MassBioEd
Massachusetts Biotechnology Education Foundation

Massachusetts Life Sciences Employment Outlook 2024

Prepared by TEConomy Partners, LLC for Massachusetts Biotechnology Education Foundation

June 2024

TECONOMY PARTNERS LLC

MassBioEd
Massachusetts Biotechnology Education Foundation

The Massachusetts Biotechnology Education Foundation (MassBioEd) is committed to understanding and supporting the needs of the state's life sciences workforce. The annual Massachusetts Life Sciences Employment Outlook analyzes employment data and hiring demand to forecast job trends and skills required, impacting the state's education and training institutions in supplying critical talent.

For over 20 years MassBioEd has strengthened and diversified the life sciences workforce.

We offer a continuum of programs that support primary, secondary, and post-secondary students and educators, career-seeking adults, and life sciences professionals to enter, persist, and thrive in the industry.

We build bridges connecting industry, academia, and the public sector.

Emerging Workforce

Engaging educators, inspiring students grades 6-12

Teacher Training and Mentoring

Curriculum Development

Career Exploration

Comprehensive District Partnerships

Imminent Workforce

Illuminating careers for college students and adults

Career Resources

College to Career

Career Hub

Apprenticeships

Incumbent Workforce

Building skills of the current workforce

Incumbent Worker Training

Life Sciences Workforce Conference

Labor Trends Report

Key Findings: Talent Demand Dynamics

Massachusetts continues to grow its life sciences industry, with each of the state's major segments outpacing its national counterparts. While employment trends point to slowing growth relative to levels seen both during and immediately following the pandemic, the projected 10-year growth remains strong.

- State life sciences employment increased by 11.6% from 2021 to 2023, continuing to outpace national growth of 6.3% over the same period. With more than 140,000 total life sciences jobs, the state continues to serve as a leading global life sciences hub employing a highly-skilled, highly specialized scientific and technical workforce.

- Recent job growth has slowed, however, increasing just 2.5% in 2023 after exceptionally strong growth from 2020 to 2022 that averaged 7.8% annually. Massachusetts biopharmaceuticals companies have been conducting a series of ongoing layoffs in 2023 that have led to a "cooling" job market, with further layoffs occurring in Q1 of 2024.[1,2]

- After increasing by nearly 46% from 2021 to 2022, job postings activity by the Massachusetts life sciences industry decreased by 33% from 2022 to 2023, a key signal of softening labor demand. This aligns with a broader trend of slowing job growth across biopharmaceuticals that has continued into 2024 nationwide, with 57 layoff announcements in the first quarter as companies cite declining revenues and difficult business environments.[3]

- Looking forward, Massachusetts is still projected to grow life sciences jobs by 32% or nearly 38,000 net new jobs by 2033.

1. Boston Globe, 'Like playing the lottery': Laid-off life sciences workers give a snapshot of a cooling-down sector, October 10, 2023.
2. Drug Discovery and Development, Layoff tracker: Mapping the 11,350-plus biotech and pharma layoffs in early 2024, April 25, 2024.
3. Fierce Biotech, No reprieve for biopharma layoffs in Q1: Fierce Biotech analysis, April 1, 2024.

Key Findings: Shifting Occupational, Skill Demands

Occupational workforce trends reveal continued, though slowing, growth in some segments and shifting areas of emphasis relative to the past several years in key life sciences roles—a call to action for the state's industry to retain its top talent and meet emerging industry needs for new skills.

- After several years of strong growth, key occupational segments of the biopharmaceuticals and medical labs workforce highlighted in previous annual outlooks exhibited slower growth from 2022 to 2023, namely:
    - Scientific occupations grew at an average annual rate of nearly 7% from 2020 to 2022, but only grew by 2.7% from 2022 to 2023.
    - Computing and IT occupations grew at an average annual rate of 17.5% from 2020 to 2022, but only grew by 4.7% from 2022 to 2023.
    - Production occupations grew at an average annual rate of 16.6% from 2020 to 2022, but only grew by 1.7% from 2022 to 2023.
    - Scientific technician occupations grew at an average annual rate of 4.5% from 2020 to 2022, but only grew by 2.9% from 2022 to 2023.
- Meanwhile, several engineering occupations saw significant growth within the life sciences sector from 2021-23, with mechanical engineering employment increasing by 47% and industrial engineering jobs increasing by 43%. Statisticians represent a specialized and emerging occupational segment within the life sciences with a growth rate of 31% from 2021 to 2023, likely reflecting the increasing role of bioinformatics in supporting life sciences business operations.
- Skills with rising importance in life sciences job postings were focused on production facilities management, regulatory affairs, quality control/quality assurance, and information privacy.

Key Findings: Talent Supply Dynamics

Demand for life sciences talent produced by the state's world-class educational institutions continues to exceed the available supply. Growing the talent pipeline must remain a priority for the state.

- Massachusetts' educational institutions remain 1.4 times more concentrated in life sciences degree production compared to the U.S., producing an average of 7,600 life sciences degree graduates annually from 2021 through 2023.
- Despite this pipeline and relatively strong in-state retention, demographic data suggest that the biopharmaceuticals and medical labs industry that anchors the state's life sciences sector captures just 1 in 5 life sciences and chemistry degree graduates, with 80% choosing other industry sectors.
- Projections indicate a lower level of annual job openings in key life sciences occupations over the next decade—life scientists, biotechnicians, and medical lab technicians—however, the state's educational institutions produce just 61% of the projected annual need in new graduates with degrees most closely aligned with these openings.
- The state's women and racial and ethnic minority life sciences degree graduate levels have remained relatively flat over the last several years, representing an area for ongoing investment to help industries build a more diverse workforce.
- In spite of the outsized levels of life sciences graduate output by the state's institutions, the ongoing supply-demand misalignment further emphasizes the importance of complementary alternative credentialing and new "on-ramps" for life sciences careers.

Massachusetts' life sciences industry continues to compete with other states and other local industries for talent, reinforcing the need to remain consistent in retaining skilled talent and supporting ongoing life sciences workforce development despite concerns about industry contraction.

- Recent industry trends highlight the ongoing competition with tech and other R&D-intensive industries for skilled workers, while demographic data shows evidence of significant "outflows" of life sciences degree holders to other traded sector industries in Massachusetts.
- Demographic data suggests that the share of life sciences degree holders working in the biopharmaceuticals and medical labs industry sees significant attrition in Massachusetts as workers age.

Recommendations: Building the Talent Pipeline

Higher Education

Continue to invest in programs serving the life sciences talent pipeline—despite signs of a leaner growth environment—to meet the consistent need for replacement workers and to position the state for future growth.

Although early signals point to some contraction in 2024, it is still critical for higher education institutions to keep expanding life sciences educational programs to close the projected supply-demand gap of just over 2,200 graduates per year in key life sciences occupations. The state should seek to maintain its focus on growing this critical workforce segment despite an uncertain industry climate to ensure Massachusetts can meet consistent demand for replacement workers and is well-positioned for the industry's next growth cycle as a signature talent and innovation ecosystem.

Higher Education & Government

Embed exposure to emerging life sciences technology concepts in educational programs to enhance career awareness and to ensure a future-ready workforce for the state.

Exposure to emerging technologies that are expected to rapidly transform the industry in coming years is critical. Education systems and government stakeholders can embed these topics into STEM programs and highlight relevancy to the life sciences industries in areas such as:

- Machine learning and generative AI and its role in drug discovery and bioinformatics
- Cell and gene therapies, which rely on the convergence of a portfolio of synthetic biology and multi-omics technologies
- Continuous bioprocessing, which is expected to incorporate a variety of advanced manufacturing technologies to enable new production methods.

Industry, Higher Education, & Government

Continue to invest in K-12 STEM education initiatives designed to engage under-represented students in hands-on learning, to excite students about careers in STEM professions, and to connect them to local colleges and employers to pursue their career interests.

K-12 students represent the future of life sciences innovation but are often unaware of how exciting careers in science- and tech-driven industries can be. Hands-on programs that bring careers to life in the classroom, company tours in real-world laboratories, and with university and industry mentors and connections, are proven to enhance the likelihood of pursuing a degree or career in a STEM field. Massachusetts has been a leader in funding internships and career connections, but academic and industry under-representation persist. It is critical to invest in a diverse future STEM workforce.

Recommendations: Growing & Retaining the Workforce

Higher Education & Workforce Programs

Expand multidisciplinary skills-building programs for current students and the incumbent workforce in life sciences to meet emerging industry demand.

Approaches can use certifications, micro-credentialing, industry-recognized credentials (IRCs), or other skills-based and experiential programs to supplement existing life sciences curriculum or industry experience. Evidence from rising skills in Massachusetts job postings suggests that industry demand is rapidly expanding in applied skills areas such as:

- Industrial production management systems and technologies
- Quality control and quality assurance
- Regulatory affairs and compliance
- Clinical data management and data privacy.

Industry & Workforce Programs

Develop programs and incentives to better retain experienced, mid-career life sciences workers to ensure their experiential knowledge does not leave the workforce.

Mid-career professionals bring valuable experience, skills, and mentorship to the life sciences industry, helping to ensure diffusion of experiential knowledge and ensuring continuity within companies. However, demographic data suggests a high rate of attrition for life sciences degree holders as they age, with biotech layoffs driving the potential for further exits. Industry and workforce development agencies can invest in programs to retain these critical workers through programs targeting opportunities for skills development, work-life balance, and worker assistance services in navigating job transitions that result from industry churn.

Recommendations: Expanding Career Opportunities & Diversity

Industry, Higher Education, & Workforce Programs

Work to identify opportunities where there are potential "on-ramps" for underutilized STEM workforce segments to increase access to a broader scientific talent supply.

To help expand the talent pipeline and provide more access to the life sciences industry, particularly for STEM workers, companies can work with education and workforce development programs to identify alternative entry-level requirements, hybrid experiential learning on-ramps, and other apprenticeship-style models to provide career pathways to associates and bachelor's-level life sciences graduates. Encouraging more students to begin careers in life sciences at pre-graduate school levels can offer access to a broader talent supply, while continuing education and nontraditional growth paths can help upskill talent to take on higher level job functions.

Industry, Workforce Programs, & Government

Accelerate efforts to invest in life sciences skills training programs at public institutions and in underserved communities to advance diversity, equity, and inclusion in the life sciences.

Shares of women and minority life sciences degree graduates have either remained flat or decreased slightly in Massachusetts since 2022, indicating the need to re-prioritize development of a diverse workforce. A number of studies demonstrate the "business case" for investing in workplace DEI initiatives, while state and national competitiveness of the life sciences industry relies on expanding opportunity for a wider range of potential workers. Public-private initiatives that emphasize awareness and training for underserved populations across the education to workplace continuum are needed to ensure that the state does not lose ground in broadening its talent base.

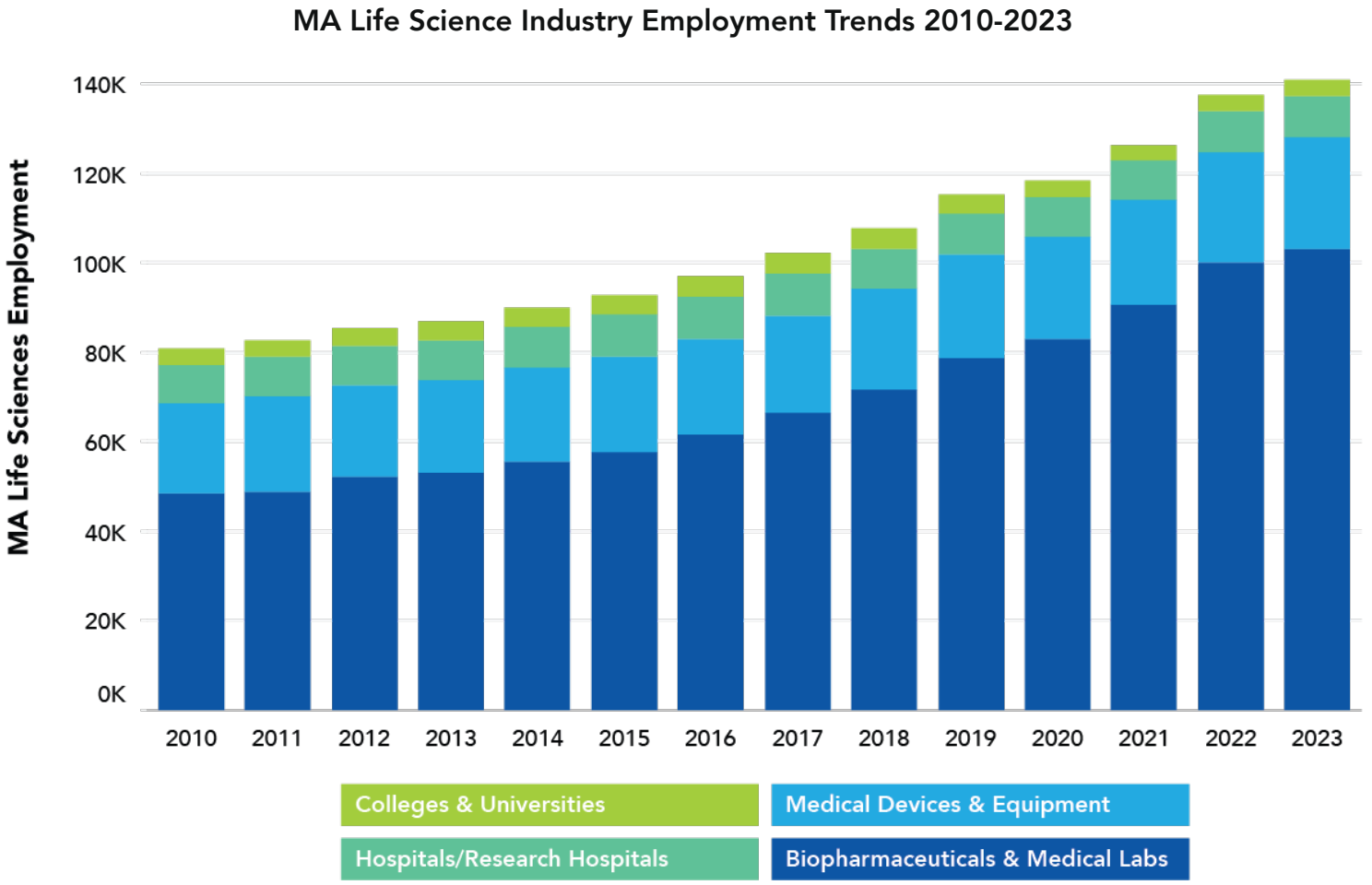
Industry & Higher Education

Commit to assessing DEI efforts across academia and industry and further investing in initiatives that are making progress to reduce barriers to career entry and advancement for underrepresented groups.

Underrepresentation in the life sciences industry persists for women and most racial and ethnic minority populations, a long-standing situation for both Massachusetts and nationally. MassBio recently found significant underrepresentation continues among people of color in the state's overall biopharmaceutical industry workforce, in its executive leadership, and among its corporate board members. TEConomy's recent research with PhRMA finds biopharmaceutical companies are investing significantly to advance DEI using holistic approaches—but industry alone cannot solve this challenge, and further coordination and collaboration is needed across ecosystem partners.

Steady Life Sciences Growth for MA Over the Past Decade

- In 2023, there were 140,952 life sciences jobs in the state, growing by 2.5% since 2022
- The life sciences industry had grown at an average annual rate of nearly 7.8% from 2020 to 2022
- Over 73% of life sciences jobs in 2023 were in biopharmaceuticals and medical labs



Note: Industry employment totals for 2023 are based on preliminary estimates of annual totals by Lightcast through Q2.
Source: TEConomy Partners' analysis of Lightcast QCEW Data, 2024.1

Projected Growth Trends Reaffirm the Long-Term Importance of High Skills STEM Workers to the Life Sciences Industry's Future in the State

Projected job growth in leading life sciences occupational segments over the next decade:

Scientists	27% growth
Management	31% growth
Computing & IT	47% growth
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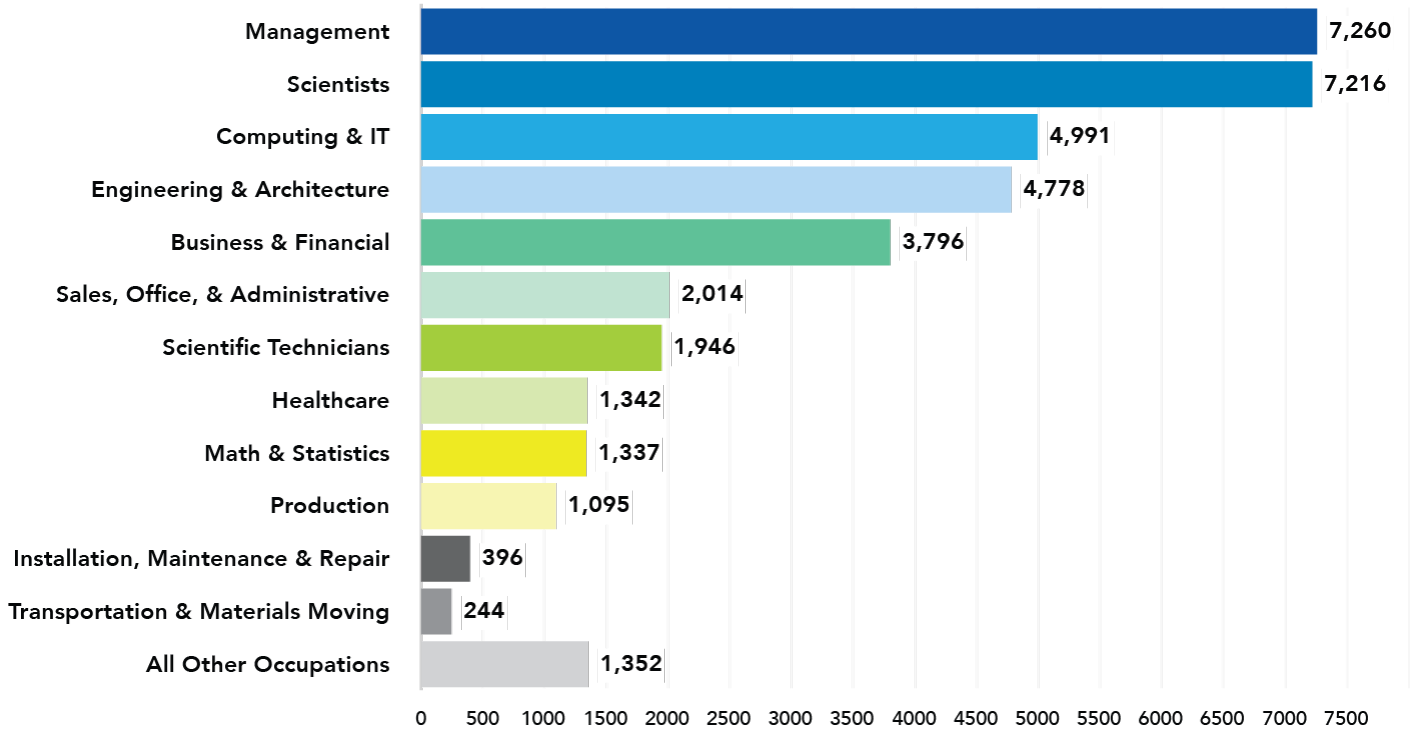
Scientific Technicians	31% growth
Math & Statistics	53% growth

Segments listed with at least 1k projected new jobs and >30% job growth from 2023-2033

Projected Occupational Growth Trends Within Biopharmaceuticals & Medical Labs, 2023-33

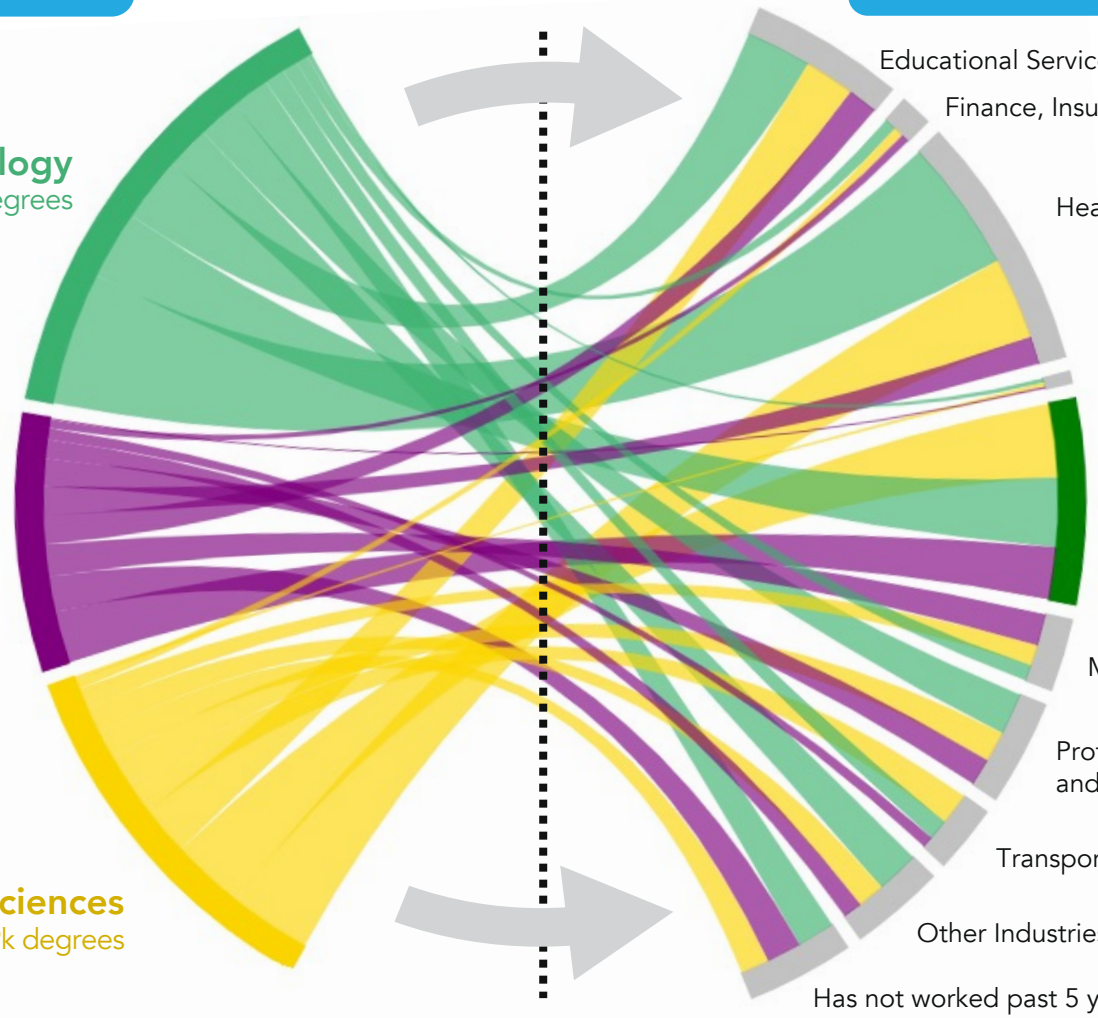


Note: Lightcast uses a combination of national (BLS), state/local, and internal projection methods. Lightcast occupation projections are based on estimated industry data with projected, regionalized staffing patterns applied to the figures. As a result, the occupational projects will necessarily differ from BLS and state labor market information (LMI) occupation numbers.
Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

Biopharmaceuticals & Medical Labs Industry Only Capturing 1 in 5 Life Sciences & Chemistry Degree Holders Over Long Term in Massachusetts

MA Life Sciences-related Degree Graduates

MA Industry Employment for LS Graduates



Biology
Estimated 90.4k MA degrees

Chemistry and Chemical Engineering
Estimated 49.9k MA degrees

Other Biosciences
Estimated 72.9k degrees

Educational Services – 14% of total

Finance, Insurance, Real Estate, and Rentals – 3% of total

Healthcare – 23% of total

Information – 1% of total

Biopharmaceuticals & Medical Labs – 19% of total

Manufacturing (non-Biopharma) – 7% of total

Professional, Technical, and Managerial Services – 10% of total

Transportation, Distribution, and Wholesale – 6% of total

Other Industries – 9% of total

Has not worked past 5 years – 10% of total

The Life Sciences Degree to Industry Pipeline

Across the over 213k life sciences-related degree holders in MA (and including chemistry-related degrees), this graphic examines the intra-state "flows" of life sciences talent with respect to which industries they ultimately work in.

