Labor Market Analysis for Program Modification: 0708.00/Computer Infrastructure and Support

(Cybersecurity Associate of Science)
(Cybersecurity Certificate of Achievement)
(Cybersecurity Analyst Certificate of Achievement)
(Cybersecurity Fundamentals Certificate of Accomplishment)
(Digital Forensics and Incident Response Associate of Science Degree)
(Digital Forensics and Incident Response Certificate of Achievement)
(IT Foundation Certificate of Achievement)
(IT Support Specialist Certificate of Achievement)
(Information Technology Associate of Science)
(Information Technology Certificate of Achievement)

Orange County Center of Excellence, November 2023

Summary

Program LMI Endorsement	Endorsed: All LMI Criteria Met ☒	Endorsed: Some LMI Criteria Met ☐	Not LMI Endorsed ☐

Program LMI Endorsement Criteria		
	Yes ☑	No ☐
Supply Gap:	*Comments:* There is projected to be **1,506 annual job openings** throughout Los Angeles and Orange counties for these middle-skill IT occupations, which **is more than the 845 awards conferred by educational institutions.** Additionally, the related educational programs included in this report have historically trained for an additional 12 occupations that account for over 22,000 annual job openings. **Therefore, supply is overstated for these IT occupations.**	
	Yes ☑	No ☐
Living Wage: (Entry-Level, 25th)	*Comments:* **All annual job openings for these middle-skill IT occupations have entry-level hourly wages above the OC living wage of $20.63.**	
	Yes ☑	No ☐
Education:	*Comments:* The majority (72%) of annual job openings for these middle-skill IT occupations typically require a bachelor's degree. **However, more than one-third of workers in the field have completed some college or an associate degree as their highest level of education.**	

Emerging Occupation(s)	
Yes ☑	*No* ☐

Comments: Currently, there is no single occupation within the Federal Bureau of Labor Statistics (BLS) Standard Occupational Classification (SOC) specifically for cybersecurity. However, the skills required for cybersecurity have been absorbed into existing computer networking and information technology occupations.

Additionally, there are three emerging cybersecurity occupations that are grouped under the broader Computer Occupations, All Other (15-1299) SOC code: Penetration Testers (15-1299.04), Information Security Engineers (15-1299.05), and Computer Systems Engineers/Architects (15.1299.08). This report includes an analysis of online job postings for these emerging occupations to better understand real-time demand from employers.

The Orange County Center of Excellence for Labor Market Research (OC COE) prepared this report to determine whether there is a supply gap in the Los Angeles/Orange County regional labor market related to six IT occupations:

- Middle-Skill
  - Computer Network Support Specialists (15-1231)
  - Computer User Support Specialists (15-1232)
  - Computer Network Architects (15-1241)
  - Network and Computer Systems Administrators (15-1244)
- Above Middle-Skill – denoted with an asterisk (*) throughout this report.
  - Information Security Analysts (15-1212)*
  - Computer Occupations, All Other (15-1299)*
    - Includes data for the following emerging occupations:
      - Penetration Tester (15-1299.04)*
      - Information Security Engineers (15-1299.05)*
      - Computer Systems Engineers/Architects (15.1299.08)*

Middle-skill occupations typically require a community college education while above middle-skill occupations typically require at least a bachelor's degree.

Based on the available data, there appears to be a supply gap for these middle-skill IT occupations in the region. Additionally, supply is overstated because the related educational programs that train for these IT occupations also train for 12 other occupations not included in this report. Typical entry-level wages for these middle-skill IT occupations are above the living wage and typical education requirement align with a community college education. **Therefore, due to all of the regional labor market criteria being met, the COE endorses this proposed program.**

Exhibit 1 lists the occupational demand, supply, typical entry-level education, and educational attainment for the occupations included in this report.

Exhibit 1: Labor Market Endorsement Summary

Occupation (SOC)	Demand (Annual Openings)	Supply (CC and Non-CC)	Entry-Level Hourly Earnings (25th Percentile)	Typical Entry-Level Education	Community College Educational Attainment
Computer Network Support Specialists (15-1231)	LA: 298	LA: 64	OC: $26.74	Associate degree	40%
	OC: 126	OC: 18			
	TTL: 424	*TTL:* 82			
Computer User Support Specialists (15-1232)	LA: 1,486	LA: 184	OC: $25.12	Some college, no degree	40%
	OC: 691	OC: 124			
	TTL: 2,177	*TTL:* 308			
Computer Network Architects (15-1241)	LA: 223	Accounted for below	OC: $40.71	Bachelor's degree	37%
	OC: 108				
	TTL: 331				

Occupation (SOC)	Demand (Annual Openings)	Supply (CC and Non-CC)	Entry-Level Hourly Earnings (25th Percentile)	Typical Entry-Level Education	Community College Educational Attainment
Network and Computer Systems Administrators (15-1244)	LA: 530	LA: 242	OC: $35.61	Bachelor's degree	39%
	OC: 221	OC: 208			
	TTL: 751	*TTL: 450*			
Middle-Skill Total	**3,683**	**840**	**N/A**	**N/A**	**N/A**
Information Security Analysts (15-1212)*	LA: 282	LA: 214	OC: $45.67	Bachelor's degree	27%
	OC: 133	OC: 17			
	TTL: 415	*TTL: 231*			
Computer Occupations, All Other (15-1299)*	LA: 1,440	LA: 2,617	OC: $28.38	Bachelor's degree	27%
	OC: 562	OC: 1,547			
	TTL: 2,002	*TTL: 4,164*			
Above Middle-Skill Total	**2,417**	**4,395**	**N/A**	**N/A**	**N/A**
Total	**6,100**	**5,235**	**N/A**	**N/A**	**N/A**

**Denotes an above middle-skill occupation*

Demand:

- The number of jobs related to these middle-skill IT occupations is projected to increase 3% through 2027. There is projected to be 3,683 annual job openings.
- Hourly entry-level wages for these middle-skill IT occupations range from $25.12 to $40.71 in Orange County, which is above the living wage of $20.63.
- There were 16,253 online job postings for these middle-skill IT occupations over the past 12 months. The highest number of postings were for network engineers, systems administrators, desktop support technicians, and IT support specialists.
- The typical entry-level education for these middle-skill IT occupations ranges from some college, no degree to a bachelor's degree.
- Between 37% and 40% of workers in these middle-skill occupations have completed some college or an associate degree as their highest level of education.

Supply:

- There was an average of 1,661 awards conferred by 28 community colleges in Los Angeles and Orange Counties from 2019 to 2022. Of those, 44% (726) were for the middle-skill occupations.
- Non-community college institutions conferred an average of 3,574 awards from 2019 to 2021. Of those, 6% (231) were for the middle-skill occupations.
- Orange County community college students that exited computer infrastructure and support programs in the 2020-21 academic year had a median annual wage of $52,028 after exiting the program and 63% attained the regional living wage.
- Throughout Orange County, 89% of computer infrastructure and support students that exited their program in 2019-20 reported that they are working in a job closely related to their field of study.

Demand

Occupational Projections:

Exhibit 2 shows the annual percent change in jobs for all five of the IT occupations researched in this report from 2017 through 2027. Employment in these IT occupations declined 6% from 2019 to 2020 in Orange County which is slightly less than the 7% decline across all occupations due to the COVID-19 pandemic. Employment in these IT occupations is projected to grow at a similar rate when compared to all occupations through 2027.

