moderate | H.S. diploma/GED | ↑ | \$44,025 | Yes | 1.3 |
| 43-3061 | Procurement Clerks | Moderate | H.S. diploma/GED | ↑ | \$39,680 | Balanced | 0.8 |
| 43-4051 | Customer Service Representatives | Short | H.S. diploma/GED | ↓ | \$36,991 | Yes | 1.4 |
| 43-4071 | File Clerks | Short | H.S. diploma/GED | ↔ | \$31,622 | Yes | 1.1 |
| 43-4141 | New Accounts Clerks | Short | H.S. diploma/GED | ↔ | \$35,102 | No | -0.9 |
| 43-4161 | Human Resources Assistants, Except Payroll and Timekeeping | Short | H.S. diploma/GED | ↔ | \$40,988 | Yes | 1.4 |
| 43-4171 | Receptionists and Information Clerks | Short | H.S. diploma/GED | ↔ | \$29,825 | Yes | 1.5 |
| 43-6012 | Legal Secretaries | Moderate | H.S. diploma/GED | ↓ | \$50,449 | Yes | 0.6 |
| 43-6013 | Medical Secretaries | Moderate | H.S. diploma/GED | ↓ | \$39,529 | Yes | 1.6 |
| 43-6014 | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive | Short | H.S. diploma/GED | ↓ | \$39,269 | Yes | 1.3 |
| 43-9011 | Computer Operators | Moderate | H.S. diploma/GED | ↔ | \$47,144 | Yes | 2.2 |
| 43-9021 | Data Entry Keyers | Moderate | H.S. diploma/GED | ↔ | \$31,311 | Yes | 2.1 |
| 43-9022 | Word Processors and Typists | Short | H.S. diploma/GED | ↓ | \$47,724 | Balanced | 0.7 |
| 43-9031 | Desktop Publishers | Short | Associate's degree | ↑ | \$40,703 | Balanced | 1.1 |
| 43-9061 | Office Clerks, General | Short | H.S. diploma/GED | ↔ | \$33,384 | Yes | 1.4 |

^a Source: Bureau of Labor Statistics (BLS), details in Appendix B and C. Legend: ↑ - Training/education requirements have increased; ↓ - Training/education requirements have decreased; ↔ - Training/education requirements have remained unchanged.

^b Information applies to King County. Source: Washington State Employment Security Department (ESD)

The median annual wages in King County for 9 of the 20 entry-level occupations identified in Table 1 are higher than the median annual wages as reported in the 2010 American Community Survey for all jobholders ages 16 and over in the Seattle/King County area, which is \$39,920. The average median annual wage for the positions in Table 1 is \$37,214.⁶ Table 2 displays the wages for entry-level workers and experienced workers within selected occupations for professional and business services. For particular occupations in the professional and business services sector, there is very little variation between the 25th and 75th percentile for annual wages. This would indicate that these professions do not offer as much opportunity for wage increases compared to other occupations in the industry. For example, entry-level positions for file clerks earn approximately \$26,700 and experienced workers within this occupation earn

TABLE 2. Entry-Level (25th percentile) and Experienced (75th percentile) Wages for Professional and Business Services Occupations in King County

| Occupation | 2011 Entry-Level Wage | 2011 Experienced Wage |
|---|-----------------------|-----------------------|
| Medical Records & Health Information Technicians | \$31,990 | \$49,920 |
| Switchboard Operators, Including Answering Service | \$27,394 | \$38,314 |
| Bill & Account Collectors | \$27,040 | \$44,803 |
| Billing & Posting Clerks & Machine Operators | \$33,530 | \$45,282 |
| Bookkeeping, Accounting, & Auditing Clerks | \$33,218 | \$47,174 |
| Payroll & Timekeeping Clerks | \$37,814 | \$50,274 |
| Procurement Clerks | \$33,488 | \$47,195 |
| Customer Service Reps | \$29,453 | \$42,453 |
| File Clerks | \$26,707 | \$36,213 |
| New Accounts Clerks | \$30,909 | \$38,418 |
| Human Resources Assistants, Not Payroll & Timekeeping | \$35,360 | \$46,384 |
| Receptionists & Information Clerks | \$24,794 | \$34,445 |
| Legal Secretaries | \$38,501 | \$60,174 |
| Medical Secretaries | \$33,800 | \$47,819 |
| Secretaries, Not Legal, Medical, & Executive | \$33,155 | \$45,573 |
| Computer Operators | \$38,126 | \$54,226 |
| Data Entry Keyers | \$24,960 | \$37,170 |
| Word Processors & Typists | \$35,922 | \$57,533 |
| Desktop Publishers | \$34,195 | \$46,821 |
| Office Clerks, General | \$26,312 | \$38,376 |

6. The median annual wages for *all occupations* (from Table 1) was weighted based on the number of jobs available within each occupation.

approximately \$36,200, a difference of only \$9,500. Conversely, for other occupations within the industry, the wage gap between entry-level and experienced workers is much greater. Legal secretaries, for example, earn approximately \$38,500 as entry-level workers, but around \$60,200 as experienced workers (a difference of \$21,700).

TABLE 3. Shifts in Training and Education Requirements Over the Past 10 Years in the Professional and Business Services Industry (for Selected Occupations from Table 1)

| Occupation | Prior Training/Educ. Required (and year) | Current Training/Educ. Required (2010) | Training or education shift |
|---|--|--|-----------------------------|
| Billing and posting clerk | Moderate-term on-the-job training (OJT) (2006) | Short OJT | ↓ |
| Customer service representative | Moderate OJT (2008) | Short OJT | ↓ |
| New accounts clerk | Work experience (2008) | H.S. diploma/GED with some OJT | ↓ |
| Medical records and health information technician | Associate's degree (2008) | Postsecondary non-degree award | ↓ |
| Legal secretaries | Associate's degree (2008) | H.S. diploma/GED with some OJT | ↓ |
| Medical secretaries | Postsecondary vocational award (2004) | H.S. diploma/GED with some OJT | ↓ |
| Secretaries and administrative assistants | Moderate OJT (2008) | Short OJT | ↓ |
| Word processors and typists | Moderate OJT (2008) | Short OJT | ↓ |
| Payroll and timekeeping clerk | Short OJT (2000) | Moderate OJT | ↑ |
| Procurement clerk | Short OJT (2004) | Moderate OJT | ↑ |
| Bill and account collector | Short OJT (2008) | Moderate OJT | ↑ |
| Desktop publisher | Postsecondary vocational award (2008) | Associate's degree | ↑ |

Typical entry-level positions in professional and business services require a high school diploma or equivalent and short- to moderate-term on-the-job training. Table 3 provides the specific shifts in the training or education requirements that have occurred since 2000 for the entry-level occupations we identified. Most of the occupations listed in Table 3 previously required moderate-term on-the-job training, but more recently only require short-term training, or previously required more than the high school diploma that they now require. Additionally, four of the jobs listed in Table 3 require more training or education as of 2010 than previously required.

The majority of entry-level occupations within the business and professional services sector require a high school diploma (or equivalent) along with some amount of on-the-job training.⁷ Yet, for a number of occupations, the typical level of education required does not accurately reflect the actual distribution of individual educational levels within the occupation. For example, the entry-level requirement for procurement clerks is a high school diploma and moderate-term on-the-job training. However, all of the individuals employed as procurement clerks in the Seattle area have at least some college education according to the 2010 American Community Survey (with 64.4 percent having some college or an associate's degree and 35.6 percent having a bachelor's degree or higher). Similarly, for desktop publishers, an associate's degree may be the typical educational requirement, but nearly 41 percent of individuals employed in this occupation in the Seattle area have a bachelor's degree.

The final examination of entry-level employment within the business and professional services sector looks at how educational attainment has changed, if at all, within each occupation over the past decade in the greater Seattle area (Table 4). We do so by looking at Census data from 2000 and American Community Survey (ACS) data from 2005 and 2010. We then compare the 2010 data in Seattle to the entirety of the state. Overall, 12 of 18 occupations with complete data have shown an increase in the proportion of incumbent workers with education beyond a high school degree between 2000 and 2010. Further, within this sector, 14 of the 18 occupations have a higher level of educational attainment among incumbent workers in the Seattle area when compared to workers in the same positions in the entirety of Washington (inclusive of Seattle).

7. The specific knowledge, skills, and abilities required for each occupation tend to vary by employer; Appendix D provides an example of the typical technological skills needed and abilities required for one of the occupations listed in Table 1. A more comprehensive examination of occupation-based skills is beyond the scope of this report.

