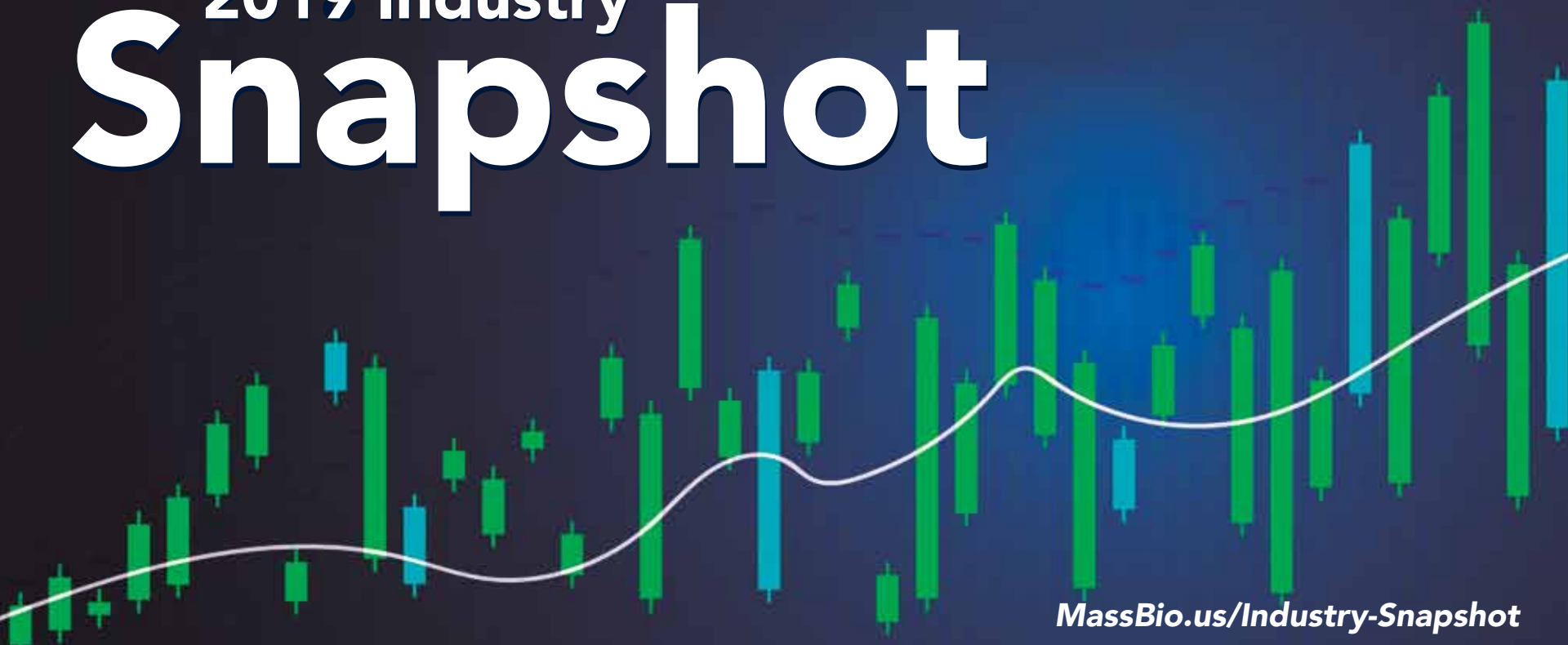


2019 Industry Snapshot



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2019 Industry Snapshot

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Industry Employment

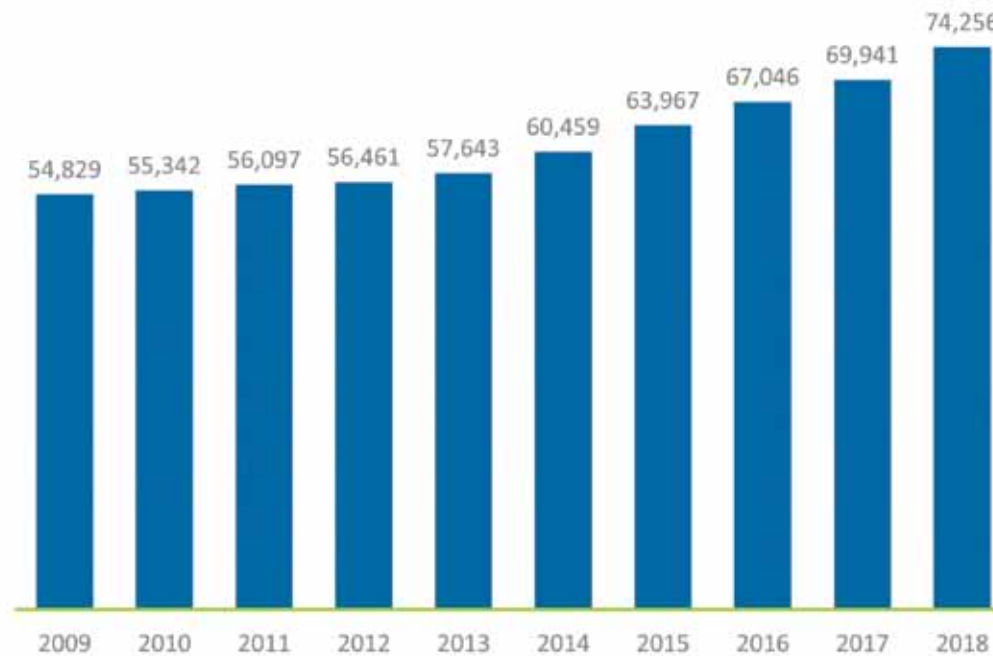
Massachusetts Biopharma Industry Employment



