

Life Science Employment Memo

BPDA Research Division

August 2021

Introduction

The COVID-19 pandemic and the race to develop a vaccine spotlight the nation's growing Life Science industry. Employment in the Life Sciences has been particularly resilient in the past year, despite the high rates of unemployment in many other sectors.¹ This has helped insulate Boston's workforce and economy which has a growing Life Science sector. According to CBRE, the Boston-Cambridge area is the largest Life Science cluster in the nation.² The Boston-Cambridge area benefits from a highly educated workforce and world-renowned higher education, research, and medical institutions. These factors contribute to the growing Life Science sector in Boston.

Definition of Life Sciences Employment

In 2015, MassBio created a method for measuring employment in the Life Sciences.³ MassBio considers life science employment as all employment in pharmaceutical manufacturing and medical testing laboratories, 84 percent of employment in scientific research and development (R&D) services, 4.5 percent of hospital employment, and 1.9 percent of university employment. Burning Glass, an aggregator of online job postings, defines biotech jobs as those requiring knowledge of scientific fields such as biochemistry and genetics, laboratory techniques such as chromatography and clinical research, and/or experience with technology that incorporates biological processes such as biosensors and bio-chips. BPDA Research combined these definitions for the purposes of this analysis. We take all employment in pharmaceutical manufacturing, medical testing laboratories, and scientific research and development services as life science employment. For hospital and university employees, we take only workers in occupations considered "biotech jobs" by Burning Glass.⁴

Life Sciences Employment in Massachusetts

Overall, 3.1 percent of employment in Massachusetts is in the Life Sciences, compared to just 1 percent for the nation as a whole. Life Sciences employment in Massachusetts has grown by 42 percent since 2010, reaching 96,064 workers in Q2 2020.

¹ CBRE, [Leading Life Science Clusters: The Bio-Boom Intensifies](#), October 2020.

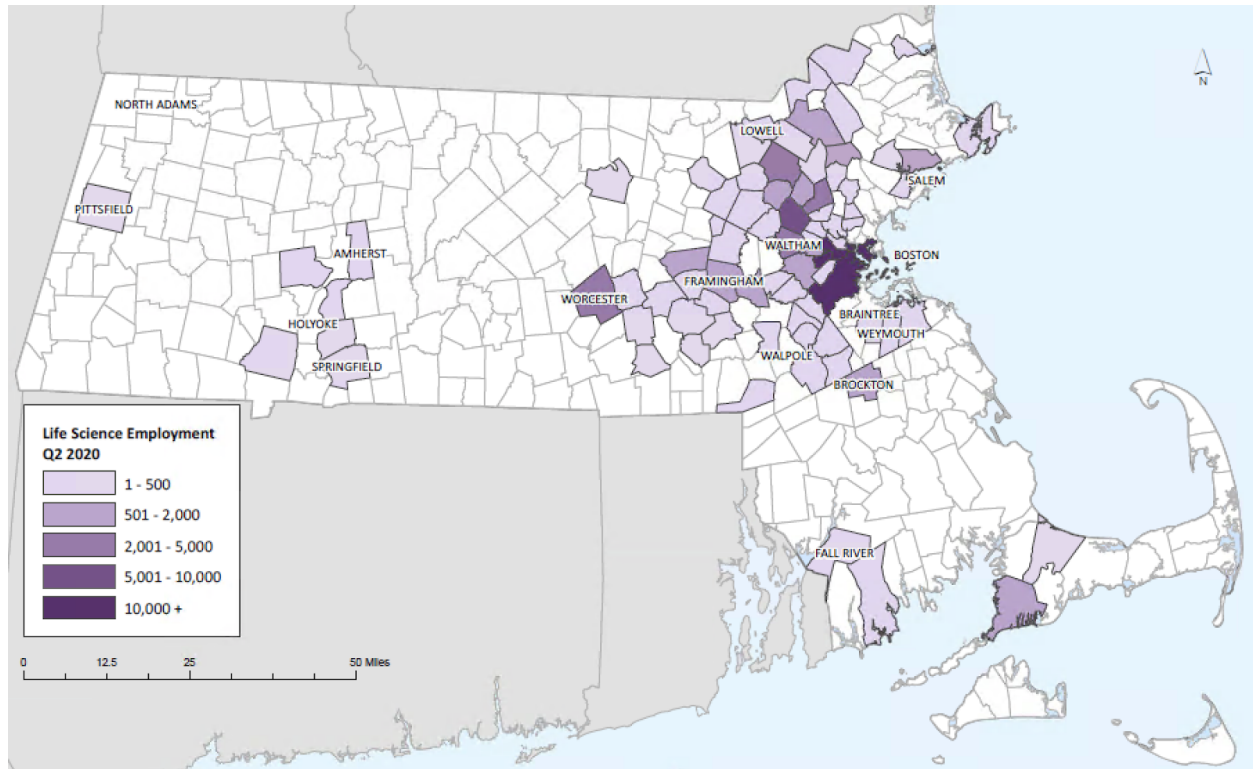
² CBRE, [Leading Life Science Clusters: The Bio-Boom Intensifies](#), October 2020.

³ MassBio, [Industry Snapshot](#), 2015. Using the North American Industry Classification System (NAICS), MassBio defined the "life science" industry as NAICS 3254: Pharmaceutical Manufacturing, including biologics (100%); NAICS 6215: Medical testing laboratories (100%); NAICS 5417: Scientific Research and Development services (84%); NAICS 54138: Testing Laboratories (30%); NAICS 622: Hospitals (4.5%); NAICS 6113: Universities (1.9%)

⁴ Natural sciences managers, computer programmers (hospitals only), biomedical and agricultural engineers, biological scientists, other life scientists, and biological technicians

The map below shows the distribution of Life Science employment across the Commonwealth. Employment is concentrated around Cambridge and Boston; however, there are also Life Sciences clusters in Worcester and the Amherst area.⁵

Map 1: Massachusetts Towns by Life Sciences Employment, Q2 2020



Source: MassBio, Industry Snapshot, 2015, Massachusetts Office of Unemployment Assistance - Economic Research Division, Employment and Wages Data, 2010-2020, and BPDA Research Division Analysis.

