2019

WASHINGTON APPRENTICESHIP GROWTH AND EXPANSION STUDY

PREPARED FOR THE

WASHINGTON STATE LABOR COUNCIL

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EXECUTIVE SUMMARY

Summary of Results

WAGES examines the impact an apprenticeship's model of governance and funding has on apprentice and taxpayer outcomes for the program, comparing the performance of joint labor-management partnership ("JLMP") apprenticeship programs in Washington state to non-union multi-employer partnership ("MEP") programs,[1] publicly subsidized employer apprenticeships ("PSEA")[2] and plant programs. WAGES' analysis of Washington state and federal data for 2017 finds that, overall, JLMP apprenticeship programs outperform non-union apprenticeship programs in enrollment, completion rates, journey wages and the inclusion and performance of underrepresented groups. A detailed analysis of large programs in the construction trades reveals that JLMP programs also provide a greater return on investment ("ROI") for individual apprentices and taxpayers than comparable MEP programs. Moreover, while public officials have invested millions of taxpayer dollars in newly created PSEA programs, WAGES' analysis finds that JLMP programs in high-growth and strategic industries actually do a better job of providing high-wage, sustainable careers for apprentices. In light of these results, officials should ensure that tax dollars support apprenticeships exhibiting the unique characteristics that make JLMP programs successful. Apprenticeship programs that receive public funding should provide high journey wages, ensure the democratic participation of workers in governance and standard setting, and employ a sustainable funding model that doesn't require taxpayers to finance day-to-day operations.

Data and Methodology

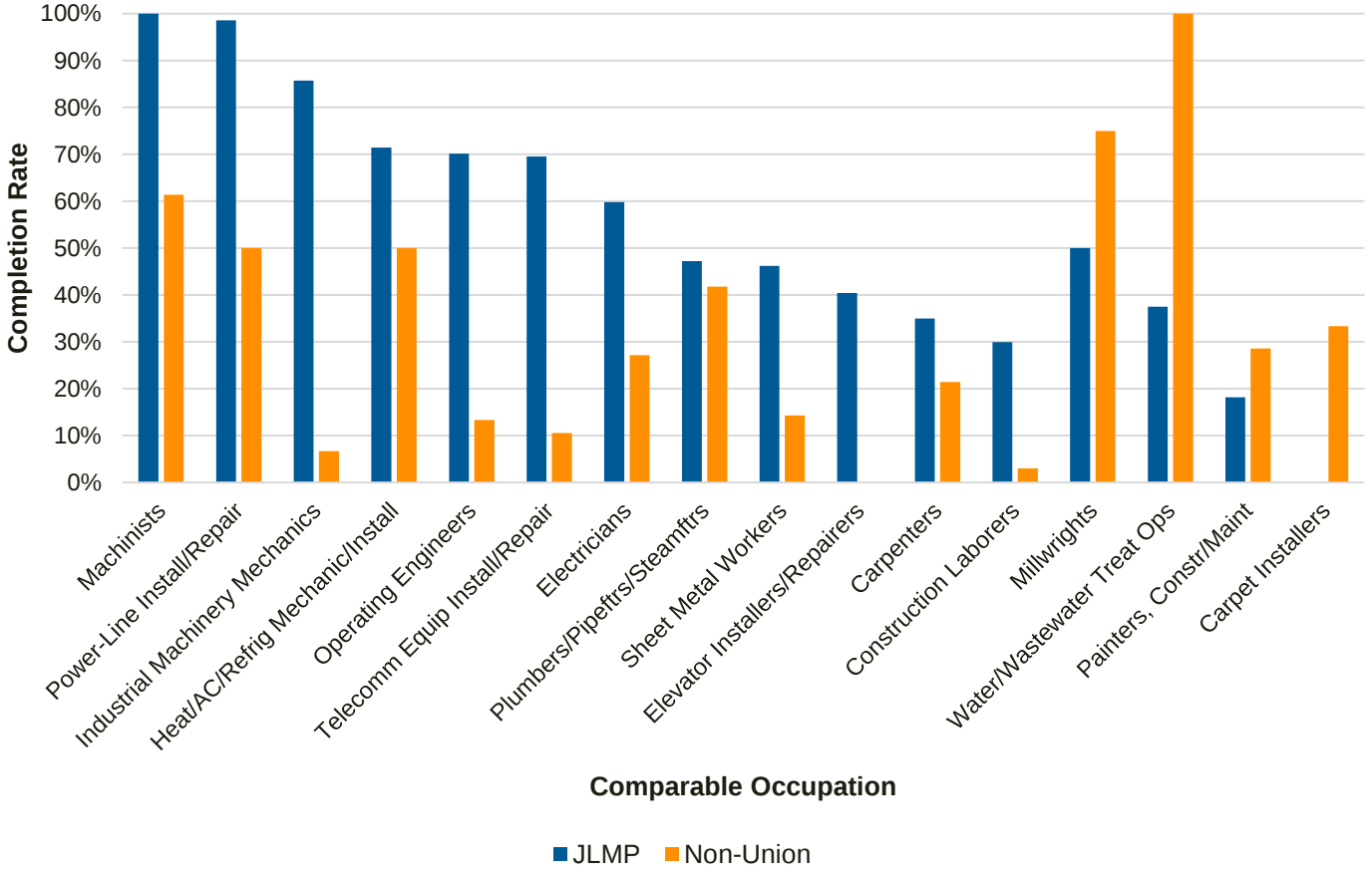
- **WAGES relies on individual apprentice and journey wage data from L&I, occupational wage and demographic data from BLS, and economic estimates from the WAGES ROI Model.** The most recent data available are combined to examine the performance of different apprenticeship models.
- **WAGES uses completion rates,[3] journey wages,[4] inclusion of underrepresented groups, net impact and ROI to compare JLMP and non-union apprenticeships.** The Study compares JLMP and non-union (MEP, PSEA and Plant programs) overall performance, the ROI of JLMP and MEP programs, and alternatives to PSEA programs. WAGES is the first comprehensive examination of the performance of different apprenticeship models in Washington state.
- **The WAGES ROI Model uses completion status, journey wage, average wage, hours worked and occupational wage data to compare twelve established JLMP and MEP construction apprenticeship programs.** The Model uses realistic assumptions to estimate the net impact and ROI for individuals and taxpayers of programs training apprentices in the six largest comparable occupations.
- **WAGES analyzes the performance of three Washington PSEA programs serving high-growth and strategic industries and compares them to similar JLMP programs.** WAGES examines completion rates, journey wages and local occupational average wages to compare the PSEA and JLMP models.

Program Performance

Enrollment and Completion Rates

- **JLMP apprenticeship programs train 83% of all apprentices in Washington.** In 2017, 14,253 apprentices trained in 205 JLMP programs, while 2,897 apprentices trained in 98 MEP, PSEA and Plant non-union programs.
- **The completion rate for JLMP programs was 8 percentage points higher (43.0% vs. 34.8%) than non-union programs.** In 2017, 6 of every 7 successful apprentices in Washington state journeyed out of JLMP programs.
- **Across comparable occupations,[5] JLMP programs had a completion rate that was more than 11 percentage points higher than non-union programs (44.0% vs. 32.2%).** JLMP programs had a higher completion rate in 12 of 16 occupations where both JLMP and non-union programs trained apprentices (**Figure 1**).

Figure 1. Successful Completion Rate for Apprentices by Occupation
2017 Apprentices by Comparable Standard Occupational Classification

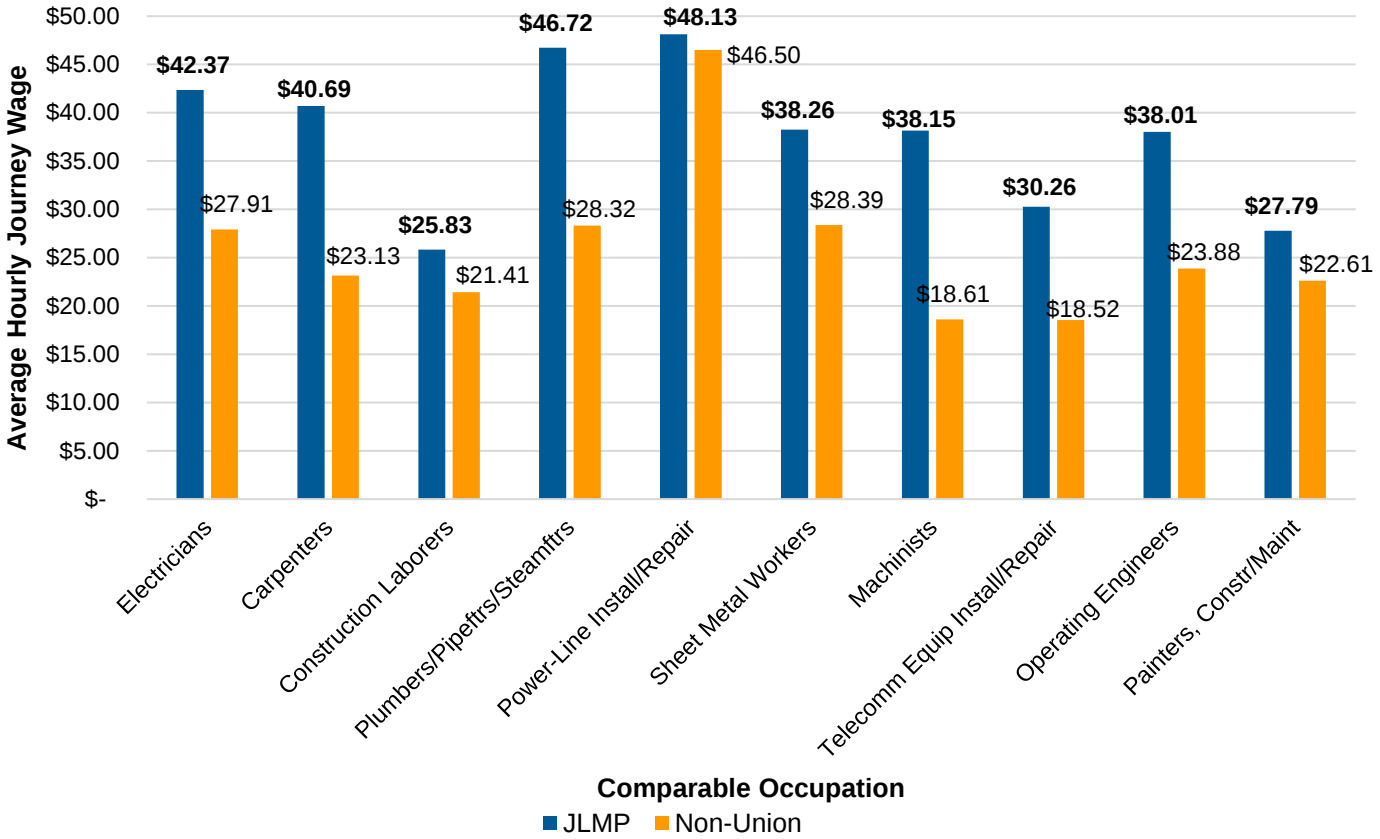


Source: ARTS, Washington State Department of Labor and Industries.

Journey Wages

- **Successful JLMP apprentices achieved journey wages 50.1% higher than non-union completers ($34.42/hour vs. $22.93/hour).** JLMP journey wages were higher across the 10 largest comparable occupations (**Figure 2**) and 13 of 14 comparable occupations overall, sometimes more than doubling non-union journey wages.

Figure 2. Average Journey Wages of 2017 Completing Apprentices
10 Largest Comparable SOC Occupations



Note: All dollar values are expressed in May 2017 dollars. Journey wages in WAGES, drawn from L&I data, represent the lowest regional journey wage for each apprenticeship program. However, some statewide programs pay significantly higher wages in certain regions. L&I reports a journey wage of $26.01/hour for the Northwest Laborers - Employers Training Trust Fund apprenticeship, for instance, but the program pays Journeyman General Laborers $37.27/hour in Western Washington. Journey wage data should therefore be interpreted as a lower bound estimate.
Source: Apprenticeship Program Details, Washington Department of Labor and Industries; Apprenticeship Registration and Tracking System, Washington State Department of Labor and Industries.

- **JLMP journey wages placed successful apprentices 16.4% above their local occupational average,[6] while non-union journey wages were 15.2% below.** For 40 of 51 occupations, JLMP journeymen finished their program earning above the average local hourly wage, compared to just 10 of 30 occupations for non-union programs.

- **In 14 comparable occupations, JLMP journey wages exceeded the local occupational average 100.0% of the time, while non-union journey wages did so in only 35.7% of fields.** JLMP program journey wages were higher than the local occupational average wage for 14 of 14 occupations, while non-union programs exceeded the average for only 5 of 14 occupations.

Gender Inclusion and Outcomes

- **JLMP programs increased female participation relative to occupational averages by a larger amount than non-union programs, training 571 more female apprentices than expected.** In 2017, the weighted average of female participation in JLMP programs was more than double the national average for those occupations (8.8% vs. 4.2%). For non-union programs, participation was also slightly above the weighted national occupational average for occupations they trained (13.5% vs. 11.3%).
- **For 14 comparable occupations, JLMP programs boosted weighted female participation by significantly more than non-union programs.** JLMP programs more than tripled weighted average national female participation (7.9% vs. 2.8%) in these male-dominated fields, while non-union programs increased it more modestly (4.9% vs. 3.1%).
- **Non-union programs enrolled a slightly higher percentage of women overall, driven by two apprenticeships serving the healthcare and beauty industries.** Women comprised 13.6% of non-union and 8.4% of JLMP apprentices in 2017. However, women training to be medical and dental assistants in Washington Association for Community Health ("WACH") programs, and beauty industry workers in SAGE Apprentice Programs, represented 49.9% of all non-union female apprentices.

Table 1. Average Journey Wages for Completing Female Apprentices in 2017
9 Largest L&I Occupations for Completing Women

	JLMP Programs			Non-Union Programs		
Rank	Occupation	#	Journey Wage	Occupation	#	Journey Wage
1	Workers Comp Adjudicator	32	$22.76	Medical Assistant	22	$12.13
2	Laborer	15	$25.25	Dental Assistant	4	$13.29
3	Retail Meatcutter	10	$22.37	Machinist (Aircraft Oriented)	2	$18.61
4	Fire Fighter	8	$21.36	Cosmetologist	2	$12.13
5	Carpenter	7	$40.69	Carpenter	1	$22.56
6	Electrician	7	$42.24	Production Welder	1	$27.85
7	Operating Engineer	5	$36.92	Barber	1	$12.13
8	Instructional Assistant	5	$13.79	Web Developer	1	$36.40
9	Ironworker	3	$32.03	Dispensing Optician	1	$17.47
All	**All Occupations**	**116**	**$27.03**	**All Occupations**	**35**	**$14.23**

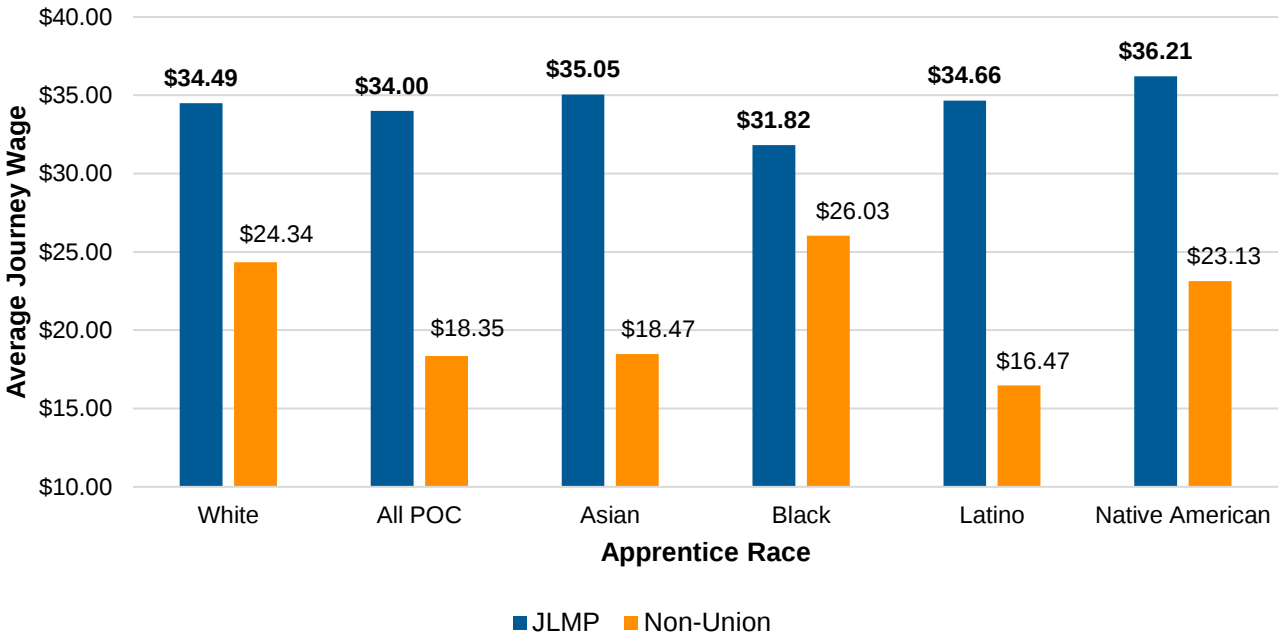
Note: Journey wages in WAGES represent the lower bound estimate for journey wages in each occupation.
Source: Apprenticeship Program Details, Washington Department of Labor and Industries; Apprenticeship Registration and Tracking System, Washington State Department of Labor and Industries.

- **In 2017 in comparable occupations, female JLMP apprentices completed their programs at 8 times the rate of non-union female apprentices.** Approximately 1 in 3 JLMP apprentices completed their programs in 7 comparable fields, compared to only 1 in 25 non-union apprentices.
- **Female completion rates for all occupations in JLMP (41.3%) and non-union (41.7%) programs were nearly identical, driven almost entirely by high completion rates in the WACH program.** Overall, 26 of the 35 women who successfully completed non-union programs in 2017 were WACH medical and dental assistants, who journeyed out earning $12.13/hour and $13.29/hour, respectively.
- **Female JLMP apprentices earned journey wages that were twice as high as non-union female journey wages ($27.03 vs. $14.23).** In the one comparable occupation, carpentry, JLMP journeywomen out-earned non-union journeywomen $40.69/hour to $22.56/hour. (**Table 1**)

Racial Inclusion and Outcomes

- **JLMP programs trained a slightly higher percentage of apprentices of color.** In 2017, 28.5% of JLMP apprentices and 25.6% of non-union apprentices were apprentices of color.
- **For the majority of comparable occupations, JLMP programs had a higher share of apprentices of color.** Across 18 comparable occupations, apprentices of color made up a higher share of JLMP programs in 10, non-union programs in 7, and an equal share in 1 occupation.
- **Apprentices of color journeyed out of JLMP programs at a higher rate for the majority of comparable occupations, although non-union apprenticeships held a slight edge overall.** For the 10 comparable occupations, JLMP programs had a higher completion rate for apprentices of color (33.8% vs. 24.3%) than for non-union programs. However, non-union programs had a slight edge overall (34.0% vs. 30.7%).
- **Apprentices of color journeyed out of JLMP programs earning journey wages $15.65/hour higher than successful non-union apprentices of color.** Overall, successful JLMP apprentices of color achieved an average journey wage of $34.00/hour compared to just $18.35/hour for apprentices of color journeying out of non-union programs (**Figure 3**).

Figure 3. Average Journey Wages for Completing Apprentices by Race
JLMP vs. Non-Union Programs in 2017



Source: Apprenticeship Program Details, Washington Department of Labor and Industries; Apprenticeship Registration and Tracking System, Washington State Department of Labor and Industries.

- **The journey wage gap between white apprentices and apprentices of color was 12 times larger across all non-union programs than across JLMP programs.** In 2017, white JLMP apprentices completed their programs earning an average journey wage of $34.49/hour, compared to a $34.00/hour journey wage for completing JLMP apprentices of color. However, white non-union apprentices earned $24.34/hour in journey wages upon completion, compared to an average of $18.35/hour in journey wages for non-union apprentices of color who journeyed out of their non-union program in 2017.

Veteran Inclusion and Outcomes

- **JLMP apprenticeship programs enroll a higher percentage of veterans (13.7%) than non-union programs (12.8%).** The overall percentage of veterans in apprenticeship is higher than for Washington state as a whole, where 9.6% of adults are veterans.
- **Veterans journeyed out of JLMP programs at a higher rate (35.8%) than non-union programs (32.8%).** In 2017, more than five times as many veterans completed JLMP programs (115 apprentices) than non-union programs (22 apprentices).
- **Veterans completing JLMP programs earned an average of $9.55 more per hour in journey wages than those completing non-union programs ($35.64/hour vs. $26.09/hour).** Overall, 71.1% of JLMP veteran completers earned journey wages above the local hourly occupational average, while only 22.7% of veterans completing non-union apprenticeships journeyed out above the local occupational average.

Return on Investment Analysis

WAGES ROI Model - Description

- **The WAGES ROI Model estimates the net impact on apprentice wages, benefits and tax payments, and return on investment for taxpayers, of the largest JLMP and MEP programs in the six largest comparable occupations.** The Model analyzes JLMP and MEP programs training carpenters, construction electricians, construction equipment operators, laborers, plumbers and sheet metal workers.
- **The Model utilizes wage, benefit, cost, wage scale and program length data, and a set of realistic assumptions, to project each program's lifetime impact on apprentices.** The Model relies on L&I ARTS, WTB, BLS OES and other data to create estimates for each apprentice's wages, benefits and tax payments with and without apprenticeship.

WAGES ROI Model - Results

- **JLMP programs have a greater net impact on individuals across all six comparable occupations.** The six JLMP programs increase total compensation for an individual apprentice, net of taxes and program costs, by an average of $810,444 over each apprentice's lifetime, more than double the $353,187 individual net impact for comparable MEP programs (**Table 2**).

Table 2. WAGES ROI Model Results
Per Apprentice Individual and Taxpayer Net Impact for 2013-2016 Exiting Apprentices

Occupation	Program	Individual Net Impact	Taxpayer Net Impact	Taxpayer ROI
Carpenter	NWCI	$533,421	$205,976	78x
	CITC - Carpenter	$312,153	$113,163	41x
Construction Electrician	PSEJATC	$1,609,808	$605,809	99x
	CITC - Con. Electrician	$423,045	$160,868	51x
Construction Equip Operator	OERTP	$884,923	$309,652	76x
	INWAGC Operators AC	$169,518	$49,819	13x
Laborer	NWLETT	$393,744	$142,583	57x
	INWAGC Laborers AC	$226,075	$44,842	59x
Plumber	SAPT	$2,103,586	$606,079	69x
	CITC - Plumber	$437,241	$188,893	37x
Sheet Metal Worker	WWSMJATC	$1,345,124	$409,841	64x
	CITC - Sheet Metal	$397,594	$149,522	47x
Six Largest Comparable	**All JLMP**	**$810,444**	**$285,612**	**74x**
	All MEP	**$353,187**	**$134,309**	**38x**

Note: Acronyms refer to Northwest Carpenters Institute ("NWCI"), Construction Industry Training Council of Washington ("CITC"), Puget Sound Electrical JATC ("PSEJATC"), Operating Engineers Regional Training Program ("OERTP"), Inland Northwest Associated General Contractors ("INWAGC"), Seattle Area Pipe Trades ("SAPT") and Western Washington Sheet Metal JATC ("WWSMJATC"). *Source*: WAGES ROI Model.