Industry Employment

Industry jobs grew by **35%** in the last 10 years adding close to 20,000 jobs.

The industry grew at its fastest rate year-over-year in over a decade at **6.4%**.



35% growth
over 10 years

Source: Privately owned companies, U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW)

10 and 1 Year Employment Biotech Research & Development



Industry Employment

Massachusetts
biotech R&D
jobs have grown
by **47%** in the
past 10 years.

State	2009	2017	2018	10 Year Change (09-18)	1 Year Change (17-18)
California	21,336	39,203	44,751	110%	14%
Massachusetts	26,759	35,768	39,365	47%	10%
Pennsylvania	13,565	13,413	15,099	11%	13%
New Jersey	9,086	12,976	14,822	63%	14%
North Carolina	6,778	8,578	10,468	54%	22%
Maryland	9,801	15,351	9,697	-1%	-37%
New York	3,706	8,856	9,680	161%	9%
Washington	2,737	7,149	7,962	191%	11%
Texas	4,456	5,437	5,556	25%	2%
Illinois	2,257	2,770	3,291	46%	19%

Source: Privately owned companies, U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW)

10 and 1 Year Employment Biopharma Manufacturing



Industry Employment

Employment at Massachusetts companies focused on biopharma manufacturing has grown by **6% since 2009**.

In the same period, the biomanufacturing jobs in the U.S. as a whole only grew by 1%

State	2009	2017	2018	10 Year Change (09-18)	1 Year Change (17-18)
California	43,035	52,125	46,693	9%	-10%
New Jersey	37,957	22,335	21,950	-42%	-2%
North Carolina	18,787	20,770	21,705	16%	5%
New York	20,971	20,435	21,531	3%	5%
Illinois	18,534	19,778	20,297	10%	3%
Pennsylvania	22,294	18,105	18,065	-19%	0%
Indiana	18,822	18,080	17,093	-9%	-5%
Puerto Rico	22,556	14,376	14,214	-37%	-1%
Texas	10,077	11,994	12,494	24%	4%
Massachusetts	9,581	10,072	10,148	6%	1%

Source: Privately owned companies, U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW)

Largest Biopharma Industry Employers in Massachusetts, 2018



Industry Employment

Takeda is now the **largest biopharma employer** in Massachusetts.

Rank	Company	Employees
1	Takeda	4,927
2	Sanofi	4,800
3	Biogen	2,400
4	Novartis	2,337
5	Pfizer	2,226
6	Vertex	1,741
7	MilliporeSigma	1,600
8	Charles River Laboratories	1,545
9	Quest Diagnostics	1,450
10	Parexel International	1,220
11	EMD Serono	1,047
12	AbbVie	1,020
13	Alkermes	823

Rank	Company	Employees
14	GE Healthcare Life Sciences	777
15	Alnylam	754
16	bluebird bio	745
17	Moderna	640
18	Foundation Medicine	600
18	Merck	600
20	Sunovion Pharmaceuticals	590
21	SAGE Therapeutics	540
22	Amgen	500
23	Tesaro	435
24	AstraZeneca	400
25	Bristol-Myers Squibb	400