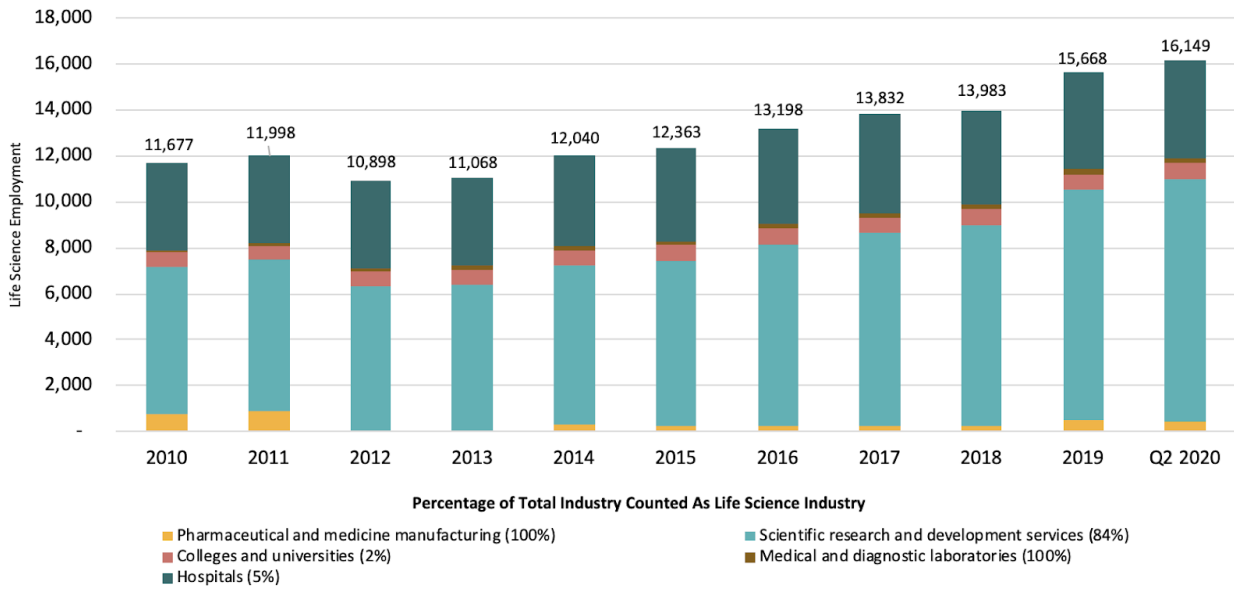
In Cambridge, 22 percent of all employment is in the Life Science industry, 19 times the nation’s share of Life Science employment. Life Sciences employment grew by 83 percent in Cambridge since 2010, reaching 28,731 in Q2 2020.

Comparatively, Boston has a more diverse economy with approximately 3 percent of all employment in the Life Science industry. Life Science employment grew by 38 percent in Boston since 2010, reaching 16,149 in Q2 2020.⁶ Scientific Research and Development Services made up 66 percent and hospitals made up 26 percent of Life Sciences employment in Boston in 2020. Pharmaceutical and medicine manufacturing makes up only 3 percent of Life Sciences employment in Boston, but 9 percent of Life Sciences employment in Massachusetts in 2020.

Figure 2: Boston Life Science Employment, 2010- Q2 2020

⁵ MassBio, Industry Snapshot, 2015, Massachusetts Office of Unemployment Assistance - Economic Research Division, Employment and Wages Data, 2010-2020, and BPDA Research Division Analysis.

⁶ MassBio, Industry Snapshot, 2015, Massachusetts Office of Unemployment Assistance - Economic Research Division, Employment and Wages Data, 2010-2020, and BPDA Research Division Analysis.

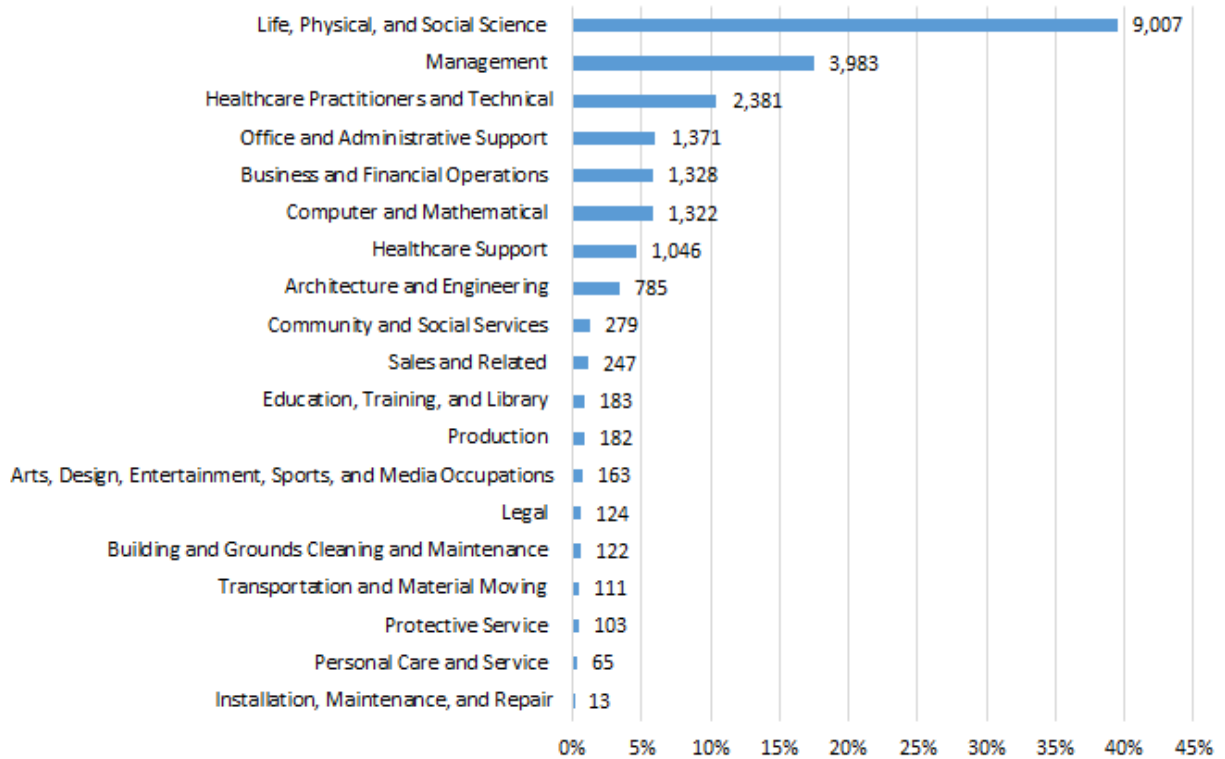


Source: MassBio, Industry Snapshot, 2015, Massachusetts Office of Unemployment Assistance - Economic Research Division, Employment and Wages Data, 2010-2020, and BPDA Research Division Analysis.

Life Science Employment by Occupation

Using the 2019 American Community Survey, we can look at life science employment located in Suffolk County by occupation. Life Science workers as defined here include workers in a variety of occupations in pharmaceutical manufacturing, scientific R&D, and medical testing lab companies, but only “biotech” occupations in hospitals or universities. About 40 percent of life science workers in this definition are in life science occupations. An additional 15 percent of life science workers are in health care occupations working in life science industries. The remainder of life science workers are in auxiliary occupations such as management, administrative support, or business or financial operations. Workers in these occupations are considered to be life science workers only if they work in pharmaceutical manufacturing, scientific R&D, and medical testing lab companies.

