ORANGE COUNTY HEALTHCARE INFORMATION TECHNOLOGY (IT) & CYBERSECURITY WORKFORCE REPORT

ORANGE COUNTY BUSINESS COUNCIL
WWW.OCBC.ORG

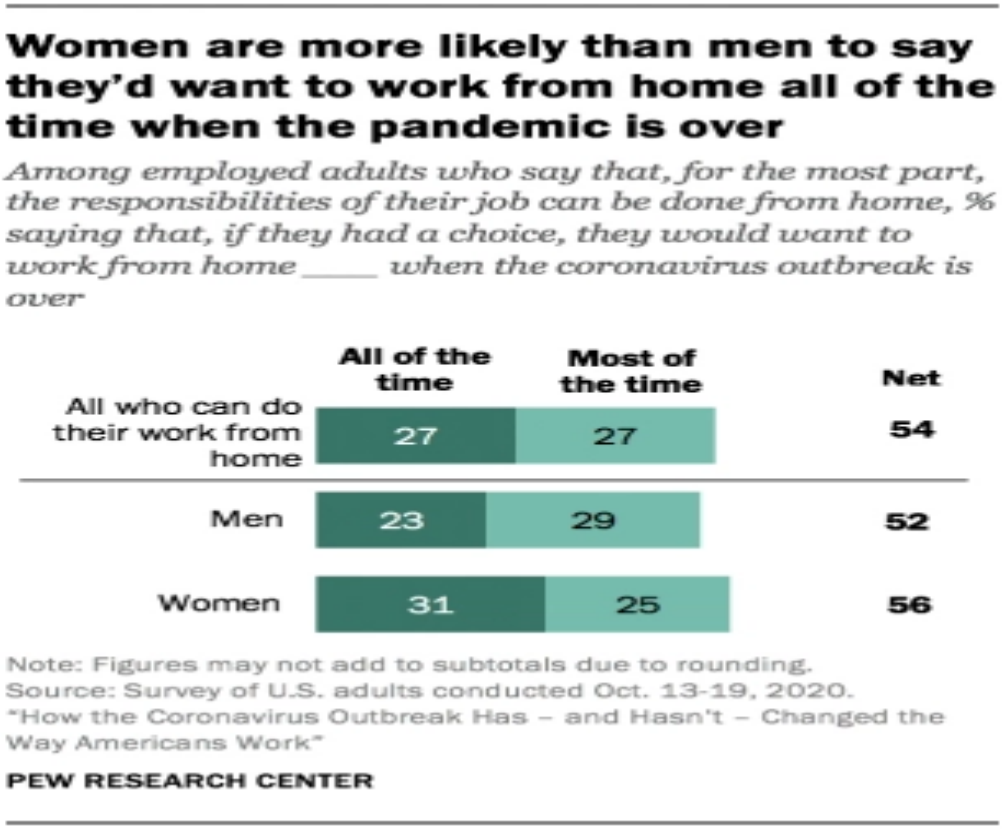
Contents

Introduction

"2021 will be the year of transition. Barring any unexpected catastrophes, individuals, businesses, and society can start to look forward to shaping their futures rather than just grinding through the present."

- McKinsey, January 2021[1]

The COVID-19 pandemic has disrupted every industry and nearly every aspect of our social, economic and cultural lives. These changes will likely long outlast a vaccine rollout or herd immunity. The shift online, for example, has greatly accelerated the long-term market share gains of e-commerce websites against traditional brick-and-mortar retail.



[1] https://www.mckinsey.com/featured-insights/leadership/the-next-normal-arrives-trends-that-will-define-2021-and-beyond

Working from home has also become an increasingly accepted option; a Pew Research Center poll found that more than half of Americans who worked from home in December 2020 would like to continue doing so after the end of the pandemic, as seen in the chart above.[2] Global Workplace Analytics predicts that between 25 and 30 percent of the workforce currently working from home will continue to work from home for at least a few days per week by the end of 2021.[3] All of the above trends will create many new employment opportunities in Healthcare IT and Cybersecurity.

While COVID-19 has disrupted and transformed every single part of the economy, this report focuses on two sectors particularly unlikely to return to the "old normal:" Healthcare IT and Cybersecurity. Both sectors were in a period of transition, driven by rapid technological advances, even before the pandemic hit. Both have experienced rapid employment growth since the turn of the millennium, far outpacing the rest of the economy. The pandemic, which has necessitated advances in telehealth unimagined before COVID, including virtual versions of doctor's offices and many other formerly physical spaces, has further increased demand for Healthcare IT and Cybersecurity services. This demand is likely here to stay, creating significant employment opportunities for students and job seekers. Educators, policymakers, and workforce development professionals should focus new initiatives to prepare students for these exciting career opportunities.

Healthcare IT

Healthcare Information Technology (IT) or Healthcare IT is a new and highly innovative facet of the Healthcare industry, one that has revolutionized administrative and business process tasks such as medical recordkeeping, service delivery to patients, and healthcare data analytics. Healthcare IT has allowed practitioners to leverage the abundance of available patient data and create new health management tools, more effective operational and treatment procedures and electronic health record software processes. According to KPMG, the Telehealth sector of Healthcare IT saw the second highest deal volume in 2020 with a record $6.5 billion in venture capital funding. KPMG cites one Healthcare provider, Intermountain Health, which saw daily telehealth visits increase from 100 per month before the pandemic to 50,000 per day in March and April 2020. [4]

In the past, medical professionals would often have to comb through a significant number of health records and technical documents when studying patients which often lead to delays in care or diagnosis. With Healthcare IT, the digitization of those health records combined with improved communication technologies allows medical professionals more efficiently spend their time – not only improving the quality of care but allowing them to see more patients than they could have.

[2] https://www.pewresearch.org/social-trends/2020/12/09/how-the-coronavirus-outbreak-has-and-hasnt-changed-the-way-americans-work/

[3] https://globalworkplaceanalytics.com/work-at-home-after-covid-19-our-forecast

[4] https://institutes.kpmg.us/healthcare-life-sciences/articles/2021/hcls-investment-outlook.html

The Healthcare portion of this report aims to provide estimates of both Computer Occupations in the Healthcare sector as well as more specific Health IT occupations. While Information Technology is an industry on its own: the increased adoption of new technologies and processes across nearly all industry sectors makes defining IT occupations somewhat difficult. This report, therefore, defines Healthcare IT as the work done by the following occupations:

Computer occupations in the Healthcare sector:

1) Actuaries
2) Computer and Information Research Scientists
3) Computer Network Architects
4) Computer Network Support Specialists
5) Computer Occupations, All Other
6) Computer Programmers
7) Computer Systems Analysts
8) Computer User Support Specialists
9) Data Scientists and Mathematical Science Occupations, All Other
10) Database Administrators and Architects
11) Information Security Analysts
12) Mathematicians
13) Network and Computer Systems Administrators
14) Operations Research Analysts
15) Software Developers and Software Quality Assurance Analysts and Testers
16) Statisticians
17) Web Developers and Digital Interface Designers

Healthcare-specific IT occupations include:

1) Health Information Technologists
2) Medical Registrar
3) Surgical Assistants
4) Health Practitioners and Technical Workers.

Telehealth is one of the most important trends in Healthcare IT both in Orange County and across the country. The American Medical Association (AMA) found that 28 percent of surveyed physicians used telehealth for virtual office visits in 2019, twice as many as in 2016.[5] 22 percent used remote monitoring to improve care in 2019 while 16 percent used remote monitoring to improve efficiency; 58 percent provided digital access to clinical data. AMA Vice President of Digital Innovation, Meg Barron, estimates

[5] https://www.ama-assn.org/system/files/2020-02/ama-digital-health-study.pdf

that up to 90 percent of US physicians offered telehealth services in 2020 with around half of them doing so for the first time.[6]

While demand will likely decrease as the pandemic fades, an above-baseline demand for Telehealth is likely here to stay. McKinsey partner Jenny Rost, for instance, notes "sustained interest from consumers and providers in continuing to use telehealth and a lot more innovation in the models… more opportunities to really integrate telehealth in those video visits with remote monitoring, with digital patient engagement, and digital therapeutics tools."[7]

Telehealth has also become a much larger part of the patient experience than ever before, most obviously in online scheduling of COVID-19 tests. An April 2020 McKinsey survey found that, while only 11 percent of healthcare consumers used telehealth in 2019, more than 75 percent of reported interest in telehealth going forward, with 74 percent reporting high satisfaction with telehealth services.[8] In May, McKinsey researchers identified five main growth areas for telehealth:

1. On-demand virtual urgent care, potentially allowing patients to avoid costly ER visits;
2. Virtual office visits;
3. Near-virtual office visits, combining virtual meeting with healthcare providers and in-person tests and immunizations;
4. Virtual home health services, such as speech therapy and some types of physical therapy; and
5. Tech-enabled home medication administration.

Overall, McKinsey predicts that as much as $250 billion in United States healthcare services could switch from physical to digital in the near future, a trend greatly accelerated by COVID-19. The potential for significant cost savings will likely fuel post-pandemic use of telehealth and other Healthcare IT services.

Cybersecurity

As more and more businesses, industries and people integrate technology into their daily lives, protecting those individuals and businesses, along with their information, becomes a greater challenge. As proven by the seemingly unending number of data leaks from social media platforms, credit bureaus and other private and public businesses, the public is constantly at-risk of having their private and personal data – from health records to banking information – sold to the highest bidder. Cybersecurity employment has grown alongside these threads and will only accelerate as life becomes increasingly more digital. This report measures Cybersecurity employment by focusing on one important occupation – Information

[6] https://www.ama-assn.org/practice-management/digital/telehealth-s-post-pandemic-future-where-do-we-go-here

[7] https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/vital-signs-the-growing-impact-of-digital-health-innovation?cid=podcast-eml-alt-mip-mck&hdpid=b8c90668-0686-4f26-9fb8-3176eb2796ba&hctky=1945270&hlkid=812f73a0d2ee4cc4849b40e9d47fbe9e

[8] https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/telehealth-a-quarter-trillion-dollar-post-covid-19-reality

Security Analysts. While Cybersecurity firms may employ a number of other occupations, Information Security Analysts are the central Cybersecurity occupation.

The pandemic greatly accelerated the trend of digitalization, as seen with Zoom meetings replacing in-person conferences, food deliveries replacing restaurant dining, and telehealth replacing in-person visits to doctor's offices. This, in turn, opened up great vulnerabilities to hackers and malware.

As McKinsey writers Venky Anant, Jeffrey Caso, and Andreas Schwarz noted in July 2020, "few corporate functions shifted priorities so much and so quickly when the COVID-19 crisis struck as corporate cybersecurity operations and the technology providers that support them."[9] In October, the U.S. Chamber of Commerce released a *Special Report on Cybersecure Remote Working During COVID-19*. Around the same time, Risk Based Security reported 36 billion data breaches by September 2020, making it by far the worst year on record for data privacy.[10]

A March 2020 Deloitte article lists six cybersecurity impacts from the COVID-19 pandemic, from virtual private network (VPN) vulnerabilities to potential delays in responding to breaches. The dramatic pandemic-driven rise in unemployment may have incentivized hacking, as "idle people with internet access who have lost their jobs from the effects of COVID-19 may see an opportunity to make a living out of this pandemic" (through cybercrime).[11] The pandemic seems to have directly increased cybercrime in another way; Deloitte's Cyber Intelligence Center has "observed a spike in phishing attacks, malspams and ransomware attacks as attackers are using COVID-19 as bait to impersonate brands, thereby misleading employees and customers."

As with Healthcare IT, Cybersecurity saw significant growth in demand and usage before 2020, with total employment rising from approximately 30,000 in 2001 to more than 134,000 in 2019. This growth is likely to continue and even pick up pace after the pandemic as working from home, virtual meetings and conferences and telehealth usage remain well above 2019 baselines.