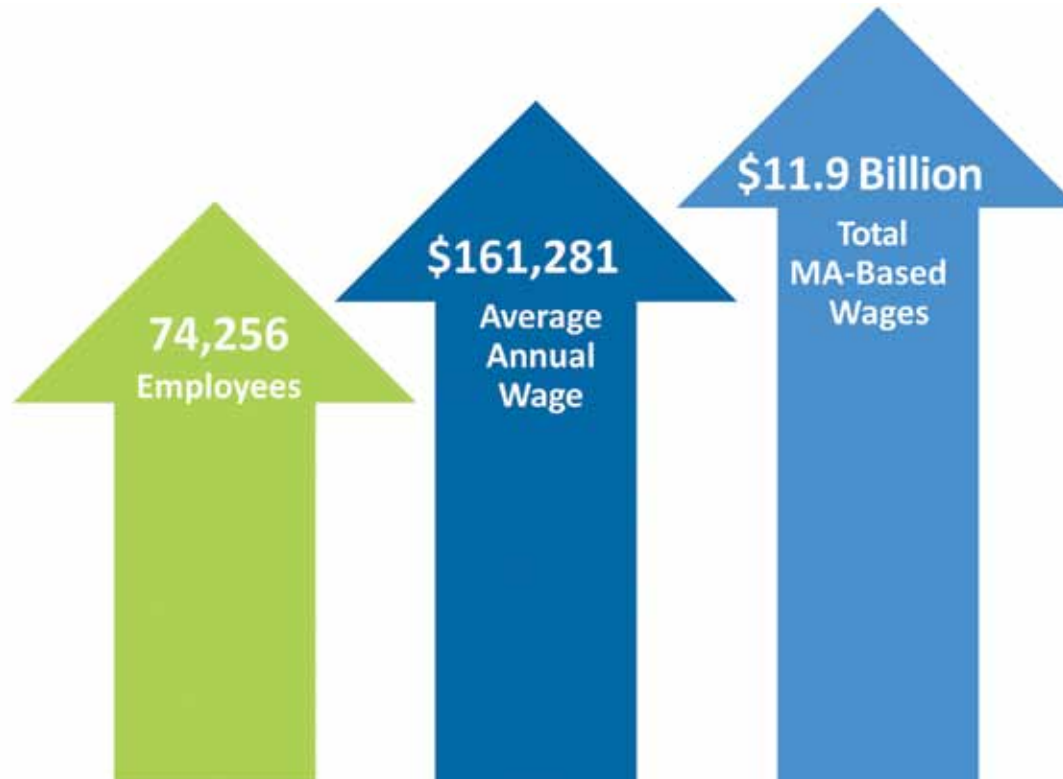
Sources: MassBio Membership Reports & Surveys; Boston Business Journal Book of Lists, 2018

Biopharma

Economic Impact, 2018



Industry Employment



Source: Privately sector, U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW)

Life Sciences Lab Inventory Growth



Industry Employment

Over **12.4 million** square feet of commercial lab space has been added to Massachusetts in the last 10 years, an increase of **70%**.



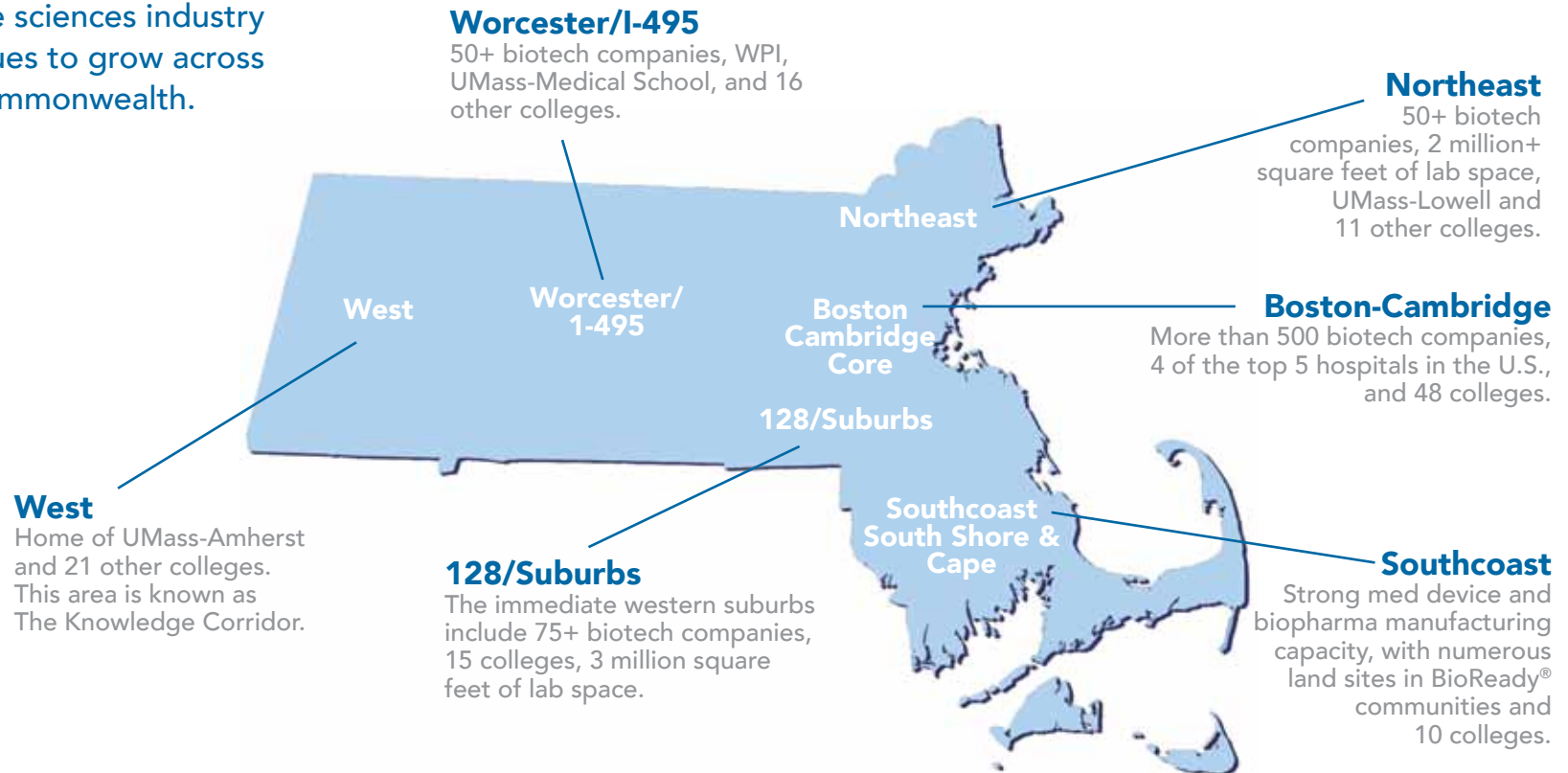
Sources: Colliers Meredith & Grew, Life Science Review, 2007-2015; CBRE 2016-2019