Source: TEConomy Partners' analysis of American Community Survey Public Use Microdata, 2022 5-year data.

Defining the Scope of the Life Sciences Industry in Massachusetts

The primary focus of the Outlook remains on the biopharmaceutical and medical labs segment of the industry (73% of total life sciences employment in 2023) that includes:

- Drug and pharmaceutical manufacturing
- Biotechnology and other commercial life sciences research, development, and testing
- Medical labs

Additional sectors where the life sciences workforce is actively deployed including Medical Devices (18% of employment), Hospitals (7% of employment) and Universities (3% of employment) are highlighted in select analyses (as shown in figure)

North American Industry Classification System (NAICS) Codes and Industry Sectors Associated with Life Sciences

Biopharmaceuticals & Medical Labs	Medical Devices	Hospitals/ Research Hospitals	Colleges & Universities**
325411, 325412, 325413, 325414 Pharmaceutical & Medicine Manufacturing	334510 Electromedical Manufacturing	622110* General medical & surgical hospitals	611310* Colleges, universities & professional schools
541380* Testing Laboratories	334516 Analytical lab Instruments	622210* Psychiatric & substance abuse Hospitals	
541713*, 541714, 541715* Commercial Life Sciences/ Biotech R&D	334517 Irradiation apparatus	622310* Other specialty hospitals	
621511 Medical Labs	339112 Surgical, medical Instruments		
	339113 Surgical supplies		
	339114 Dental equipment & supplies		

*Includes only the portion of these engaged in relevant life sciences activities, and in the case of Hospitals and Colleges/Universities is focused on clinical and life sciences scientific R&D-related personnel (i.e., non-clinical and excluding core teaching faculty).
**Note: Includes both public and private institutions

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- Graduate demographics & retention
- Leading programs generating talent

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- Key Findings from Quantitative Analyses of Life Sciences Talent Dynamics

Massachusetts' Life Sciences Talent Demand Dynamics

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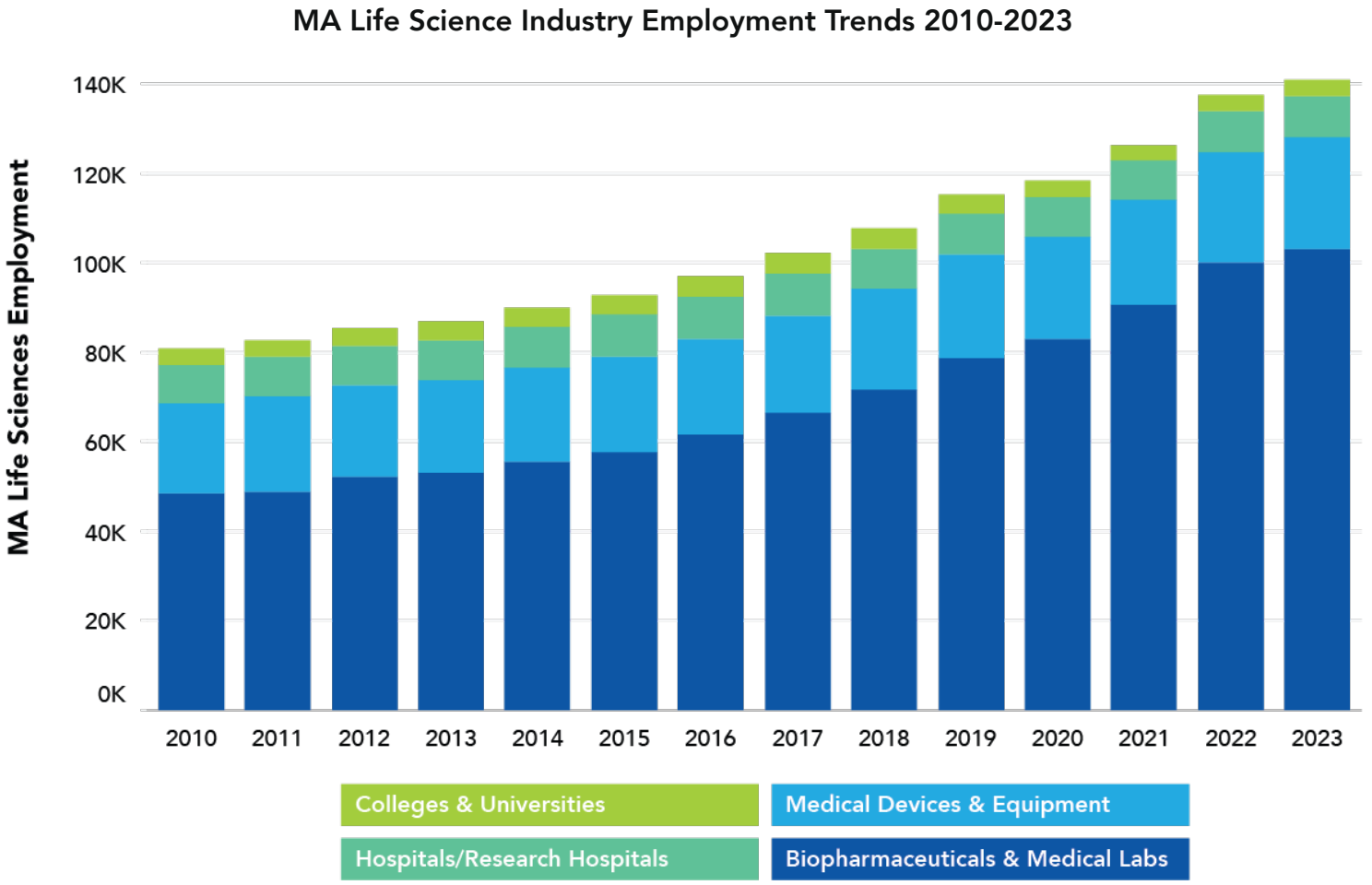

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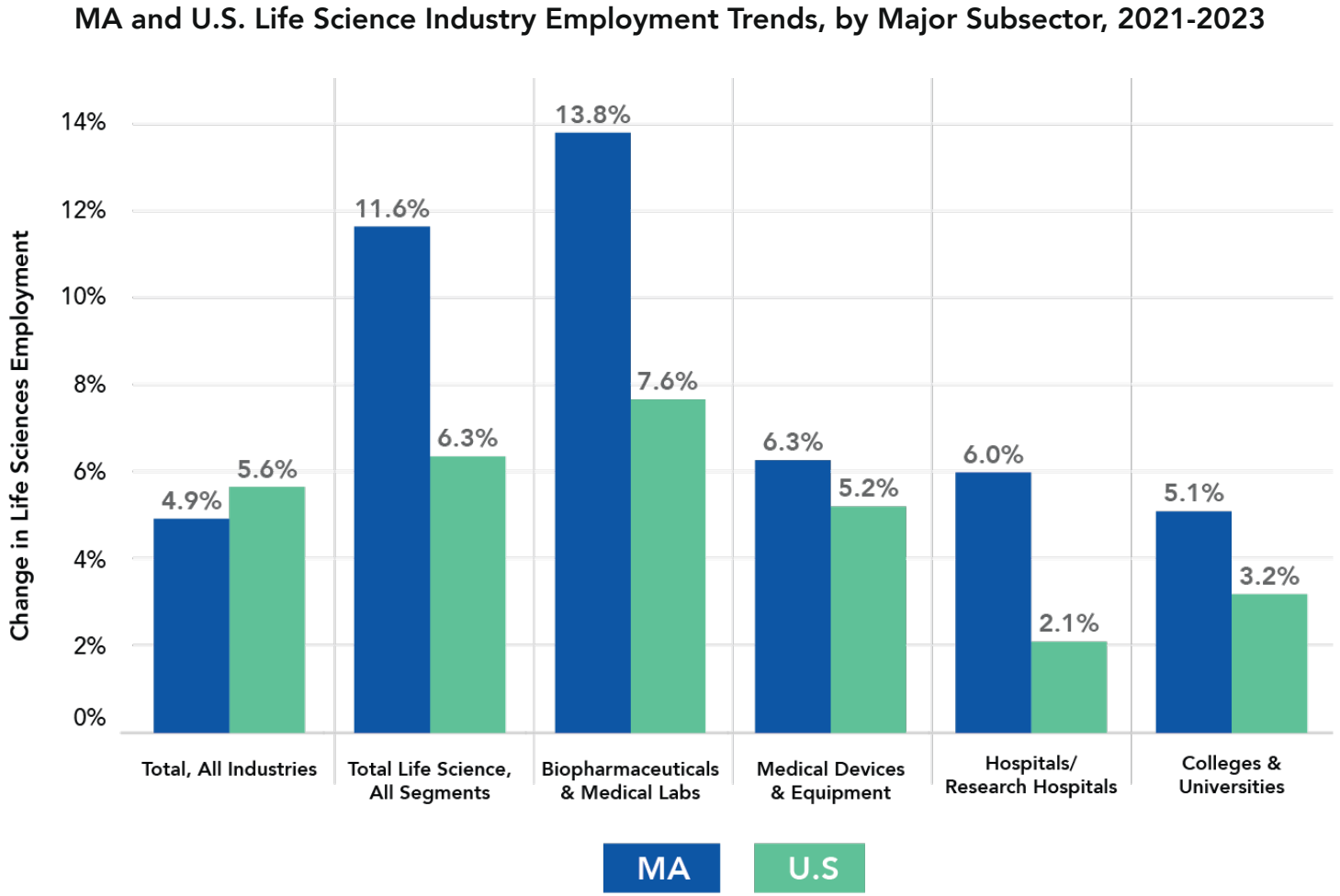
Source: TEConomy Partners' analysis of Lightcast QCEW Data, 2024.1

Amidst Slower Growth Environment, MA Life Sciences Industry Still Outpacing Broader U.S. Trends

- Life Sciences in MA has grown by 11.6% since 2021 compared to total employment growth of 4.9%
- MA life sciences growth has outpaced that of the U.S. by more than 5 percentage points since 2021



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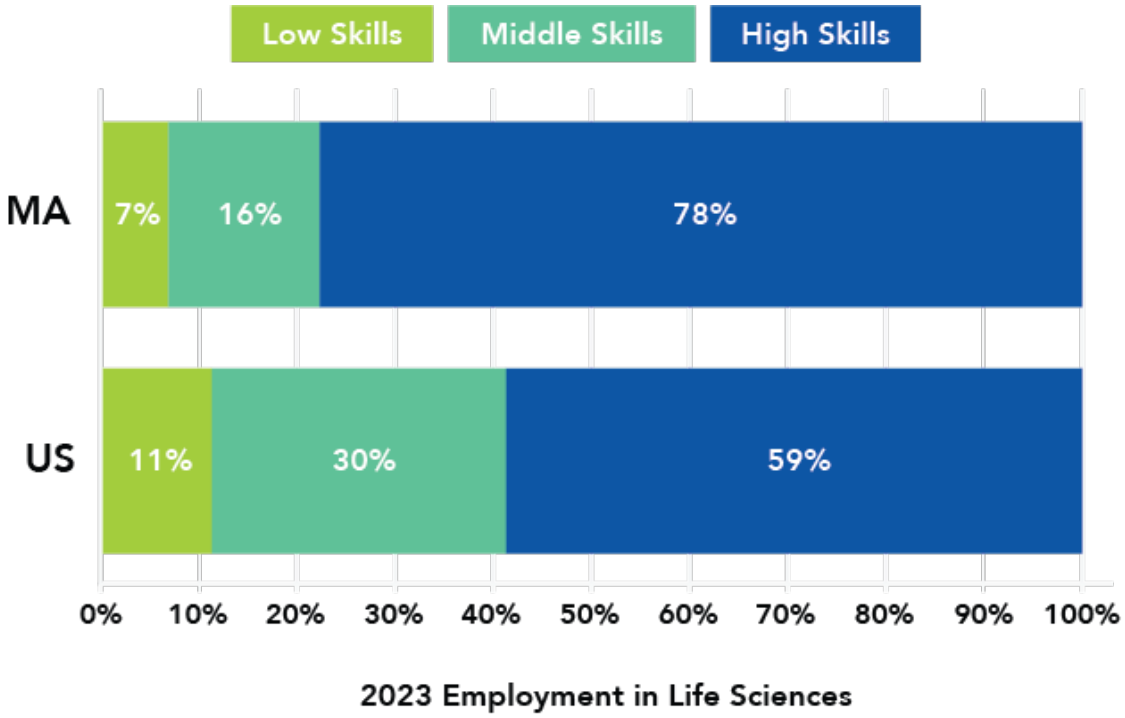
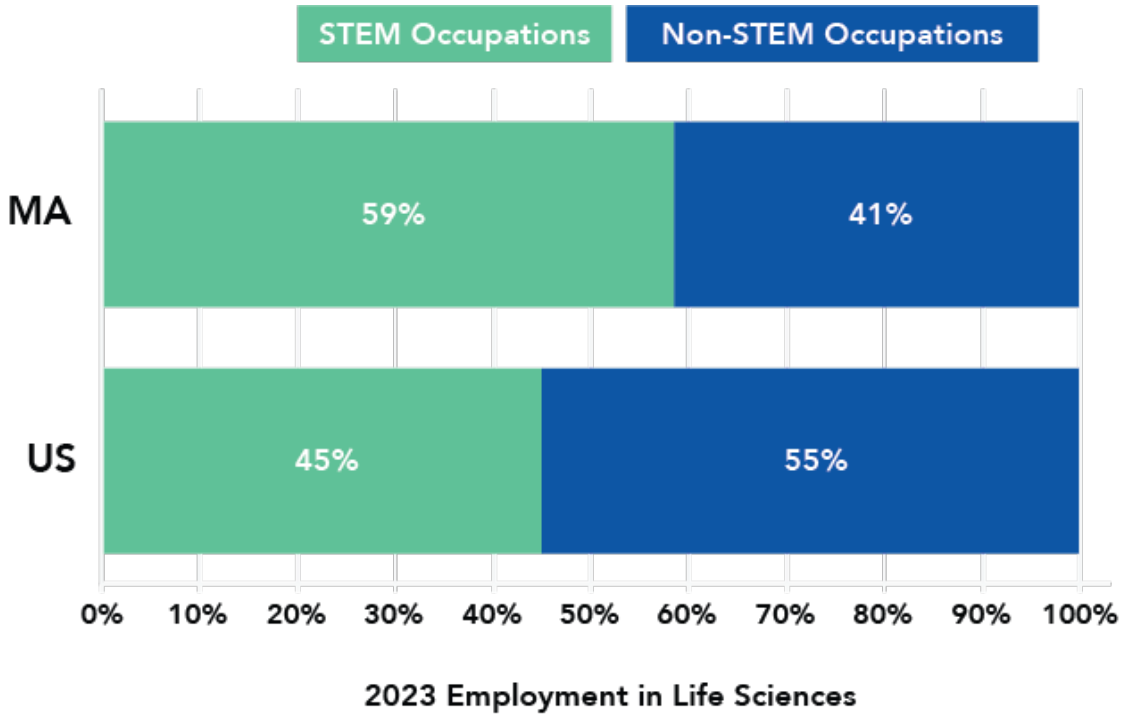
Massachusetts Remains a Hub for a Highly Specialized, STEM-Intensive Life Sciences Workforce

Occupational Employment by Skills Levels & STEM Job Classifications Within MA Biopharmaceuticals & Medical Labs Industries, 2023





Note: Skills level determined from typical federal classifications of required education, training, and experience. "High skills" occupations typically require a bachelor's degree or higher, "middle skills" jobs typically require more education and/or experience than a high school education but less than a bachelor's degree, and "low skills" jobs typically require a high school education or less.
Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

MA Life Sciences Industry Has Continued to Grow its High Skills Labor Segments, Expand Engineering Workforce

Job growth in key occupational segments since 2021:

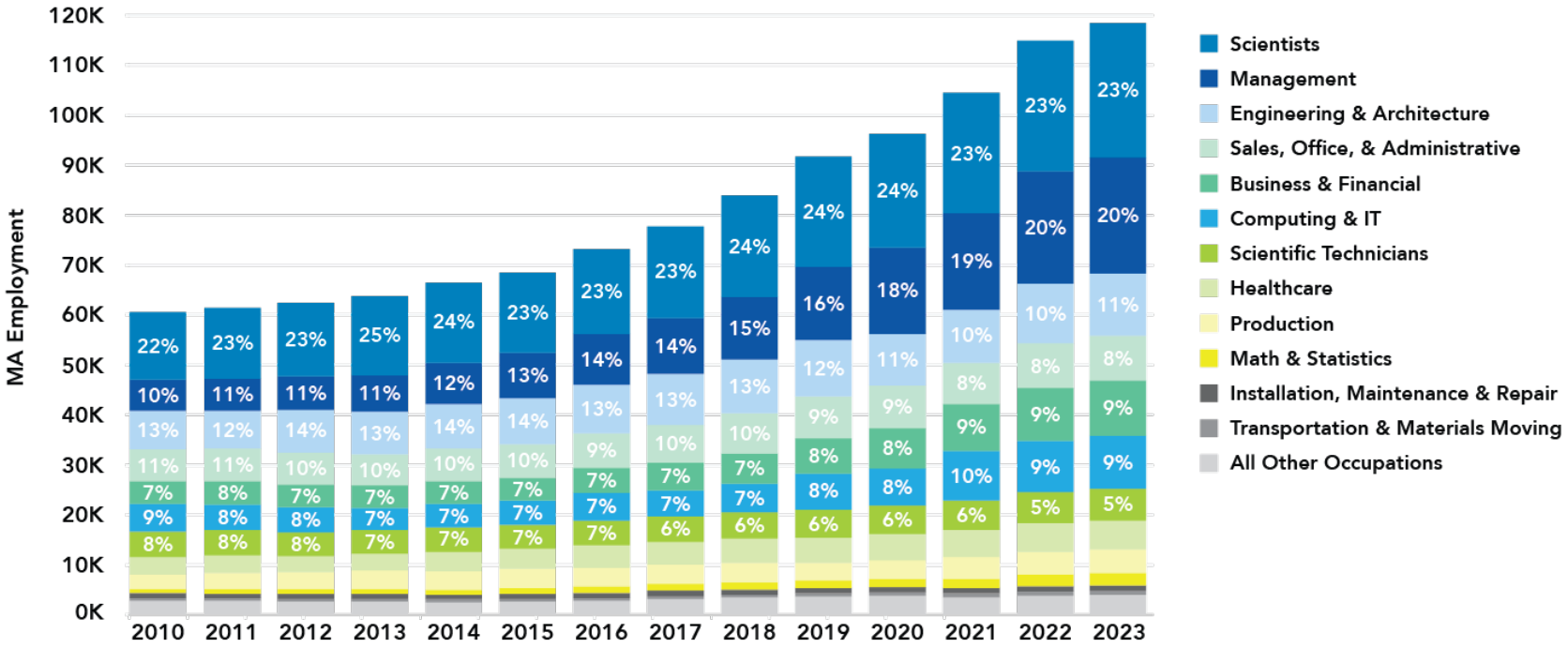
Life Scientists
- 2.8k jobs
- 12% growth

Management
- 3.8k jobs
- 20% growth

Engineering
- 1.9k jobs
- 19% growth

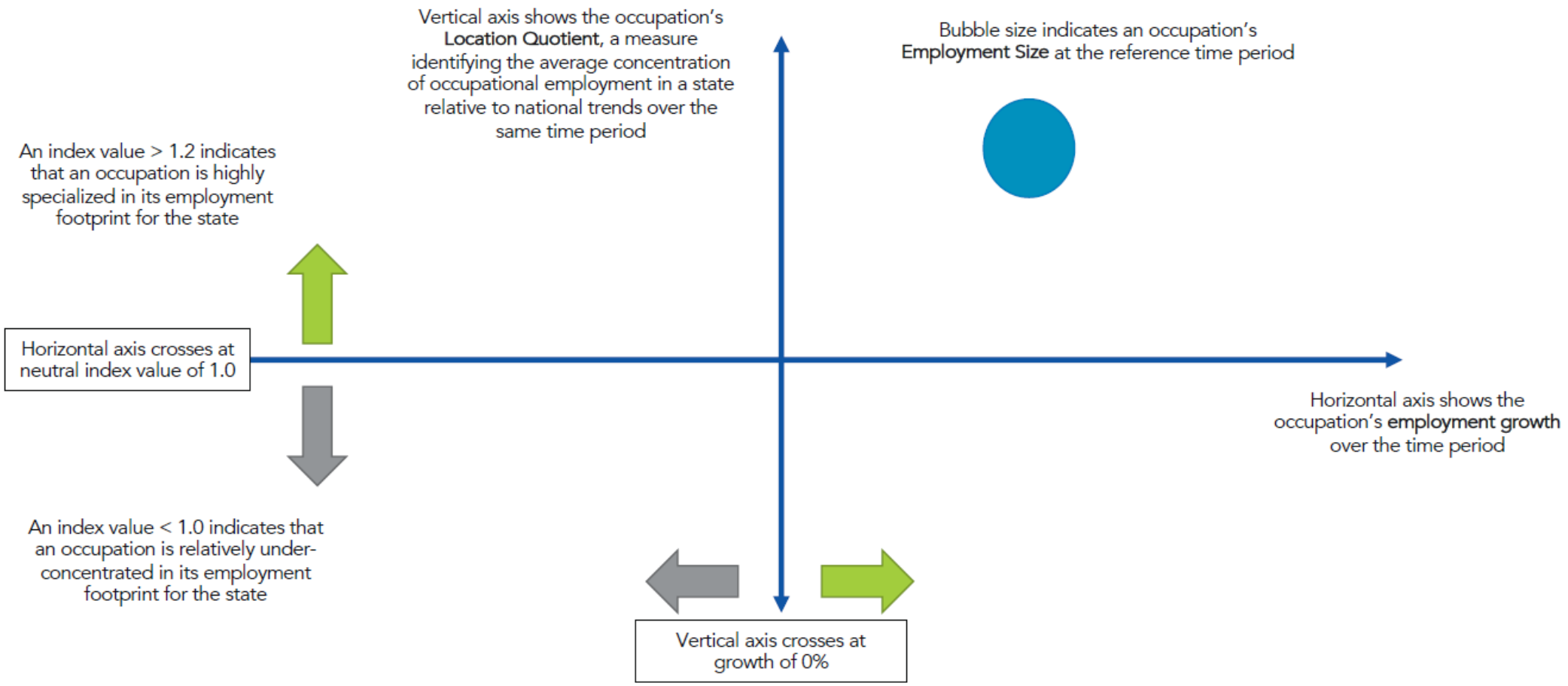
Business & Financial
- 1.6k jobs
- 17% growth