Exhibit 2: Annual Percent Change in Jobs for IT Occupations, 2017-2027

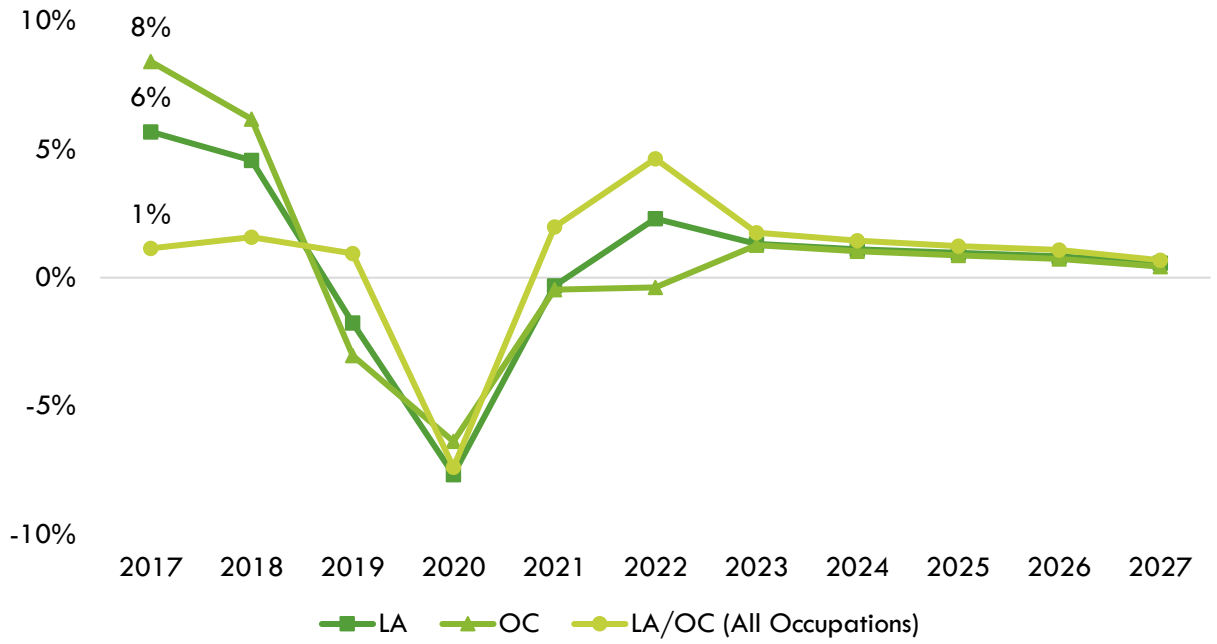


Exhibit 3 shows the five-year occupational demand projections for the four middle-skill IT occupations. In Los Angeles/Orange County, the number of jobs related to these occupations is projected to increase by 3% through 2027. There is projected to be 3,683 jobs available annually.

Exhibit 3: Middle-Skill Occupational Demand in Los Angeles and Orange Counties[1]

Geography	2022 Jobs	2027 Jobs	2022-2027 Change	2022-2027 % Change	Annual Openings
Los Angeles	31,351	32,377	1,026	3%	2,537
Orange	13,887	14,435	548	4%	1,147
Total	**45,238**	**46,811**	**1,574**	**3%**	**3,683**

Exhibit 4 shows the five-year occupational demand projections for *information security analysts* and *computer occupations, all other,* the two above middle-skill IT occupations in this report. In Los Angeles/Orange County, the number of jobs related to these occupations is projected to increase by 6% through 2027. There is projected to be 2,417 jobs available annually. Of those, 71% (1,722) are projected to be in Los Angeles County.

[1] Five-year change represents new job additions to the workforce. Annual openings include new jobs and replacement jobs that result from retirements and separations.

Exhibit 4: Above Middle-Skill Occupational Demand in Los Angeles and Orange Counties

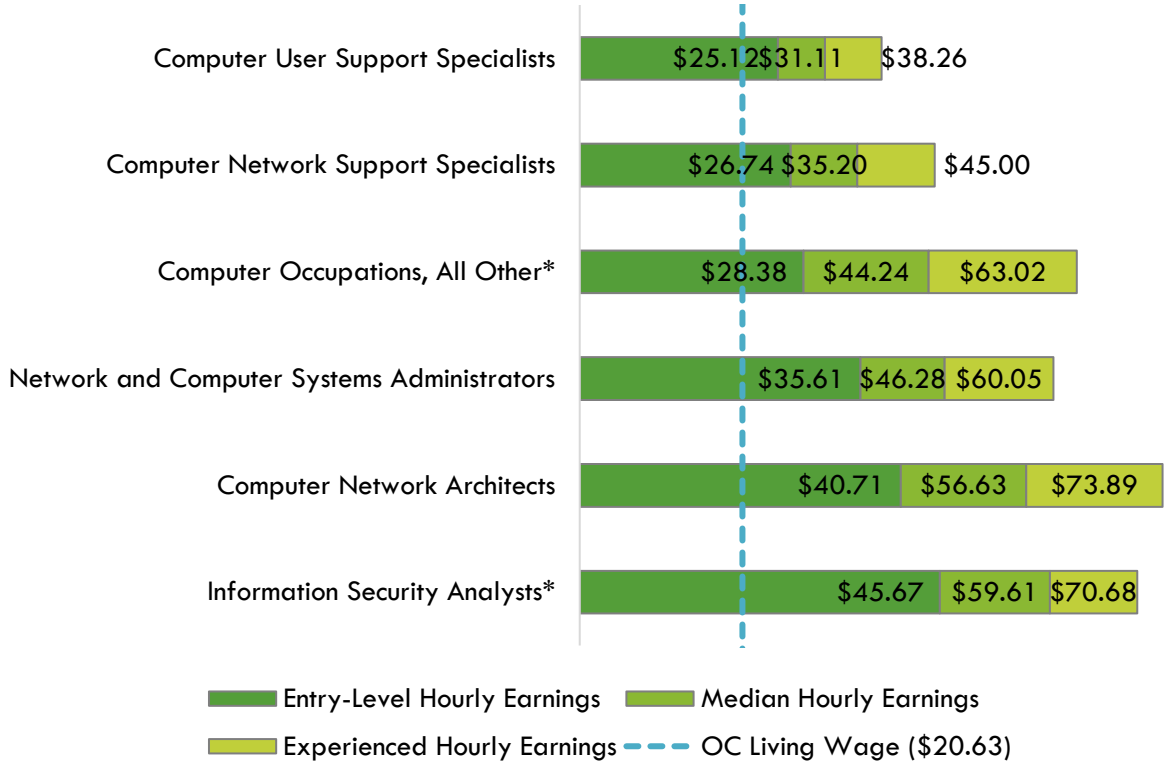
Geography	2022 Jobs	2027 Jobs	2022-2027 Change	2022-2027 % Change	Annual Openings
Los Angeles	20,080	21,345	1,265	6%	1,722
Orange	8,371	8,794	423	5%	694
Total	**28,451**	**30,139**	**1,688**	**6%**	**2,417**

Wages:

The labor market endorsement in this report considers the entry-level hourly wages for the six IT occupations in Orange County as they relate to the county's living wage. Los Angeles County wages are included below in order to provide a complete analysis of the LA/OC region.

