

Boston: Most NIH Funds for 23 Consecutive Years

In fiscal year 2017, Boston continued its unparalleled 23-year record with more NIH funding than any other U.S. city. This report delves into funding provided by the National Institutes of Health for the fiscal year 2017, with a concentration on grant recipients in Boston. It also cites specific advancements in science and medicine that were made possible by the NIH awards to Boston research institutes, hospitals, universities, and private companies.

The Boston Planning & Development Agency

We strive to understand the current environment of the city to produce quality research and targeted information that will inform and benefit the residents and businesses of Boston. Our Division conducts research on Boston's economy, population, and commercial markets for all departments of the BPDA, the City of Boston, and related organizations.

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About NIH

The National Institutes of Health (NIH), part of the U.S. Department of Health and Human Services, is the largest source of funding for medical research in the world. Its mission is “to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability.”¹ NIH is comprised of 27 Institutes and Centers, each with a specific research agenda.² More than 80% of the \$32.3 billion NIH budget goes to funding researchers outside the NIH – at more than 2,500 universities and research organizations.³

Boston: Most NIH Funds for 23 Consecutive Years

For the fiscal year 2017, Boston continued its unparalleled 23-year record with more NIH funding than any other U.S. city. Forty-five Boston institutions received total funds approaching \$1.97 billion and 3,710 NIH awards. Boston represents 7.5% and 72% of total NIH funding across the U.S. and Massachusetts, respectively. Additionally, Boston is home to twenty-five

organizations that received over \$1 million in NIH funding, and eight organizations that received over \$100 million, demonstrating that Boston’s medical research scene is consistent in its excellence across many celebrated organizations, rather than concentrated in a select few.

TABLE 1 Boston’s Top Recipients of NIH Funding
FY2017

Organization Name	Awards	Funding in Millions
Massachusetts General Hospital	812	\$394
Brigham and Women's Hospital	571	\$390
Harvard Medical School	415	\$213
Boston Children's Hospital	345	\$157
Dana-Farber Cancer Institute	219	\$144
Boston University Medical Campus	265	\$134
Beth Israel Deaconess Medical Center	240	\$130
Harvard School of Public Health	192	\$127
Total of Top Boston Recipients	3,059	\$1,693

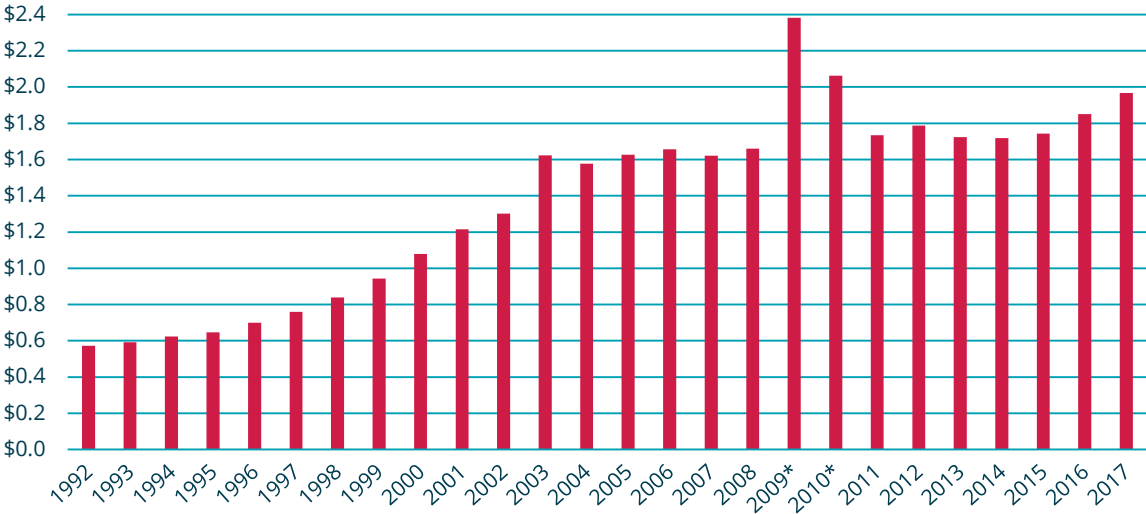
Source: National Institutes of Health “NIH Awards by Location and Organization FY2017,” BPDA Research Division Analysis

History of NIH Funds in Boston

Since 1992, Boston has received \$36 billion in NIH funding. Boston’s NIH funding reached a record high in 2009 due to economic stimulus dollars created by the American Recovery and Reinvestment Act (ARRA), which was awarded to projects with

end dates no later than September 2011.⁴ As ARRA ended, funding levels normalized to pre-ARRA levels, and have been gradually increasing in recent years. Boston’s annual NIH funding has remained over \$1.7 billion per year since 2011.