TABLE 4. Educational Attainment within Occupation for Selected Occupations in Professional and Business Services

| | | Seattle/King County* | | | | | | Washington* | |
|----------------------|---|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|
| | | 2000 | | 2005 | | 2010 | | 2010 | |
| SOC Code | Occupation | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher |
| 29-2071 | Medical Records and Health Information Technicians | 41.7% | 25.3% | 74.9% | 25.1% | 0.0% | 100.0% | 54.3% | 14.6% |
| 43-2011 | Switchboard Operators, Including Answering Service | 47.1% | 13.6% | 75.0% | 25.0% | 0.0% | 100.0% | 0.0% | 78.7% |
| 43-3011 | Bill and Account Collectors | 46.6% | 22.4% | 31.0% | 12.9% | 49.9% | 15.5% | 47.5% | 8.9% |
| 43-3021 | Billing and Posting Clerks | 44.5% | 21.6% | 52.3% | 18.8% | 70.4% | 23.0% | 61.8% | 16.2% |
| 43-3031 | Bookkeeping, Accounting, and Auditing Clerks | 54.1% | 19.3% | 43.5% | 20.1% | 44.8% | 28.1% | 51.3% | 17.6% |
| 43-3051 | Payroll and Timekeeping Clerks | 55.5% | 16.9% | 67.1% | 29.9% | 40.1% | 30.5% | 63.9% | 17.8% |
| 43-3061 | Procurement Clerks | 41.3% | 39.6% | 51.5% | 48.5% | 64.4% | 35.6% | 55.1% | 44.9% |
| 43-4051 | Customer Service Representatives | 44.6% | 27.5% | 40.6% | 27.9% | 43.9% | 29.6% | 49.1% | 18.7% |
| 43-4071 | File Clerks | 41.2% | 21.0% | 56.5% | 17.7% | 51.9% | 27.2% | 53.5% | 17.9% |
| 43-4141 | New Accounts Clerks | 40.9% | 34.8% | n/a | n/a | n/a | n/a | n/a | n/a |
| 43-4161 | Human Resources Assistants, Except Payroll and Timekeeping | 39.5% | 37.0% | 30.3% | 46.9% | 37.7% | 31.1% | 56.6% | 30.8% |
| 43-4171 | Receptionists and Information Clerks | 48.3% | 16.4% | n/a | n/a | n/a | n/a | n/a | n/a |
| 43-6012 ^a | Legal Secretaries | 53.0% | 24.7% | 50.6% | 25.2% | 44.7% | 33.9% | 53.1% | 20.3% |
| 43-6013 ^a | Medical Secretaries | 53.0% | 24.7% | 50.6% | 25.2% | 44.7% | 33.9% | 59.1% | 22.4% |
| 43-6014 ^a | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive | 53.0% | 24.7% | 50.6% | 25.2% | 44.7% | 33.9% | 44.9% | 33.1% |
| 43-9011 | Computer Operators | 49.3% | 23.4% | 21.6% | 58.0% | 27.6% | 59.4% | 59.1% | 22.4% |
| 43-9021 | Data Entry Keyers | 50.9% | 18.0% | 39.4% | 25.9% | 37.1% | 41.8% | 44.9% | 33.1% |
| 43-9022 | Word Processors and Typists | 53.0% | 25.7% | 37.9% | 32.3% | 24.4% | 29.6% | 58.9% | 16.8% |
| 43-9031 | Desktop Publishers | 52.9% | 42.7% | 46.5% | 40.6% | 41.8% | 40.9% | 48.6% | 23.3% |
| 43-9061 | Office Clerks, General | 50.4% | 21.4% | 54.8% | 23.8% | 45.0% | 43.8% | 55.2% | 24.6% |

^a 2000 Census lists as "Secretaries and Administrative Assistants (570) SOC 43-6010."

*n/a indicates that data was not available from the American Community Survey for this occupation.

TABLE 5. Training Requirements, Education Requirements, Wages, and Growth for 20 Selected Entry-Level Occupations in Logistics

| SOC Code | Occupation | On-the-job training required (2010) ^a | Education required (2010) ^a | Training or education shift (2000-2010) ^a | Median annual wage (2011) ^b | Occupation is "in-demand" (2010) ^b | Avg. annual growth (2014-2019)(%) ^b |
|----------|---|--|--|--|--|---|--|
| 17-3012 | Electrical and Electronics Drafters | None | Associate's degree | ↑ | \$67,431 | Balanced | 0.4 |
| 17-3023 | Electrical and Electronic Engineering Technicians | None | Associate's degree | ↔ | \$58,411 | Yes | 1.2 |
| 33-3052 | Transit and Railroad Police | Short | H.S. diploma/GED | ↓ | \$69,572 | No | 0.9 |
| 43-5041 | Meter Readers, Utilities | Short | H.S. diploma/GED | ↔ | \$49,517 | No | 0.6 |
| 43-5053 | Postal Service Mail Sorters, Processors, and Processing Machine Operators | Short | H.S. diploma/GED | ↔ | \$52,351 | No | 0.1 |
| 49-2093 | Electrical and Electronics Installers and Repairers, Transportation Equipment | Long | Postsecondary non-degree award | ↔ | \$50,144 | No | -0.4 |
| 49-2094 | Electrical and Electronics Repairers, Commercial and Industrial Equipment | Long | Postsecondary non-degree award | ↔ | \$69,935 | Yes | 0.2 |
| 49-2095 | Electrical and Electronics Repairers, Powerhouse, Substation, and Relay | Long | Postsecondary non-degree award | ↔ | \$70,567 | No | 1.4 |
| 49-9012 | Control and Valve Installers/Repairers, Except Mechanical Door | Moderate | H.S. diploma/GED | ↔ | \$74,850 | No | 0.9 |
| 49-9021 | Heating, Air Conditioning, and Refrigeration Mechanics and Installers | Long | Postsecondary non-degree award | ↑ | \$58,639 | Balanced | 2.2 |
| 49-9041 | Industrial Machinery Mechanics | Long | H.S. diploma/GED | ↔ | \$57,433 | Yes | 0.9 |
| 49-9051 | Electrical Power-Line Installers and Repairers | Long | H.S. diploma/GED | ↔ | \$68,217 | No | 0.6 |
| 49-9042 | Maintenance and Repair Workers, General | Moderate | H.S. diploma/GED | ↓ | \$42,931 | Yes | 1.3 |
| 49-9098 | Helpers—Installation, Maintenance, and Repair Workers | Moderate | H.S. diploma/GED | ↑ | \$32,072 | Yes | 0.6 |
| 51-8013 | Power Plant Operators | Long | H.S. diploma/GED | ↔ | \$81,366 | No | 0.7 |
| 51-8021 | Stationary Engineers and Boiler Operators | Long | H.S. diploma/GED | ↔ | \$60,082 | Balanced | 1.8 |
| 51-8031 | Water and Wastewater Treatment Plant and System Operators | Long | H.S. diploma/GED | ↔ | \$64,071 | No | 1.0 |
| 53-6031 | Automotive and Watercraft Service Attendants | Short | Less than H.S. | ↔ | \$22,439 | No | -0.6 |
| 53-6051 | Transportation Inspectors | Short | Some college, no degree | ↑ | \$72,986 | No | 0.5 |
| 53-7081 | Refuse and Recyclable Material Collectors | Short | Less than H.S. | ↔ | \$46,323 | Yes | 1.4 |

^a Source: Bureau of Labor Statistics (BLS), details in Appendix B and C. Legend: ↑ - Training/education requirements have increased; ↓ - Training/education requirements have decreased; ↔ - Training/education requirements have remained unchanged.

^b Information applies to King County. Source: Washington State Employment Security Department (ESD)

LOGISTICS

The logistics sector consists of occupations providing transportation, warehousing, and the production and delivery of utilities. Employment in logistics—also commonly referred to as the transportation and utilities services sector—has comprised an important part of the U.S. labor force over the past 50 years (Holzer & Lerman, 2007). In 1983, only 28 percent of logistics workers had at least some college education; this number increased to 48 percent by 1992 and maintained similar education requirements through 2008 (and is projected to remain the same through 2018) (Carnevale et al., 2010).