All annual openings for these middle-skill IT occupations have entry-level wages above the living wage for one adult ($20.63 in Orange County). Typical entry-level hourly wages for these middle-skill IT occupations range between $25.12 and $40.71. When analyzing the middle-skill occupations, Orange County's average wages ($40.11) are below the average statewide wage of $45.00. Exhibit 5 shows the wage range for each of these IT occupations in Orange County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

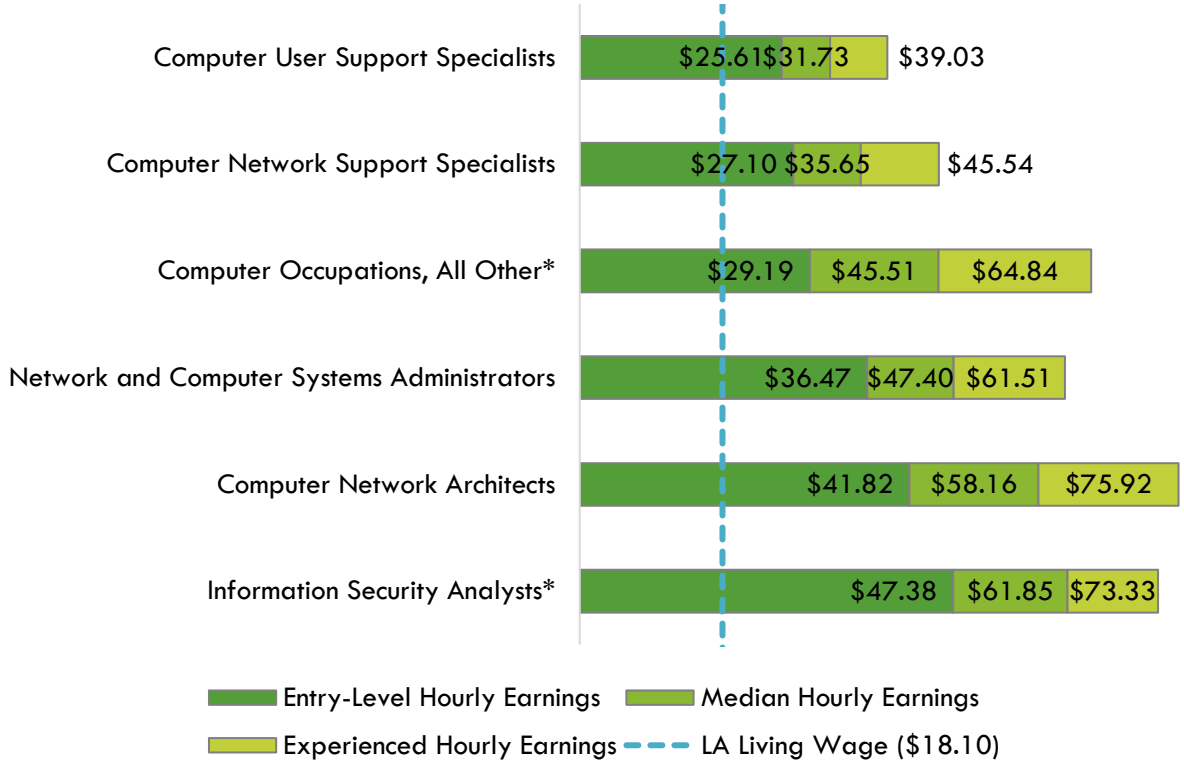
Exhibit 5: Wages by Occupation in Orange County



**Denotes an above middle-skill occupation*

All annual openings for these middle-skill IT occupations have entry-level wages above the living wage for one adult ($18.10 in Los Angeles County). Typical entry-level hourly wages for these middle-skill occupations are in a range between $25.61 and $41.82. When analyzing the middle-skill occupations, Los Angeles County's average wages ($41.11) are below the average statewide wage of $45.00. Exhibit 6 shows the wage range for each of these IT occupations in Los Angeles County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 6: Wages by Occupation in Los Angeles County



**Denotes an above middle-skill occupation*

Job Postings:

Important Online Job Postings Data Note: *Online job postings data is sourced from Lightcast, a labor market analytics firm that scrapes, collects, and organizes data from online job boards such as LinkedIn, Indeed, Glassdoor, Monster, GovernmentJobs.com, and thousands more. Lightcast uses natural language processing (NLP) to determine the related company, industry, occupation, and other information for each job posting. However, NLP has limitations that include understanding contextual words of phrases; determining differences in words that can be used as nouns, verbs, and/or adjectives; and misspellings or grammatical errors.*[2] *For these reasons, job postings could be assigned to the wrong employer, industry, or occupation within Lightcast's database.*

Additionally, there are several limitations when analyzing job postings. A single job posting may not represent a single job opening, as employers may be creating a pool of candidates for future openings or hiring for multiple positions with a single posting. Additionally, not all jobs are posted online, and jobs may be filled through other methods such as internal promotion, word-of-mouth advertising, physical job boards, or a variety of other channels.

This section includes an analysis of online job postings for these IT occupations. Additionally, an analysis of online job postings for three emerging occupations – Penetration Testers (15-1299.04)*, Information Security Engineers (15-1299.05)*, and Computer Systems Engineers/Architects (15.1299.08)* – is included to better understand the knowledge, skills, and abilities for these emerging areas.

There were 33,161 online job postings related to these IT occupations listed in the past 12 months. Of those, 49% (16,253) were for middle-skill IT occupations. Exhibit 7 shows the number of job postings by occupation.

Exhibit 7: Number of Job Postings by Occupation (n=33,161)

Occupation	Job Postings	Percentage of Job Postings
Computer Systems Engineers/Architects*	11,783	36%
Computer User Support Specialists	9,164	28%
Information Security Analysts*	4,915	15%
Network and Computer Systems Administrators	3,570	11%
Computer Network Architects	2,796	8%
Computer Network Support Specialists	723	2%
Information Security Engineers*	178	1%
Penetration Testers*	32	0.1%
Total Postings	**33,161**	**100%**

**Denotes an above middle-skill occupation*

[2] K. R. Chowdhary, Fundamentals of Artificial Intelligence (Basingstoke: Springer Nature, 2020), https://link.springer.com/book/10.1007/978-81-322-3972-7.

The top employers for the middle-skill IT occupations in the region, by number of job postings, are shown in Exhibit 8.

Exhibit 8: Top Middle-Skill Employers by Number of Job Postings (n=16,253)

Employer	Job Postings	Percentage of Job Postings
Boeing	316	2%
Robert Half	298	2%
Randstad	278	2%
Northrop Grumman	263	2%
Bowman Williams	203	1%
Best Buy	199	1%
University of California	141	1%
Ledgent	115	1%
Kforce	81	0.5%
TEKsystems	75	0.5%

The top employers for the two above middle-skill occupations, as well as the emerging occupations, in the region, by number of job postings, are shown in Exhibit 9.

Exhibit 9: Top Above Middle-Skill Employers by Number of Job Postings (n=16,908)

Employer	Job Postings	Percentage of Job Postings
Boeing	2,183	13%
Northrop Grumman	1,350	8%
Raytheon Technologies	269	2%
SpaceX	242	1%
The Aerospace Corporation	215	1%
L3Harris Technologies	192	1%
Motion Recruitment	174	1%
Linquest Corporation	171	1%
SAIC	138	1%
Robert Half	138	1%

The top specialized, soft, and computer skills listed by those most frequently mentioned in job postings (denoted in parentheses) are shown for these middle-skill occupations in Exhibit 10.

