



CENTER OF EXCELLENCE
FOR LABOR MARKET RESEARCH

ORANGE COUNTY



ORANGE COUNTY SECTOR PROFILE:
**LIFE SCIENCES AND
BIOTECHNOLOGY**

2024

ORANGE COUNTY
REGIONAL CONSORTIUM

WORKFORCE
DEVELOPMENT ALLIANCE



California
Community
Colleges

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[Supplemental Appendices](#)¹ are available as a companion to this report and include the following:

Appendix D: Life Sciences and Biotechnology Demand – Labor Market Data

Appendix E: Life Sciences and Biotechnology Supply – Community College and Non-Community College Awards



INTRODUCTION

This report is the sixth in a series of 12 sector profiles that aim to provide a comprehensive analysis of Orange County's occupational landscape. This series dives into each of the 12 community college sectors, offering historical and projected occupational insights while building upon foundational research established through the [Orange County Labor Market Overview](#).² This sector profile focuses on Life Sciences and Biotechnology, which the Orange County Region has ranked seventh out of the 12 sectors based on the Orange County Labor Market Overview and corresponding region-wide survey of community colleges and key partners.

The Life Sciences and Biotechnology sector is a multidisciplinary field that combines biological, chemical, and engineering principles to innovate and produce technologies and products that enhance health, agriculture, and environmental sustainability. Jobs within this sector include *Bioengineers and Biomedical Engineers (17-2031)*^{^#}, who design medical devices and technologies, as well as *Biological Scientists, All Other (19-1029)*[^] who conduct research to advance understanding of biological processes. *Biological Technicians (19-4021)* support laboratory research and experiments, while *Chemical Technicians (19-4031)* handle materials and processes involved in chemical testing and production. *Clinical Laboratory Technologists and Technicians (29-2018)*[#] perform critical diagnostic tests, while *Medical Equipment Repairers (49-9062)*[#] ensure the functionality of sophisticated biomedical instruments. Jobs such as *Inspectors, Testers, Sorters, Samplers, and Weighers (51-9061)* ensure quality control and compliance with industry standards, contributing to the safe and effective production of biotechnological products.



The Life Sciences and Biotechnology sector is comprised of eight (8) occupations, five (5) of which were highlighted in the Orange County Labor Market Overview. These eight (8) occupations account for 1% of the total number of occupations in the federal Bureau of Labor Statistics (BLS) Standard Occupational Classification (SOC) system and 38% (3) are on the U.S. News & World Report's 100 Best Jobs of 2024 list.³

Occupations are denoted throughout this report in italics, with their corresponding SOC code in parentheses, with below middle-skill occupations denoted with an * and above middle-skill occupations denoted with a ^ and occupations that are on the U.S. News & World Report's 2024 100 Best Jobs list denoted by #, such as *Bioengineers and Biomedical Engineers (17-2031)*^{^#}.

By examining key aspects such as occupational trends, major employers, skills, program completions, and opportunities, the OC COE seeks to highlight underlying dynamics and intricacies shaping the Life Sciences and Biotechnology sector in Orange County. Community colleges and regional stakeholders can use this information for strategic planning and data-informed decision making to address workforce needs in this sector.

LIFE SCIENCES AND BIOTECHNOLOGY OCCUPATIONAL DATA ANALYSIS

Orange County's Occupational Landscape

The Life Sciences and Biotechnology sector is comprised of eight occupations that accounted for 14,811 jobs in 2022, representing 1% of all jobs in Orange County. These jobs are expected to grow by 5% through 2027, resulting in 1,755 projected annual openings.

Life Sciences and Biotechnology Sector Key Facts



14,811

Number of Jobs
in 2022



749

5-Year Change
through 2027



5%

5-Year Percent
Change



1,755

Annual
Openings



2,541

Establishments



\$17.73 - \$40.23

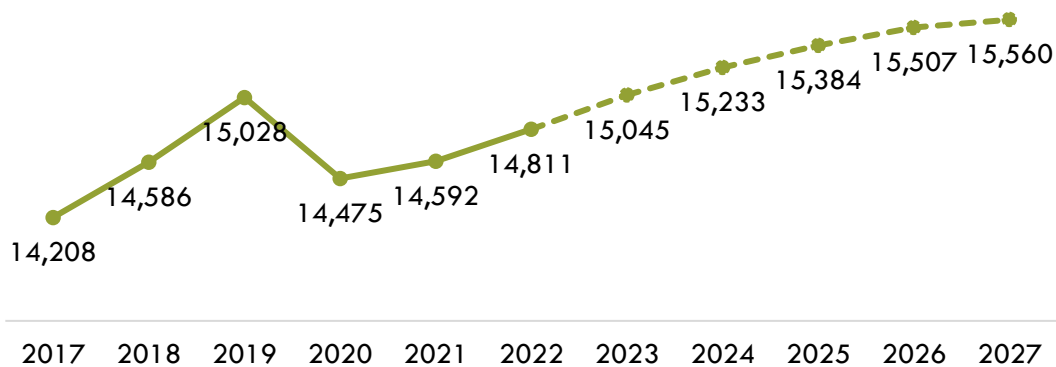
Occupational Entry-Level
Wage Range



Historical and Projected Employment

Over a 10-year period, from 2017 projected through 2027, Life Sciences and Biotechnology jobs have been and are projected to continue steadily rising at a consistent pace, except in 2020 due to the COVID-19 pandemic-related economic downturn (Exhibit 1).

Exhibit 1: Historical and Projected Life Sciences and Biotechnology Employment in Orange County (2017-2027)



The eight occupations in the Life Sciences and Biotechnology sector include two above middle-skill, six middle-skill, and zero below middle-skill occupations (Exhibit 2). In 2022, the six middle-skill occupations accounted for 13,758 jobs, constituting 93% of the total Life Sciences and Biotechnology workforce; followed by the two above middle-skill occupations, with 1,053 jobs, representing 7% of the total workforce (Exhibit 3).

Exhibit 2: Skill-Level for Life Sciences and Biotechnology Occupations

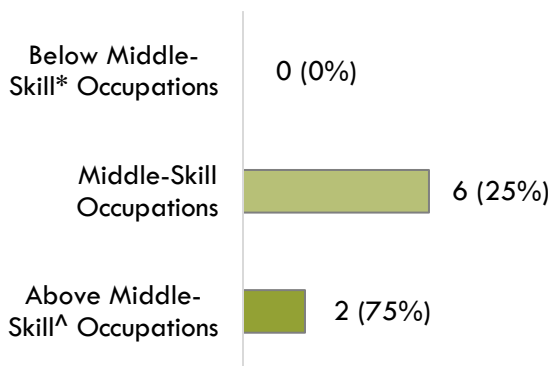
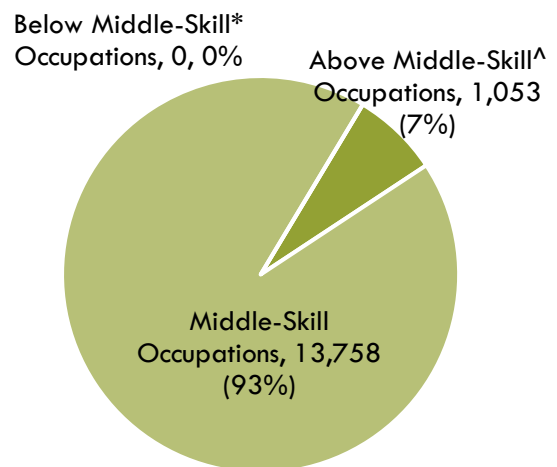


Exhibit 3: Breakdown of 2022 Jobs for Life Sciences and Biotechnology Occupations by Skill-Level



*Note: Throughout this report, Below Middle-Skill Occupations are denoted with an * and Above Middle-Skill Occupations are denoted with a ^.*