Recent data suggest that the availability of logistics jobs is on the decline, and that the education required for these jobs has not changed much over the past 20 years (Carnevale et al., 2010). While not particular to the logistics industry, workers with more education are projected to be in greater demand across all industries. The Center on Education and the Workforce forecasts the demand for workers in logistics with at least a bachelor’s degree to be 19 percent of the workforce by 2018; an additional 9 percent of the demand in the industry will be for workers with an associate’s degree; and more than 50 percent of the workforce demand in the industry will be for workers with a high school diploma or less (Carnevale et al., 2010). While there is a projected increase in demand for less educated workers, this industry is projected to have fewer jobs openings than most other industries (Carnevale et al., 2010). Employment in logistics is projected to decline from 4.2 percent (in 2008) of the country’s total employment to 4.1 percent of total employment by 2018 (Carnevale et al., 2010).

TABLE 6. Entry-Level (25th percentile) and Experienced (75th percentile) Wages for Logistics Occupations in King County

| Occupation | 2011 Entry-Level Wage | 2011 Experienced Wage |
|---|-----------------------|-----------------------|
| Electrical Engineers | \$71,947 | \$109,491 |
| Meter Readers, Utilities | \$43,347 | \$53,914 |
| Postal Service Mail Sorters/Processors/Processing Machine Operators | \$51,958 | \$53,955 |
| Electronics Install/Repair, Transportation Equipment | \$39,291 | \$58,198 |
| Electrical/Electronics Repairers, Industrial Equipment | \$57,408 | \$79,477 |
| Control & Valve Installers & Repairers (Not Mechanical Door) | \$55,661 | \$95,368 |
| Heating, Air Conditioning, Refrigeration Mechanics & Installers | \$44,782 | \$69,389 |
| Industrial Machinery Mechanics | \$48,693 | \$71,074 |
| Maintenance & Repair Workers, General | \$33,176 | \$52,978 |
| Helpers--Installation, Maintenance, & Repair Workers | \$23,421 | \$39,957 |
| Water & Liquid Waste Treatment Plant & System Operators | \$55,474 | \$73,757 |
| Service Station Attendants | \$19,323 | \$24,731 |
| Refuse & Recyclable Material Collectors | \$40,560 | \$56,035 |

We identified 20 entry-level occupations in the logistics industry (Table 5). On average, these occupations have a projected annual growth of 1.1 percent in King County between 2014-2019, which is a rate comparable to that of the manufacturing sector, lower than both professional and business services and healthcare.⁸ The majority of these entry-level logistics occupations are not in demand in King County, with only 30 percent of the occupations considered in demand (and another 15 percent considered neither expanding nor declining in demand). The median annual wages in King County for 18 of the 20 entry-level logistics occupations identified are higher than the median annual wages for all jobholders ages 16 and over in the Seattle/King County area as reported by the 2010 American Community Survey, which is \$39,920, with the exception of postal service mail sorters, processors, and processing machine operators. The average median annual wage for the occupations listed in Table 5 is \$49,625.⁹ Table 6 displays the wages for the 25th and 75th percentile of workers within selected occupations for logistics. For particular occupations in the logistics sector, there is very little variation between the 25th and 75th percentile for annual wages. Low variation between the percentiles indicates professions that do not offer as much opportunity for wage increases, occupations where an experienced worker makes little more than an entry-level worker. For example, entry-level positions for postal service mail sorters and processors earn approximately \$52,000 and experienced workers within this occupation earn approximately \$54,000, a difference of only \$2,000. Conversely, if the wage gap between entry-level and experienced workers is greater, this may be an indicator that wages significantly increase with on-the-job experience. Electrical engineers, for example, earn approximately \$71,900 as entry-level workers, but around \$109,500 as experienced workers (a difference of \$37,600).

TABLE 7. Shifts in Training and Education Requirements Over the Past 10 Years in the Logistics Industry (for Selected Occupations from Table 5)

| Occupation | Prior Training/Educ. Required (and year) | Current Training/Educ. Required (2010) | Training or education shift |
|--|--|--|-----------------------------|
| Maintenance and repair workers (general) | Long-term on-the-job training (OJT) (2000) | Moderate OJT | ↓ |
| Transit and railroad police | Long OJT (2008) | Short OJT | ↓ |
| Transportation inspectors | Work experience (2008) | Some college education with OJT | ↑ |
| Electrical and electronics drafters | Postsecondary vocational award (2008) | Associate's degree | ↑ |
| Helpers—installation, maintenance, repair workers | Short OJT (2008) | Moderate OJT | ↑ |
| Heating, air conditioning, and refrigeration mechanics | Moderate OJT (2008) | Long OJT | ↑ |

8. Projected annual growth rate for *all occupations* (from Table 5) was weighted based on the number of jobs available within each occupation.

9. The median annual wages for *all occupations* (from Table 5) was weighted based on the number of jobs available within each occupation.

Entry-level positions in logistics require educational levels that range from less than high school to an associate's degree, with the majority of the entry-level positions requiring a high school diploma or equivalent along with short- to long-term on-the-job training. Table 7 provides the specific shifts in the training or education requirements for those occupations indicated in Table 5. As demonstrated by Table 7, a few occupations from Table 5 lowered the amount of on-the-job training required, while others raised this training requirement.

For a number of occupations, the typical level of education required does not accurately reflect the distribution of educational attainment for incumbent workers (i.e., those currently employed in the occupation). For example, entry-level requirements for transit and railroad police are a high school diploma and short-term on-the-job training. However, nearly 95 percent of the individuals employed as transit and railroad police in the Seattle area have at least some college education according to the 2010 American Community Survey. Similarly, postal service mail sorters, processors, and processing machine operators typically are only required to have a high school diploma and short-term on-the-job training; however, over 30 percent of the individuals employed in this occupation in the Seattle area have at least some college education. Additionally, automotive and watercraft service attendants typically require less than a high school diploma and short-term on-the-job training; however, over 55 percent of the individuals employed in this occupation have at least a high school diploma in Seattle.

Conversely, there are a few occupations listed in Table 5 for which a substantial proportion of incumbent workers lack the current entry-level employment requirements for their occupation. This finding is suggestive of what is commonly referred to as *upskilling*, whereby current jobholders would not be able to garner their current job with the credentials they had in securing employment years ago. For electrical and electronic engineering technicians, the typical level of education required in the U.S. is an associate's degree, yet as of 2010, 34 percent of individuals employed in this occupation in the Seattle area had not earned an associate's degree.

The final examination of training is to look at how educational attainment has changed if at all, within each occupation over the past decade in the greater Seattle area (Table 8). We do so by looking at Census data from 2000 and American Community Survey (ACS) data from 2005 and 2010. We then compare the 2010 data in Seattle to the entirety of the state. Overall, 13 of 19 occupations with complete data have shown an increase in the proportion of incumbent workers with education beyond a high school degree between 2000 and 2010. Further, within this sector, 15 of the 19 occupations have a higher level of educational attainment among incumbent workers in the Seattle area when compared to workers in the same positions in the entirety of Washington (inclusive of Seattle).

TABLE 8. Educational Attainment within Occupation for Selected Occupations in Logistics