Occupational Employment Trend Within MA Biopharmaceuticals & Medical Labs Industries, 2010-2023



Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

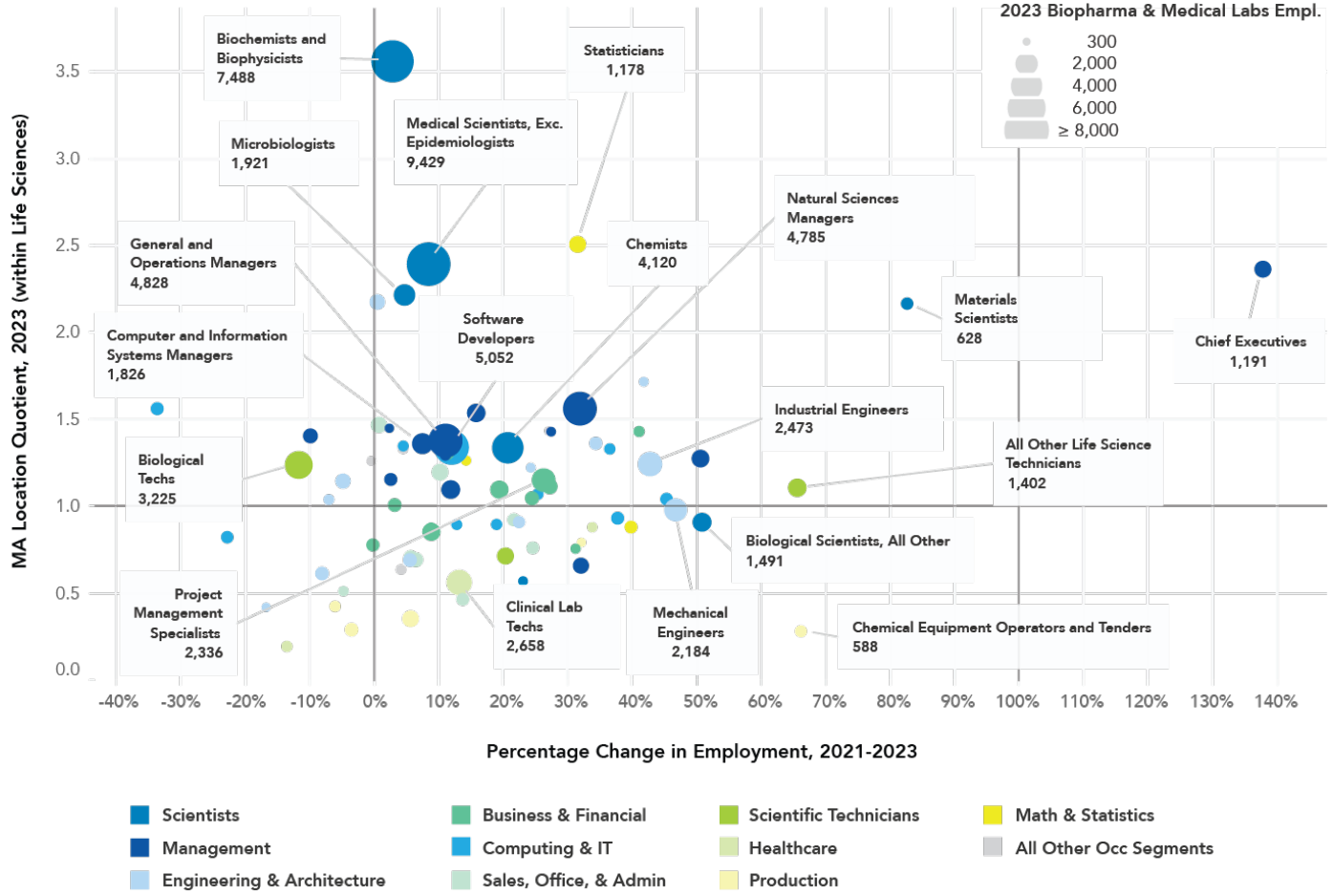
How to Read Detailed Life Sciences Occupational Employment Profiles Shown on Subsequent Slide



Performance & Position of Detailed Occupations Within Life Sciences: Ongoing Specializations in Life Scientists, Strong Growth in Engineering

- MA has further increased the specialized position of its life scientist workforce, but some evidence of flattening growth relative to pandemic trends
- Strong post-pandemic growth in mechanical and industrial engineers
- Mixed picture for technician and production occupations with some roles seeing increased growth, but biological tech growth slowing
- Weaker growth rates in software development and IT occupations may signal slowing hiring of tech workers
- Increasing role of biostatistics evidenced by growing statistician roles
- Managers, business support occupations remain large, growing segments

Occupational Employment in MA Life Sciences Industry: Size, Relative Concentration, and Growth, 2021-23



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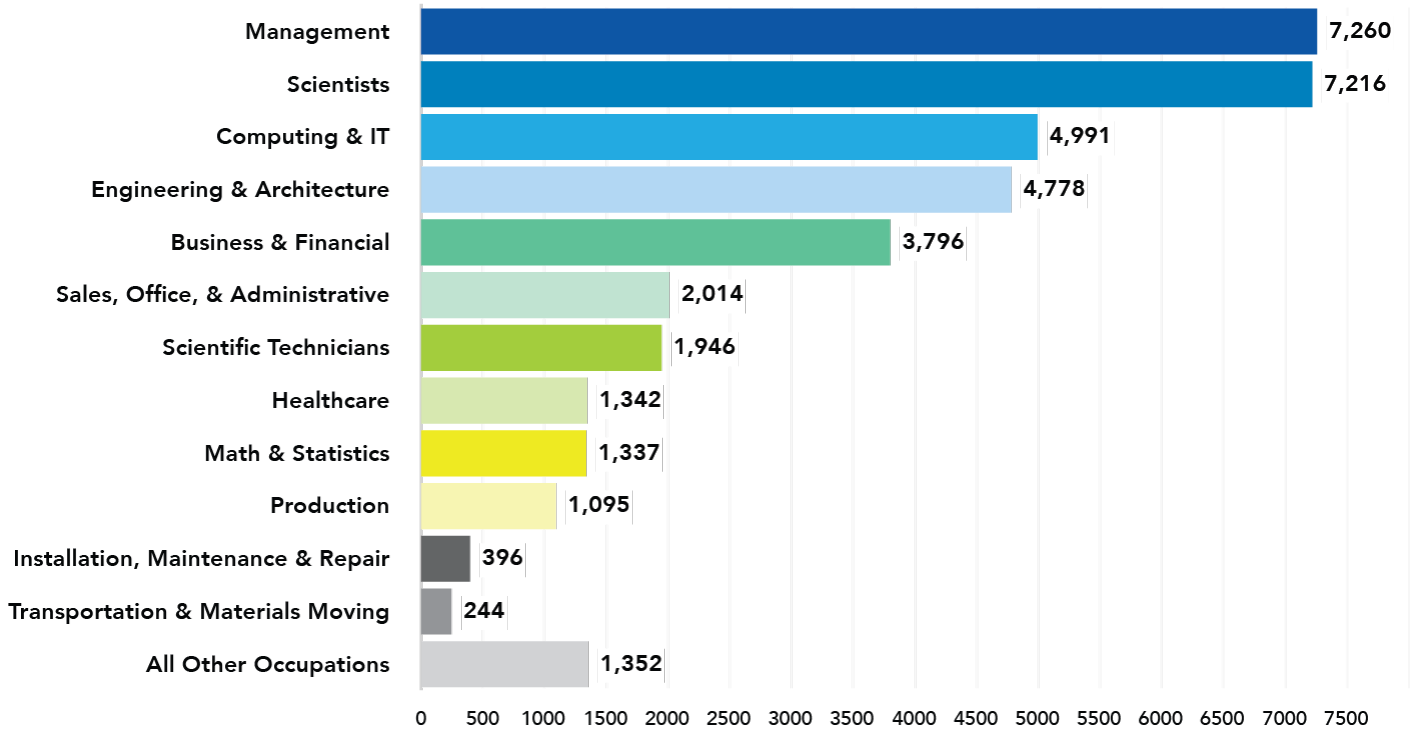


Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

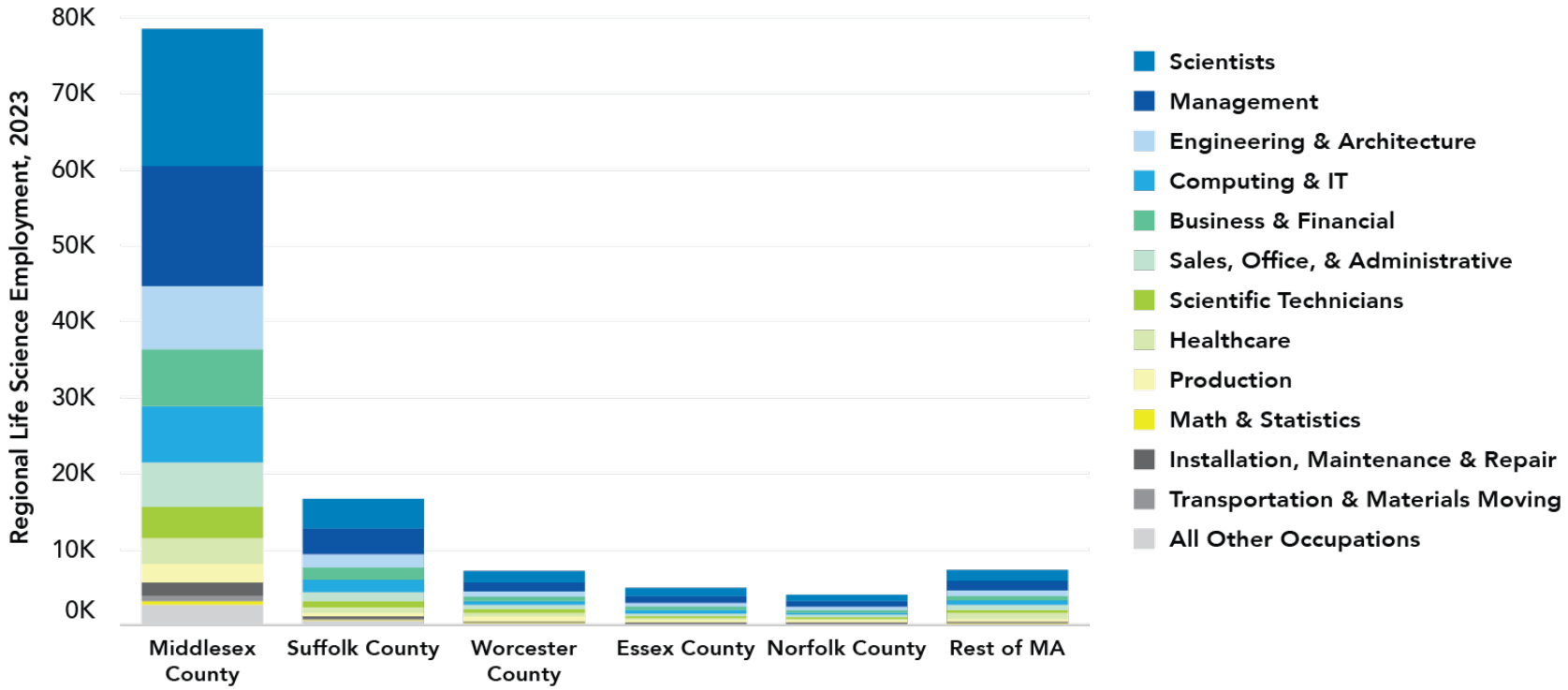
Geographic Footprint of the Life Sciences Industry Within Massachusetts

Of the over 118k life sciences workers in MA, more than 78k (encompassing more than 66% of the state's workforce) are located in Middlesex County. The industry has significant employment footprint in other key regions of the state, as well.

Growth in life sciences jobs from 2021-2023

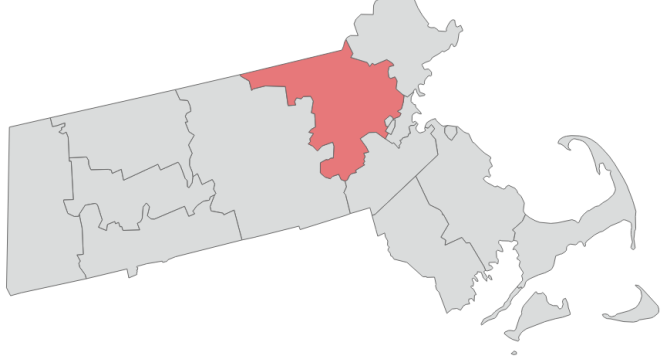
- Middlesex County – 12.6% growth
- Suffolk County – 21.9% growth
- Worcester County – 14.1% growth
- Essex County– 6.5% growth
- Norfolk County – 11.8% growth

Geographic Distribution of Occupational Employment Within MA Biopharmaceuticals & Medical Labs Industries, 2023



Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

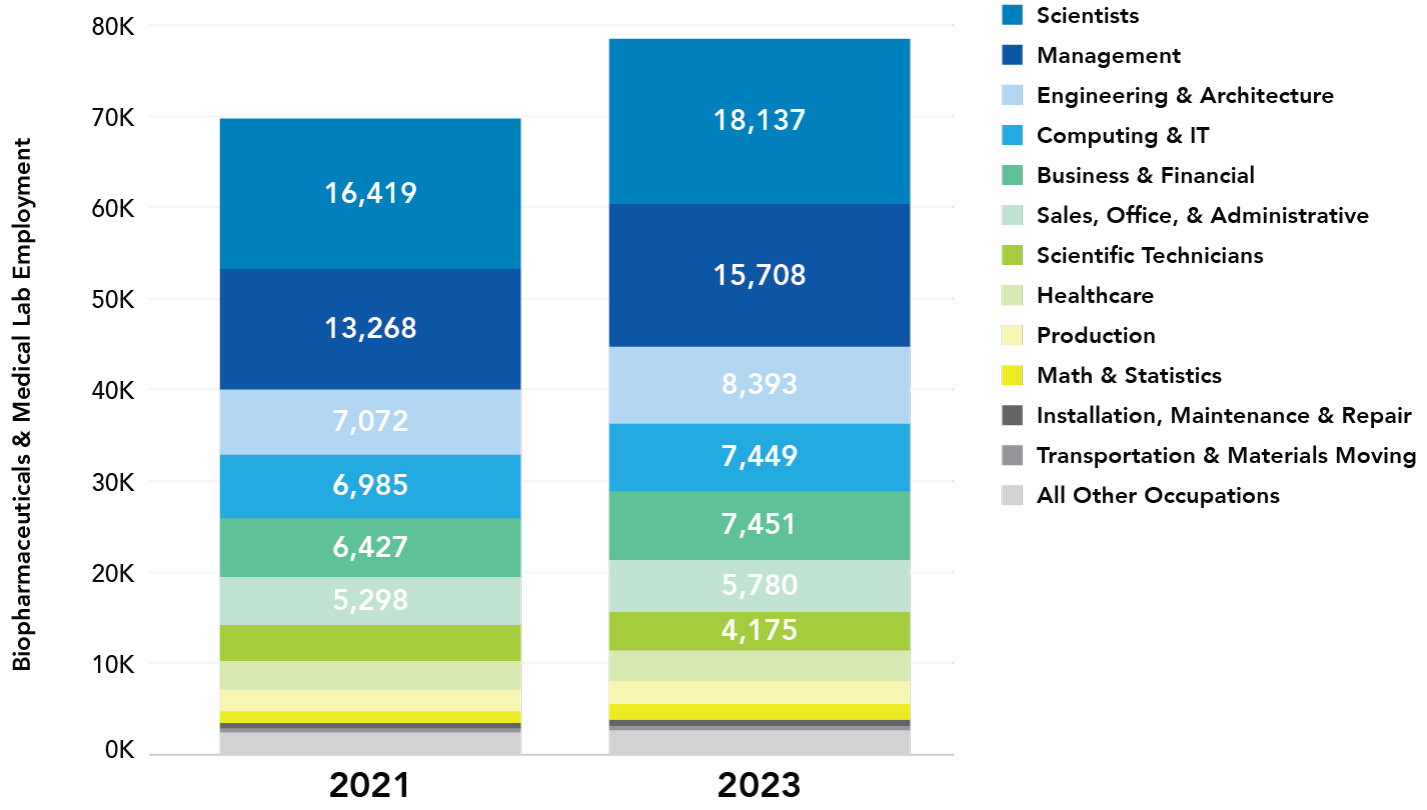
Geographic Profile: Middlesex County



Middlesex County's life sciences workforce expanded by more than 8.8k jobs over 2021-2023, over 12% growth in employment

Key Life Sciences Employers

- Takeda Pharmaceuticals
- Sanofi
- AstraZeneca
- Biogen
- Novartis
- EMD Serono
- Novo Nordisk



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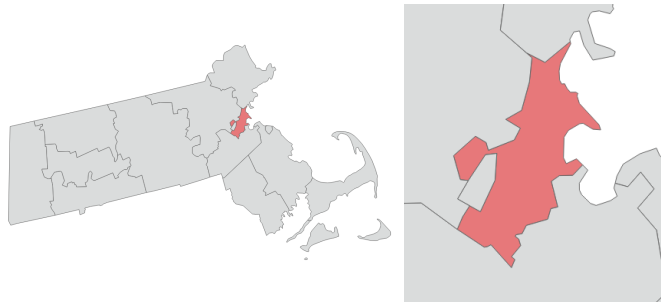
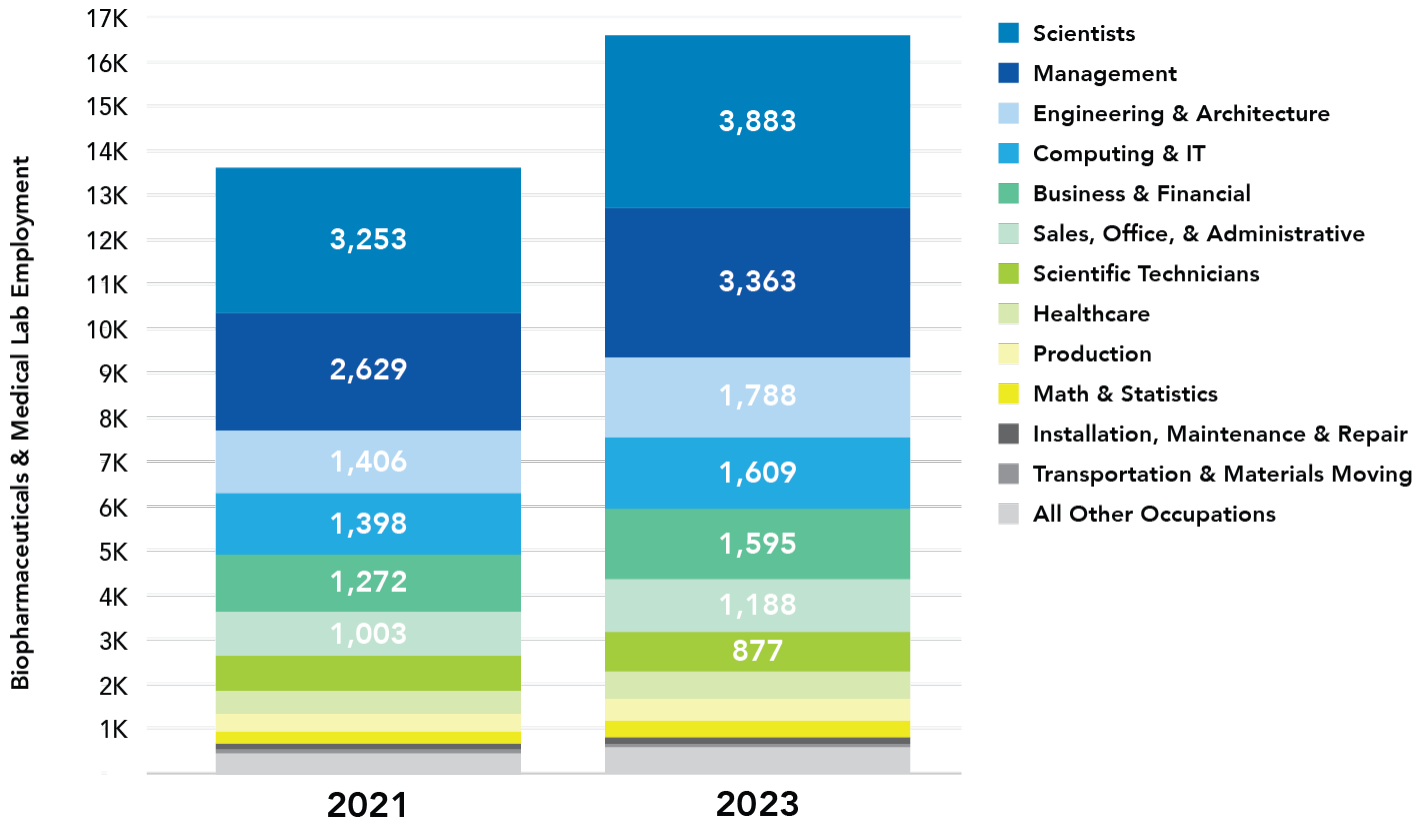
Geographic Profile: Suffolk County



Suffolk County's life sciences workforce expanded by nearly 3k jobs over 2021-2023, nearly 22% growth in employment

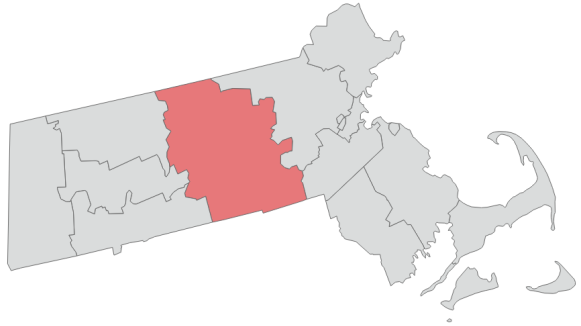
Key Life Sciences Employers

- Vertex Pharmaceuticals
- Ginkgo Bioworks
- Merck & Company
- Alexion
- Eli Lilly and Company



Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

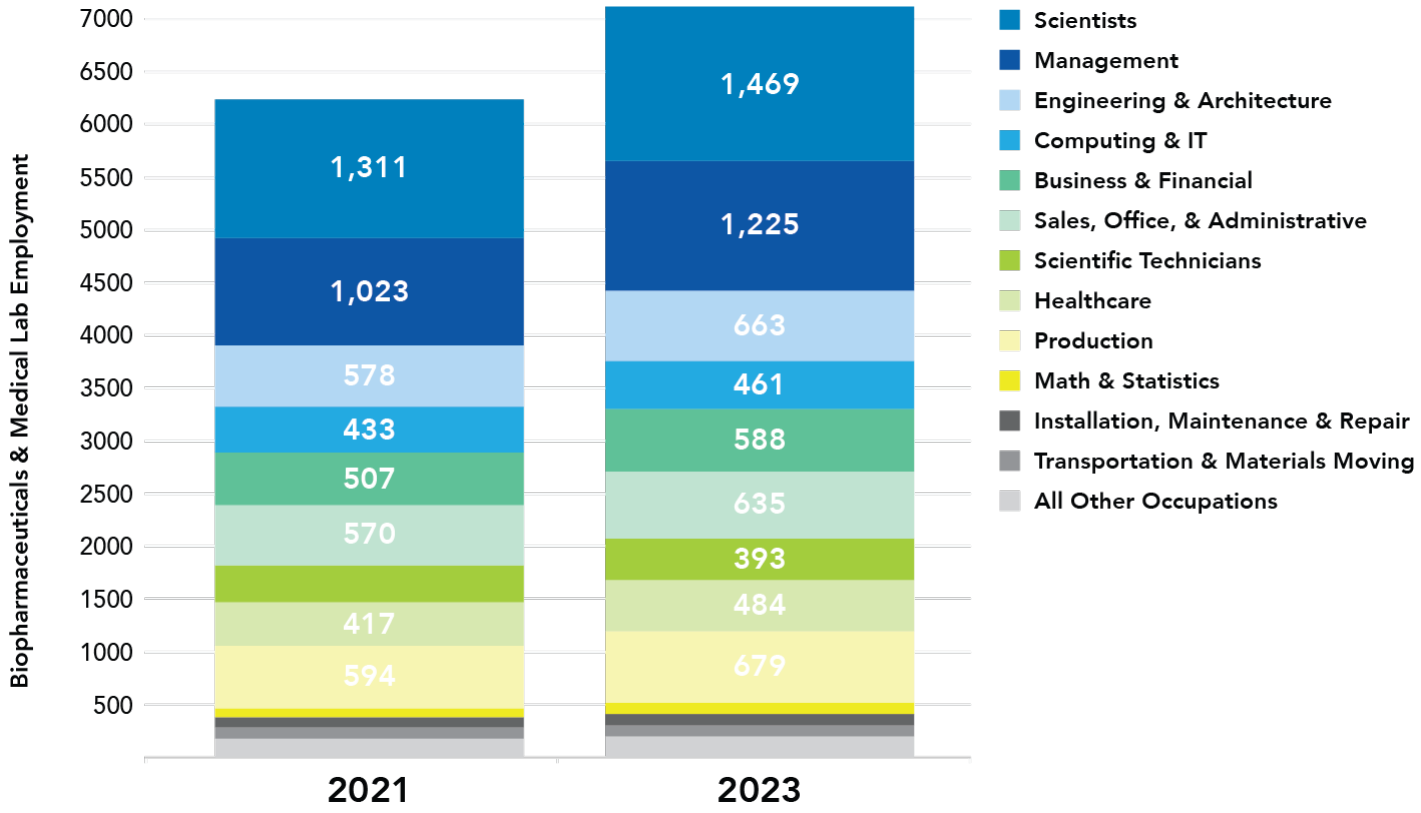
Geographic Profile: Worcester County



Worcester County's life sciences workforce expanded by more than 800 jobs over 2021-2023, a 14% growth in employment

Key Life Sciences Employers

- AbbVie
- Bristol Myers Squibb
- uBriGene
- WuXi Biologics



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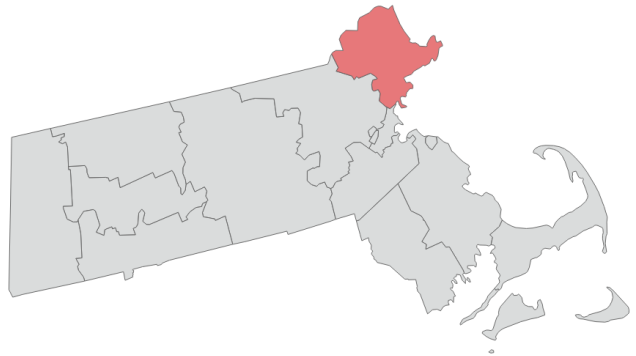
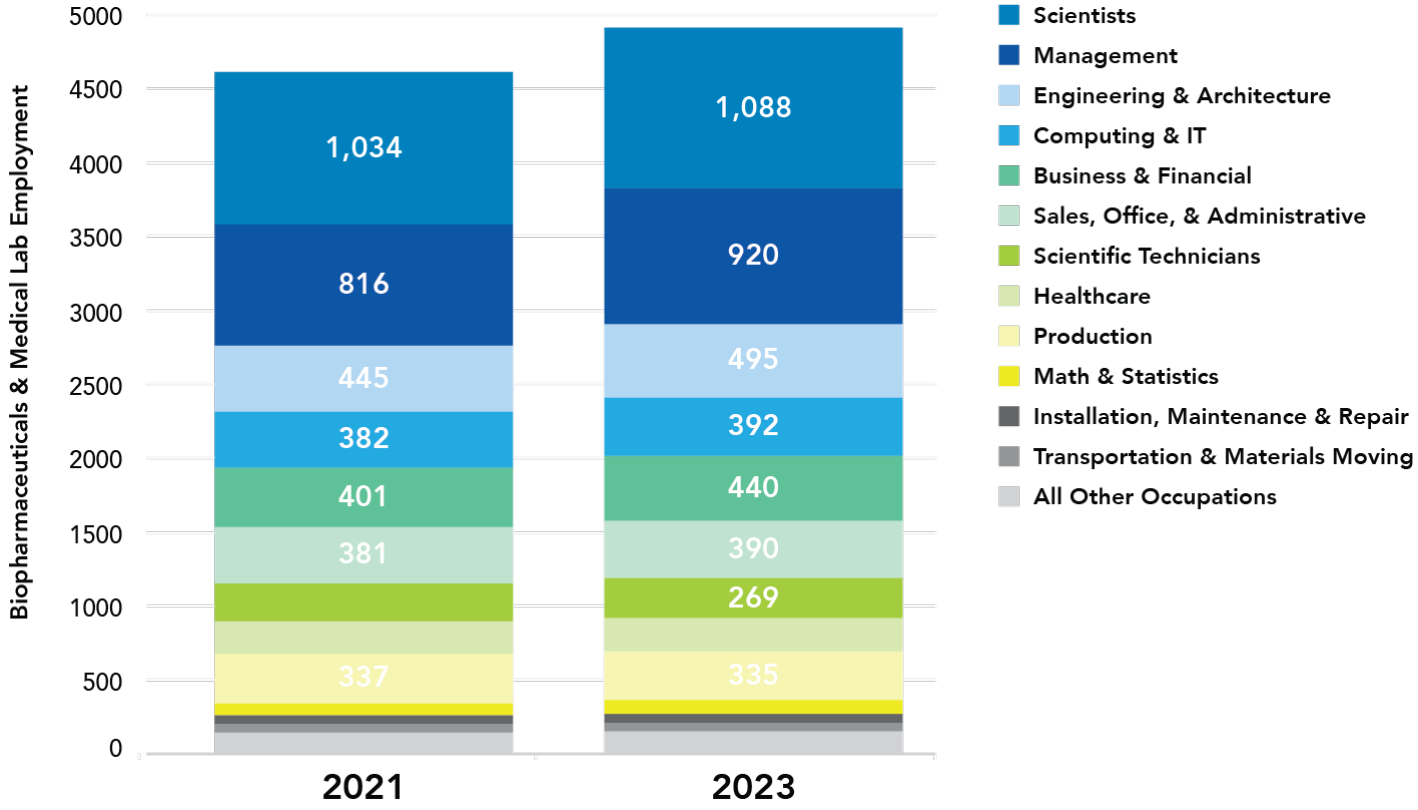
Geographic Profile: Essex County



Essex County's life sciences workforce expanded by than 300 jobs over 2021-2023, nearly 7% growth in employment

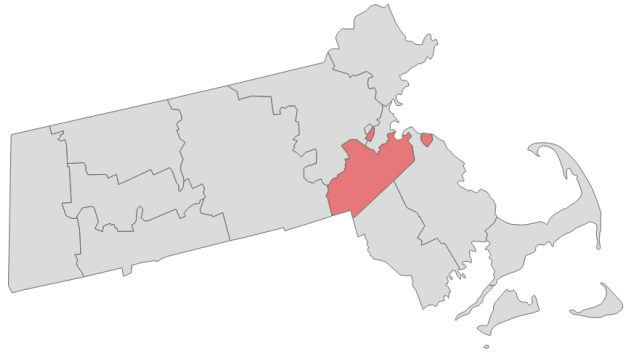
Key Life Sciences Employers

- Pfizer
- Millipore Sigma
- New England Biolabs



Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

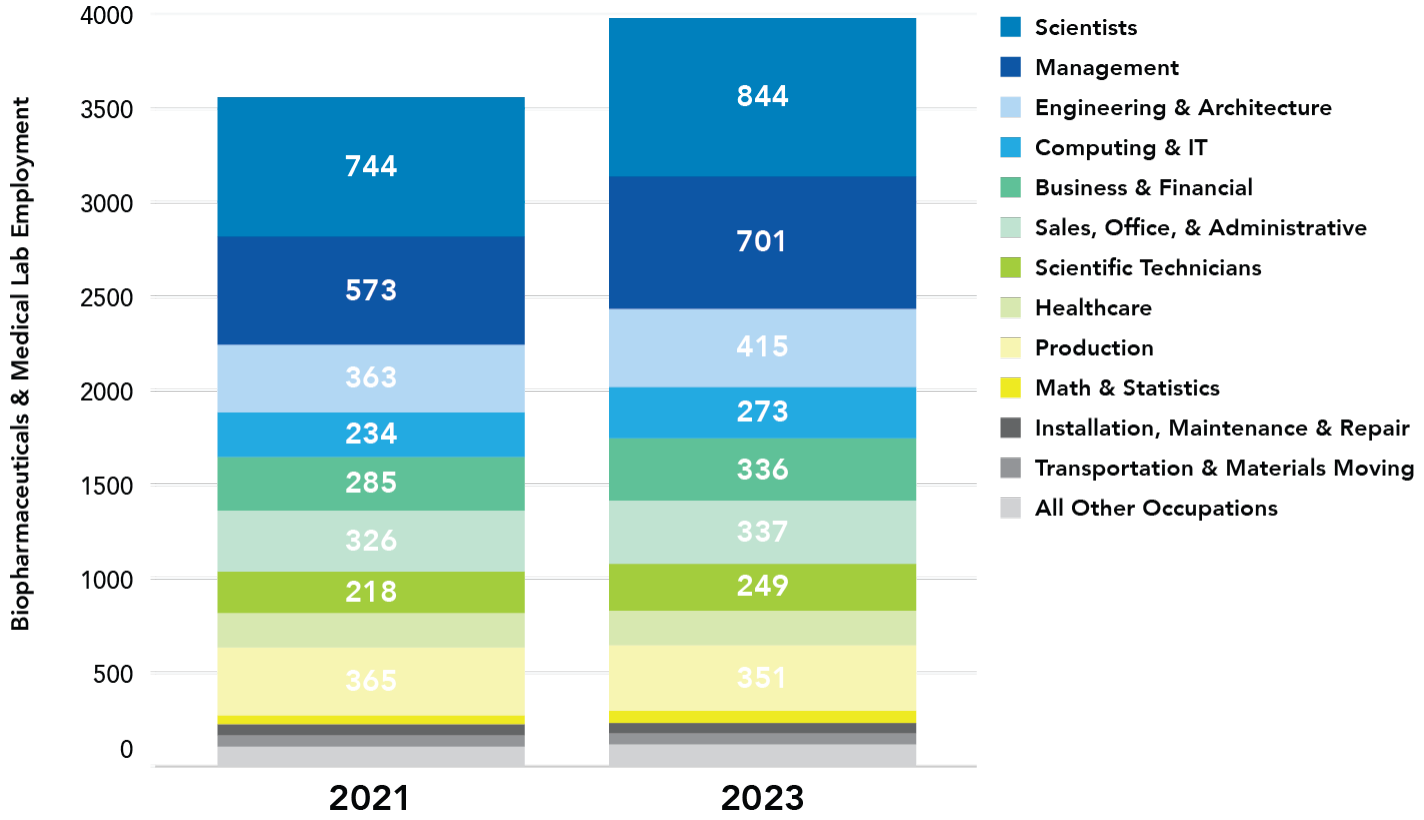
Geographic Profile: Norfolk County



Norfolk County's life sciences workforce expanded by more than 400 jobs over 2021-2023, nearly 12% growth in employment

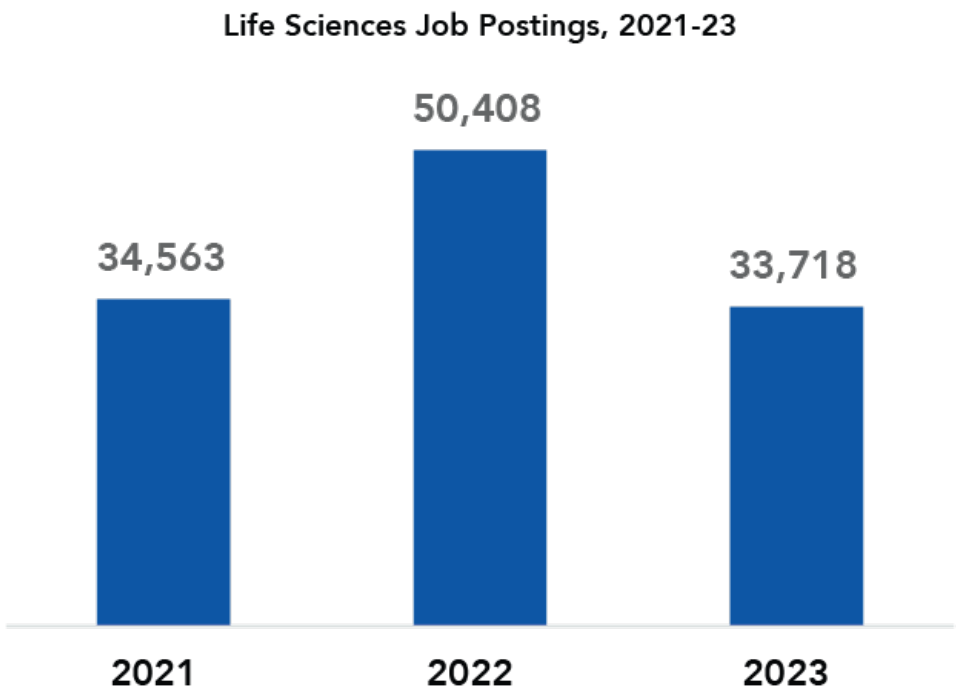
Key Life Sciences Employers

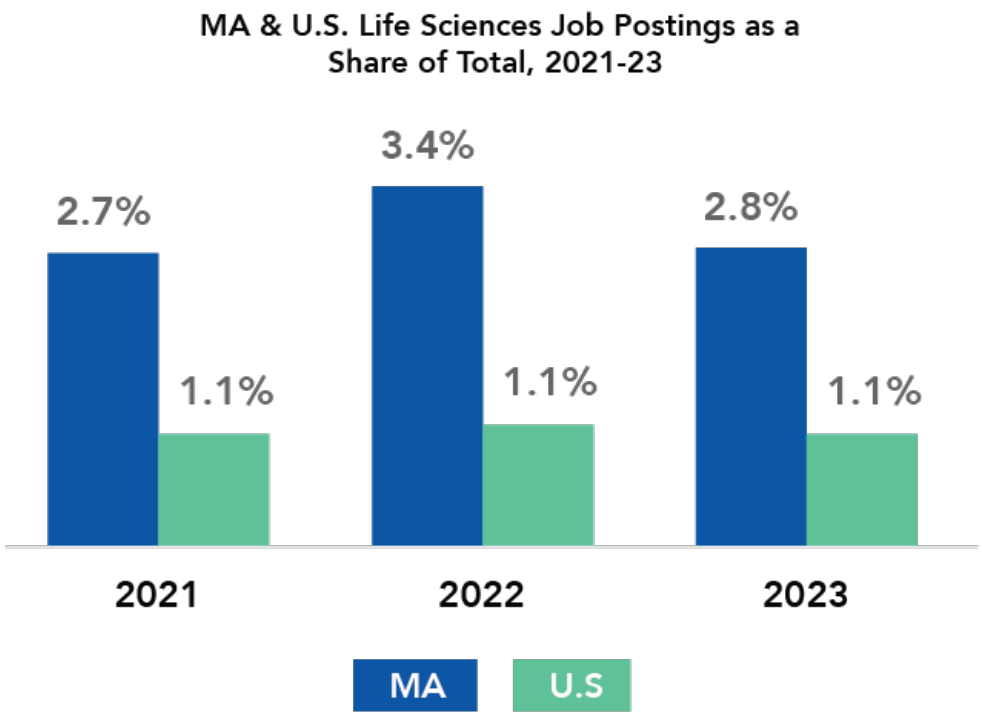
- Moderna
- Alnylam Pharmaceuticals
- Thermo Fisher Scientific



Note: Postings data shown above includes only biopharmaceuticals and medical labs industry sectors; the individual years in trend analysis will not sum to cumulative totals due to unique postings that span individual years
Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

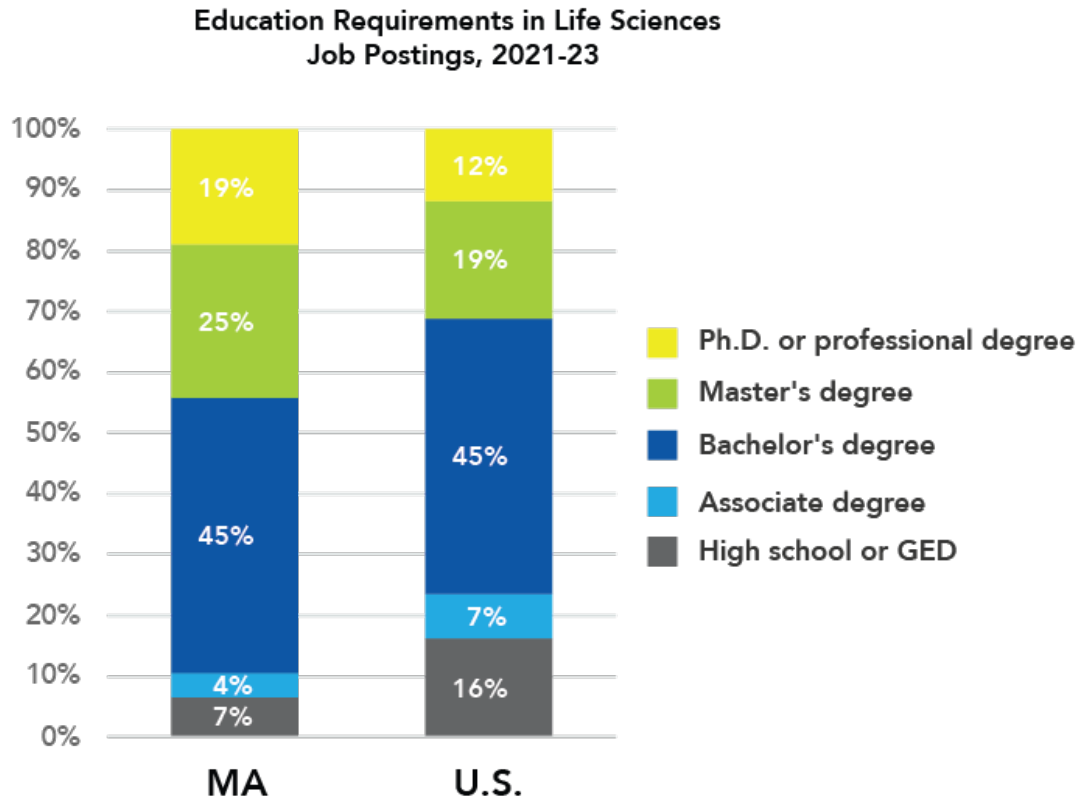
MA Life Sciences Job Postings Activity Significantly Decreased from 2022 to 2023, a Leading Indicator of Softening Labor Demand by Industry, and a Return to 2021 Activity Levels

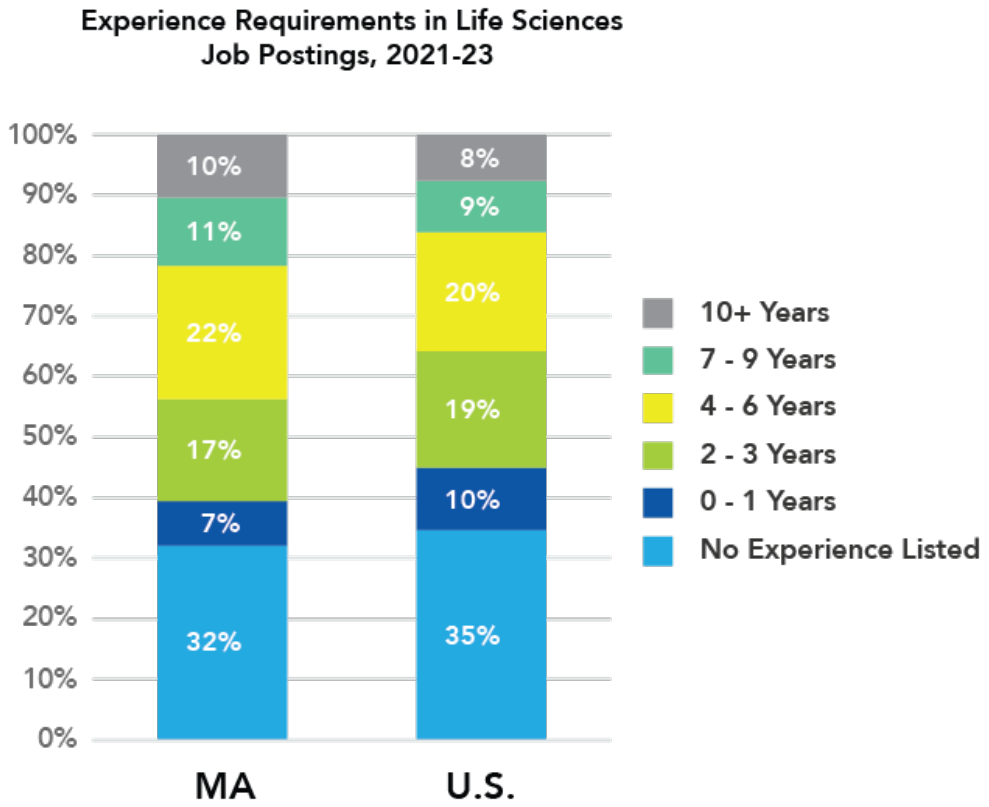




Note: Postings data shown above includes only biopharmaceuticals and medical labs industry sectors; the individual years in trend analysis will not sum to cumulative totals due to unique postings that span individual years
Source: TEConomy Partners' analysis of Lightcast job postings database, 2024.1