- **JLMP programs also have a greater net impact for taxpayers across all six comparable occupations.** Public officials who invest taxpayer dollars in training one JLMP apprentice earn an average net return of $285,612 in taxes per apprentice, while MEP programs generate a net impact for taxpayers of $134,309 per apprentice.
- **The return on investment ("ROI") ratio for taxpayers is 74:1 for JLMP programs.** For every $1 that taxpayers spend on public training costs for JLMP apprentices, the same apprentices will generate an estimated $74 more in additional income, sales, Social Security and Medicare taxes, net of unemployment insurance transfers.
- **Higher journey wages in JLMP programs are correlated with higher net individual impact and net taxpayer impact.** The programs with the highest journey wages, Seattle Area Pipe Trades ("SAPT"), Puget Sound Electrical JATC ("PSEJATC") and Western Washington Sheet Metal JATC ("WWSMJATC"), also have the highest net impacts for individuals and taxpayers.

"Public officials who invest taxpayer dollars in training one JLMP apprentice earn an average net return of $285,612 in taxes per apprentice."

Lessons of Success from JLMP Construction Apprenticeships

- **JLMP apprenticeship programs examined in the WAGES ROI Model all had higher journey wages and superior completion rates than comparable CITC and INWAGC programs.** JLMP completion rates were between 14 and 59 percentage points higher than for MEP programs, while journey wages were between $8.94/hour and $23.06/hour above comparable MEP journey wages.
- **JLMP apprenticeship programs rely on the collaborative input of union workers and employers to drive program success.** Employers provide cutting edge industry knowledge, active participation in governance and generous funding. Union workers negotiate high program standards, provide support to fellow members and amplify apprentice voices at the worksite.
- **JLMP programs make concerted efforts to recruit and retain more apprentices from underrepresented groups.** All six JLMP programs examined in the WAGES ROI model had a higher percentage of women in training than their MEP counterparts. JLMP coordinators visit worksites to support women and veteran apprentices, partner with pre-apprenticeship programs for people of color and women, and hire women to conduct outreach as program leaders.

Apprenticeships for Growing Industries

Washington PSEAs

- **Three quarters of the Washington occupations poised to see the highest absolute growth in jobs are not currently covered by apprenticeships.** Among the 100 highest growth occupations, only 24 are currently served by apprenticeships.
- **Government efforts to encourage apprenticeships in new and strategic industries have focused on financing publicly subsidized employer apprenticeships ("PSEAs").** Washington Association for Community Health ("WACH"), Aerospace Joint Apprenticeship Committee ("AJAC") and the Washington Technology Industry Association's ("WTIA") Apprenti programs have received millions of taxpayer dollars to expand apprenticeship in the healthcare, aerospace and tech industries.
- **These PSEA programs have a mixed record journeying out apprentices, and underperform JLMP programs and local occupational averages in terms of journey wages.** WACH, Apprenti and AJAC have varying completion rates, but all offer journey wages well below the average for the occupations they train (**Table 3**).

Table 3. Average JLMP vs. PSEA Programs
All Apprentices Active in 2017

Metric	JLMP Avg	AJAC	Apprenti	WACH
Apprentices	145	484	84	135
Completion Rate	43%	52%	29%	90%
Journey Wage	$36.33	$18.53	$35.41	$12.33
Journey/Local Occ Avg	124%	73%	67%	68%
High School or Less	68%	62%	15%	56%
Women vs Occ Avg	+4.5%	-1.6%	+15.5%	+1.0%
POC	29%	23%	52%	47%
Veterans	14%	9%	28%	0%

Note: All dollar values are expressed in May 2017 dollars.
Source: Apprenticeship Program Details, Washington Department of Labor and Industries; Apprenticeship Registration and Tracking System, Washington State Department of Labor and Industries; May 2017 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates, Occupational Employment Statistics, Bureau of Labor Statistics, May 2017.

Washington Association for Community Health ("WACH")

- **Approximately 9 of 10 apprentices successfully complete WACH's medical assistant ("MA") and dental assistant ("DA") programs, but they earn journey wages far below industry average.** WACH's journey rate for MAs ($12.13 per hour in May 2017 dollars), for instance, puts journeymen in the bottom 10% of MA earners in every Washington region but Walla Walla.
- **WACH wages also significantly trail JLMP wages for apprentices in other states.** JLMP MA apprentices in Rhode Island journey out earning $10.00/hour more than successful WACH MAs.

Apprenti

- **WTIA's Apprenti program has received $4 million in federal money and a pledge for $4 million more from Washington state, while WTIA members earn billions in profits.** WTIA leader Microsoft, for instance, has earned $72.6 billion in profits since Apprenti's inception, while WTIA member Amazon.com has grown to a market capitalization of almost $1 trillion.
- **For the 84 Apprenti apprentices training in 2017, the journey wage they'll eventually earn is only 66.7% of the local average.** Apprenti software developers journey out at a rate of $35.57/hour (in May 2017 dollars), while the average wage earned by a software developer in Seattle was $57.84/hour.

Aerospace Joint Apprenticeship Committee ("AJAC")

- **The state's largest PSEA, AJAC, journeys out a lower percentage of its apprentices (51.7%) than the comparable IAM/Boeing Joint Apprenticeship Committee (100.0%) across all occupations.** For example, 100.0% of IAM/Boeing industrial machinery mechanic apprentices successfully completed their program, versus 0.0% of industrial machinery mechanic apprentices exiting the AJAC program.
- **The JLMP IAM/Boeing program recruits a higher percentage of apprentices from underrepresented groups.** The IAM/Boeing program has a higher share of apprentices of color (36.8% vs. 22.5%), veterans (10.3% vs. 7.9%) and women (6.9% vs. 4.3%) than AJAC.
- **AJAC's journey wages also dramatically lag behind local averages and their IAM/Boeing counterparts.** Apprentices completing AJAC's program earn an average journey wage equal to 74.0% of their local occupational average. The highest journey wage achieved by an AJAC apprentice completing their program in 2017 was $19.41/hour (in May 2017 dollars) for a tool and die maker. Meanwhile, IAM/Boeing apprentices journeyed out at $42.41/hour.

JLMP Alternatives

- **Many of Washington's fastest growing occupations are currently served by JLMP programs.** For instance, carpenters (#14), construction laborers (#19) and electricians (#41) are all projected to be among the 50 highest growth occupations in Washington over the next 10 years.
- **JMLP programs across the country are starting to serve high growth non-trades occupations, many with a higher share of women and people of color.** SEIU and UNITE HERE have been active in extending registered apprenticeship and raising standards in traditionally lower-wage healthcare, food service and hospitality occupations.
- **SEIU's JLMP apprenticeship programs train apprentices in high growth healthcare occupations in New York, Rhode Island and Philadelphia.** SEIU Locals have started apprenticeship programs for medical assistants, home health aides and community health workers that journey out apprentices into high wage union jobs.
- **UNITE HERE's JLMP programs in Los Angeles, Las Vegas and Boston serve 5 of the 50 highest growth occupations in Washington.** Locals partner with union employers to train waiters, cooks, bartenders and food service workers and place them in jobs with industry-leading benefits.

Recommendations

- **Public officials should support apprenticeship programs providing high-wage opportunities in their field of training.** Officials should only invest taxpayer dollars in apprenticeships that create a pathway to high-skill, high-wage jobs, ensuring higher completion rates and greater taxpayer ROI.
- **Public funds should support the democratic participation of workers in apprenticeship program governance and standard setting.** A strong, institutionalized worker voice raises wages and completion rates, ensures shop floor knowledge is included in curriculum, and improves accountability.
- **Taxpayers should fund innovation, support and inclusion services for apprenticeship programs, not pay for day-to-day operations.** Public funds should help fledgling programs in new industries get off the ground, support apprentices with worksite visits or transportation, and increase inclusion of underrepresented groups. However, given the financial benefits of apprenticeship for employers, there's no reason taxpayers should be responsible for sustaining employer programs.
- **Washington should fund pre-apprenticeship programs directly linked or closely connected to high-performing apprenticeship programs.** Taxpayers should support successful pre-apprenticeship programs like Apprenticeship and Nontraditional Employment for Women ("ANEW"), Pre-Apprenticeship Construction Education ("PACE"), and the Ironworkers Local 86 pre-apprenticeship program that serve as direct pipelines to strong apprenticeship programs.

"Public officials should support apprenticeship programs providing high-wage opportunities in their field of training" and "support the democratic participation of workers in apprenticeship program governance and standard setting."

- **The state should provide support services for pre-apprentices to help with retention, especially for those from underrepresented communities.** Pre-apprenticeship programs represent months of unpaid training, so assistance with childcare, tools and transportation would improve retention.
- **Funding for additional apprenticeship coordinators to help apprentices early in their program would improve retention, especially with vulnerable groups.** New apprentices, female apprentices, apprentices of color and veterans could all benefit from additional support at their worksite.
- **Capital grants or affordable loans would help apprenticeship programs keep machinery, equipment and technology up-to-date.** To build relevant skills, apprentices must train with cutting edge worksite equipment and technology. Tax dollars could help keep program technology current.
- **Public officials should support greater marketing and networking efforts to introduce qualified applicants to apprenticeship.** After applicants are introduced to their programs, apprenticeships do a great job of retaining them. Public marketing and events could help get them in the door.
- **Washington should lead the country by measuring the net impact of individual apprenticeship programs.** In order to intelligently invest public tax dollars, state agencies should begin measuring the return on investment for individual apprenticeship programs.

INTRODUCTION

Washington Apprenticeships for the 21st Century

Governor Jay Inslee's Career Connect Washington Initiative has raised a number of important questions about apprenticeship in Washington state. How should we structure Washington state's apprenticeships to meet the challenges and opportunities of the coming decade? How can apprenticeship programs train skilled workers to fill the openings in Washington's fastest growing industries? Can apprenticeship programs address the growing income gap by providing working class people a pathway to good jobs and good wages? How should we spend public funds to maximize the impact of pre-apprenticeship and apprenticeship programs? The Washington Apprenticeship Growth and Expansion Study ("WAGES") draws on the expertise and experience of apprenticeship coordinators from the state's largest programs, long-time public servants in the apprenticeship field, and a range of public data to provide answers to these questions.

Apprenticeship Models: What Works?

Joint labor-management partnership ("JLMP") apprenticeship programs, funded and overseen by joint apprenticeship and training committees ("JATCs"), train the large majority of apprentices in Washington. However, recent public discussion has centered around newly created publicly subsidized employer apprenticeships ("PSEA") that receive millions of dollars in taxpayer funding and promise to rapidly expand apprenticeships in high-growth industries. Additionally, multi-employer partnership ("MEP") programs run by non-union employers and employer associations have expanded in recent years. WAGES explores what works by examining the relative performance of these different models of apprenticeship in Washington state, comparing JLMP, PSEA and MEP apprenticeship models. The Study compares 170 apprenticeship organizations operating 303 apprenticeship programs across a variety of metrics, including total enrollment, completion rates, journey wages, the inclusion and outcomes of underrepresented groups, net impact for individuals and taxpayers, and taxpayer return on investment.

Investing Public Funds to Best Support Apprenticeship

The Governor's Career Connect Initiative has signaled that investing in skill training and apprenticeship is a priority for Washington state public officials. Relying on an objective, quantitative comparison of apprenticeship models, and incorporating ideas from apprenticeship coordinators managing the state's largest programs, WAGES concludes by providing a menu of powerful policy solutions to grow and expand successful, strategically situated, high-wage apprenticeships in Washington state.

Acknowledgements

The Study author would like to thank a number of apprenticeship coordinators and public servants who provided data and context for WAGES. Dave Wallace and Terje Gjertsen at Washington's Workforce Training and Education Coordinating Board provided important apprentice wage data and feedback on methodology that were important pieces of the return on investment analysis. Rachel McAloon from Washington's Department of Labor & Industries provided an overview of the Apprenticeship Registration and Tracking System database. Eric Peterson and Jeff Reinhardt from the Western Washington Sheet Metal JATC, Lacey Hall from the Operating Engineers Regional Training Program, Heather Winfrey and P.J. Moss from the Seattle Area Pipe Trades, Bob Susee, Paula Resa, Lisa Marx and Jody Kane from the Northwest Carpenters Institute, and Clay Tschillard from the Puget Sound Electrical JATC provided a wealth of information about their programs and a great overview of Washington's apprenticeship landscape as a whole.

Study Structure

The Washington Apprenticeship Growth and Expansion Study ("WAGES") is divided into **five sections.**

Data and Methodology

The data and methodology section includes a discussion of WAGES' methodology, public and private data sources used in the Study, and a description of JLMP and non-union apprenticeship models.

Program Performance

The program performance section looks at overall program performance, comparing enrollment, completion rates and journey wages for 303 JLMP and non-union programs, looking at all apprentices, women, people of color and veterans.

Return on Investment ("ROI")

The ROI section analyzes the ROI and net impact of 12 apprenticeship programs, contrasting the largest JLMP program and the largest MEP program serving each of the six largest comparable occupations in Washington state.

Apprenticeships for Growing Industries

The apprenticeships for growing industries section examines the performance of Washington's recently created PSEA programs and explores JLMP alternatives for high growth occupations and strategic industries.

Recommendations

WAGES' final section recommends strategic public investments in high-wage, sustainable, democratically governed apprenticeship programs, as well as support for successful pre-apprenticeship programs, to best meet the needs of Washington's apprentices and growing industries.

DATA & METHODOLOGY

Data Sources and Methodology

Data Sources

WAGES uses data from 170 apprenticeship organizations, 303 programs and 567 occupations in Washington state to compare the performance of JLMP programs to non-union apprenticeship programs. WAGES utilizes data from a number of state agencies, federal agencies and individual apprenticeship programs. Demographic, enrollment, program duration, completion and occupation data are drawn from the Washington State Department of Labor & Industries (L&I) Apprenticeship Registration and Tracking System ("ARTS"). The Bureau of Labor Statistics' ("BLS") Occupational Employment Statistics ("OES") provide wages by occupation for Washington's metropolitan statistical areas ("MSAs"), sub-regions and the state as a whole. Washington's Workforce Training and Education Coordinating Board ("WTB") provided entry and exit wages and hours for groups of Washington apprenticeship programs. Washington's Employment Security Department ("ESD") provided Washington job growth projections by occupation for 2016-2026. The U.S. Census Bureau provided demographic information. These data are used to compare the performance of three apprenticeship models defined in WAGES: joint labor-management partnership ("JLMP"), multi-employer partnership ("MEP"), and publicly subsidized employer apprenticeship ("PSEA") programs.

Quantitative Methodology

WAGES examines two broad apprentice groups: all apprentices who participated or completed a Washington state apprenticeship program in 2017, and apprentices who exited one of twelve programs serving six large construction trades between 2013 and 2016. The cohort of 17,150 apprentices active at any point in 2017 include all apprentices who started training in 2017, apprentices who cancelled, completed, transferred or were suspended from their programs in 2017, apprentices who exited their program in 2018 and started training before 2017, and apprentices listed as active who started work before 2017. In order to conduct the ROI analysis, WAGES analyzes wages and hours for apprentices working in six large trades who cancelled or completed their programs between 2013 and 2016, the most recent data available.

A Note on Journey Wages

Journey wages in WAGES, drawn from L&I data, represent the lowest regional journey wage for each apprenticeship program. However, some statewide programs pay significantly higher wages in certain regions. L&I reports a journey wage of $26.01/hour for the Northwest Laborers - Employers Training Trust Fund apprenticeship, for instance, but the program pays Journeyman General Laborers $37.27/hour in Western Washington. Journey wage data should therefore be interpreted as a lower bound estimate.

Wages in WAGES are converted to May 2017 dollars to allow for a direct comparison with BLS' OES occupational data. BLS' most recent occupational wage data is from May 2017. Journey wages for each apprenticeship program analyzed in WAGES are current as of August 2018, and have been deflated to May 2017 dollars using the CPI-U historical CPI index to facilitate a direct comparison of journey wages to state, sub-region and MSA averages. It's important to note that while journey wages are reported for each program, the actual wage that apprentices earn when they journey out is not. Some industries may pay journeymen above their journey rate, while others may pay an hourly wage that's closer to their journey rate.

WAGES holds as many factors constant as possible – occupation, gender, race – while comparing different models of apprenticeship, allowing an apples-to-apples comparison of JLMP and non-union programs. WAGES compares the performance of different apprenticeship models serving the same occupation rather than different occupations, because occupational demographics, wage rates and program success vary substantially. For example, in 2017, 99.7% of Lathing Acoustical Drywall Systems Installer apprentices in Washington were male, while 94.6% of Medical Assistant apprentices in Washington were female.[7] Roofer apprentices were 58.0% apprentices of color, while Firefighter apprentices were 90.0% White.[8] Washington's average hourly wage for Electrical Engineers is $53.06 per hour, while Childcare Workers earn just $13.37 per hour.[9] The completion rate for exiting apprentices from Sheet Metal Programs was 54.6%, but only 12.9% for Roofing programs.[10] Given the way program demographics, wages and outcomes vary dramatically by occupation, it makes sense to directly compare different apprenticeship models which serve the same occupation. A similar logic is used when comparing outcomes for women or people of color. To explore the impact of the JLMP model on women, for instance, WAGES compares the completion rates for JLMP female carpenters to non-union female carpenters, or the enrollment rates for women in JLMP sheet metal programs to women in non-union sheet metal programs. This method helps isolate the impact of the apprenticeship model itself.

A Note on Completion Rates

Completion rates throughout WAGES are calculated by comparing the number of apprentices that successfully complete their program in a given year to the total number of apprentices that either cancel or complete their program in that year. This method is consistent with the methodology of the Washington Workforce Training and Education Coordinating Board ("WTB's") annual apprenticeship reports and provides a useful basis for comparison to other studies.

$$Completion\ Rate_{Year\ X} = \frac{All\ Completing\ Apprentices_{Year\ X}}{All\ Completing\ Apprentices_{Year\ X} + All\ Cancelling\ Apprentices_{Year\ X}}$$

However, many apprenticeship program coordinators calculate completion rates based on a federal method that only includes cancelling apprentices who make it through their probationary period, with early cancellers not counted against a program's completion rate. Since many cancelling apprentices don't make it through their probationary period, the completion rates in WAGES will be significantly lower than completion rates calculated according to this federal method. Probationary period data was not available for all programs in this Study, so WAGES calculates completion rates using all completing and cancelling apprentices.

While WAGES uses all available data and methods to accurately compare JLMP and non-union programs, the individual-level data necessary to facilitate a regression analysis of individual and program performance were unavailable for this Study, so the results should be interpreted conservatively. WAGES attempts to hold multiple factors constant, including exit year, occupation, gender, race and veteran status, and then compares the performance of similar groups and subgroups training in JLMP and non-union programs. However, an individual-level data set with large enough sample sizes and all relevant variables was unavailable for this Study. Additionally, certain data such as age, ability, experience and earnings history were not available. It could be the case that a share of the results attributed to the success of JLMP or non-union programs may be a function of differences in the programs' demographic mix, apprentice skill level, apprentice work experience, or the age of apprentices. However, other studies have found results consistent with WAGES results for Washington state, namely that JLMP apprentices earn higher wages,[11] that joint-labor management programs narrow the gender pay gap,[12] and that workers of color do better in unionized trades.[13]

Apprenticeship Models

Washington's apprenticeship programs are administered by a variety of different organizations, working in vastly different industries, through an array of educational institutions, across the entire state of Washington. Most apprenticeship organizations are a collaborative effort between workers' unions and employers, but some apprenticeship programs are run by an individual employer, a larger trade association or through a grant-funded non-profit. While apprenticeships are concentrated in traditional trades like carpentry or ironworking, Washington's programs train everyone from school secretaries to custodians to firefighters. Related supplemental instruction ("RSI") is provided at community or technical colleges, union training institutes or employer training facilities. In addition to program governance and differences in training facilities, apprenticeships vary in geographic scope. Some provide training for a single worksite, while others encompass dozens of employers working across multiple states.

WAGES makes a fundamental distinction between JLMP programs and programs operated solely by employers. While apprenticeship programs vary in a number of important ways, the most fundamental difference is that JLMP apprenticeship programs are bargained over, formed, designed and administered by workers and their democratically elected representatives. Some employer programs include seats for workers on their governing committees and many consider worker input. However, only JLMP programs are secured by agreements bargained by and voted on by workers themselves. This fundamental distinction explains why JLMP programs have successfully secured higher wages, a larger number of apprentices and superior completion rates than their non-union counterparts.

"Some employer programs include seats for workers on their governing committees and many consider worker input. However, only JLMP programs are secured by agreements bargained by and voted on by workers themselves."

Joint Labor-Management Partnership Apprenticeships

JLMP apprenticeship programs are the most common model of apprenticeship in Washington, training more than 5 of every 6 Washington apprentices in 2017.[14] JLMPs are funded by union workers and their employers, and governed by joint apprenticeship and training committees ("JATC"). Some JLMP programs are small partnerships between a single local workers' union and one employer, and others result from large agreements between international unions and national employers' associations. Woodworkers Local Lodge W536's apprenticeship programs with Weyerhaeuser Longview, for instance, trained 5 apprentices in 2017 to become industrial maintenance electricians, saw filers and industrial maintenance millwrights at the Weyerhaeuser lumber plant in Longview, Washington. The Puget Sound Electrical JATC, on the other hand, oversaw 3 large programs training 1,356 apprentices across Western Washington in 2017, works with dozens of employers, and is the local affiliate of the Electrical Training Alliance, a national apprenticeship partnership between the International Brotherhood of Electrical Workers ("IBEW") and National Electrical Contractors Association ("NECA") that has trained over 350,000 journeymen nationwide.[15]

In a JLMP apprenticeship program, the union and its employer partners create an apprenticeship trust that is typically funded by hourly contributions from employers and union employees determined by a negotiated collective bargaining agreement. A JATC governed by equal numbers of union and employer representatives oversees the trust, hires the executive leadership of the training program and makes sure the trust is financially sustainable. The trust then pays union training centers and/or local community and technical colleges to provide instruction and training material to apprentices.