| | | Seattle/King County* | | | | | | Washington* | |
|----------------------|---|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|
| | | 2000 | | 2005 | | 2010 | | 2010 | |
| SOC Code | Occupation | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher |
| 17-3012 ^a | Electrical and Electronics Drafters | 63.8% | 26.4% | 44.9% | 40.7% | 21.3% | 66.3% | 52.8% | 30.8% |
| 17-3023 ^a | Electrical and Electronic Engineering Technicians | 61.9% | 18.9% | 45.4% | 25.9% | 49.5% | 18.1% | 61.0% | 15.3% |
| 33-3052 ^a | Transit and Railroad Police | 47.4% | 43.2% | 40.1% | 40.4% | 38.9% | 55.8% | 41.8% | 32.6% |
| 43-5041 | Meter Readers, Utilities | 44.8% | 17.0% | n/a | n/a | 71.4% | 28.6% | 74.5% | 17.1% |
| 43-5053 | Postal Service Mail Sorters, Processors, and Machine Operators | 39.7% | 18.5% | 7.5% | 20.9% | 31.4% | 0.0% | 43.6% | 7.0% |
| 49-2093b | Electrical/Electronic Installers and Repairers, Transportation Equip. | 29.2% | 38.5% | 58.5% | 0.0% | 57.1% | 42.9% | 56.7% | 15.0% |
| 49-2094 ^b | Electrical/Electronic Repairers, Commercial and Industrial Equip. | 29.2% | 38.5% | 58.5% | 0.0% | 57.1% | 42.9% | 56.7% | 15.0% |
| 49-2095 ^b | Electrical/Electronic Repairers, Powerhouse, Substation, and Relay | 29.2% | 38.5% | 58.5% | 0.0% | 57.1% | 42.9% | 56.7% | 15.0% |
| 49-9012 | Control and Valve Installers and Repairers, Except Mechanical Door | 50.0% | 3.3% | n/a | n/a | n/a | n/a | 67.9% | 0.0% |
| 49-9021 | Heating, Air Conditioning, and Refrigeration Mechanics and Installers | 48.6% | 4.8% | 22.5% | 0.0% | 15.7% | 24.5% | 31.2% | 8.2% |
| 49-9041 | Industrial Machinery Mechanics | 48.1% | 9.0% | 63.6% | 2.6% | 41.2% | 28.4% | 48.0% | 14.9% |
| 49-9051 | Electrical Power-Line Installers and Repairers | 44.9% | 11.5% | 38.4% | 0.0% | 47.7% | 24.7% | 42.9% | 5.6% |
| 49-9071 ^a | Maintenance and Repair Workers, General | 46.0% | 9.7% | 34.3% | 10.6% | 36.1% | 0.0% | 48.3% | 1.6% |
| 49-9098 | Helpers--Installation, Maintenance, and Repair Workers | 40.0% | 0.0% | 35.6% | 5.2% | 49.2% | 8.9% | 45.5% | 7.0% |
| 51-8013 | Power Plant Operators | 52.0% | 18.7% | n/a | n/a | 0.0% | 0.0% | 48.5% | 13.5% |
| 51-8021 | Stationary Engineers and Boiler Operators | 67.3% | 13.2% | 81.2% | 0.0% | 66.4% | 23.4% | 68.9% | 5.1% |
| 51-8031 | Water and Wastewater Treatment Plant and System Operators | 43.5% | 24.7% | 100.0% | 0.0% | 100.0% | 0.0% | 47.6% | 1.4% |
| 53-6031 | Automotive and Watercraft Service Attendants | 32.8% | 2.6% | 4.4% | 20.0% | 44.6% | 0.0% | 41.1% | 3.5% |
| 53-6051 | Transportation Inspectors | 52.1% | 15.3% | 29.0% | 27.9% | 25.5% | 74.5% | 49.6% | 19.5% |
| 53-7081 | Refuse and Recyclable Material Collectors | 29.0% | 4.5% | 0.0% | 0.0% | 0.0% | 0.0% | 31.3% | 10.7% |

^a Census 2000 listed electrical and electronics drafters as "Drafters (154) SOC 17-3010," electrical and electronic engineering technicians as "Engineering Technicians, Except Drafters (155) SOC 17-3020," transit and railroad police as "Police Officers (385) SOC 33-3050," and maintenance and repair workers as "Maintenance and Repair Workers, General SOC 49-9042."

^b Census 2000 collapsed SOC codes 49-2093, 49-2094, and 49-2095 into one occupation.

* n/a indicates that data was not available from the American Community Survey for this occupation.

TABLE 9. Training Requirements, Education Requirements, Wages, and Growth for 20 Selected Entry-Level Occupations in Healthcare

| SOC Code | Occupation | On-the-job training required (2010) ^a | Education required (2010) ^a | Training or education shift (2000-2010) ^a | Median annual wage (2011) ^b | Occupation is "in-demand" (2010) ^b | Avg. annual growth (2014-2019)(%) ^b |
|----------|---|--|--|--|--|---|--|
| 29-1124 | Radiation Therapists | None | Associate's degree | ↔ | \$99,290 | No | 2.9 |
| 29-1126 | Respiratory Therapists | None | Associate's degree | ↔ | \$66,445 | Yes | 2.9 |
| 29-2012 | Medical and Clinical Laboratory Technicians | None | Associate's degree | ↔ | \$41,990 | Yes | 1.8 |
| 29-2021 | Dental Hygienists | None | Associate's degree | ↔ | \$93,136 | Balanced | 0.6 |
| 29-2032 | Diagnostic Medical Sonographers | None | Associate's degree | ↔ | \$81,907 | Balanced | 1.9 |
| 29-2041 | Emergency Medical Technicians and Paramedics | None | Postsecondary non-degree award | ↔ | \$43,961 | Yes | 1.4 |
| 29-2052 | Pharmacy Technicians | Moderate | H.S. diploma/GED | ↔ | \$39,389 | Yes | 1.4 |
| 29-2055 | Surgical Technologists | None | Postsecondary non-degree award | ↔ | \$51,141 | Yes | 2.6 |
| 29-2056 | Veterinary Technologists and Technicians | None | Associate's degree | ↔ | \$30,554 | Yes | 2.0 |
| 29-2061 | Licensed Practical and Licensed Vocational Nurses | None | Postsecondary non-degree award | ↔ | \$48,460 | Yes | 1.1 |
| 29-2081 | Opticians, Dispensing | Long | H.S. diploma/GED | ↔ | \$48,974 | Balanced | 1.4 |
| 29-9012 | Occupational Health and Safety Technicians | Moderate | H.S. diploma/GED | ↓ | \$52,826 | No | 1.0 |
| 31-1011 | Home Health Aides | Short | Less than H.S. | ↔ | \$24,250 | Yes | 3.3 |
| 31-1013 | Psychiatric Aides | Short | H.S. diploma/GED | ↔ | \$27,144 | No | 1.2 |
| 31-2011 | Occupational Therapy Assistants | None | Associate's degree | ↔ | \$54,642 | Balanced | 3.3 |
| 31-2021 | Physical Therapist Assistants | None | Associate's degree | ↔ | \$51,755 | Balanced | 2.1 |
| 31-9091 | Dental Assistants | None | Postsecondary non-degree award | ↑ | \$40,186 | Yes | 0.3 |
| 31-9092 | Medical Assistants | Moderate | H.S. diploma/GED | ↔ | \$36,024 | Yes | 1.7 |
| 31-9093 | Medical Equipment Preparers | Moderate | H.S. diploma/GED | ↑ | \$34,082 | Balanced | 1.9 |
| 31-9094 | Medical Transcriptionists | None | Postsecondary non-degree award | ↔ | \$36,094 | Yes | 2.1 |

^a Source: Bureau of Labor Statistics (BLS), details in Appendix B and C. Legend: ↑ - Training/education requirements have increased; ↓ - Training/education requirements have decreased; ↔ - Training/education requirements have remained unchanged.

^b Information applies to King County. Source: Washington State Employment Security Department (ESD)

HEALTHCARE

The healthcare sector consists of occupations such as registered nurses and physical therapists that diagnose and treat medical conditions. Many of the occupations in this industry operate medical equipment or provide personal care services. The proportion of the U.S. labor force employed in the healthcare sector has steadily increased over the past 50 years (Holzer & Lerman, 2007). Employment in the healthcare industry is projected to grow from 11.2 percent (in 2008) of the country’s total employment to 12.7 percent of total employment by 2018 (Carnevale et al. 2010).

We identified 20 entry-level healthcare occupations (Table 9). On average, these entry-level positions have a projected annual growth of 1.8 percent in King County between 2014-2019.¹⁰ Four of the occupations we identified are among the top 25 occupations in King County in terms of projected annual growth rate between 2014-2019: radiation therapists (2.9 percent), respiratory therapists (2.9 percent), home health aides (3.3 percent), and occupational therapy assistants (3.3 percent). None of the entry-level

TABLE 10. Entry-Level (25th percentile) and Experienced (75th percentile) Wages for Healthcare Occupations in King County

| Occupation | 2011 Entry-Level Wage | 2011 Experienced Wage |
|---|-----------------------|-----------------------|
| Respiratory Therapists | \$56,410 | \$74,859 |
| Medical & Clinical Laboratory Technicians | \$34,528 | \$48,963 |
| Dental Hygienists | \$83,013 | \$103,958 |
| Diagnostic Medical Sonographers | \$72,842 | \$91,458 |
| Emergency Medical Technicians & Paramedics | \$24,461 | \$65,270 |
| Pharmacy Technicians | \$34,611 | \$43,347 |
| Surgical Technologists | \$42,661 | \$57,928 |
| Licensed Practical & Licensed Vocational Nurses | \$43,222 | \$54,766 |
| Occupational Health & Safety Technicians | \$42,557 | \$62,816 |
| Occupational Therapist Assistants | \$21,736 | \$25,979 |
| Physical Therapist Assistants | \$45,365 | \$58,053 |
| Dental Assistants | \$33,322 | \$46,467 |
| Medical Assistants | \$31,678 | \$39,458 |
| Medical Equipment Preparers | \$27,997 | \$38,334 |
| Medical Transcriptionists | \$25,147 | \$45,240 |

10. Projected annual growth rate for *all occupations* (from Table 9) was weighted based on the number of jobs available within each occupation.

healthcare occupations are projected to experience declining long-term job growth in King County. Additionally, the majority of these careers are in demand in King County. The exceptions are radiation therapists, occupational health and safety technicians, and psychiatric aides, which are not in demand.