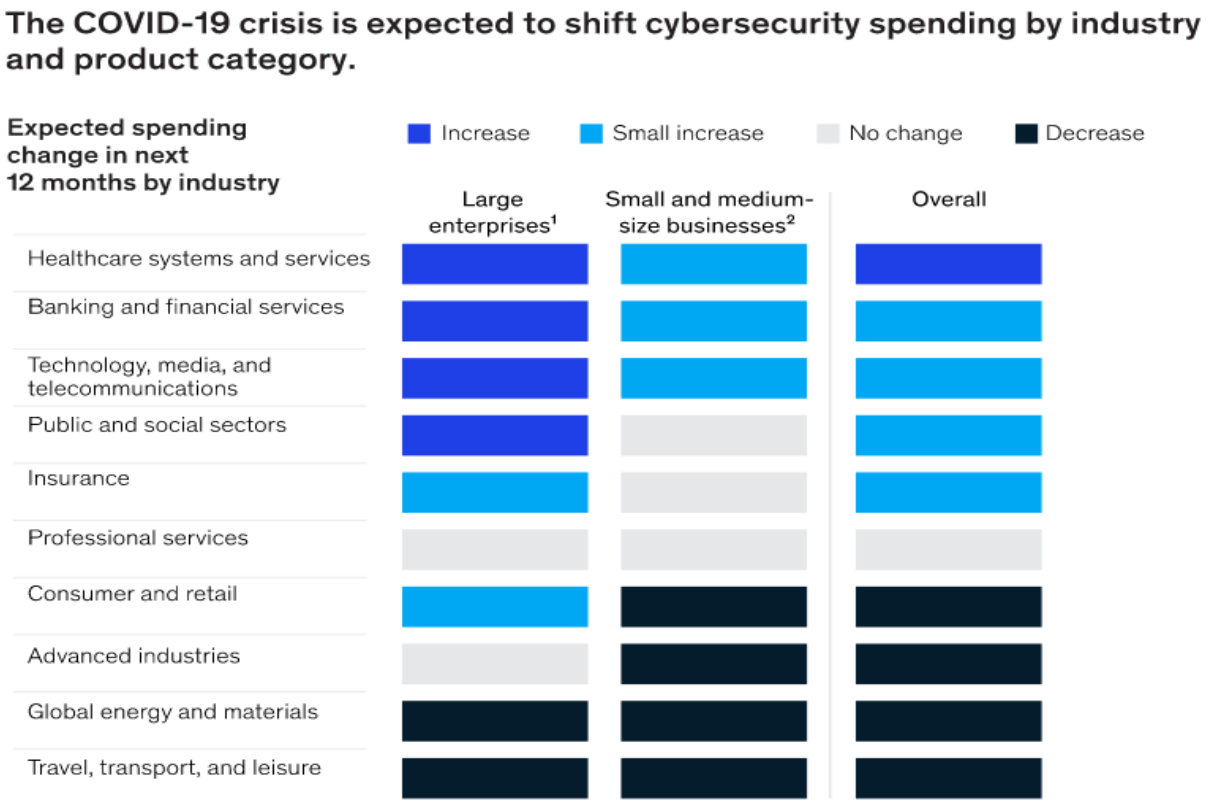
[9] https://www.mckinsey.com/business-functions/risk/our-insights/covid-19-crisis-shifts-cybersecurity-priorities-and-budgets

[10] https://pages.riskbasedsecurity.com/hubfs/Reports/2020/2020%20Q3%20Data%20Breach%20QuickView%20Report.pdf

[11] https://www2.deloitte.com/ng/en/pages/risk/articles/covid-19-impact-cybersecurity.html

The Important Nexus of Healthcare IT and Cybersecurity

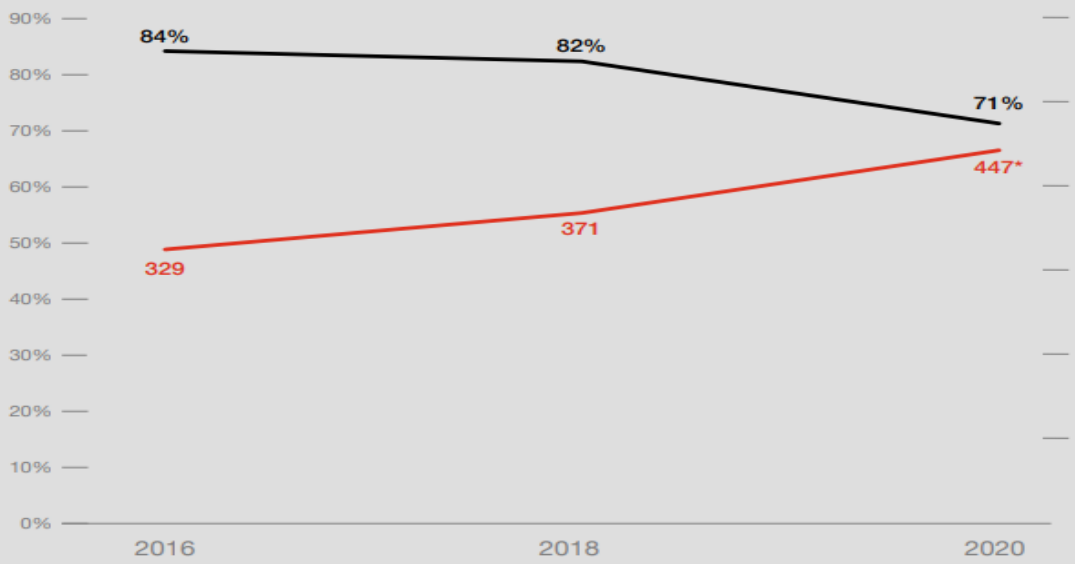
Healthcare IT and Cybersecurity have become increasingly interconnected in the COVID-19 era. In their *2020 Q3 Report*, Risk Based Security notes that healthcare had more data breaches than any other sector between January 1 and September 30 2020, accounting for around 11.5 percent of total breaches.[12] While Cybersecurity is an important concern for many industries (Healthcare, Information, Finance & Insurance, Public Administration and Professional/Scientific all saw more than 200 breaches in Q3 2020), it is particularly vital for healthcare due to patient privacy laws and other regulations. McKinsey predicts significant increases in healthcare cybersecurity spending, as seen in the graph below:



[12] https://pages.riskbasedsecurity.com/hubfs/Reports/2020/2020%20Q3%20Data%20Breach%20QuickView%20Report.pdf

According to PriceWaterhouse Coopers' *Top Health industry Issues of 2021: Will a shocked system emerge stronger?,* consumers are discouraged from sharing healthcare information due to an increasing number of data breaches in recent years, as seen in the chart below.[13]

Figure B: Consumers are becoming less open to sharing healthcare information as data breaches are trending upward



Source: PwC Health Research Institute consumer surveys, 2016, May 2018, September 2020
HIPAA Journal healthcare data breach statistics - https://www.hipaajournal.com/healthcare-data-breach-statistics/
*PwC Health Research Institute projected monthly breaches for September-December 2020 based on the monthly average of January-August actuals.

Healthcare IT and Cybersecurity have tremendous growth potential in the wake of a pandemic that has supercharged the digitization of work and daily life. This growth, however, will need to be supported by an enlarged, enhanced and robust skilled talent pipeline. This report identifies some of the most promising opportunities for doing so.

[13] https://www.pwc.com/us/en/industries/health-industries/top-health-industry-issues.html

Labor Market Trends

Both Healthcare IT and Cybersecurity have seen incredible growth since the turn of the millennium, more than doubling in size, in the case of Healthcare IT, and quadrupling in the case of Cybersecurity. They have both outpaced the rest of the national, state and county economies and could see equally fast – or even faster – employment growth in the wake of a pandemic that has shifted so much of life online.

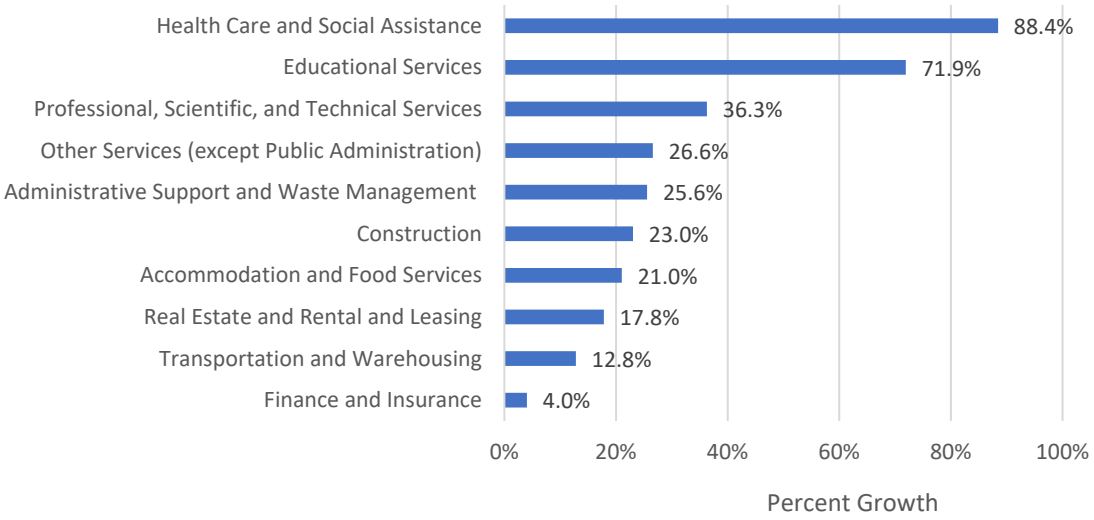
Healthcare IT has significantly outpaced the rapid growth experienced by the rest of the Healthcare industry, as seen below. While Orange County widely surpassed national overall Healthcare employment growth, it mirrored the statewide rate of 88.5 percent. Statewide Healthcare employment growth was largely driven by Los Angeles County, which saw its Healthcare industry expand by 98.4 percent from 2001 to 2020 representing 32 percent of the statewide increase during the same time period.

Health IT and Overall Healthcare Industry Job Growth Rates, 2001-2020		
	Health IT	**Overall Healthcare Industry**
United States	102.9%	48.5%
California	143.8%	88.5%
Orange County	132.8%	88.4%

Source: Emsi

Orange County's Healthcare sector saw the most significant growth of any industry between 2001 and 2020, expanding by 88.4 percent, followed by Educational Services (+71.9 percent) and Professional, Scientific, and Technical Services (+36.3 percent). This was driven in large part by an aging population, a trend that will likely continue; the California Department of Finance estimates that residents aged 65 and above will account for 27 percent of the county's population in 2060. Therefore, a robust and innovative healthcare system with well-educated, qualified employees will be crucial to properly serve county residents.

Top 10 Orange County Industries by Employment Growth, 2001-2020

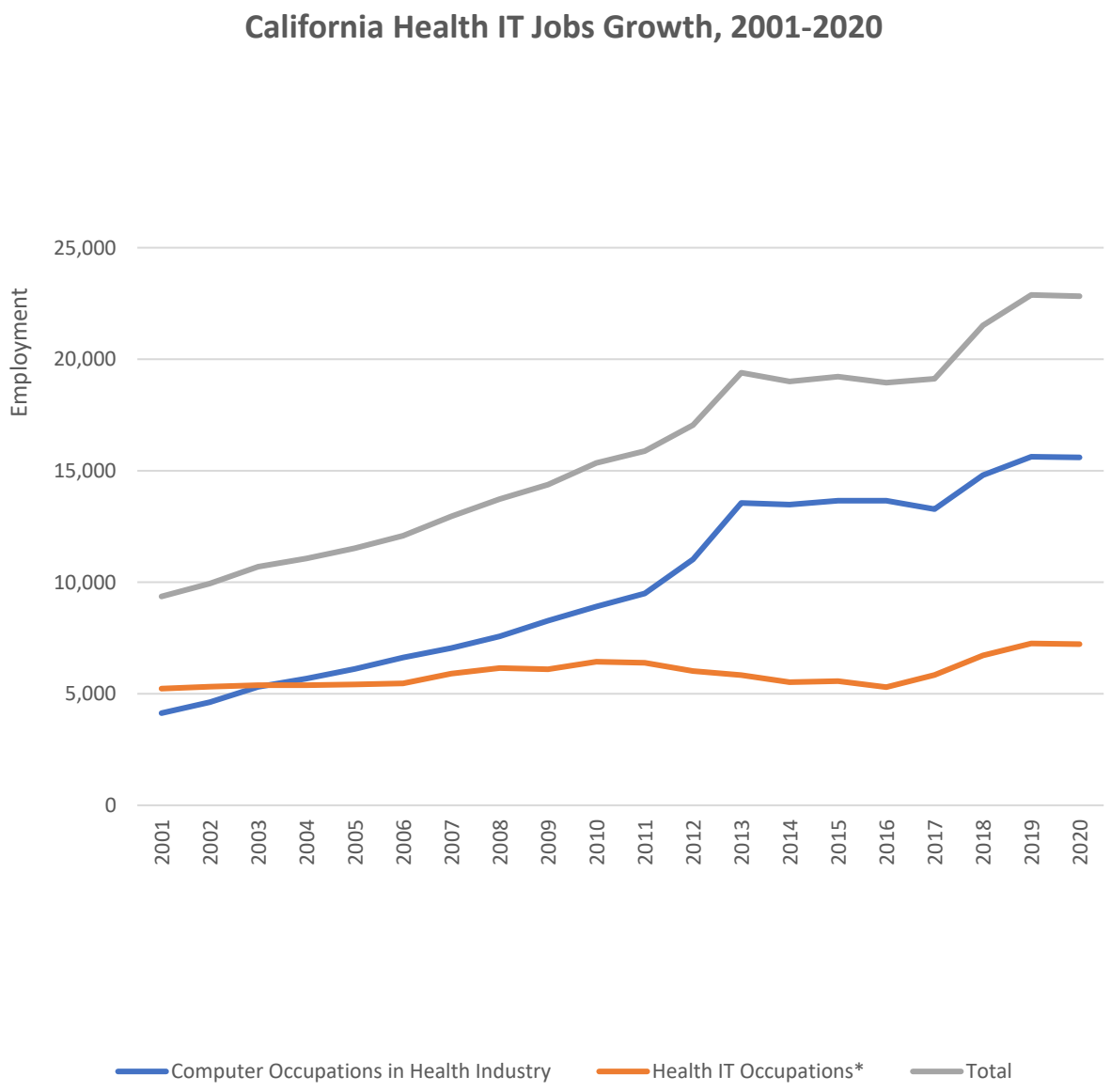


Source: Emsi

Healthcare IT - State Level

California Healthcare IT employment increased from 9,000 in 2001 to 22,800 in 2020. As seen below, Computer Occupations in the Health Industry have seen particularly fast growth over the past two decades, more than tripling its total employment between 2001 and 2020. The combined category of

Health Information Technologists, Medical Registrars, Surgical Assistants and Healthcare Practitioners and Technical Workers saw much slower but still significant growth – total employment increased by approximately 2,000 from 2001 to 2020, reaching 7,223 in the latter year.