Figure 3: Life Science Industry Employment by Occupation in Suffolk County



Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

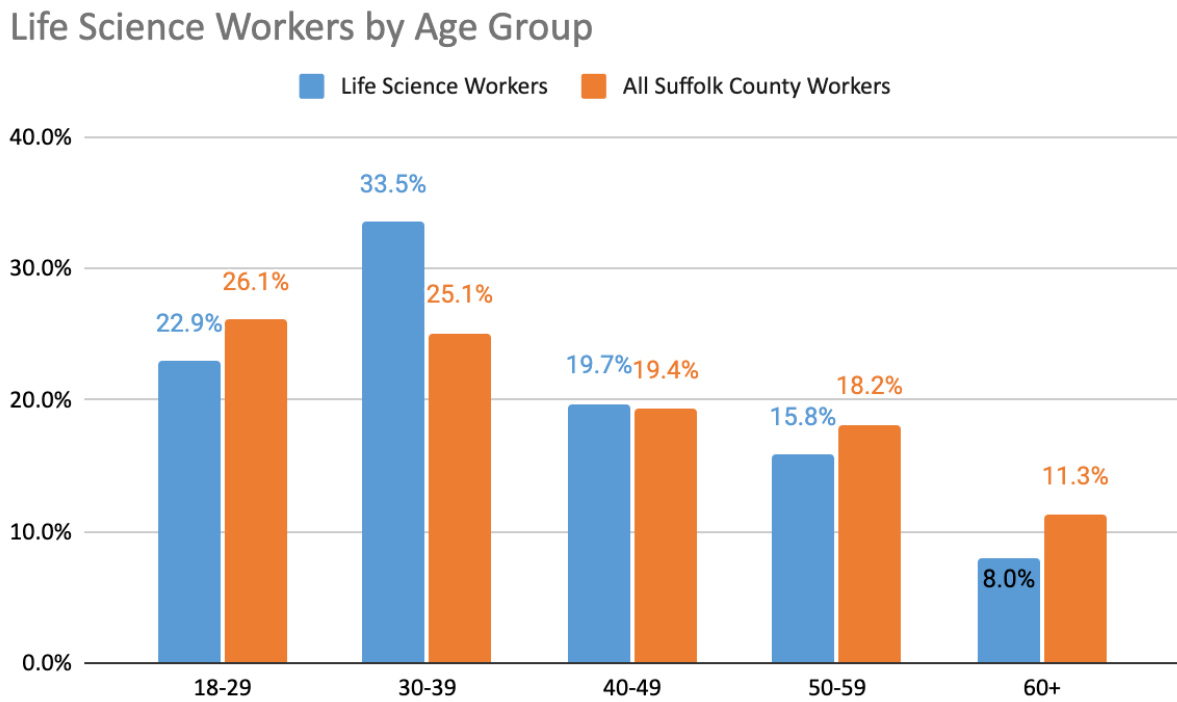
Demographics of Life Science Workers

The following analysis looks at the demographics of workers in life science industries and occupations who are working in Suffolk County.⁷

Life sciences workers are more likely to be in their thirties. More than a third of all life sciences workers in Suffolk County are aged 30 to 39, compared with a quarter of all Suffolk County workers.

⁷ Place of work data are not available from the American Community Survey below the county level. The vast majority of life science employment in Suffolk County is in the City of Boston.

Figure 4: Life Science Workers in Suffolk County by Age Group

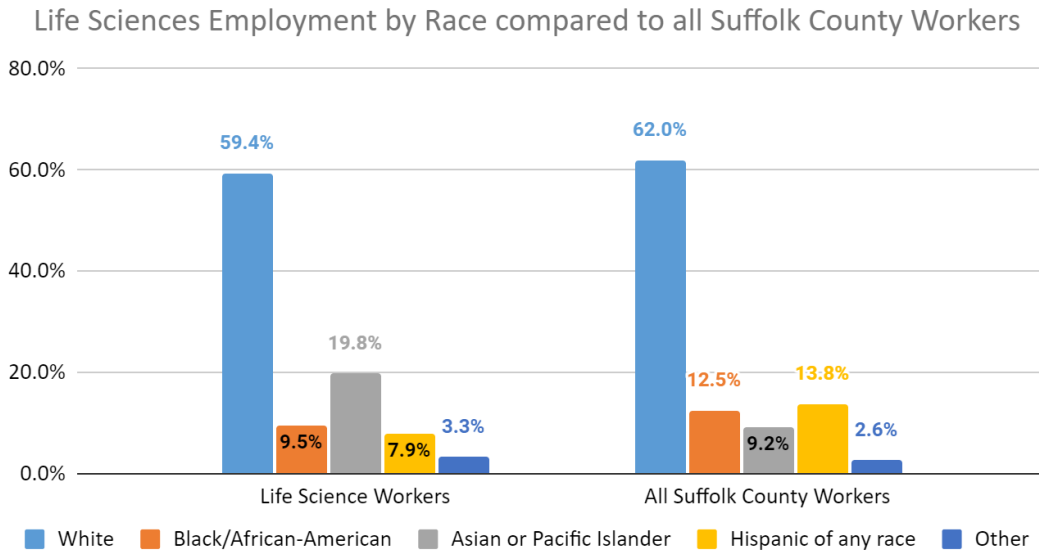


Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

Life sciences workers are more likely to be female. Almost 53 percent of life sciences workers in Suffolk County are female, compared to 48 percent of all workers in Suffolk County. Medical Testing Labs skew female at 62 percent and Life Science employment in Universities has the smallest share of women, just under 45 percent.

About 59 percent of Life Science workers are non-Hispanic Whites, below their share of the Suffolk County workforce overall. Asian or Pacific Islander workers are overrepresented in Life Science employment. Twenty percent of life sciences workers are Asian or Pacific Islander, compared to just 9.2 percent of all workers in Suffolk County. Within the life science industries, medical testing labs have a higher share of Black/African-American workers, who are 9.5 percent of life sciences workers overall, but 26 percent of workers in medical testing labs.