The median annual wages in King County for the entry-level healthcare positions listed in Table 9 are higher than the median annual wages for 13 of the 20 entry-level healthcare occupations identified compared to all jobholders ages 16 and over in the Seattle/King County area as reported in the 2010 American Community Survey, which is \$39,920. The average median annual wage for the occupations in Table 9 is \$42,382.¹¹ Table 10 displays the wages for the 25th and 75th percentile of workers within selected occupations for healthcare. Within some occupations in the healthcare sector, entry-level and experienced workers earn about the same amount of income, whereas for other occupations the gap in earnings between entry-level and experienced workers is much larger. For example, entry-level positions for occupational therapist assistants earn approximately \$21,700 and experienced workers within this occupation earn approximately \$26,000, a difference of only \$4,300. Conversely, EMTs and paramedics earn approximately \$24,500 as entry-level workers, but around \$65,300 as experienced workers (a difference of \$40,800).

Typical entry-level positions in the healthcare industry require more than a high school diploma, with nearly half of the occupations we identify requiring at least an associate's degree. In 1983, 52 percent of healthcare workers in the U.S. had at least some college education; this number has steadily increased to 66 percent in 1992, 73 percent in 2008, and is projected to increase to 75 percent by 2018 (Carnevale et al., 2010).

The Center on Education and the Workforce forecasts the demand for workers with at least a bachelor's degree to be 39 percent of the workforce by 2018 in the healthcare industry; an additional 19 percent of the demand in the industry will be for workers with an associate's degree, and only a quarter of the workforce demand in the industry will be for workers with a high school diploma or less (Carnevale et al., 2010). The increased demand for workers with higher education is especially noteworthy in the healthcare industry because this sector is also projected to be one of the highest growth industries in terms of job openings (Carnevale et al., 2010).

For a number of occupations, the level of education required for entry-level employment does not accurately reflect the educational attainment of incumbent workers within the job. For example, an associate's degree is the entry-level requirement for medical

11. The median annual wages for *all occupations* (from Table 9) was weighted based on the number of jobs available within each occupation.

TABLE 11. Shifts in Training and Education Requirements Over the Past 10 Years in the Healthcare Industry (for Selected Occupations from Table 9)

| Occupation | Prior Training/Educ. Required (and year) | Current Training/Educ. Required (2010) | Training or education shift |
|--|--|--|-----------------------------|
| Occupational health and safety technicians | Bachelor's degree (2006) | H.S. diploma/GED and moderate OJT | ↓ |
| Dental assistants | Moderate (2008) | Postsecondary non-degree award | ↑ |
| Medical equipment preparers | Short OJT (2008) | Moderate OJT | ↑ |

and clinical laboratory technicians. However, over half of the individuals employed as medical and clinical laboratory technicians in the Seattle area have at least a bachelor's degree according to the 2010 American Community Survey.

For several jobs listed in Table 9, entry-level employment necessitates a high school diploma (or equivalent) along with some amount of on-the-job training. Table 11 provides the specific shifts in the training or education requirements for those occupations indicated in Table 9. For example, occupational health and safety technicians previously required an associate's degree (in 2008), but decreased to a high school diploma with some on-the-job training by 2010. Nonetheless, all of the individuals employed in 10 of the 20 entry-level healthcare professions in the Seattle area have at least some college education. Further, for most occupations, all of the incumbent workers within each occupation have at least some level of education beyond high school. For example, a high school diploma is considered the entry-level requirement for occupational health and safety technicians, yet in the Seattle area nearly 20 percent have some college or an associate's degree and the remaining 80 percent have a bachelor's degree or higher. Similarly, home health aides typically require less than a high school diploma with some short-term on-the-job training, yet nearly 90 percent of Seattle incumbent workers have at least a high school diploma.

The final examination of training is to look at how educational attainment has changed, if at all, within each occupation over the past decade in the greater Seattle area (Table 12). We do so by looking at Census data from 2000 and American Community Survey (ACS) data from 2005 and 2010. We then compare the 2010 data in Seattle to the entirety of the state. Overall, 18 of 19 occupations with complete data have shown an increase in the proportion of incumbent workers with education beyond a high school degree between 2000 and 2010. Further, within this sector, 17 of the 19 occupations have a higher level of educational attainment among incumbent workers in the Seattle area when compared to workers in the same positions in the entirety of Washington (inclusive of Seattle).

TABLE 12. Educational Attainment within Occupation for Selected Occupations in Healthcare

| | | Seattle/King County* | | | | | | Washington* | |
|----------------------|---|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|
| | | 2000 | | 2005 | | 2010 | | 2010 | |
| SOC Code | Occupation | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher |
| 29-1124 | Radiation Therapists | 60.9% | 29.6% | n/a | n/a | 100.0% | 0.0% | 67.5% | 32.5% |
| 29-1126 | Respiratory Therapists | 77.4% | 19.3% | 21.0% | 79.0% | 74.4% | 25.6% | 83.0% | 17.0% |
| 29-2012 | Medical and Clinical Laboratory Technicians | 27.1% | 67.0% | 40.0% | 60.0% | 14.3% | 85.7% | 26.7% | 68.1% |
| 29-2021 | Dental Hygienists | 46.9% | 50.9% | 39.0% | 61.0% | 63.3% | 36.7% | 54.5% | 45.5% |
| 29-2032 | Diagnostic Medical Sonographers | 65.2% | 28.8% | 58.6% | 41.4% | 44.1% | 55.9% | 57.5% | 41.3% |
| 29-2041 | Emergency Medical Technicians and Paramedics | 79.1% | 17.0% | 100.0% | 0.0% | 80.8% | 19.2% | 66.4% | 18.9% |
| 29-2052 | Pharmacy Technicians | 60.4% | 19.1% | 62.4% | 14.7% | 36.7% | 50.1% | 50.1% | 20.5% |
| 29-2055 | Surgical Technologists | 60.4% | 19.1% | 62.4% | 14.7% | 36.7% | 50.1% | 50.1% | 20.5% |
| 29-2056 | Veterinary Technologists and Technicians | 60.4% | 19.1% | 62.4% | 14.7% | 36.7% | 50.1% | 50.1% | 20.5% |
| 29-2061 | Licensed Practical and Licensed Vocational Nurses | 68.4% | 13.1% | 57.4% | 22.3% | 73.5% | 26.5% | 78.5% | 9.2% |
| 29-2081 | Opticians, Dispensing | 60.3% | 24.4% | n/a | n/a | 0.0% | 0.0% | 78.2% | 5.9% |
| 29-9012 ^a | Occupational Health and Safety Technicians | 23.2% | 62.6% | 29.4% | 70.6% | 18.7% | 81.3% | 25.9% | 70.4% |
| 31-1011 | Home Health Aides | 42.0% | 20.6% | 43.2% | 21.9% | 42.8% | 24.2% | 46.1% | 12.5% |
| 31-1013 | Psychiatric Aides | 42.0% | 20.6% | 43.2% | 21.9% | 42.8% | 24.2% | 46.1% | 12.5% |
| 31-2011 | Occupational Therapy Assistants | 98.5% | 0.0% | 6.7% | 93.3% | n/a | n/a | 100.0% | 0.0% |
| 31-2021 | Physical Therapist Assistants | 58.0% | 29.6% | 100.0% | 0.0% | 22.1% | 77.9% | 53.4% | 44.2% |
| 31-9091 | Dental Assistants | 64.2% | 7.4% | 81.1% | 7.4% | 63.5% | 12.5% | 74.3% | 6.0% |
| 31-9092 ^b | Medical Assistants | 52.2% | 23.8% | 51.4% | 25.8% | 71.1% | 6.2% | 71.9% | 5.7% |
| 31-9093 ^b | Medical Equipment Preparers | 52.2% | 23.8% | 51.4% | 25.8% | 79.2% | 7.0% | 56.6% | 14.5% |
| 31-9094 ^b | Medical Transcriptionists | 52.2% | 23.8% | 51.4% | 25.8% | 20.1% | 79.9% | 62.1% | 27.4% |

^a Census 2000 lists occupational health and safety technicians with "Other Healthcare Practitioners and Technical Occupations (354) SOC 29-9000."