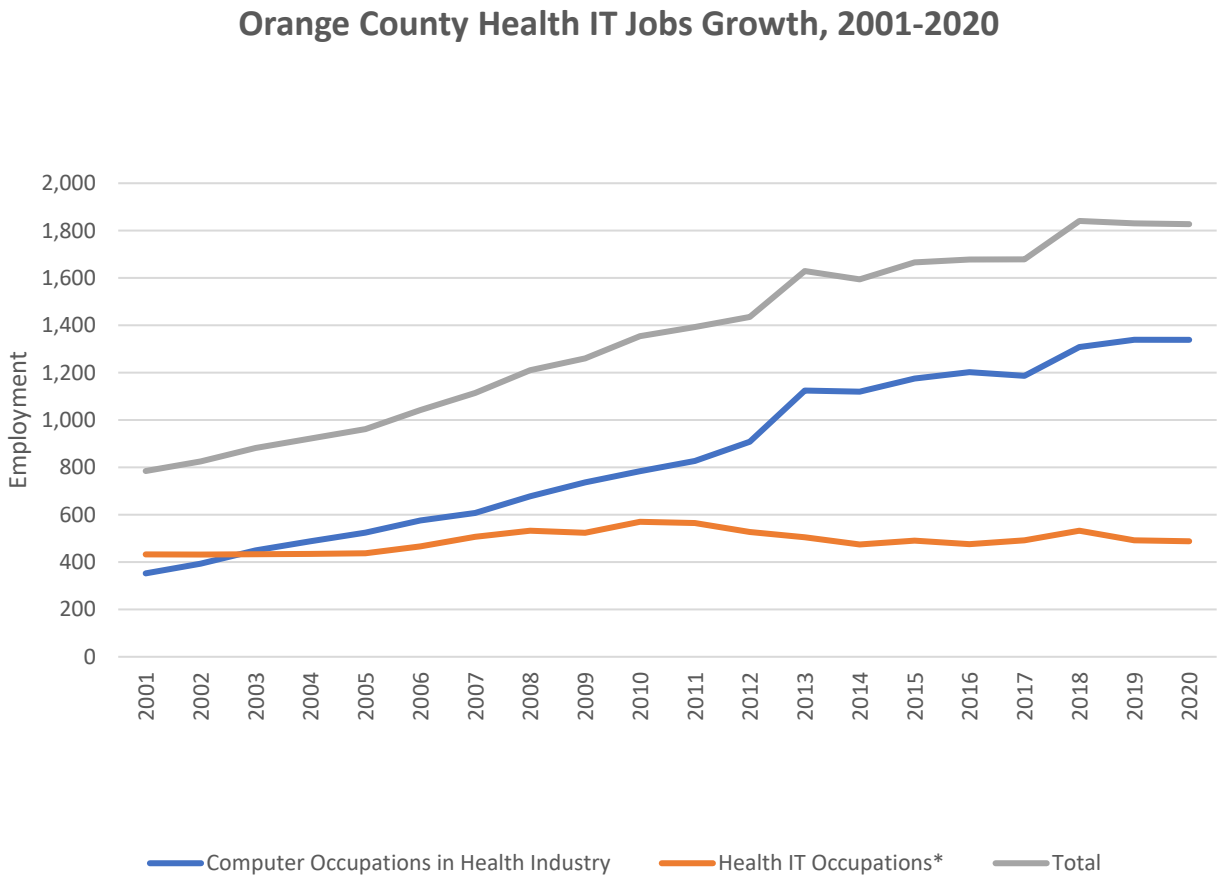
*Health IT Occupations includes: Health Information Technologists, Medical Registrars, Surgical Assistants, and Healthcare Practitioners and Technical Workers.
Source: Emsi


Monthly Job Postings for Health IT Jobs in California, 2016-2021
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Job Postings
Sep 2016
Nov 2016
Jan 2017
Mar 2017
May 2017
Jul 2017
Sep 2017
Nov 2017
Jan 2018
Mar 2018
May 2018
Jul 2018
Sep 2018
Nov 2018
Jan 2019
Mar 2019
May 2019
Jul 2019
Sep 2019
Nov 2019
Jan 2020
Mar 2020
May 2020
Jul 2020
Sep 2020
Nov 2020
Jan 2021

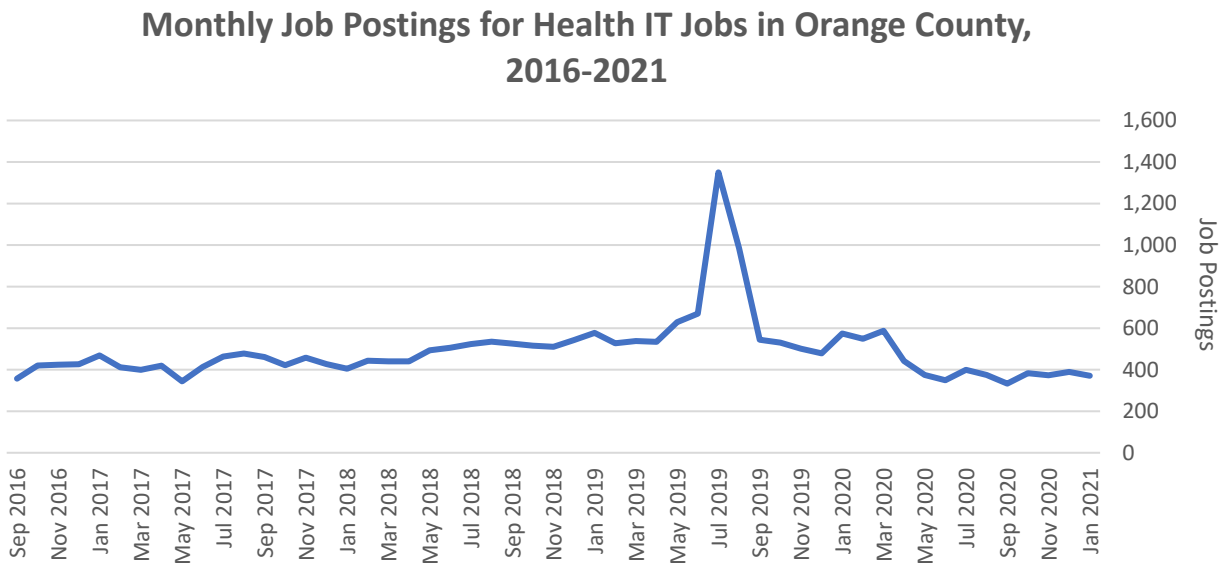
Source: Emsi

Healthcare IT- Orange County Level

Orange County also saw rapid growth (133 percent), with total Healthcare IT employment increasing from 785 in 2001 to 1,827 in 2020. One subset of Healthcare IT jobs, Computer Occupations in Healthcare, grew by almost 280 percent, increasing from 352 in 2001 to 1,339 in 2019. Healthcare IT employment experienced significantly higher growth than other major occupational categories in Healthcare, such as Other Healthcare Practitioners and Technical Occupations (61 percent employment growth), Healthcare Diagnosing or Treating Practitioners (50 percent) and Health Technologists and Technicians (48 percent). Orange County Healthcare IT has seen fairly consistent growth over the past 20 years, as seen below, with the exception of a slight dip in 2014.



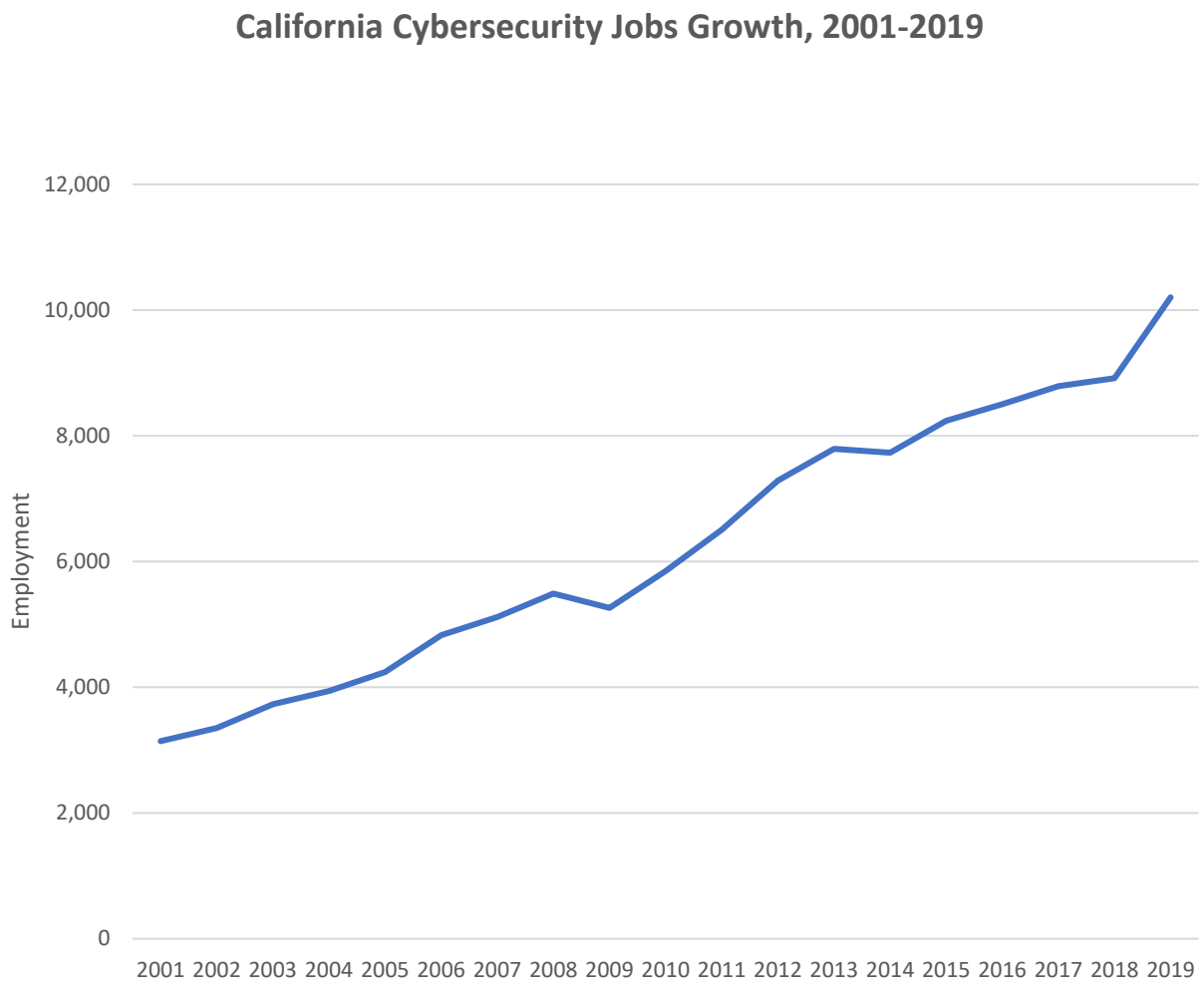
*Health IT Occupations includes: Health Information Technologists, Medical Registrars, Surgical Assistants, and Healthcare Practitioners and Technical Workers.
Source: Emsi


Monthly Job Postings for Health IT Jobs in Orange County, 2016-2021
1,600
1,400
1,200
1,000
800
600
400
200
0
Job Postings
Sep 2016
Nov 2016
Jan 2017
Mar 2017
May 2017
Jul 2017
Sep 2017
Nov 2017
Jan 2018
Mar 2018
May 2018
Jul 2018
Sep 2018
Nov 2018
Jan 2019
Mar 2019
May 2019
Jul 2019
Sep 2019
Nov 2019
Jan 2020
Mar 2020
May 2020
Jul 2020
Sep 2020
Nov 2020
Jan 2021

Source: Emsi

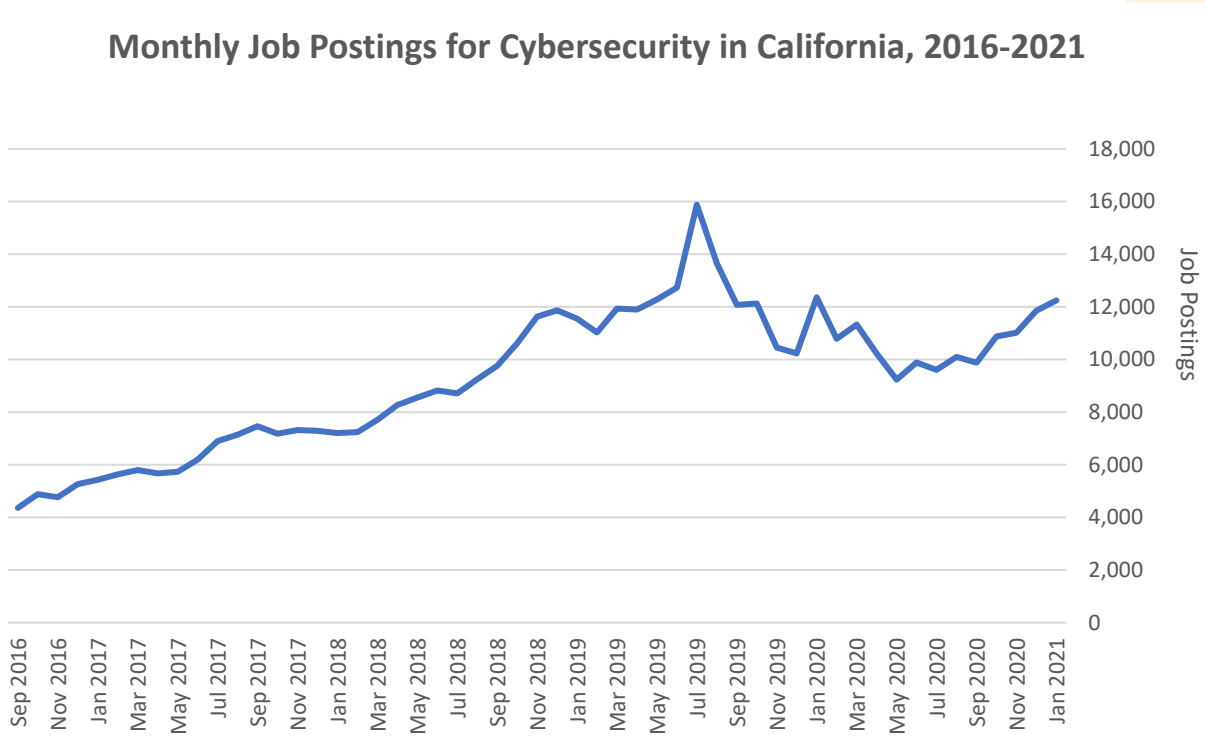
Cybersecurity – State Level

More than 10,000 Californians were employed in Cybersecurity in 2019, compared to only 3,143 in 2001, an amazing growth rate unmatched by any other sector of the state's labor market. California's Cybersecurity sector has seen fairly consistent growth since 2001, as seen below.