Exhibit 10: Top Skills for Middle-Skill Occupations by Number of Job Postings (n=16,253)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Help Desk Support (3,322)	Troubleshooting (Problem Solving) (8,039)	Operating Systems (3,287)
Technical Support (3,300)	Communications (7,463)	Active Directory (2,668)
Operating Systems (3,287)	Customer Service (5,367)	Microsoft Office (2,498)
Computer Science (2,812)	Management (4,827)	Firewall (1,710)
Active Directory (2,668)	Problem Solving (3,993)	Microsoft Office 365 (1,476)
Local Area Networks (1,745)	Operations (3,617)	Microsoft Excel (1,473)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Computer Hardware (1,733)	Microsoft Office (2,498)	Linux (1,282)
Network Switches (1,718)	Information Technology (2,394)	Windows Servers (1,265)
Firewall (1,710)	Writing (2,297)	Microsoft Outlook (1,243)
Peripheral Devices (1,642)	Detail Oriented (2,246)	Microsoft Azure (1,175)

The top specialized, soft, and computer skills listed by those most frequently mentioned in job postings (denoted in parentheses) are shown for *information security analysts* and *computer occupations, all other* in Exhibit 11.

Exhibit 11: Top Skills for Above Middle-Skill Occupations by Number of Job Postings (n=16,908)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Systems Engineering (6,968)	Communications (6,555)	Python (2,913)
Computer Science (6,173)	Management (5,735)	Linux (2,173)
Physics (2,915)	Operations (4,064)	Amazon Web Services (2,022)
Python (2,913)	Mathematics (3,939)	Microsoft Azure (1,957)
Cyber Security (2,816)	Leadership (3,863)	Operating Systems (1,915)
Automation (2,639)	Planning (3,475)	Firewall (1,641)
Agile Methodology (2,446)	Troubleshooting (3,078)	C++ (1,637)
Chemistry (2,223)	Problem Solving (2,486)	C (1,308)
Linux (2,173)	Research (2,363)	Java (1,273)
Systems Architecture (2,170)	Innovation (1,887)	Microsoft Excel (1,205)

Educational Attainment:

The Bureau of Labor Statistics (BLS) lists the following typical entry-level education for these occupations:

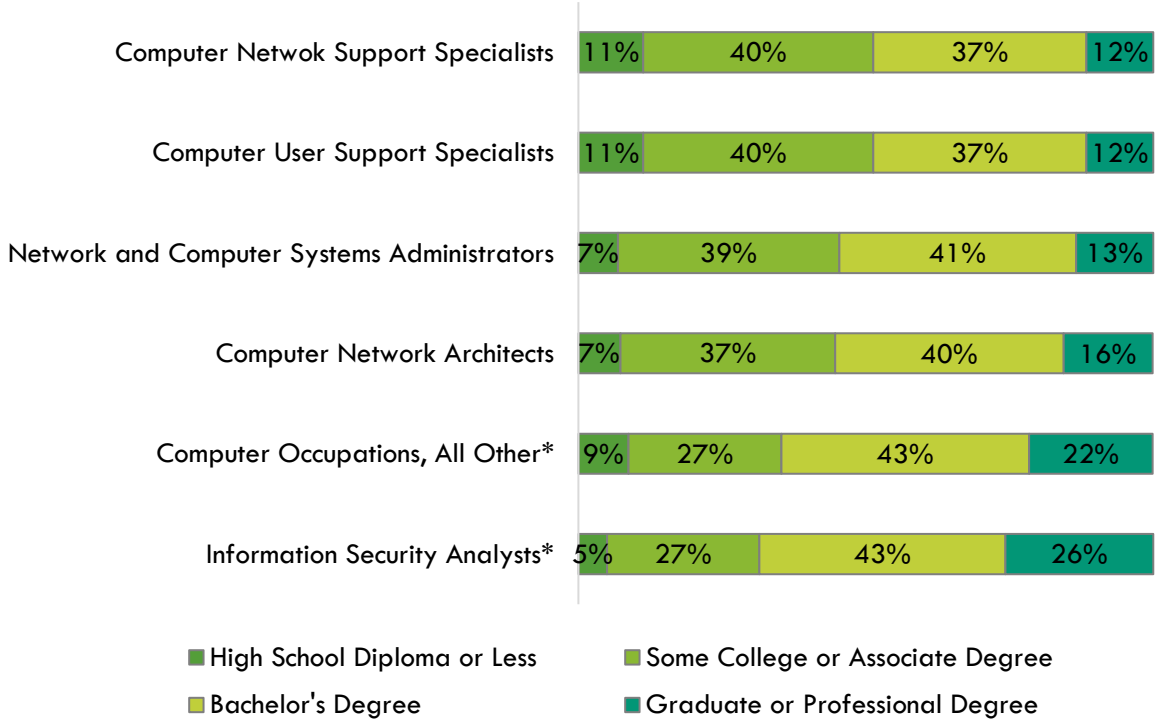
- Some College, No Degree
  - Computer User Support Specialists
- Associate Degree
  - Computer Network Support Specialists
- Bachelor's Degree
  - Information Security Analysts
  - Computer Network Architects
  - Network and Computer Systems Administrators
  - Computer Occupations, All Other

The national-level educational attainment data indicates between 37% and 40% of workers in the middle-skill occupations have completed some college or an associate degree as their highest level of education. Approximately 27% of *information security analysts and computer occupations, all other* have completed some college or an associate degree. Exhibit 12 shows the educational attainment for each occupation, sorted by highest community college educational attainment to lowest.

Of the 61% of the cumulative job postings for these middle-skill IT occupations that listed a minimum education requirement in Los Angeles/Orange County, 22% (971) requested a high school diploma or an associate degree and 76% (3,318) requested a bachelor's degree. Conversely, of the 76% of the postings for these above middle-skill IT occupations that listed a minimum education requirement, 89%

(11,536) requested a bachelor's degree and 8% (980) requested a high school diploma or an associate degree.

Exhibit 12: National-level Educational Attainment for Occupations



**Denotes an above middle-skill occupation*

Educational Supply

Community College Supply:

Exhibit 13 shows the three-year average number of awards conferred by community colleges in the related TOP codes:

- Information Technology, General (0701.00)
- Computer Information Systems (0702.00)
- Software Applications (0702.10)
- Computer Software Development (0707.00)
- Computer Programming (0707.10)
- Computer Systems Analysis (0707.30)
- Computer Infrastructure and Support (0708.00)
- Computer Networking (0708.10)
- Computer Support (0708.20)
- World Wide Web Administration (0709.00)

The colleges with the most completions in the region are Mt. San Antonio, Long Beach, Orange Coast, and Coastline. Over the past 12 months, there were four other related program recommendation requests from regional community colleges.

Exhibit 13: Regional Community College Awards (Certificates and Degrees), 2019-2022

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
0701.00	Information Technology, General	East LA	10	4	30	15
		Glendale	-	3	17	7
		LA Harbor	-	1	2	1
		LA Mission	3	1	4	3
		LA Southwest	-	2	12	5
		Long Beach	64	106	88	86
		Mt San Antonio	90	49	23	54
		Santa Monica	-	1	-	0
		West LA	5	-	6	4
		LA Subtotal	**172**	**167**	**182**	**174**
		Santa Ana	-	3	9	4
		OC Subtotal	**-**	**3**	**9**	**4**
Supply Subtotal/Average			**172**	**170**	**191**	**178**
0702.00	Computer Information Systems	Citrus	8	4	6	6
		Compton	-	-	12	4
		East LA	15	23	11	16
		El Camino	21	11	28	20
		Glendale	5	6	8	6
		LA City	1	4	3	3
		LA Harbor	-	-	1	0
		LA Mission	1	1	1	1
		LA Southwest	-	-	21	7
		LA Trade	20	15	17	17
		Long Beach	-	3	-	1
		Mt San Antonio	79	6	68	51
		Rio Hondo	10	6	15	10