^b Census 2000 combines medical assistants, equipment preparers, and transcriptionists as "Medical Assistants and Other Healthcare Support Occupations (365) SOC 31-909X."

* n/a indicates that data was not available from the American Community Survey for this occupation.

TABLE 13. Training Requirements, Education Requirements, Wages, and Growth for 20 Selected Entry-Level Occupations in Manufacturing

| SOC Code | Occupation | On-the-job training required (2010) ^a | Education required (2010) ^a | Training or education shift (2000-2010) ^a | Median annual wage (2011) ^b | Occupation is "in-demand" (2010) ^b | Avg. annual growth (2014-2019)(%) ^b |
|----------|---|--|--|--|--|---|--|
| 51-2011 | Aircraft Structure, Surfaces, Rigging, and Systems Assemblers | Moderate | H.S. diploma/GED | ↓ | \$54,043 | Yes | -0.5 |
| 51-2022 | Electrical and Electronic Equipment Assemblers | Short | H.S. diploma/GED | ↔ | \$33,545 | Yes | 2.2 |
| 51-2092 | Team Assemblers | Moderate | H.S. diploma/GED | ↔ | \$34,072 | Yes | 1.5 |
| 51-2099 | Assemblers and Fabricators, All Other | Moderate | H.S. diploma/GED | ↔ | \$31,914 | Yes | 1.8 |
| 51-3011 | Bakers | Long | Less than H.S. | ↔ | \$30,418 | Balanced | 0.4 |
| 51-3022 | Meat, Poultry, and Fish Cutters and Trimmers | Short | Less than H.S. | ↔ | \$30,458 | Yes | 2.4 |
| 51-4041 | Machinists | Long | H.S. diploma/GED | ↔ | \$55,360 | Yes | 0.6 |
| 51-5022 | Prepress Technician and Workers | None | Postsecondary non-degree award | ↑ | \$42,542 | No | 0.2 |
| 51-5023 | Printing Machine Operators | Moderate | H.S. diploma/GED | ↔ | \$40,589 | No | 0.6 |
| 51-6011 | Laundry and Dry-Cleaning Workers | Short | Less than H.S. | ↓ | \$24,364 | No | 0.5 |
| 51-6031 | Sewing Machine Operators | Short | Less than H.S. | ↓ | \$26,575 | Balanced | 0.3 |
| 51-6052 | Tailors, Dressmakers, and Custom Sewers | Moderate | Less than H.S. | ↓ | \$31,121 | No | 0.3 |
| 51-6093 | Upholsterers | Moderate | H.S. diploma/GED | ↓ | \$41,378 | No | 0.7 |
| 51-7011 | Cabinetmakers and Bench Carpenters | Moderate | H.S. diploma/GED | ↓ | \$38,080 | No | 0.8 |
| 51-8091 | Chemical Plant and System Operators | Long | H.S. diploma/GED | ↔ | \$47,058 | N/A | 0.0 |
| 51-9032 | Cutting and Slicing Machine Setters, Operators, and Tenders | Short | H.S. diploma/GED | ↓ | \$32,150 | No | 0.9 |
| 51-9061 | Inspectors, Testers, Sorters, Samplers, and Weighers | Moderate | H.S. diploma/GED | ↔ | \$49,187 | Yes | 0.3 |
| 51-9071 | Jewelers and Precious Stone and Metal Workers | Long | H.S. diploma/GED | ↓ | \$41,514 | Balanced | 1.0 |
| 51-9111 | Packaging and Filling Machine Operators and Tenders | Moderate | H.S. diploma/GED | ↑ | \$31,474 | Yes | 1.5 |
| 51-9198 | Helpers--Production Workers | Short | Less than H.S. | ↔ | \$27,672 | Yes | 2.5 |

^a Source: Bureau of Labor Statistics (BLS), details in Appendix B and C. Legend: ↑ - Training/education requirements have increased; ↓ - Training/education requirements have decreased; ↔ - Training/education requirements have remained unchanged.

^b Information applies to King County. Source: Washington State Employment Security Department (ESD)

MANUFACTURING

The manufacturing sector consists of jobs using machines and handling equipment in plants and factories, and also occupations such as bakers, jewelers, and tailors. Employment in the manufacturing industry is projected to decline from 9.3 percent (in 2008) of the country's total employment to 8.1 percent of total employment by 2018 (Carnevale et al., 2010). Employment in the manufacturing sector has steadily comprised less and less of the labor force over the past 50 years, making up an estimated 28.4 percent of the labor market in 1960 and around 10 percent today (Holzer & Lerman, 2007). In 1983, 22 percent of manufacturing workers had at least some college education. This increased to 34 percent in 2008 and is projected to increase to 38 percent by 2018 (Carnevale et al., 2010). But although the proportion of overall U.S. employment within manufacturing is on the decline, more education is required for the manufacturing jobs that remain. For example, recent evidence suggests that the industry is beset by a severe shortage of skilled technicians to operate in the modern manufacturing industry, in which brawn has been replaced by high-skilled laborers with degrees beyond high school and often less than an associate's degree (e.g., Hemphill and Perry, 2012).

TABLE 14. Entry-Level (25th percentile) and Experienced (75th percentile) Wages for Manufacturing Occupations in King County

| Occupation | 2011 Entry-Level Wage | 2011 Experienced Wage |
|--|-----------------------|-----------------------|
| Electrical & Electronic Equipment Assemblers | \$27,102 | \$39,291 |
| Team Assemblers | \$26,000 | \$39,582 |
| Assemblers & Fabricators, All Other | \$24,294 | \$36,858 |
| Bakers | \$23,816 | \$36,691 |
| Meat, Poultry, & Fish Cutters & Trimmers | \$20,405 | \$39,957 |
| Machinists | \$40,747 | \$64,418 |
| Prepress Technicians & Workers | \$32,635 | \$50,357 |
| Printing Machine Operators | \$32,365 | \$48,838 |
| Laundry & Dry-Cleaning Workers | \$20,010 | \$27,685 |
| Sewing Machine Operators | \$21,299 | \$32,219 |
| Upholsterers | \$27,602 | \$50,003 |
| Cabinetmakers & Bench Carpenters | \$28,330 | \$40,123 |
| Inspectors, Testers, Sorters, Samplers, & Weighers | \$36,400 | \$65,270 |
| Jewelers & Precious Stone & Metal Workers | \$31,408 | \$46,155 |
| Packaging & Filling Machine Operators & Tenders | \$23,774 | \$36,712 |
| Helpers--Production Workers | \$21,965 | \$30,950 |

Table 13 showcases the 20 entry-level occupations we identified in the manufacturing sector. On average, these occupations have a projected annual growth of 1.0 percent in King County between 2014-2019, which is comparable to the logistics sector.¹² Manufacturing occupations in King County are mixed in terms of demand for employment, with 45 percent in demand and 35 percent not in demand. The median annual wages in King County for 8 of the 20 entry-level manufacturing occupations identified are higher than the median annual wages for all jobholders ages 16 and over in the Seattle/King County area as reported by the 2010 American Community Survey, which is \$39,920. The average median annual wage for the occupations listed in Table 13 is \$37,756.¹³ Table 14 displays the wages for the 25th and 75th percentile of workers within selected occupations for manufacturing. All of the occupations have some wage variation. For example, among inspectors, testers, sorters, samplers, and weighers, entry-level workers earn approximately \$36,400, whereas experienced workers earn around \$65,300 (a difference of \$28,900).

TABLE 15. Shifts in Training and Education Requirements Over the Past 10 Years in the Manufacturing Industry (for Selected Occupations from Table 13)

| Occupation | Prior Training/Educ. Required (and year) | Current Training/Educ. Required (2010) | Training or education shift |
|---|--|--|-----------------------------|
| Aircraft structure, surfaces, rigging, and systems assemblers | Long-term on-the-job training (OJT) (2004) | Moderate OJT | ↓ |
| Upholsterers | Long OJT (2008) | Moderate OJT | ↓ |
| Cabinetmakers and bench carpenters | Long OJT (2008) | Moderate OJT | ↓ |
| Tailors, dressmakers, and custom sewers | Long OJT (2008) | Moderate OJT | ↓ |
| Jewelers and precious stone and metal workers | Postsecondary vocational award (2008) | H.S. diploma/GED with some OJT | ↓ |
| Laundry and dry-cleaning workers | Moderate OJT (2008) | Short OJT | ↓ |
| Sewing machine operators | Moderate OJT (2008) | Short OJT | ↓ |
| Cutting and slicing machine setters, operators, and tenders | Moderate OJT (2008) | Short OJT | ↓ |
| Packaging and filling machine operators and tenders | Short OJT (2008) | Moderate OJT | ↑ |
| Prepress technicians and workers | Long OJT (2002) | Postsecondary vocational award | ↑ |

12. Projected annual growth rate for *all occupations* (from Table 13) was weighted based on the number of jobs available within each occupation.