MA Job Demand Remains Oriented Toward Higher Levels of Education and Experience Relative to U.S., but 56% of Postings Are Accessible with a Bachelor's Degree or Less

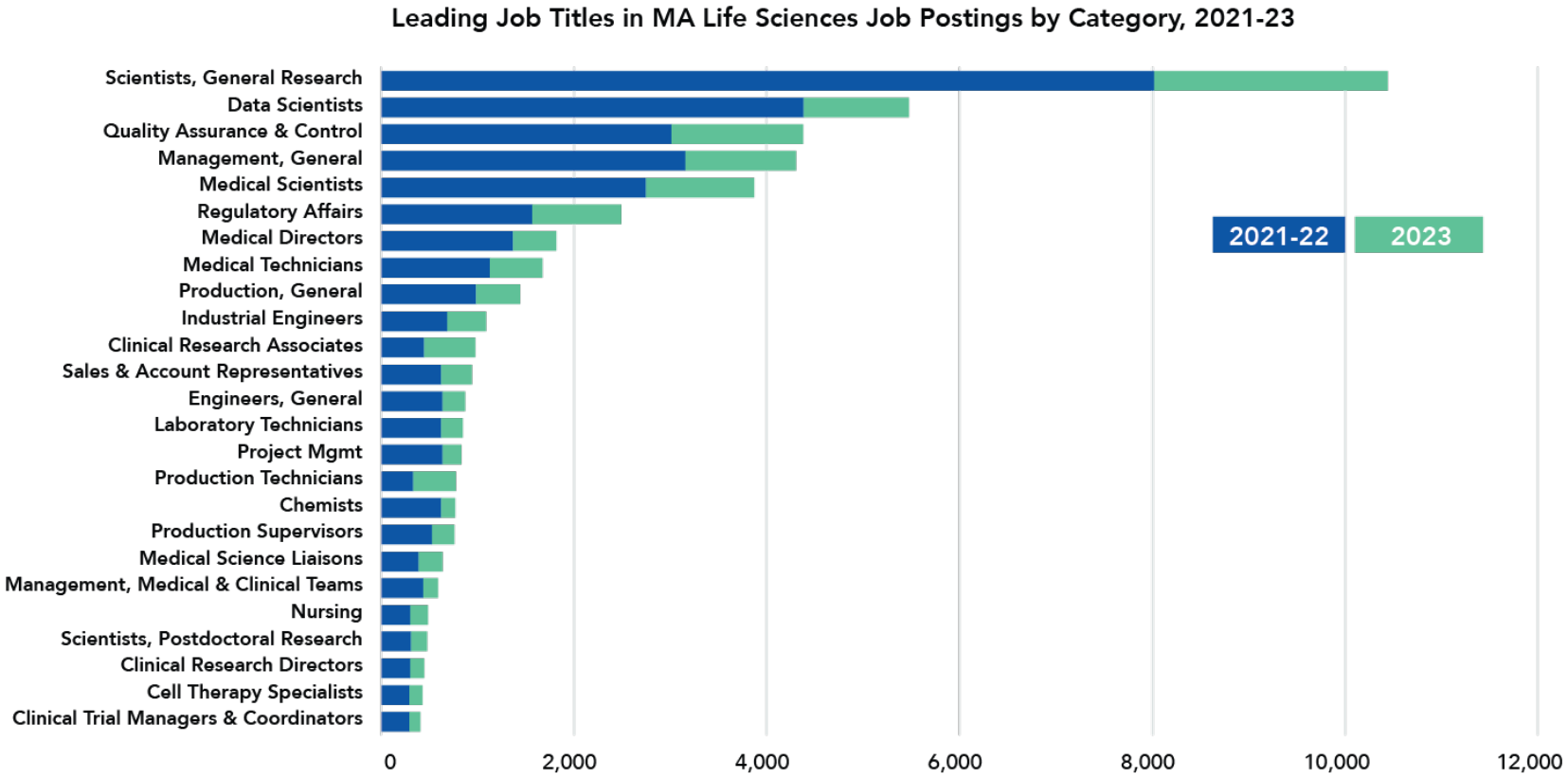




Note: Postings data shown above includes only biopharmaceuticals and medical labs industry sectors.
Source: TEConomy Partners' analysis of Lightcast job postings database, 2024.1

Strong Demand for Scientific and Data Sciences Workers Remains, Rising Manufacturing and QA/QC Activity in Job Postings

- Strong ongoing demand for Research Scientists (General Research, and Medical), Data Scientists, Quality Assurance and Control, and Management roles
- Significant shares of 2023 posting activity for production and manufacturing-related roles in life sciences, including Engineers, Production Technicians, and Production Supervisors
- Strong demand for industry support roles such as Regulatory Affairs, Clinical Research



Note: Postings data shown above includes only biopharmaceuticals and medical labs industry sectors; Lightcast limits information on job titles and corresponding numbers of postings to the top 1,000, limiting the ability to provide comprehensive totals by categories.
Source: TEConomy Partners' analysis of Lightcast job postings database, 2024.1

Who's Hiring: Leading Companies Hiring in MA Life Sciences

- Key employers driving life sciences hiring in MA include major pharmaceutical manufacturers, life science contract R&D firms, and medical and analytical lab service providers
- There were 12 major employers with more than 2,000 unique life sciences job postings each in the state during this 3-year period

Top 20 Companies by Unique Job Posting Totals for 2021-23 in Descending Order

Takeda Pharmaceutical Company	IQVIA
Moderna Therapeutics	AstraZeneca
Sanofi	Novartis
Vertex Pharmaceuticals	AbbVie
Bristol-Myers Squibb	Alexion Pharmaceuticals
Pfizer	Eurofins
Johnson & Johnson	GlaxoSmithKline
Charles River Laboratories	LabCorp Drug Development
Biogen	Parexel
Quest Diagnostics	Merck

Note: Postings data shown above includes only biopharmaceuticals and medical labs industry sectors.
Source: TEConomy Partners' analysis of Lightcast job postings database, 2024.1

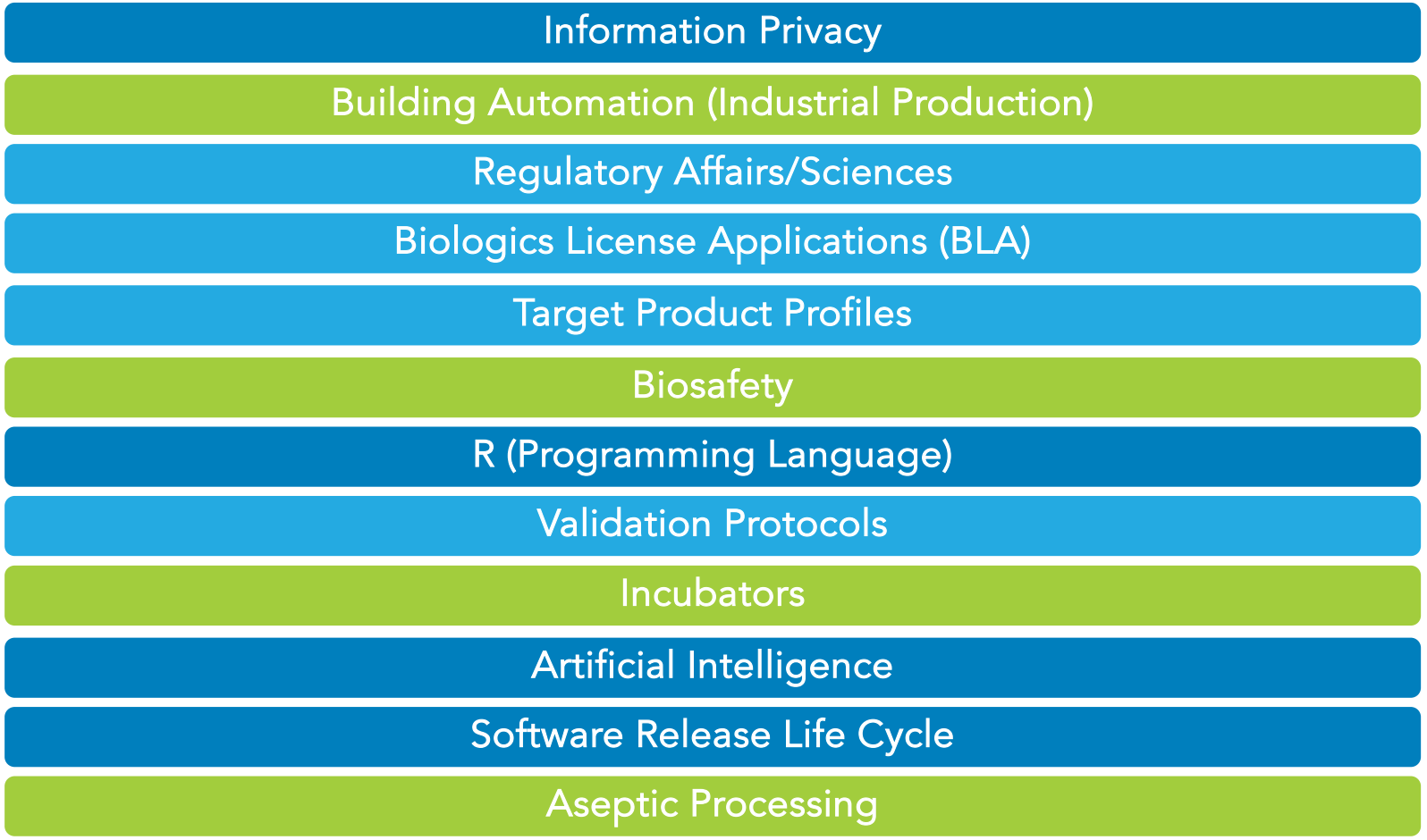
Trends in Job Postings Highlight Rising Importance of Data Privacy, Information Management, and Regulatory Sciences Skills

Data Science, Software, and Other Digital Skills

Biosciences Production & Manufacturing Skills

Life Sciences Business & Research Skills

Top 12 Skills in Life Sciences Job Postings Ranked by Increase in Activity from 2021-2023



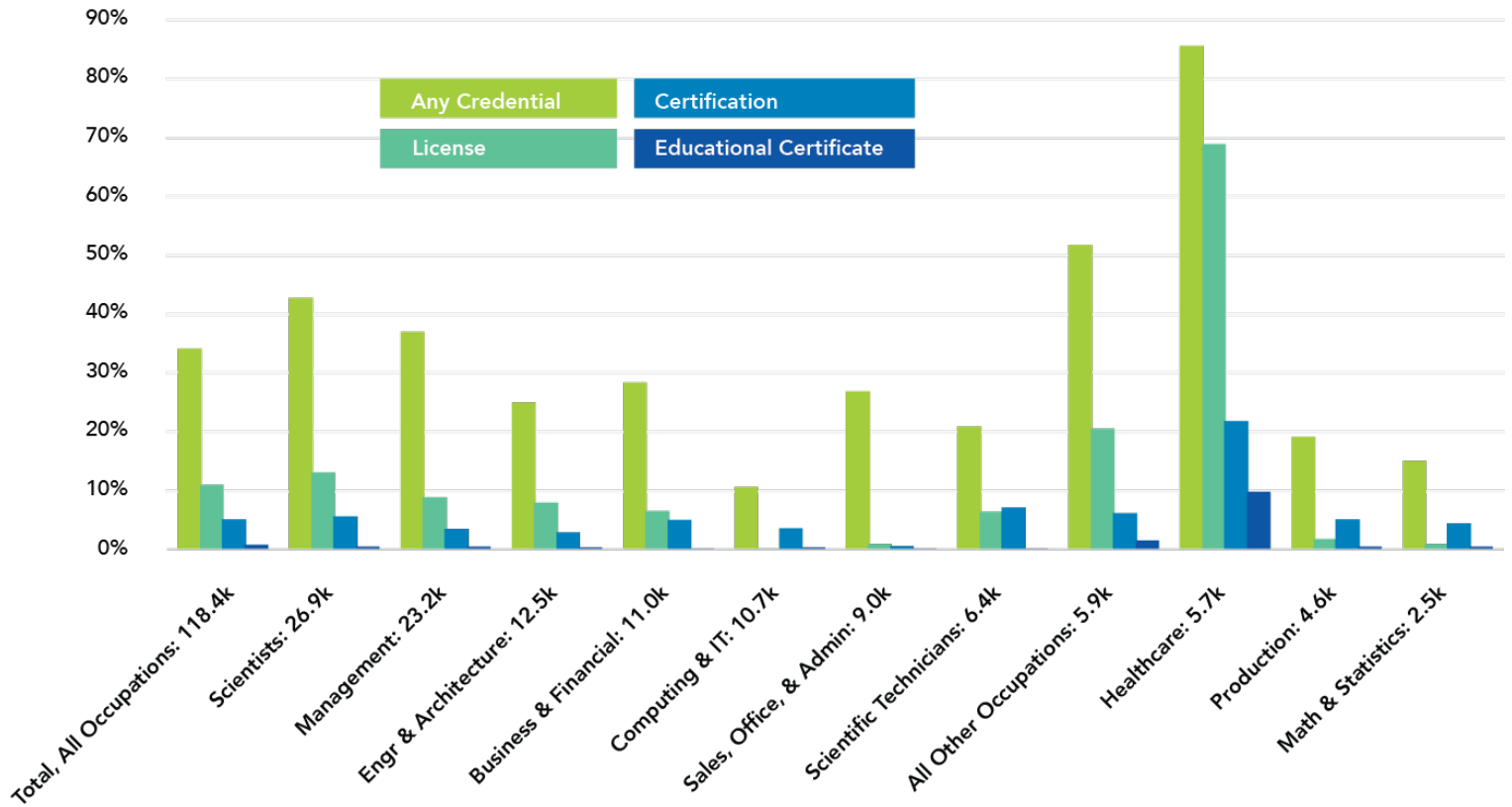
Note: Postings data shown above includes only biopharmaceuticals and medical labs industry sectors.
Source: TEConomy Partners' analysis of Lightcast job postings database, 2024.1

National Data on Requirements for Life Sciences Workers Shows Significant Need for Non-Degree Credentials Across Segments

Credentials include training time required as a condition of hiring, which often results in certifications, licenses, or educational certificates that are a part of education, training, and experience requirements but are distinct from educational degrees. Credential requirements include:

- Certifications which are issued by a certification body, industry association, or professional association
- Educational certificates which are issued by an educational institution (or a training provider)
- Licenses which are issued by a government agency
- Apprenticeships, vocational training, non-credit courses, and credit courses that do not result in a degree are included in the "any credential category" alongside other credential types

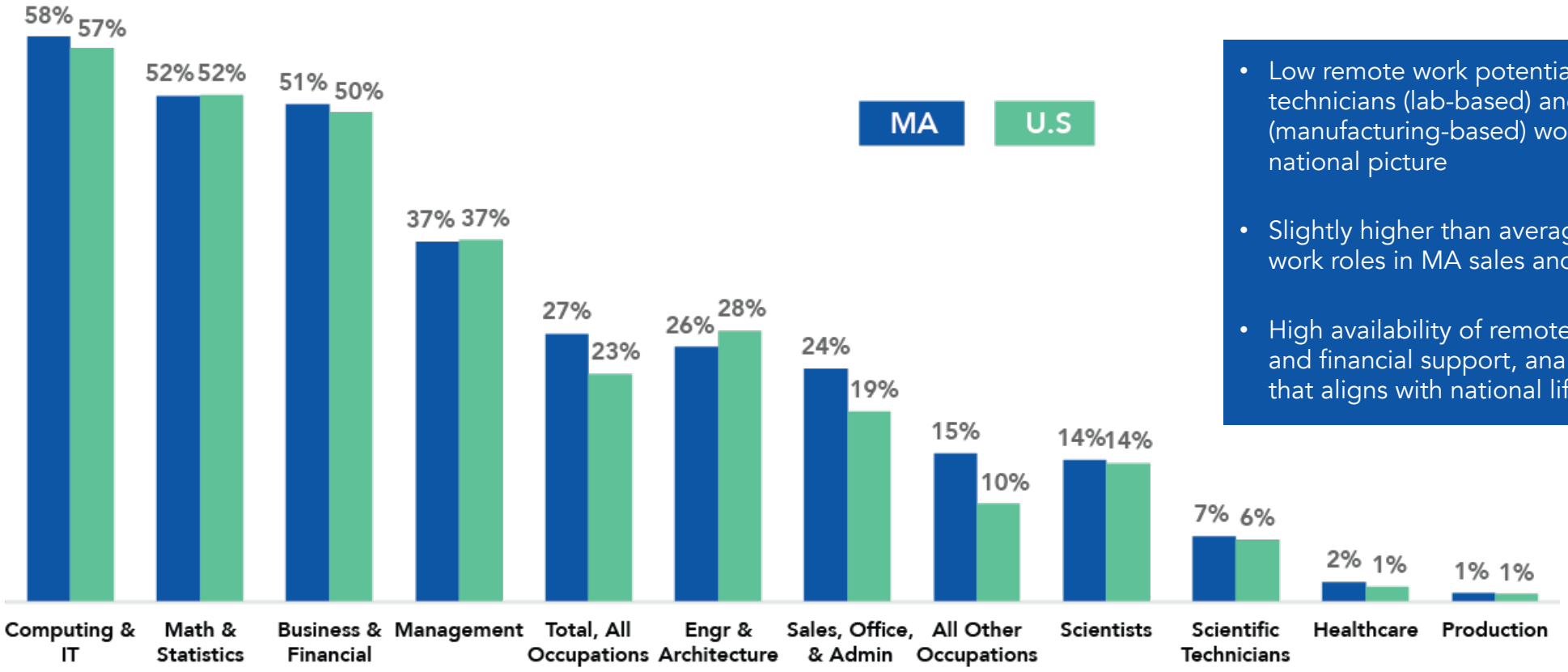
Estimated* Percent of MA Life Sciences Workers by Occupational Segment with Credential Requirements, 2023



*Note: ORS data are available only at the national level. National estimates of the share of employees with credentials by occupation were applied to Massachusetts' unique occupational mix to generate estimates of credential requirements by life sciences segment.
**The Occupational Requirements Survey (ORS) publishes job-related information on physical demands; environmental conditions; education, training, and experience; as well as cognitive and mental requirements. The job requirements reflect those necessary for workers to perform critical tasks in support of the critical job functions, and not the capabilities of individual workers. Credentials include training time required as a condition of hiring, which often results in certifications, licenses, or educational certificates and are part of the education, training, and experience requirements.
Source: TEConomy Partners' analysis of BLS Occupational Requirements Survey and Lightcast Staffing Patterns Data, 2024.1.

Availability of Remote Work for MA Life Sciences Workers Closely Mirrors National Trends, Presents Both a Limitation and Opportunity to Access Out of State Talent

Estimated* Percent of Workers by Occupational Segment with Telework Options Available, 2023



- Low remote work potential for scientific technicians (lab-based) and production (manufacturing-based) workers, mirroring national picture
- Slightly higher than average volume of remote work roles in MA sales and office occupations
- High availability of remote work in business and financial support, analytics, and IT roles that aligns with national life sciences market

	Computing & IT	Math & Statistics	Business & Financial	Management	Total, All Occupations	Engr & Architecture	Sales, Office, & Admin	All Other Occupations	Scientists	Scientific Technicians	Healthcare	Production
Total MA jobs	10,723	2,516	11,007	23,176	118,436	12,468	9,038	5,934	26,865	6,370	5,705	4,634

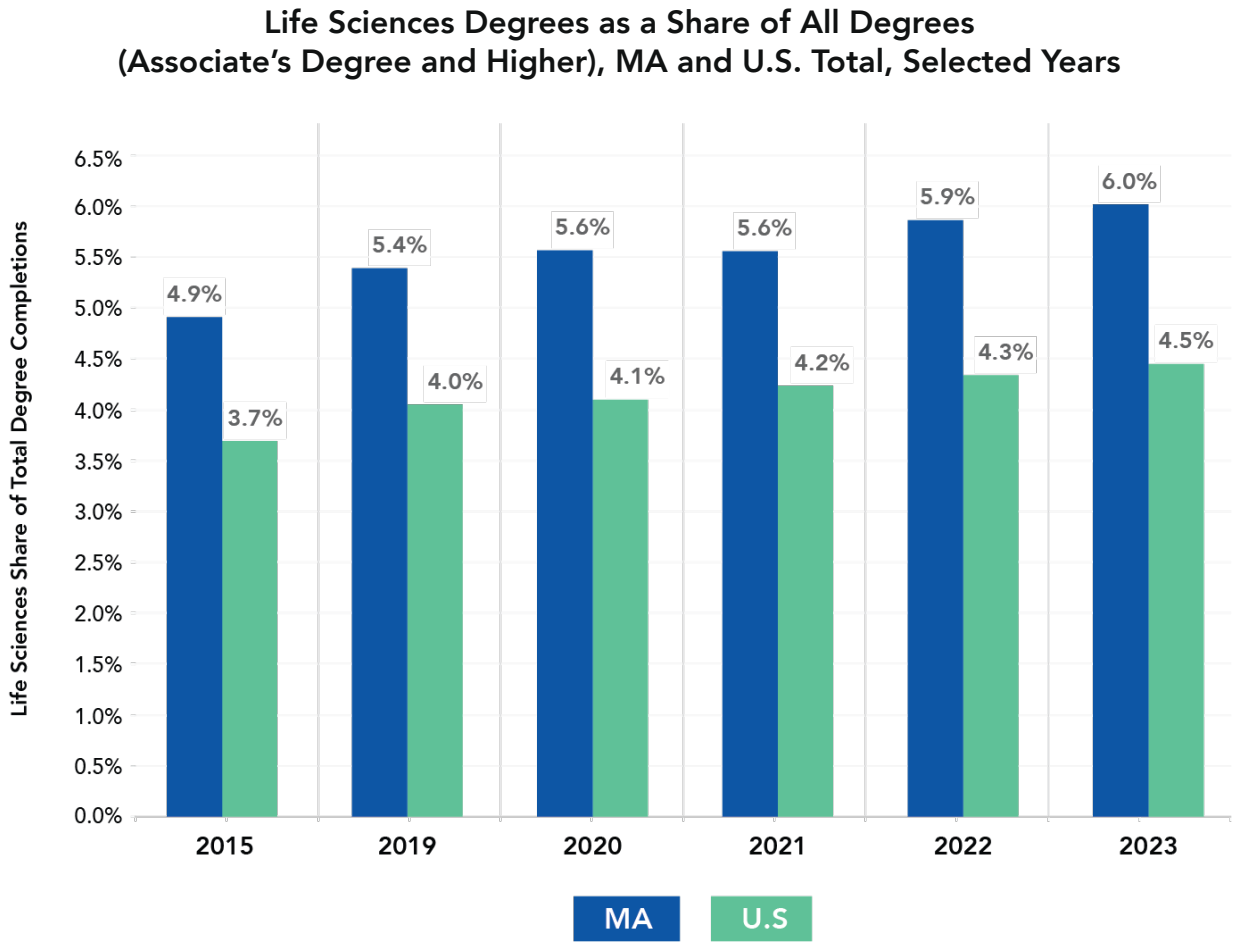
Note: ORS data are available only at the national level. National estimates of the share of employees with telework access by occupation were applied to Massachusetts' unique occupational mix to generate estimates of telework access by life sciences segment.
Source: TEConomy Partners' analysis of BLS Occupational Requirements Survey and Lightcast Staffing Patterns Data, 2024.1.