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		West LA	10	9	14	11
		LA Subtotal	**170**	**88**	**205**	**154**
		Coastline	-	-	2	1
		Cypress	4	-	-	1
		Fullerton	11	31	49	30
		Irvine	2	-	-	1
		Orange Coast	2	-	1	1
		Saddleback	-	1	-	0
		Santa Ana	2	16	18	12
		Santiago Canyon	4	1	1	2
		OC Subtotal	**25**	**49**	**71**	**48**
Supply Subtotal/Average			**195**	**137**	**276**	**203**
0702.10	Software Applications	Cerritos	6	2	8	5
		LA City	1	1	-	1
		LA Mission	-	3	-	1
		LA Southwest	-	-	3	1
		Long Beach	7	-	-	2
		Mt San Antonio	2	-	1	1
		Santa Monica	13	6	12	10
		LA Subtotal	**29**	**12**	**24**	**22**
		Coastline	8	8	14	10
		Cypress	-	-	2	1
		Irvine	48	50	89	62
		Saddleback	7	11	10	9
		OC Subtotal	**63**	**69**	**115**	**82**
Supply Subtotal/Average			**92**	**81**	**139**	**104**
0707.00	Computer Software Development	LA City	-	-	1	0
		LA Harbor	-	-	2	1
		LA Mission	-	-	2	1
		LA Pierce	-	4	7	4
		Santa Monica	-	1	1	1
		West LA	-	-	6	2
		LA Subtotal	**-**	**5**	**19**	**8**
		Cypress	1	-	-	0
		Golden West	2	6	4	4
		Orange Coast	2	2	-	1
		Saddleback	3	10	15	9
		OC Subtotal	**8**	**18**	**19**	**15**
Supply Subtotal/Average			**8**	**23**	**38**	**23**
0707.10	Computer Programming	Cerritos	2	3	7	4
		Citrus	1	3	9	4
		East LA	4	1	-	2
		Glendale	3	-	-	1

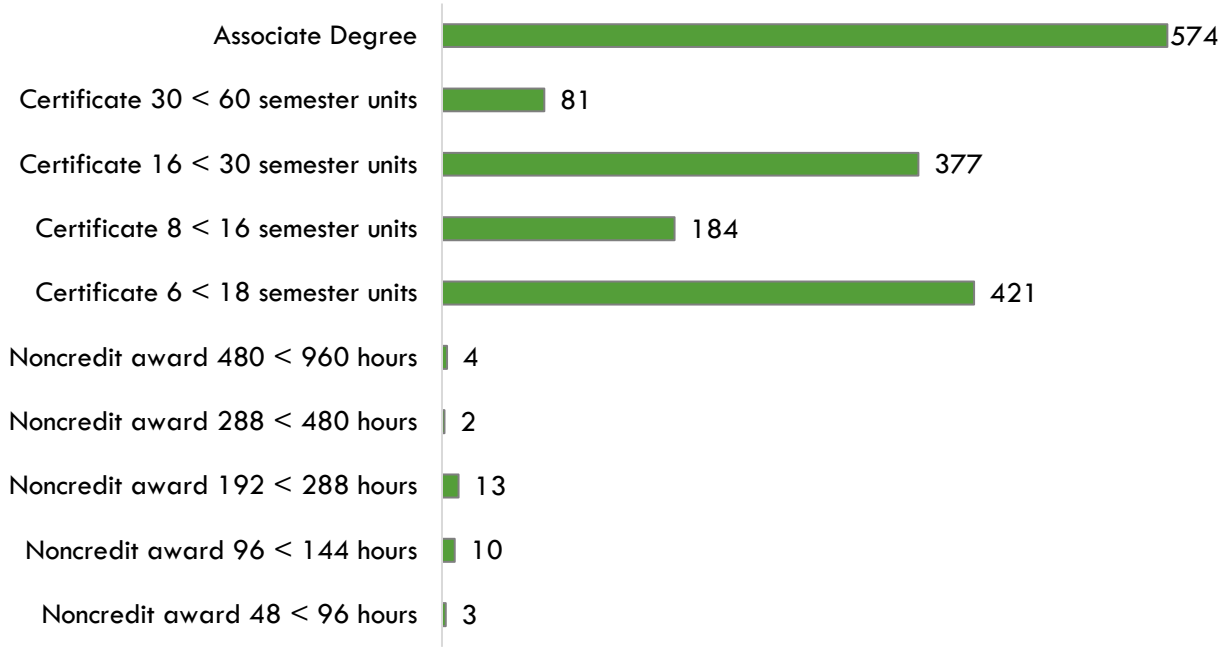
TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		LA City	6	8	10	8
		LA Harbor	-	2	4	2
		LA Mission	4	7	7	6
		LA Pierce	4	5	5	5
		LA Southwest	1	2	2	2
		LA Valley	6	13	8	9
		Long Beach	5	3	7	5
		Mt San Antonio	114	83	125	107
		Pasadena	21	23	23	22
		Santa Monica	46	65	71	61
		LA Subtotal	**217**	**218**	**278**	**238**
		Coastline	-	-	1	0
		Cypress	20	6	5	10
		Fullerton	28	24	28	27
		Irvine	4	-	-	1
		Orange Coast	157	206	160	174
		Santa Ana	1	-	-	0
		Santiago Canyon	3	2	2	2
		OC Subtotal	**213**	**238**	**196**	**216**
Supply Subtotal/Average			**430**	**456**	**474**	**453**
0707.30	Computer Systems Analysis	Cerritos	3	-	5	3
		East LA	1	-	-	0
		LA City	-	1	6	2
		LA Harbor	-	1	1	1
		LA Mission	1	1	1	1
		LA Pierce	-	6	5	4
		Mt San Antonio	-	-	9	3
		Rio Hondo	-	-	3	1
		LA Subtotal	**5**	**9**	**30**	**15**
Supply Subtotal/Average			**5**	**9**	**30**	**15**
0708.00	Computer Infrastructure and Support	Cerritos	4	4	9	6
		East LA	-	-	3	1
		El Camino	-	-	5	2
		Glendale	3	4	11	6
		LA City	3	5	12	7
		LA Harbor	1	1	2	1
		LA Mission	12	17	32	20
		LA Valley	2	4	3	3
		Long Beach	8	8	2	6
		Mt San Antonio	24	24	36	28
		Pasadena	1	24	8	11
		Rio Hondo	10	11	19	13
		West LA	15	16	7	13

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		LA Subtotal	**83**	**118**	**149**	**117**
		Coastline	46	73	91	70
		Cypress	3	1	1	2
		Orange Coast	7	5	7	6
		Saddleback	-	3	13	5
		Santa Ana	-	27	14	14
		OC Subtotal	**56**	**109**	**126**	**97**
Supply Subtotal/Average			**139**	**227**	**275**	**214**
0708.10	Computer Networking	Cerritos	9	8	6	8
		Glendale	3	-	2	2
		LA City	-	4	8	4
		LA Pierce	20	12	19	17
		Long Beach	47	48	52	49
		Mt San Antonio	11	4	25	13
		Rio Hondo	7	2	5	5
		West LA	48	58	24	43
		LA Subtotal	**145**	**136**	**141**	**141**
		Coastline	59	92	49	67
		Cypress	95	61	71	76
		Fullerton	-	1	-	0
		Irvine	21	10	18	16
		Saddleback	21	19	15	18
		Santa Ana	12	23	45	27
		OC Subtotal	**208**	**206**	**198**	**204**
Supply Subtotal/Average			**353**	**342**	**339**	**345**
0708.20	Computer Support	Citrus	1	1	4	2
		Glendale	7	2	7	5
		LA Pierce	8	6	6	7
		LA Valley	-	1	-	0
		Long Beach	14	40	33	29
		Pasadena	30	34	12	25
		LA Subtotal	**60**	**84**	**62**	**69**
		Cypress	5	3	13	7
		OC Subtotal	**5**	**3**	**13**	**7**
Supply Subtotal/Average			**65**	**87**	**75**	**76**
0709.00	World Wide Web Administration	Cerritos	-	-	3	1
		Glendale	7	10	7	8
		LA Pierce	-	2	-	1
		Long Beach	24	34	44	34
		Santa Monica	-	16	-	5
		West LA	9	6	7	7
		LA Subtotal	**40**	**68**	**61**	**56**
		Fullerton	-	1	-	0