Industry Geography



Industry Employment

The life sciences industry continues to grow across the Commonwealth.



Source: MassBio Membership Reports



Investment in the Industry



Top NIH-Funded States: by Total Funding & Per Capita, 2018



More than 10%

of all NIH funding went to Massachusetts organizations in 2018.

Total NIH Funding

State	Funding
California	\$4,243,446,496
Massachusetts	\$2,887,150,148
New York	\$2,632,652,693
Pennsylvania	\$1,810,217,516
Maryland	\$1,531,640,271
North Carolina	\$1,402,438,380
Texas	\$1,243,375,373
Washington	\$1,042,298,686
Illinois	\$895,375,844
Ohio	\$816,911,217
US	\$28,319,914,865



Source: NIH, Research Portfolio Online Reporting, U.S. Census Bureau

Top NIH-Funded Independent Hospitals, 2018

Investment in the Industry

Four of the top five
NIH-funded independent
hospitals are in Massachusetts.

Massachusetts receives
56% of all NIH funding
to Independent Hospitals.

Organization	City	State	Awards	Funding
Massachusetts General Hospital	Boston	MA	906	\$465,776,958
Brigham and Women's Hospital	Boston	MA	560	\$388,928,321
Vanderbilt University Medical Center	Nashville	TN	491	\$269,892,304
Dana-Farber Cancer Institute	Boston	MA	228	\$172,449,395
Boston Children's Hospital	Boston	MA	344	\$167,075,825
Children's Hospital of Philadelphia	Philadelphia	PA	236	\$145,610,804
Beth Israel Deaconess Medical Center	Boston	MA	240	\$128,148,819
Cincinnati Children's Hospital Medical Center	Cincinnati	OH	290	\$120,876,156
St. Jude's Children's Research Hospital	Memphis	TN	117	\$92,105,597
New York State Psychiatric Institute	New York	NY	113	\$63,361,395
Cedars-Sinai Medical Center	Los Angeles	CA	143	\$63,195,585
Seattle Children's Hospital	Seattle	WA	112	\$47,077,137
National Jewish Health	Denver	CO	60	\$41,511,120
Roswell Park Cancer Institute Corporation	Buffalo	NY	66	\$37,884,585
Boston Medical Center	Boston	MA	79	\$34,824,666
Rhode Island Hospital	Providence	RI	67	\$29,973,204
McLean Hospital	Belmont	MA	71	\$29,212,777
Henry Ford Health System	Detroit	MI	44	\$28,807,855
California Pacific Medical Center Research Institute	San Francisco	CA	12	\$28,580,332
Massachusetts Eye and Ear Infirmary	Boston	MA	52	\$24,738,160
Children's Hospital of Los Angeles	Los Angeles	CA	41	\$22,295,828
Tufts Medical Center	Boston	MA	41	\$20,654,118

Please note:
NIH lists university-operated
hospitals separately.

Source: NIH, Research Portfolio Online Reporting

Top MA NIH-Funded Higher Education & Research Institutes, 2018

Investment in the Industry

Massachusetts centers of Higher Education and Research Institutes received **\$1.28 billion in 2018.**

Organization	Awards	Funding
Harvard Medical School	387	\$208,813,296
University of Massachusetts Medical School	345	\$160,982,250
Boston University Medical Campus	284	\$140,229,291
Harvard School of Public Health	178	\$125,227,087
Broad Institute, Inc.	89	\$120,715,260
Massachusetts Institute of Technology	247	\$113,534,157
Harvard University	151	\$79,310,611
Tufts University Boston	131	\$57,680,765
Boston University (Charles River Campus)	143	\$50,625,100
Northeastern University	89	\$37,859,153
University of Massachusetts Amherst	89	\$29,509,799
Brandeis University	78	\$26,392,393
Boston College	44	\$18,597,050
Whitehead Institute for Biomedical Research	35	\$14,681,320
Joslin Diabetes Center	35	\$14,563,515