Non-Union Programs

Multi-Employer Partnership Apprenticeships

The most common model of non-union apprenticeship in Washington state is the multi-employer partnership ("MEP") apprenticeship program. MEP apprenticeships are organizations set up to provide apprenticeship to a larger group of primarily or exclusively non-union employers. MEP programs are often created with seed money from large employer associations, and then rely on per-apprentice or per-year funding from employers to train apprentices. Executives or representatives from participating employers sit on the board and oversee the program. The Construction Industry Training Council of Washington ("CITC"), originally created by the Associated General Contractors, Associated Builders and Contractors and National Utility Contractors Association and now funded through a fee-for-service model for members,[16] is the largest multi-employer apprenticeship in Washington state.[17] CITC apprenticeship programs trained 1,354 apprentices in 2017 in 10 occupations, including construction electricians, plumbers and carpenters. The Inland Northwest Associated General Contractors sponsor apprenticeship programs in Eastern Washington for carpenters, construction equipment operators and laborers[18] and trained 165 apprentices in 2017.[19] Smaller groups like the Spokane Home Builders Association also run apprenticeship programs. WAGES will compare the performance of MEP and JLMP apprenticeships in the Return on Investment section.

Publicly Subsidized Employer Apprenticeships

Publicly subsidized employer apprenticeship (PSEA) programs are controlled by employers but receive a significant subsidy of taxpayer dollars. These apprenticeship programs are administered by non-profits, typically controlled by employer associations, and significantly funded by taxpayer dollars. Established in 2008 by the Washington legislature with $3 million in annual funding,[20] the Aerospace Joint Apprenticeship Committee ("AJAC") is Washington's largest PSEA, training 484 apprentices in 2017.[21] AJAC includes a limited amount of union worker input. Two International Association of Machinists ("IAM") representatives serve on the eight-member governing committee alongside employer representatives,[22] but most apprentices work in non-union shops.[23] The Washington Technology Industry Association ("WTIA") runs the Apprenti PSEA program, overseen by directors from Microsoft, Amazon, union avoidance law firm Davis Wright Tremaine[24] and Washington community colleges and universities. Apprenti received $3.5 million in start-up grants from the U.S. Department of Labor ("DOL") and Washington State Labor & Industries ("L&I") in 2016,[25] $7.5 million from DOL later that year to expand the program nationwide,[26] and a $4 million pledge from Washington state in 2017.[27] In 2017, Apprenti trained 84 apprentices in Washington state. WAGES will compare JLMP apprenticeship programs to PSEA programs in the Apprenticeships for Growing Industries section.

Plant Programs

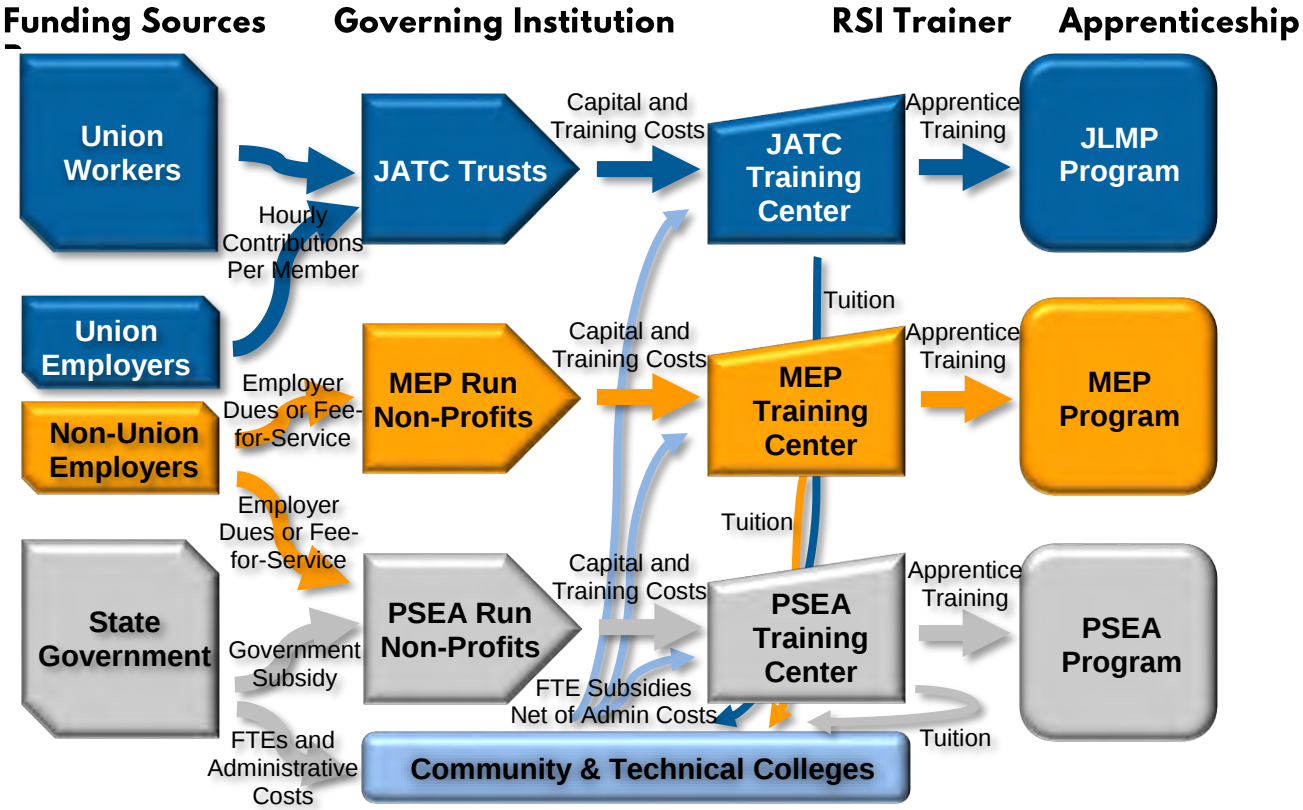
Individual employers can also create and administer apprenticeship programs to train their workforce. In 2017, for instance, Nichols Brothers Boat Builders ran five apprenticeship programs training 83 apprentices in five ship-building trades on Whidbey Island, Evco Electronics worked with 16 low voltage technician apprentices out of Spokane, and 1 apprentice police officer successfully completed their program with the Oak Harbor Police Department.[28] Plant programs tend to be smaller in scope and will be analyzed in WAGES only as part of the larger non-union program group.

Apprenticeship Funding and Program Administration

Apprenticeship programs receive funding from a variety of sources and rely on a variety of institutions to provide related supplemental instruction ("RSI") training (**Figure 4**). Larger JLMP programs like the United Brotherhood of Carpenters JATC or Northwest Laborers Employers Training Trust set up their own training centers to provide RSI training and oversee curriculum. Many JLMP programs also rely on local community and technical colleges ("CTCs") to provide RSI. For instance, the Boilermakers Local 104 apprenticeship trains and provides RSI at South Seattle College's Georgetown Campus.[29] PSEA programs also rely on CTCs for training and RSI to varying degrees. AJAC opened its own Advanced Manufacturing Training Center in Kent in 2017 and also provides training to apprentices at CTCs like Bates Technical College and Everett Community College.[30] MEP programs like CITC run their own training centers, while the Inland Northwest AGC programs partner with Spokane Community College.[31]

In addition to providing training facilities to many programs, Washington state provides per apprentice funds to registered apprenticeships that are administered through the state's CTCs. CTCs keep a significant percentage of this funding as an administrative fee for accreditation, receive tuition payments from apprenticeship programs themselves, and then pay any net remainder out to programs to help with training.

Figure 4. Funding Models for JLMP, MEP and PSEA Apprenticeship Programs



Note: Acronyms include Joint Apprenticeship and Training Committee ("JATC"), Joint Labor-Management Partnership ("JLMP"), Multi-Employer Partnership ("MEP"), and Publicly Subsidized Employer Apprenticeship ("PSEA"). Many JATC Trust, MEP Run Non-Profits and PSEA Run Non-Profits also rely on community and technical college training centers and classrooms to train apprentices.

Joint Labor-Management Partnership – A Model That Works

JLMP apprenticeships have a number of advantages that allow them to outperform non-union apprenticeship programs. JLMPs are funded by union-employer trusts that are contractually secured for years at a time. JLMP programs often partner with industry associations representing multiple employers, allowing for the sharing of both training costs and benefits. Furthermore, JLMP programs provide higher wages than comparable non-union programs. This higher wage, and union members' incentives to grow the union, help drive a higher completion rate. Finally, unions have launched a number of initiatives to benefit members and increase the inclusivity of their programs.

JLMP programs are funded by contributions based on union worker hours secured by a collective bargaining agreement. Unions and employers make contributions to a jointly administered trust that distributes training funds to JLMP apprenticeship programs. The funding levels are secured in collective bargaining agreements, negotiated and voted on by union workers, that can last for 6 years or longer between renewals. This contractually secure funding allows JLMP programs to plan for the long term and avoid reliance on taxpayers.

Unions partner with industry associations to spread the costs and benefits of training programs. Individual employers are often reticent to start apprenticeship programs because they fear that after spending thousands of dollars to train and credential an apprentice, that worker will take their newfound skills to another employer. By partnering with associations of employers, unions spread the costs of the program to a broader group of employers, and the benefits are then widely shared as trained journeymen are able to transfer between union employers based upon employer demand.

"The higher wages in JLMP apprenticeships incentivize apprentices to stick with and complete their programs."

JLMP programs provide apprentices with much higher wages and benefits than non-union programs. The same collective bargaining process that enables the creation of large training trusts also allows union workers to bargain for higher wages and benefits. Unions can secure a higher journey wage for JLMP apprentices than their non-union counterparts, especially since union representatives sit on the governing committees for their apprenticeship programs. These higher wages and stronger benefits improve the lives of successful apprentices after they complete their programs.

Higher wages and greater buy-in drive lower turnover and higher completion rates for union apprentices. The higher wages in JLMP apprenticeships incentivize apprentices to stick with and complete their programs. Additionally, every other union member has an incentive to help and grow the apprenticeship program. A larger number of talented apprentices means a larger number of future union members and a more powerful voice at the bargaining table.

The labor movement has launched a number of successful initiatives to support women, people of color and veterans, helping JLMP programs train apprentices from these underrepresented groups. The Washington State Labor Council's race and labor initiative, launched in 2015, aims to erase racial disparities and barriers to participation in union workplaces and programs.[32] At least 10 Washington unions have partnered with the Apprenticeship & Nontraditional Employment for Women ("ANEW") pre-apprenticeship program encouraging women to enter the trades.[33] The Washington State Building and Construction Trades Council, which represents over 100,000 union construction workers, was the first state Council in the country to start a pre-apprenticeship program, Pre-Apprenticeship Construction Education ("PACE"), to serve a "diverse population" of "women, men, people of color, ex-offenders, [and] veterans."[34] These efforts help JLMP programs include a higher share of apprentices from underrepresented groups.

PROGRAM PERFORMANCE

Enrollment and Completion Rates

Enrollment

JLMP apprenticeship programs train 83% of all apprentices in Washington state.[35] In 2017, there were 14,253 apprentices training in 205 JLMP programs funded by 98 joint apprenticeship and training committee ("JATC") trusts. The largest JLMP organizations were the Washington State United Brotherhood of Carpenters JATC (2,497 apprentices), Northwest Laborers Apprenticeship Committee (1,480 apprentices) and Puget Sound Electrical JATC (1,356 apprentices).[36] An additional 2,897 apprentices trained in 98 programs run by 72 plant, multi-employer partnership ("MEP") and publicly subsidized employer apprenticeship ("PSEA") organizations.[37] This includes 1,354 apprentices training with the Construction Industry Training Council of Washington ("CITC"), 484 with the Aerospace Joint Apprenticeship Committee ("AJAC") and 135 apprentices training with the Washington Association for Community Health ("WACH").[38]

Completion Rates

Nationally, studies find that JLMP programs have a higher completion rate than non-union apprenticeship programs. A 2013 analysis by the Aspen Institute found that for the building trades, completion rates for JLMP apprenticeship programs were 6 percentage points higher (37% vs. 31%) than non-union programs.[39] A 2005 study from Oregon found that "on a trade-by-trade basis, union programs had higher completion rates than their non-union counterparts."[40] A 2004 AFL-CIO study found that nationally, non-union Associated Builders and Contractors programs journeyed out apprentices at half the rate of JLMP programs.[41] A 2002 Pennsylvania study found that completion rates were 15 percentage points higher in JLMP apprenticeships than in non-union programs.[42] Consistent with these findings, an analysis of ARTS data reveals that JLMP programs in Washington maintain much higher completion rates than non-union programs.

In Washington, apprentices training in JLMP programs had a significantly higher rate of successful completions than those in non-union programs. Overall, 3,238 apprentices completed or cancelled JLMP programs in 2017, while 640 completed or cancelled non-union programs. Among these exiting apprentices, the successful completion rate for JLMP programs was more than 8 percentage points higher than for non-union programs (43.0% vs. 34.8%).[43] In 2017, 86.2% of all successful apprentices in Washington state who journeyed out of their programs trained in JLMP apprenticeship programs.[44]

JLMP programs had a higher successful completion rate across 12 of 16 comparable occupations where both JLMP and non-union programs trained apprentices.[45] Comparing completion rates within the same occupation can provide a more accurate assessment of program success because cancellation and completion rates vary substantially for different occupations. For example, a national 2013 study found that roofers had a cancellation rate almost three times higher than elevator installers and repairers (64% vs. 23%).[46] Washington's occupations display similar patterns. Holding occupation constant, JLMP programs outperformed non-union programs. For instance, electrician apprentices successfully completed JLMP programs at double the rate of non-union programs (59.8% vs. 27.2%).[47] Among laborer apprentices leaving their programs in 2017, those exiting JLMP programs were ten times more likely to successfully journey out (30.0%) than in non-union programs (3.0%).[48] The overall completion rate across these 16 comparable occupations was 44.0% for JLMP programs and 32.2% for non-union programs.[49]

Journey Wage Rates

Journey Wage Comparison

Apprentices journeying out of JLMP programs earned an average journey wage[50] of $34.42/hour, compared to $22.93/hour for completers of non-union programs.[51] This JLMP journey wage premium is consistent with premiums reported in studies from other states, and the overall gap between union and non-union wages. In Michigan, a 2017 study found that apprentices earned an average of $22.21/hour completing JLMP programs compared to $14.55/hour after completing non-union programs.[52] Nationally, union workers earn 25% more in median weekly earnings than non-union workers.[53] Washington's JLMP programs demonstrate the same wage premium, and it remains when holding occupation constant.

For 13 of 14 comparable occupations in 2017, JLMP journey wages were between 3.5% and 105.1% higher than for non-union journeymen.[54] For example, machinist journeymen earned an average hourly journey wage[55] of $38.15/hour after journeying out of JLMP programs, but only $18.61/hour in journey wages upon completion of non-union programs. Among heating, air conditioning, and refrigeration mechanics and installers, the JLMP journey wage premium was $22.22 per hour ($49.73/hour vs. $27.51/hour).[56] Journey JLMP carpenters achieved an average journey wage of $40.69/hour in 2017, compared to $23.13/hour for journeymen completing non-union carpentry programs.[57] This substantial JLMP journey wage premium provides JLMP apprentices a much higher standard of living upon program completion, and likely contributes to the higher successful completion rates for JLMP programs.

Journey Wages Compared to Local Occupational Average Wages

JLMP programs provide journey wages that place successful apprentices 16.4% above their local occupational average wage, while non-union programs journey out apprentices 15.2% below their local mean wage. For each standard occupational classification ("SOC"), BLS publishes average hourly wages earned within each MSA, micropolitan statistical area and subregion in Washington state. WAGES calculates an estimate for the average hourly wage for each apprentice's occupation and area by assuming they work in their zip code. By comparing this estimate to an apprentice's journey wage, WAGES attempts to measure how well apprentices are paid relative to other workers in their trade and area. Across Washington state, apprentices who journeyed out of JLMP programs stood to earn journey wages equal to 116.4% of their local occupational mean wage, compared to only 84.8% of the local average for non-union completers.[58]

Table 4. JLMP Journey Wages vs. Local Occupational Average
Journey Wages for 2017 JLMP Completers by Largest SOC Occupations

SOC Occupation	2017 JLMP Completers	Avg. JLMP Journey Wage	Avg. Local Occ. Wage
Electricians	162	$42.37	$31.20
Carpenters	157	$40.69	$27.89
Firefighters	142	$21.36	$35.05
Construction Laborers	122	$25.83	$22.80
Structural Iron and Steel Workers	72	$32.17	$37.18
Power-Line Installers/Repairers	70	$48.13	$39.94
Sheet Metal Workers	61	$38.26	$30.91
Plumbers/Pipefitters/Steamfitters	59	$46.72	$34.11
Telecomm Equipment Installers/Repairers	48	$30.26	$27.96
Butchers and Meat Cutters	47	$22.26	$20.16

Source: Apprenticeship Program Details, Washington Department of Labor and Industries; Apprenticeship Registration and Tracking System, Washington State Department of Labor and Industries.

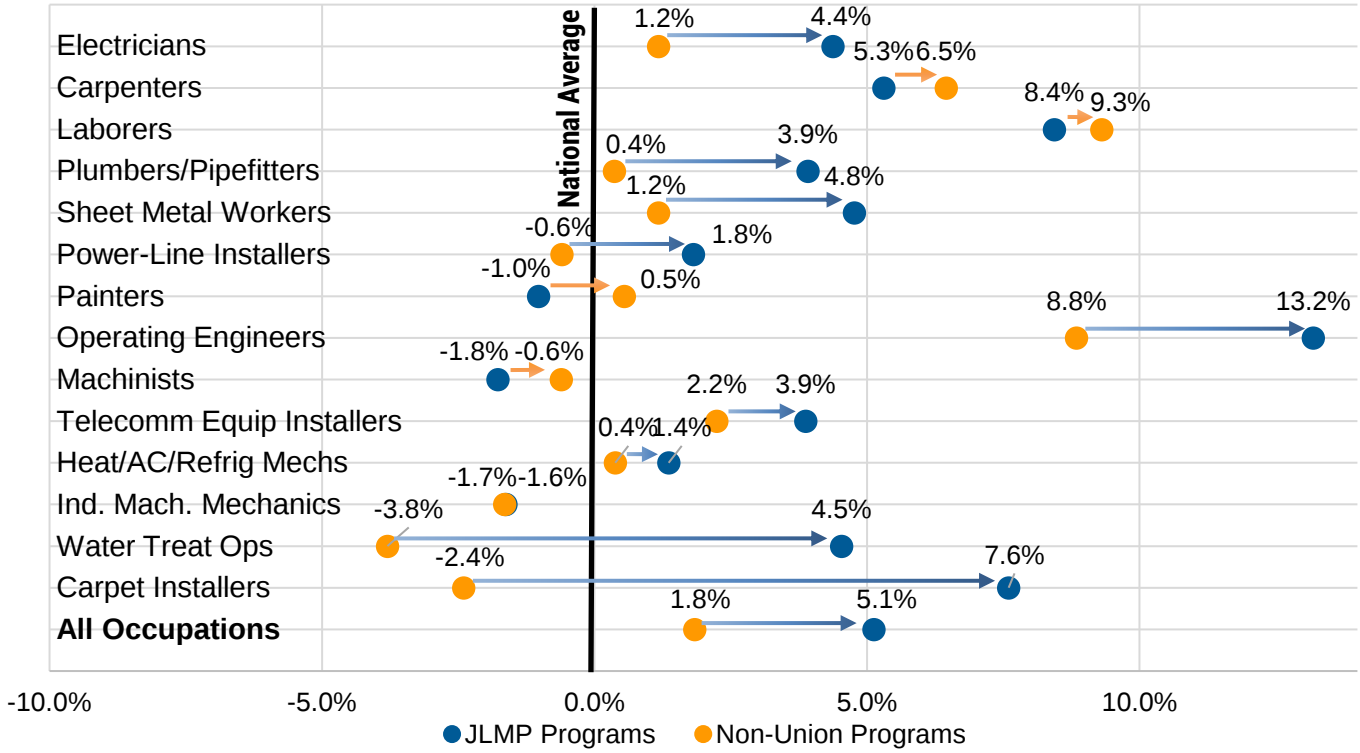
Apprentices journeying out of JLMP programs in 2017 earned journey wages above their local occupational average for the large majority of occupations (40 of 51).[59] Journey JLMP stonemasons journeyed out of their programs earning 2.1x the local average for their occupation, JLMP automotive body and related repairers earned 1.5x the local occupational mean wage, and JLMP tree trimmers and pruners earned 1.4x the local occupational mean.[60] Non-union programs, on the other hand, were able to provide journey wages above the local mean for only 10 of 30 occupations for which data was available. For instance, non-union carpenters journeyed out earning only 84.8% of their local mean wage, non-union web developers only 77.9% of their local mean and non-union medical assistants only 71.4% of their local mean.[61] Across the 14 occupations where JLMP and non-union programs both journeyed out apprentices, JLMP apprentices earned journey wages above the local average for all 14 occupations, while non-union apprentices journeyed out above the local average for only 5 occupations.[62] It's clear that JLMP apprenticeship programs do a better job of launching journeymen into careers where they earn well above a typical worker in their occupation and area.

Gender Inclusion and Outcomes

Female Enrollment

While more than 9 in 10 Washington apprentices are men, a comparison of the gender composition of Washington's apprenticeship occupations to the national averages for each occupation can provide a benchmark for gender inclusion in specific trades. In 2017, BLS' Current Population Survey captured the gender composition of 361 occupations.[63] Occupational gender ratios ran the gamut from male-dominated professions like brickmasons (99% male), to female-dominated professions like preschool and kindergarten teachers (98% female).[64] By comparing the gender ratios in occupations covered by Washington's apprenticeship programs to the national average for those same occupations, it's possible to gauge how well these programs are doing at bringing women into the traditionally male-dominated world of apprenticeships.

Figure 5. JLMP and Non-Union Female Participation vs. National Average
2017 Share of Women for Largest 14 Comparable Occupations



Source: ARTS Database, L&I; Table 11. Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity, Labor Force Statistics from the Current Population Survey, U.S. Census Bureau, 2017.

JLMP apprenticeship programs did a better job of engaging female apprentices than non-union, employer-run programs in 2017. There were 46 occupations trained by JLMP apprenticeship programs in Washington state for which national data on gender composition was available.[65] In these occupations, the percentage of female apprentices training in the JLMP programs was more than twice the weighted national average (8.8% vs. 4.2%).[66] By doubling the national average in female participation, the state's JLMP apprenticeship programs trained 571 more female apprentices in 2017 than would be expected according to the national average.[67] Washington's non-union apprenticeship programs also trained a slightly higher percentage of women than the national weighted average in the 39 occupations for which data was available (13.5% vs. 11.3%).[68] This translates into 62 more female apprentices training in non-union programs than would have been training had the programs enrolled women at the national average rate for their occupations.