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		Saddleback	2	2	3	2
		OC Subtotal	**2**	**3**	**3**	**3**
		Supply Subtotal/Average	**42**	**71**	**64**	**59**
		Supply Total/Average	**1,501**	**1,603**	**1,901**	**1,661**

Exhibit 14 shows the annual average community college awards by type from 2019-20 through 2021-22. Approximately one-third of the awards are associate degrees, followed by certificates of 6 to less than 18 semester units, and certificates of 16 to less than 30 semester units.

Exhibit 14: Annual Average Community College Awards by Type, 2019-2022



Community College Student Outcomes:

Exhibit 15 shows the Strong Workforce Program (SWP) metrics for computer infrastructure and support programs in Coast Community College District (CCCD), the Orange County Region, and California. Of the 687 computer infrastructure and support students in Orange County, 73% (500) attended a CCCD college.

CCCD students that exited computer infrastructure and support programs in the 2020-21 academic year had median earnings of $56,078, which is higher than students throughout Orange County ($52,028) and California ($53,844). However, CCCD students had a smaller median change in earnings (9%) when compared to Orange County and statewide (17% each). A slightly higher percentage of CCCD students attained the living wage (69%) when compared to Orange County (63%) and statewide (68%). Additionally, 93% of CCCD computer infrastructure and support students that exited in the 2019-20 academic year reported that they are employed in their field of study, which is higher than Orange County (89%) and significantly higher than students throughout the state (71%).

Exhibit 15: Computer Infrastructure and Support (0708.00) Strong Workforce Program Metrics, 2020-21[3]

SWP Metric	CCCD	OC Region	California
SWP Students	500	687	6,750
SWP Students Who Earned 9 or More Career Education Units in the District in a Single Year	27%	32%	41%
SWP Students Who Completed a Noncredit CTE or Workforce Preparation Course	Insufficient Data	Insufficient Data	86%
SWP Students Who Earned a Degree or Certificate or Attained Apprenticeship Journey Status	41	60	520
SWP Students Who Transferred to a Four-Year Postsecondary Institution (2019-20)	44	44	333
SWP Students with a Job Closely Related to Their Field of Study (2019-20)	93%	89%	71%
Median Annual Earnings for SWP Exiting Students	$56,078 ($26.96)	$52,028 ($25.01)	$53,844 ($25.88)
Median Change in Earnings for SWP Exiting Students	9%	17%	17%
SWP Exiting Students Who Attained the Living Wage	69%	63%	68%

[3] All SWP metrics are for 2020-21 unless otherwise noted.

Non-Community College Supply:

For a comprehensive regional supply analysis, it is also important to consider the supply from other institutions in the region that provide training programs for these IT occupations. Exhibit 16 shows the annual and two-year average number of awards conferred by these institutions in the related Classification of Instructional Programs (CIP) Codes: Computer and Information Sciences, General (11.0101), Information Technology (11.0103), Computer Programming/Programmer, General (11.0201), Computer Science (11.0701), Computer Systems Networking and Telecommunications (11.0901), Network and System Administration/Administrator (11.1001), Computer and Information Systems Security/ Auditing/Information Assurance (11.1003), and Computer Support Specialist (11.1006). Due to different data collection periods, the most recent two-year period of available data is from 2019 to 2021. Between 2019 and 2021, non-community colleges in the region conferred an average of 3,574 awards annually in related training programs.

Exhibit 16: Regional Non-Community College Awards, 2019-2021

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
11.0101	Computer and Information Sciences, General	Azusa Pacific University	21	25	23
		Chapman University	18	23	21
		Los Angeles Pacific College	6	2	4
		Loyola Marymount University	27	45	36
		Mount Saint Mary's University	-	-	-
		Pacific States University	-	-	-
		Pitzer College	-	1	1
		The Master's University and Seminary	11	5	8
		University of California-Irvine	-	1	1
		University of La Verne	23	36	30
		University of Massachusetts Global	30	36	33
		University of the People	203	292	248
		Westcliff University	-	-	-
		Supply Subtotal/Average	**339**	**466**	**403**
11.0103	Information Technology	Bethesda University	-	-	-
		Brand College	13	17	15
		California Intercontinental University	2	-	1
		California State University-Dominguez Hills	4	10	7
		California State University-Los Angeles	166	116	141
		California State University-Northridge	29	51	40
		Platt College-Anaheim	15	17	16
		Platt College-Los Angeles	12	6	9
		University of La Verne	2	3	3
		Westcliff University	-	-	-
		Supply Subtotal/Average	**243**	**220**	**232**

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
11.0201	Computer Programming/ Programmer, General	ABCO Technology	46	34	40
		Platt College-Anaheim	4	-	2
		Supply Subtotal/Average	**50**	**34**	**42**
11.0701	Computer Science	Biola University	18	19	19
		California Institute of Technology	72	83	78
		California State Polytechnic University-Pomona	238	270	254
		California State University-Dominguez Hills	57	66	62
		California State University-Fullerton	264	308	286
		California State University-Long Beach	220	221	221
		California State University-Los Angeles	119	152	136
		California State University-Northridge	160	214	187
		Chapman University	30	45	38
		Claremont McKenna College	35	17	26
		Harvey Mudd College	47	48	48
		Occidental College	18	18	18
		Pitzer College	10	5	8
		Pomona College	34	33	34
		Scripps College	11	5	8
		Southern California Institute of Technology	10	7	9
		The Master's University and Seminary	-	-	-
		University of California-Irvine	805	822	814
		University of California-Los Angeles	287	342	315
		University of Southern California	247	293	270
		Supply Subtotal/Average	**2,682**	**2,968**	**2,825**
11.0901	Computer Systems Networking and Telecommunications	Brand College	2	-	1
		PCI College	-	-	-
		Supply Subtotal/Average	**2**	**-**	**1**
11.1001	Network and System Administration/ Administrator	ABCO Technology	25	40	33
		Brand College	9	16	13
		California Intercontinental University	1	1	1
		Supply Subtotal/Average	**35**	**57**	**46**
11.1003	Computer and Information Systems Security/Auditing/	Azusa Pacific University	-	-	-
		Learnet Academy Inc	5	4	5
		University of La Verne	-	-	-

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
	Information Assurance				
		Supply Subtotal/Average	**5**	**4**	**5**
11.1006	Computer Support Specialist	Southern California Institute of Technology	26	17	22
		Supply Subtotal/Average	**26**	**17**	**22**
		Supply Total/Average	**3,382**	**3,766**	**3,574**