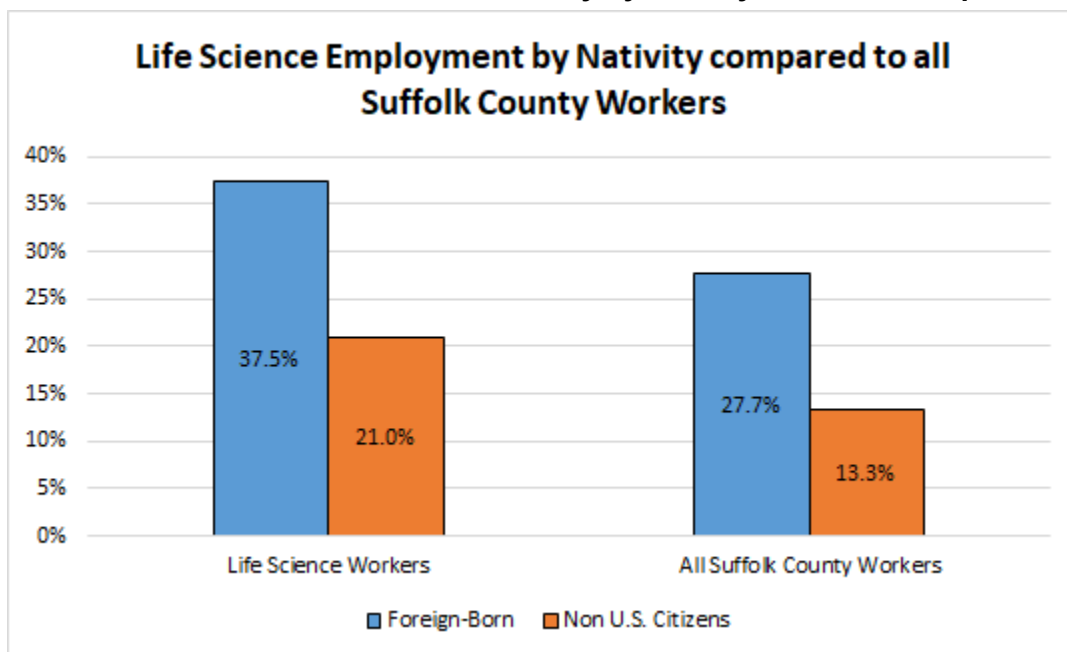
Figure 5: Life Science Workers in Suffolk County by Race/Ethnicity



Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

Life science workers are more likely to be foreign-born. Approximately 37.5 percent of life science workers in Suffolk County are foreign-born, and 21 percent are not U.S. citizens. In comparison, 27.7 percent of all workers in Suffolk County are foreign-born, and 13.3 percent are not U.S. citizens.

Figure 6: Life Science Workers in Suffolk County by Nativity and Citizenship



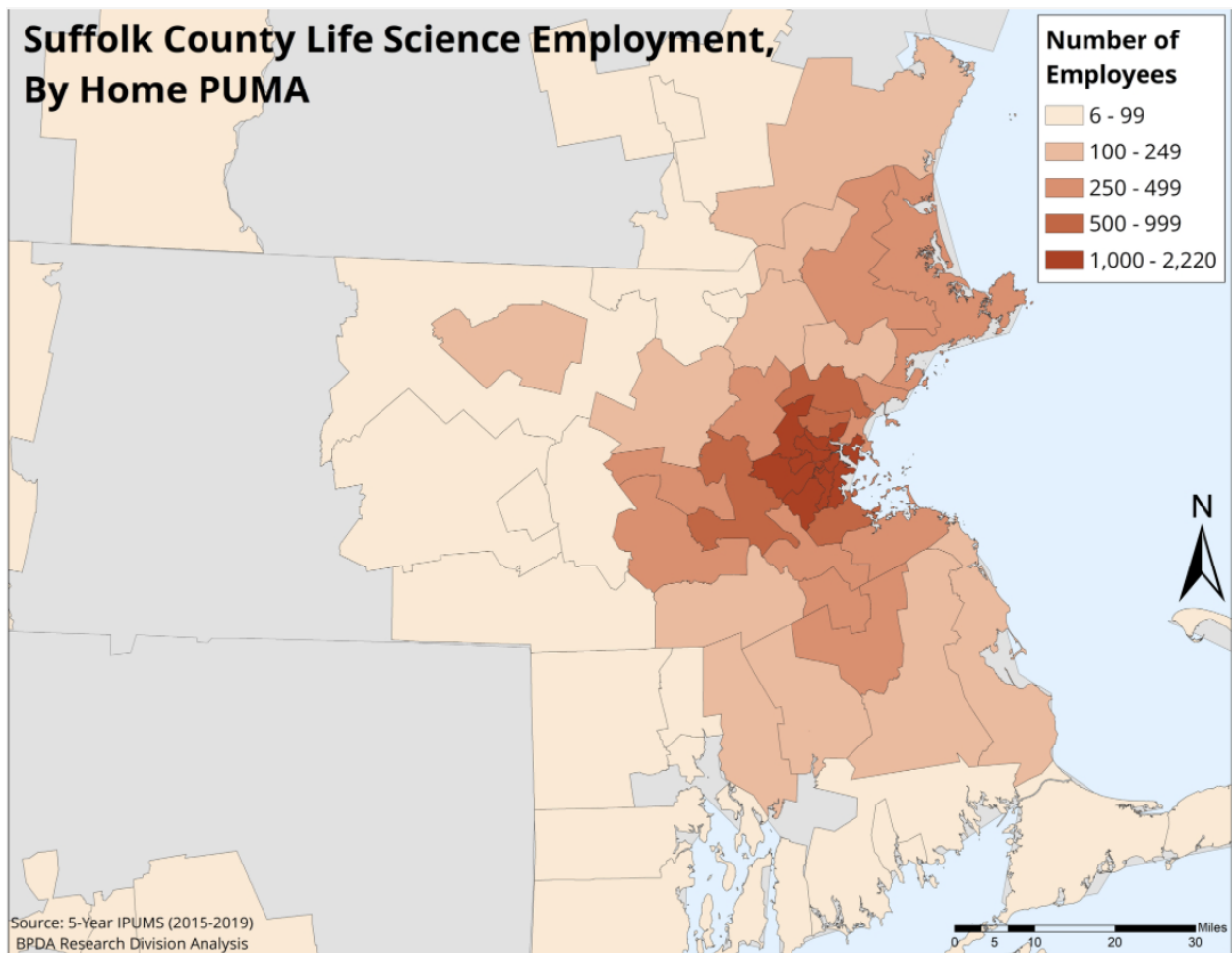
Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

Residence of Life Science Workers

About half of life science workers live in married family households, and about 37 percent have their own children in the household. About half of life science workers own their homes, and 35 percent live in detached single-family houses. This is similar to all workers in Suffolk County: about 52 percent of all workers live in married family households, and over 36 percent have their own children in the household. About 56 percent of all workers own their homes, and nearly 40 percent live in detached single-family houses.