Massachusetts' Life Sciences Talent Pipeline: The Role of Educational Institutions in Generating Skilled Workers

MA Institutions Continue to Specialize in Life Sciences Talent Generation Relative to the U.S.

- Massachusetts remains nearly **1.4x more concentrated in life sciences degree production than the U.S. at large**

- MA state institutions generated an average of 7.6k life sciences degree graduates annually during 2021-2023

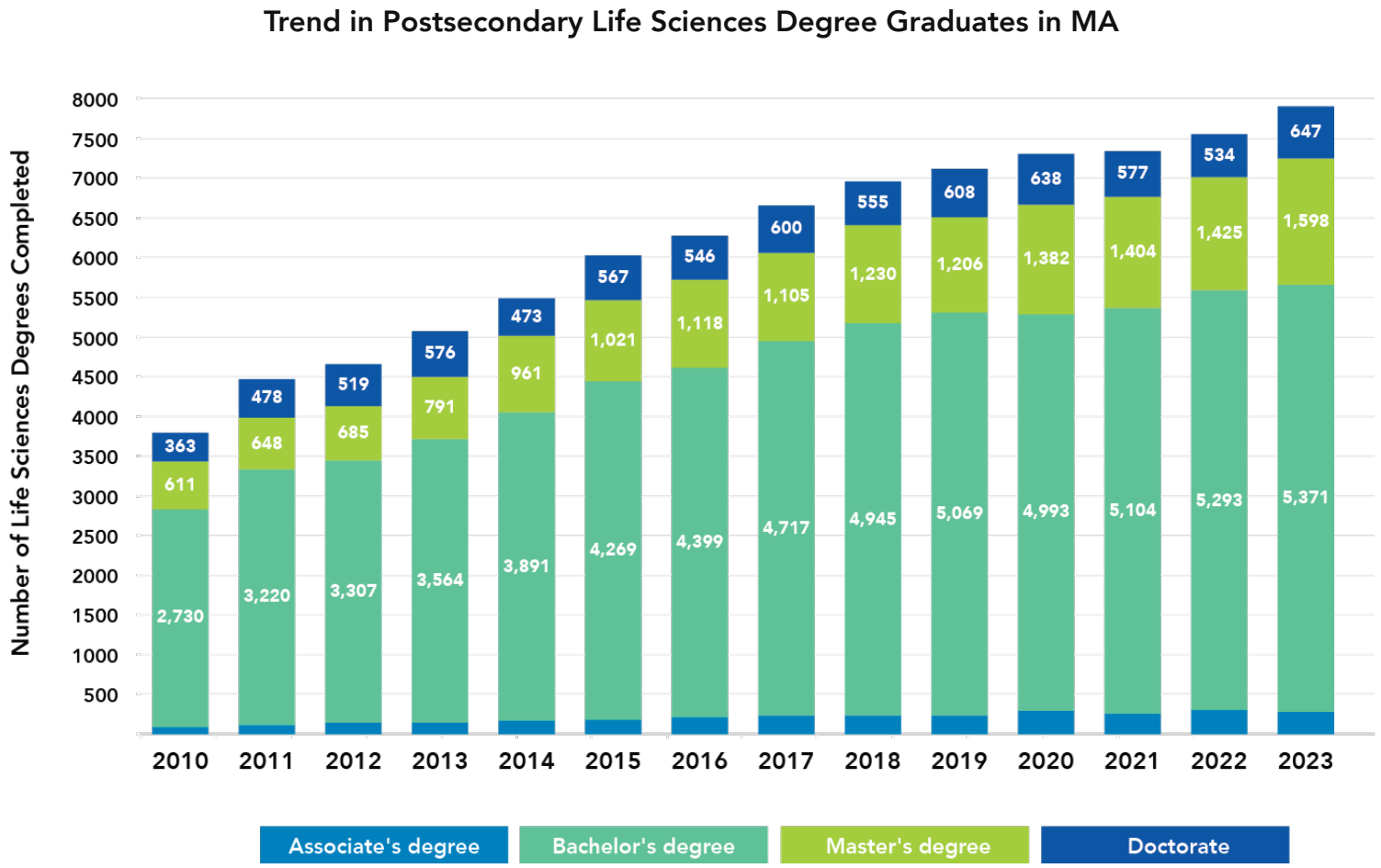


Source: TEConomy Partners' analysis of NCES IPEDS data.

Significant Growth in the Postsecondary Life Sciences Talent Pipeline for 2023 Affirms Ongoing Recovery from Pandemic-related Disruption

- After only a 1% increase in life sciences degree completion between 2020 to 2021 and a 3% growth from 2021 to 2022, the 2022-2023 period saw a further increase of 5%

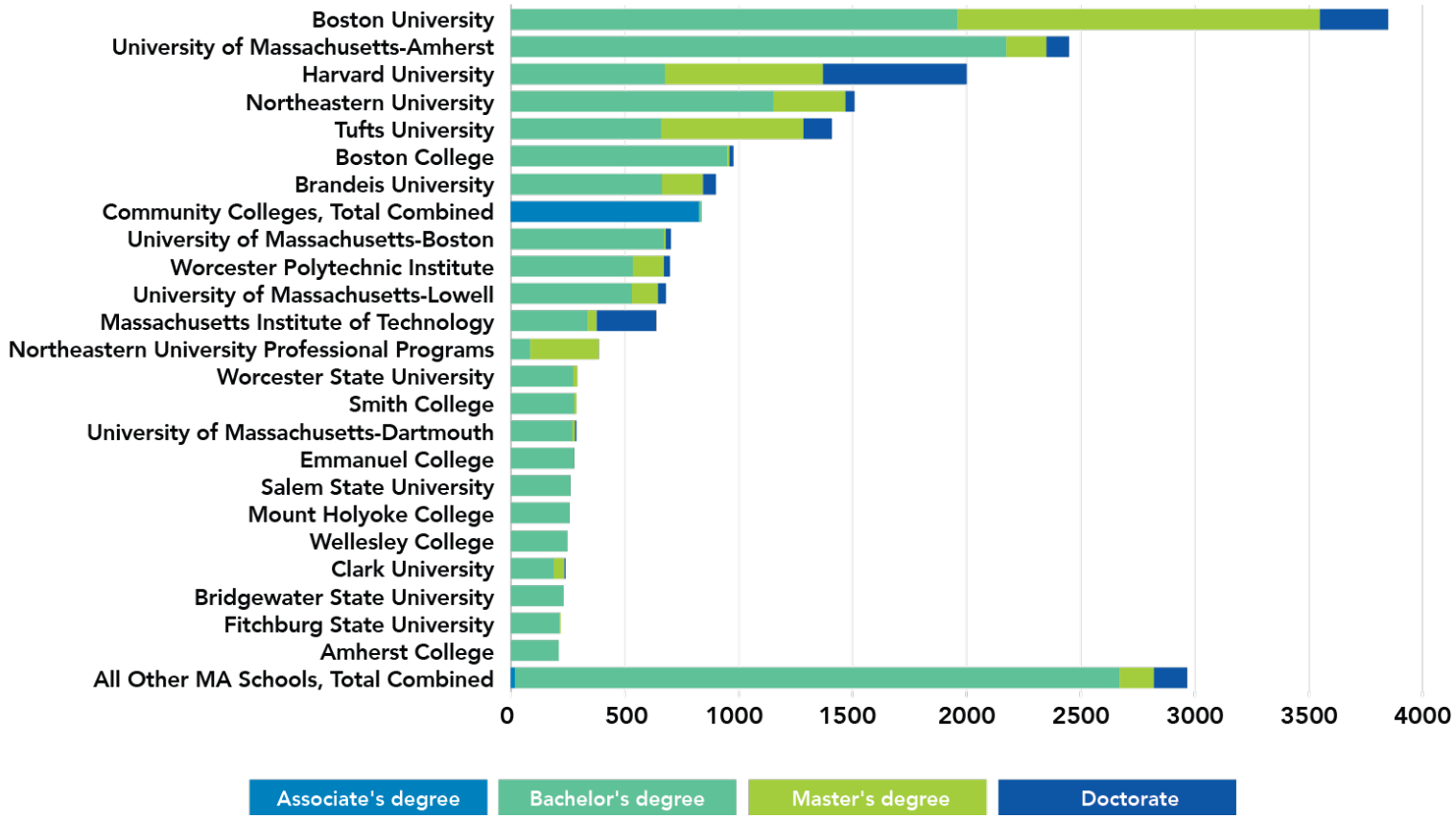
- Note that these totals do not capture growing demand for occupations in secondary degree fields such as:
  - Computer sciences
  - Engineering & industrial production
  - Business & finance
  - Regulatory affairs and compliance



Note: The primary life sciences degree analysis includes all degrees in the biological and biomedical sciences (all NCES CIP Codes in the 26 series) and is inclusive of bioinformatics/biostatistics; selected bio-specific degree fields within engineering; and biology technician and biotechnology lab tech degree fields. The analysis does not include professional degrees in health and clinical sciences per the focus of MassBioEd on the industrial and research ecosystem.
Source: TEConomy Partners' analysis of NCES IPEDS data.

MA has Numerous Nationally-Recognized Public and Private Life Sciences Educational Programs Generating Significant Volumes of Graduates

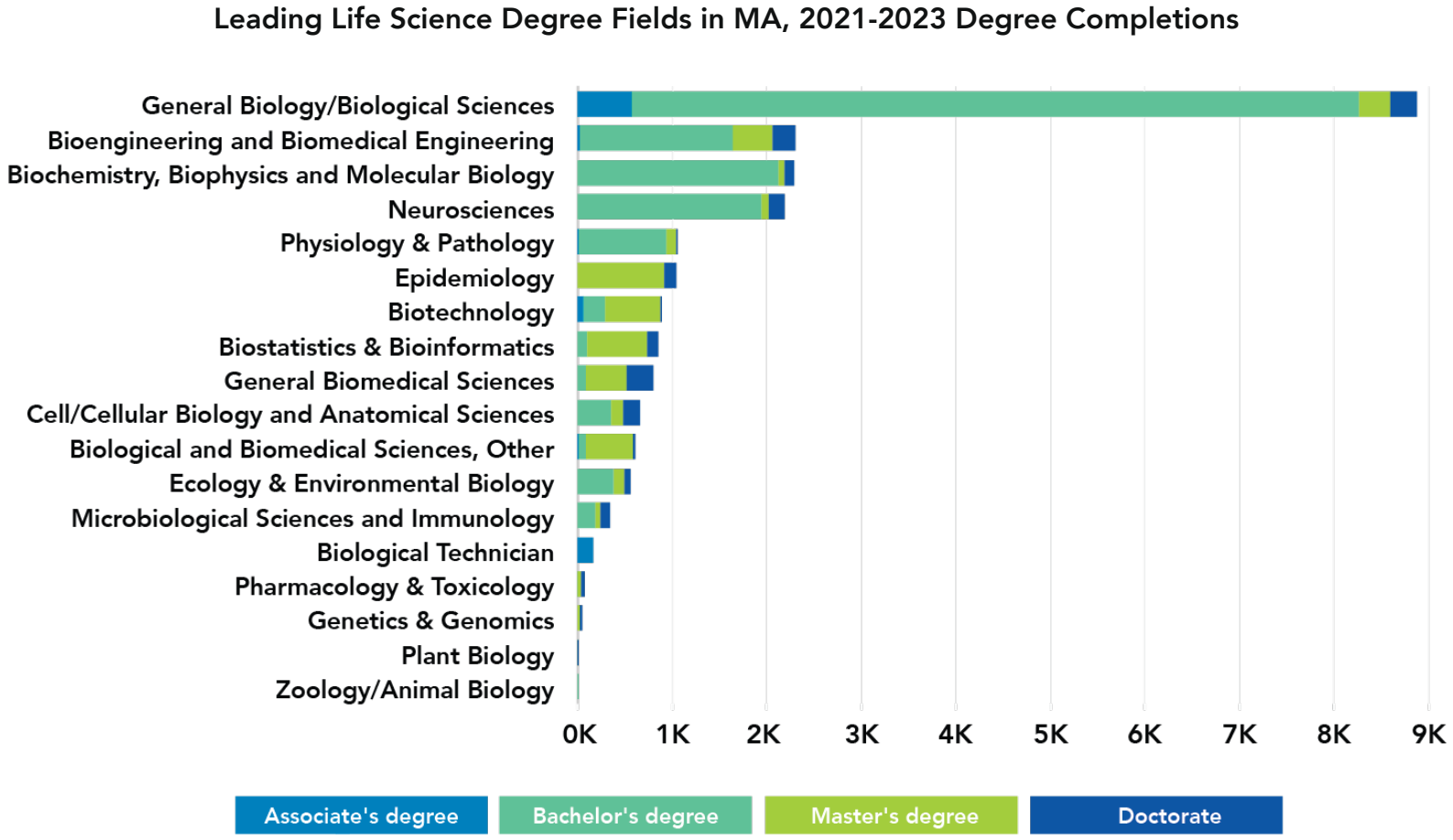
Leading Massachusetts Institutions Generating Life Sciences Talent, 2021-2023 Life Sciences Degree Completions



Note: See Appendix (slide 54) for summary of life sciences graduate totals from Massachusetts community colleges.
Source: TEConomy Partners' analysis of NCES IPEDS data.

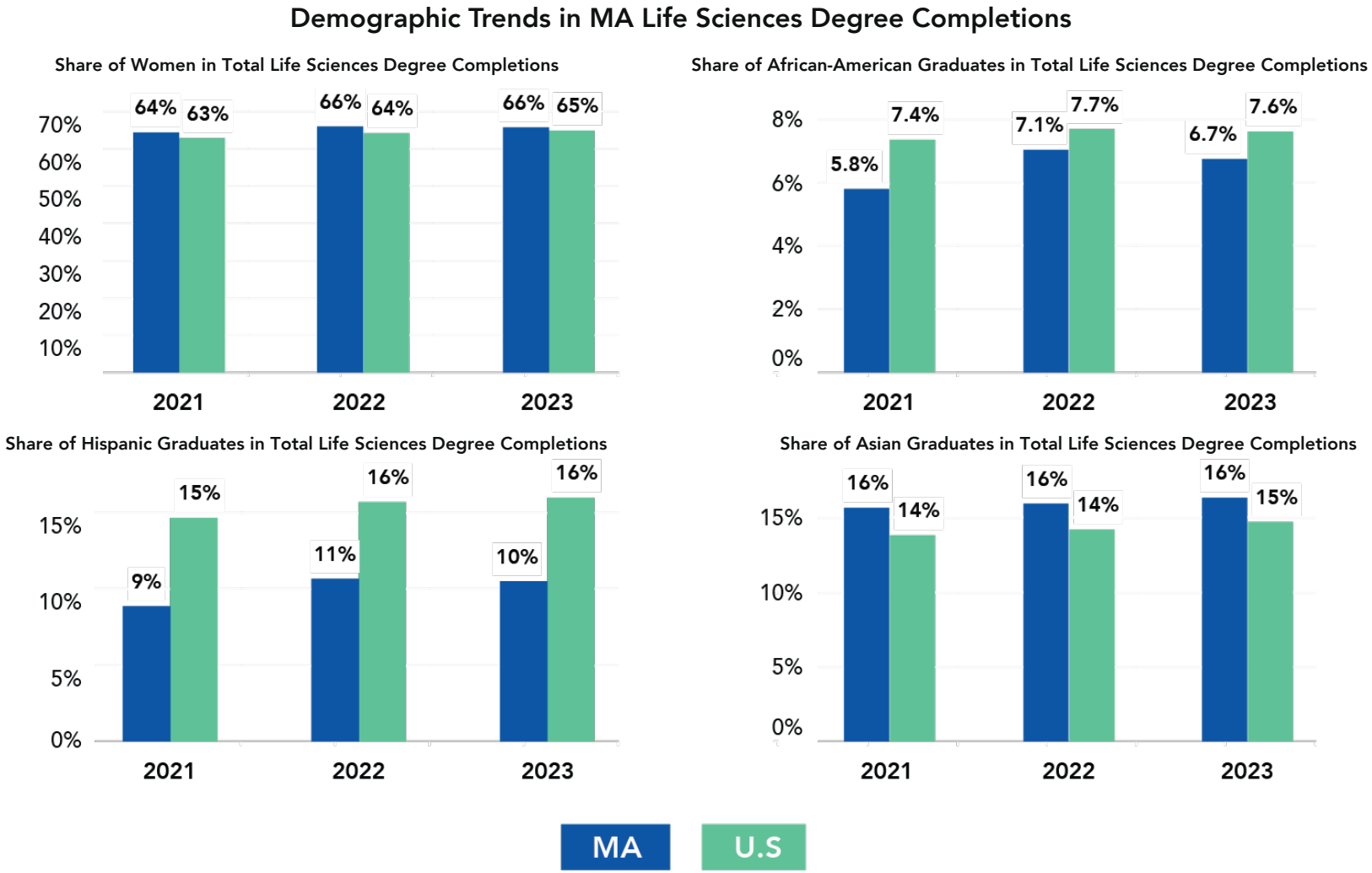
MA Continues to Produce High Levels of Biological Sciences Grads, Significant National Shares in Specialized Graduate Level Fields

Ongoing specialization: MA produces more than 10% of the nation's supply of biostatistics and bioinformatics program graduates, and more than 15% of the nation's supply of epidemiology program graduates



Source: TEConomy Partners' analysis of NCES IPEDS data.

Women and Minority Life Sciences Degree Graduate Shares Have Remained Relatively Flat Over the Last Several Years in MA, Suggesting an Ongoing Need to Prioritize Diverse Talent

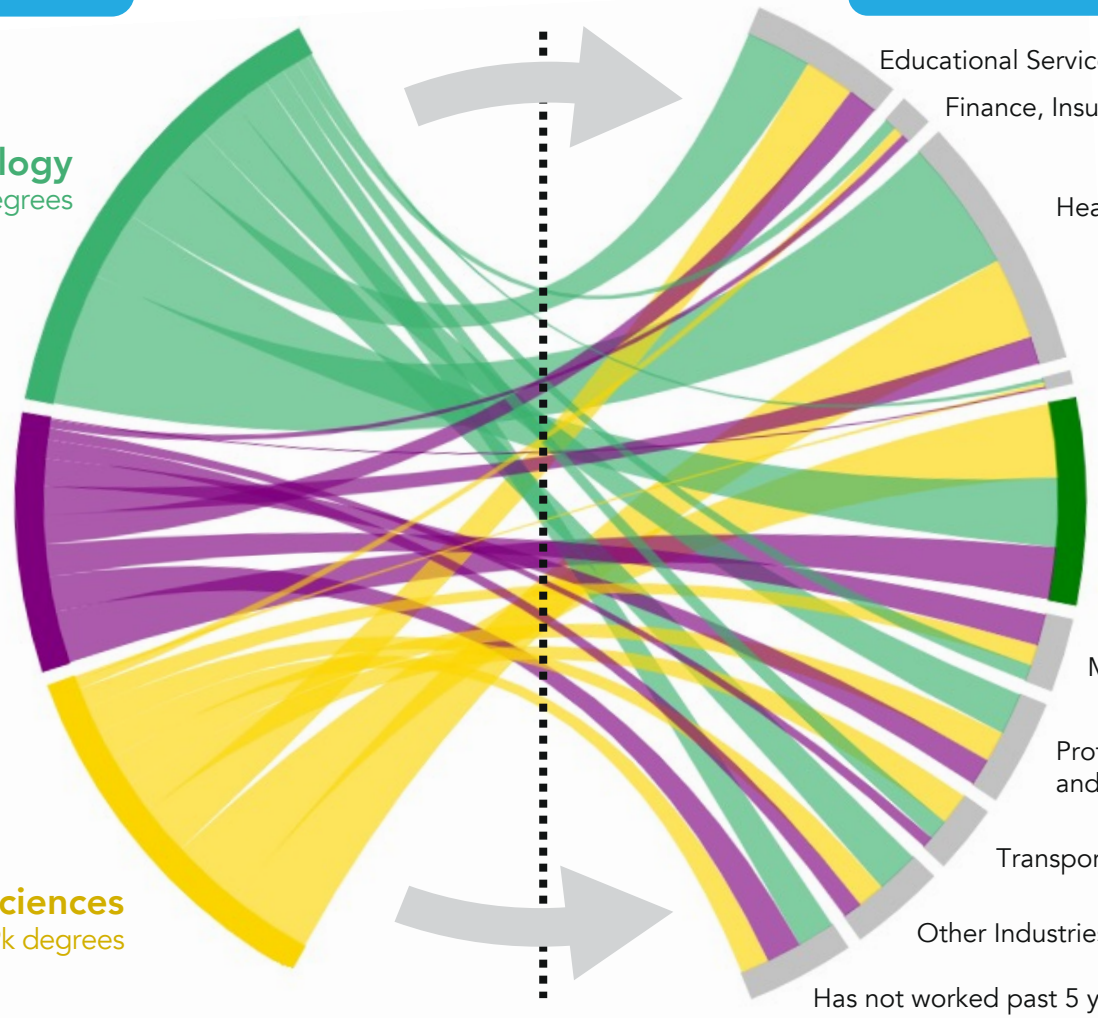


Source: TEConomy Partners' analysis of NCES IPEDS data.