Regional Demographics

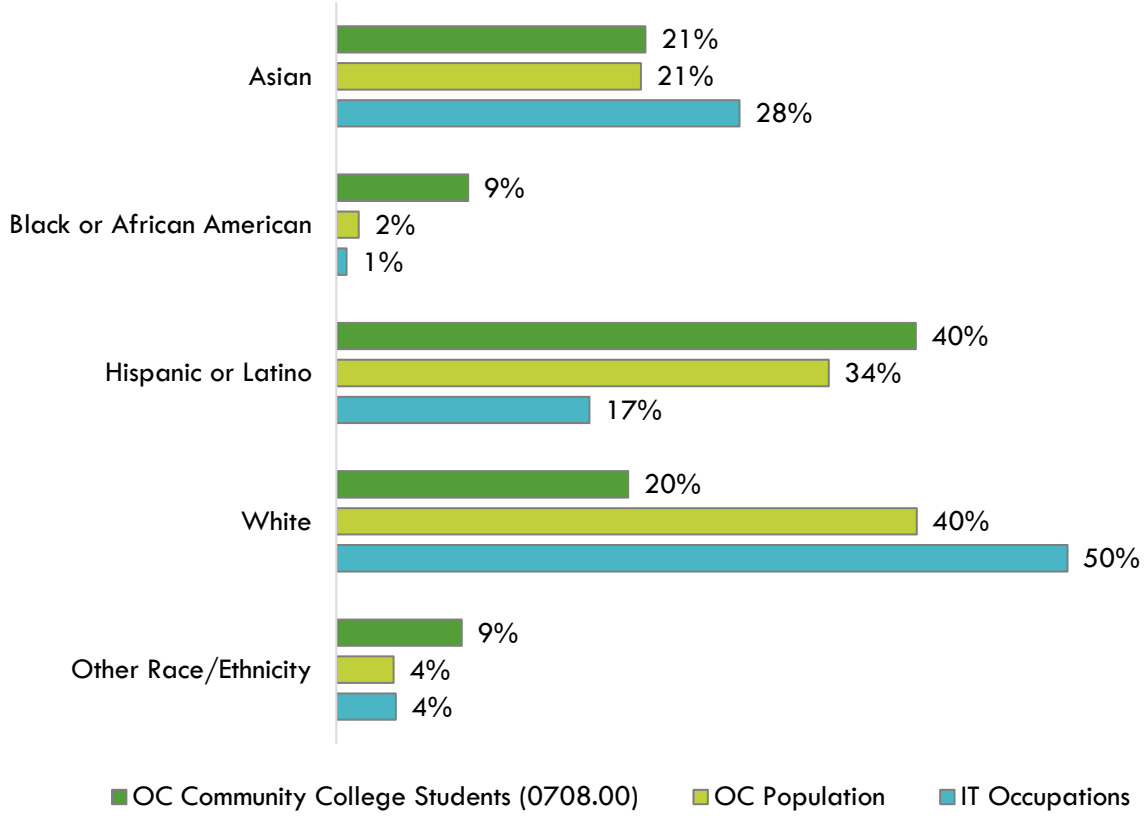
This section analyzes demographic data for Orange County community college students enrolled in computer infrastructure and support programs compared to the OC population, as well occupational data, for the purpose of identifying potential diversity and equity issues that can be addressed by community college programs.

Ethnicity:

Exhibit 17 shows the ethnicity of Orange County community college students enrolled in computer infrastructure and support programs compared to the overall Orange County population, as well as the five IT occupations included in this report. Notably, 50% of workers employed in these IT occupations are white, which is higher than the population (40%) and community college computer infrastructure and support students (20%). Conversely, 40% of community college IT computer infrastructure and support students are Hispanic or Latino, which is higher than the Orange County population (34%) and significantly higher than workers in these IT occupations (17%).

Examining disaggregated data for each occupation (not shown), the occupations with the highest percentage of Hispanic or Latino workers are *computer occupations, all other* (above middle-skill), followed by *computer network support specialist* (middle-skill).

Exhibit 17: Program and County Demographics by Ethnicity

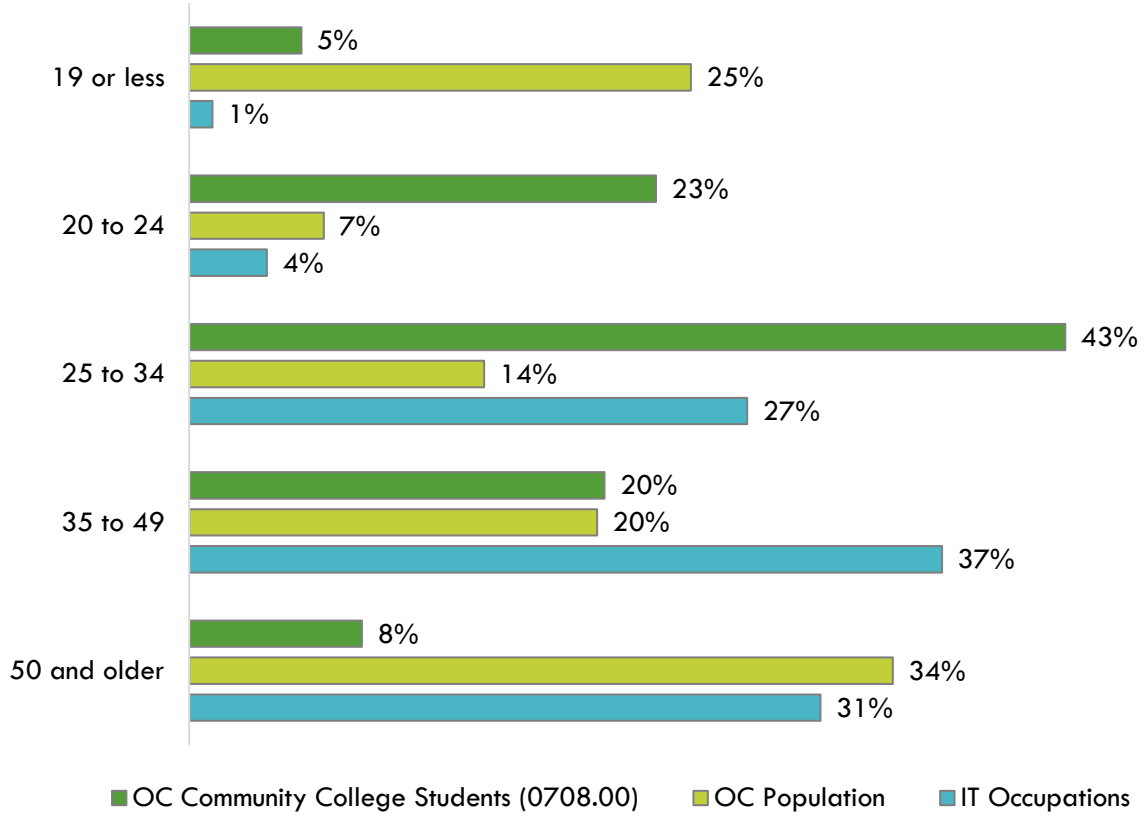


Age:

Exhibit 18 shows the age of Orange County community college students enrolled in computer infrastructure and support programs compared to the overall Orange County population, as well as the five IT occupations included in this report. The plurality of workers in these IT occupations are age 35 to 49 (37%), which is higher than the population (20%) and community college computer infrastructure and support students (20%). Only 5% of workers in these occupations are 24 or less, which is lower than the population (32%), and community college computer infrastructure and support students (28%). Notably, 43% of community college computer infrastructure and support students are between the age of 25 and 34, compared to 14% of the population and 27% of IT workers.

Examining disaggregated data for each occupation (not shown), 50 and older is the largest age group for three occupations: *computer network support specialists* (36%); *computer occupations, all other* (29%); and *computer network architects* (39%).