FIGURE 1 Boston’s NIH Awards: FY1992-2017 in billions of dollars



* Including ARRA funding

Source: National Institutes of Health, “NIH Awards by Location and Organization,” FY1992-FY2017, BPDA Research Division Analysis

Top Funded U.S. Cities

Although Boston has remained NIH's highest funded city for 23 years, New York City, with a population nearly thirteen times that of Boston, has long been a close second. Boston received \$2,986 in NIH funding per capita in FY2017, the highest per capita funding among the top 10 funded cities and

a \$221 per capita increase from FY2016. Following Boston and New York are Seattle, Philadelphia and Baltimore with funding just below \$1 billion each. These five cities received approximately 25% of the total NIH funding.

FIGURE 2 Top Five U.S. Cities in NIH Funding FY2017
in billions of dollars



Source: National Institutes of Health, "NIH Funding by Location and Organization," FY2017, BPDA Research Division Analysis

Top Funded Organizations

Boston's two largest hospitals, Massachusetts General Hospital and Brigham and Women's Hospital, were the only hospitals listed among the top 20 NIH funding recipients in the United States. Together

they received 1,383 awards and over \$785 million in funding. Their combined funding represents 29% of all funding in Massachusetts and 40% of Boston's entire NIH funding.

TABLE 2

**Top 20 Recipients of NIH Funding
FY2017**

Rank	Organization Name	City	Awards	Funding In Millions
1	Johns Hopkins University	Baltimore, MD	1,317	\$652
2	University of California, San Francisco	San Francisco, CA	1,246	\$594
3	University of Michigan	Ann Arbor, MI	1,155	\$522
4	University of Pennsylvania	Philadelphia, PA	1,127	\$494
5	University of Pittsburgh	Pittsburgh, PA	1,095	\$485
6	Stanford University	Stanford, CA	979	\$466
7	University of Washington	Seattle, WA	969	\$443
8	Duke University	Durham, NC	823	\$440
9	Washington University	Saint Louis, MO	950	\$436
10	Yale University	New Haven, CT	955	\$425
11	University of California San Diego	San Diego, CA	889	\$424
12	University of North Carolina Chapel Hill	Chapel Hill, NC	906	\$420
13	Columbia University Health Sciences	New York, NY	851	\$403
14	University of California Los Angeles	Los Angeles, CA	838	\$401
15	Massachusetts General Hospital	Boston, MA	812	\$395
16	Brigham and Women's Hospital	Boston, MA	571	\$391
17	Emory University	Atlanta, GA	711	\$325
18	Icahn School of Medicine at Mount Sinai	New York, NY	558	\$318
19	University of Wisconsin-Madison	Madison, WI	619	\$298
20	Fred Hutchinson Cancer Research Center	Seattle, WA	261	\$285