Source: Emsi

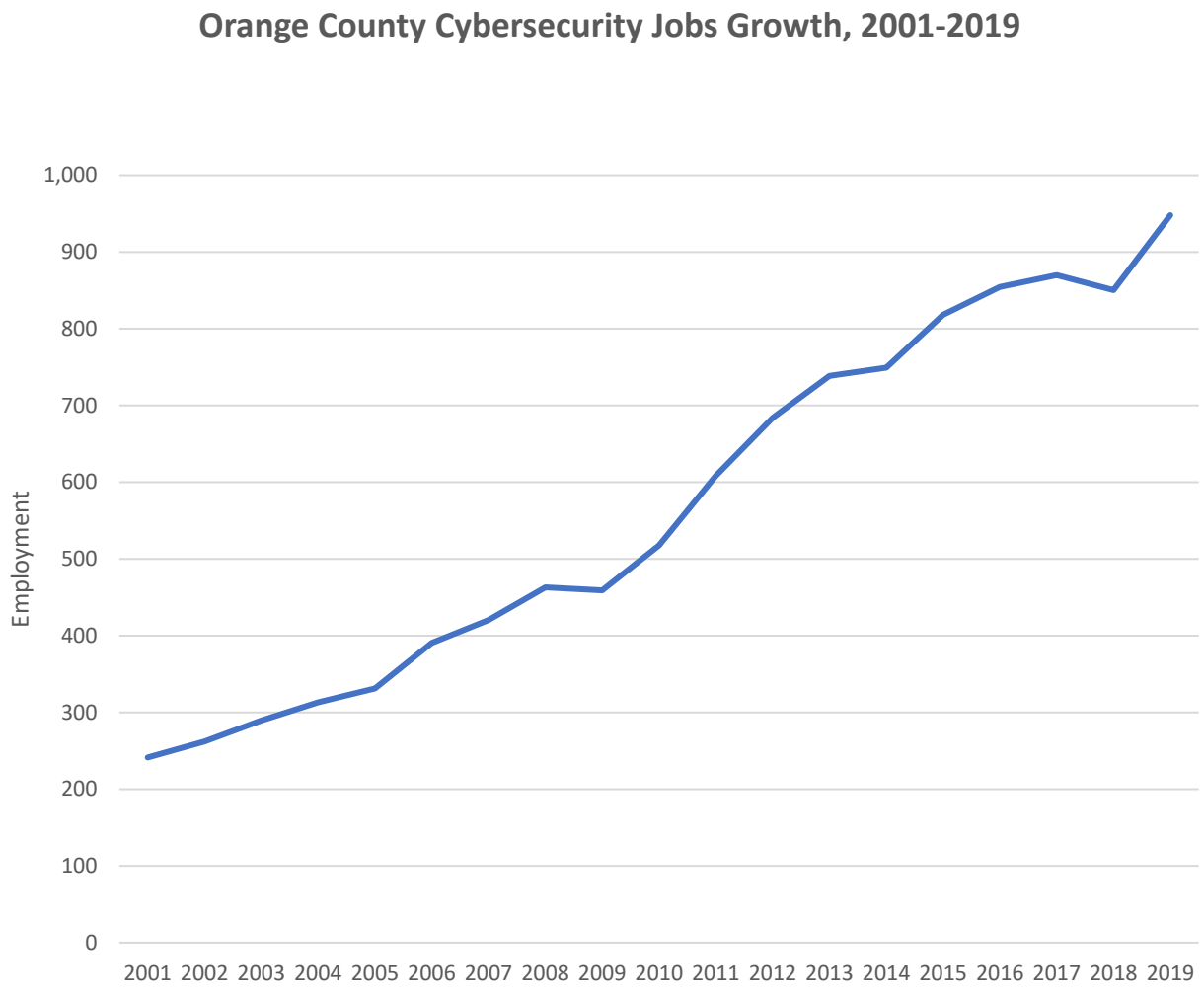
State-level average monthly job postings increased from 6,477 in 2017 to 10,594 in 2020. California had 12,240 job postings in January 2021, more than its 2019 and 2020 monthly averages.



Source: Emsi

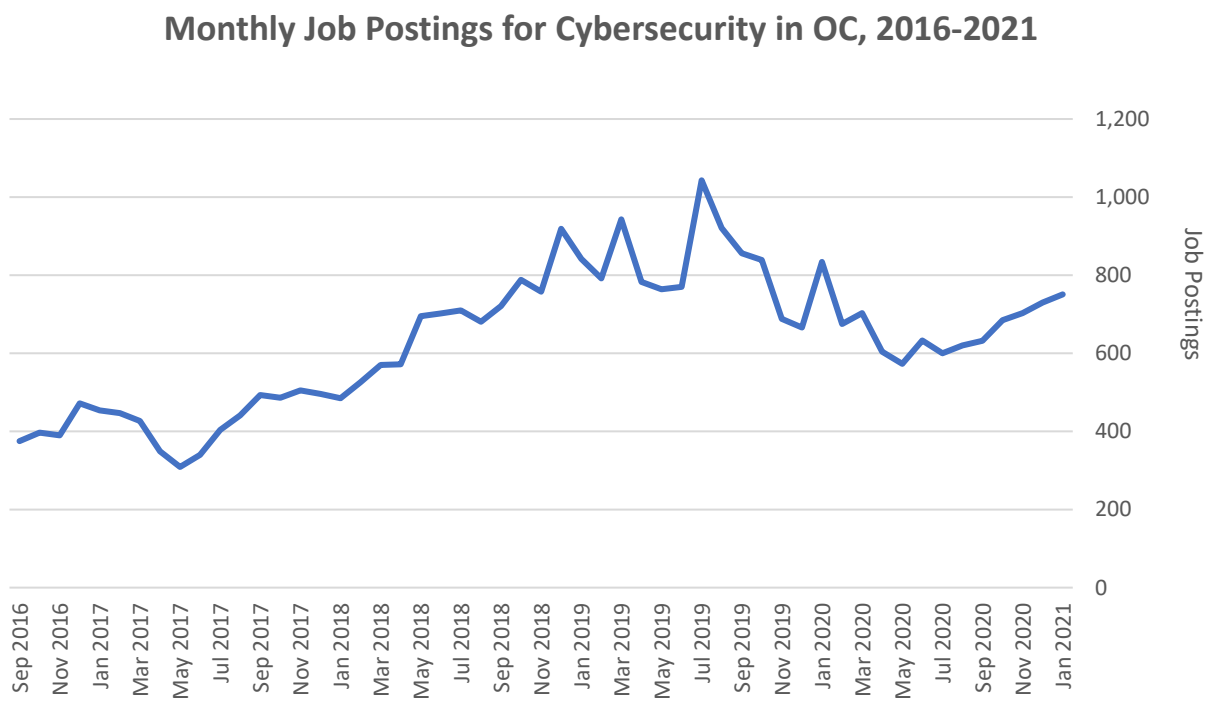
Cybersecurity – Orange County Level

Orange County Cybersecurity employment grew by 293 percent between 2001 and 2019, reaching 948 in the latter year.



Source: Emsi

Orange County had 751 Cybersecurity job postings in January 2021 and has seen consistent increases in the number of monthly job postings since July 2020. January 2021's total, however, was still well below the county's peak of 1,043 in July 2019.



Source: Emsi

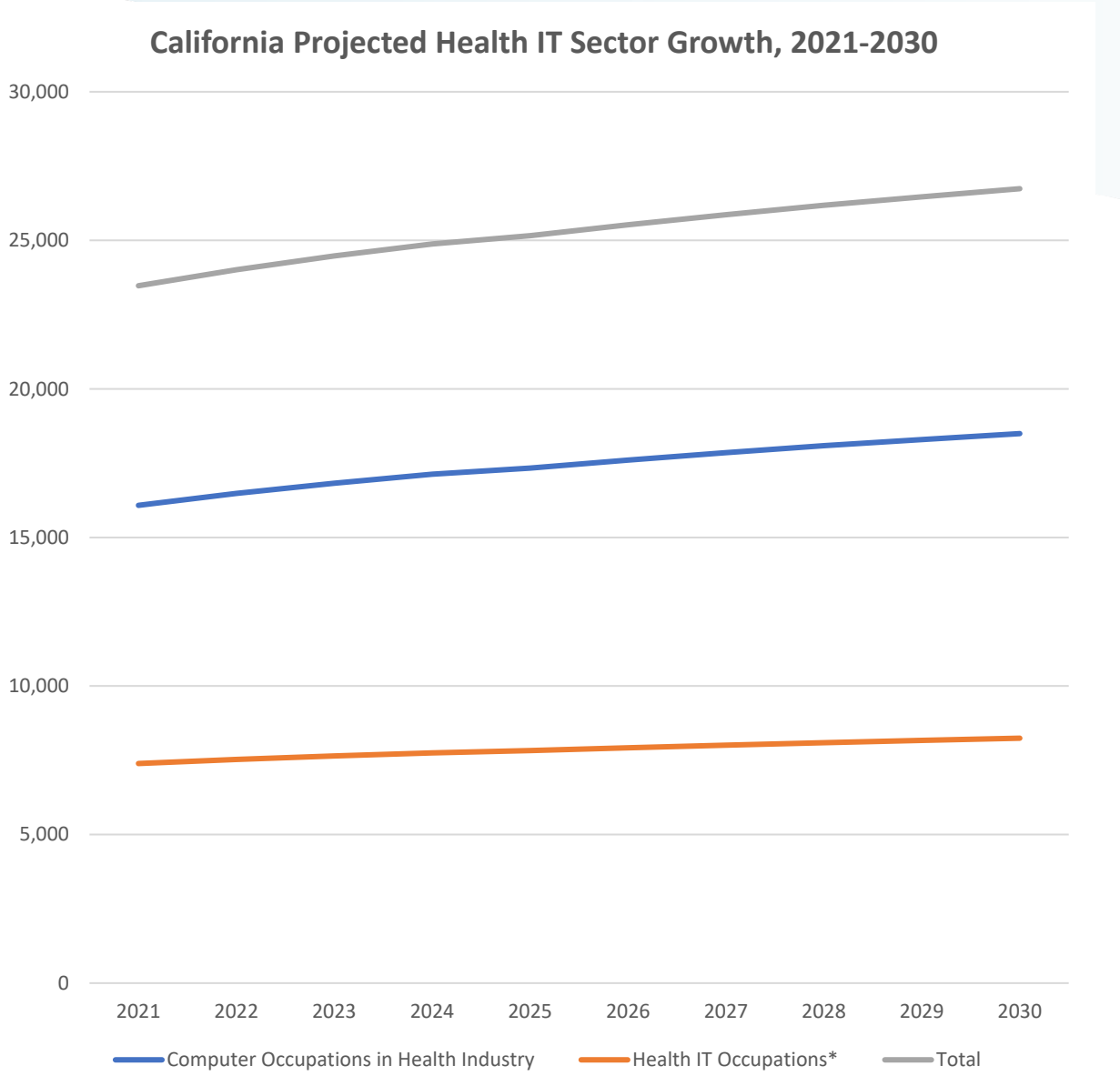
Labor Market Projections

Healthcare IT

Healthcare industry employment and Healthcare IT employment are both expected to steadily increase over the next decade despite the major progress made against COVID-19. The state's aging population, accelerated adoption of new medical technologies, improvements in operational efficiencies and a number of other factors will all contribute to the Healthcare IT sector's expansion. This increasing shift towards Healthcare IT can be highlighted by PWC's 2021 survey of healthcare executives in which 38 percent indicated more than a quarter of their clinical trials would be virtual by 2025. Further, nearly all (98 percent) of pharmaceutical and life sciences executives expected increases in digital investments in clinical trials over the next year.[14]