Trends In Occupational Demand

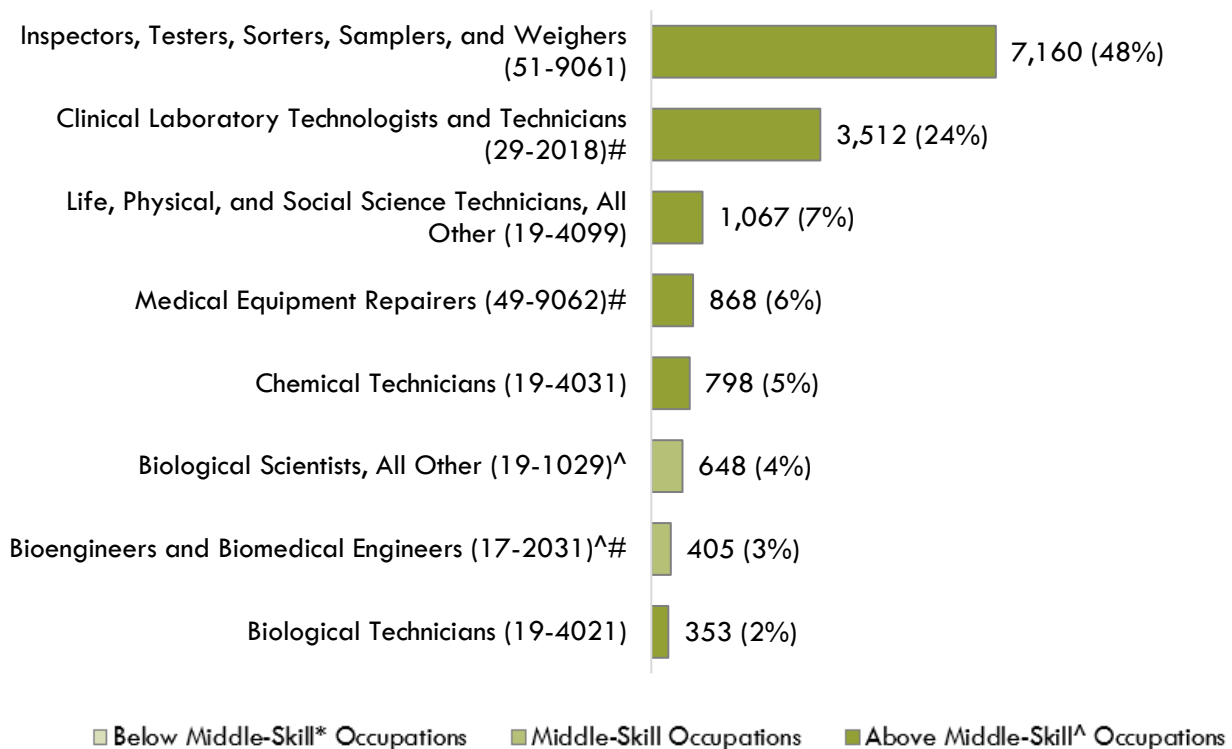
The 2024 Biocom California Life Science Economic Impact Report highlights the vital role of life sciences and biotechnology in California’s economy. In 2023, the industry directly employed 466,888 workers, supported 1.24 million jobs, and generated \$414.2 billion in economic statewide output and \$128.6 billion in labor income.⁴ Orange County employed 62,361 workers in the industry, generated \$46.4 billion in output, but saw a 2.1% decline in industry employment. The industry supported over 1.24 million jobs in the county, with growth in Biotechnology, Medical Devices, Scientific/Research Tools, and Food and Ag Biotech. Major Orange County employers include Edwards Life Sciences, Masimo, and Medtronic.⁵ California received \$6.02 billion from the National Institutes of Health (NIH) and National Science Foundation (NSF), plus \$59.6 billion in private investments, while Orange County received \$294.1 million from NSF and NIH. Biocom’s report emphasizes that the industry requires a highly educated workforce.

Regionally, the eight occupations in this sector accounted for nearly 15,000 jobs in 2022 and are estimated to have over 1,700 annual openings through 2027 in Orange County. Jobs in this sector are projected to grow at a slower rate compared to all occupations in Orange County through 2027 and a quarter (25%) of the occupations have entry-level wages above the MIT Living Wage for Orange County of \$30.48.⁶ The vast majority of Life Sciences and Biotechnology sector jobs (93%) are for middle-skill occupations with the remaining 7% of jobs for above middle-skills occupations.

Jobs

Jobs equate to the number of people currently in an occupation as opposed to unmet demand, which refers to the number of people still needed in an occupation. Comprising nearly half of all jobs (48%) in the Life Sciences and Biotechnology sector, *Inspectors, Testers, Sorters, Samplers, and Weighers (51-9061)*, a middle-skill occupation, has the most jobs (7,160), followed by *Clinical Laboratory Technologists and Technicians (29-2018)#*, another middle skill occupation with nearly a quarter of all jobs (24%). All eight Life Sciences and Biotechnology jobs, 2022 are shown in Exhibit 4.

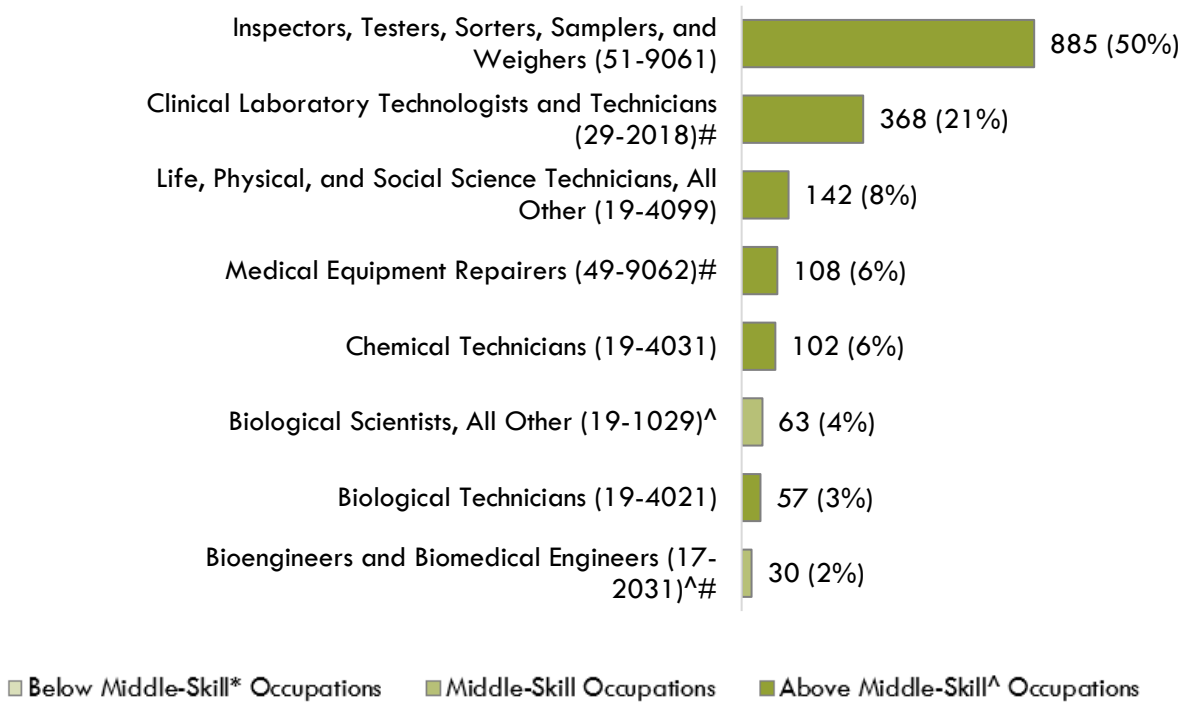
Exhibit 4: Life Sciences and Biotechnology Jobs, 2022



Annual Openings

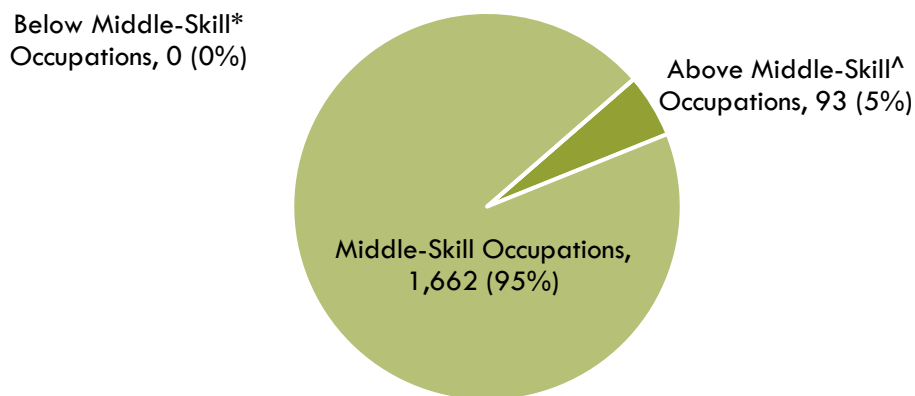
There are 1,755 Life Sciences and Biotechnology sector annual openings, also known as “demand” or “unmet demand”, in Orange County. *Inspectors, Testers, Sorters, Samplers, and Weighers (51-9061)* accounts for the largest percentage of annual openings (50%), followed by *Clinical Laboratory Technologists and Technicians (29-2018)#* (21%), with *Bioengineers and Biomedical Engineers (17-2031)^#* (2%) rounding out the Life Sciences and Biotechnology sector’s annual openings, as shown in Exhibit 5.

Exhibit 5: Annual Openings by Life Sciences and Biotechnology Occupation



Middle-skill occupations comprise 95% of all annual openings in the Life Sciences and Biotechnology sector, followed by above middle-skill occupations (5%). There are no below middle-skill occupations in this sector. Exhibit 6 shows the annual openings by skill-level.