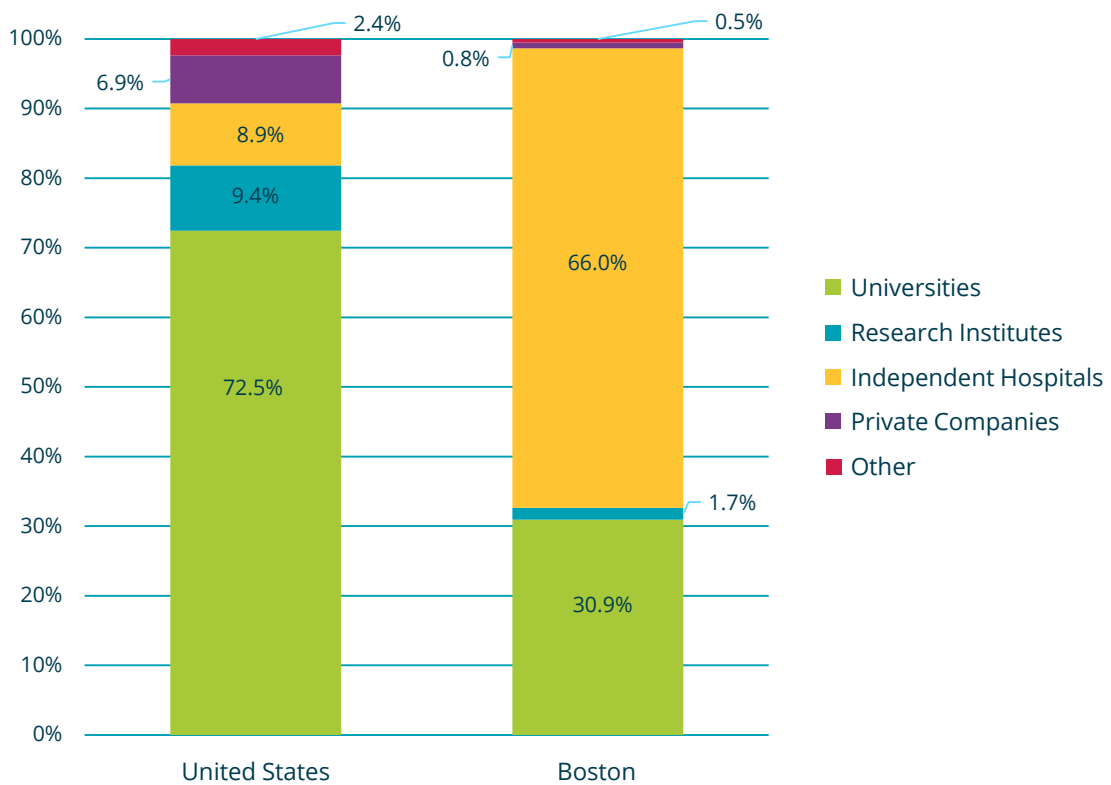
Source: National Institutes of Health, "NIH Funding by Location and Organization" FY2017, BPDA Research Division Analysis

Funding By Organization Type

Nationally, 73% of NIH funding goes to universities and only 9% goes to hospitals. However, the bulk of Boston's NIH funding goes toward hospitals due to their integral role in advancing biomedical research in the U.S. NIH also provides vital funds to research institutes, private companies, and other organizations. The major research institutes that received NIH funding in Boston were the Joslin Diabetes Center and the Schepens Eye Research Institute,

an affiliate of Massachusetts Eye and Ear Infirmary. Private companies which received NIH funding are concentrated in the biotech and healthcare industries, but also include manufacturing, fitness, and software companies. "Other organizations" includes non-profits, such as the Harvard Pilgrim Health Care Institute which received close to \$9 million in NIH funding for a study examining environmental influences on child health.⁵

FIGURE 2 NIH Funding by Type of Institution
FY2017



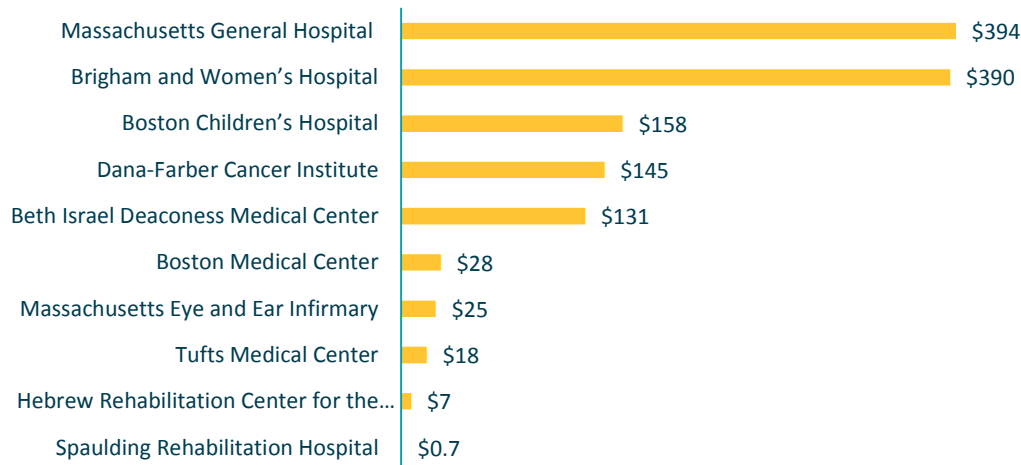
Source: National Institute of Health, "NIH Funding by Location and Organization," FY2017, BPDA Research Division Analysis

Hospitals and Health Centers

The funding awarded to Boston's hospitals alone exceeds total funding received by any other city, with the exception of New York; this demonstrates the National Institute of Health's recognition of Boston's hospitals as national leaders in health care and medical research. As of 2017, Boston hosts 21 in-patient hospitals with a combined total

of 6,021 beds.⁶ Ten Boston hospitals were granted 2,364 NIH awards, \$1.3 billion of funding, and represent 66% and 48% of the city's and state's totals, respectively. Of the top six NIH-funded hospitals in the country, Boston claims five. Of the top 30 NIH-funded hospitals in the country, Massachusetts claims ten, with nine of those in Boston.