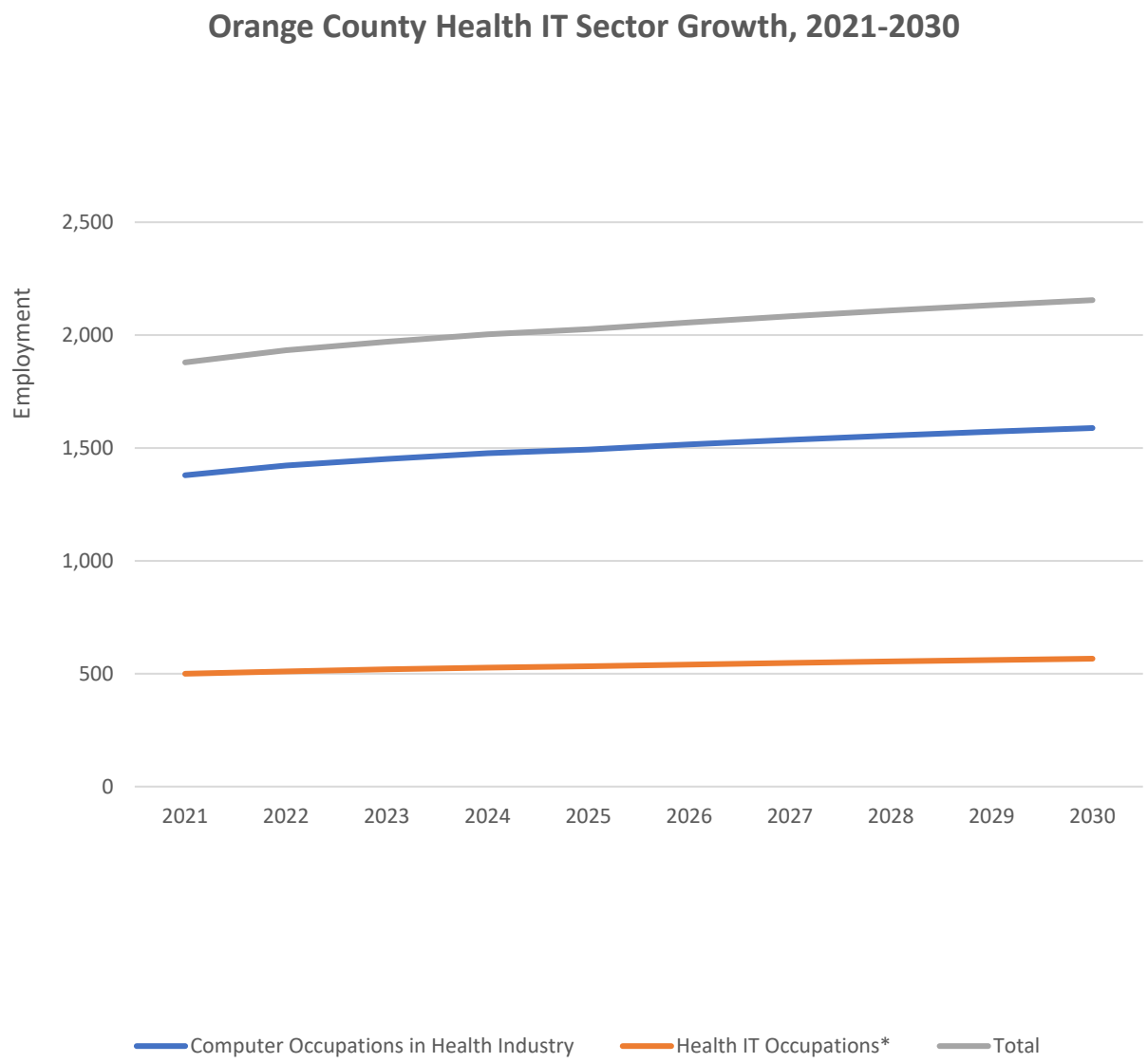
State Healthcare IT employment is projected to reach 26,738 in 2030, with Computer Occupations in the Health Industry expected to account for the majority (18,495 or approximately 69 percent.) If telehealth and other "consumerized" Healthcare IT services remain popular after the pandemic, growth could exceed these predictions at the state and county levels.

[14] https://www.pwc.com/us/en/industries/health-industries/top-health-industry-issues.html



*Health IT Occupations includes: Health Information Technologists, Medical Registrars, Surgical Assistants, and Healthcare Practitioners and Technical Workers.
Source: Emsi

According to Emsi projections, Orange County is expected to have 2,155 Healthcare IT workers in 2030. The COVID-19 recession's impacts on labor market data projections are likely the cause for these underestimates and should be taken with a note of caution. However, industry analysis amongst Orange County Healthcare IT professionals highlights that the healthcare industry may add significantly greater numbers of new jobs created and in fact, Computer Occupations in the Health Industry are predicted to see faster growth than other types of Healthcare IT employment. In fact, Orange County could develop a significant industry cluster around Healthcare IT as it has all of the building blocks to do so in terms of workforce and entrepreneurial talent.

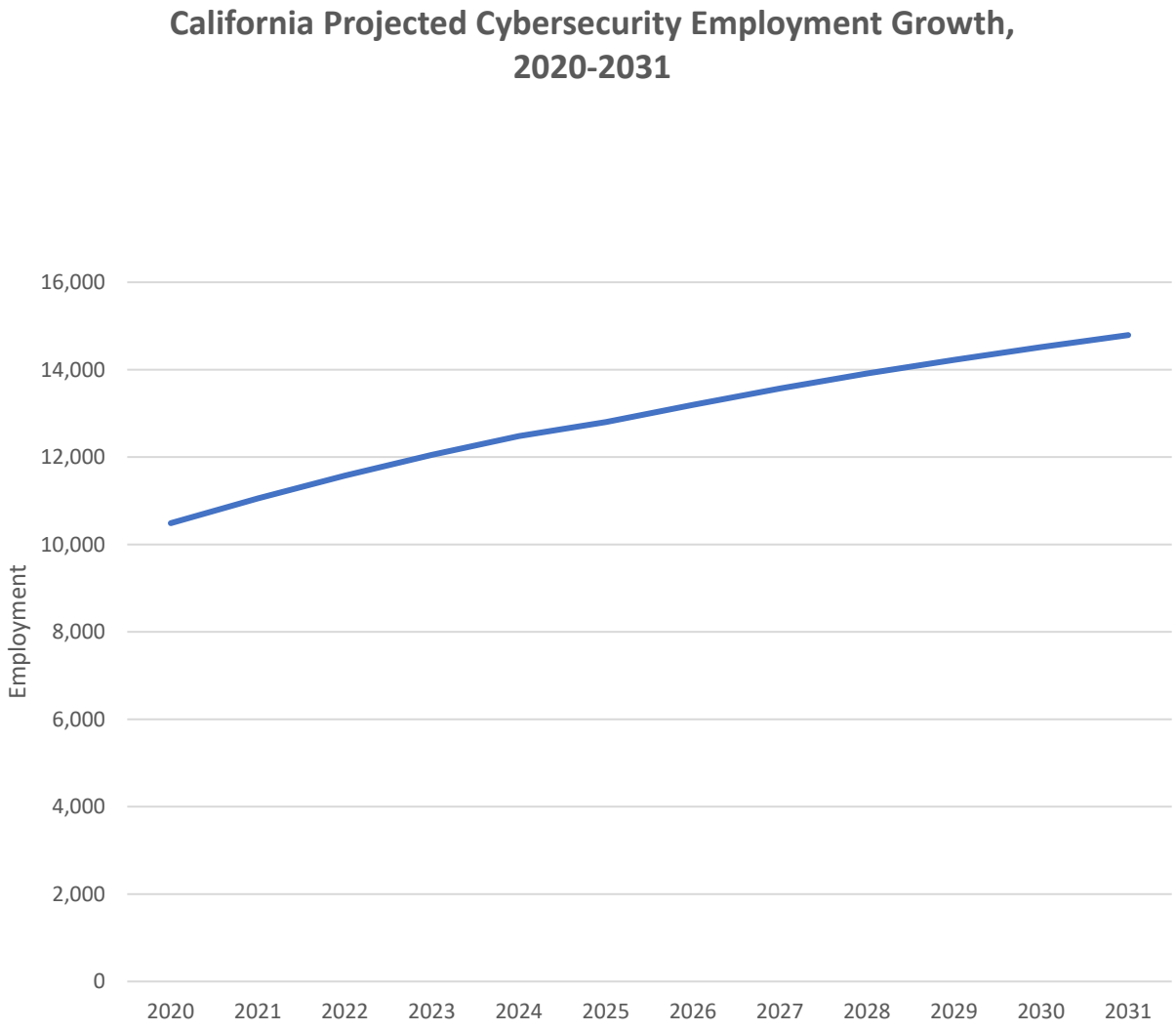


*Health IT Occupations includes: Health Information Technologists, Medical Registrars, Surgical Assistants, and Healthcare Practitioners and Technical Workers.
Source: Emsi

Cybersecurity

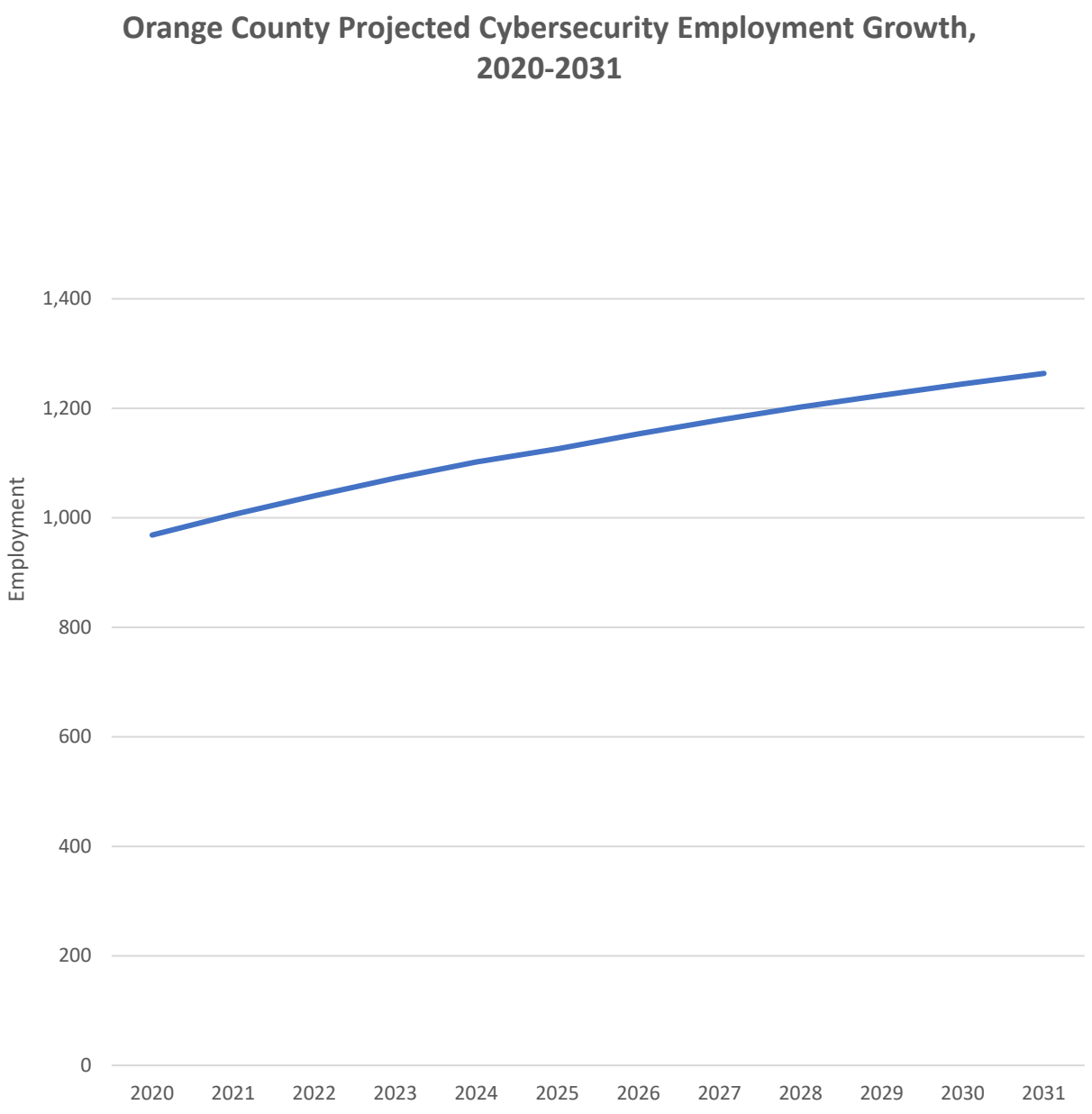
Emsi forecasts that US Cybersecurity employment will increase from just under 137,000 in 2020 to over 180,000 in 2031, representing growth of 31.5 percent. This rate is significantly higher than projected overall employment growth (6.9 percent) and projected employment growth in Computer and Mathematical Occupations (16.1 percent). Cybersecurity's projected growth rate in Orange County (30.5 percent) is in line with the national average, with California experiencing a slightly higher growth rate of 41.0 percent. California Cybersecurity employment is projected to rise from 10,487 in 2020 to 14,791 in 2031.

These predictions – at both the state and county levels – likely underestimate Cybersecurity's growth going forward. As discussed elsewhere in this report, the COVID-19 pandemic greatly increased Cybersecurity vulnerability across the economy, which will likely lift Cybersecurity demand (and thus employment growth) above these projections. Another issue with Cybersecurity labor market projections is that these occupations are spreading throughout many industries, not just IT, which likely leads to undercounting future job growth.



Source: Emsi

Emsi expects Orange County Cybersecurity employment to reach 1,264 jobs in 2031. The COVID-19 recession's impacts on labor market data projections are likely the cause for these underestimates and should be taken with a note of caution. As previously mentioned, this is likely a very conservative prediction and undoubtedly underestimates future job growth potential in this vibrant sector due to Orange County's Cybersecurity cluster which has developed in the last decade.



Source: Emsi

While Orange County Cybersecurity employment has historically grown faster than Cybersecurity at the state level, California is predicted to even outpace Orange County between 2020 and 2031 (while Orange County's growth rate will still be high). From 2001 to 2020, average annual employment growth for California Cybersecurity averaged 7.2 percent, compared to 7.9 percent for Orange County. California's higher projected growth rate between 2020 and 2031 – 3.9 percent vs. Orange County's 3.0 percent- will be driven by rapid growth in San Francisco and Santa Clara Counties, which are expected to see growth of 81 percent and 53 percent, respectively, due to the heavy tech presence in Silicon Valley which will also

benefit Cybersecurity employment. However, due to the industry cluster dynamics that have accrued to Orange County as a Cybersecurity center of excellence over the last decade, Orange County may indeed outperform the state growth rates again and will far surpass national growth rates in the Cybersecurity industry.

	California		Orange County	
	2001-2020	2020-2031	2001-2020	2020-2031
Average Annual Growth	7.2%	3.9%	7.9%	3.0%
Overall Growth	268.8%	42.5%	315.0%	32.6%

Source: Emsi

Major Skills and Competencies

Skills requirements continue to change as new technologies, processes, and industries emerge. While the Cybersecurity sector has a high degree of technical skills and educational requirements due to the complexity of IT systems, Healthcare IT requires a steady mix of both "hard" and "soft" skills due to its mix of both complex IT systems and customer service and interaction. Educators and workforce development professionals need to build the talent pipelines necessary to support these growing sectors.