Across the 14 directly comparable occupations where both JLMP and non-union programs trained apprentices, JLMP programs achieved female participation in excess of the national average at a rate almost three times larger than in non-union programs. In 2017, there were 14 occupations where national gender composition data was available and both JLMP and non-union programs trained apprentices (**Figure 5**). The share of women training in JLMP programs was more than triple the weighted national average for these occupations (7.9% vs. 2.8%).[69] Non-union programs also trained a slightly higher percentage of women than the weighted national average (4.9% vs. 3.1%).[70] The number of percentage points by which JLMP programs trained women above the weighted national average (5.1 percentage points) was almost triple the percentage by which non-union programs beat the weighted national average (1.8 percentage points).

"For comparable occupations, women successfully completed JLMP apprenticeship programs at more than eight times the rate of non-union programs."

Female Completion Rates

In 2017 for comparable occupations, women successfully completed JLMP apprenticeship programs at more than eight times the rate of non-union programs.[71] There were seven occupations[72] in which women exited both JLMP and non-union apprenticeship programs in 2017, either by cancelling or successfully completing their apprenticeship. Over these occupations, 1 of 25 exiting women completed their non-union programs (4.0%), while 40 of 121 exiting women in union programs (33.1%) completed their union apprenticeships.[73] Among women working to become journey laborers, for instance, 0 of 7 exiting apprentices (0%) successfully completed two non-union programs in 2017, while 7 of 15 female apprentices (46.7%) completed four JLMP apprenticeship programs.[74] For female operating engineer apprentices, 5 of 7 exiting women successfully completed JLMP programs (71.4%), while 0 of 3 exiting women successfully completed non-union operating engineer programs.[75]

The overall completion rate for female apprentices was nearly identical for JLMP (41.3%) and non-union programs (41.7%), driven entirely by relatively low-paid WACH apprentices.[76] WACH has achieved a very high rate of successful completion for its exiting female apprentices (92.9%), journeying out 26 female apprentices in 2017.[77] For all other non-union apprenticeship programs, only 9 of 56 exiting women successfully completed their apprenticeships, a completion rate of 16.1%.[78] While WACH should be commended for its completion success, WACH's female medical and dental assistants journey out earning $12.13/hour and $13.29/hour, respectively, in 2017 dollars.[79] These hourly wages place successful WACH female MAs and DAs well below the average wages in their field in every region of the state, a subject that will be discussed in more detail in the Apprenticeships for Growing Industries section.

Female Journey Wages

In addition to superior completion rates in comparable trades, women journeying out of JLMP programs in 2017 stood to earn almost twice as much, on average, as women journeying out of non-union apprenticeship programs.[80] The average journey wage for a woman completing a JLMP program in 2017 was $27.03/hour, compared to just $14.23/hour for women completing non-union programs.[81] The non-union statistics are somewhat skewed by the large percentage of female completers (74.3%) who journeyed out of WACH programs, where medical assistant journeywomen complete the program earning relatively low wages.[82] However, even after removing the relatively low-paid WACH journeywomen, the average journey wage for the remaining female completers from non-union programs is $19.76/hour, $7.26/hour below the female union journeywoman average. In the one occupation where women journeyed out of both union and non-union programs, union journeywomen carpenters earned an average journey wage of $40.69/hour, compared to $22.56/hour for non-union journeywomen carpenters.[83] Whether you hold occupation constant or look at completing journeywomen as a whole, JLMP journeywomen earn significantly more than their non-union counterparts.

Racial Inclusion and Outcomes

Apprentice of Color Enrollment

Analyzing apprenticeship program performance on racial inclusion by occupation is challenging because demographic data by occupation is unavailable at the state level, and Washington's demographics vary substantially from the national averages that are available. The Current Population Survey does not capture racial demographic data for occupations at the state level. National occupational data by race is available, but Latino workers are not separated out from the White, Black and Asian racial categories. Additionally, Washington's racial demographics vary substantially from nationwide racial demographics, with a higher share of White workers, a share of Black workers equivalent to only 1/3rd the national average, a lower share of Latino workers and a higher share of Asian workers. Consequently, it is not possible to measure racial inclusion by program compared to a national occupational average.

"Apprentices of color completing JLMP programs earned an average journey wage of $34.00/hour in 2017, compared to only $18.35/hour for apprentices of color from non-union programs."

In 2017, JLMP programs enrolled a higher percentage of apprentices of color than non-union programs overall, as well as in 10 of 18 comparable occupations. Overall, 28.5% of apprentices training in JLMP programs in 2017 were apprentices of color, compared to 25.6% in non-union programs.[84] Across the 18 occupations where apprentices trained in both JLMP and non-union programs, the JLMP programs trained a higher percentage of apprentices of color in 10 occupations, non-union programs performed better across 7 occupations, and the programs performed equally in 1 occupation. For the five largest occupations, JLMP programs trained more apprentices of color to be electricians (21.5% vs. 19.7%), laborers (35.8% vs. 25.2%) and plumbers, pipefitters and steamfitters (20.3% vs. 11.3%), while non-union programs performed better in training carpenters (37.7% vs. 30.2%) and sheet metal workers (34.0% vs. 20.2%) of color.[85]

Apprentice of Color Completion Rates

JLMP programs successfully journeyed out a higher percentage of apprentices of color in 7 of 10 comparable occupations in 2017. For the 10 comparable occupations, 153 of 453 exiting apprentices of color (33.8%) successfully completed their JLMP programs in 2017, while 26 of 107 apprentices of color (24.3%) exiting non-union programs completed them.[86] For instance, among electrician apprentices of color, 49.1% of exiting JLMP apprentices successfully completed their programs versus 13.9% of non-union

apprentices.[87] Fourteen of fifteen exiting telecommunications equipment installer and repairer apprentices of color completed their JLMP programs in 2017, while all 5 non-union apprentices of color who exited their programs did not.[88] In comparable trades, JLMP programs did a better job of journeying out apprentices of color than non-union programs. However, overall, non-union programs journeyed out a slightly higher percentage of apprentices of color than JLMP programs (34.0% vs. 30.7%), driven in large part by WACH's high completion rates.[89] Excluding WACH, the non-union completion rate for apprentices of color dropped over 10 percentage points to 23.3%.[90]

Apprentice of Color Journey Wages

Apprentices of all races journeyed out of their JLMP programs at much higher wage rates than non-union programs, and the JLMP wage premium was higher for apprentices of color. Apprentices of color completing JLMP programs earned an average journey wage of $34.00/hour in 2017, compared to only $18.35/hour for apprentices of color from non-union programs.[91] This $15.65 per hour (or 85.3%) JLMP wage premium for apprentices of color was significantly larger in both absolute and percentage terms than the JLMP premium for white apprentices completing their programs. Additionally, the average journey wage rate for white apprentices ($34.49/hour) and apprentices of color ($34.00/hour) were essentially the same for those journeying out of JLMP programs, while white apprentices completing non-union programs earned 32.7% more than apprentices of color completing non-union programs ($24.34/hour vs. $18.35/hour).[92]

Veteran Inclusion and Outcomes

Enrollment

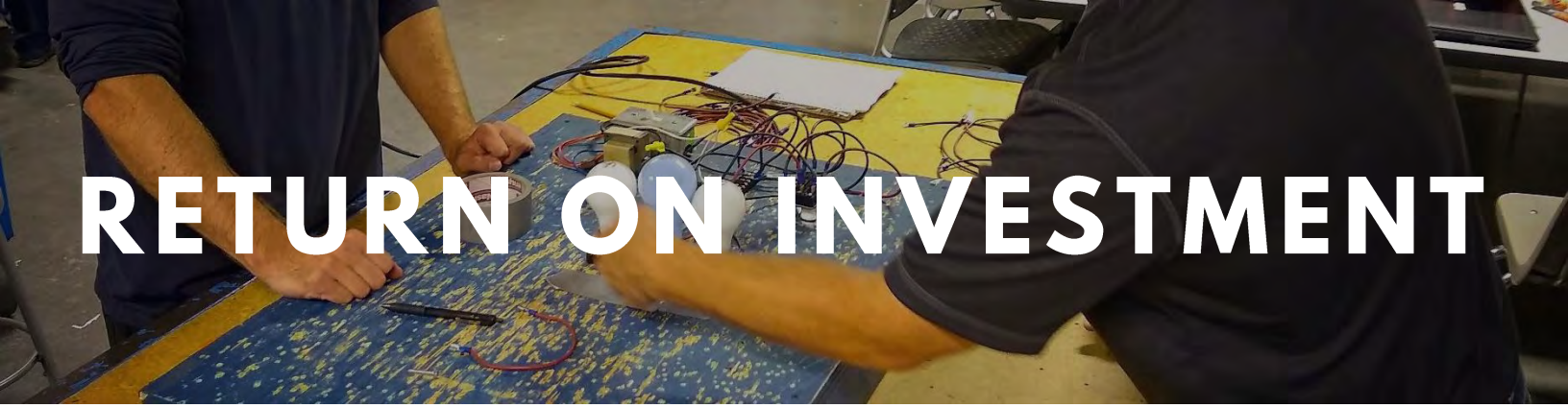
Veterans comprise a slightly higher percentage of apprentices training in JLMP apprenticeship programs than non-union programs. In 2017, 13.7% of JLMP apprentices and 12.8% of non-union apprentices were veterans.[93] Among apprenticeship programs reporting data for 100 or more apprentices in 2017, the International Union of Elevator Constructors Local 19 - National Elevator Industry Educational Program (24.8%), Puget Sound Electrical JATC (21.3%), Southwest Washington Electrical JATC (19.5%) and CITC of Washington's Construction Electrician Program (18.8%) all trained a higher than average percentage of veteran apprentices. Overall, the share of veterans in apprenticeship was higher than for the population of Washington state as a whole, where 9.6% of adult Washingtonians are veterans.[94]

Completion Rate

Veterans completed JLMP programs at a higher rate than non-union programs in 2017. Overall, 115 of 321 veterans exiting JLMP programs in 2017 (35.8%) successfully journeyed out, compared to 22 of 67 veterans exiting non-union programs (32.8%). Certain apprenticeship programs journeyed out higher percentages of veterans, like the Washington State Firefighters JATC where 20 of 20 veterans successfully completed the program in 2017, or Puget Sound Electrical JATC's where 55.9% of 34 exiting veterans completed their program.[95] Overall, veterans had a lower successful completion rate (35.3%) than all exiting apprentices as a whole (41.6%).

Journey Wages

Veteran apprentices journeying out of JLMP programs earned $9.55/hour more than veterans completing non-union programs in 2017. The 115 veteran apprentices that completed JLMP programs earned an average journey wage of $35.64/hour, while the 22 veterans completing non-union programs earned an average journey wage of $26.09/hour.[96] Only 22.7% of completing non-union veteran apprentices had journey wages above the local mean for their occupation, vs. 71.1% of veteran apprentices journeying out of JLMP programs.[97]



RETURN ON INVESTMENT

Return on Investment Analysis

Introduction

While the Program Performance section compared the performance and inclusion metrics for JLMP and non-union programs, WAGES' return on investment analysis calculates the estimated extra earnings for apprentices and taxpayers generated by both JLMP and MEP programs. Enrollment, completion rates, journey wages and inclusion are important metrics of apprenticeship success. A return on investment ("ROI") model can add another layer of depth by estimating the impact that an apprenticeship program has on an apprentice's lifetime earnings and benefits. The model can also estimate a ROI for taxpayers by comparing the cost of public investment in training to future increases in taxes paid by higher earning journeymen. In order to calculate these individual and taxpayer impacts, and analyze what effect program model has on ROI, WAGES compares the largest and most established JLMP and MEP programs in the state. This comparison provides insight on how different apprenticeship models may serve apprentices and taxpayers as they are expanded to new industries.

The longevity, size and success of Washington's JLMP and MEP construction apprenticeship programs makes them an ideal group to analyze in an ROI model. The Seattle Area Pipe Trades ("SAPT"), Western Washington Sheet Metal JATC ("WWSMJATC"), Laborers-Employers Training Trust Fund ("NWLETT"), Puget Sound Electrical JATC ("PSEJATC"), Washington United Brotherhood of Carpenters JATC and Operating Engineers Regional Training Program ("OERTP") JLMP programs have all been operating for over 40 years.[98] In 1985,[99] the Associated General Contractors ("AGC"), Associated Builders and Contractors ("ABC") and National Utility Contractors Association ("NUCA") partnered[100] to create the largest MEP program, CITC, which trains four occupations included in the Model. Together, the twelve programs analyzed by the WAGES ROI Model trained 6,200 apprentices in 2017, 36.1% of all apprentices in the state.[101] Additionally, 1,839 apprentices journeyed out of these programs over the past five years.[102] These large, established JLMP and MEP programs provide an ideal comparison group to look at how apprenticeship model affects ROI.

"The longevity, size and success of Washington's JLMP and MEP construction apprenticeship programs makes them an ideal group to analyze in an ROI model."

WAGES compares outcomes for the six largest JLMP and six largest MEP programs serving the largest comparable construction occupations to understand what role the model of apprenticeship plays on program outcomes. The WAGES ROI Model examines apprenticeship programs for carpenters, construction electricians/inside wiremen, construction equipment operators, laborers, plumbers and sheet metal workers. For each occupation, the Model compares the ROI and net impact on apprentices and taxpayers of the largest MEP and JLMP program. The results can be used to inform policymaking decisions on which type of apprenticeship programs to invest in, both in existing trades and new occupations, and help apprentices make decisions on which apprenticeships produce the greatest individual returns. For both individuals and taxpayers, WAGES finds that JLMP programs yield a far greater return on investment and net impact than non-union MEP programs.

Return on investment and Net Impact of Washington's Apprenticeship Programs

Calculating an apprenticeship program's return on investment ("ROI") for taxpayers is a useful way to measure program impact and make public investment decisions. Conceptually, taxpayer ROI attempts to compare the extra net taxes in a world where workers go through the apprenticeship program and earn higher wages, to net taxes for taxpayers in a world where the same workers do not go through the program. The additional income, sales, Social Security and Medicare taxes resulting from the program are compared to any additional costs incurred to pay for the program to calculate a taxpayer ROI. Public officials can then compare ROIs for different apprenticeship programs, or different workforce development programs in general, to make decisions about how best to invest tax dollars in the present to generate additional tax revenue in the future.

The ROI and net impact of an apprenticeship program for individual apprentices provides similar information about financial returns to individuals. For apprentices, the net impact and ROI of an apprenticeship program is a comparison of the additional wages and benefits (net of taxes) they earn over the course of their lifetime, minus the tuition, books and other costs they incur to go through the program. Net impact and ROI measurements can help individual apprentices make decisions about where they want to spend thousands of hours training in order to build a high-wage, high-skill career.

Washington's Workforce Training and Education Coordinating Board ("WTB") conducts regular ROI and net impact analyses of Washington's workforce development programs, including apprenticeship. WTB contracts with the W.E. Upjohn Institute for Employment Research ("Upjohn") to conduct sophisticated analyses for 12 of Washington's workforce development programs, including apprenticeship. Upjohn's net impact and cost-benefit analysis "attempts to answer the question of how outcomes compare to what would have happened to participants if there were no program, and individuals were left to their next best alternatives."[103] To model what would happen in this alternative universe where apprentices did not enroll in their program, Upjohn creates a demographically similar comparison pool of workers who sign up for job search services at Washington Work Source offices, but don't participate in a workforce development program. By comparing the wage, benefit and tax results for participants in workforce development programs to the wage, benefit and tax results for this demographically similar group of workers, Upjohn can theoretically attribute the difference in outcomes between the two groups to the workforce development program.

Upjohn found "individual apprentices stood to earn $342,560 in additional total compensation over their lifetimes. Taxpayers, meanwhile, earn $103,239 in additional taxes."

The net impacts of apprenticeship programs in Washington are positive and very large. Upjohn's 2016 analysis looked at completing and non-completing apprentices who exited their programs in 2010-2011 and 2012-2013, finding annual earnings increases of almost $13,800 per year in 2016 dollars.[104] Projecting these results forward over the lifetime of an apprentice,[105] Upjohn found that apprentices earned $258,676 more in gross wages, $103,470 more in fringe benefits, and $55,728 more in gross total compensation during training than they would have earned had they not participated in their program.[106] After subtracting away program costs and taxes, individual apprentices stood to earn $342,560 in additional total compensation over their lifetimes. Taxpayers, meanwhile, earn $103,239 in additional taxes, net of program costs.[107] Apprenticeship has the second highest net impact of any workforce development program in the state.[108]

However, Upjohn's analysis does not examine the ROI or net impact for individual apprenticeship programs. Programs with higher completion rates, higher journey wages and more benefits, all else equal, will likely see higher ROIs for taxpayers and net impacts for apprentices. Since JLMP programs have achieved higher completion rates, better journey wage standards and larger benefit packages, they will theoretically produce greater returns for individuals and taxpayers. To test that theory, WAGES uses the WAGES ROI Model to compare the ROI for taxpayers and net impact for individuals for the largest JLMP program and largest MEP program serving the six largest comparable occupations.

The WAGES ROI Model - Description

WAGES develops an economic model of ROI and net impact that allows for comparison of different apprenticeship programs and models. Upjohn's sophisticated statistical analysis examines the ROI and net impact of all apprenticeship programs in Washington state, but is not applied to individual apprenticeship programs. WAGES employs an economic model ("WAGES ROI Model") to estimate the ROI and net impacts of twelve apprenticeship programs (**Table 5**). The WAGES ROI Model is an economic model that relies on a large set of assumptions, not a statistical model. The results should, therefore, be interpreted conservatively as estimates providing a basis for comparison, rather than precise figures. Nonetheless, the WAGES ROI Model utilizes the best data available, realistic economic assumptions, and results in ROIs and net impacts that are broadly consistent with the Upjohn analysis.

Table 5. WAGES ROI Model Apprenticeship Programs
Largest JLMP and MEP Program in Six Largest Comparable Occupations

Occupation	JLMP Program	MEP Program
Carpenter	Northwest Carpenters Institute	Construction Industry Training Council of Washington - Carpenter
Construction Electrician	Puget Sound Electrical JATC	Construction Industry Training Council of Washington - Construction Electrician
Construction Equip Operator	Operating Engineers Regional Training Program	Inland Northwest Associated General Contractors Operators Apprenticeship Committee
Laborer	Northwest Laborers-Employers Training Trust	Inland Northwest Associated General Contractors Laborers Apprenticeship Committee
Plumber	Seattle Area Pipe Trades	Construction Industry Training Council of Washington - Plumber
Sheet Metal Worker	Western Washington Sheet Metal JATC	Construction Industry Training Council of Washington - Sheet Metal

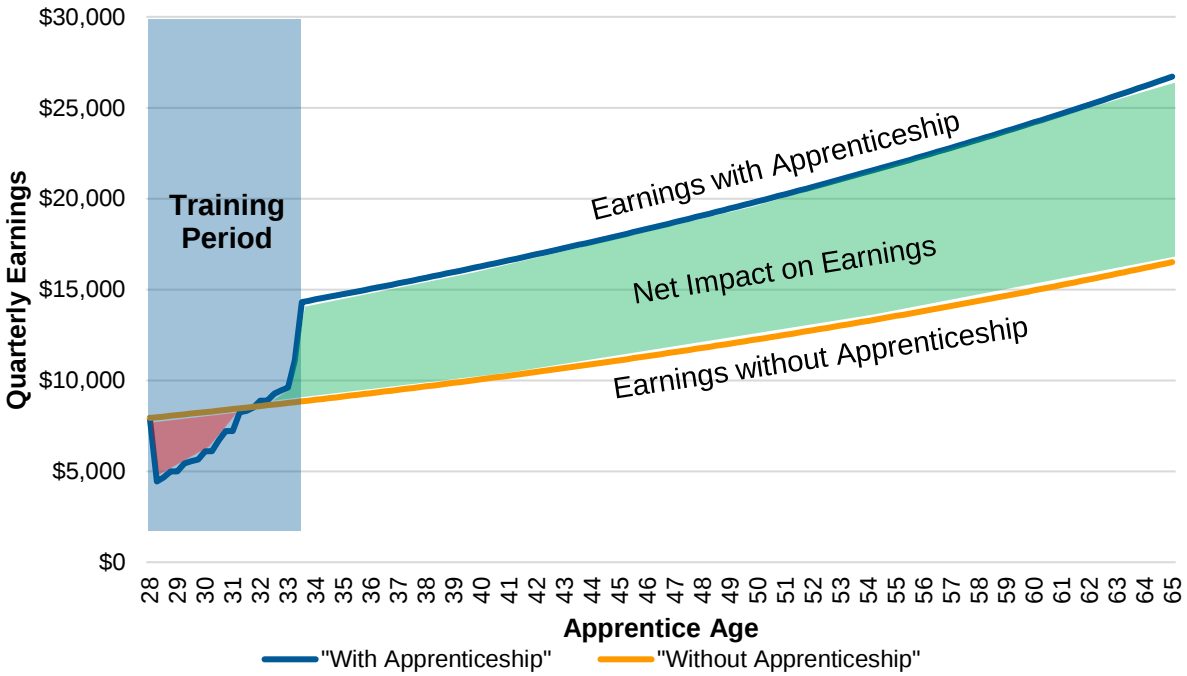
Note: "Largest comparable occupations" are defined as the top ten occupations with the largest number of 2017 enrolled apprentices where both JLMP and MEP programs trained apprentices. "Largest program" is defined as the JLMP or MEP program with the largest number of exiting apprentices for those occupations in 2017.

WAGES applies the WAGES ROI Model to twelve programs (six JLMP and six MEP) serving the six largest apprenticeship occupations trained by both a JLMP and MEP program between 2013 and 2016.[109] The WAGES ROI Model universe includes all apprentices in the six relevant occupations who completed or canceled their program between July 1, 2013 and June 30, 2016, excluding apprentices who transferred or trained in multiple programs.[110] Staff at WTB provided pre-program earnings, post-program earnings, pre-program hours and post-program hours data for three program years – 2013/2014, 2014/2015 and 2015/2016 – for both completers and non-completers for the group of twelve programs as a whole. This was the most up-to-date data available, and the most granulated wage and hours data provided.