Biopharmaceuticals & Medical Labs Industry Only Capturing 1 in 5 Life Sciences & Chemistry Degree Holders Over Long Term in Massachusetts

MA Life Sciences-related Degree Graduates

MA Industry Employment for LS Graduates



Biology
Estimated 90.4k MA degrees

Chemistry and Chemical Engineering
Estimated 49.9k MA degrees

Other Biosciences
Estimated 72.9k degrees

Educational Services – 14% of total

Finance, Insurance, Real Estate, and Rentals – 3% of total

Healthcare – 23% of total

Information – 1% of total

Biopharmaceuticals & Medical Labs – 19% of total

Manufacturing (non- Biopharma) – 7% of total

Professional, Technical, and Managerial Services – 10% of total

Transportation, Distribution, and Wholesale – 6% of total

Other Industries – 9% of total

Has not worked past 5 years – 10% of total

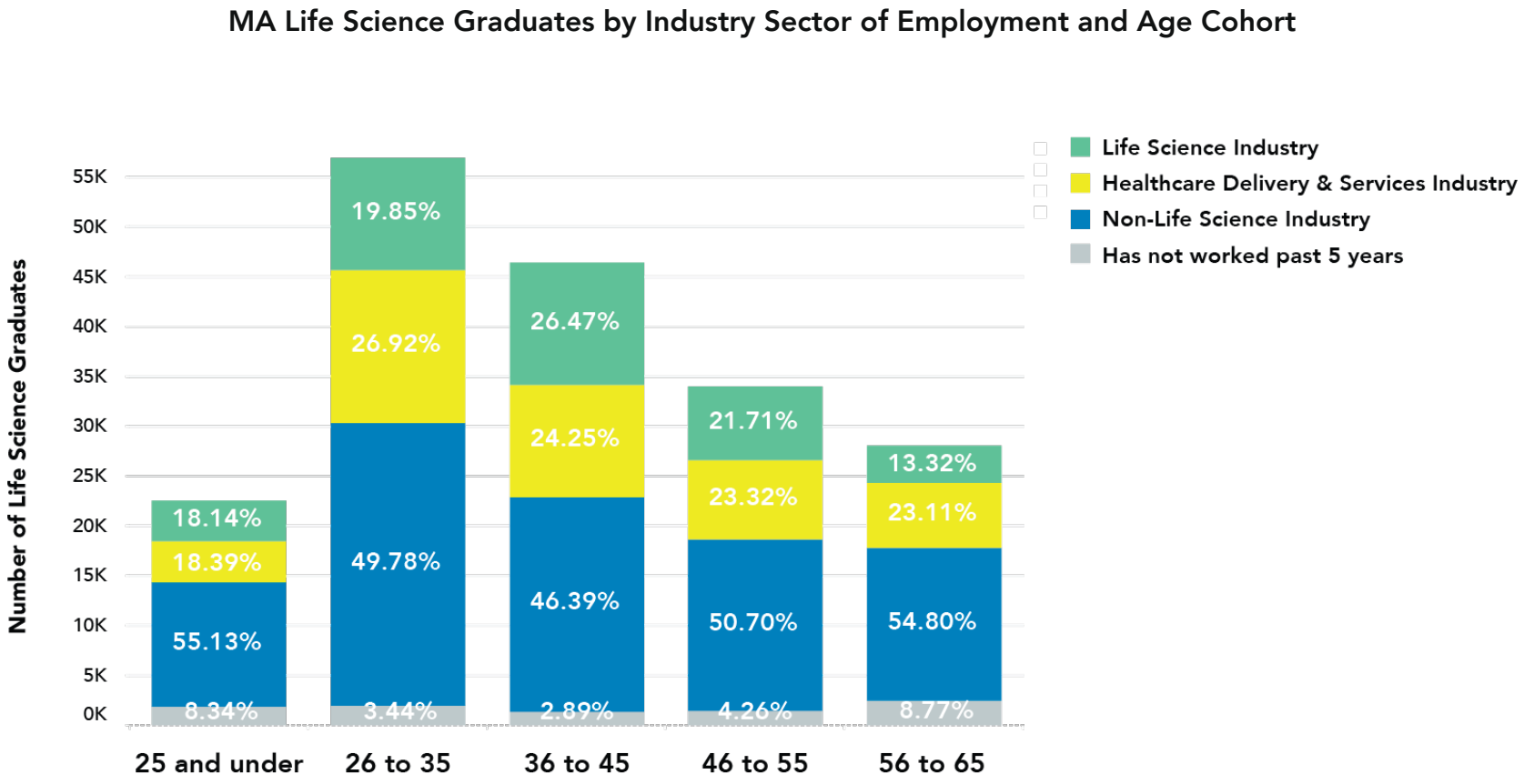
The Life Sciences Degree to Industry Pipeline

Across the over 213k life sciences-related degree holders in MA (and including chemistry-related degrees), this graphic examines the intra-state "flows" of life sciences talent with respect to which industries they ultimately work in.

Source: TEConomy Partners' analysis of American Community Survey Public Use Microdata, 2022 5-year data.

Share of MA Life Sciences Degree Holders Working in Biopharma and Medical Labs Sectors Sees Peak in 36 to 45 Year-Olds, Significant Attrition as Workers Age

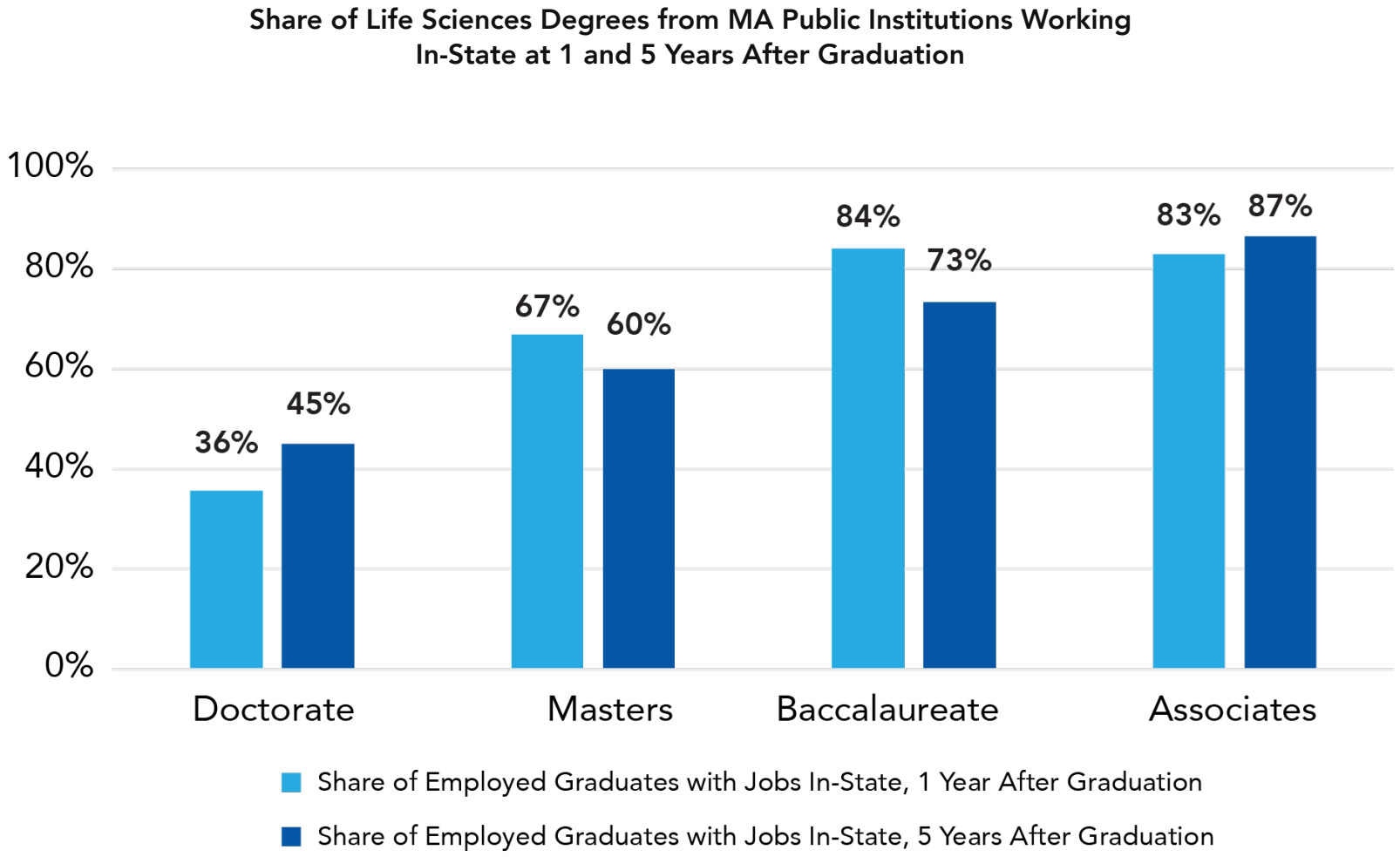
Nearly half the share of life sciences degree holders are working in the industry at ages 56 to 65 as observed for life sciences degree holders 30 years younger.



Source: TEConomy Partners' analysis of American Community Survey Public Use Microdata, 2022 5-year data.

MA Retains Relatively High Shares of its Life Sciences Graduates Over Time

- MA public institutions report high in-state employment retention rates for Bachelor's and Associate's level bioscience and biomedical degrees
- 83% aggregate in-state retention of employed life sciences graduates one year after graduation across all degree levels

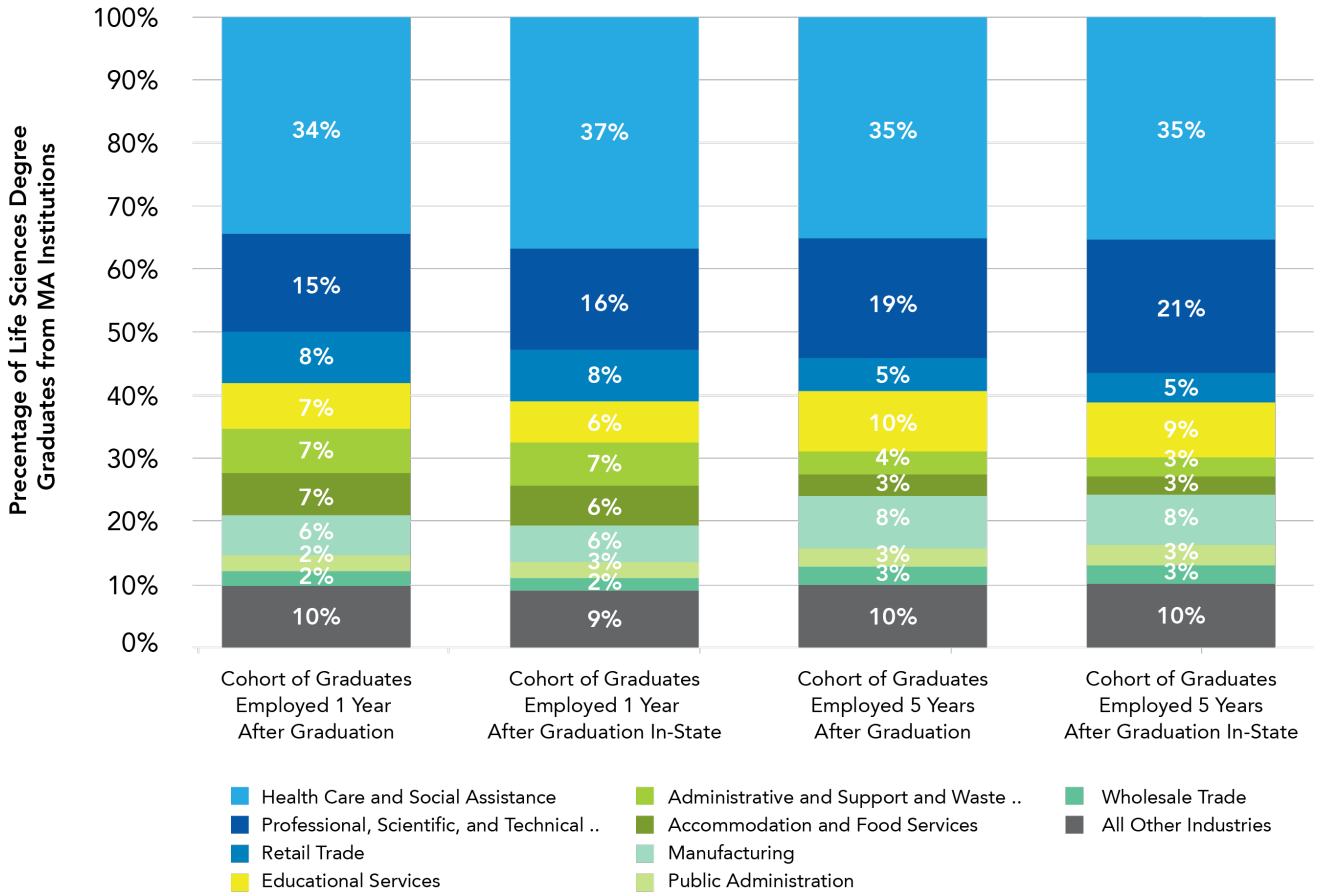


Note: PSEO data limited to MA partner institutions, includes only public institutions and an estimated XX% coverage across all state graduates.
Source: TEConomy Partners' analysis of Census PSEO data.

MA Life Sciences Graduates are Widely Distributed Across Various Industries Beyond Life Sciences Sectors* Once They Enter the Workforce

- The majority of life sciences graduates in MA are employed in sectors outside of industrial life sciences at 1 and 5 years after graduation
- The top industry sector for new life sciences graduates was in healthcare, with 37% of grads employed in-state 1 year after graduation and 35% working in healthcare 5 years post graduation

Industry Employment Flows of Life Science Graduates from MA Public Institutions by NAICS Sector



Note: PSEO data limited to MA partner institutions, includes only public institutions and an estimated XX% coverage across all state graduates.
Source: TEConomy Partners' analysis of Census PSEO data.

Key Findings, Insights, and Considerations for MA Life Sciences Workforce Development Efforts

Aligning Supply & Demand for MA Life Sciences Talent: Demand Continuing to Outpace the Talent Pipeline

- Projections indicate 5,720 average annual job openings in key life sciences occupations over next decade, a decrease from average of 6,497 average annual openings over last 3 years
- In recent years, the state's educational institutions have produced life sciences degree graduates in closely aligned fields that could supply, on average, 3,497 new workers annually
- Despite some signs of an industry growth slowdown, the ongoing supply-demand misalignment indicates that higher education and workforce development programs must continue to expand the talent pipeline.

Primary Life Sciences Occupational Groups	Degree Levels Generally Required for Entry	MA Average Annual Job Openings, 2021-23	Projected MA Average Annual Job Openings, 2023-2033	MA Average Annual Degree Graduates in Relevant Fields, 2021-2023	MA Aligned Degree Graduate % Share of Projected 2023-2033 Openings
Life Scientists	Masters & Doctorate	2,960	2,752	1,846	67%
Life Sciences Technicians	Associate's & Bachelor's	684	807	110	14%
Medical & Clinical Lab Technicians	Associate's & Bachelor's	1,510	1,326	772	58%
Life Sciences Engineers (biomedical only)	Bachelor's & Higher	229	153	769	>100%
Life Sciences Managers	Bachelor's & Higher	1,114	682	N/A	N/A

Note: Definitively linking supply and demand trends is difficult since new life sciences degrees may not translate directly to specific occupational roles and companies will hire from other labor pools; this analysis thus represents a high-level way of assessing major imbalances in the workforce and is not a comprehensive analysis of all worker types needed in the industry. It is not possible to accurately isolate graduates specific to life sciences managerial roles as these occupations source talent from across a wide variety of degree types.
Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1, NCES IPEDS Data; mapping of degree fields to occupations utilizes an Occupations to Degrees crosswalk developed by the Federal statistical system.

Key Findings from Quantitative Analyses of Life Sciences Talent Dynamics

Massachusetts' life sciences industry is still a national hub for talent, but workforce trends indicate a slowing labor market amidst signs of industry contraction.

- Recent growth across all life sciences sectors has slowed from an average annual growth rate of 7.8% from 2020-2022 to only 2.5% from 2022 to 2023.
- After increasing by nearly 46% from 2021 to 2022, job postings activity by the Massachusetts life sciences industry decreased by over 33% from 2022 to 2023, a key signal of softening labor demand.
- Amidst a challenging national business environment for life sciences companies, Massachusetts has seen its own companies conduct a series of ongoing layoffs throughout 2023 that have led to a "cooling" market, with further layoffs occurring in Q1 of 2024.[1,2,3]

Amidst slowing labor market growth, there are some signs of shifting areas of emphasis in the occupational workforce relative to the past several years across key life sciences roles and skills.

- Several engineering occupations saw significant growth within the life sciences sector, with Mechanical Engineer jobs increasing by 47% and Industrial Engineering jobs increasing 43%.
- Skills that saw rising importance in life sciences job postings were focused on production facilities management, regulatory affairs, quality control/quality assurance, and information privacy.

Despite promising growth in graduate levels and taking into account potentially lower industry hiring trends, industry demand in Massachusetts is still projected to exceed the levels of life science graduates produced by the state's talent pipeline in coming years.

- Projections indicate a lower level of annual job openings in key life sciences occupations over next decade—Life Scientists, Biotechnicians, and Medical Lab Technicians, with more than 5,700 average annual openings over the period — but, the state's education institutions still produce only 61% of this amount in new graduates with degree fields most aligned with these openings.
- Despite an excellent pipeline and relatively strong in-state retention, demographic data suggest that the biopharmaceuticals and medical labs industry that anchors the state's life sciences sector only captures 1 in 5 life sciences and chemistry degree graduates.

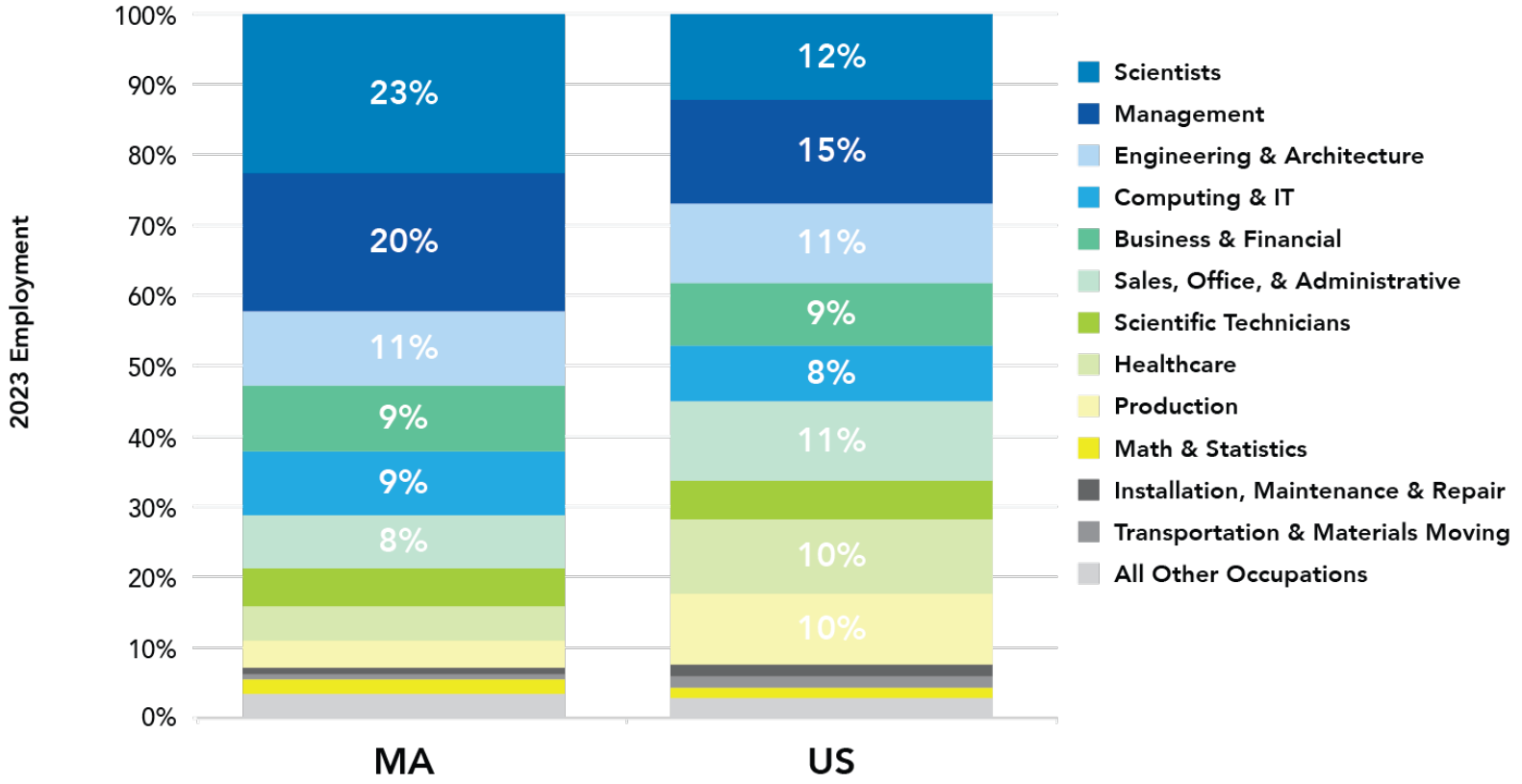
1. Boston Globe, *'Like playing the lottery': Laid-off life sciences workers give a snapshot of a cooling-down sector,* October 10, 2023.
2. Drug Discovery and Development, *Layoff tracker: Mapping the 11,350-plus biotech and pharma layoffs in early 2024,* April 25, 2024.
3. Fierce Biotech, *No reprieve for biopharma layoffs in Q1: Fierce Biotech analysis*, April 1, 2024.