FIGURE 3 Top Boston Hospital in NIH Funding FY2017 in millions of dollars



Source: National Institute of Health, "NIH Funding by Location and Organization," FY2017, BPDA Research Division Analysis

Massachusetts General Hospital (MGH) and Brigham and Women's Hospital, both teaching hospitals for Harvard Medical School, were the top two NIH-funded hospitals in the United States. Massachusetts General Hospital received 30% of all grants to hospitals in Boston, and has remained Boston's top NIH-funded hospital for 17 consecutive years. Massachusetts General Hospital conducts the largest hospital-based research program in the United States with over 10,000 researchers and staff and 1.25 million square feet of research space, primarily in downtown Boston and Charles-

town.⁷ Within MGH is the Massachusetts Eye and Ear Infirmary, which was ranked the nation's #1 ear, nose, and throat care hospital according to the 2016-2017 *U.S. News & World Report*.⁸ The organization has teamed with NIH-recipient Schepens Eye Research Institute to become the largest vision and hearing research center in the world.

Brigham and Women's Hospital has the largest medical research program in the Longwood Medical Area (LMA). The LMA is a sprawling campus of 22 medical institutions that includes Boston Children's

Hospital, Dana-Farber Cancer Institute, Beth Israel Deaconess Medical Center, and Joslin Diabetes Center. Harvard Medical School and Harvard School of Public Health are also located in the Longwood area, making it an epicenter of medical training, research, and health care. The Longwood Medical Area has

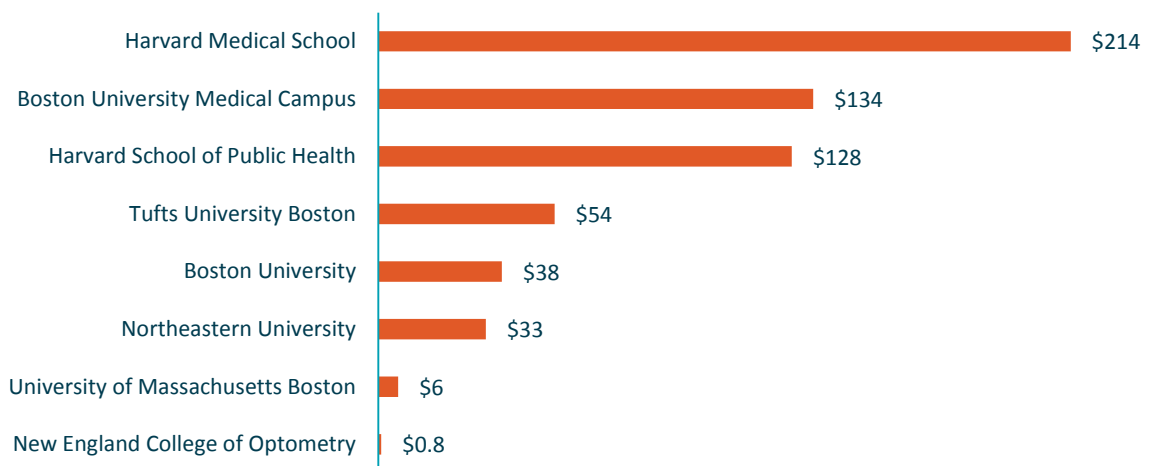
over 46,000 employees, researchers and staff, and over 21,000 students.⁹ The powerhouse institutions in the Longwood area brought in over \$1.18 billion of Boston's NIH funds in FY2017, exceeding NIH funding received by 44 states.

Education

Boston is also a world-renowned center of higher education. Eight of Boston's higher education institutions received 1,227 NIH awards and \$608 million in funding, comprising 31% and 22% of the city's and state's totals, respectively. Boston's success in the scientific research field stems from the city's well-educated labor force. For the population of residents over 25, 46% of Bostonians have a Bachelor's degree or higher, compared to the national rate of 30%.¹⁰ As of academic year 2017-18, there were 139,201 students enrolled in undergraduate and graduate

programs in 29 Boston colleges and universities.¹¹ Boston, with less than 10% of the state's population, has about 18% of Massachusetts' students enrolled in colleges and universities. Boston companies, hospitals, and research centers benefit from the prevalence of scholars in its prestigious educational institutions. Likewise, prospective students and graduates are attracted to Boston for the partnerships established between schools and the surrounding advanced industries of biotech, science, and health care.