Exhibit 6: Distribution of All Life Sciences and Biotechnology Annual Openings by Skill-Level

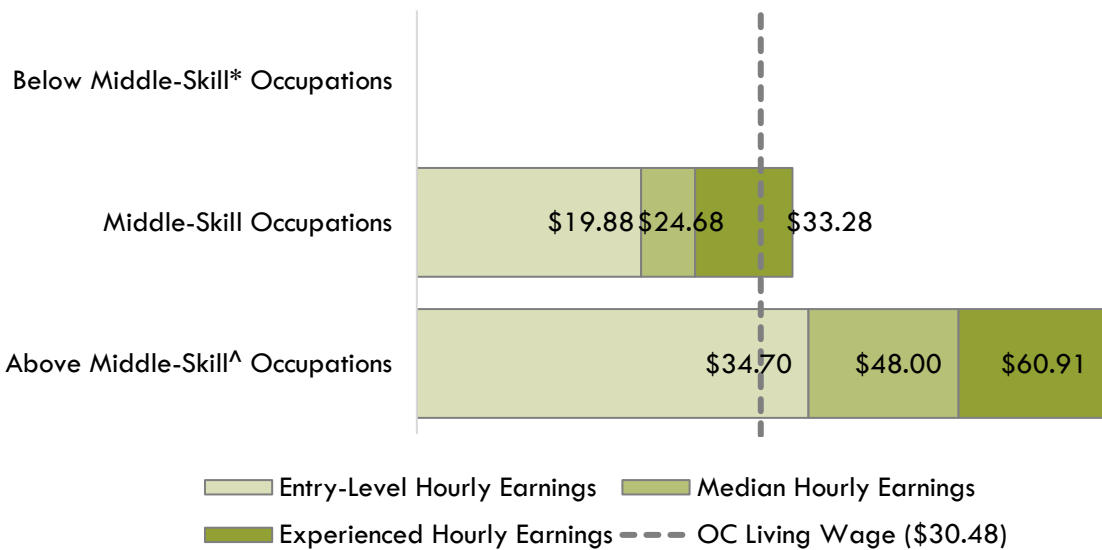


Earnings

In Orange County, the MIT Living Wage for one adult is \$30.48 per hour, which is the floor benchmark for wages in the county. Of the eight occupations in this sector, only two occupations have entry-level wages above Orange County’s living wage. Entry-level wages across all eight Life Sciences and Biotechnology occupations range from \$17.73 to \$40.23 per hour, with *Inspectors, Testers, Sorters, Samplers, and Weighers (51-9061)* and *Bioengineers and Biomedical Engineers (17-2031)*^{^#} at the lower- and upper-end of this range, respectively.

To better understand Life Sciences and Biotechnology sector wages in Orange County, wages are weighted by the number of 2022 jobs. This accounts for wage variation between occupations by normalizing the data based on the number of jobs. It adjusts for situations like a large number of low-wage jobs, a small number of high-wage jobs, or any combination of the two. Exhibit 7 shows the full spectrum of weighted wages (from entry-level to experienced) by skill level for the eight Life Sciences and Biotechnology occupations, ranging from middle-skill entry-level wages of \$19.88 to above middle-skill experienced wages of \$60.91.

Exhibit 7: Life Sciences and Biotechnology Occupational Wages by Skill Level, Weighted by 2022 Jobs



Notably, only 5% of the annual job openings in this sector have entry-level wages above the living wage. All (100%) openings for above-middle skill occupations are above the living wage and all (100%) job openings for middle-skill occupations are below the living wage, as shown in Exhibit 8.

Exhibit 8: Comparison of Living Wages by Life Sciences and Biotechnology Annual Openings and Skill Level

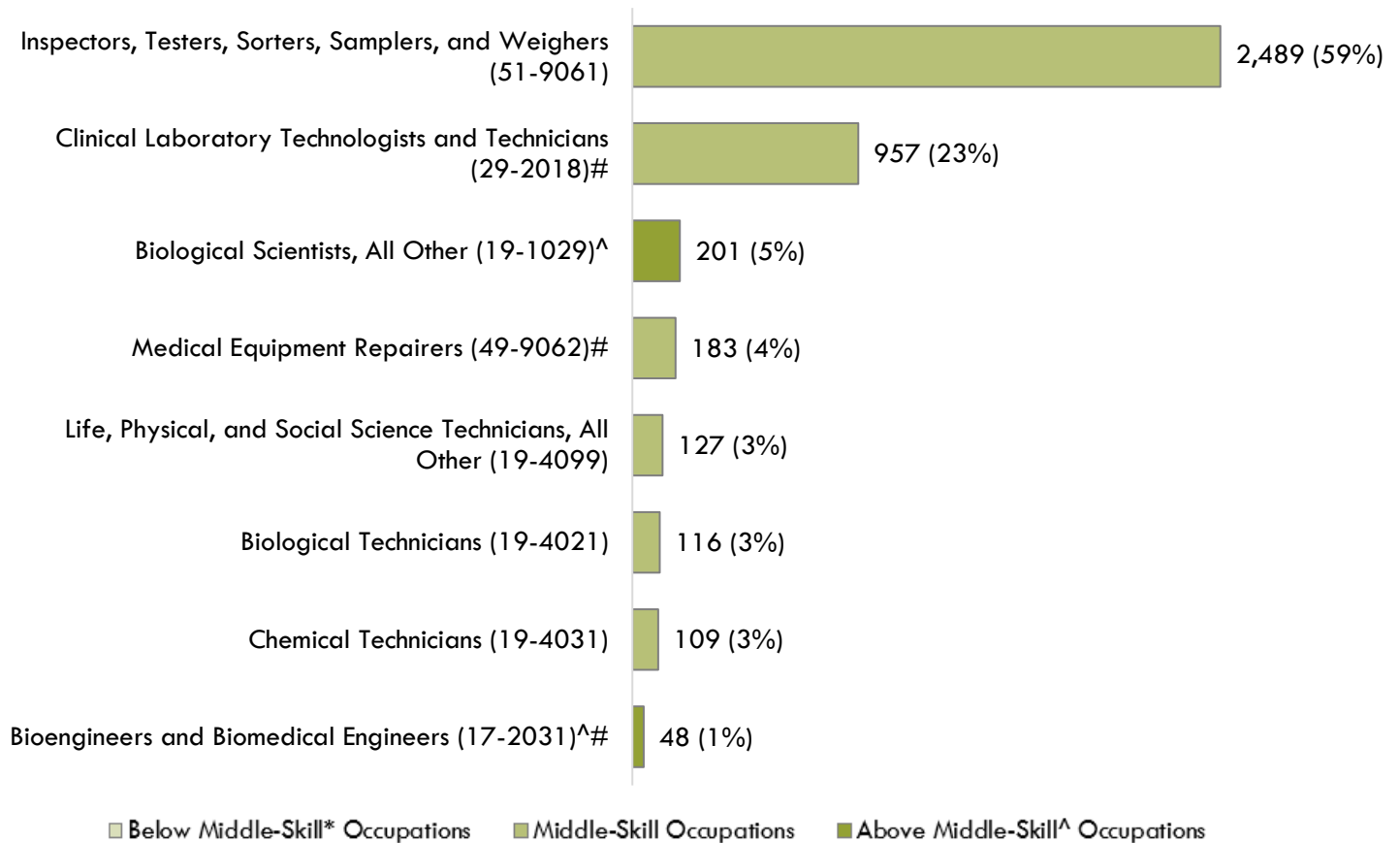


JOB POSTINGS INFORMATION

Job Postings in Orange County

Over the past 12 months (August 2023 – July 2024), there were 4,230 employer job postings within Orange County for all Life Sciences and Biotechnology occupations. Exhibit 9 shows the eight occupations with the corresponding number of job postings. Most notably, *Inspectors, Testers, Sorters, Samplers and Weighers (51-9061)* comprise more than half (59%) of the job postings.

Exhibit 9: Life Sciences and Biotechnology Occupations by Number of Job Postings



Top Employers

Orange County’s Life Sciences and Biotechnology sector employers are very diverse, as shown in Exhibit 10. Employers with postings for middle-skill occupations, such as staffing agencies Aerotek, Actalent, and Kelly Services, which typically provides temporary and permanent job placements and opportunities for those with practical experience and technical expertise. These middle-skill jobs often require specialized training or technical certifications but may not necessarily require advanced degrees. On the other hand, above middle-skill employers include companies like AbbVie, Zymo Research Corp, Ambry Genetics, and Brainlab, which generally seek candidates with bachelor’s or higher education levels, often offer more specialized jobs that require in-depth knowledge and advanced skills. Higher-education institutions like Coast Community College District, North Orange County Community College District, and Rancho Santiago Community College, hire experienced faculty to teach students. The University of California and Quest Diagnostics are listed under both categories, indicating they have a range of positions that cater to various skill levels, from middle-skill to more advanced jobs such as lab technicians as well as teaching positions.

Exhibit 10: Top 10 Life Sciences and Biotechnology Regional Employers with the Most Job Postings by Skill Level

Below Middle-Skill*	Middle-Skill	Above Middle-Skill^
Not Applicable	<ol style="list-style-type: none"> 1. Aerotek 2. Actalent 3. University of California 4. Quest Diagnostics 5. Kelly Services 6. Volt 7. Neogenomics Laboratories 8. Antech Diagnostics 9. Supernal 10. Pathway Group 	<ol style="list-style-type: none"> 1. AbbVie 2. University of California 3. Zymo Research Corp 4. Ambry Genetics 5. Coast Community College District 6. North Orange County Community College District 7. Quest Diagnostics 8. Rancho Santiago Community College 9. Brainlab 10. Stantec

Top Job Titles

Middle-skill job titles consist of jobs that require technical expertise but may not necessarily demand advanced degrees, including Quality Control Inspectors, Product Testers, and Coordinate Measuring Machine (CMM) Programmers, reflecting a need for specialized knowledge and problem-solving abilities. Above middle-skill job titles incorporate professions with a higher degree of technical complexity and require advanced education or specialized training, such as Biologists, Anatomy and Physiology Instructors, and Biomedical Engineers, indicating a demand for advanced technical skills and analytical capabilities. Job titles by skill level are shown in Exhibit 11.