Unfortunately, the pandemic has had significant consequences for talent pipelines across the economy. As with many businesses, college campuses were forced to close their doors and, while many institutions were able to implement distance learning programs, many potential students decided to put off their academic careers. The National Student Clearinghouse Research Center reported a 2.5 percent decline in college enrollments in Fall 2020, a loss of about 400,000 students. Community college enrollment declined by 10.1 percent, led by a 13.1 percent decline in freshmen enrollment, while public colleges lost an estimated 4 percent of enrollment. [15]

With these two diverging trends - an increasing demand for Healthcare IT and Cybersecurity workers alongside declining college enrollment - industry stakeholders and local educators will need to work collaboratively to ensure steady, continued growth of these sectors.

HARD AND SOFT SKILLS

This report uses the term "hard skills" to refer to technical, easily definable skills and competencies, such as the ability to use a certain programming language. "Soft skills," on the other hand, refer to less easily definable social and interpersonal skills, such as Communications and Problem Solving. While hard skills are often specific to particular industries or occupations, soft skills tend to be transferrable across a wide variety of occupations in various sectors.

[15] https://www.insidehighered.com/news/2020/12/17/final-fall-enrollment-numbers-show-pandemics-full-impact

Major Healthcare IT Skills and Competencies

Industry participants at a recent 2021 OCBC/JPMorgan Chase Healthcare IT Advisory Group meeting identified two interrelated trends in Healthcare IT skills demand. First, soft skills, which job candidates sometimes lack, are increasingly important throughout the job market and vitally important within healthcare. Second, technical skills are quickly evolving due to emerging technologies such as cloud computing and AI.

The increasing consumerization of healthcare creates new soft skill demands in at least two different ways. First, it makes skills such as user interface design much more important. Healthcare IT providers often find themselves hiring workers from outside the medical field (such as Web Developers) who have these technical skills but may lack vital communications and customer service skills. Healthcare IT Advisory Group members emphasized the need for empathetic workers who identify with the organization's overall mission.

In terms of technical skills, Healthcare IT Advisory Group members identified multiple technologies with the potential to change skills demands, including cloud computing, virtual/augmented reality and AI. Several experts emphasized the importance of broadly transferable technical skills (such as statistics) and the ability to innovate in a rapidly evolving work environment.

This report analyzes online job postings in order to identify which hard skills, soft skills and qualifications are currently in demand for Healthcare IT and Cybersecurity occupations. Healthcare IT soft skills were fairly consistent at the state and county levels, with both top five listings including Communications, Management, Customer Service, Operations and Problem Solving (although not always in that order). Certified Coding Specialist was the most in-demand qualification at both levels.

California Healthcare IT Skills and Competencies Data

California's Healthcare IT sector demonstrates a high demand for Computer Science skills and expertise in the programming languages SQL and Python, as seen below.

California Healthcare IT Hard Skills Frequency in Job Postings	
Hard Skill	**Frequency in Postings**
Medical Records	20.8%
Auditing	11.3%
ICD Coding (ICD-9/ICD-10)	10.9%
SQL (Programming Language)	10.6%
Computer Science	10.0%
Medical Terminology	8.5%
CPT Coding	8.4%
Information Systems	7.8%
Billing	7.5%
Python (Programming Language)	6.8%
Java (Programming Language)	6.7%
Agile Methodology	6.7%
Medical Billing and Coding	6.5%
Software Development	6.3%

Source: Emsi

California's soft skills demand is generally in line with national averages, with Communications, Management and Customer Service leading the way.

California Healthcare IT Soft Skills Frequency in Job Postings	
Soft Skill	**Frequency**
Communications	35.8%
Management	30.2%
Customer Service	16.3%
Operations	19.2%
Troubleshooting (Problem Solving)	14.2%
Leadership	16.6%
Problem Solving	15.9%
Research	15.1%
Interpersonal Communications	10.6%
Coordinating	9.8%
Infrastructure	9.6%
Planning	9.2%
Integration	9.1%
Information Technology	7.6%
Presentations	7.5%

Source: Emsi

California Healthcare IT Qualification Frequency in Job Postings	
Qualification	**Frequency in Postings**
Certified Coding Specialist	8.6%
Registered Health Information Technician	7.1%
Registered Health Information Administrator	6.3%
Coder Certification	4.1%
Certified Professional Coder	2.0%

Source: Emsi

Orange County Healthcare IT Skills and Competencies Data

Orange County Healthcare IT employers have higher than average demands for Auditing, SQL, Computer Science and CPT Coding skills.

Orange County Healthcare IT Hard Skills Frequency in Job Postings	
Hard Skill	**Frequency in Postings**
Medical Records	22.8%
ICD Coding (ICD-9/ICD-10)	14.2%
Auditing	13.4%
SQL (Programming Language)	11.9%
Computer Science	11.1%
CPT Coding	10.5%
Medical Terminology	9.1%
Information Systems	9.0%
Billing	8.1%
Medicare	8.1%
Medical Billing and Coding	7.6%
Agile Methodology	7.4%
Software Development	6.1%
Business Requirements	6.1%

Source: Emsi

Communications skills are in higher demand in Orange County's Healthcare IT sector (38.5 percent of job postings) than at the state level (35.8 percent). County Healthcare IT employers are also more likely to require Management, Problem Solving, Leadership and Microsoft Excel skills.

Orange County Healthcare IT Soft Skills Frequency in Job Postings	
Soft Skill	**Frequency in Postings**
Communications	38.5%
Management	31.6%
Problem Solving	20.0%
Customer Service	19.6%
Operations	19.4%
Leadership	18.3%
Microsoft Excel	17.7%
Detail Oriented	16.2%
Research	14.7%
Troubleshooting (Problem Solving)	14.3%
Planning	9.1%
Integration	8.3%
Microsoft Office	7.9%
Infrastructure	7.5%
Presentations	7.4%

Source: Emsi

The Certified Coding Specialist qualification was slightly more in demand in Orange County (10.8 percent of job postings) than in California as a whole (8.6 percent).

Orange County Healthcare IT Qualifications Frequency in Job Postings	
Qualification	**Frequency in Postings**
Certified Coding Specialist	10.8%
Registered Health Information Technician	8.6%
Registered Health Information Administrator	7.6%
Coder Certification	4.7%
Project Management Professional Certification	1.8%

Source: Emsi

Major Cybersecurity Skills and Competencies

California Cybersecurity Skills and Competencies Data

Hard skills common to both Healthcare IT and Cybersecurity include Computer Science, Auditing and Information Systems, as seen below. As might be expected, Cyber Security is by far the most frequently demanded skill in Cybersecurity job postings. Similarly, Certified Information Systems Professional was the most in-demand qualification, followed by GIAC Certifications, Certified Information Security Manager, Certified Information System Auditor (CISA) and CompTIA Security+. The most in-demand soft skills remain consistent at the state and county levels: Management, Communications, Operations, Leadership and Infrastructure.

California Cybersecurity Hard Skills Frequency in Job Postings	
Hard Skill	**Frequency in Postings**
Cyber Security	39.4%
Vulnerability	18.4%
Computer Science	17.9%
Auditing	17.8%
Firewall	15.6%
Python (Programming Language)	15.3%
Linux	15.0%
Risk Analysis	12.1%
Security Policies	12.4%
Incident Response	12.0%

Source: Emsi

Management and Communications are the two most frequently demanded soft skills in both Healthcare IT and Cybersecurity; this is true at the national, state and county levels. Leadership, Research, Operations and Infrastructure are also fairly important for both sectors.

California Cybersecurity Soft Skills Frequency in Job Postings	
Soft Skill	**Frequency**
Management	37.6%
Communications	38.0%
Operations	25.8%
Leadership	23.9%
Infrastructure	21.7%
Research	17.1%
Information Technology	15.0%
Innovation	16.2%
Problem Solving	15.5%
Presentations	14.8%

Source: Emsi

California Cybersecurity Qualifications Frequency in Job Postings	
Qualification	**Frequency in Postings**
Certified Information Systems Security Professional	19.6%
GIAC Certifications	8.2%
Certified Information System Auditor (CISA)	7.5%
Certified Information Security Manager	7.2%
CompTIA Security+	4.8%

Source: Emsi

Orange County Cybersecurity Skills and Competencies Data

Firewall was more in-demand in Orange County (19.5 percent of job postings) than at the state level (15.6 percent); Risk Analysis and Network Security also saw higher demand in Orange County.

Orange County Cybersecurity Hard Skills Frequency in Job Postings	
Hard Skill	**Frequency in Postings**
Cyber Security	39.7%
Auditing	20.4%
Computer Science	19.5%
Firewall	19.5%
Vulnerability	19.0%
Incident Response	15.0%
Linux	14.3%
Network Security	13.8%
Risk Analysis	13.5%
Risk Management	13.1%

Source: Emsi

Orange County Cybersecurity Soft Skills Frequency in Job Postings	
Soft Skill	**Frequency in Postings**
Management	39.2%
Communications	35.1%
Operations	24.2%
Leadership	22.3%
Infrastructure	22.1%
Problem Solving	16.9%
Research	15.9%
Information Technology	16.8%
Presentations	15.7%
Planning	14.2%

Source: Emsi

Orange County Healthcare IT employers had a higher than average demand for Certified Information Systems Security Professional qualifications.

Orange County Cybersecurity Qualifications Frequency in Job Postings	
Qualification	**Frequency in Postings**
Certified Information Systems Security Professional	26.2%
Certified Information Security Manager	10.5%
GIAC Certifications	9.9%
Certified Information System Auditor (CISA)	9.9%
CompTIA Security+	4.6%

Source: Emsi

Current Education and Workforce Training Program Analysis

As previously indicated, the pandemic dramatically disrupted academic programs all over the country. As regulations limited in-person instruction, many college campuses closed and shifted to offering distance learning programs – many of which have come under scrutiny by students. The resulting school closures and dissatisfaction with alternative learning programs have led to a 2.5 percent decline enrollment decline (400,000 students) as of Fall 2020.[16] While continuing students have largely done well, new enrollments have suffered indicating the potential for a skilled-worker supply shortage over the next few years.

As the nation's demographic makeup continues to shift, as seen with the increasing proportion of older residents, especially in Orange County, the demand for Healthcare professionals continues to grow. Registered Nurses became one of the most in-demand positions which led to a number of new healthcare programs, many of which are looking to expand program offerings. Cybersecurity programs have also grown in popularity due to the increasing prevalence of IT systems and importance of data protection. IT-related programs have also greatly benefitted from certification programs – more focused learning programs which require less time and are cheaper than traditional educational programs.

As the nation continues its slow return to normal, and careers paths become a bit clearer to individuals, it is important that current Healthcare IT and Cybersecurity academic programs are better promoted to ensure the future demand for workers can be effectively met.

[16] https://www.insidehighered.com/news/2020/12/17/final-fall-enrollment-numbers-show-pandemics-full-impact

Healthcare IT

United States Healthcare IT-related program completions rose by 54 percent between 2003 and 2019, increasing faster at the state level (86 percent) and much faster in Orange County (242 percent.) At the national level, the most popular Healthcare IT-related programs in 2019 included:

- Computer Science (47,619 completions);
- Computer and Information Sciences, General (46,295);
- Mathematics (30,163);
- Information Technology (26,425); and
- Health Services/Allied Health/Health Sciences, General (21,028).

Most undergraduate courses relevant to Healthcare IT are basic math and science courses, which are applicable to many different occupations. This suggests that students gain Healthcare IT-specific skills and knowledge in other ways, such as through Master's programs, credential programs and on-the-job training.

The following chart lists Orange County's top Healthcare IT colleges and universities by number of program completions. As might be expected, the county's two largest universities account for the lion's share of relevant program completions, with Orange County's Community Colleges playing a significant and expanding role, currently accounting for a combined 1,338 completions in 2019 but projected to grow rapidly.

Number of Completions by Top Healthcare IT Colleges and Universities in Orange County	
Institution	**Number of Completions, 2019**
University of California-Irvine	1,509
California State University-Fullerton	1,275
Trident University International	460
Saddleback College	350
Orange Coast College	228
Cypress College	147
Golden West College	128
Irvine Valley College	128
Chapman University	109
Coastline Community College	96
Fullerton College	95
Santiago Canyon College	90
Touro University Worldwide	90
Santa Ana College	76
Southern California Institute of Technology	27
Brandman University	20
California University of Management and Sciences	17
Platt College-Anaheim	15

Source: Emsi

The University of California, Irvine's Donald Bren School of Information and Computer Science offers a Bachelor of Science in Informatics with four possible specializations: Human-Computer Interaction (HCI), Organizations and Information Technology (OIT), Health Informatics (HI), or Specialization in Individual Studies.[17] It also offers a minor in Health Informatics that emphasizes "the expanding role of information technology in health care."[18]

California State University, Fullerton offers a Professional Development program in Applied Healthcare Informatics which covers "data intelligence as it applies to clinical decision support, care assessment, evidence-based protocol, and meaningful-use" as well as "the future of healthcare technology, including telemedicine, robotic applications, and virtual reality."[19] The university's Extension and International Programs include online certificate programs in Medical Billing and Coding[20] and Certified Electronic Health Records Specialist.[21]

Several Orange County community colleges offer Healthcare IT-related programs. Saddleback College offers both an Associate Degree and a Certificate of Achievement in Healthcare IT, as well as two more specialized certificates: Medical Coding Specialist Certificate of Achievement and Healthcare Technology Optimization (HCTOS) Certificate.[22]

Cypress College offers an Associate in Science degree as well as a certificate program in Health Information Technology;[23] this program received a Bronze Star from the California Community College Strong Workforce Program, signifying that it provides a substantial increase in earnings for graduates. Students can choose one of three focus areas: Health Information Management, Health Information Technology or Health Informatics.[24] Required courses include: Health Information Management, Trends in Healthcare Delivery, Healthcare Data Analysis and Medical Quality Management.