Exhibit 18: Program and County Demographics by Age



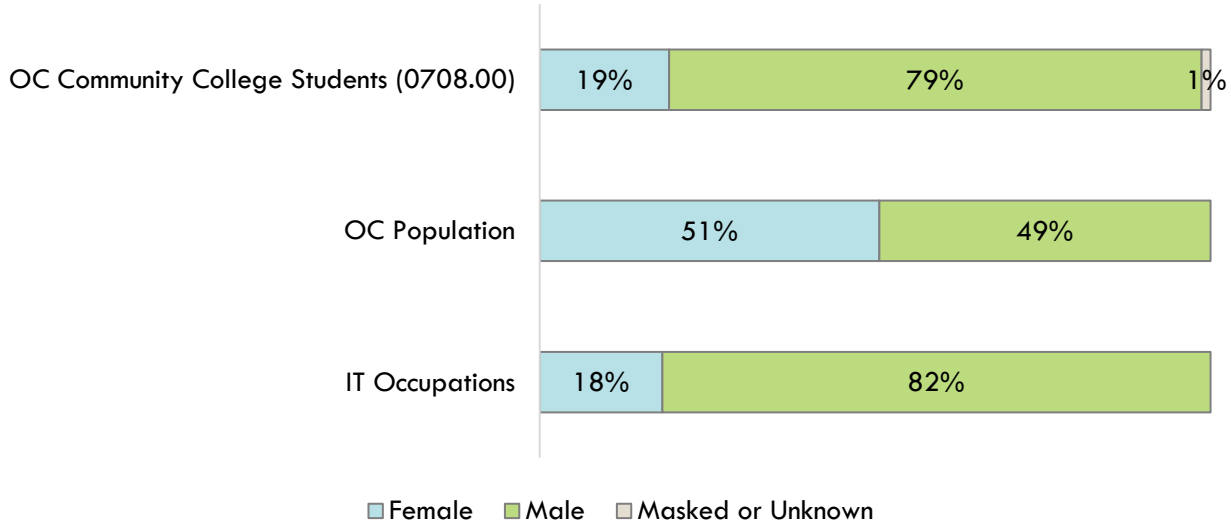
Sex:

Exhibit 19 shows the sex of Orange County community college students enrolled in computer infrastructure and support programs compared to the overall Orange County population as well as the five IT occupations included in this report.

Though the Orange County population is split nearly evenly between men and women, 82% of workers in these IT occupations are men. Similarly, 79% of community college computer infrastructure and support students are men.

Examining disaggregated data for each occupation (not shown), *computer network architects* has the highest percentage of men (88%) and lowest percentage of women (12%).

Exhibit 19: Program and County Demographics by Sex



Appendix A: Methodology

The OC COE prepared this report by analyzing data from occupations and education programs. Occupational data is derived from Lightcast, a labor market analytics firm that consolidates data from the California Employment Development Department (EDD), U.S. Bureau of Labor Statistics (BLS) and other government agencies. Program supply data is drawn from two systems: Taxonomy of Programs (TOP) and Classification of Instructional Programs (CIP).

Using a TOP-SOC crosswalk, the OC COE identified middle-skill jobs for which programs within these TOP codes train. Middle-skill jobs include:

- All occupations that require an educational requirement of some college, associate degree or apprenticeship;
- All occupations that require a bachelor's degree, but also have more than one-third of their existing labor force with an educational attainment of some college or associate degree; or
- All occupations that require a high school diploma or equivalent or no formal education, but also require short- to long-term on-the-job training where multiple community colleges have existing programs.

The OC COE determined labor market supply for an occupation or SOC code by analyzing the number of program completers or awards in a related TOP or CIP code. The COE developed a "supply table" with this information, which is the source of the program supply data for this report. TOP code data comes from the California Community Colleges Chancellor's Office MIS Data Mart (datamart.cccco.edu) and CIP code data comes from the Integrated Postsecondary Education Data System (nces.ed.gov/ipeds/use-the-data), also known as IPEDS. TOP is a system of numerical codes used at the state level to collect and report information on California community college programs and courses throughout the state that have similar outcomes. CIP codes are a taxonomy of academic disciplines at institutions of higher education in the United States and Canada. Institutions outside of the California Community College system do not use TOP codes in their reporting systems.

Data included in this analysis represent the labor market demand for relevant positions most closely related to the proposed program as expressed by the requesting college in consultation with the OC COE. Traditional labor market information was used to show current and projected employment based on data trends, as well as annual average awards granted by regional community colleges. Real-time labor market information captures job post advertisements for occupations relevant to the field of study which can signal demand and show what employers are looking for in potential employees, but is not a perfect measure of the quantity of open positions.

All representations have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. The most recent data available at the time of the analysis was examined; however, data sets are updated regularly and may not be consistent with previous reports. Efforts have been made to qualify and validate the accuracy of the data and findings; however, neither the Centers of Excellence for Labor Market Research (COE), COE host district, nor California Community Colleges Chancellor's Office are responsible for the applications or decisions made by individuals and/or organizations based on this study or its recommendations.

Appendix B: Data Sources

Data Type	Source
Occupational Projections, Wages, and Job Postings	Traditional labor market information data is sourced from Lightcast, a labor market analytics firm. Lightcast occupational employment data are based on final Lightcast industry data and final Lightcast staffing patterns. Wage estimates are based on Occupational Employment Statistics and the American Community Survey. For more information, see https://lightcast.io/
Living Wage	The living wage is derived from the Insight Center's California Family Needs Calculator, which measures the income necessary for an individual of family to afford basic expenses. The data assesses the cost of housing, food, child care, health care, transportation, and taxes. For more information, see: https://insightcced.org/family-needs-calculator/ The living wage for one adult in Orange County is $20.63 per hour ($42,910.40 annually). This figure is used by the CCCCO to calculate the percentage of students that attained the regional living wage.
Typical Education and Training Requirements, and Educational Attainment	The Bureau of Labor Statistics (BLS) provides information about education and training requirements for hundreds of occupations. BLS uses a system to assign categories for entry-level education, work experience in a related occupation, and typical on-the-job training to each occupation for which BLS publishes projections data. For more information, see https://www.bls.gov/emp/documentation/education/tech.htm
Emerging Occupation Descriptions, Additional Education Requirements, and Employer Preferences	The O*NET database includes information on skills, abilities, knowledges, work activities, and interests associated with occupations. For more information, see https://www.onetonline.org/help/online/
Educational Supply	The CCCCO Data Mart provides information about students, courses, student services, outcomes and faculty and staff. For more information, see: https://datamart.cccco.edu The National Center for Education Statistics (NCES) Integrated Postsecondary Integrated Data System (IPEDS) collects data on the number of postsecondary awards earned (completions). For more information, see https://nces.ed.gov/ipeds/use-the-data/survey-components/7/completions
Student Metrics and Demographics	LaunchBoard, a statewide data system supported by the California Community Colleges Chancellor's Office and hosted by Cal-PASS Plus, provides data on progress, success, employment, and earnings outcomes for California community college students. For more information, see: https://www.calpassplus.org/LaunchBoard/Home.aspx

Data Type	Source
Population and Occupation Demographics	The Census Bureau's American Community Survey (ACS) is the premier source for detailed population and housing information. For more information, see: https://www.census.gov/programs-surveys/acs Data is sourced from IPUMS USA, a database providing access to ACS and other Census Bureau data products. For more information, see: https://usa.ipums.org/usa/about.shtml

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