Exhibit 11: Top Life Sciences and Biotechnology Job Titles in Orange County by Skill Level

Below Middle-Skill *	Middle-Skill	Above Middle-Skill^
Not Applicable	<ol style="list-style-type: none"> 1. Quality Control Inspectors 2. Quality Inspectors 3. Laboratory Technicians 4. Quality Control Technicians 5. Laboratory Assistants 6. Quality Assurance Technicians 7. Product Testers 8. Quality Assurance Specialists 9. Quality Technicians 10. CMM Programmers 	<ol style="list-style-type: none"> 1. Biologists 2. Biological Scientists 3. Anatomy and Physiology Instructors 4. Biomedical Technicians 5. Principal Scientists 6. Clinical Research Scientists 7. Biomedical Engineers 8. Bioinformatics Scientists 9. Molecular Biologists 10. Cell Biologists

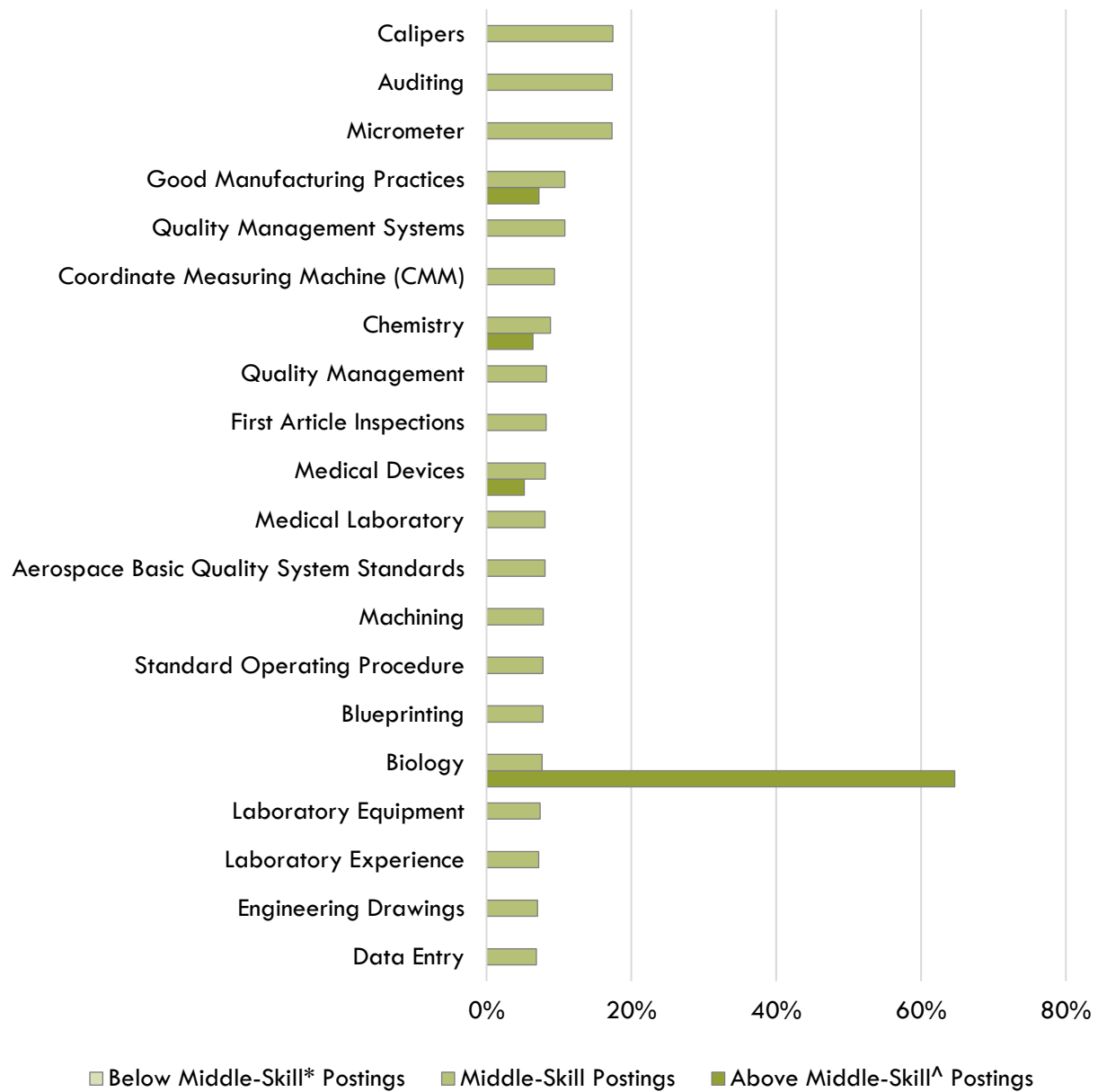
Skills in Job Postings

There are three types of skills listed in job postings: specialized (“technical” or “hard”), common (“soft” or “human”), and computer skills.

Top Specialized Skills

Among the 20 specialized skills listed, only four are common across the two occupational skill levels: good manufacturing practices, chemistry, medical devices, and biology. Calipers (17%), auditing (17%), and micrometer (17%) are the highest requested skills in middle-skill postings; significant in jobs such as *Inspectors, Testers, Sorters, Samplers, and Weighers (51-9061)*. The skill biology (65%) is essential in the above middle-skill occupations, *Bioengineers and Biomedical Engineers (17-2031)*^{^#} and *Biological Scientists, All Other (19-1029)*[^], as shown in Exhibit 12.

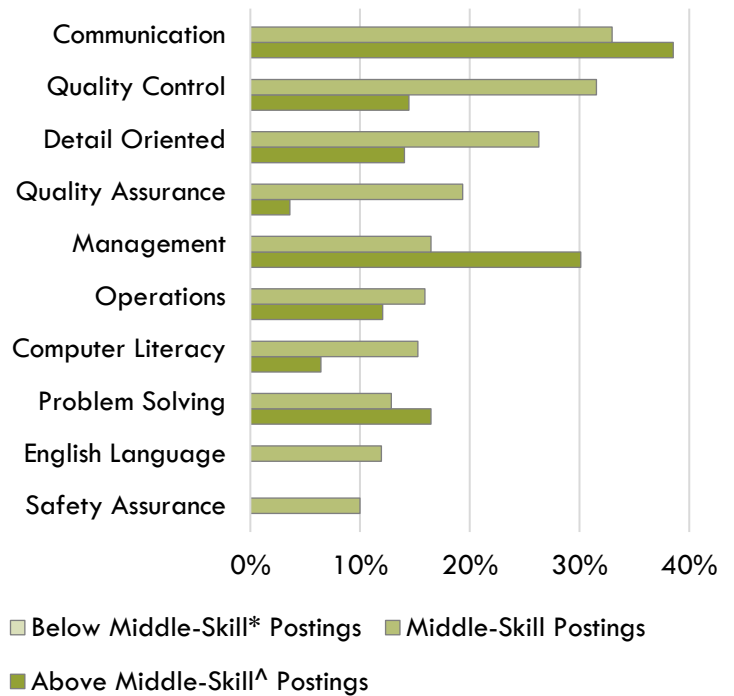
Exhibit 12: Top 20 Specialized Skills in Life Sciences and Biotechnology Occupations



Top Common Skills

Among the top 10 common skills listed in Exhibit 13, communication skills are the most frequently demanded, peaking at 39% in above middle-skill postings and 33% in middle-skill postings. Quality control is requested more for middle-skill postings (32%) than in above middle-skill postings (14%). Also notable, is detail oriented which is requested in 26% of middle-skill and 14% of above middle-skill postings. Above middle-skill postings rank communication (39%), management (30%), and problem solving (16%) as the most requested common skills.