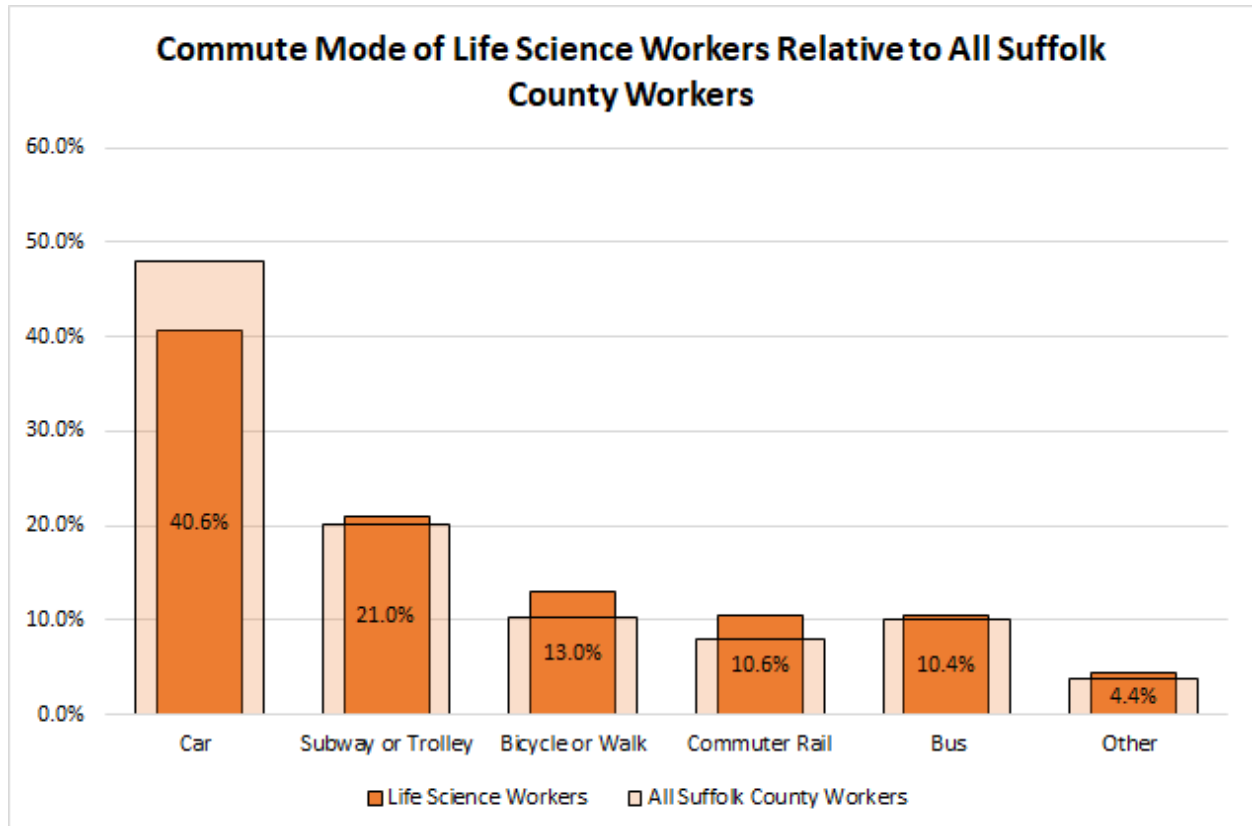
Approximately 32 percent of life science workers working in Suffolk County live in the city of Boston. Another 10 percent live in Brookline or Newton. Approximately 54 percent live in other Massachusetts cities and towns, and 4 percent live in other states, particularly Rhode Island. Overall, 37 percent of Suffolk County workers live in Boston.

Map 2: Life Science Workers in Suffolk County by Home Address



Life science workers are more likely to commute by public transit or by biking or walking. About 42 percent of life science workers commute by public transit - 21 percent by subway and just over 10 percent each by commuter rail and bus. Another 40 percent of life science workers commute by car. Approximately 13 percent of life science workers walk or bike to work. In comparison, about 39 percent of all workers in Suffolk County commute by public transit, including 19 percent by subway, 10 percent by bus, and 8 percent by commuter rail. Of all workers, 48 percent commute by car and approximately 10 percent walk or bike to work.

Figure 7: Life Science Workers in Suffolk County by Commute Mode



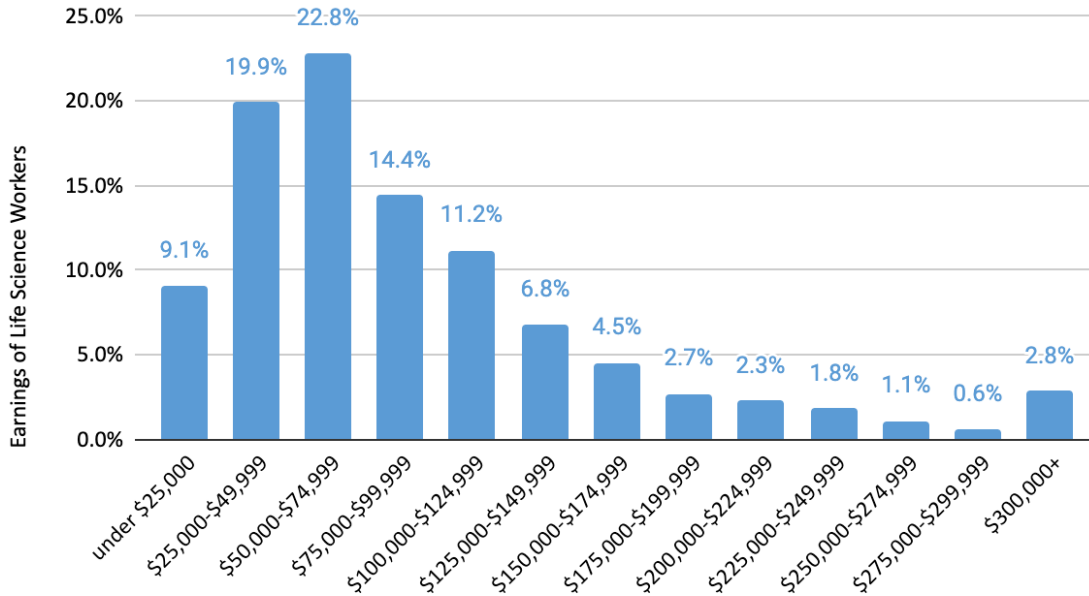
Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

Earnings of Life Sciences Workers

In general, life science jobs are higher paying jobs. The median annual earnings for life science workers is approximately \$70,000 per year. About a quarter of life science workers make less than \$45,000 per year and a quarter earn more than \$120,000 per year. In comparison, the median annual earnings for all workers in Suffolk County is lower at \$58,600.

Figure 8: Life Science Workers in Suffolk County by Earnings

Earnings of Life Science Workers



Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

By industry, life science workers in pharmaceutical manufacturing tend to have the highest salaries.

Table 1: Earnings Percentiles for Life Science Workers by Industry

Percentile	Pharma Manufacturing	Sci RnD	Medical test labs	Hospitals	University
25%	\$83,000	\$48,870	\$32,373	\$47,941	\$43,164
50%	\$122,174	\$74,576	\$60,000	\$59,051	\$50,072
75%	\$172,657	\$130,000	\$89,797	\$86,540	\$64,000

Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

Among life science workers, some occupations typically earn more than others. Management, sales, and legal occupations are the highest paid occupations within the life science industry. The most common occupation within the life science industry (life, physical, and social sciences occupations) has median annual earnings of \$63,922. The life science industry also employs some lower paid workers in occupations such as health care support, building and grounds cleaning and maintenance, and protective service.