13. The median annual wages for *all occupations* (from Table 13) was weighted based on the number of jobs available within each occupation.

The Center on Education and the Workforce forecasts the demand for workers with an associate's degree to be 11 percent of the manufacturing industry by 2018, and approximately 46 percent of the workforce demand in the industry will be for workers with a high school diploma or less (Carnevale et al., 2010). By and large, entry-level positions in the manufacturing industry require a high school diploma. Yet, 30 percent of the occupations we identify require only on-the-job training and do not require a high school diploma. Table 15 provides the specific shifts in the training or education requirements for those occupations indicated in Table 13. Most of the jobs listed in Table 15 require less on-the-job training than previously (with jewelers requiring less *education* as well). While there may appear to be a higher demand for less educated workers in this sector, this industry is projected to have fewer jobs openings than most other industries (Carnevale et al., 2010).

For a number of entry-level manufacturing occupations—as with other occupations in the Seattle area—the level of education required for employment does not accurately reflect the distribution of educational credentials among the current workforce. Many of the jobs identified do not require a high school diploma. Nevertheless, for all but three occupations (printing press operators, laundry and dry-cleaning workers, and jewelers and precious stone and metal workers), over 40 percent of the existing labor force has at least some college education.

The final examination of training is to look at how educational attainment has changes, if at all, within each occupation over the past decade in the greater Seattle area, as presented in Table 16. We do so by looking at Census data from 2000 and American Community Survey (ACS) data from 2005 and 2010. We then compare the 2010 data in Seattle to the entirety of the state. Overall, 11 of 19 occupations with complete data have shown an increase in the proportion of incumbent workers with education beyond a high school degree between 2000 and 2010. Further, within this sector, 13 of the 19 occupations have a higher level of educational attainment among incumbent workers in the Seattle area when compared to workers in the same positions in the entirety of Washington (inclusive of Seattle). Compared to the other four sectors examined, manufacturing occupations in the Seattle area showed the largest overall decline in the number of entry-level occupations with decreases in the proportion of incumbent workers with education above a high school diploma.

TABLE 16. Educational Attainment within Occupation for Selected Occupations in Manufacturing

| | | Seattle/King County* | | | | | | Washington* | |
|----------------------|---|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|
| | | 2000 | | 2005 | | 2010 | | 2010 | |
| SOC Code | Occupation | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher | Some college or A.A. degree | B.A. degree or higher |
| 51-2011 | Aircraft Structure, Surfaces, Rigging, and Systems Assemblers | 55.2% | 4.6% | 0.0% | 0.0% | 88.6% | 0.0% | 85.8% | 0.0% |
| 51-2022 | Electrical and Electronic Equipment Assemblers | 30.8% | 5.5% | 28.3% | 0.0% | 54.1% | 6.5% | 54.4% | 2.3% |
| 51-2092 ^a | Team Assemblers | 27.4% | 9.6% | 21.0% | 15.5% | 30.0% | 10.5% | 32.4% | 6.1% |
| 51-2099 ^a | Assemblers and Fabricators, All Other | 27.4% | 9.6% | 21.0% | 15.5% | 30.0% | 10.5% | 32.4% | 6.1% |
| 51-3011 | Bakers | 35.7% | 13.0% | 26.4% | 19.1% | 19.7% | 22.7% | 36.1% | 11.9% |
| 51-3022 | Meat, Poultry, and Fish Cutters and Trimmers | 28.3% | 11.6% | 0.0% | 0.0% | 31.7% | 14.6% | 18.8% | 4.0% |
| 51-4041 | Machinists | 48.5% | 2.9% | 34.5% | 5.6% | 59.3% | 5.4% | 60.4% | 4.1% |
| 51-5111 ^b | Prepress Technician and Workers | 46.8% | 24.0% | 26.6% | 0.0% | 42.5% | 36.2% | 66.6% | 15.0% |
| 51-5112 ^b | Printing Press Operators | 38.7% | 8.1% | 78.8% | 0.0% | 49.7% | 5.8% | 53.1% | 8.8% |
| 51-6011 | Laundry and Dry-Cleaning Workers | 27.5% | 10.2% | 5.9% | 8.2% | 16.4% | 10.6% | 16.1% | 5.5% |
| 51-6031 | Sewing Machine Operators | 16.5% | 4.8% | 6.5% | 23.4% | 7.0% | 0.0% | 13.2% | 7.0% |
| 51-6052 | Tailors, Dressmakers, and Custom Sewers | 31.1% | 16.5% | 0.0% | 0.0% | 0.0% | 29.1% | 26.9% | 15.9% |
| 51-6093 | Upholsterers | 28.6% | 7.6% | 67.6% | 0.0% | 0.0% | 100.0% | 35.5% | 37.7% |
| 51-7011 | Cabinetmakers and Bench Carpenters | 36.3% | 17.3% | 100.0% | 0.0% | 100.0% | 0.0% | 37.3% | 6.0% |
| 51-8091 | Chemical Plant and System Operators | 58.7% | 0.0% | n/a | n/a | n/a | n/a | n/a | n/a |
| 51-9032 | Cutting and Slicing Machine Setters, Operators, and Tenders | 26.9% | 7.1% | 25.6% | 10.9% | 12.4% | 0.0% | 23.4% | 0.0% |
| 51-9061 | Inspectors, Testers, Sorters, Samplers, and Weighers | 45.1% | 21.9% | 39.0% | 8.3% | 36.1% | 29.6% | 39.2% | 18.1% |
| 51-9071 | Jewelers and Precious Stone and Metal Workers | 43.5% | 18.3% | 79.0% | 0.0% | 0.0% | 0.0% | 14.0% | 46.2% |
| 51-9111 | Packaging and Filling Machine Operators and Tenders | 19.7% | 6.1% | 26.8% | 0.0% | 19.0% | 16.5% | 22.9% | 7.6% |
| 51-9198 | Helpers--Production Workers | 27.7% | 4.7% | 51.4% | 0.0% | 0.0% | 0.0% | 16.8% | 0.0% |

^a Census 2000 lists team assemblers and assemblers and fabricators (all other) together as "Miscellaneous Assemblers and Fabricators (775) SOC 51-2090."

^b Census 2000 lists as "Prepress Technicians and Workers (825) SOC 51-5022" and "Printing Machine Operators (826) SOC 51-5023."

* n/a indicates that data was not available from the American Community Survey for this occupation.

SUMMARY

Overall, long-term job growth in the U.S. economy is expected to increase by 14.3 percent over the coming decade (Bureau of Labor Statistics, 2012c). Thus, while the bulk of job growth in the U.S. economy will be in jobs requiring at least some postsecondary education, a substantial amount of labor market growth will be in occupations that require less than a bachelor's degree. Among the entry-level jobs we identified in this report, annual growth is projected at less than 2 percent overall within King County (between 2014 and 2019). Within each of the industries we focus on, projected average annual job growth between for the 20 occupations is 1.4 percent for professional and business services, 1.8 percent for health care, 1.1 percent for logistics, and 1.0 percent for manufacturing.

Our assessment of entry-level employment in the Seattle area over the past decade finds the following:

- 12 of 80 jobs increased their training requirements (4 in professional and business services, 4 in logistics, 2 in healthcare, and 2 in manufacturing).
- 18 of 80 jobs decreased their training requirements (7 in professional and business services, 2 in logistics, 1 in healthcare, and 8 in manufacturing).
- 54 of 75 jobs (72 percent; 5 jobs lack comparable data) have shown an increase in the educational attainment of incumbent workers over the last decade in the Seattle area (12 in professional and business services, 13 in logistics, 18 in healthcare, and 11 in manufacturing).