FIGURE 4 Boston's NIH Grant Recipients In Higher Education FY2017
in millions of dollars



Source: National Institute of Health, "NIH Funding by Location and Organization," FY2017, BPDA Research Division Analysis

Private Companies

Arietis is a biotechnology company located at Boston University's Bio Square Discovery and Innovation Center in the South End. Arietis' primary focus is antimicrobial drug discoveries that will transcend current treatments for chronic bacterial infections such as MRSA.¹² Receiving more than \$2.2 million in NIH funding for FY2017, Arietis is the most highly funded NIH recipient of all private companies in Boston.

Immunetics, Inc. is located in the Innovation District on the South Boston Waterfront and received nearly \$1.8 million in NIH funding in FY2017. Immunetics develops instruments for the diagnostic testing of diseases which are used by laboratories worldwide. Examples of their innovations include tests for Lyme antibodies, Anthrax antibodies, and bacterial contamination in platelets.¹³

Micro-Leads, Inc. specializes in the development of wireless devices that record data for scientific studies, such as wireless implants used to monitor rodents during experiments.¹⁴ Micro-Leads is located within Boston University's Photonics Center and received \$1.97 million from NIH for FY2017.

Sample6 Technologies, Inc. provides health and safety products to implement preventative measures for more than 50 companies in the food industry, and aids these companies in FDA compliance.¹⁵ Located in Back Bay, Sample6 achieved \$1.5 million in funding from NIH for FY2017.

Riparian Pharmaceuticals, Inc. is a biotech company in its early stages that is making strides in the fight against endothelial dysfunction, which is at the root of a multitude of afflictions involving the arteries, including diabetes, heart attacks, and strokes.¹⁶ Riparian is located at the Harvard Life Lab in Allston and has received over \$1.2 million in NIH funding for its endeavors in vascular health therapies in FY2017.

Gel4med, Inc. is inventing solutions to tackle the rising problem of antibiotic-resistant infections, creating new preventative treatments that will reduce the likelihood of bacterial adaptation.¹⁷ Based in the Harvard Innovation Lab in Allston, their research involving tissue regeneration received nearly \$815,000 from NIH for FY2017.

Boston: Leader of a Regional Powerhouse

The city of Boston is a center for biomedical research within the United States. It also benefits from research collaborations with prominent institutions in neighboring cities as well as across Massachusetts. Cambridge boasts premier research centers, particularly at Harvard, MIT, and in Kendall Square. In FY17, Cambridge institutions received 629 NIH awards for \$372 million in funding. A prime example of collaboration between

Boston and Cambridge is the Broad Institute, which brings together researchers across various disciplines from Cambridge's Harvard and MIT, as well as five Harvard-affiliated hospitals located in Boston.¹⁸ Massachusetts as a whole received more than \$2.7 billion dollars in NIH funding in FY2017, allocated among 5,185 awards. Massachusetts led the country in NIH funding per capita at \$402.95 – about five times the national average.

Conclusion

Boston has world-class hospitals and universities, as well as robust life-tech industries and a well-educated labor force. Due to the demonstrated commitment of its researchers to channel resources into the improvement of healthcare and quality of life for years to come, Boston has earned the most NIH funding of any U.S. city for the 23rd year in a row.

NIH funding is the foundation that allows Boston's dramatic breakthroughs in science and medicine. The following are a few examples of the outstanding work achieved through the support of Boston's NIH funding in 2017:

- Scientists at Harvard Medical School Boston successfully recorded and displayed a movie scene inside of living bacterial DNA cells with 90 percent pictorial accuracy. This incredible discovery will potentially lead to an unob-

trusive tool for scientists to store recorded frame-by-frame brain activity within a cell.¹⁹

- Brigham and Women's Hospital and Massachusetts General Hospital were selected to lead research for the Alzheimer's Clinical Trial Consortium along with USC's Alzheimer's Therapeutic Research Institute in San Diego and the Mayo Clinic of Rochester, MN. Funding for the study will provide for five years of extensive research on the treatment and prevention of Alzheimer's.²⁰

- A study conducted by Boston Children's Hospital and Harvard Medical School uncovered a brain abnormality that could be the driving cause behind SIDS, or Sudden Infant Death Syndrome. This discovery will be used to further research how to identify symptoms and reduce the number of infants lost to SIDS.²¹

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