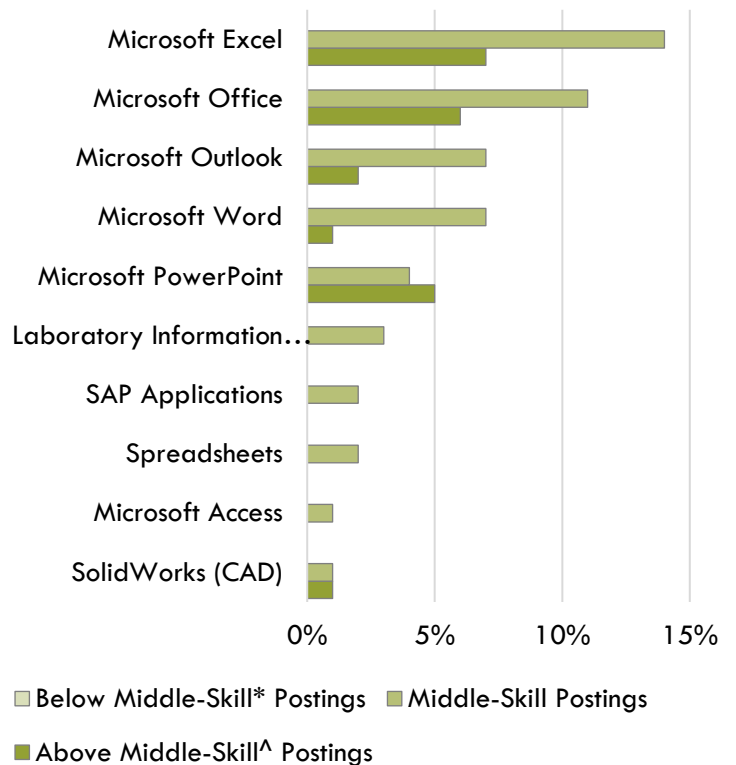
Exhibit 13: Top 10 Common Skills in Life Sciences and Biotechnology Occupations



Top Computer Skills

Computer skills are not requested nearly as often as those in the other skills categories within the Life Sciences and Biotechnology sector. However, generally they are most frequently requested in middle-skill job postings. Microsoft Excel is mentioned the most with 14% of middle-skill postings and 7% of above middle-skill postings requesting it. Microsoft PowerPoint is the highest in above middle-skill postings (5%), compared to 4% in middle-skill postings. Notably, Laboratory Information Management Systems (3%), SAP Applications (2%), spreadsheets (2%), and Microsoft Access (1%) appear only in middle-skill postings. The top 10 computer skills are shown in Exhibit 14.

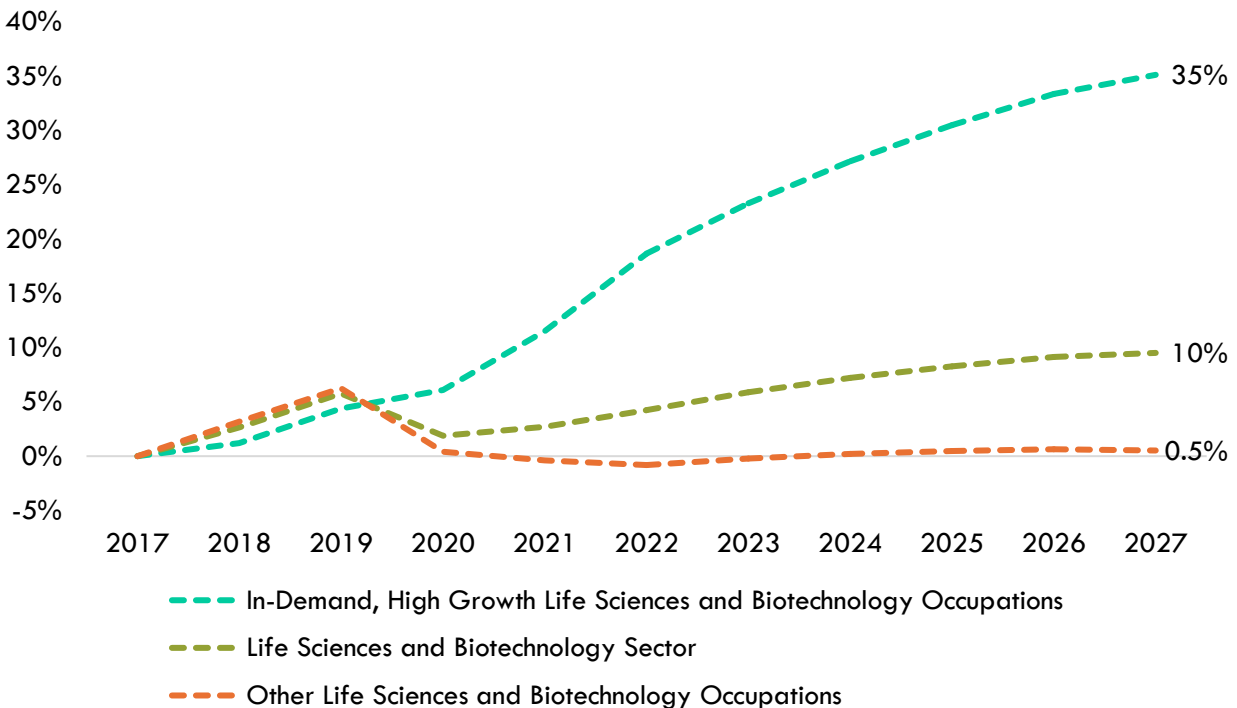
Exhibit 14: Top 10 Computer Skills in Life Sciences and Biotechnology Occupations



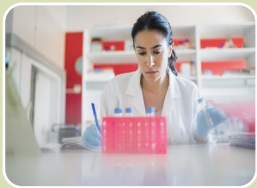
KEY OCCUPATIONS DRIVING EMPLOYMENT

There are two Life Sciences and Biotechnology occupations, 25% of the total eight occupations in the sector, that have a significant number of jobs and annual openings and are projected to have high growth through 2027. These two occupations are projected to drive employment with a projected 35% change from 2017 to 2027— more than triple the growth of all occupations in the Life Sciences and Biotechnology sector, as shown in Exhibit 15.

Exhibit 15: Life Sciences and Biotechnology Employment Change, 2017-2027



The two key occupations driving employment in the Life Sciences and Biotechnology sector are both middle-skill occupations and are on the U.S. News & World Report's 100 Best Jobs of 2024 list. The two occupations are:



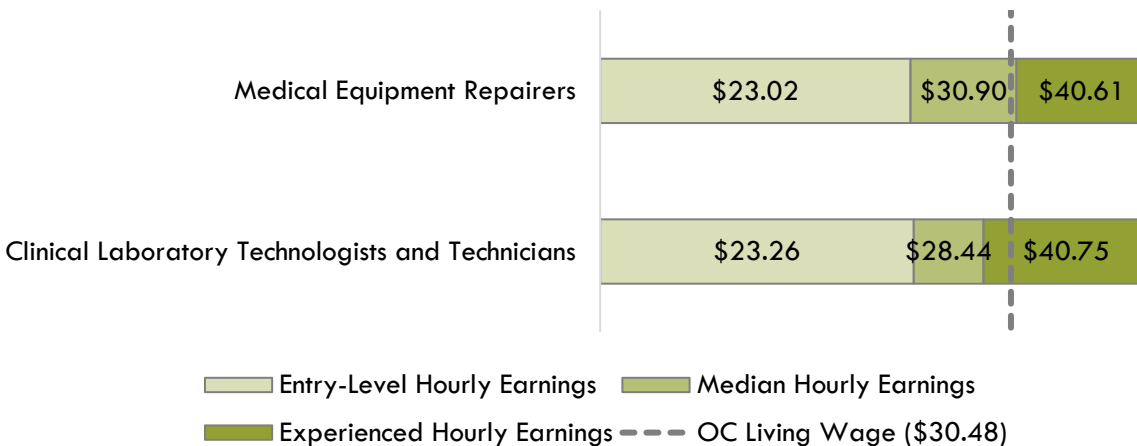
Clinical Laboratory Technologists and Technicians (29-2018)#



Medical Equipment Repairers (49-9062)#

Wages for these high-growth occupations are similar to each other, with *Clinical Laboratory Technologists and Technicians (29-2018)*[#] having slightly higher entry-level hourly wages (\$23.26) than *Medical Equipment Repairers (49-9062)*[#] (\$23.02). Exhibit 16 shows the wage range for these two key occupations.

Exhibit 16: Wages by Key Life Sciences and Biotechnology Occupation



Though these two key occupations accounted for nearly 30% of the Life Sciences and Biotechnology sector’s online job postings over the past 12 months, as shown in Exhibit 17.