Table 2: Median Earnings, Educational Attainment, and Racial/Ethnic Background of Life Science Workers in Suffolk County by Occupation

Life Science Occupation	Share of Life Science Employment	Median Earnings	Share of Workers with a Bachelor's Degree or Higher	Share of Workers who are non-Hispanic Whites
All Suffolk County Workers	NA	\$58,600	63.1%	62.1%
Life, Physical, and Social Science	39.5%	\$63,922	95.9%	56.3%
Management	17.5%	\$114,723	90.5%	71.0%
Healthcare Practitioners and Technical	10.4%	\$68,000	58.1%	66.2%
Office and Administrative Support	6.0%	\$47,852	36.5%	59.7%
Business and Financial Operations	5.8%	\$89,566	96.0%	67.1%
Computer and Mathematical	5.8%	\$96,993	87.9%	60.5%
Healthcare Support	4.6%	\$30,037	15.2%	24.9%
Architecture and Engineering	3.4%	\$81,000	78.6%	68.9%
Community and Social Services	1.2%	\$57,015	78.5%	43.0%
Sales and Related	1.1%	\$130,367	91.1%	73.3%
Education, Training, and Library	0.8%	\$88,650	100.0%	79.8%
Production	0.8%	\$80,000	60.4%	59.9%
Arts, Design, Entertainment, Sports, and Media Occupations	0.7%	\$61,000	80.4%	77.9%
Legal	0.5%	\$166,870	100.0%	43.5%
Building and Grounds Cleaning and Maintenance	0.5%	\$21,582	0.0%	0.0%
Transportation and Material Moving	0.5%	\$17,482	0.0%	47.7%
Protective Service	0.5%	\$21,067	8.7%	8.7%
Personal Care and Service	0.3%	\$42,615	66.2%	66.1%
Installation, Maintenance, and Repair	0.1%	\$94,000	100.0%	100.0%

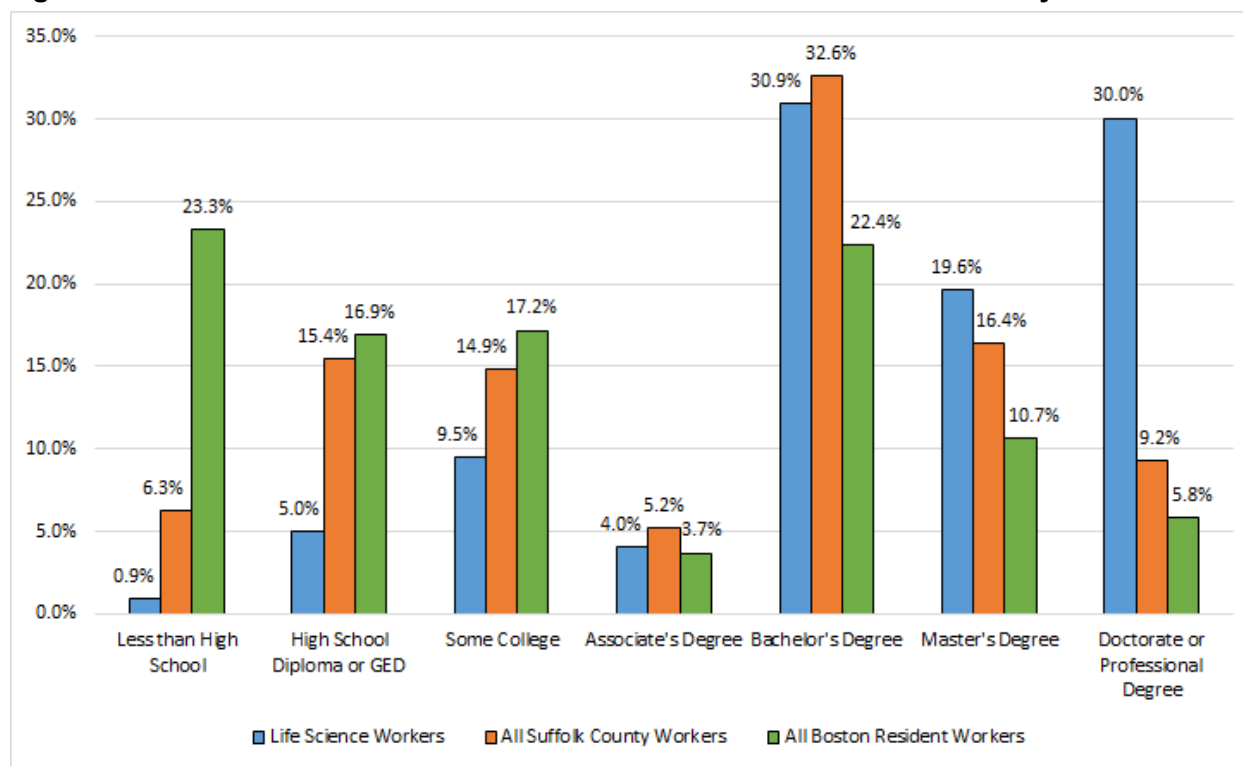
Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

Education of Life Sciences Workers

Life sciences workers generally have higher levels of education. Eighty percent of life science workers working in Suffolk County have a Bachelor's degree and 50 percent have a graduate degree. Almost 20 percent of life sciences workers have a Bachelor's degree in biology and life sciences, and almost 9 percent each in engineering, medical and health sciences, and business. Job postings for future life science workers also ask for high levels of education. Almost 93 percent of job postings for biotech jobs in Boston in 2020 required a Bachelor's degree or higher, and 25 percent required a graduate degree.⁸ For all online job postings in Boston in 2020, over 75 percent required a Bachelor's degree or higher, and 11 percent required a graduate degree.

Life science workers who work in Suffolk County tend to have higher levels of education than the overall level of workers who work in Suffolk County, as shown in **Figure 9**. Life science workers also tend to have higher levels of education than Boston resident workers.

Figure 9: Educational Attainment of Life Science Workers in Suffolk County



Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

As shown in **Table 2**, educational attainment of life science workers varies by occupation. Nearly 96 percent of life science workers in life, physical, or social science occupations have a Bachelor's degree or higher, but only 37 percent of the office and administrative support workers have a Bachelor's degree. Educational attainment of life science workers also varies by industry

⁸ Burning Glass

with medical testing labs having the highest share of workers with lower levels of education. About 48 percent of medical testing lab workers do not have a Bachelor's degree - about 33 percent have some college or an Associate's degree.

Life science workers of different levels of education earn different salaries, as shown in **Table 3**. Life science workers with Master's degrees have the highest median earnings at \$95,883 while life science workers with no college degrees earn at median about \$42,000.