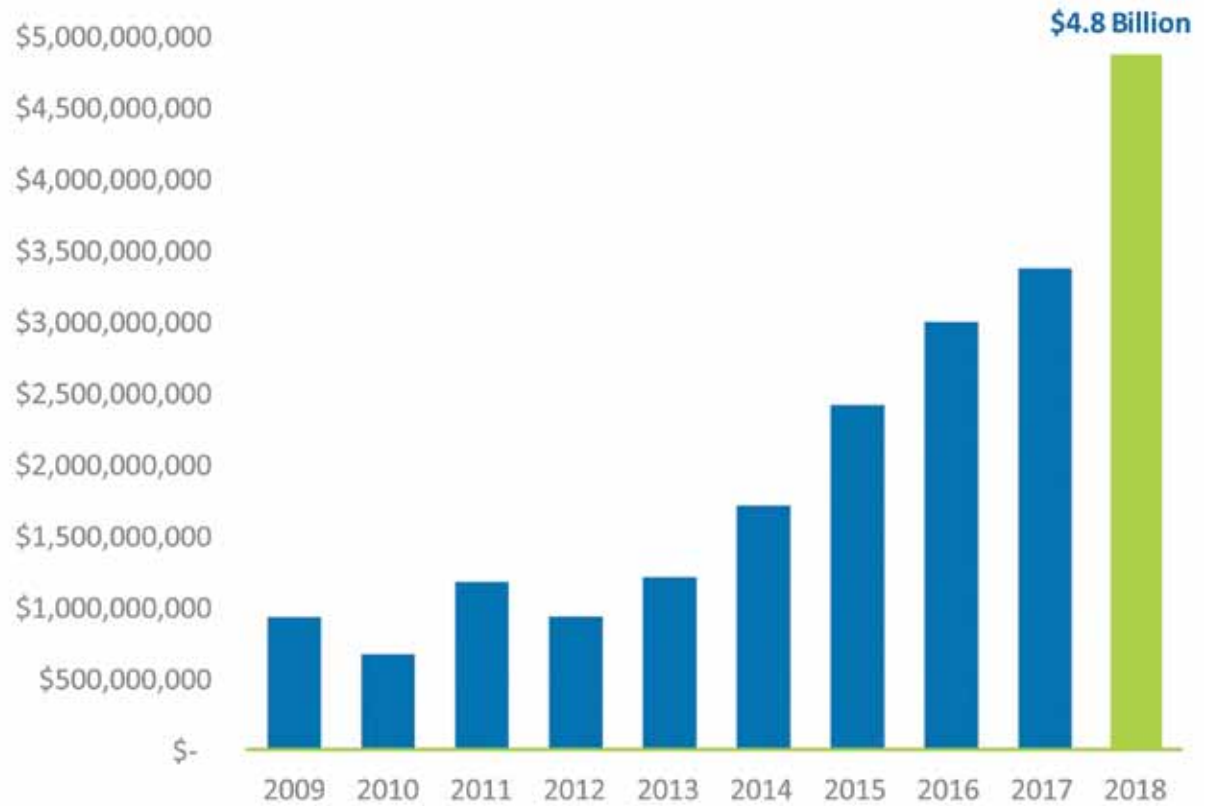
Source: NIH, Research Portfolio Online Reporting

Venture Capital Investment: Biopharma



Venture capital investment in Massachusetts biopharma companies was **\$4.8 billion** in 2018.

In the first two quarters of 2019, Massachusetts biopharma companies raised just under **\$1.5 billion**.



Top Venture Capital Financings in Massachusetts, 2018

Investment in the Industry

Moderna raised the largest financing round in 2018, totaling **\$500 million**, followed by Relay Therapeutics at **\$400 million**.

Company	Financing (\$ million)	Investment Round
Moderna	500	Series Undisclosed
Relay Therapeutics	400	Series C
Cerevel Therapeutics	350	Series Undisclosed
TCR2 Therapeutics	125	Series B
Kaleido Biosciences	101	Series C
Constellation Pharmaceuticals	100	Series Undisclosed
Generation Bio	100	Series B
Rubius Therapeutics	100	Series B
Stoke Therapeutics	90	Series B
Beam Therapeutics	87	Series A
Fulcrum Therapeutics	80	Series B
KSQ Therapeutics	80	Series C
Morphic Therapeutic	80	Series B
SQZ Biotech	72	Series C
Compass Therapeutics	70	Series A
Akero Therapeutics	70	Series B

Source: EvaluatePharma®, July 2019 Note: Excluding PIPE numbers.

Top Venture Capital financings in Massachusetts, 2019 (Q1&2)

Investment in the Industry

The first half of 2019 has seen smaller financing rounds, with Beam Therapeutics raising the largest financing amount at **\$135 million**.