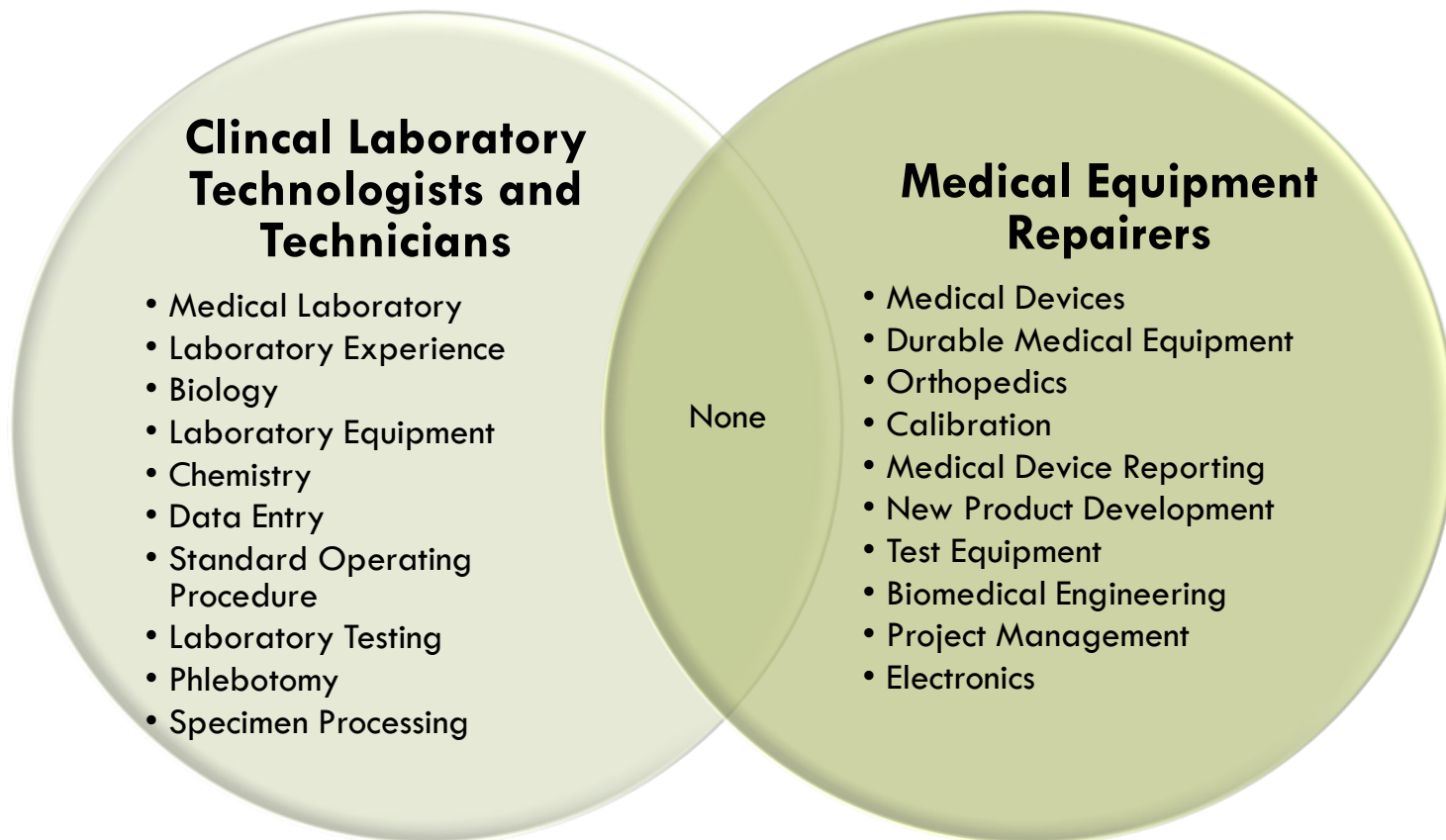
Exhibit 17: Number of Job Postings by Key Life Sciences and Biotechnology Occupation Group

Key Occupation	Number of Postings	% of Total Life Sciences and Biotechnology Postings
<i>Clinical Laboratory Technologists and Technicians (29-2018)</i> [#]	956	23%
<i>Medical Equipment Repairers (49-9062)</i> [#]	180	4%
Total	1,136	27%

The skills requested by employers in online job postings for these occupations vary significantly. While there is no overlap in the top 10 skills for both occupations, there are numerous unique skills requested in online job postings for these two occupations, as shown in Exhibit 18.

- Skills for ***Clinical Laboratory Technologists and Technicians (29-2018)*[#]** are directly related to working in medical laboratories to process and test specimens.
- ***Medical Equipment Repairers (49-9062)*[#]** skills involve testing, calibrating, and repairing medical equipment and medical devices.

Exhibit 18: Life Sciences and Biotechnology Key Occupations Unique Skills Analysis



The following sections highlight trends and examine emerging topics and areas for each of the two key occupations driving employment in the Life Sciences and Biotechnology Sector.

Clinical Laboratory Technologists and Technicians

As noted above, *Clinical Laboratory Technologists and Technicians (29-2018)*[#] is a middle-skill occupation and on U.S. News & World Report's 100 Best Jobs of 2024 list.

Workforce Shortages

The American Society for Clinical Laboratory Science reports national clinical laboratory workforce shortages related to ongoing retirements, an increase in demand for laboratory services, and because there are not enough medical laboratory scientist (MLS) and medical laboratory technician (MLT) graduates to meet demand.⁷ “

Though advances in technology, such as point of contact testing and automated systems, may reduce the number of lab technologists and technicians needed to conduct tests while other advances require specialized knowledge and a more complex skill set.⁸ To close these gaps educational institutions will need to train more MLS and MLT, as well as develop advanced training programs and degrees that teach complex testing methods and processes.

Licensing Requirements

All licensed clinical laboratories in California employ laboratory personnel with state licenses. There are numerous licenses, ranging from those specifically for trainees to clinical laboratory directors. Requirements for these licenses vary, with many of them requiring at least a bachelor's degree and completion of specific courses related to areas such as biological sciences, chemistry, biochemistry, math, and more.

Notably, only the Medical Laboratory Technician License requires an associate degree, while all other licenses require a bachelor's degree. provides basic information about each California laboratory personnel license as well as respective degree requirements and any available specializations. A full list of laboratory personnel training programs is maintained by the California Department of Public Health (CDPH).⁹

Orange County community colleges could consider developing programs that fulfill CDPH requirements. However, these programs should be marketed as upskilling opportunities because the majority of these licenses require a bachelor's degree.

Exhibit 19: California Laboratory Personnel Licenses

Medical Laboratory Technician License

- Associate degree
- Coursework in physical or biological sciences, chemistry, and biology

Clinical Laboratory Scientist (Generalist) and Limited Clinical Laboratory Scientist Licenses

- Bachelor's degree
- Nine specializations are available; each have different requirements

Cytotechnologist License

- Bachelor's degree
- Coursework in biological sciences, chemistry, and math

Public Health Microbiologist Trainee Certificate

- Bachelor's degree
- Coursework in biological sciences; must include medical microbiology, pathogenic microbiology, or bacteriology

Clinical Laboratory Director License

- Bachelor's degree
- Ten specializations are available; each have different requirements

*Note: to see specific licensure and specialization information, see endnote.*¹⁰

Medical Equipment Repairers

Medical Equipment Repairers (49-9062)[#] is a middle-skill occupation and on U.S. News & World Report's 100 Best Jobs of 2024 list.

Right-to-Repair

Medical Equipment Repairers (49-9062)[#] (commonly known as biomedical equipment technicians) monitor, calibrate, and repair medical equipment such as MRI machines, CT scanners, X-Ray machines, and more. If medical equipment is not properly maintained or repaired, health care delivery is disrupted.¹¹ Repairing medical devices in a timely fashion is particularly critical when there are device shortages due to manufacturing challenges, such as those experienced during the COVID-19 pandemic. However, manufacturer policies can prevent in-house biomedical equipment technicians from repairing devices and require the device to be returned to the manufacturer, even if only for basic repairs.¹² A survey of biomedical equipment technicians from the U.S. Public Interest Research Group found "76% of respondents...had been denied access to service information for critical equipment by the manufacturer and 80% said their hospital had unrepairable equipment because of restricted access to service keys, parts or other materials."¹³

The "Right-to-Repair" movement, which aims to "expand access and affordability of repair," is typically associated with consumer electronics such as cell phones, televisions, computers.¹⁴ In California, there have been attempts to expand right-to-repair to medical devices. During the 2021-22 legislative session, Senate Bill (SB) 605: Medical Device Right to Repair Act was introduced and would have required medical device manufacturers "to make the documentation, software, and parts necessary to maintain and repair such devices available to a hospital and an independent service organization engaged by the hospital...so that the hospital or its engaged repair service can conduct its own maintenance and repairs."¹⁵ However, SB 605 did not proceed beyond the Senate Appropriations Committee and became inactive.

A broader act, SB 244: Right to Repair Act, took effect on July 1, 2024, but does not cover medical devices.¹⁶ Future legislation could impact hospital and other medical facilities' ability to repair equipment in-house, which could create more demand for *Medical Equipment Repairers (49-9062)*[#].

LIFE SCIENCES AND BIOTECHNOLOGY SUPPLY

Orange County’s educational institutions provide programs tailored to equip students with skills suited for different levels of occupations within the Life Sciences and Biotechnology sector. The following visuals outline the number of awards conferred by both community colleges and non-community colleges, program observations from COCI¹⁷, as well as the regional programs and institutions that have conferred the most awards.



89

community college awards



1,887

non-community college awards



1,976

total awards conferred

COCI Observations

- There are 17 unique Life Sciences and Biotechnology programs offered by Orange County community colleges.
- Most programs (76%) are for Certificates of Achievement, followed by Associate degrees (18%) and noncredit awards (6%).
- Santa Ana offers the most Life Sciences and Biotechnology programs (7), followed by Santiago Canyon (5), and Fullerton (4)
- Almost all (94%) Life Sciences and Biotechnology programs are listed under the 0430.00 (Biotechnology and Biomedical Technology) TOP code.