For each apprentice, the WAGES ROI Model compares data for their actual participation in apprenticeship to a hypothetical model where they never trained as an apprentice. The WAGES ROI Model uses on-the-job training ("OJT") hours and wage scales data for individual apprentices reported by L&I to estimate actual apprentice earnings, benefits and taxes during training, assuming a starting age of 28 for every apprentice. The Model then uses average wage data supplied by WTB to estimate apprentice earnings after completing their program, projecting this out for the remainder of their career (**Figure 6**). The hypothetical model without apprenticeship uses each apprentice's pre-apprenticeship hours and wages, adjusted for

geographic and occupational conditions in their trade, and projects that forward until retirement. By comparing the estimated lifetime earnings and benefits for individuals who went through an apprentice program, to the hypothetical earnings for each apprentice in a world where they never participated in an apprenticeship program, the WAGES ROI Model estimates a net impact for each apprentice and for taxpayers for each apprentice in each program. A more detailed explanation of the WAGES ROI Model, including an explanation of all model assumptions, can be found in **"Appendix A: The WAGES ROI Model."**

Figure 6. Estimated Quarterly Earnings for Apprentice John Doe
Apprenticeship vs. No Apprenticeship, Age 28 to 65



Note: Post-training earnings for apprentices, and all earnings for non-apprentices, estimated to grow at a real wage rate of 2%.

The WAGES ROI Model - Results

JLMP programs produced significantly greater gains in additional wages, benefits and taxes for individuals and taxpayers than MEP programs for all six of the state's largest comparable occupations. On average, the six JLMP programs increased an individual apprentice's lifetime earnings by $446,118 and lifetime benefits by $365,427, net of tax payments (**Table 6**). For taxpayers, these higher earning JLMP apprentices generated an additional $289,474 in income, sales, Social Security and Medicare taxes, net of unemployment insurance transfers. MEP programs also produced additional wages, benefits and taxes for apprentices. The average annual earnings of MEP apprentices increased by $233,221 over their lifetimes, benefits by $120,971 and net payments to taxpayers by $137,970.

JLMP programs added significantly more to lifetime benefits because of their generous health and retirement packages. In 2017, employers in the construction trades paid their workers an average hourly wage of $24.85/hour along with $7.79/hour in health, retirement and paid leave benefits.[111] The Model uses this benefit percentage (31.3%) as an estimate for benefits accrued by individuals who never enter apprenticeship, all MEP completers and non-completers, and JLMP non-completers. JLMP completers, however, accrue a far higher amount of retirement and healthcare benefits through their union jobs. WWSMJATC apprentices, for instance, journey out of their programs earning benefits equal to 56.8% of their

wages, while inside wiremen/construction electrician apprentices journey out of their PSEJATC program earning a benefit package worth 44.8% of their wages.[112] These higher benefit rates drive the much higher lifetime additional benefits enjoyed by JLMP program apprentices.

Higher wage occupations had a greater positive effect on lifetime earnings, benefits and tax payments. The programs that contributed to the largest increases in apprentice lifetime earnings and tax payments were the SAPT, PSEJATC and WWSMJATC apprenticeship programs. These three programs also had the highest journey wages (in May 2017 dollars), with SAPT apprentices journeying out at $51.50/hour, PSEJATC apprentices journeying out at $48.62/hour and WWSMJATC apprentices journeying out at $41.89/hour.[113] All three programs also achieved greater lifetime earnings and tax payments for apprentices because of their higher completion rates. Among MEP programs, the greatest returns for individuals were also achieved by the three programs with the highest journey wages (in May 2017 dollars) – CITC – Plumber ($29.11/hour), CITC – Construction Electrician ($29.02/hour) and CITC – Sheet Metal ($28.39/hour).

Table 6. WAGES ROI Model Results – Additional Wages, Benefits, Taxes and Costs
Avg. Additional Lifetime Wages, Benefits, Taxes and Costs for 2013-2016 Exiting Apprentices

Occupation	Program	Additional Wages	Additional Benefits	Additional Taxes	Taxpayer Costs	Individual Costs
Carpenter	NWCI	$332,661	$201,567	$208,655	$2,679	$806
	CITC - Carpenter	$208,228	$104,774	$115,988	$2,824	$849
Construction Electrician	PSEJATC	$850,625	$760,850	$611,976	$6,166	$1,667
	CITC - Con. Electrician	$281,961	$141,933	$164,110	$3,242	$850
Construction Equip Operator	OERTP	$435,085	$451,126	$313,781	$4,129	$1,287
	INWAGC Operators AC	$116,084	$54,689	$53,870	$4,051	$1,255
Laborer	NWLETT	$265,652	$128,849	$145,083	$2,500	$757
	INWAGC Laborers AC	$164,787	$61,429	$45,611	$769	$140
Plumber	SAPT	$932,672	$1,173,210	$615,006	$8,927	$2,297
	CITC - Plumber	$277,470	$161,121	$194,183	$5,289	$1,350
Sheet Metal Worker	WWSMJATC	$626,715	$720,181	$416,395	$6,554	$1,771
	CITC - Sheet Metal	$263,048	$135,402	$152,785	$3,263	$856
Six Largest Comparable	**All JLMP**	**$446,118**	**$365,427**	**$289,474**	**$3,862**	**$1,101**
	All MEP	**$233,221**	**$120,971**	**$137,970**	**$3,661**	**$1,005**

Note: All figures are per apprentice, presented in real May 2017 dollars, discounted by 3% per year.

Program costs increased with program RSI hours and the average length of program participation. Following Upjohn, the WAGES ROI Model estimates taxpayer costs as an annual administrative fee of $495/apprentice (in May 2017 dollars) and an FTE cost of $4,396/year (in May 2017 dollars). Annual individual costs are estimated at $400/apprentice (see "Appendix A" for methodological details). Apprenticeships that require apprentices to study for the most RSI hours, like plumbers (216 annual hours), construction electrician (200 annual hours) and sheet metal worker (200 annual hours) programs, tend to have higher taxpayer costs. Additionally, individual and taxpayer costs increase with average length of program participation. The only outlier among the 12 programs is the Inland Northwest Association of General Contractors Laborers Apprenticeship Committee ("INWAGC Laborers AC") program, where apprentices exited after training for an average of only one quarter. This leads to an estimated taxpayer and individual program cost which may underestimate total costs for a typical apprentice, and likely overestimates program benefits.

The net impact of JLMP programs for individuals and taxpayers is far higher than MEP programs for all six of Washington's largest comparable occupations. Overall, the six JLMP programs created an average net impact (wages + benefits – taxes – private costs) for individuals of $810,444 (**Table 7**). SAPT's apprenticeship program achieved the highest net impact, with individuals earning an average of $2,103,586 more in net total compensation over the course of their lifetime than if they had not trained in the program. The JLMP net impact for taxpayers (taxes – taxpayer costs) per apprentice was also positive and significantly higher than for the MEP apprenticeships. On average, an apprentice training in one of the six JLMP program generated $285,612 in additional tax revenue, net of the initial public program costs, over the course of their lifetime. MEP programs also produce positive net impacts for individuals and taxpayers. MEP apprenticeship had an average net impact of $353,187 on the lifetime earnings and benefits of MEP apprentices, net of taxes and individual program costs. This additional income generated a net impact for taxpayers of $134,309 per MEP apprentice.

Table 7. WAGES ROI Model Results – Net Impact and Return on investment
Individual and Taxpayer Net Impact of 2013-2016 Exiting Apprentices

Occupation	Program	Individual Net Impact	Taxpayer Net Impact	Taxpayer ROI
Carpenter	NWCI	$533,421	$205,976	78x
	CITC - Carpenter	$312,153	$113,163	41x
Construction Electrician	PSEJATC	$1,609,808	$605,809	99x
	CITC - Con. Electrician	$423,045	$160,868	51x
Construction Equip Operator	OERTP	$884,923	$309,652	76x
	INWAGC Operators AC	$169,518	$49,819	13x
Laborer	NWLETT	$393,744	$142,583	57x
	INWAGC Laborers AC	$226,075	$44,842	59x
Plumber	SAPT	$2,103,586	$606,079	69x
	CITC - Plumber	$437,241	$188,893	37x
Sheet Metal Worker	WWSMJATC	$1,345,124	$409,841	64x
	CITC - Sheet Metal	$397,594	$149,522	47x
Six Largest Comparable	**All JLMP**	**$810,444**	**$285,612**	**74x**
	All MEP	**$353,187**	**$134,309**	**38x**

For JLMP apprenticeships examined by the Model, the ROI for taxpayers was 74x the initial taxpayer costs. PSEJATC achieved the largest taxpayer ROI (99x) because the program produced significant increases in net taxes while incurring slightly lower program costs. NWCI also produced a high taxpayer ROI (78x) driven primarily by its lower program costs associated with a shorter training period. MEP programs generated an ROI for taxpayers of 38x public program costs. INWAGC Laborers AC achieved the highest ROI level among MEP programs, but those results should be interpreted cautiously because of the program's abnormally short average length of training and small number of exiting apprentices.

JLMP programs achieve superior results by investing in advanced training facilities, drawing on the contributions of both union workers and employers, and recruiting talented apprentices from all communities. A brief overview of the largest JLMP and MEP program for each occupation provides some background explaining how JLMP programs are able to achieve such powerful results. These successful JLMP programs provide important lessons that should be applied to new apprenticeship programs in growing industries.

Carpenters

Washington State UBC JATC's Northwest Carpenters Institute ("NWCI")

NWCI is a JLMP between United Brotherhood of Carpenters local unions in Washington and Idaho, and AGC and other employers.[114] Headquartered in Kent, NWCI runs five training centers across the state[115] and is planning to add a sixth in Dupont in the near future. NWCI is the largest apprenticeship organization in Washington state, training thousands of apprentices across 12 occupational programs,[116] with the large majority training to become journey carpenters (62.8%) and lathing acoustical drywall systems installers (23.7%).[117] In addition to traditional woodwork and framing, apprentices learn to erect scaffold, operate forklifts, construct complex interior roofing systems and weld together metal frames.

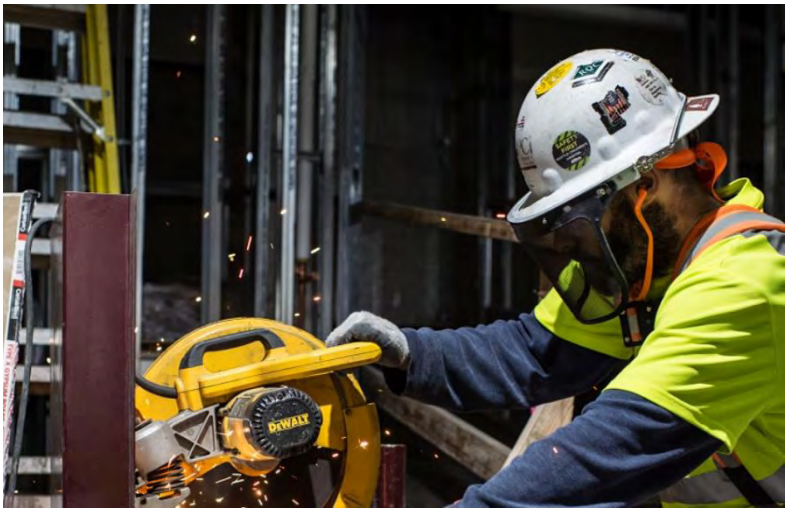


Photo: NWCI apprentice runs power saw

The JLMP model works well for apprentice carpenters and helps retain women and veterans. JLMP apprentices benefit when both their apprenticeship coordinators and union reps monitor their progress and onsite job training, especially apprentices from vulnerable groups. NWCI coordinators and union reps strive to stay in constant contact with apprentices to ensure they're receiving enough on-the-job training to advance to the next level of apprenticeship. Additionally, NWCI provides expansive continuing education to journeymen. "It does not stop at apprenticeship," says NWCI Outreach Coordinator Lisa Marx. Program leaders recently invested approximately one million dollars in upgraded tablets, huddle screens and facilities, keeping equipment up-to-date so apprentices and journeymen are trained with the latest technology.

NWCI's relationships with pre-apprenticeship programs are also crucial to its success. Paula Resa says the construction trades are experiencing a "silver tsunami" as older workers retire and programs struggle to keep up with the demand for new carpenters. NWCI runs a state-recognized pre-apprenticeship program to bring in qualified candidates directly once they graduate. NWCI also partners with pre-apprenticeship programs like ANEW, a great resource to recruit women to carpentry. Signatory contractors are aware of the tight labor market and NWCI is working with them to identify talented workers. These efforts are opening doors for more people of color and women. NWCI Admissions data from 3Q 2018 shows apprentices of color now comprise 41% of new apprentices and 34% of apprentices overall.

Construction Industry Training Council of Washington – Carpenter ("CITC")

CITC was started by AGC, the Associated Builders and Contractors ("ABC") and National Utility Contractors Association ("NUCA") in 1985 to train apprentices in a number of construction trades.[118] CITC's apprenticeship programs have since expanded to cover at least ten occupations.[119] The organization has training and education facilities in Spokane, Pasco, Vancouver, Bellevue and Marysville. CITC is overseen by an executive board of employer representatives and counts seven employer associations as Associate Partners.[120] Programs are funded by non-union contractors which pay CITC an hourly fee to train their apprentice workers while they work on projects. Carpentry was CITC's first ever apprenticeship field,[121] and the program trained 133 apprentices in 2017.[122] Apprentices work and train over four years to complete the 8,000-hour program.[123]

Table 8. Northwest Carpenters Institute and CITC – Carpenters Performance Comparison

Metric	NWCI	CITC
2017 Apprentices	1,567	133
2017 Completion Rate*	36%	22%
2018 Journey Wage	$41.92	$25.00
Individual Net Impact	$533,421	$312,153
Taxpayer Net Impact	$205,976	$113,163
2017 Women	8%	7%
2017 People of Color	29%	44%
2017 Veterans	14%	9%

***** Completion rates are measured as completers/(completers+cancellers). However, many programs use a Federal method which excludes probationary cancellers and returns a much higher completion rate. Data was unavailable for this calculation.
Source: Net Impacts from WAGES ROI Model. All other data from L&I's ARTS Database and Apprenticeship Program Info.

Construction Electricians

Puget Sound Electrical JATC ("PSEJATC")

PSEJATC is a joint labor and management program between International Brotherhood of Electrical Workers ("IBEW") Local 46 and the Puget Sound Chapter of the National Electrical Contractors Association ("NECA"). PSEJATC's three programs provide training for over 1,356 apprentices per year,[124] a number that has doubled in the past three years as the organization expands. Apprentices train to achieve certification as inside wireman (construction electricians), limited energy/sound and communication electricians, and residential electricians.[125]

Photo: PSEJATC electrician apprentices training in Motor Control classroom lab exercises.

Since 2001, PSEJATC has operated a 66,000 sq. ft. training facility in Renton with cutting edge equipment. PSEJATC Training Director Clay Tschillard says that the program's "classrooms and labs have been designed specifically to educate instructors, journeyworker electricians and apprentices in all aspects of the electrical industry."

PSEJATC's joint labor and management partnership instills a spirit of collaboration in the program. Employers are constantly upgrading their equipment and working with the most modern technology available. They bring that knowledge to PSEJATC's program to keep its curriculum and equipment up-to-date. Oversite from the electricians' union IBEW Local 46 and NECA ensures that apprentices work on a wide variety of skills beneficial to their careers, rather than focusing on specialized requirements driven by any one employer. The program also continually works to grow and train more apprentices, increasing the supply of skilled electricians in the industry. Overall, labor and management "working together to improve the program creates a less adversarial environment," says Clay Tschillard.

PSEJATC partners with a number of community-based organizations to expand apprenticeship opportunities in underrepresented communities. ANEW is headquartered at PSEJATC's training facility, introducing aspiring apprentices to the program and providing support services like tools, clothes and boots to those who need them. PSEJATC also partners with the Urban League and Pre-Apprenticeship Construction Education ("PACE") to recruit apprentices of color, and the Department of Corrections to connect formerly incarcerated men and women to good jobs.

Construction Industry Training Council of Washington – Construction Electrician ("CITC")

CITC trains apprentices in three electrical industry trades – construction electrician, residential wireman and low energy/sound and communication technician.[126] The programs vary in length from two to four years, with apprentices meeting on a weekly basis to learn their trade.[127] The 677 apprentices training to become CITC construction electricians comprised 50% of all apprentices training in CITC programs in 2017.[128]

CITC's programs focuses on training, workforce development and safety. "We want our workers to be skilled, and we want them to come home safe every night" says CITC CEO Halene Sigmund.[129] Most CITC apprentices continue to work for their employers even after they journey out.

Table 9. PSEJATC and CITC – Construction Electrician Performance Comparison

Metric	PSEJATC	CITC
2017 Apprentices	1,081	677
2017 Completion Rate*	54%	31%
2018 Journey Wage	$50.09	$29.90
Individual Net Impact	$1,609,808	$423,045
Taxpayer Net Impact	$605,809	$160,868
2017 Women	6%	4%
2017 People of Color	23%	22%
2017 Veterans	24%	19%

***** Completion rates are measured as completers/(completers+cancellers). However, many programs use a Federal method which excludes probationary cancellers and returns a much higher completion rate. Data was unavailable for this calculation.
Source: Net Impacts from WAGES ROI Model. All other data from L&I's ARTS Database and Apprenticeship Program Info.

Construction Equipment Operators

Operating Engineers Regional Training Program ("OERTP")

OERTP is a JLMP between International Union of Operating Engineers Locals 302 and 612, and a number of employers and employer groups, including the Associated General Contractors of Washington ("AGC").[130] Started in 1974 using old military-issue gear, OERTP has expanded to fill a 1,600-acre training center in Ellensburg packed with state-of-the art equipment. OERTP trains operating engineer apprentices in three occupations - construction equipment operator, heavy duty repairman mechanic, and hoisting engineer – learning to operate everything from dozers to cranes to asphalt rollers.[131] OERTP trained 379 apprentices in 2017, including 264 construction equipment operators.[132]

Photo: Steven Neese (2yr Apprentice) taking a moment from his busy day running a D10 dozer for Kiewit Construction at a rock quarry in Skagit County.

The collaborative relationship between labor and management at OERTP has been a boon to both workers and employers. For contractors, high standards negotiated by the union ensure a stable, highly-skilled workforce. "If people are paid well, with good benefits and pensions, you'll have more productive workers" says Lacey Hall, Coordinator at OERTP. The union hiring hall also ensures that contractors can secure veteran journeymen with specialized skills at a moment's notice. The JLMP benefits apprentices as well. Hall says that journeymen in the union "have skin in the game" with apprentices because today's apprentice is tomorrow's union brother or sister. This incentivizes journeymen to help apprentices succeed in the program and become the next generation of union members keeping wage and benefit standards high.

OERTP has a relatively high percentage of female apprentices (13.3% of construction equipment operators in 2017) for the construction trades. Coordinator Lacey Hall attributes this to OERTP's strong partnership with pre-apprenticeship programs that empower women like Apprenticeship and Nontraditional Employment for Women ("ANEW"), where OERTP puts on half-day workshops for mostly female pre-apprentices. Additionally, three of OERTP's coordinators in the field are women, connecting with interested applicants and providing needed support to apprentices.

Inland Northwest Associated General Contractors Operators Apprenticeship Committee ("INWAGC")

Headquartered in Spokane, INWAGC's operators apprenticeship program trained 50 apprentices in 2017 and journeyed out 1 apprentice.[133] INWAGC's 6,000-hour program requires 160 hours per year of RSI and trains apprentices "in all aspects of equipment operation, maintenance and safety."[134]

Table 10. OERTP and INWAGC Operators AC Performance Comparison

Metric	OERTP	Inland NW AGC
2017 Apprentices	264	50
2017 Completion Rate*	73%	14%
2018 Journey Wage	$40.29	$24.54
Individual Net Impact	$884,923	$169,518
Taxpayer Net Impact	$309,652	$49,819
2017 Women	13%	10%
2017 People of Color	21%	27%
2017 Veterans	11%	25%

***** Completion rates are measured as completers/(completers+cancellers). However, many programs use a Federal method which excludes probationary cancellers and returns a much higher completion rate. Data was unavailable for this calculation.
Source: Net Impacts from WAGES ROI Model. All other data from L&I's ARTS Database and Apprenticeship Program Info.

Laborers

Northwest Laborers-Employers Training Trust Fund ("NWLETT")

NWLETT is a JLMP between 13,000 members of Laborers International Union of North America ("LIUNA") locals in Washington and Idaho, and AGC.[135] Founded in 1969, NWLETT has six locations statewide, including large training centers in Kingston, Des Moines and Spokane. The Kingston training center is housed on 15 acres of former military land, where hundreds of laborer apprentices spend several weeks every year training, learning, and building structural improvements to the center and nearby community. NWLETT is the second largest apprenticeship program in the state, training 1,480 apprentices in 2017.[136] "Laborers are the first on and last off a site" explains NWLETT Training Director Glen Freiberg. "We do everything from the ground down," including digging trenches and tunnels, pouring cement, and tending other crafts.

Photo: A Laborer apprentice hydroblasts concrete

NWLETT's laborer-employer partnership ensures a structured learning environment, steady stream of skilled workers and improved worker safety. For Glen Freiberg, the main benefit of the apprenticeship program for employers is that it is highly structured. Courses start with general construction, move on to concrete, and then proceed progressively based upon the skills laborers will need at their worksites. Employers can also count on an organized supply of experienced workers from union hiring halls, where journey laborers call-in or wait in person to be dispatched based on skill and need. The collaborative nature of the NWLETT program also protects worker safety and lowers employer costs. Apprentices go through an OSHA-10 training, receive an asbestos abatement card and attend environmental classes to learn about worksite safety. They also have a voice on the job to speak up about safety issues with the backing of their union. Employers, in turn, benefit from reduced injury claims and lower insurance rates.

NWLETT's program structure and outreach efforts encourage participation from underrepresented groups. While many college courses and other workforce development programs charge participants hefty tuition or fees, NWLETT provides apprentices money for gas, food, travel and other supports while they learn, and wages while they train. Program staff also present at trade fairs in distressed neighborhoods, engage veterans in the Helmets to Hardhats program and recruit from Joint Base Lewis-McChord.

Inland Northwest Associated General Contractors Laborers Apprenticeship Committee ("INWAGC")

INWAGC's laborers apprenticeship program trains 60 laborer apprentices per year[137] **in Eastern Washington**[138] **at its Spokane facility.**[139] Apprentices learn "everything from site preparation, clean up & security to asbestos abatement" on their way to becoming "highly skilled worker[s] who's qualifications are recognized and respected throughout the industry."[140] Additionally, many government agencies require public works construction projects to use a certain percentage of apprentice hours.[141] According to Inland Northwest AGC, "the Inland Northwest AGC Apprenticeship Programs are here to partner with employers to help with [these] apprentice utilization requirements."[142].