[17] http://catalogue.uci.edu/donaldbrenschoolofinformationandcomputersciences/departmentofinformatics/informatics_bs/#text

[18] http://catalogue.uci.edu/donaldbrenschoolofinformationandcomputersciences/departmentofinformatics/healthinformatics_minor/

[19] Applied Healthcare Informatics (fullerton.edu)

[20] Online CBCS Medical Billing and Coding (Voucher Included) from California State University - Fullerton (ed2go.com)

[21] Online Certified Electronic Health Records Specialist (CEHRS) from California State University - Fullerton (ed2go.com)

[22] https://www.saddleback.edu/hs/Health-Information-Technology

[23] https://careers.cypresscollege.edu/programs/health-information-technology/

[24] http://news.cypresscollege.edu/Documents/health-science/Health-Information-Technology-Brochure.pdf

Other Orange County community colleges offer more general Information Technology or Informatics programs, including:

- Fullerton College (Associate of Science and certificate in Computer Information Systems);[25]
- Orange Coast College (Certificate in Information Technology with a variety of Certificates of Specialization, including Network Administration and Operations, Network Security, Network Services and Applications and Virtualization and Cloud Computing);[26] and
- Santa Ana College (Associate of Science in Computer Information Systems; Certificate programs in Computer Information Systems, IT Support Specialist, IT Network and Security Operations, Database, IT Desktop and Server Operations and Web Development).[27]

Chapman University offers several relevant courses, including CS 635 - BioMedical Informatics[28] and PHS 676 - Health Information Technology and Patient Safety.[29] Brandman University offers an in-person Bachelor of Science in Computing Technology and Information Technology[30] and two online Bachelor of Science programs: Information Technology[31] and Data Science.[32]

Approximately 44 percent of Healthcare IT job postings require a Bachelor's degree, as seen below, with 17.1 percent requiring an Associate's and 8.3 percent requiring a Master's. Only 2.8 percent of job postings required a PhD or professional degree (such as MD).

[25] https://cte.fullcoll.edu/programs/computer-information-systems/

[26] http://www.orangecoastcollege.edu/academics/career-advantage/information-technology/default.aspx

[27] https://www.sac.edu/AcademicProgs/Business/ComputerScience/Pages/cis.aspx

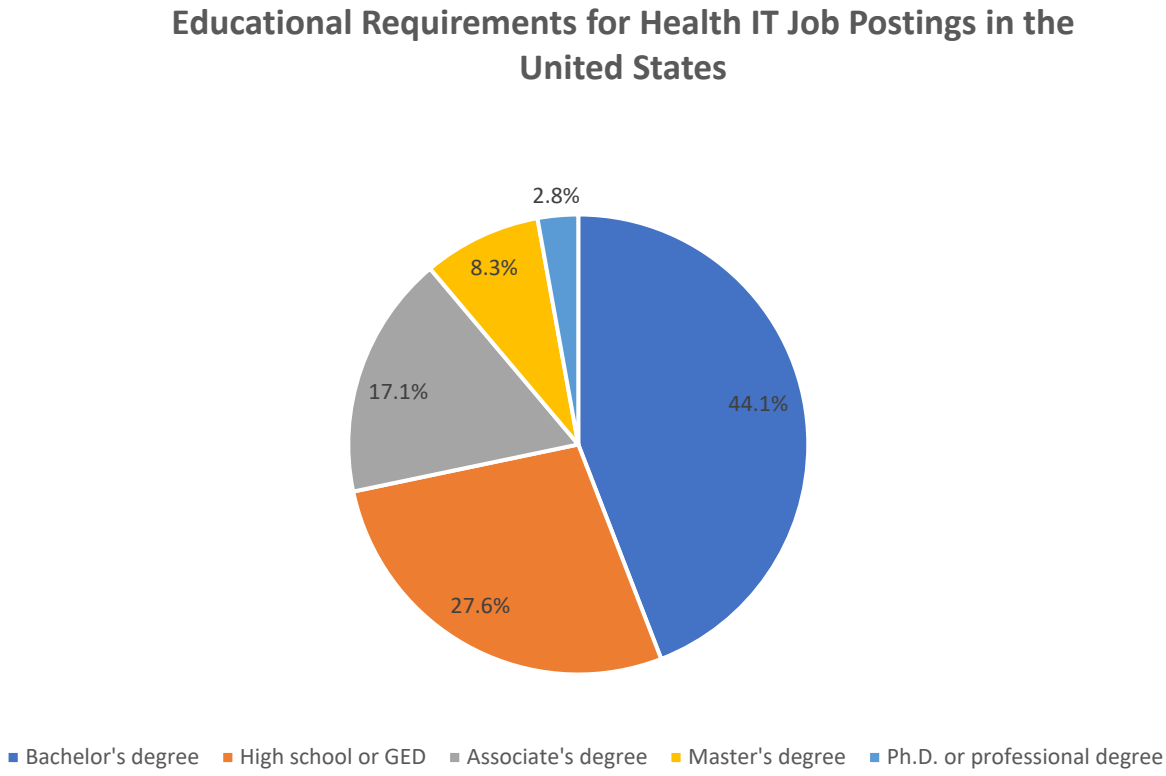
[28] https://catalog.chapman.edu/search_advanced.php?cur_cat_oid=18&search_database=Search&search_db=Search&cpage=1&ecpage=1&ppage=1&spage=1&tpage=1&location=33&filter%5Bkeyword%5D=Informatics&filter%5Bexact_match%5D=1

[29] PHS 676 - Health Information Technology and Patient Safety - Acalog ACMS™ (chapman.edu)

[30] https://www.brandman.edu/academic-programs/business-and-professional-studies/bs-in-computing-technology-information-technology

[31] Bachelor of Science in Information Technology | Brandman MyPath™

[32] Bachelor of Science Information Technology, Data Science (Brandman MyPath™)


Educational Requirements for Health IT Job Postings in the United States
2.8%
8.3%
17.1%
44.1%
27.6%
Bachelor's degree
High school or GED
Associate's degree
Master's degree
Ph.D. or professional degree

Source: Emsi

Cybersecurity

Between 2003 and 2019, Cybersecurity-related program completions increased by 56 percent at the state level and 75 percent at the Orange County level, showing Orange County's educators have been out in front in terms of preparing students for this vibrant industry sector. Online Cybersecurity programs have seen meteoric growth over the past decade, with program completions increasing by 396 percent since 2012. In 2019, the most popular relevant fields of study at the national level included:

- Computer Science (47,619 completions);
- Computer and Information Sciences, General (46,295);
- Information Technology (26,425);
- Computer and Information Systems Security/Information Assurance (17,652); and
- Computer Systems Networking and Telecommunications (13,932).

Five Orange County educational institutions had more than 100 completions in 2019, as seen below.

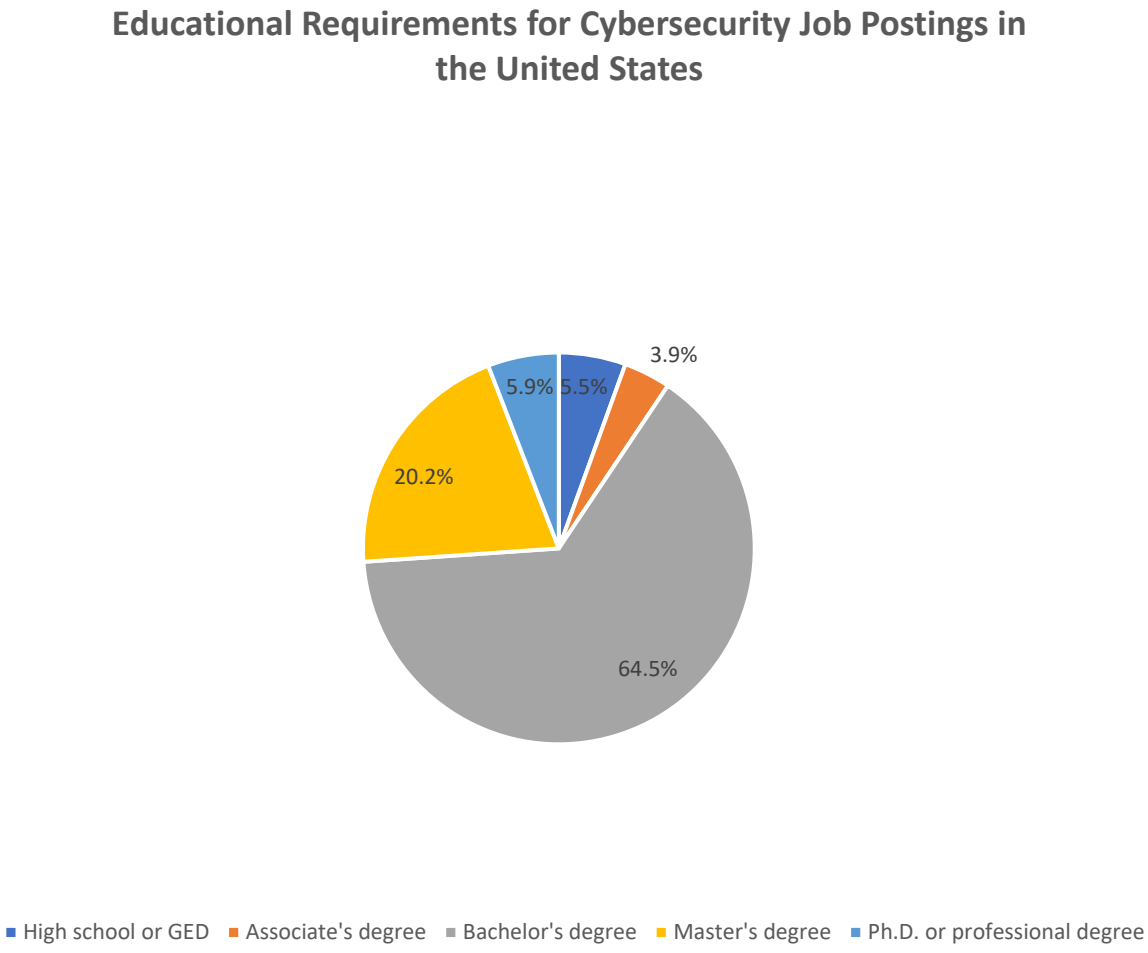
Number of Completions by Top Cybersecurity Colleges and Universities in Orange County	
Institution	**Number of Completions, 2019**
University of California-Irvine	871
California State University-Fullerton	576
Trident University International	238
Orange Coast College	136
Cypress College	101
Coastline Community College	88
Irvine Valley College	61
Saddleback College	53
Chapman University	44
Santiago Canyon College	38
Santa Ana College	37
Fullerton College	33
Brandman University	20
California University of Management and Sciences	17
Platt College-Anaheim	15

Source: Emsi

Cybersecurity program completions in Orange County totaled 2,328 in 2019. Orange County stakeholders should leverage this competitive advantage, using this talent pool to attract and retain Cybersecurity employers and generate new entrepreneurial opportunities not only in Healthcare and IT, but across most industry sectors in the county. Healthcare IT Cybersecurity is a particularly fertile area for occupational growth due to the unique needs of the healthcare industry in terms of safeguarding sensitive patient personal information. Students graduating from such programs will be in high demand in terms of the job market.

California State University, Fullerton (Extension),[33] Coastline College[34], Cypress College[35] and the UC Irvine Division of Continuing Education all offer certificate programs in Cybersecurity, with Coastline College and Cypress College also offering an Associate of Science in Cybersecurity. The National Security Administration (NSA) has named the University of California, Irvine a Center of Academic Excellence in Information Assurance Research. Only two other schools in California have received this title: The University of California, Davis and the Naval Postgraduate School.

Almost two thirds of Cybersecurity job postings require a Bachelor's degree, as seen below. 20.2 percent require a Master's degree while 5.9 percent require a PhD or professional degree.



Source: Emsi

[33] https://extension.fullerton.edu/professionaldevelopment/certificates/crime

[34] https://www.coastline.edu/programs/computer-networking.php#Cybersecurity

[35] https://www.cypresscollege.edu/program-information/

Next Steps for Existing Healthcare IT and Cybersecurity Education Initiatives

"We've seen two years' worth of digital transformation in two months."

- Microsoft CEO Satya Nadella, April 2020[36]

After shifting their own operations online during the pandemic, educators and workforce development professionals face another challenging adjustment: preparing students for an exponentially more digital workplace. This workplace, as previously mentioned, may be a home office in many cases. Both Healthcare IT and Cybersecurity are likely to see significant employment growth even after the end of the pandemic, necessitating an expansion of their talent pipelines. Graduates in both sectors will be in high demand and it is crucial that Orange County develop and retain this valuable talent pool.

One silver lining of the past year's unprecedented disruption is that it provides an opportunity for educators and industry leaders to collaborate. This is especially important in the Healthcare IT and Cybersecurity sectors, which have both seen recent, significant disruption. This change, for example, has created new occupations such as Medical Transcriptionists and Medical Scribes; educators and employers need to work together in order to create the pipelines necessary to fill these positions.

Expanding Orange County's Medical Scribes pathway is another promising way forward, one identified by multiple 2021 OCBC/JPMorgan Chase Healthcare IT Advisory Group members. "A medical scribe," according to the Medical Scribes Training Institute, "is someone who is trained to document physician-patient encounters quickly and accurately… this allows doctors to spend more time face-to-face with patients and provide personalized care without getting caught up in charts."[37]Orange County's Saddleback College offers a Medical Scribe Certificate of Achievement program; required courses include Medical Terminology, Healthcare Organization Practice and Intermediate or Advanced Keyboarding for Computers.[38]

While Medical Scribes are not generally considered to be IT professions, they do play an important role in linking doctors with Healthcare IT infrastructure. Additionally, Advisory Group members pointed to Medical Scribe training programs as an important way for students to gain necessary skills for Healthcare IT employment. With this in mind, expanding Medical Scribe Certificate programs to other Orange County community colleges could go a long way towards expanding the county's Healthcare IT pipeline.