While many of the professional and business services sector jobs indicate that the typical education is a high school diploma with some on-the-job training, the distribution of educational attainment within occupations demonstrates an increased demand for workers with higher educational attainment and training. This is especially important for the Seattle/King County area, as this industry is projected to have higher growth than other industries over the next ten years. Similarly, the healthcare industry is one of the fastest growing areas of the local and national economy. Many of the occupations in this industry contain the highest occupational-specific rates of growth and are considered in-demand in Seattle/King County. Like the professional and business services sector, educational attainment in the healthcare industry has been steadily increasing and the demand for workers with higher levels of education has been increasing as well.

Job growth in the logistics sector is expected to remain relatively stagnant compared to other industries, with fewer projected job openings and a lower proportion of in-demand occupations. Furthermore, the educational attainment of workers within the logistics sector and the training requirements for many occupations therein are not expected to substantially change over the next decade. While the educational composition of the logistics industry is not expected to undergo a significant shift in the coming years, current data indicates that many occupations within this sector require more than a high school diploma and the educational attainment of individuals within these occupations is often higher than the education that is typically required. Manufacturing jobs are projected to decline over the next decade, with these jobs composing less and less of the labor market. Of the four sectors examined in the report, manufacturing has the lowest percentage of entry-level occupations that require workers to have educational credentials beyond a high school diploma. However, evidence exists that the manufacturing jobs that remain will require some advanced education beyond a high school diploma.

It may prove critical for many individuals seeking work in all sectors to receive more than just the minimum education and training requirements that are typical of jobs in this industry. As industries grow and employ higher-skilled labor, workers will need to increase their skills and education to remain competitive with younger workers who often have higher levels of educational attainment than incumbent workers, as well as to keep pace with the increasing technical requirements of jobs in all fields.

Additional training beyond the minimum requirements may also be necessary in the Seattle/King County area, as the education and training requirements assigned by BLS are based on national data. Thus, higher levels of education and training requirements may be required for all occupations in major metropolitan areas such as Seattle/King County, where the competition for jobs, and concomitantly credentials needed to compete in the labor market, are higher than in the rest of Washington or the nation. For example, of the entry-level occupations identified in this report, 59 of the 75 (approximately 79 percent) with available data show higher rates of educational attainment among incumbent workers in Seattle/King County than for workers in those occupations throughout Washington (inclusive of Seattle/King County) as of 2010. This pattern among the entry-level occupations identified in this report matches the overall educational attainment for the Seattle/King County labor market compared to the entirety of the state. Whereas just over 40 percent of individuals ages 16 and over in the Seattle/King County area have an associate's degree or higher, the proportion for Washington is just below 30 percent. Further, the difference when looking at individuals with a bachelor's degree or higher is 34 percent in Seattle/King County and just below 23 percent in Washington.

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Appendix A - Entry-Level versus Middle-Wage Jobs

In this report, we define *entry-level jobs* as those requiring not more than an associate's degree. These jobs require little to no prior work experience in a related area and typically require some level of on-the-job training, and are non-managerial. Additionally, we do not place any restriction on the wages these jobs typically pay.

The Middle-Wage Jobs Report (Seattle Jobs Initiative, 2011) defines middle-wage jobs as those requiring at least a high school diploma, but not necessarily a four-year degree, and that pay a living wage (defined as an hourly wage \$15.91), but do not place any restriction on managerial status.

Because these definitions overlap, 26 of the 80 (approximately 33 percent) entry-level occupations identified in this report are also included in the middle-wage jobs report. Specifically, this breaks down to 10 occupations within the professional and business services industry, three in the logistics industry, nine in the healthcare industry, and four in the manufacturing industry. Of the remaining 54 entry-level occupations identified in this report, many would likely be considered middle-wage as well, though they were not included in the latest Middle-Wage Jobs Report.

Appendix B - Selected Occupations and Industries

Entry-level occupations were identified that satisfied the criteria of: (a) requiring an associate's degree or less, (b) requiring little or no experience in a related occupation, and (c) falling primarily within one of the four identified industry sectors of interest (based on Census data and North American Industry Classification System (NAICS) industry codes). Drawing upon existing reports from SJI, and using the occupation codes (SOC) provided by the Employment Security Department (ESD) for King County, twenty occupations were identified within each sector that satisfied the above criteria. For jobs that span multiple sectors, occupations were selected and categorized based on their prevalence within NAICS industries. For example, while new accounts clerks are found in almost all industry sectors, the occupation is most commonly associated with the professional and business services sector based on NAICS codes.

Appendix C - BLS Training Requirements

HOW BLS DETERMINES OCCUPATIONAL TRAINING REQUIREMENTS

BLS uses a combination of quantitative and qualitative information in order to determine training requirements for occupations. The quantitative includes information on the percent of jobholders at each education level within a given occupation from the American Community Survey (ACS), as well as data on education, work experience, and on-the-job training requirements from the Occupational Information Network (ONet). BLS also relies on qualitative information obtained from educators, employers, workers in the occupation, training experts, and representatives of professional and trade associations and unions. For more information, see the BLS documentation (Bureau of Labor Statistics, 2012d).

2010 REVISION IN HOW BLS DETERMINES OCCUPATIONAL TRAINING REQUIREMENTS

Prior to 2010, the BLS assigned the most significant source of education or training. This system had 11 categories and placed on-the-job training requirements together with education requirements. The new system, first used in 2010, now provides entry-level education requirements and on-the-job training as separate categories. Accordingly, some occupations will have a different education/training level assigned in 2010 than in prior years.

As BLS explains, the assignments under the new system describe the typical education needed to enter, and the typical type of on-the-job training required to be competent. The work experience in a related occupation assignment represents what employers commonly consider necessary or is a commonly accepted substitute for formal training. The three assignments complement each other in that they would represent a typical "path of entry" into the occupation, but they are not necessarily equal in importance for entry into the occupation. For more information, see the BLS documentation (Bureau of Labor Statistics, 2012a; 2012d).

2010 BLS OCCUPATIONAL TRAINING REQUIREMENTS

Below we provide the education and on the job training categories BLS assigns to each occupation. For a complete description of each, see the BLS documentation (Bureau of Labor Statistics, 2011b).

Typical education needed for entry

This factor describes the typical level of education that most workers need to enter the occupation.

- ***Associate's degree.***
- ***Postsecondary non-degree award.***
- ***Some college, no degree.***
- ***High school diploma or equivalent.***
- ***Less than high school.***

Typical on-the-job training needed to attain competency in the occupation

This factor encompasses any additional training or preparation that is typically needed, once employed in an occupation, to attain competency in the skills needed in that occupation. Training

is occupation-specific rather than job-specific; skills learned can be transferred to another job in the same occupation.

- **Long-term on-the-job training.** More than 12 months of on-the-job training or, alternatively, combined work experience and formal classroom instruction, are needed for workers to develop the skills to attain competency.
- **Moderate-term on-the-job training.** Skills needed for a worker to attain competency in an occupation that can be acquired during 1 to 12 months of combined on-the-job experience and informal training.
- **Short-term on-the-job training.** Skills needed for a worker to attain competency in an occupation that can be acquired during 1 month or less of on-the-job experience and informal training.
- **None.** There is no additional occupation-specific training or preparation typically required to attain competency in the occupation.

Appendix D – Knowledge, Skills, and Abilities Required to be a Desktop Publisher in Washington State

The Occupational Information Network provides state specific data on most occupations for Washington State (ONet Online, 2010). For example, the typical tasks required of desktop publishers include:

- Check preliminary and final proofs for errors and make necessary corrections.
- Operate desktop publishing software and equipment to design, lay out, and produce camera-ready copy.
- Position text and art elements from a variety of databases in a visually appealing way to design print or web pages, using knowledge of type styles and size and layout patterns.
- Convert various types of files for printing or for the Internet, using computer software.
- Transmit, deliver or mail publication master to printer for production into film and plates.
- Study layout or other design instructions to determine work to be done and sequence of operations.
- Enter digitized data into electronic prepress system computer memory, using scanner, camera, keyboard, or mouse.
- View monitors for visual representation of work in progress and for instructions and feedback throughout process, making modifications as necessary.
- Import text and art elements such as electronic clip-art or electronic files from photographs that have been scanned or produced with a digital camera, using computer software.
- Collaborate with graphic artists, editors and writers to produce master copies according to design specifications.

Desktop publishers are expected to be able to use desktop computers, graphics tablets, laser printers, notebook computers, and scanners, as well as have a familiarity with any, or all, of the following: data conversion software, desktop publishing software, development environment software, graphics or photo imaging software, and optical character reader or scanning software.