Company	Financing (\$ million)	Investment Round
Beam Therapeutics	135	Series B
OncologiE	80	Series B
Arrakis Therapeutics	75	Series B
Karuna Therapeutics	68	Series B
Inozyme Pharma	67	Series A
Ribon Therapeutics	65	Series B
Imara	63	Series B
Dewpoint Therapeutics	60	Series A
Lyndra	55	Series B
Dyne Therapeutics	50	Series A
Life Biosciences	50	Series B

Source: EvaluatePharma®, July 2019 Note: Excluding PIPE numbers.

Location of Venture Capital Backed Companies

Investment in the Industry

Cambridge-based biopharma companies received **63%** of all biotech venture investment in the state.

Location of venture-backed companies (\$ million)



Source: EvaluatePharma®, July 2019

Massachusetts IPOs

2018

Investment in the Industry

There were **18 IPOs** from Massachusetts biotech companies in 2018.
31% of all US-based biotech IPOs in 2018 were from Massachusetts companies.



\$604 MM



\$108 MM



\$84 MM



\$277 MM



\$100 MM



\$80 MM



\$165 MM



\$100 MM



\$84 MM



\$143 MM



\$99 MM



\$69 MM



\$121 MM



\$97 MM



\$69 MM



\$114 MM



\$86 MM



\$60 MM

Massachusetts IPOs

2019 (Q1&2)

Investment in the Industry

There have been **9 IPOs** from Massachusetts biotech companies in the first half of 2019.
35% of all US-based biotech IPOs in the first half of 2019 were from Massachusetts companies.



\$142 MM



\$90 MM



\$75 MM



\$105 MM



\$78 MM



\$71 MM



\$102 MM



\$75 MM



\$70 MM

Note: Figures refer to "offer amounts" (investment secured) at time of IPO. Source: Nasdaq.com

Geography of Companies with IPOs, 2018

Investment in the Industry

Location of Companies with IPOs

In 2018, **78%** of all Massachusetts biotech companies that went public were located in Cambridge.



Source: EvaluatePharma®, July 2019

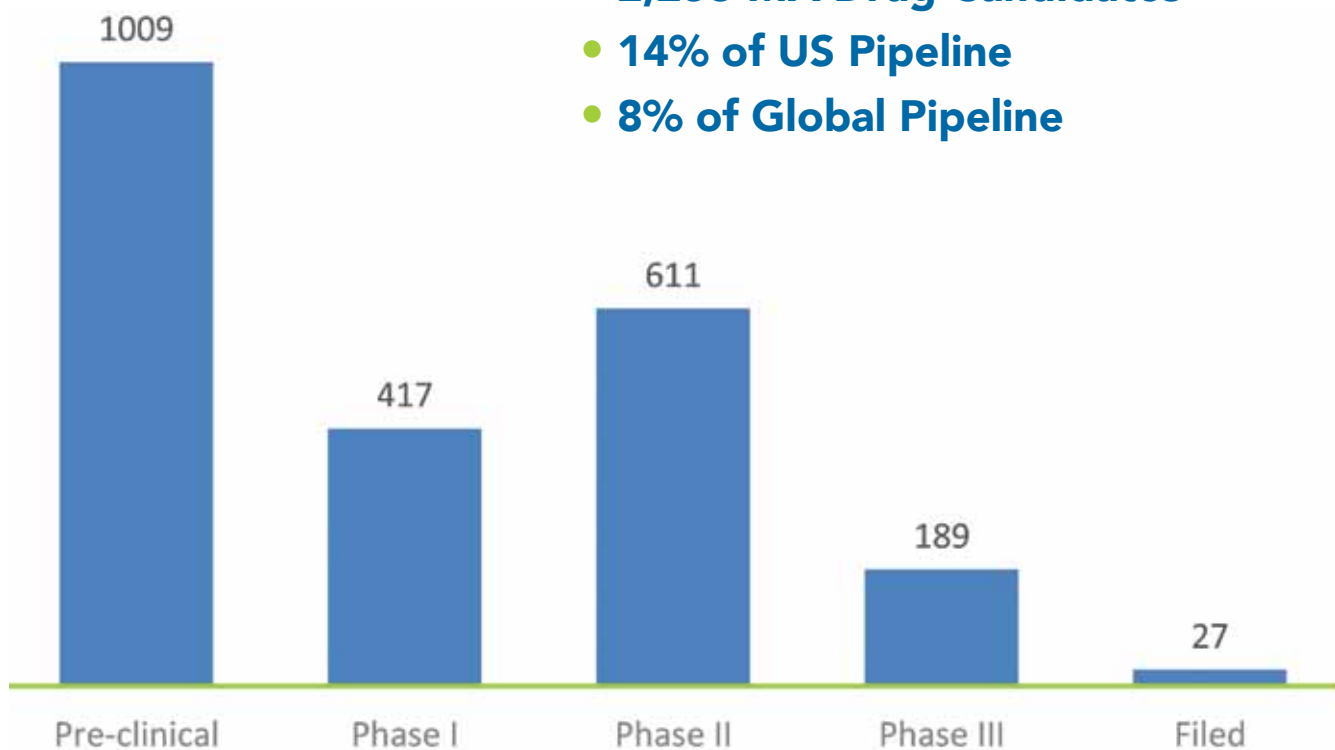


Drug Development Pipeline

Massachusetts Drug Development Pipeline & Trials by Phase

The Massachusetts drug development pipeline includes **27 candidates** pending FDA approval.