Appendix/Reference Slides

MA Life Sciences Industry is Anchored by its Specialized Scientific Workforce

Massachusetts has a significant concentration of scientist employment relative to the U.S. workforce, over 11 percentage points higher as a share of the total industry

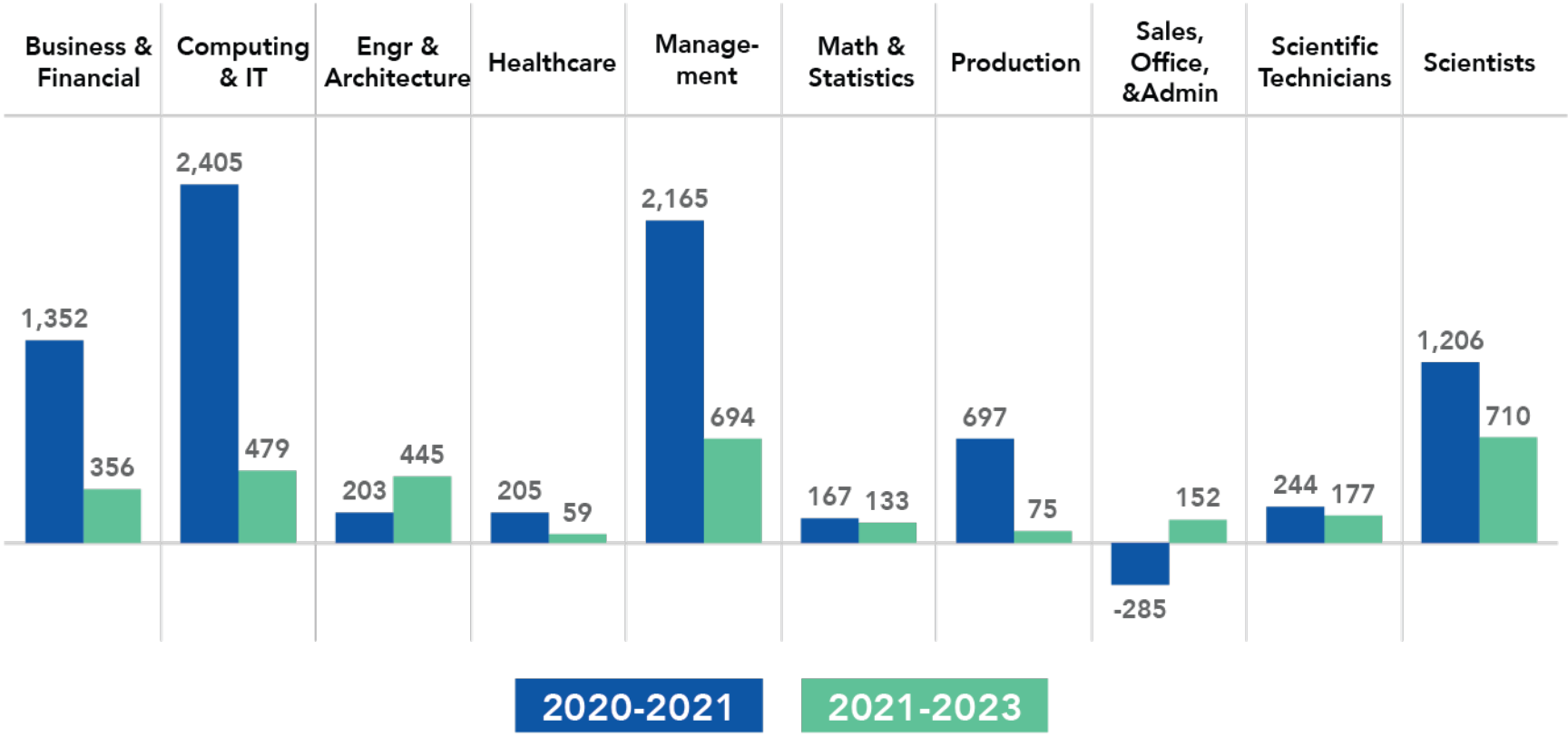
Distribution of Current MA Occupational Employment Mix Relative to U.S. Life Sciences Industries, 2023



Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

Recent Growth Has Slowed After Exceptionally Strong Growth in 2020-2021 Driven by Pandemic-Related Hiring

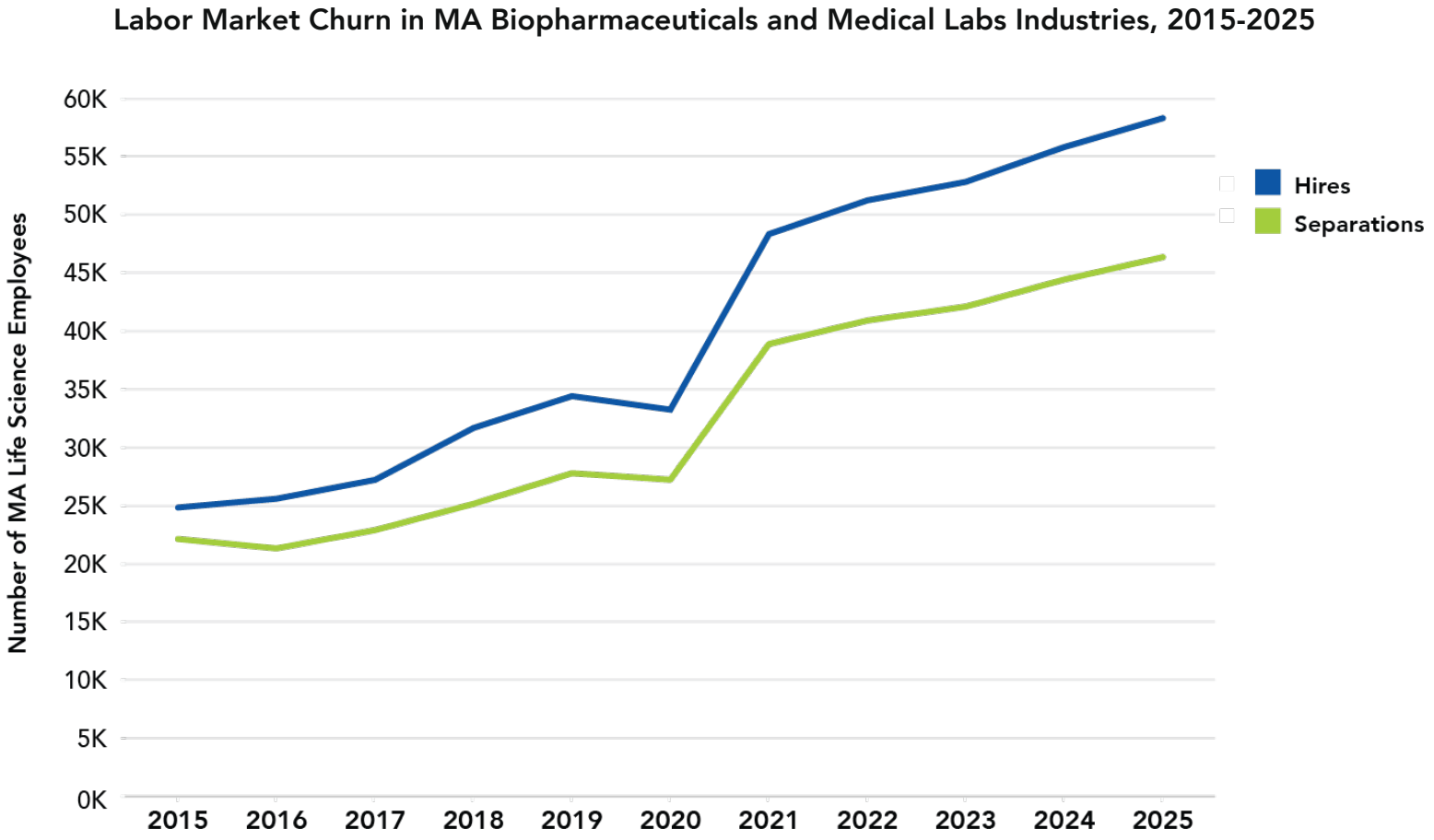
Net Job Change in Leading MA Life Sciences Occupational Segments (>2k jobs) in Post-Pandemic Years, 2020-2021 and 2021-2023



Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

Life Sciences Labor Market Churn Projected to Remain Stable Through 2025

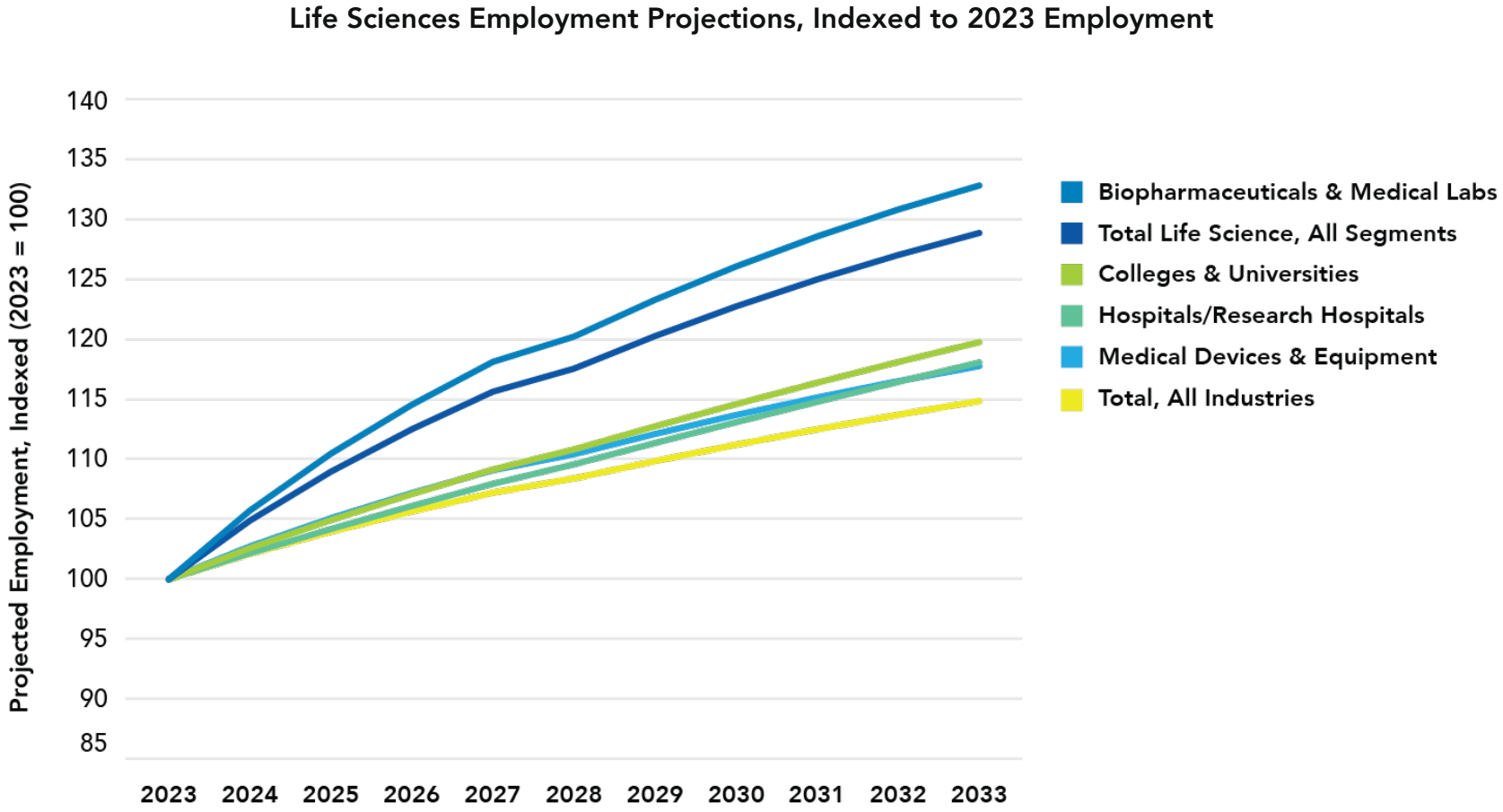
- More than 58k new hires in biopharmaceuticals and medical labs are projected in 2025
- Hiring demand is projected to continue outpacing churn through 2025 indicating ongoing expansion and job creation despite challenging conditions for industry



Note: Hires and separations from 2015 through 2023 are estimates by Lightcast.
Source: TEConomy Partners' analysis of Lightcast QCEW Data, 2024.1

Employment Projections Expect Continued Growth, Led by Biopharmaceuticals & Medical Labs

While the overall MA economy is projected to grow in employment by about 15% by 2033, the life sciences industry is projected to grow by nearly 29%, adding a projected 40,200 net jobs

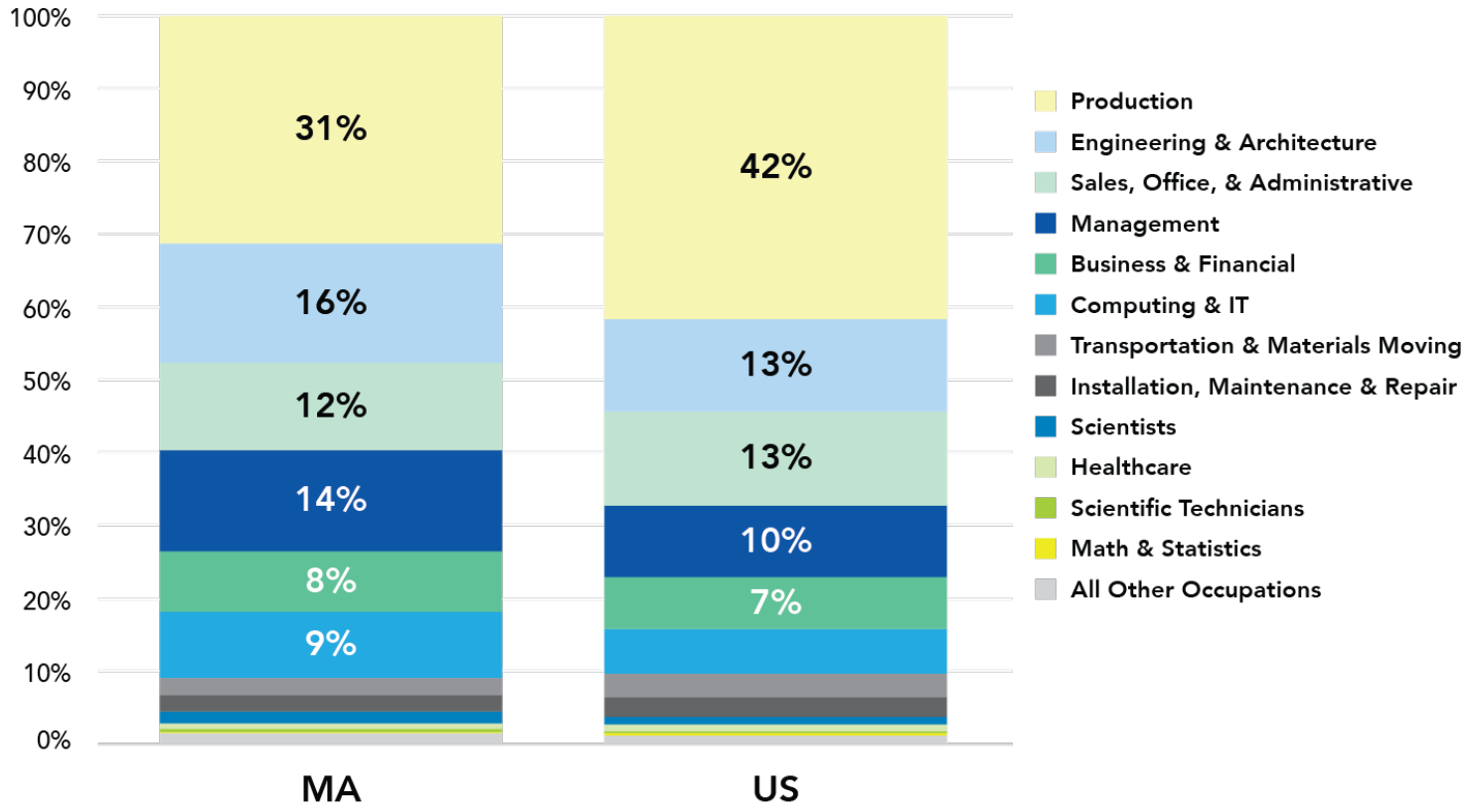


Note: Lightcast uses a combination of national (BLS), state/local, and internal projection methods. Lightcast occupation projections are based on estimated industry data with projected, regionalized staffing patterns applied to the figures. As a result, the occupational projects will necessarily differ from BLS and state labor market information (LMI) occupation numbers.
Source: TEConomy Partners' analysis of Lightcast QCEW Data, 2024.1

MA Medical Device Industry Continues to Play a Complementary Role in Anchoring the State's Life Sciences Sector

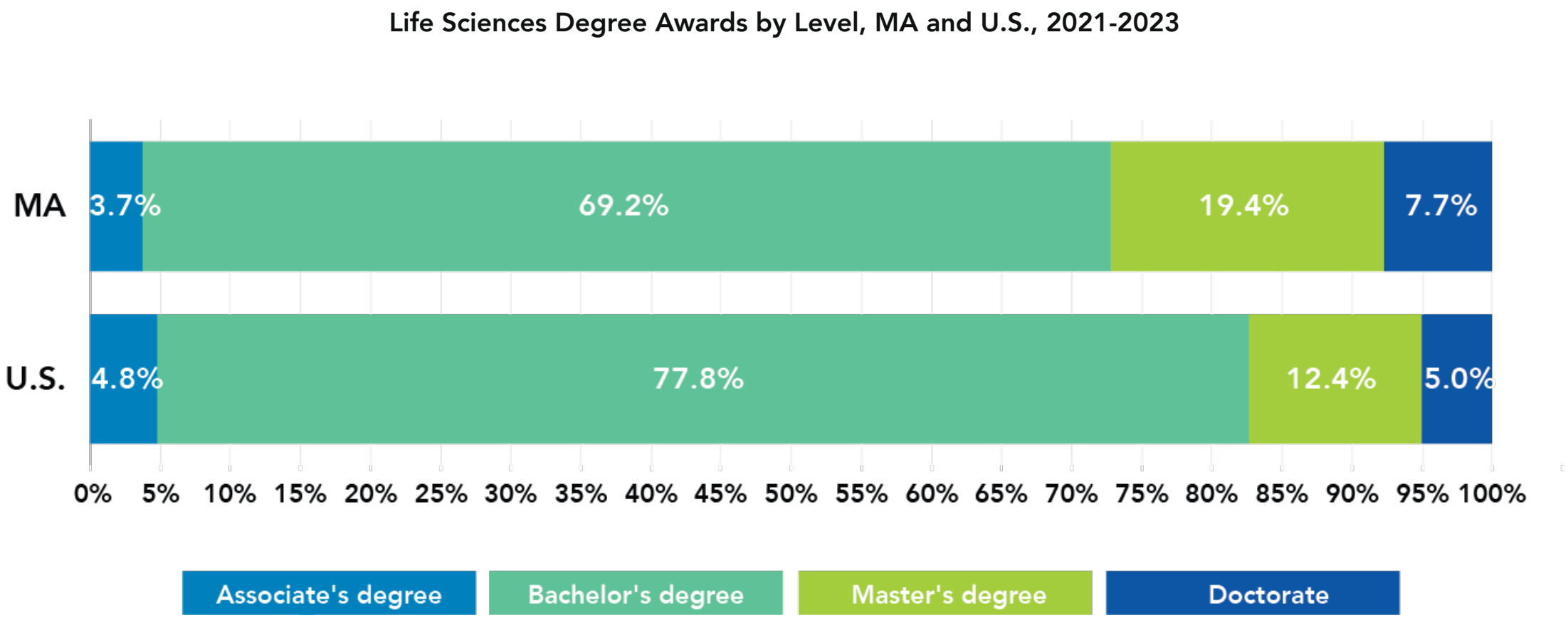
- Medical device industry employed 24.9k workers in 2023, a growth of 6.3% from 2021
- MA medical device industry is specialized in engineering, employing 3 percentage points more than national average

Distribution of Current MA Occupational Employment Mix Relative to U.S. Medical Device Industries, 2023



Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

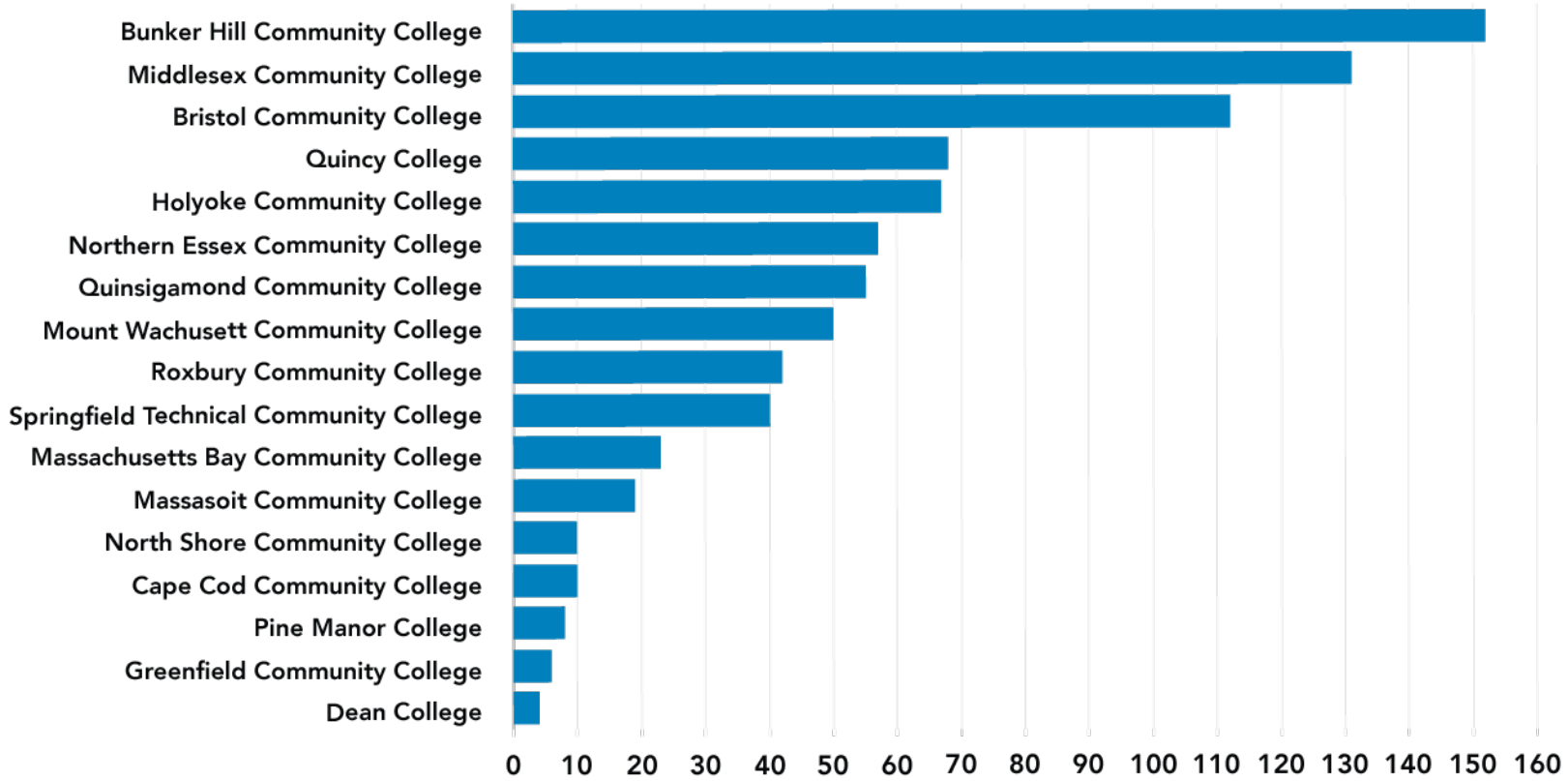
Postsecondary Life Sciences Degree Graduates in MA More Concentrated at Advanced, Graduate Levels



Source: TEConomy Partners' analysis of Lightcast Staffing Patterns Data, 2024.1

MA Life Sciences Talent Pipeline is Served by an Active Community College System, With Programs Generating Skilled Technician and Biotechnology Associates-Level Talent

MA Community Colleges Generating Life Sciences Talent, 2021-2023 Life Sciences Degree Completions



Source: TEConomy Partners' analysis of NCES IPEDS data.

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