Table 3: Median Earning by Educational Attainment for Life Science Workers

Educational Attainment	Share of all Life Science Workers	Median Earnings
Professional or Doctoral Degree	30.6%	\$79,878
Master's Degree	19.4%	\$95,883
Bachelor's Degree	30.4%	\$70,920
Associate's Degree	4.1%	\$48,870
Some College	9.7%	\$41,717
High School Diploma or GED	4.9%	\$42,000

Source: U.S. Census Bureau, 2015-2019 American Community Survey, IPUMS, BPDA Research Division Analysis

In order to access most high paying jobs in the life sciences, Boston residents need to obtain college degrees. In the BPS class of 2011, 64 percent of students graduated from high school on time, and 25 percent received an Associate's or Bachelor's degree within 10 years of beginning high school.⁹ In the BPS class of 2019, 73 percent of students graduated from high school on time, and 47 percent enrolled in a post-secondary institution.¹⁰ Future research will determine how many students in the BPS class of 2019 go on to receive a college degree.

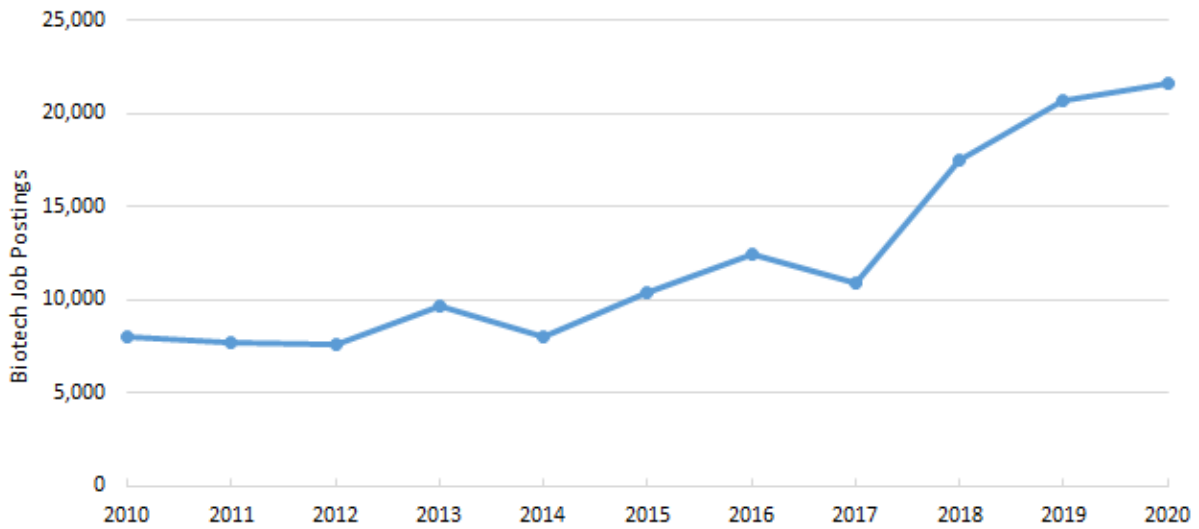
Biotech Job Postings in Boston

Biotech job postings in Boston have been on the rise. Burning Glass Technologies, which collects data on job listings posted on major job boards and company websites, defines biotech jobs as those requiring knowledge of scientific fields such as biochemistry and genetics, laboratory techniques such as chromatography and clinical research, and/or experience with technology that incorporates biological processes such as biosensors and bio-chips. According to Burning Glass data, Boston saw its highest ever number of biotech job postings in 2020, despite the COVID-19 pandemic, with over 21,500 job postings.

⁹ Boston Private Industry Council and Success Boston, <https://www.successboston.org/-/media/tbf/reports-and-covers/2018/success-boston-april3.pdf>

¹⁰ Massachusetts Department of Education, <https://profiles.doe.mass.edu/statereport/gradrates.aspx>

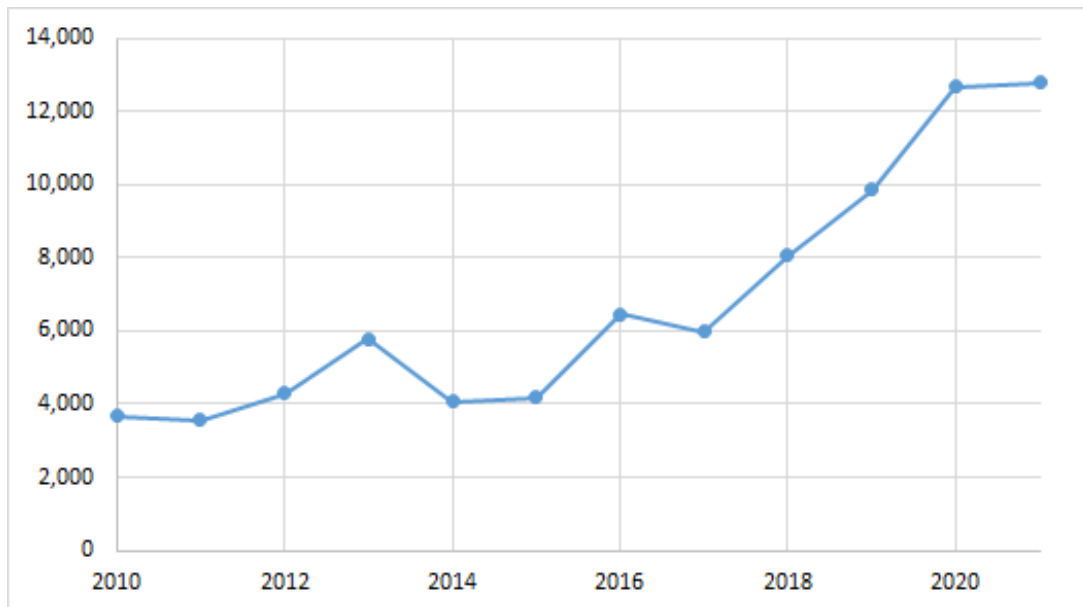
Figure 10: Biotech Job Postings in Boston by Year, 2010-2020



Source: Burning Glass Technologies Labor Insight Jobs, 2010-2020, and BPDA Research Division Analysis.

Examining the first half of each year, 2020 and 2021 look similar with approximately 13,000 biotech job postings each.

Figure 11: Biotech Job Postings in Boston from January 1st - June 30th by Year



Source: Burning Glass Technologies Labor Insight Jobs, 2010-2021, and BPDA Research Division Analysis.

Life Science Employers in Boston

Hospitals, universities, and government institutions are large employers of life science workers in Boston. The top ten institutional employers by number of biotech job postings in Boston in 2020 are shown in the following table. Partners Healthcare has consistently had the highest number of biotech job postings since 2018.¹¹ Hospitals and universities decreased their biotech job postings in 2020 compared to the year prior.