Table 11. NWLETT and INWAGC Laborers AC Performance Comparison

Metric	NWLETT	Inland NW AGC
2017 Apprentices	1,480	60
2017 Completion Rate*	32%	5%
2018 Journey Wage[143]	$27.11 - $37.27	$22.06
Individual Net Impact	$393,744	$226,075
Taxpayer Net Impact	$142,583	$44,842
2017 Women	12%	8%
2017 People of Color	35%	22%
2017 Veterans	10%	10%

***** Completion rates are measured as completers/(completers+cancellers). However, many programs use a Federal method which excludes probationary cancellers and returns a much higher completion rate. Data was unavailable for this calculation.
Source: Net Impacts from WAGES ROI Model. All other data from L&I's ARTS Database and Apprenticeship Program Info.

Plumbers

Seattle Area Pipe Trades ("SAPT")

SAPT is a partnership between United Association Local 32 and a coalition of employers led by the Mechanical Contractors Association of Western Washington ("MCAWW").[144] Established in 1968, SAPT trains 483 apprentices per year, including 181 plumber apprentices,[145] in five trades – commercial plumbers, residential plumbers, steamfitters, HVAC/refrigeration mechanics and marine pipefitters.[146]

Photo: An SAPT apprentice welds pipes

SAPT emphasizes meritocracy and apprentice ownership of the program. According to third-generation union member and SAPT Training Coordinator P.J. Moss, the program's motto is "The Best Mechanic Wins."[147] Program staff, union journeymen and apprentices strive to recruit the most talented individuals. Apprentices are also encouraged to participate in program oversight, regularly sitting on interview panels and recruiting skilled workers to the program.

SAPT is a strong JLMP with active participation from both employers and union workers. Moss reports that MCAWW has a "passion for apprenticeship" and executives sit on the SAPT board of trustees. Training program staff ensure that enrollment matches industry demand, so that apprentices know they can count on a high-wage job in the pipe trades when they journey out. The participation of Local 32 members in the program means that union journeymen seek to recruit strong candidates who will build and strengthen the union. Employers and union members both contribute to fund the apprenticeship program, explains SAPT Assistant Training Coordinator Heather Winfrey. Since journeymen, apprentices and employers help fund the program, they all have a stake in seeing it succeed. This supportive environment, and the program's high wages and benefits lead to low turnover. The retention rate for apprentices who successfully journey out of SAPT programs is 97% after one year and 90% after five years.[148]

SAPT works to increase the participation of underrepresented groups through active recruitment. SAPT staff attend events with talented female and person of color candidates, giving out push cards and inviting them to apply. Apprentices achieve based on their own skills, and many top performers in the program are women. SAPT expects to increase the participation of women and apprentices from other underrepresented groups as networks widen into previously underserved communities.

Construction Industry Training Council of Washington – Plumber ("CITC")

CITC's plumber apprenticeship trained 270 apprentices in 2017, with 22 successfully completing the program.[149] CITC also offers a number of continuing education courses for journey plumbers.[150] Although journey wages for CITC's apprenticeship programs reported by L&I are lower than their JLMP counterparts, CITC CEO Halene Sigmund says that CITC apprentices working on public works projects are often paid the same public rate as union workers on the same project. According to Sigmund, non-union employers often stick with the public rate even on private jobs in order to improve retention.

Table 12. Seattle Area Pipe Trades and CITC - Plumbers Performance Comparison

Metric	SAPT	CITC
2017 Apprentices	181	270
2017 Completion Rate*	71%	44%
2018 Journey Wage	$53.06	$30.00
Individual Net Impact	$2,103,586	$437,241
Taxpayer Net Impact	$606,079	$188,893
2017 Women	5%	1%
2017 People of Color	25%	10%
2017 Veterans	13%	10%

***** Completion rates are measured as completers/(completers+cancellers). However, many programs use a Federal method which excludes probationary cancellers and returns a much higher completion rate. Data was unavailable for this calculation.
Source: Net Impacts from WAGES ROI Model. All other data from L&I's ARTS Database and Apprenticeship Program Info.

Sheet Metal Workers

Western Washington Sheet Metal JATC ("WWSMJATC")

WWSMJATC is a partnership between Sheet Metal Workers Local 66 and Sheet Metal and Air Conditioning Contractors' National Association – Western Washington ("SMACNA").[151]
WWSMJATC runs two main training centers in Everett and Dupont, and oversees sattellite training centers in Bellingham and Bremerton.[152] WWSMJATC trains 534 apprentices per year, including 384 sheet metal workers,[153] in four trades - HVAC service technicians, HVAC test adjust and balance technician, residential sheet metal worker and sheet metal worker. Apprentices learn to cut, roll, bend, and shape sheets of steel, tin, nickel, titanium, aluminum, brass, and copper into ductwork, building facades, refrigeration unit cabinets and a wide variety of other objects.[154]

Photo: A WWSMJATC apprentice works on a building

The collaborative nature of WWSMJATC improves employee retention, provides a higher standard of living for apprentices and encourages continuing education.
WWSMJATC's mission is to "to bring Labor and Management together for the development of a highly skilled and competitive workforce for the ever-changing sheet metal industry."[155] Collective bargaining agreements solidifying WWSMJATC funding levels are negotiated for three to six-year terms, providing stability to the program. WWSMJATC's industry-leading wage standards create lower turnover and stabilize the workforce as well. "Higher wages and benefits provide a better living environment," says WWSMJATC Executive Administrator Jeff Reinhardt. "Guys take their jobs seriously and are more dedicated to the work."[156]

WWSMJATC also funds state-of-the-art training facilities where journey level sheet metal workers can stay up-to-date training on the industry's latest equipment.

WWSMJATC works with a number of pre-apprenticeship programs to increase the inclusion of underrepresented groups.
WWSMJATC works closely with PACE to recruit apprentices of color and others pre-apprentices looking to enter the trade. WWSMJATC also hosts groups from ANEW's 12-week pre-apprenticeship program and strives to recruit more female apprentices. In August 2017, WWSMJATC and Local 66 joined with SMACNA, Helmets to Hardhats and others to launch SMART Heroes, a program to provide "free sheet metal industry training to enlisted U.S. Military men and women who plan to enter civilian life within the year."[157]

Construction Industry Training Council of Washington – Sheet Metal ("CITC")

CITC offers a Sheet Metal apprenticeship program which trains 53 apprentices per year.[158]
CITC sheet metal apprentices spend 9,000 hours in on-the-job training and an additional 800 hours in the classroom, learning to cut, bend and straighten sheet metal, solder and weld sheet metal parts and shape metal over anvils, blocks, or forms using a hammer.[159] According to CITC CEO Halene Sigmund, journey rates for CITC programs vary by county and are often higher than those listed on L&I's website.[160] Additionally, CITC contractors working on public works construction projects are required to pay the minimum rate just like union contractors, meaning CITC apprentices earn more.

Table 13. Western WA Sheet Metal JATC and CITC – Sheet Metal Performance Comparison

Metric	WWSMJATC	CITC
2017 Apprentices	384	53
2017 Completion Rate*	49%	14%
2018 Journey Wage	$43.16	$29.25
Individual Net Impact	$1,345,124	$397,594
Taxpayer Net Impact	$409,841	$149,522
2017 Women	11%	4%
2017 People of Color	20%	34%
2017 Veterans	15%	12%

***** Completion rates are measured as completers/(completers+cancellers). However, many programs use a Federal method which excludes probationary cancellers and returns a much higher completion rate. Data was unavailable for this calculation.
Source: Net Impacts from WAGES ROI Model. All other data from L&I's ARTS Database and Apprenticeship Program Info.

APPRENTICESHIPS FOR GROWING INDUSTRIES

The Rise of Publicly Subsidized Employer Apprenticeships

Washington's PSEA Efforts

Washington state leaders recognize the value of expanding apprenticeship to increase the number of skilled workers in fast-growing industries. In December 2017, Washington Governor Jay Inslee's Career Connect Washington initiative secured a $6.4 million federal grant under the Workforce Innovation and Opportunity Act to connect "students to great employers and high-quality job training" and "create 29,000 new career connected learning experiences in 11 communities from [2017] through September 2019."[161] Along with job shadowing, career planning and internships, Career Connect Washington officials plan to "move over 1,400 young people, plus more than 400 adults, into new apprenticeships and pre-apprenticeships in fields such as advanced manufacturing, health care, agricultural irrigation systems, building trades, IT and maritime manufacturing."[162]

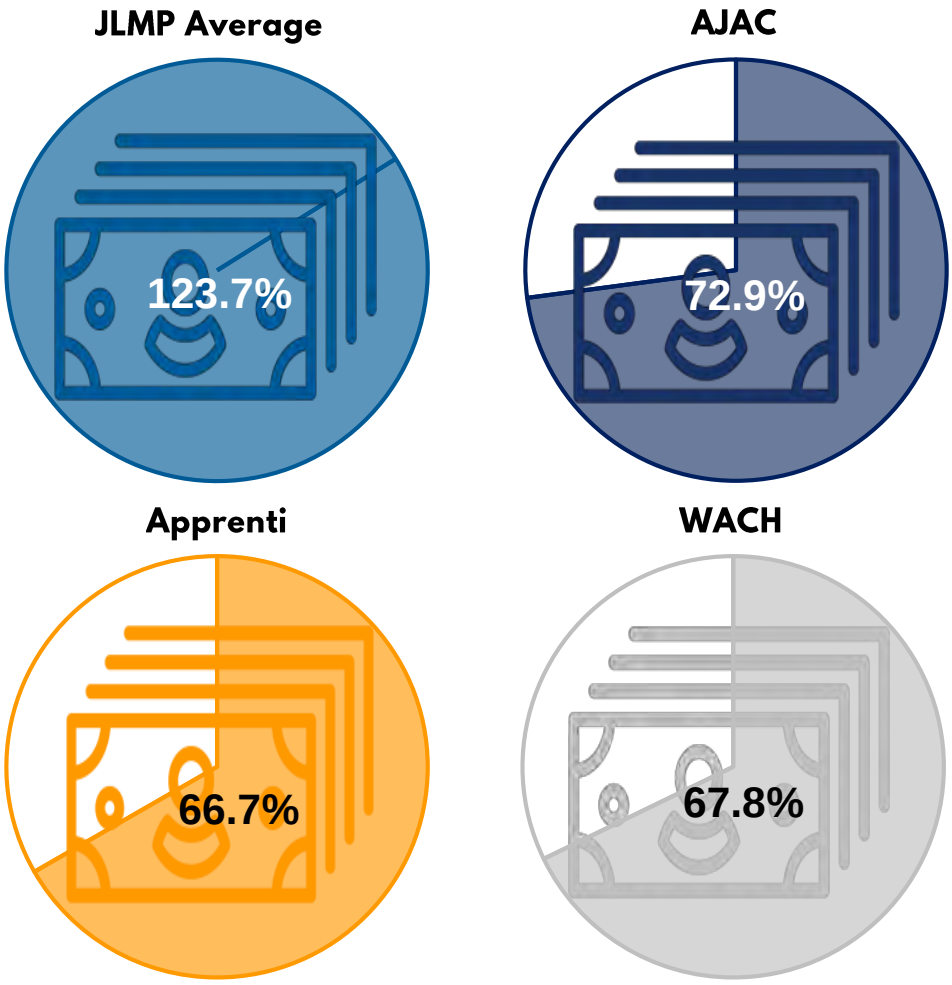
There is a strong need for new apprenticeships, as three-quarters of the Washington occupations poised to see the greatest job growth over the next 10 years are not currently served by an apprenticeship program. Every year, the Washington State Employment Security Department ("ESD") creates 10-year employment projections for Washington state. There are currently apprenticeship programs serving just 24 of the 100 occupations projected to experience the largest growth in absolute jobs over the next decade. None of the top 5 highest growth occupations - software developers for applications, combined food preparation and serving workers including fast food, waiters and waitresses, personal care aides and registered nurses – currently have registered apprenticeship programs training apprentices in Washington state. There is clearly a need for more apprenticeships to serve these fast-growing fields.

Recent efforts to establish apprenticeships in these fields have focused on publicly subsidized employer apprenticeships ("PSEAs"). The Washington state legislature established the Aerospace Joint Apprenticeship Committee ("AJAC") in 2008, providing funding of $3 million per year to train machinists, tool and die makers, industrial maintenance technicians and other aerospace workers in partnership with the state's community and technical colleges[163] and a primarily non-union group of employers.[164] The federally-funded Washington Association for Community Health ("WACH") started a medical assistant ("MA") apprenticeship program in 2014, and a dental assistant ("DA") program in 2016.[165] The Washington Technology Industry Association ("WTIA"), led by local tech giants like Microsoft,[166] created a non-profit WTIA Workforce Institute in 2015[167] to oversee its Apprenti apprenticeship programs for software developers, network security administrators, web developers and other tech industry occupations. Apprenti has received millions of dollars from the U.S. Department of Labor and Washington L&I to expand their programs nationwide, pay for RSI and launch a national apprenticeship loan program.[168] These new PSEA programs serve high-growth or strategically important occupations and are primarily driven by employers and employer associations.

PSEA Challenges

However, PSEA programs have a mixed record of success and provide journey wages that trail significantly behind local averages, JLMP programs and comparable union pay rates (**Figure 7**)**.** In terms of completion rates, WACH's apprentices complete their program at a high rate, Apprenti lags behind the apprenticeship average and AJAC journeys out a far lower percentage of its apprentices than the comparable IAM/Boeing Joint Apprenticeship Committee JLMP program.[169] PSEA programs also have difficulties providing high journey wages. WACH's MAs journey out of their program earning a wage equivalent to the bottom ten percent of MAs in Washington.[170] Apprenti's software developers who completed the program in 2017 earned journey wages equal to just 61.5% of the local occupational average.[171] For AJAC, machinists journeying out earned less than half the journey wage of apprentices completing the IAM/Boeing JLMP program.[172] In order to better understand the efficacy of these new PSEA programs, and consider potentially superior JLMP alternatives, it's instructive to compare the achievements of WACH, Apprenti and AJAC to Washington's JLMP apprenticeship programs.

Figure 7. JLMP and PSEA Journey Wages as a Percent of Local Occupational Mean Hourly Wage
Average Journey Wages for All 2017 Apprenticeship Programs, Weighted by Apprentices



Note: For each apprentice in the organization, the journey wage for their occupation (May 2017 dollars) was compared to the average hourly wage for their occupation in their area, and those ratios were then averaged for all 2017 apprentices in each organization to establish an average journey wage:local occupational average ratio for the organization as a whole.
Source: Apprenticeship Program Details, Washington L&I; ARTS Database, Washington L&I; May 2017 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates, OES, BLS, May 2017.

WACH Apprenticeship Program

Overview

The Washington Association for Community Health ("WACH") is a federally-funded primary care association comprised of 27 community health center employers in Washington state that runs two apprenticeship programs.[173] WACH operates apprenticeship programs to certify medical assistants ("MA") and dental assistants ("DA") through its Institute for Rethinking Education & Careers in Healthcare ("In-Reach") initiative.[174] The MA program started training cohorts of MA apprentices in 2014,[175] while the DA program launched a pilot in November 2016.[176] The MA and DA programs are each 2000 hour, 12-month apprenticeships, and successful MA apprentices are accredited through South Seattle College.[177]

Enrollment and Completion Rates

WACH has achieved a modest level of enrollment, but high completion rates among exiting apprentices. WACH enrolled 16 apprentices in its DA program in 2017, and an average of 41 new apprentices per year in its MA program between 2014 and 2017.[178] Although WACH's apprenticeship programs are relatively small, journeying out 74 total apprentices between 2015 and 2017, its apprentices have been able to journey out of their programs at a high rate. The completion rate for MA and DA apprentices in WACH's programs was 94.7% for apprentices exiting in 2015, 96.8% for apprentices in 2016 and 89.7% for apprentices in 2017.[179] WACH's 2017 completion rate ranked 41st among the 132 programs with exiting apprentices, well above the average completion rate of 41.7% for all programs.

"If medical assistants earn the journey wage after completing WACH's program, they will be in the bottom 10% of wage earners in their field in every single region in Washington state besides Walla Walla."

Gender and Racial Inclusion

WACH trains a percentage of women roughly in line with their occupational averages, and a higher percentage of people of color than typical apprenticeship programs. Nationally, 91.6% of medical assistants and 95.9% of dental assistants are women. In WACH's programs, 94.6% of MA apprentices and 87.0% of DA apprentices are women. WACH programs enroll a higher percentage of apprentices of color than the state average. In 2017, 34.8% of the program's DAs were apprentices of color, while 49.1% of MA apprentices were people of color. According to WACH officials, a majority of graduates "are Latina women living in underserved areas of Eastern Washington. Many of them are single mothers who live in multigenerational households and face financial, geographic or familial barriers to attending a traditional college."[180]

Journey Wages

However, while WACH has been successful journeying out DAs and MAs, especially apprentices of color, journey wages for apprentices are far below local levels. Journey wages for successful MAs and DAs in WACH's programs are $12.13/hour and $13.29/hour, respectively, in May 2017 dollars. These wages place graduates far below the average for workers in their field, even in lower wage regions in Eastern Washington. By comparison, medical assistants in Yakima earned an average of $17.35/hour in 2017, $16.86/hour on average in Spokane, and an average of $16.43/hour in the Tri-Cities.[181] In fact, if medical assistants earn the journey wage after completing WACH's program, they will be in the bottom 10% of wage

earners in their field in every single region in Washington state besides Walla Walla.[182] Results for dental assistants are similar. In Wenatchee, the average DA earns $20.43/hour, in the Tri-Cities $19.60/hour and in Yakima $18.05/hour. WACH DAs earning the journey wage will be in the bottom quartile of DA earners in all Washington regions.[183]

WACH journey wages also significantly trail entry level union wages. Under the United Food and Commercial Workers ("UFCW") Local 21's 2017 contract with MultiCare Health Systems, certified medical assistants start at $17.72/hour.[184] In 2017, medical assistants working for University of Washington Medicine represented by Service Employees International Union ("SEIU") Local 1199NW earned a starting base salary of $17.20/hour.[185] Washington State Nurses Association ("WSNA") medical assistants working with Whatcom county started out earning $16.30/hour in 2017.[186] These starting union salaries, in some cases $5.00/hour more than the WACH journey wage, show the crucial role that healthcare unions play in ensuring that healthcare workers who spend countless hours earning a credential receive the living wage they deserve.

JLMP medical assistant apprenticeships in Rhode Island also provide far higher journey wages. MA apprentices in the Care New England – SEIU JLMP earn a journey wage of $22.91/hour upon program completion.[187] Successful apprentices in the Providence Community Health Center JLMP journey out earning a journey wage of $19.37/hour.[188] These apprenticeship programs demonstrate that it's possible to raise standards in traditionally lower-wage occupations if there's a concerted effort to raise wages.

Apprenticeship without Collective Bargaining – Lower Wages, Unsustainable Careers

WACH shows that apprenticeship without collective bargaining cannot guarantee higher wages or a sustainable career path. Although WACH has done a good job of journeying out its MA and DA apprentices, the program's journey wages are well below local occupational averages, comparable union salaries and JLMP programs in other parts of the country. Many MA journeywomen will either have to subsist on lower non-union wages, or leave their community health center to look for higher paid work. The participation of a healthcare union in the WACH program would ensure that successful apprentices earn the livable wages and strong benefits that they deserve.

Apprenti Apprenticeship Program

Overview

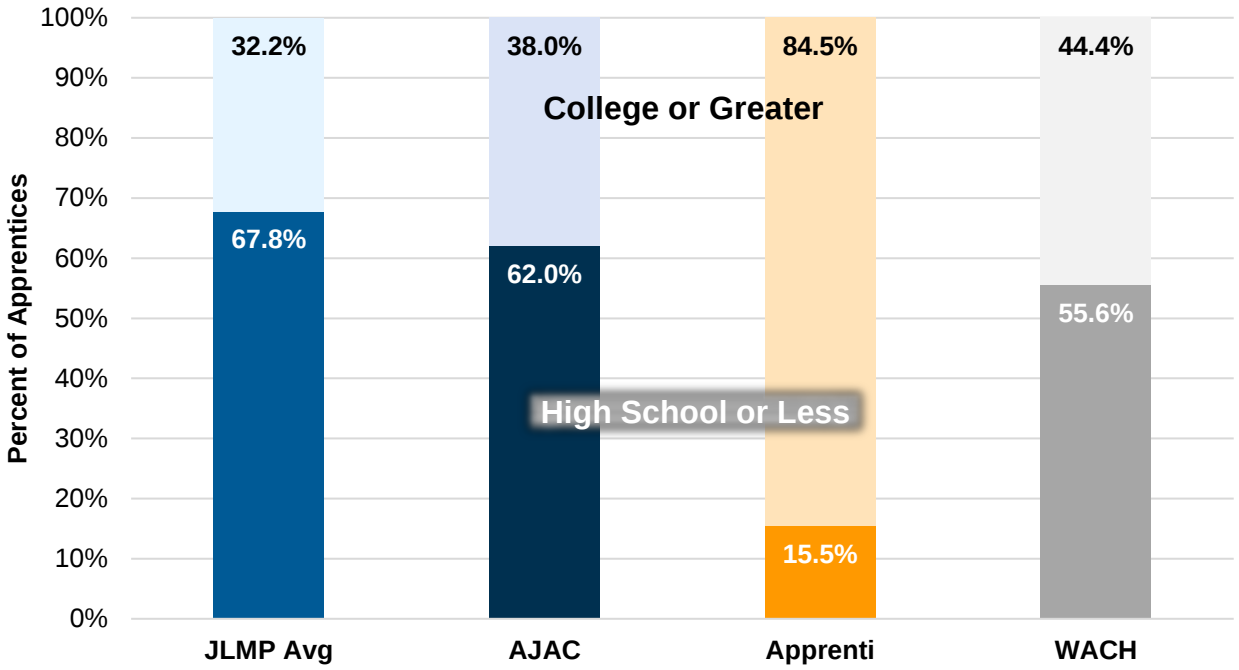
WTIA started the Apprenti apprenticeship program in 2016 to train mostly college educated workers for careers in the tech industry, focusing on underrepresented groups. Apprenti has overseen apprentice programs in eight tech fields, with two of three apprentices training to be either software developers or datacenter technicians.[189] Programs take between 2,000 and 3,000 hours to complete.[190] Apprenti recruits primarily college-educated workers for its apprenticeships. In 2017, 84.5% of Apprenti apprentices listed an education of "college or greater," compared to 32.7% for Washington apprentices as a whole (**Figure 8**),[191] and at least 55% already have an A.A. or B.A. degree coming into their program.[192] Apprenti's stated goal is to provide a "pipeline for underrepresented groups such as minorities, women and veterans to gain training, certification and placement within the talent-hungry tech industry."[193] Since its inception, 50.4% of Apprenti's apprentices have been apprentices of color, 30.0% women and 45.7% veterans.[194]

Taxpayer Funding

Apprenti is generously funded by U.S. and Washington taxpayers, even as WTIA members earn billions of dollars in profit. In September 2016, DOL pledged $7.5 million in grant money for Apprenti,[195] and the program had received $4 million in federal money by July 2018.[196] In 2017, Apprenti was also able to secure Washington state funding after "actively work[ing] with policy and budget leaders in the Executive Branch, the State House, and State Senate."[197] Washington's final 2017 budget included $4 million to fund Apprenti's

RSI.[198] The funds were subsequently repurposed "as a reward for small companies who pre-fund RSI and/or [to be] used as seed capital to launch a national apprenticeship loan program."[199] Taxpayer funding for the program comes as WTIA's largest members earn billions of dollars in profits. Microsoft, for instance, earned profits of $20.5 billion in FY 2016, $25.5 billion in FY 2017 and $16.6 billion in FY 2018.[200] T-Mobile generated $4.5 billion in net income for 2017,[201] while Amazon's market capitalization reached almost $1 trillion in 2018.[202] While training workers to join the booming tech industry is an important goal, it's unclear why highly profitable multi-national corporations require taxpayer funding to do so.