- **2,253 MA Drug Candidates**
- **14% of US Pipeline**
- **8% of Global Pipeline**

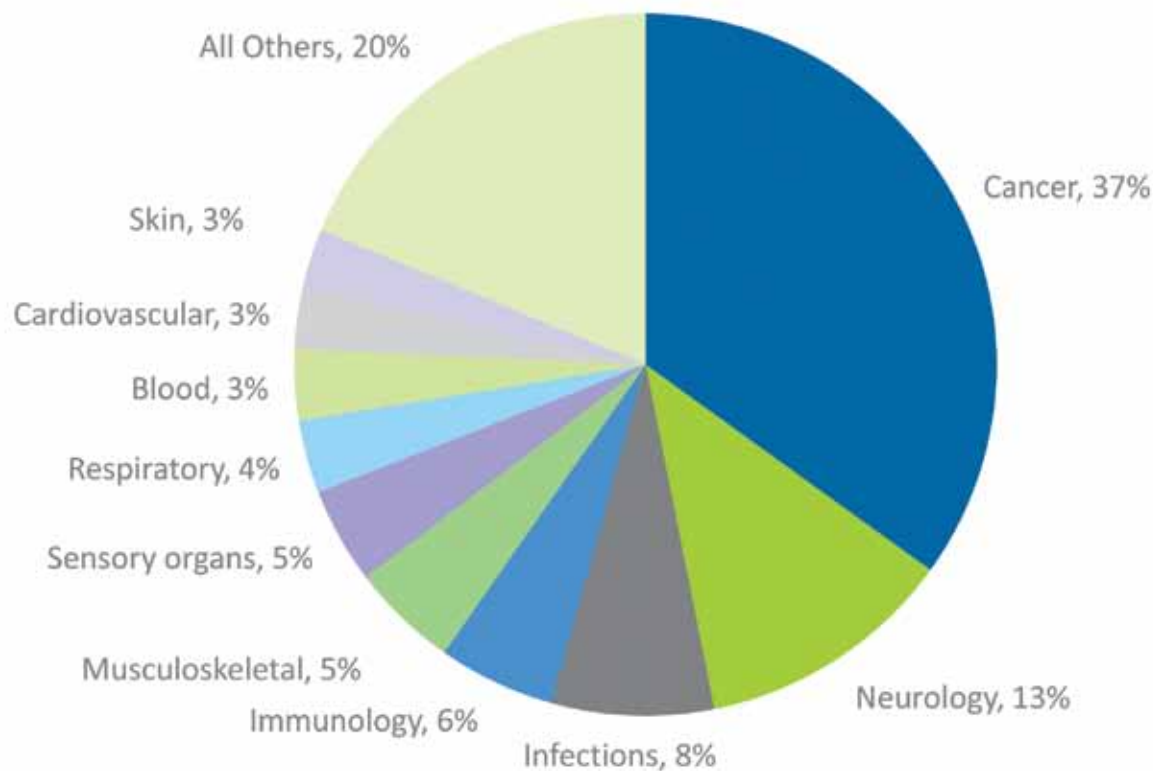


Only Massachusetts-headquartered company pipelines are included. Source: EvaluatePharma®, August 2019

Massachusetts Pipeline by Therapeutic Area

Drug Development Pipeline

Oncology continues to be the most frequently researched therapeutic area in Massachusetts.



Only Massachusetts-headquartered company pipelines are included. Source: EvaluatePharma®, August 2018 Percent of total drug candidates

Massachusetts Pipeline by Medical Indication (Top 25)

Massachusetts researchers are currently researching and developing products for patients with over **400 different medical indications.**

Medical Indication	Number of Investigational Drugs	% of all Investigational Drugs
General cancer indications	245	12.23%
Solid tumor indications	198	9.89%
Undisclosed	114	5.69%
Other neurological indications	95	4.74%
Other immune indications	58	2.90%
General blood malignancies	53	2.65%
General inflammatory disorders	49	2.45%
Duchenne muscular dystrophy	48	2.40%
Cystic fibrosis (CF)	46	2.30%
Other metabolic indications	42	2.10%
Breast cancer	39	1.95%
Alzheimer's disease	39	1.95%
Leukemia, acute myeloid (AML)	35	1.75%
Non-Hodgkin lymphoma (NHL)	35	1.75%
Amyotrophic lateral sclerosis (ALS)	34	1.70%
Melanoma	32	1.60%
Non-small cell lung cancer (NSCLC)	32	1.60%
Parkinson's disease	32	1.60%
Ovarian cancer	28	1.40%
Diabetes, type II (maturity onset)	28	1.40%
General bacterial indications	27	1.35%
General eye disorders	27	1.35%
Diabetes, type I (juvenile onset)	26	1.30%
Gram negative infections	26	1.30%
Nonalcoholic steatohepatitis (NASH)	25	1.25%