Top Program Awards

Community College:
 Biotechnology and Biomedical Technology: 65
 Medical Laboratory Technology: 23

Non-Community College:
 Biology/Biological Sciences, General: 1,036
 Chemistry, General: 229
 Bioengineering and Biomedical Engineering: 196
 Biochemistry: 92
 Human Biology: 87

Most Awards

Community College:
 Santiago Canyon: 27
 Saddleback: 23
 Irvine Valley: 16
 Santa Ana: 13
 Fullerton: 9

Non-Community College:
 University of California-Irvine: 1,391
 California State University-Fullerton: 322
 Chapman University: 67
 Southern California Institute of Technology: 56
 Concordia University-Irvine: 28
 Vanguard University of Southern California: 23

Community College Student Outcomes

Orange County community college students account for 14% of all Life Sciences and Biotechnology community college students in California. The visuals below show the Strong Workforce Program (SWP) metrics for the Life Sciences and Biotechnology sector in Orange County. However, there are two metrics that are unavailable due to the small number of students.



383

SWP Students
(2021-22)



24

SWP Students Who
Earned a Degree or
Certificate or Attained
Apprenticeship Journey
Status (2021-22)



41

SWP Students Who
Transferred to a Four-
Year Postsecondary
Institution (2019-20)



\$40,498

Median Annual Earnings
for SWP Exiting Students
(2020-21)



15%

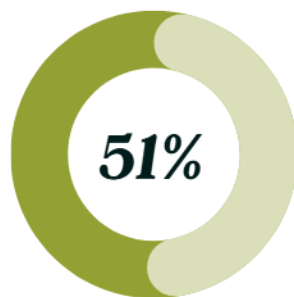
SWP Students Who Earned
9 or More Career Education
Units in the District in a single
Year (2021-22)

**Not
Available**

SWP Students Who Completed
a Noncredit CTE or Workforce
Preparation Course (2021-22)

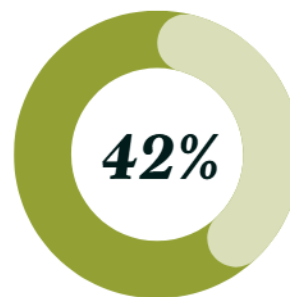
**Not
Available**

SWP Students with a Job Closely
Related to Their Field of Study
(2019-20)



51%

Median Change (Gain) in
Earnings for SWP Exiting
Students (2020-21)



42%

SWP Exiting Students Who
Attained the Living Wage
(2020-21)

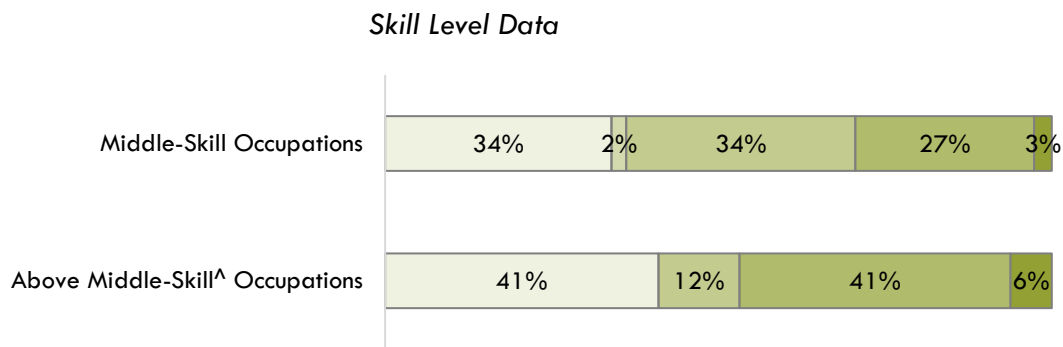
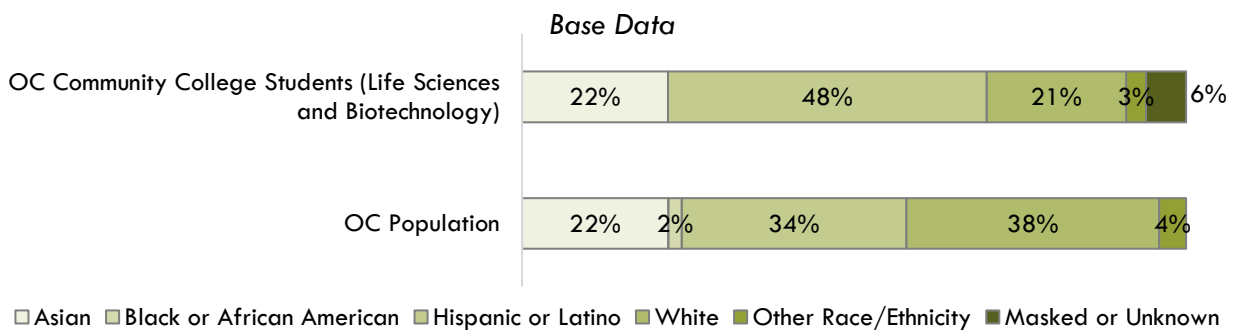
DEMOGRAPHICS

Ethnicity

Exhibit 20 shows the ethnicity of Orange County community college students enrolled in Life Sciences and Biotechnology programs compared to the overall Orange County population and the two skill-level occupational groups. Notably, 48% of Life Sciences and Biotechnology students are Hispanic or Latino, which is higher than the population (34%), and significantly higher than workers in above middle-skill occupations (12%). Conversely, 82% of workers in these above middle-skill occupations are either Asian or white (41% each), which is higher than the population (60%) (22% Asian and 38% white), and community college Life Sciences and Biotechnology students (43%) (22% Asian and 21% white).

More than two-thirds (68%) of workers in middle-skill occupations are Asian (34%) or Hispanic or Latino (34%).

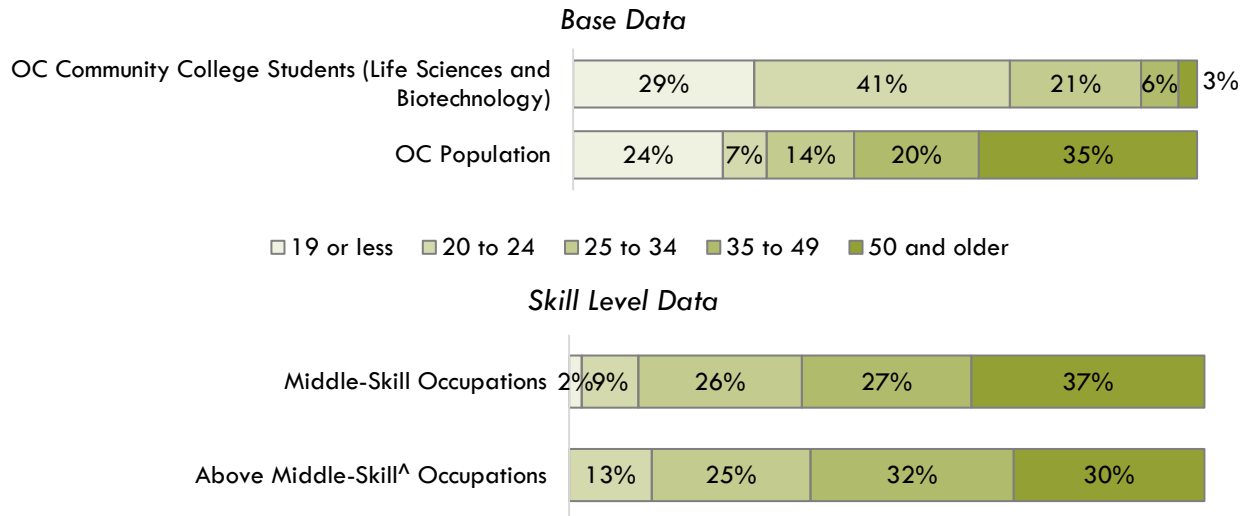
Exhibit 20: Life Sciences and Biotechnology Sector Demographics by Ethnicity



Age Group

Exhibit 21 shows the age of Orange County community college students enrolled in Life Sciences and Biotechnology programs compared to the overall Orange County population and the two skill-level occupational groups. At least 60% of workers in each of the two skill level occupations are 35 and older, which is higher than the population (55%) and community college Life Sciences and Biotechnology students (9%). Notably, more than one-third of middle-skill (37%) workers are 50 and older.