Figure 8. JLMP and PSEA Percent of 2017 Apprentices By Education
High School or Less Compared to College or Greater



Note: "High School or Less" refers to apprentices reporting an education level of High School Graduate, G.E.D., Some High School (9th – 12th) and 8th Grade or Less. "College or Greater" refers to apprentices reporting an education level of College or Greater.
Source: Apprenticeship Registration and Tracking System, Washington State Department of Labor and Industries.

Completion Rates

Only seven apprentices completed Apprenti's programs as of August 2018, with a successful completion rate of 28.6%. According to L&I data, 2 out of 7 of Apprenti's exiting apprentices journeyed out of the program in 2017, and none had exited by August 2018. Apprenti's 2017 completion rate of 28.6% is below the rate for all Washington's apprenticeships (41.6%) and the rate for JLMP apprenticeships (43.0%). The completion rate for apprentices of color was 16.7%, and 25.0% for female apprentices. However, the low sample size of program completers and short history of the program make it hard to draw any conclusions about Apprenti's ability to journey out successful tech workers.

Journey Wages

Apprenti's journey wages across all occupations are well below state and local averages. For the 84 Apprenti apprentices training across 7 occupations in 2017, the average journey wage for their program was equivalent to just 66.7% of the local occupational average. For instance, Apprenti software developer 1 apprentices journey out at a rate of $35.57/hour in May 2017 dollars.[203] However, software developers creating systems software earn an average of $57.84/hour in the Seattle metropolitan area, $51.75/hour in the Portland metropolitan area and $48.53/hour on average in Yakima.[204] In fact, successful Apprenti apprentices earning the journey wage would be in the bottom 10% of software developer earners in Seattle, the Tri-Cities and Bremerton-Silverdale.[205] The journey wage for another popular Apprenti occupation, web developer, is 22.1% below the Seattle average and 17.9% below the average hourly wage for the state as a whole. Apprentices journeying out of the Apprenti program can and do earn wages above their journey rate,[206] but the program's journey rates as a percentage of local occupational averages (66.7%) are below the non-union program average (85.1%) and well below the JLMP program average (123.7%).

"[Apprenti's] journey rates as a percentage of local occupational averages (66.7%) are below the non-union program average (85.1%) and well below the JLMP program average (123.7%)."

JLMP Programs Are Large and Successful Enough to Serve Growing Industries

While Apprenti does serve fast growing industries and some underserved groups, JLMP programs do so on a far larger scale and at far better wages. Apprenti serves many of the 100 highest growth occupations in Washington state, including IT support professionals (#13), software developers (#31), web developers (#44) and network security administrators and systems administrators (#62).[207] However, JLMP programs also serve in demand occupations, including top 100 growth fields like carpenters (#14), construction laborers (#19) and electricians (#41).[208] In 2017, 16 veterans successfully completed the Puget Sound Electrical JATC and came out as inside wiremen / construction electricians at a journey wage of $48.62/hour, 38 carpenters of color journeyed out of the United Brotherhood of Carpenters JATC program at a journey wage of $40.49/hour and 15 non-college educated women became journey laborers earning a journey wage of $25.25/hour. These and other JLMP programs provide financially sustainable pathways for work-class men and women from all backgrounds to train for high-skill trades without requiring millions in public subsidy.

AJAC Apprenticeship Program

Overview

Washington's State Legislature founded the non-profit Aerospace Joint Apprenticeship Committee ("AJAC") as a PSEA overseeing aerospace and manufacturing apprenticeship programs in 2008. AJAC is the largest PSEA in Washington state, training 484 apprentices in 2017[209] at 18 locations across Washington state, including 7 community and technical colleges.[210] Most AJAC apprentices (70.7%) train to become journeyman machinists, but AJAC also trains industrial maintenance technicians, tool and die makers, manufacturing precision metal fabricators, plastic process technicians, aircraft airframe mechanics and even youth production technicians.[211] AJAC's employers are majority non-union,[212] but the program's advisory committee does include two current or former members of the International Association of Machinists and Aerospace Workers (IAM) District 751.[213]

Completion Rate

AJAC journeys out apprentices at a higher rate than the state average, but below the rate of the JLMP IAM/Boeing Joint Apprenticeship Committee. In 2017, 51.7% of exiting AJAC apprentices successfully journeyed out of their program, 10 percentage points higher than the statewide completion rate of 41.6%.[214] However, the AJAC completion rate trails the comparable IAM/Boeing Joint Apprenticeship Committee, a joint effort of Boeing and IAM District 751, where 21 of 21 exiting apprentices successfully journeyed out of their apprenticeship in 2017.[215] For the two occupations where AJAC and the IAM/Boeing program both trained exiting apprentices, the differences were stark. IAM/Boeing journeyed out 100% of their machinist apprentices versus 61.4% of AJAC machinists, and 100% of their industrial machinery mechanics versus 0% of AJAC's apprentices in the same field.[216] AJAC does a good job journeying out its apprentices, but falls short of the comparable JLMP program.

Gender, Racial and Veteran Inclusion

The IAM/Boeing JLMP program does a better job than AJAC at training apprentices from underrepresented groups. In 2017, the IAM/Boeing program trained a higher percentage of women, people of color and veterans than AJAC (**Table 14**). Approximately 36.8% of IAM/Boeing's 2017 apprentices were apprentices of color, versus just 22.5% for AJAC. Women comprised 6.9% of IAM/Boeing apprentices versus 4.3% of AJAC's apprentices, and 10.3% of IAM/Boeing apprentices were veterans against 7.9% of AJAC's apprentices.[217] Training apprentices in the same industry and similar occupations, IAM/Boeing's JLMP program has done a better job of including women, people of color and veterans in its apprenticeship program.

Table 14. Comparison of IAM/Boeing and AJAC Programs
2017 Completion, Wages and Inclusion Metrics

Metric	IAM/Boeing JLMP	AJAC
Completion Rate	100%	52%
Average Journey Wage	$41.84	$18.62
Journey Wage: Local Occ Avg.	184%	74%
Percent Women	7%	4%
Percent Apprentice of Color	37%	23%
Percent Veterans	10%	8%

Note: Average journey wage and journey wage: local occupational average for all 2017 completing apprentices.
Source: Apprenticeship Program Details, Washington Department of Labor and Industries; Apprenticeship Registration and Tracking System, Washington State Department of Labor and Industries.

Journey Wages

The biggest difference between the AJAC and IAM/Boeing programs is the large journey wage gap for successful apprentices. Union workers earn significantly higher pay and benefits in the aerospace industry, and that difference is reflected in Washington's aerospace apprenticeship programs. The highest paid AJAC apprentices in 2017 completed their tool and die maker programs earning a journey wage of $19.41/hour in May 2017 dollars.[218] Meanwhile, IAM/Boeing's maintenance machinists completed their programs at a journey wage of $42.41/hour.[219] Relative to the machinist industry average, AJAC's machinists journeyed out at wages equal to 74.0% of their local occupational average, while IAM/Boeing machinists journeyed out at rates equal to 164.0% of their local occupational average wage.[220] Overall, IAM/Boeing machinists completed their programs earning more than double the pay rate of their AJAC counterparts.

Even Significant Worker Input Cannot Secure High Wages in the Absence of a Union

Among PSEAs, AJAC has achieved the greatest degree of program success and worker voice, but still lags the standards set by JLMP programs. Between 2010 and 2017, 166 apprentices successfully completed AJAC programs and started careers in the aerospace industry.[221] In 2017, for the first time, more than half of AJAC's exiting apprentices successfully journeyed out of their program, a marked improvement from 2014, when only 15.2% successfully journeyed out.[222] However, AJAC's completion rate still trails the IAM/Boeing program, and its journey wages are substantially lower. In addition, the IAM/Boeing program does a better job of engaging underrepresented groups. The participation of IAM District 751 representatives on AJAC's governing committee undoubtedly helps, but without the sustained participation of a labor-management partnership and pathway into good-paying union jobs, AJAC will continue to struggle with below average wages, a less inclusive apprentice cohort and significant apprentice turnover.

Successful JLMP Apprenticeship Programs in Growing Industries

The JLMP Advantage in Growing Industries

Workers in many of Washington's fastest growing occupations are represented by unions. Food service workers, the second fastest growing occupation in Washington,[223] are represented by UNITE HERE Local 8 in corporate offices, WFSE at university dining halls, and Public School Employees SEIU Local 1948 in high school cafeterias.[224] Certified Nursing Assistants ("CNAs") and Home Care Aides ("HCAs"), the fourth fastest growing Washington occupation,[225] are represented by a number of unions, including SEIU 775, UFCW 21 and SEIU Healthcare 1199NW.[226] Registered Nurses are the fifth highest growth occupation in Washington, and heavily organized with WSNA, SEIU Healthcare 1199NW and UFCW 21.[227] JLMP programs could train apprentices in these occupations and achieve the high standards that PSEAs have failed to provide.

"The best way for public officials, unions and employers to help workers improve their skills and build better lives is to embrace the establishment of sustainable JLMP programs in growing industries, rather than settling for publicly subsidized employer apprenticeship programs."

Union organizing efforts have boosted occupational wages and benefits in these rapidly growing industries, especially for women.[228] Many of SEIU 775's home care aides ("HCA") will start at a wage of $15.00/hour in 2019[229] in a field where 9 of 10 workers are women[230] and 75% of Washington HCAs were earning less than $14.32/hour as recently as May 2017.[231] For registered nurses, a field that's 89.9% female,[232] the 2017 Association of periOperative Registered Nurses ("AORN") Salary and Compensation survey found that unionized nurses earned $8,200 more per year in annual base compensation than non-union nurses,[233] while a 2017 Medscape RN/LP Compensation Report found that union nurses earned $11,000 more per year.[234] In 2018, UNITE HERE food service workers working in Silicon Valley were able to achieve $4.75/hour raises and a $19.00/hour minimum contract wage at some worksites.[235]

JLMP programs for these high growth occupations would serve as pipelines for workers to high wage, good union jobs by including a worker voice in apprenticeship governance and standards. Journey wages for Washington's JLMP apprenticeship programs are much higher than for non-union programs training the same occupations.[236] Unions and employers are starting innovative JLMP apprenticeship programs across the country that promise to do the same thing in healthcare, food service and other occupations. The best way for public officials, unions and employers to help workers improve their skills and build better lives is to embrace the establishment of sustainable JLMP programs in growing industries, rather than settling for PSEA programs.

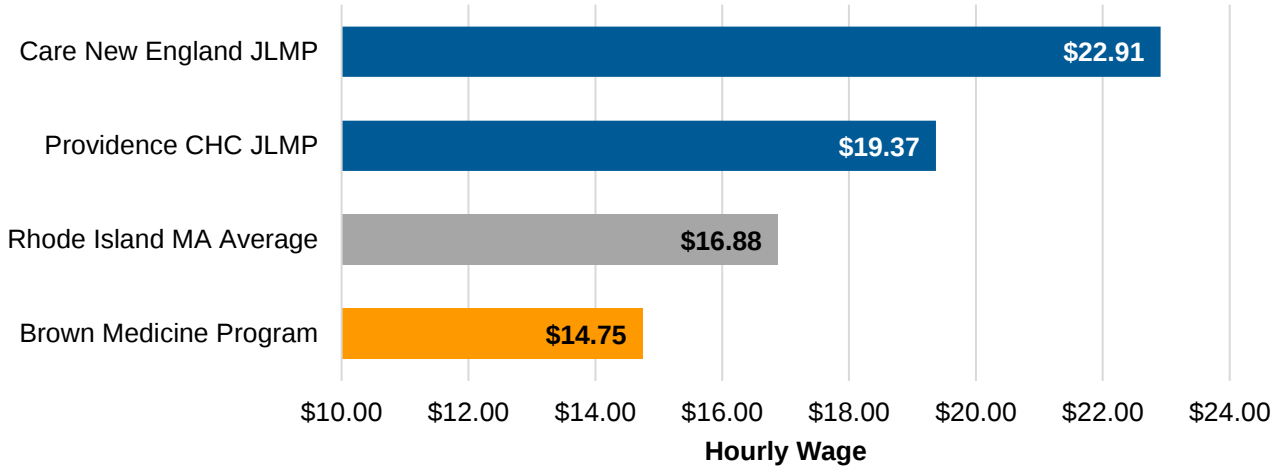
Innovative JLMP Apprenticeship Programs in Healthcare

Service Employees International Union ("SEIU") has partnered with healthcare employers nationwide to launch Healthcare Career Advancement Program ("H-CAP"), an organization dedicated to worker training, continuing education and apprenticeship.[237] H-CAP supports registered apprenticeships, funds training programs, conducts policy research, and operates the non-profit H-CAP Education Association comprised of "16 industry-driven, labor/management, and labor-based training organizations that include over 900 employers and more than 600,000 employees in 14 states plus Washington, DC."[238]

In 2016, SEIU and AFSCME worked through H-CAP to create a National JATC, found a National Center for Healthcare Apprenticeship ("NCHA"), and register national standards with the DOL.[239] The goal of the NCHA is "to facilitate and accelerate the registration of healthcare apprenticeships nationally and regionally, where needed, and bring healthcare apprenticeships to scale."[240] The JATC lists standards for 16 occupations and specialties, including some of Washington's highest growth occupations over the next ten years like medical assistants (#45), home health aides (#79) and home health directors (#84).[241]

SEIU and H-CAP have since launched JLMP healthcare apprenticeships in New York, Rhode Island and Philadelphia. In January 2017, 1199 SEIU United Healthcare Workers East partnered with Bronx Lebanon Hospital Center, LaGuardia Community College and other organizations to launch a community health worker apprenticeship.[242] In January 2018, Rhode Island's Governor's Workforce Board awarded two $25,000 development grants to JLMP registered apprenticeships serving the fast-growing health care industry.[243] Later that year, SEIU 1199NE partnered with Providence Community Health Centers to create a certified medical assistant apprenticeship, which launched in October 2018 with generous funding from H-CAP.[244] SEIU 1199NE also partnered with Care New England Healthcare System, H-CAP and other organizations to start a Community Health Worker Apprenticeship.[245] In Philadelphia, SEIU 1199C funds MA, community health worker, early childhood education teacher and direct services professional apprenticeships.[246]

Figure 9. Rhode Island Medical Assistant Journey Wages
JLMP Programs, State Average and Non-Union Brown Medicine



As with traditional trades, JLMP programs in the rapidly growing healthcare industry pay higher journey wages than non-union programs for the same occupations. In Rhode Island, the average hourly wage for a medical assistant was $16.88/hour in May 2017 (**Figure 9**).[247] Medical assistants completing the Care New England JLMP program currently earn journey wages of $22.91/hour.[248] Certified medical assistants in Providence Community Health Centers' program journey out at $19.37/hour.[249] Meanwhile, medical assistants completing their non-union apprenticeship at Brown Medicine earn journey wages of $14.75/hour.[250] JLMP apprenticeships in healthcare will continue to provide better pathways to high wage jobs because of the power of union workers to negotiate superior wages and benefits for completing apprentices.

SEIU 1199NW is now preparing to launch a registered apprenticeship program in Washington state after working for years to expand training to healthcare workers. SEIU 1199NW partnered with nine Washington employers to create the SEIU Healthcare 1199NW Multi-Employer Training and Education Fund ("The Training Fund") in 2008.[251] "Close to 14,000 Washington State healthcare workers are currently eligible for Training Fund education benefits," and 2,500 union healthcare workers each year utilize "funding for Professional Development activities, a Tuition Assistance program to cover college and university enrollment costs, and a wide variety of educational support services."[252] Almost 4 in 5 workers enrolled in school through The Training Fund are women and 54% are people of color.[253] The Training Fund is now preparing to start registered apprenticeship programs in Washington, hiring an Apprentice Lead to oversee "the development, successful implementation, management and operation of apprenticeship and pre-apprenticeship programs offered through" the Training Fund.[254] With SEIU's history of partnering to create high pay JLMP apprenticeships, SEIU 1199NW's JLMP apprenticeships in Washington will undoubtedly raise the standards for healthcare apprenticeships in the state.

Innovative JLMP Programs in the Food Service Industry

UNITE HERE has created a number of training and apprenticeship programs for workers in the fast-growing, but traditionally low-wage, food service and hospitality industry. Food preparing and service related occupations like waiters, cooks, bartenders and food service workers are projected to comprise 6 of the 50 highest growth occupations in Washington over the next 10 years.[255] Housekeepers, meanwhile, are the 38th fastest growing occupation in Washington with a projected 4,327 new workers added by 2026.[256] UNITE HERE has set up jointly funded training academies in Boston, Los Angeles and Las Vegas to provide apprenticeship programs for many workers in these occupations, including housekeepers, room attendants, line cooks, and bartenders.

"While only 5% of BEST Hospitality Training apprentices received employer sponsored health benefits before training, 83% were able to achieve health benefits through their employer after completion."

UNITE HERE Local 11 in Los Angeles partnered with educational institutions and local employers to fund and create the Hospitality Training Academy ("HTA"), which oversees room attendant and line cook apprenticeships among other training programs.[257] Through the HTA, UNITE HERE and hotel employers train over 1,200 hotel workers per year.[258] The HTA's room attendant apprenticeship trains workers to "properly and efficiently clean a hotel room while following industry guidelines for customer service, sanitation and safety."[259] The line cook apprenticeship program instills an "understanding and knowledge of safety, sanitation, food handling and preparation procedures" and is "designed to move [successful apprentices] into a culinary position at a UNITE HERE Local 11 establishment, starting as a Line Cook."[260] Both programs are effective because they connect apprentices with union jobs on completion.

UNITE HERE Local 26 partnered with employers to found Boston Education, Skills & Training Corp. ("BEST") Hospitality Training in 2006, and recently founded the nation's first housekeeping pre-apprenticeship program.[261] BEST trains 491 workers per year and has achieved strong results through its housekeepers program. The placement rate for BEST Hospitality Training graduates is 89%, with many graduates working for union employers that pay up to 50% of their wage into a comprehensive benefits package.[262] While only 5% of BEST Hospitality Training apprentices received employer sponsored health benefits before training, 83% were able to achieve health benefits through their employer after completion. The program also had a significant impact on wage earnings. Before training, only 34% of workers were

employed earning above $10.00/hour. Afterward, 89% earned more than $10.00/hour.[263] These results demonstrate that linking apprentices to high standard union jobs is the best way to improve conditions in previously low-wage, high growth industries.

UNITE HERE Culinary Union 226 and Bartenders Local 165 in Las Vegas partner with 28 union employers on the Las Vegas Strip to offer training and a bartending apprenticeship through the Culinary Academy of Las Vegas. The Culinary Academy trains several thousand people across 12 hospitality industry occupations.[264] Local 165´s bartending apprenticeship program trains bartenders on bartending and cocktails, spirits product knowledge, beer and wine over five months.[265] Through apprenticeship training and the power of collective bargaining, Local 165 bartenders are among the 8.4% of restaurant workers who earn a pension,[266] and also enjoy health and other retirement benefits.[267]

UNITE HERE´s growing number of pre-apprenticeship and apprenticeship programs show that JLMP programs can work as well in the service sector as they do in traditional trades. In 2016, the AFL-CIO's Working for America Institute ("WAI") earned a $1.37 million grant to work with UNITE HERE and local partners to build training and apprenticeship programs in the hospitality industry.[268] WAI acknowledges that while many hotel and hospitality "jobs exist in lower-paid, entry-level job classifications, there are many opportunities to secure positions that offer good wages, benefits and career pathways to worthwhile careers."[269] The strongest opportunities and career pathways in the sector come through JLMP programs linked to union jobs.

"These JLMP programs prove that it's possible to generate high-wage, high-skill jobs in any industry when you allow workers to have a real democratic say in setting standards."

Apprenticeships for Growing Industries – The Union Difference

The experience of SEIU, UNITE HERE and IAM/Boeing demonstrate that high-skill, high-wage apprenticeships are possible in high-growth and strategically important industries. While WACH medical assistants journey out earning $12.13/hour (May 2017 dollars), SEIU MAs in Rhode Island and elsewhere complete apprenticeship programs earning $20.00/hour and above. Non-union food service workers struggle to find healthcare for their families, but 83% of workers in UNITE HERE's BEST Hospitality Training program journey out with employer-paid healthcare. IAM/Boeing apprentices complete their program at nearly twice the rate of AJAC apprentices, and journey out earning more than twice as much. These JLMP programs prove that it's possible to generate high-wage, high-skill jobs in any industry when you allow workers to have a real democratic say in setting standards.

JLMP programs in growing industries create a pathway for women, people of color and other marginalized groups to build sustainable careers. SEIU Healthcare 1199NW provides training to thousands of women and people of color working in the healthcare industry, helping them learn new skills and climb the career ladder. UNITE HERE Local 11 membership is primarily people of color and women, and the Hospitality Training Academy they've partnered in building allows them to secure union jobs with great benefits. IAM/Boeing's apprenticeship programs train a higher percentage of women, people of color and veterans than AJAC, and provide a pipeline to high-wage jobs. These examples demonstrate that JLMP apprenticeship programs are the best way to meet the demand for workers in high-growth industries while ensuring high standards for all apprentices, especially those from underrepresented communities.

RECOMMENDATIONS

WAGES Recommendations

The Lessons of JLMP Program Success

WAGES' analyses demonstrate that JLMP programs have higher enrollment, better wage and benefits standards, higher completion rates, better return on investment and broader inclusion of underrepresented groups than other apprenticeship models. JLMP apprenticeship programs, where union workers participate in governance and negotiate high standards, are able to enroll more apprentices, provide higher journey wages, achieve superior completion rates, and include more apprentices from underrepresented communities than non-union programs. JLMP programs produce a greater net impact on individual apprentices, and produce a much higher return on investment for taxpayers, than MEP programs. Finally, while government efforts have focused on funding PSEAs, JLMP programs actually do a better job of providing high-wage, high-skill jobs in growing and strategic industries.