Changing the Lives of Patients

Drug Development Pipeline

**Massachusetts-headquartered companies
have developed therapies that treat
patient populations of up to**



**265 million patients
IN THE UNITED STATES**



**2 billion patients
AROUND THE WORLD**

Appendix

What's in a Number?

Why use the QCEW?

QCEW data is comprised of employment and wages from unemployment insurance (UI) tax reports submitted by employers and is augmented by both BLS worksite reports and the Annual Re-filing Survey (ARS), which surveys one quarter of all private-sector establishments each year. The QCEW data is available on a more timely basis than the CBP and is directly related to the state's ES-202 data, providing an additional, ongoing corroborative source.

What is considered "biopharma" employment?

Using the North American Industry Classification System (NAICS), with which QCEW data is reported, MassBio has determined that several NAICS classifications can be considered part of the biotechnology and pharmaceutical industry. However, only in certain cases can the industry claim 100% of any one NAICS code. MassBio determined that a percentage of some industry classifications could be used in estimating overall industry employment. In some cases, the percentage determination for certain industry codes was based on reports developed by other organizations. The following NAICS codes are utilized:

NAICS 3254: Pharmaceutical MFG, including Biologics (100%)

NAICS 541714 Research and Development in Biotechnology (except Nanobiotechnology) (100%)

NAICS 541715 Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology) (27% in 2017 and beyond, 22% for 2016 and prior.)

NAICS 541713 Research and Development in Nanotechnology (22%)

NAICS 334516: Analytical Laboratory Instrument MFG (30%)

NAICS 54138: Testing Laboratories (9%)

NAICS 622: Hospitals (4.5%)

NAICS 61131: Universities (1.9%)

NAICS 621511: Medical Testing Laboratories (100%)

As of 2017 data, NAICS 541711, Research and Development in Biotechnology and NAICS 541712, R&D in Physical, Engineering, and Life Sciences (except biotech) have been replaced by 541714 and 541715 respectively. NAICS 541715 was created from parts of the previous NAICS 541711 and NAICS 541712 and now stands alone in the 2017 data.

NAICS 4242, Drug merchant wholesalers, is no longer included in any current or annual employment figures. NAICS 621511, Medical Laboratories, is included. Prior to 2013, we omitted Medical Laboratories, as these laboratories are health care services related, providing services to the medical delivery and patient care system, rather than the Biopharma research development and manufacturing industry. We now acknowledge that Medical Laboratories are closely connected to the Biopharma industry, requiring similar capacity and skills found in the Biopharma industry.

About Us

MassBio's mission

is to advance Massachusetts' leadership in the life sciences to grow the industry, add value to the healthcare system and improve patient lives.

We represent 1,200+ organizations in the life sciences industry, including biopharma, medical device, combination product, digital health companies, along with academic institutions, research hospitals, disease foundations and service providers.

MassBio.org



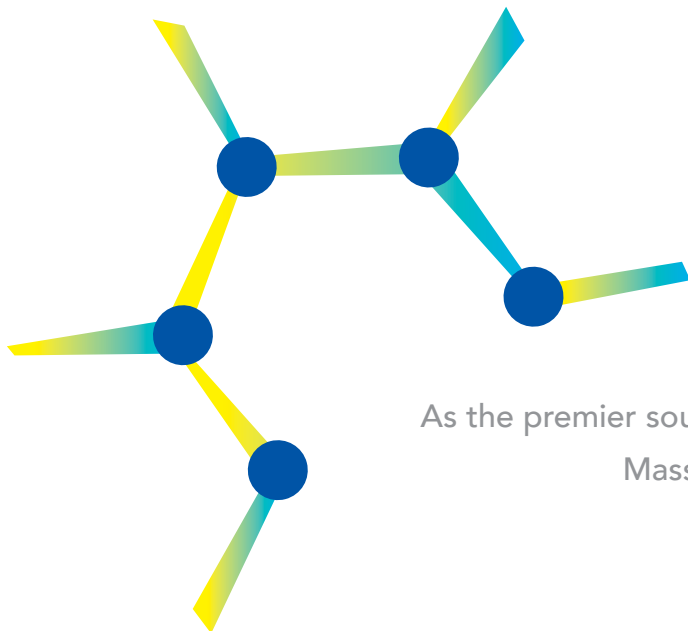
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As the premier source of information on life sciences in Massachusetts, MassBio tracks industry statistics over time and issues an overview Industry Snapshot each year.

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