Changing program curricula, however, is only one part of improving the pipeline. County educators and stakeholders also need to better publicize Healthcare IT and Cybersecurity career opportunities, especially

[36] https://www.microsoft.com/en-us/microsoft-365/blog/2020/04/30/2-years-digital-transformation-2-months/

[37] https://medicalscribes.org/what-is-a-medical-scribe/

[38] http://catalog.saddleback.edu/preview_program.php?catoid=18&poid=5984&returnto=2328

among high schoolers and other prospective students. 2021 OCBC/JPMorgan Chase Healthcare IT Advisory Group members suggested expanding internship opportunities to accomplish this goal.

NEW ONLINE PROGRAMS

A number of colleges and universities across the nation have begun offering completely online bachelor's programs in Healthcare IT, including CUNY School of Professional Studies, University of Central Florida, University of Cincinnati, and Ferris State University. Similarly, the University of North Dakota, Maryville University of St. Louis, Drexel University, University of Arizona, University of Texas at San Antonio, and others currently offer fully online Cybersecurity programs. Online education in these fields could be scaled up and applied to other areas, especially in light of the tremendous experience in online education gained by virtually every US institution during the COVID-19 pandemic.

Conclusion

"There's no going back. The great acceleration in the use of technology, digitization, and new forms of working is going to be sustained. Many executives reported that they moved 20 to 25 times faster than they thought possible on things like building supply-chain redundancies, improving data security, and increasing the use of advanced technologies in operations."

- McKinsey, January 2021[39]

The term "new normal" has been used in countless headlines since the beginning of the pandemic to describe almost every occupation, industry, and facet of life. While 2021 will likely see a reopening of the economy and a return to many pre-pandemic activities and places, not everything will return to the pre-pandemic normal. Remote work, as previously mentioned, will continue to play a major role in the labor market, potentially leading to a greater emphasis on flexibility as a way to attract job candidates. E-commerce will continue its incredible growth, creating further challenges – as well as opportunities – for brick-and-mortar retailers. Video streaming services will, in all likelihood, continue to take market share from cable providers, leading to further disruption of that industry. On the other hand, in-person entertainment – including movie theaters, amusement parks and concert venues – could see a surge in later this year due to significant pent-up demand.

[39] https://www.mckinsey.com/featured-insights/leadership/the-next-normal-arrives-trends-that-will-define-2021-and-beyond

Healthcare IT and Cybersecurity will both play critical roles in the new post-pandemic economy. The Healthcare IT sector will need to keep up with several trends: the consumerization of healthcare, which has been accelerated by convenient, accessible COVID-19-related apps during the pandemic; the increasing popularity of telehealth; and the exponentially growing amounts of data generated in healthcare. This will likely necessitate growth, change, and new approaches to education, hiring and retention.

Cybersecurity concerns, as previously mentioned, are a major Healthcare IT challenge going forward, as are a lack of broadband access, especially in rural areas; a lack of computer or cellphone access in unprivileged areas; and difficulties in integrating and transferring information between different Healthcare databases.[40]

OCBC/JPMorgan Chase Healthcare IT Advisory Group members cited retaining talent as a major challenge, especially in the case of Cybersecurity experts, who are in high demand in many other sectors. (A difficulty retaining workers is a growing challenge throughout many sectors of the economy; it is often particularly acute in healthcare due to the sector's challenging and stressful working environment.) Tuition reimbursement, as previously mentioned, could be a powerful tool for increasing retention, as could non-monetary incentives such as increased flexibility, employer-provided childcare or on-the-job skills development. In terms of Cybersecurity, our increasingly virtual lives will continue to create opportunities for cybercriminals and thus demand for Cybersecurity professionals. Multiple sources, for example, predict a decline in business travel as conferences and meetings remain online.[41]KPMG predicts major growth in cybersecurity-related regulations in the near future, noting that "many companies hire IT professionals who lack cyber security perspective in relation to the regulatory environment."[42]

As the pandemic finally wraps up, both Healthcare IT and Cybersecurity confront a world where these sectors will be in high demand going forward, creating significant opportunities for students, recent graduates, and jobseekers. Both will be the cornerstones of a "new normal" that will last far beyond 2021.

40

41 https://www.mckinsey.com/about-us/covid-response-center/leadership-mindsets/webinars/corporate-travel-the-long-road-to-recovery

42 https://home.kpmg/xx/en/blogs/home/posts/2020/06/leading-cybersecurity-in-new-reality.html

Healthcare and Cyber Security Report Bibliography

Reports and White Papers

McKinsey

Corporate travel: The long road to recovery. Link

COVID-19 crisis shifts cybersecurity priorities and budgets. Link

The next normal arrives: Trends that will define 2021—and beyond. January 4, 2021 Link

Securing small and medium-size enterprises: What's next? March 24, 2021. Link

Telehealth: A quarter-trillion-dollar post-COVID-19 reality? May 29, 2020. Link

Others

American Medical Association. *Physicians' motivations and requirements for adopting digital health Adoption and attitudinal shifts from 2016 to 2019.* February, 2020. Link

Deloitte. *COVID-19's Impact on Cybersecurity*. March, 2020. Link

International Civil Aviation Organization. *Effects of Novel Coronavirus (COVID-19) on Civil Aviation: Economic Impact Analysis.* March 17, 2021. Link

KPMG. *Leading cybersecurity in the new reality*. June 2, 2020. Link

Risk Based Security. *2020 Q3 Report: Data Breach QuickView*. 2020. Link

Pew Research Center. *How the Coronavirus Outbreak Has – and Hasn't – Changed the Way Americans Work.* December 9, 2020. Link

Webpages

Lee, Kristin. "Hertz must offload almost 200,000 cars by the end of 2020 as part of its bankruptcy deal." *Business Insider.* August 3, 2020. Link

Morrow, Brendan. "Biden administration reportedly planning to purchase another 100 million doses of Johnson & Johnson's vaccine." *The Week*. March 10, 2021. Link

Spataro, Jared. "2 years of digital transformation in 2 months." *Microsoft Blog.* April 30, 2020. Link

Strazewski, Len. "Telehealth's post-pandemic future: Where do we go from here?" *American Medical Association*. September 7, 2020. Link

"The 25 Best Bachelor's in Health Informatics Online." *Best College Reviews*. December 15, 2020. Link

"What is telehealth? How is telehealth different from telemedicine?" *Office of the National Coordinator for Health Information Technology.* Link

"Work-At-Home After Covid-19—Our Forecast." *Global Workplace Analytics*. 2020. Link

Appendix 1: Computer Occupations in Health Industry and Health IT Occupations Employment in Orange County, 2020

Computer Occupations in Health Industry and Health IT Occupation Employment in Orange County, 2020	
Computer Occupations in Health Industry	**2020 Employment**
Actuaries	0
Computer and Information Research Scientists	<10
Computer Network Architects	34
Computer Network Support Specialists	61
Computer Occupations, All Other	218
Computer Programmers	30
Computer Systems Analysts	208
Computer User Support Specialists	267
Data Scientists and Mathematical Science Occupations, All Other	<10
Database Administrators and Architects	54
Information Security Analysts	19
Mathematicians	0
Network and Computer Systems Administrators	139
Operations Research Analysts	35
Software Developers and Software Quality Assurance Analysts and Testers	207
Statisticians	32
Web Developers and Digital Interface Designers	33
Health IT Occupations	**2020 Employment**
Health Information Technologists, Medical Registrars, Surgical Assistants, and Healthcare Practitioners and Technical Workers	488

Source: Emsi

Appendix 2: Healthcare IT and Cybersecurity Program Completions, 2015-2019

Healthcare IT

Healthcare IT Program Completions, 2015-2019					
	2015	2016	2017	2018	2019
Computer Science	28,193	35,129	41,526	44,073	47,619
Computer and Information Sciences, General	32,720	38,374	42,818	46,336	46,295
Mathematics, General	26,926	27,606	28,185	29,405	30,163
Information Technology	19,978	20,768	22,641	24,567	26,425
Health Services/Allied Health/Health Sciences, General	15,322	17,704	19,194	19,682	21,028
Information Science/Studies	14,299	15,496	16,612	17,300	17,718
Computer and Information Systems Security/Information Assurance	10,495	9,738	11,871	15,591	17,652
Computer Systems Networking and Telecommunications	14,458	13,777	13,505	13,670	13,932
Management Information Systems, General	12,383	12,341	12,489	12,573	12,644
Computer Engineering, General	8,325	9,946	10,963	11,728	12,220
Management Science	6,365	6,990	8,215	10,072	11,422
Health Professions and Related Clinical Sciences, Other	7,595	8,528	7,877	8,394	8,132
Computer Programming/Programmer, General	6,395	6,759	7,371	7,135	7,892
Statistics, General	4,973	5,849	6,447	7,114	7,629
Management Sciences and Quantitative Methods, Other	1,159	1,908	2,589	4,142	7,354
Network and System Administration/Administrator	5,692	6,316	5,859	5,937	5,740
Web Page, Digital/Multimedia and Information Resources Design	5,974	5,632	5,700	5,749	5,497
Applied Mathematics, General	3,264	3,490	3,788	4,149	4,375
Financial Mathematics	995	1,366	2,144	3,289	3,999

Source: Emsi

Cybersecurity

Cybersecurity Program Completions, 2015-2019					
	2015	2016	2017	2018	2019
Computer Science	28,193	35,129	41,526	44,073	47,619
Computer and Information Sciences, General	32,720	38,374	42,818	46,336	46,295
Information Technology	19,978	20,768	22,641	24,567	26,425
Computer and Information Systems Security/Information Assurance	10,495	9,738	11,871	15,591	17,652
Computer Systems Networking and Telecommunications	14,458	13,777	13,505	13,670	13,932
Computer Engineering, General	8,325	9,946	10,963	11,728	12,220
Computer Programming/Programmer, General	6,395	6,759	7,371	7,135	7,892
Network and System Administration/Administrator	5,692	6,316	5,859	5,937	5,740
Web Page, Digital/Multimedia and Information Resources Design	5,974	5,632	5,700	5,749	5,497
Computer Systems Analysis/Analyst	2,630	2,616	2,911	2,636	2,445
Information Technology Project Management	694	923	1,017	1,284	1,614
System, Networking, and LAN/WAN Management/Manager	5,752	1,471	1,317	1,471	1,509
Cyber/Computer Forensics and Counterterrorism	583	709	1,001	1,238	1,343

Source: Emsi

Appendix 3: OCBC Healthcare IT Advisory Group

Sponsored by JP Morgan Chase, the OCBC Healthcare IT Advisory Meeting Group brought together educators and executives from leading Orange County Healthcare providers to discuss the unique challenges and opportunities of the Healthcare IT sector. Representatives from Children's Hospital of Orange County (CHOC), Hoag Hospital, Kaiser Permanente, UC Irvine, and other providers shared their insights on attracting and retaining Healthcare IT talent, changing skills requirements, diversity, equity and inclusion and other key topics. This section of the report summarizes some of the main themes that emerged from these discussions and identifies some key strategies for supporting this growing subsector.

The COVID-19 pandemic was, of course, the leading topic of conversation, with many Advisory Group participants noting the challenges of greatly increasing Healthcare IT infrastructure capacity as well as opportunities for innovation, improvement and building a stronger talent pipeline. Group members also saw strong potential for integrating emerging technologies into Healthcare IT, especial cloud computing data analytics and augmented/virtual reality.

Foundational Skills for Healthcare IT Talent

Advisory group members agreed that success in Healthcare IT required a combination of both technical knowledge and key Healthcare values – such as empathy – along with Healthcare's overall sense of mission.

Deficiencies in New Hires

In general, Advisory Group members found that experienced Healthcare workers often lack the technical skills necessary to fill open Healthcare IT positions. Conversely, technically skilled workers from outside of the sector often lack key Healthcare soft skills. The recent, rapid digitalization of Healthcare (and almost every other industry) means that employers often have to look outside of the sector for job candidates with the right skillsets. Finding ways to develop these skills will become increasingly crucial as Healthcare IT grows.

Retaining Talent

"Every company is now a tech company," in the words of one Meeting Group participant; Healthcare providers must compete with employers in a variety of industries for IT talent. Participants focused on Healthcare's unique sense of mission and purpose as a powerful way to differentiate it from other industries. Skills development also emerged as an important strategy for talent retention. Kaiser Permanente, for instance, offers a tuition reimbursement program and other financial aid programs for employees. Similarly, multiple Advisory Group members counteracting burnout by giving Healthcare IT employs constant opportunities to grow and challenge themselves.

General Industry Exposure

While Healthcare continues to become more and more digital, Healthcare IT occupations remain much less visible than those of doctors and nurses, which means that students and jobseekers are often unaware of Healthcare IT career opportunities. Meeting Group participants identified several strategies for Healthcare IT awareness, including:

- Internships, such as Providence St. Joseph Health's current partnership with the Year Up program;
- Roadshows and Career Fairs spotlighting Healthcare IT Career Opportunities;
- Social Media campaigns designed to introduce students to Healthcare IT; and
- Collaborating with college and university career centers; and
- Collaborating with the Coast Community College District's TalentEd program.

Local Education Programs

As part of the OC Pathways program, the Orange County Department of Education (OCDE) has greatly expanded both Healthcare IT and Cybersecurity-related offerings at Orange County high schools. Nine of the county's community colleges, for instance, offer dual-enrollment courses in Health Science and Medical, with six community colleges offering dual-enrollment Career Technical Education (CTE) courses in the same subject. AT the high school level, 50 Orange County high schools across 14 school district offered at least one relevant course.

California State University, Fullerton offers Information Health Care Analytics Certificate program, which includes courses in Data Science and Management.

Diversity, Equity & Inclusion

Advisory Group members shared multiple strategies and best practices for hiring a diverse workforce, such as leveraging nonprofit and professional organizations in hiring a diverse workforce. UCI Health is implementing a diversity program composed of four elements: spreading awareness, educating leaders, targeted recruitment, and providing additional resources to staff.

ORANGE COUNTY
BUSINESS COUNCIL
The Leading Voice of Business

WWW.OCBC.ORG