JLMP programs are successful for a number of reasons:

- Sustainable funding from employers and union workers leads to **higher enrollment in JLMP programs.**
- Union workers are able to negotiate **higher journey wages and benefits** in JLMP programs, leading to good, high-wage union jobs on completion.
- Greater support for apprentices and better wages and benefits drive **higher completion rates** in JLMP programs.
- These higher completion rates and better standards lead to a **greater return on taxpayer investment.**
- Union efforts to improve inclusion have **increased the enrollment and success of underrepresented groups**, including women, people of color and veterans.

Decision makers should draw lessons from the success of Washington's JLMP programs to inform policy that will create more high-wage, high-skilled jobs for workers and a larger talent pool for employers. Public funding should focus on programs that offer high wage and benefit standards that lift apprentices toward the top of their field. Public officials should also support programs that give workers an equal role in governance and setting standards. Apprenticeships offer high returns for employers, so there's no need subsidize the day-to-day operations of established programs. Funding for pre-apprenticeships should focus on support services like childcare, transportation and help with tools, and target programs with a direct pipeline to apprenticeships. Public assistance for extra apprenticeship coordinators would help retention, while funding for capital and technology improvements would help apprenticeship training keep pace with rapidly developing, innovative industries. Additionally, centralized financial support to market apprenticeships to workers looking for a career transition would help get more qualified apprentices into the system. Finally, Washington state should lead the nation by being the first to measure the net impact and return on investment for individual apprenticeship programs to inform public investment decisions.

WAGES Recommendations

Public grants should go to apprenticeship programs providing high-wage opportunities in their occupational fields. According to the U.S. Department of Labor, apprenticeship is a chance for workers to seek "high-skilled, high-paying jobs" and for employers "to build a qualified workforce."[270] Apprenticeship programs that journey out apprentices at or above the average salary for their field are giving them a much better chance to achieve the high-paying jobs they deserve. Additionally, higher journey wage rates are correlated with higher completion rates for apprentices.[271] This suggests that the higher the salary an apprentice is set to earn on completion, the greater the chance that apprentice will finish their program. Tax dollars should support programs with high wage standards that improve apprentice success.

Public funds should only support apprenticeship programs that include democratically elected worker representation in program governance and decision-marking. When workers have an equal, democratic voice in setting program standards, they are able to improve wage and benefit rates, boosting apprentice retention and improving career stability. Worker representatives also contribute shop floor knowledge, increasing the relevance of program curriculum. Additionally, democratic representation of workers on an apprenticeship governing committee ensures accountability, as apprentices themselves take ownership over the long-term sustainability and effectiveness of their programs. Public officials should support these worker efforts to raise standards, ensure apprenticeship curricula reflect shop floor knowledge, and provide program accountability by only supporting apprenticeship programs with equal, democratic worker governance.

Taxpayers should fund new ideas, greater inclusion and effective support services in apprenticeship, not subsidize the long-term viability of programs. Public funds can play an exciting role in encouraging innovation, fostering inclusion and supporting the establishment of new programs. The U.S. Department of Labor has provided millions of dollars to existing programs to train apprentices in energy efficiency and renewable energy trades,[272] state governments provide grants to start-up apprenticeships in the health care industry,[273] and ApprenticeshipUSA State Expansion Grants for a number of states have boosted participation by traditionally underrepresented groups.[274] However, none of these efforts were targeted at funding the day-to-day operations and sustainability of apprenticeship programs. Washington's JLMP programs and MEP programs continue to achieve high returns on investment without relying on taxpayer hand-outs to run their operations. This is because apprenticeships are a great investment. A 2016 U.S. Department of Commerce study on apprenticeship returns for employers found an overall rate-of-return of 50% at Siemens, and an internal rate of return of 40% per year at Dartmouth Hitchcock Medical Center.[275] With substantial rates of return to employers, and proven apprenticeship models that don't rely on huge taxpayer subsidies, public funding for apprenticeship should be limited to providing innovation, inclusion and support services.

Washington should provide funding to pre-apprenticeship programs that are closely connected to high-performing apprenticeship programs. Successful pre-apprenticeship programs like Apprenticeship & Nontraditional Employment for Women ("ANEW") and Pre-Apprenticeship Construction Education ("PACE") have strong relationships with dozens of long-established apprenticeship programs, providing structured opportunities for graduates to transition into apprenticeship. Other successful pre-apprenticeship programs are directly sponsored by a specific apprenticeship program. The Pacific NW Ironworkers and Employers Local #86 program has partnered with the Washington Department of Transportation to provide a 4-week pre-apprenticeship bootcamp where aspiring ironworkers earn their OSHA 10 safety card, learn basic First Aid/CPR and gain knowledge of the basics of ironworking.[276] Students who complete pre-apprenticeship training are directly entered into the Ironworkers Apprenticeship program.[277] Pre-apprenticeship works when it creates a direct pipeline to apprenticeship, so the state should support pre-apprenticeships that have proven relationships with apprenticeship programs.

The state should provide support services for pre-apprentices to help with retention, especially for those from vulnerable communities. Pre-apprenticeships are intensive, unpaid programs that can last anywhere from one to three months. Although these programs are often free for participants, pre-apprentices are still forgoing income, paying for childcare, purchasing tools, paying for transportation and incurring other expenses. This creates a financial hurdle for many aspiring pre-apprentices, especially low-income residents, single-moms and others without the financial cushion to weather a period of low earnings and higher expenses. Apprenticeship supporters in government should consider expanding access to free childcare, financial assistance for tools and supplies, and wage stipends for pre-apprentices who qualify.

Funding additional apprenticeship coordinators to help apprentices early in their program would help with retention, especially for vulnerable groups. Apprenticeship coordinators play an important role in ensuring that apprentices are being integrated into their worksites and learning appropriate skills. This is especially true for apprentices from underserved groups like women or veterans. A rogue supervisor or foreman may fail to invest the time in training apprentices, or may assign them menial tasks that don't build appropriate skills. Apprenticeship coordinators can provide program support and backup at the worksite to get apprentices back on track. Public support for these positions would improve retention for all apprentices, and especially those from vulnerable groups.

Capital grants or affordable loans would help apprenticeship programs keep machinery and equipment up-to-date. Apprenticeship programs have an edge over purely academic programs because employers play an important role in program oversight and curriculum development. Industry is constantly evolving and becoming more efficient, and that means employers need workers familiar with new technology, new machines and new equipment. While established apprenticeship programs do a good job of keeping their training equipment up-to-date, the government could help with grant money or discounted loans that assist programs in securing cutting edge equipment.

Many apprenticeship programs do a great job with recruitment and retention once apprentices are in the door, but could use help with marketing to reach a wider applicant pool. Apprenticeship is a fantastic deal for workers looking to build a career. Washington's WTB estimates that apprentices earn $342,140 more in net wages and benefits over the course of their lifetime than similar workers who don't go through apprenticeship,[278] and the WAGES ROI Model shows that the results for higher-wage JLMP programs are even stronger. Training directors and coordinators are persuasive, passionate advocates for their programs. However, workers not connected to the world of apprenticeship have a hard time learning about these programs in the first place. Public funds to market to workers in their late 20s looking to build a career would get more qualified applicants through the door and boost apprentice participation and impact.

Washington should lead the nation by becoming the first state to measure the net impact and ROI of individual programs. Washington's WTB, relying on the sophisticated analysis of the W.E. Upjohn Institute for Employment Research, is a national leader in measuring the impact of Washington's workforce development programs. In order to make more informed public investment decisions, the Legislature should empower WTB to go further and analyze the net impact of individual apprenticeship programs. Public officials who have invested millions of dollars in PSEA programs that provide journey wages well below their respective occupational average are routing tax dollars to unproven programs without the necessary information to make sound investment decisions. A statistical analysis of all of the state's large apprenticeship programs would provide the data that legislators need to support programs with the highest net impact and return on investment for apprentices and taxpayers.

Appendix A – The WAGES ROI Model

Assumptions and Methodology

Wages

The WAGES ROI Model estimates the lifelong results for apprentices in the 12 programs by estimating in-training earnings and hours, starting at 28 years old, and then projecting an adjusted post-apprenticeship wage forward from program completion/non-completion through age 65. To derive in-training earnings, the WAGES ROI Model uses OJT hours worked for each apprentice divided by number of quarters in the program as an estimate for quarterly hours worked.[279] Wage scale progressions for each occupation and program are used to estimate quarterly earnings for each apprentice. To arrive at an estimate of post-program earnings for non-completers, the WAGES ROI Model takes the ratio of the average post-apprenticeship wage (for all 12 programs as a group) to the 25th percentile local occupational wage for non-completers for each program year, applies that ratio to the 25th percentile local occupational wage for each non-completing apprentice, and multiplies by the average post-apprenticeship hours worked per quarter for non-completers (**Table 15**). To arrive at an estimate of post-program earnings for completers, the WAGES ROI Model takes the ratio of the average post-apprenticeship wage (for all 12 programs as a group) for each program year to the average journey wage for completers for each program year, and applies that ratio to the journey wage of each completing apprentice multiplied by the average post-apprenticeship hours worked per quarter for completers.

The WAGES ROI Model creates a control group of comparable non-participants by projecting adjusted pre-apprenticeship earnings for each individual in the universe, assuming a starting age of 28, forward until they turn 65. The WAGES ROI Model takes the ratio of the average pre-program wage (for all 12 programs as a group) to the average 10th percentile local occupational wage for each completion status group for each year, and applies that ratio to the 10th percentile local occupational wage for each apprentice.[280] That adjusted pre-program wage is then multiplied by pre-program hours per quarter and projected to grow at a steady real rate of 2% for each apprentice from age 28 until age 65.[281] This serves as the control group estimate for each individual apprentice in the universe.

Taxes

The WAGES ROI Model estimates income, Social Security, Medicare and sales taxes, and net unemployment insurance benefits, for all apprentices and all control group members. Income taxes are measured for each apprentice on a quarterly basis assuming that current real rates remain constant. Following Upjohn, sales tax rates are assumed to be 8.35% of gross income. Social Security and Medicare taxes are estimated at 7.65% taken from gross individual income, and an additional 7.65% contributed by employers. Following Upjohn, post-apprenticeship unemployment insurance benefits for apprentices are estimated, conservatively, at the long-term quarterly estimate of $228 per quarter per apprentice.

Costs

Individual and taxpayer program costs in the WAGES ROI Model follow Upjohn's estimates used by WTB. Apprenticeship programs typically pay for apprentice tuition, and books average roughly $400 per year, so WAGES ROI Model estimates individual costs per apprentice of apprenticeship programs at $100 per quarter (in May 2017 dollars). These estimates have not been adjusted by program or occupation, and may therefore over or under-estimate costs per program. Following Upjohn, the WAGES ROI Model assumes a state subsidy per FTE of $4,264 ($4,396 in May 2017 dollars) and annual administrative cost of $480 per apprentice ($495 in May 2017 dollars). In order to capture initial registration costs, apprentices who exit during the first year of apprenticeship are assumed to have incurred the entire annual administrative cost. Apprentices training for greater than a year incur administrative costs on a quarterly basis. These individual

and public cost estimates are adjusted for each program's required quarterly RSI hours for each apprentice, multiplied by the number of quarters each apprentice spends in their program, and discounted by a 3% real rate to arrive at an average individual and public cost for each program.

Table 15. WAGES ROI Model Assumptions

		With Apprenticeship		Without Apprenticeship
	Assumption	Completers	Non-Completers	All
In Training	Wage Earnings In Training	Avg OJT Hours/Quarter x Wage Scale Step for Each Quarter		Occ 10th Pctl Wage x (WTB Avg/Occ 10th Avg)
	Benefits In Training	JLMP: $11.03/hour - $32.19/hour MEP: 31.3%		31.3%
After Training	Wage Earnings After Training	Journey Wage x (WTB Avg/Journey Wage Avg)	Occ 25th Pctl Wage x (WTB Avg/Occ 25th Avg)	Occ 10th Pctl Wage x (WTB Avg/Occ 10th Avg)
	Benefits After Training	JLMP: 31.0% - 62.5% MEP: 31.3%	31.3%	31.3%
Lifetime Projection	Discount Rate	3%		3%
	Wage Growth	2% (Real)		2% (Real)
Taxes	Income Tax	Current Real Rates		Current Real Rates
	SSI & Medicare	Individual 7.65% Employer 7.65%		Individual 7.65% Employer 7.65%
	Sales Tax	8.35% of Gross Earnings		8.35% of Gross Earnings
	Net UI	$228/Quarter		$0/Quarter

Note: WTB hourly wage and hours worked averages were provided for completers, non-completers and completers and non-completers combined, for one quarter before apprenticeship and three quarters after apprenticeship, for 2013-2014, 2014-2015 and 2015-2016 for all 12 apprenticeship programs as a whole. "WTB Avg" refers to the relevant completer/non-completer and year category for each apprentice.
Journey wages for all programs except NWLETT were taken from L&I's apprenticeship information. The NWLETT journey wage of $30.09 (in May 2017 dollars) was a simple average of the regional journey wages for the program across the state.

The WAGES ROI Model makes a number of assumptions about benefits for the control group and apprentices. For non-apprentices in the control group, the Model assumes a benefit rate of 31.3% of wages, consistent with BLS' estimate for healthcare, retirement and paid time off benefits for workers in the construction industry.[282] For JLMP apprentices in training, the Model assumes a benefit amount per hour of between $11.03/hour and $32.19/hour as reported by the JLMP programs, and between $6.71/hour and $9.12/hour for the MEP programs. For MEP completers and non-completers, and JLMP non-completers, the Model assumes a 31.3% benefit rate consistent with BLS estimates upon completion. For JLMP completers, the Model takes the programs' benefit amount divided by the journey wage to establish a long-term benefit rate of between 31.0% and 62.5%.

Model Universe

The WAGES ROI Model universe includes all apprentices participating in only one program who exited the largest JLMP and MEP programs training apprentices in Washington's six largest comparable occupations. In order to isolate the effects of each program, the Model excludes 431 apprentices who transferred between programs or enrolled multiple times in apprenticeship programs. After excluding these apprentices, there are a total of 2,353 exiting apprentices in the WAGES ROI Model universe (**Table 16**). The

in-universe completion rates for each program are within 5 percentage points of the completion rates for all exiting apprentices for each program in the period, implying that the exclusion of these multiple-program apprentices does not substantially change the mix of completers and non-completers for any program. The only program for which sample size is an issue is the Inland Northwest Chapter Associated General Contractors Laborers Apprenticeship Committee ("INWAGC Laborers AC") program, where only 12 exiting apprentices were included in the Model.

Apprentices who completed their programs spent an average of approximately 4-5 years in apprenticeship, while non-completers spent 1-2 years in apprenticeship. For each occupation, the respective JLMP and MEP programs required the same number of OJT hours (i.e. the SAPT and CITC apprenticeships for plumbers both require 10,000 worked or credited hours), implying that the average number of quarters that completers train for each program should be similar. This is broadly true, with the exception of plumbers and sheet metal workers, where JLMP apprentices who complete their program train for an average of 9 and 4 quarters longer than their MEP counterparts, respectively. This disparity can be explained, in part, by a larger average number of OJT hours credited to CITC – Plumbers and CITC – Sheet Metal apprentices, than to SAPT and WWSMJATC apprentices. For non-completers, the average length of apprentice participation is similar for JLMP and MEP programs with the exception of laborer, plumber and sheet metal programs. In these fields, MEP non-completers exit their program more than a year earlier than JLMP apprentices. The WAGES ROI Model treats the effect of apprenticeship on all non-completers identically regardless of the amount of time they spend in their program. This assumption could inflate the individual and taxpayer net impact of MEP laborer, plumber and sheet metal programs relatives to their JLMP counterparts.

Table 16. WAGES ROI Model Universe
Completion Status and Avg Program Length for 2013-2016 Exiting Apprentices in Universe

Occupation	Program	Completers	Non-Completers	Completers Avg. Quarters	Non-Completers Avg. Quarters
Carpenter	NWCI	134	474	20	5
	CITC - Carpenter	24	62	18	6
Construction Electrician	PSEJATC	206	78	22	7
	CITC - Con. Electrician	36	92	19	5
Construction Equip Operator	OERTP	51	49	18	10
	INWAGC Operators AC	8	59	20	13
Laborer	NWLETT	179	500	15	5
	INWAGC Laborers AC	0	12		1
Plumber	SAPT	66	24	29	15
	CITC - Plumber	40	48	20	10
Sheet Metal Worker	WWSMJATC	110	78	23	14
	CITC - Sheet Metal	7	16	19	5
Six Largest Comparable	**All JLMP**	**746**	**1203**	**21**	**6**
	All MEP	**115**	**289**	**19**	**7**

Note: The universe includes all apprentices who exited 7/1/13 - 6/30/16 who did not transfer from or train in another apprenticeship program. Excludes duplicates and transferees to isolate effects of programs in the model.

Discussion of Model Assumptions

The WAGES ROI Model provides robust economic estimates rather than precise statistical calculations. Over 100 bootstrap simulations, the Model's hypothesis that JLMP programs outperform MEP programs in terms of net impact were found significant at the 0.1% level for all six occupations.[283] Although the overall conclusions are robust, the model makes a number of assumptions about hours worked, post-apprenticeship wages and real wage growth that may over or underestimate program benefits for both JLMP and MEP programs. Wages and hours for the hypothetical scenario where participants never enter apprenticeship are based on pre-apprenticeship wages and hours, which may underestimate annual earnings if participants would have increased working hours or hourly earnings by more than the Model's assumptions. Real wage growth may be faster or slower than the 2% assumption made in the WAGES ROI Model. The age, ability or experience of apprentices may vary significantly between programs, weakening the assumption of identical age on entry. However, even allowing for these caveats, the WAGES ROI model provides statistically robust evidence that JLMP programs have a higher net impact for individuals and taxpayers than MEP programs across all the state's six largest comparable occupations.

There are a number of assumptions in the WAGES ROI Model that could affect the Model's estimates. Non-apprentices in the control group, who are estimated to work their pre-program hours for the rest of their lives, may have actually worked more hours as they gained other job skills. This would depress the wage, benefit and tax estimates for the control group in the WAGES ROI Model, inflating the relative size of the net impact and ROI for JLMP and MEP apprentices and taxpayers. The assumption that all apprentices and non-apprentices entered training working within their program's occupation, and then stay there between ages 28 to 65 may not be true. This could alter the distribution of pre-apprenticeship and post-apprenticeship wages, which are based on local occupational averages. The assumption that all apprentices, regardless of gender, race or veteran status, earn wages in relation to their local occupational average or their journey wage may also under or overestimate the net impact of programs depending on their demographic mix. It could also be the case that certain programs have a younger age profile, which would imply a higher net impact as journeyed out apprentices spend additional years earning a higher post-apprenticeship wage. The assumption of 2% real wage growth could also inflate net impacts and ROIs if it is higher than the real rate, or deflate them if it's lower. NWLETT's journey wage in the Model was based on statewide program journey wage data that was unavailable for other statewide programs, indicating that the net returns for other statewide apprenticeship programs may be higher than those found in the Model. Despite these potential drawbacks, the WAGES ROI Model makes the most realistic economic assumptions possible given the available data, and is a useful tool to compare the performance of different apprenticeship program models.

[1] Multi-Employer Partnership programs include the Construction Industry Training Council of Washington ("CITC"), Inland Northwest Associated General Contractors, and other non-union programs funded or sponsored by multiple employers.
[2] Publicly Subsidized Employer Apprenticeships include Washington Association for Community Health ("WACH") programs, the Washington Technology Industry Association's Apprenti programs and Aerospace Joint Apprenticeship Committee ("AJAC") programs.
[3] Completion rate refers to the number of apprentices who complete a program, divided by the total number of completers and cancellers. This rate is consistent with Washington's Workforce Training and Education Coordinating Board's ("WTB") method, but differs from the completion rate many apprenticeship organizations use to report their own statistics, which excludes cancellers still in their probationary period. Probationary cancellation data was unavailable for the Study, and to stay consistent with WTB practice, WAGES counts all cancellers against a program's completion rate.
[4] All journey wages listed in WAGES are represented in May 2017 dollars to allow comparison to May 2017 Bureau of Labor Statistics Occupational Employment Statistics wage and demographic data unless otherwise stated. Journey wages also represent the final step in each apprenticeship program's wage scale, but apprentices may earn more than the journey wage after program completion. Additionally, for statewide programs, journey wages reported to L&I may represent the lowest regional journey wage, and may therefore underestimate journey wages for some apprentices in higher wage regions.
[5] Comparable Occupations refers to Standard Occupational Classifications where both JLMP and non-union programs journeyed out or trained apprentices in 2017 unless otherwise stated.
[6] Local occupational average in WAGES refers to the mean hourly wage for an apprentice's occupation for their ARTS-listed zip code. BLS OES metropolitan statistical area and micropolitan statistical area wage data were used where available, and BLS OES Washington State data was used for zip codes that fell outside of recognized MSAs, Micropolitan statistical areas and Washington subregions.
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Weighted National Average Female = $\frac{\sum_{i=1}^{46} Nat'l\ Pct\ Female\ Occupation_i \times Union\ Apprentices\ in\ Occupation_i}{\sum_{i=1}^{46} Union\ Apprentices\ in\ Occupation_i}$

Weighted Union Average Female = $\frac{\sum_{i=1}^{46} Union\ Pct\ Female\ Occupation_i \times Union\ Apprentices\ in\ Occupation_i}{\sum_{i=1}^{46} Union\ Apprentices\ in\ Occupation_i}$

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[68] The 2017 percentage of females for the 39 occupations where non-union programs trained apprentices, and data was available, was weighted by the total number of non-union apprentices in those occupations in Washington state who participated in 2017. The weighted national and non-union average of females in these occupations were calculated as:

Weighted National Average Female = $\frac{\sum_{i=1}^{39} Nat'l\ Pct\ Female\ Occupation_i \times Non-Union\ Apprentices\ in\ Occupation_i}{\sum_{i=1}^{39} Non-Union\ Apprentices\ in\ Occupation_i}$

Weighted Non-Union Average Female = $\frac{\sum_{i=1}^{39} Non-Union\ Pct\ Female\ Occupation_i \times Non-Union\ Apprentices\ in\ Occupation_i}{\sum_{i=1}^{39} Non-Union\ Apprentices\ in\ Occupation_i}$

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[281] Consistent with Upjohn, the WAGES ROI Model estimates real wage growth at 2% per year, and uses a real discount rate of 3%.

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