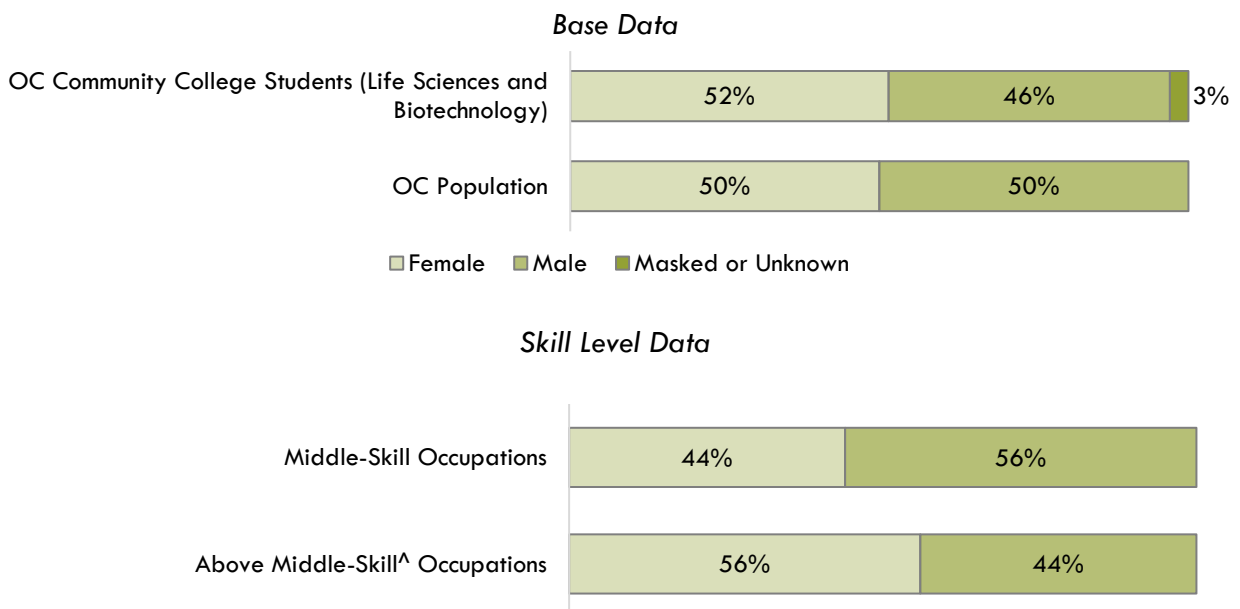
Exhibit 21: Life Sciences and Biotechnology Sector Demographics by Age Group



Sex

Exhibit 22 shows the sex of Orange County community college students enrolled in Life Sciences and Biotechnology programs compared to the overall Orange County population and the two skill-level occupational groups. Though the population is split evenly, 52% of Life Sciences and Biotechnology students and between 44% and 56% of workers in these occupations are women.

Exhibit 22: Life Sciences and Biotechnology Sector Demographics by Sex



PUBLIC POLICY AND FUNDING OPPORTUNITIES

The U.S. Food and Drug Administration, the U.S. Environmental Protection Agency, and the U.S. Department of Agriculture govern much of the regulations concerning business and research practices across the Life Sciences and Biotechnology sector. Under the U.S. Coordinated Framework for the Regulation of Biotechnology, first published in 1986 and last updated in 2017, these three agencies work together, each within their own legal authority, to regulate biotechnologically derived organisms and products, as well as assess their potential impacts on health and the environment.¹⁸

In California, statewide education initiatives have prioritized life sciences and biotechnology. In 2013, the state joined a national effort to reform K-12 science education by adopting Next Generation Science Standards (NGSS). The California Institute for Regenerative Medicine (CIRM) developed the first NGSS-based high school units that teach key concepts in cell biology, organismal biology, and genetics through the lens of stem cell research.¹⁹ Earlier, in 2009, the state legislature passed the California Stem Cell and Biotechnology Education and Workforce Development Act, making education and workforce development in stem cell and biotechnology a state priority. The law also aimed to strengthen connections between CIRM, industry, and public-school stakeholders.²⁰

Pending federal and state legislation may have business implications on biotechnology companies if passed. Specifically, the BIOSECURE Act, introduced in January 2024, would prohibit, with some exceptions, federal agencies from contracting any biotechnology equipment or services provided by companies connected to foreign adversaries that pose a risk to national security.²¹ BGI, Complete Genomics, and MGI are some businesses of which are each listed as “a biotechnology company of concern”.²²

Although attempts, such as Senate Bill (SB) 605: Medical Device Right to Repair Act, to grant California hospitals and contractors the right-to-repair biomedical devices have not successfully passed through the state legislature, future bills may require biomedical device manufactures to provide medical providers and contractors with blueprints for such equipment. As stated in the Key Occupations Driving Employment section of this profile, SB 244: Right to Repair Act, a broader act, took effect on July 1, 2024, but does not cover medical devices.

Several federal and state financial initiatives are available for further investment in the Life Sciences and Biotechnology sector. While not an exhaustive list, the following provides a sample of available sector-specific funding opportunities:

- **Cellular and Biochemical Engineering Program:** This program “supports fundamental engineering research leading to novel bioprocessing and therapeutic cells, biochemicals, biopharmaceuticals and for other biotechnology industries.”²³
- **Experiential Learning for Emerging and Novel Technologies:** This program provides financial assistance towards experiential, educative opportunities that train learners with essential skills to thrive in emerging technology fields.²⁴
- **Foundation Awards Program:** This funding opportunity helps finance research aimed at filling knowledge gaps regarding stems cells and regenerative medicine “to advance stem cell-based tools.”²⁵
- **Research Tax Credit:** This is a California tax credit available to businesses that conduct eligible research within the state.²⁶

APPENDIX A: METHODOLOGY

Traditional Labor Market Data Methodology

The COE analyzed traditional labor market demand information, which includes job counts, projections, wages, typical education requirements, for the Life Sciences and Biotechnology sector. Traditional labor market demand data was sourced from Lightcast (Datarun 2023.4), a labor market analytics firm that aggregates data from public statistical agencies including the Bureau of Labor Statistics, Census Bureau, and the California Employment Development Department. Living wage data was sourced from the Insight Center California Family Needs Calculator.²⁷ The traditional labor market demand data analyzed in this report includes:

- **2022 Jobs:** the number of jobs by industry and occupation in 2022.
- **2027 Jobs:** the projected number of jobs by industry and occupation in 2027. Projections are based on the assumption that past trends will continue into the future, including the assumption that the economy, during the projection period, will be at approximately full employment. Projections do not consider potential recessions or labor shocks, such as natural disasters or pandemics, and are intended to capture structural change in the economy over time.
- **Change:** the projected change in the number of jobs, expressed as an actual number and a percentage.
- **Average Annual Openings (Demand):** the projected number of annual job openings. This figure is the sum of job growth and replacement jobs. Job growth is the result of job creation while replacement jobs are the result of retirements and workers leaving the filled, creating the need to hire a replacement.
- **Hourly Wages:**
 - **Entry-level (25th percentile):** the typical entry-level wages for an occupation; 25% of workers earn less than this amount and 75% earn more.
 - **Median:** the median wages for an occupation; 50% of workers earn less than this amount and 50% earn more.
 - **Experienced (75th percentile):** the typical experienced-level wages for an occupation; 75% of workers earn less than this amount and 25% earn more.
- **Typical Entry-Level Education:** represents the typical education level needed to enter an occupation.
- **Educational Attainment:** the percentage of workers employed in an occupation by their highest level of education attained.

Demographic data for the Orange County population comes from the Census Bureau's American Community Survey (5-Year Estimates, 2018-2022). Demographic data for occupations was sourced via IPUMS USA and student demographic data was sourced from the LaunchBoard Community College Pipeline (2020-21 Academic Year).^{28,29}

The COE also analyzed labor market supply data that is calculated using the number of awards conferred in related training programs at community college and non-community college institutions over the past three years of available data. Community college data is sourced from the California Community College Chancellor's Office Data Mart³⁰ and includes the years 2020-2023; non-community college data is sourced from the Integrated Postsecondary Education Data System and includes the years 2019-2022.³¹

Job Postings Analysis Methodology

In addition to traditional labor market information, the COE analyzed real-time labor market information using online job postings data sourced from Lightcast (Datarun 2024.2). The job postings data in this report covers the last 12 months of available data (August 2023 – July 2024). This data is derived from online job postings that are parsed and classified into industry and occupational groups using natural language processing (NLP) to determine the related company, industry, occupation, and other information for each job posting. Online job postings do not equate to labor market demand or replace traditional labor market data. They should only be considered a supplement to traditional LMI.

APPENDIX B: SECTOR OCCUPATIONS AND TOP CODES

SOC	Occupation
19-4021	Biological Technicians
19-4031	Chemical Technicians
19-4099	Life, Physical, and Social Science Technicians, All Other
29-2018	Clinical Laboratory Technologists and Technicians [#]
49-9062	Medical Equipment Repairers [#]
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers
17-2031	Bioengineers and Biomedical Engineers ^{^#}
19-1029	Biological Scientists, All Other [^]

TOP Code	Program Name
0430.00	Biotechnology and Biomedical Technology
0934.60	Biomedical Instrumentation
0934.70	Electron Microscopy
0954.00	Chemical Technology
0955.00	Laboratory Science Technology
0956.80	Industrial Quality Control*
1205.00	Medical Laboratory Technology*

- Below Middle-Skill* Occupations
- Middle-Skill Occupations
- Above Middle-Skill[^] Occupations

Note: Two (2) TOP codes, denoted above with an asterisk (), have corresponding occupations that crosswalk to the Life Sciences and Biotechnology sector, so they and their respective supply are added to this sector profile. However, in the last Community College Chancellor's Office [TOP code inventory](#), Industrial Quality Control (TOP 0956.80) is classified as being in the Advanced Manufacturing sector and Medical Laboratory Technology (TOP 1205.00) is classified as being in the Health sector.*

APPENDIX C: END NOTES

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Important Disclaimers

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. This study examines the most recent data available at the time of the analysis; 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 the report 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.

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