Table 4: Biotech Job Postings by Institutional Employers in Boston, 2020

Institutional Employers	Biotech Job Postings in 2020	% change from 2019
Partners Healthcare	1,169	-25.0%
Dana Farber Cancer Institute	910	-13.0%
Massachusetts General Hospital	855	-27.8%
Boston Children's Hospital	393	-18.5%
Boston University	372	-14.9%
Beth Israel Deaconess Medical Center	325	-49.2%
Boston Medical Center	288	-24.0%
Tufts Medical Center	134	52.3%
Northeastern University	97	38.6%
State of Massachusetts	87	22.5%

Source: Burning Glass, Boston job postings in 2020

Private-sector companies are also large employers of life science workers in Boston. Private companies have generally seen an increase in biotech job postings by year. The top ten private-sector employers by number of biotech job postings in Boston in 2020 are shown in **Table 5:**

¹¹ Partner's HealthCare is a network of Massachusetts hospitals and care facilities, of which MassGeneral Hospital is a founding member. Partners has both direct employees and employees through its associated hospitals. We count job postings based on the organization directly listing the opening. The total jobs listed by each entity are distinct.

Table 5: Biotech Job Postings by Corporate Employers in Boston, 2020

Corporate Employers	Biotech Job Postings in 2020	% change from 2019
Takeda Pharmaceuticals North America, Inc.	1,073	37.6%
Vertex Pharmaceuticals	877	27.7%
Thermo Fisher Scientific Inc	574	272.7%
Alexion Pharmaceuticals	419	3.7%
Exonics Therapeutics, Inc	302	319.4%
Ginkgo BioWorks	240	147.4%
Covance Incorporated	237	109.7%
Merck & Company	201	36.7%
Millennium Pharma, Inc	159	38.3%
Deloitte	147	-6.4%

Source: Burning Glass, Boston job postings in 2020

Benefits of Life Science Employment to Boston

Life science employment in Boston has a local multiplier of 1.8, meaning that on average, for each job added in the life sciences sector, another 0.8 jobs will be added in other parts of Boston's economy.¹² This multiplier reflects both jobs created in adjacent industries that do business directly with life science employers, as well as jobs in service industries that support employee's consumption of goods and services. The multiplier measured here counts only employment added in Boston and the three adjacent communities in Suffolk County. Jobs added in other parts of the metro area are excluded from this multiplier calculation.

We estimate that every 1,000 life science jobs added in the city will support an additional 92 jobs in accommodation and food services, 59 jobs in retail trade, 26 jobs in the social assistance sector, which includes child care services, 19 jobs in personal care and laundry services, 11 jobs in the arts, entertainment, and recreation sector, and 7 jobs in repair and maintenance. These jobs mostly reflect the impact of employee consumption. Other industries, such as professional and technical services (90 indirect jobs), administrative and support services (86 jobs), transportation and warehousing (45 jobs) and wholesale trade (18 jobs) increase employment due to increased demand from life science employers.

¹² The estimates of multipliers and indirect and induced job creation come from analysis performed by the BPDA Research Division using the Regional Economic Models, Inc. (REMI), PI+ Massachusetts Regions, v.2.3.1 model.

Boston hosts national and international life science conferences. While many of these conferences were put on hold during the pandemic, in-person life science conferences are being scheduled in Boston for the summer and fall of 2021. The Bioprocessing Summit will be held August 16-19 at the Sheraton Boston.¹³ Biotech Week is scheduled for September 20-30th, 2021 in a hybrid model online and in-person at the Boston Convention and Exhibition Center.¹⁴ These conventions bring professionals to Boston from around the world, boosting Boston's economy with spending on hotels, restaurants, transportation, shopping, and leisure/tourist activities.

The Life Sciences bring money into the city in the form of government and private funding. According to MassBio, 2020 was a record year for Life Science venture capital funding in the Commonwealth--raising \$5.8 billion dollars.¹⁵ The top four locations for venture capital-backed companies were Cambridge, Boston, Waltham, and Lexington. Massachusetts is strengthening its position as a Life Science leader in the nation. The industry is expanding to areas beyond Cambridge-- more than half of the companies that received venture capital funding in 2020 were located outside of Cambridge.¹⁶

Life Sciences in Other Cities

According to CBRE, Boston-Cambridge is the top U.S. life science market.¹⁷ Life Science clusters are defined by size, growth and concentration of employment, laboratory inventory, National Institute of Health (NIH) awards, and relevant venture capital funding.¹⁸ From Fiscal Year 1995-2018, Boston received the highest share of NIH funding out of all U.S. cities, before falling slightly behind New York City in FY2019 and FY2020. Other cities with large NIH funding awards include Seattle, Los Angeles, and Philadelphia.

¹³ <https://www.bioprocessingsummit.com/>

¹⁴ <https://informaconnect.com/biotech-week-boston/>

¹⁵ MassBio, "[BioPharma Funding Report: Industry Snapshot](#)." February 2021.

¹⁶ MassBio, "[BioPharma Funding Report: Industry Snapshot](#)." February 2021.

¹⁷ CBRE, [Leading Life Science Clusters: The Bio-Boom Intensifies](#), October 2020

¹⁸ CBRE, [Leading Life Science Clusters: The Bio-Boom Intensifies](#), October 2020.

Table 6: Top Life Science Clusters in the U.S. according to CBRE

FIGURE 1: U.S. TOP LIFE SCIENCE CLUSTERS

1. Boston-Cambridge
2. San Francisco Bay Area
3. San Diego
4. Washington, D.C. - Baltimore
5. Raleigh-Durham
6. New Jersey
7. Philadelphia
8. New York City
9. Seattle
10. Los Angeles
11. Chicago
12. Orange County, CA
13. Denver-Boulder

Source: CBRE Research, Q3 2020.

Note: Ranked by size, growth and concentration of life sciences employment, concentration of R&D life sciences employment, size of laboratory inventory, and amount of NIH and life sciences venture capital funding.

FIGURE 2: U.S. TOP 10 EMERGING CLUSTERS

1. Pittsburgh
2. Houston
3. Austin
4. Detroit
5. Phoenix
6. Dallas/Ft. Worth
7. St. Louis
8. Atlanta
9. Portland
10. Minneapolis

Source: CBRE Research, Q3 2020.

Note: Ranked by size and growth of life sciences employment, concentration of R&D life sciences employment, amount and growth of life sciences venture capital funding and NIH funding.

The top global cities outside of the U.S. for life science research based on life sciences articles published in the journal *Nature* in 2019 are given in the following table. For comparison, the top U.S. metro regions, New York City and Boston, published 2,549 and 2,296 life science articles in *Nature* respectively.

Table 7: Global Life Science Centers Based on *Nature* Life Science Articles

City	Country	<i>Nature</i> life science articles 2019
Beijing	China	1,057
London metro	UK	1,134
Paris	France	953
Cambridge	UK	830
Shanghai	China	737
Tokyo metro	Japan	665
Oxford	UK	649
Munich	Germany	495
Toronto metro	Canada	493
Zurich	Switzerland	481

Source: <https://www.natureindex.com/supplements/nature-index-2020-science-cities/tables/life-sciences>