



Boston: Most NIH Funds for 24 Consecutive Years

In 2018, Boston continued its unparalleled 24-year record with more funding from the National Institutes of Health than any other city in the United States. This report delves into funding provided by the National Institutes of Health for FY2018, with a focus on grant recipients in Boston. This report also cites advancements in science and medicine among grant recipients, including 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.

The information provided in this report is the best available at the time of its publication. All or partial use of this report must be cited.

Author: Boston Planning & Development Agency, Research Division.

Date: March 2019.

Information: Please visit bostonplans.org/research-publications for more information.

Requests: Please contact us at bostonplans.org/research-inquiries with additional questions.

Research Division

Director

Alvaro Lima

Senior Economist

Matthew Resseger

Research Manager

Kelly McGee

Interns

Ahsim Shaaban
Dilara Sisman

Deputy Director

Jonathan Lee

Senior Demographer

Phillip Granberry

Research Assistants

Jing Chen
Avanti Krovi
Kayla Myros

Senior Research Associate

Christina Kim

Research Associate

Kevin Kang



Visit our Website
BostonPlans.org



Follow Us on Twitter
[@BostonPlans](https://twitter.com/BostonPlans)



**boston planning &
development agency**

Brian P. Golden, Director

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 biomedical 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 The NIH is comprised of 27 Institutes and Centers, each with a specific focal point for research.² More than 80 percent of the annual \$37.3 billion in the NIH’s budget goes to funding researchers outside the NIH – researchers at more than 2,500 universities and research institutes nationwide and worldwide.³

Boston: Most NIH Funds for 24 Consecutive Years

For FY2018, Boston continued its unparalleled 24-year record with more funding than any other city in the United States. 58 institutions located in Boston received 3,861 NIH awards, totaling approximately \$2.1 billion in funds. Boston represents 7.6 percent and 73.4 percent of total NIH funding across the United States and Massachusetts, respectively.

Additionally, Boston is home to 28 organizations that received over \$1 million and eight organizations that received over \$100 million in NIH funding, demonstrating that Boston’s excellence in biomedical research is spread across many diverse organizations, rather than concentrated in a select few.

TABLE 1

Boston’s Top Recipients of NIH Funding

Organization Name	Awards	Funding in Millions
Massachusetts General Hospital	906	\$ 466
Brigham and Women's Hospital	560	\$ 389
Harvard Medical School	387	\$ 209
Dana-Farber Cancer Institute	228	\$ 172
Boston Children's Hospital	344	\$ 167
Boston University Medical Campus	284	\$ 140
Beth Israel Deaconess Medical Center	240	\$ 128
Harvard School of Public Health	178	\$ 125
Total of Top Boston Recipients	3,127	\$ 1,797

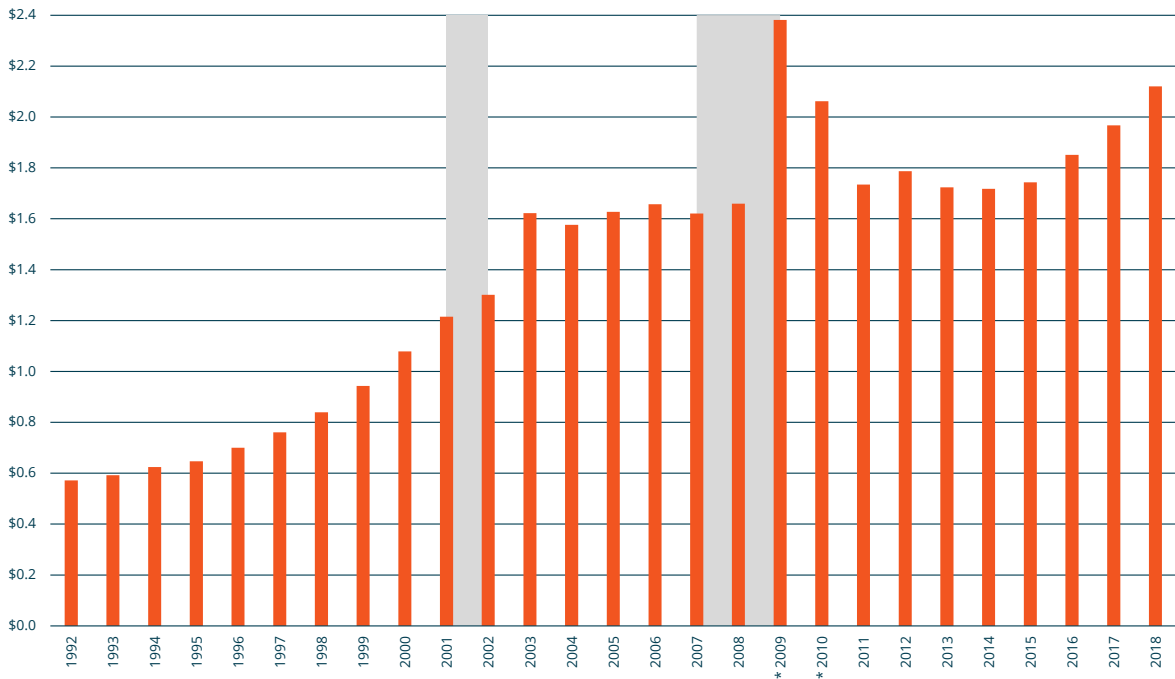
Source: National Institutes of Health “NIH Awards by Location and Organization,” FY2018, BPDA Research Division Analysis.

History of NIH Funds in Boston

Since 1992, Boston has received over \$38.1 billion in NIH funding. Boston's NIH funding reached a record high in 2009 due to economic stimulus funds created by the American Recovery and Reinvestment Act (ARRA), which were 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 - FY2018
In Billions of Nominal Dollars



* Includes ARRA Funding.

Note: Gray areas indicate periods of economic recessions.

Source: National Institutes of Health, "NIH Awards by Location and Organization," FY1992-FY2018, BPDA Research Division Analysis.

Top Funded U.S. Cities

Although Boston has remained NIH's highest funded city for 24 years, New York City, with a population nearly thirteen times that of Boston's, has long been a close second. Boston received \$3,095 in NIH funding per capita in FY2018, the highest per capita funding among the top ten funded cities and

a \$109 per capita increase from FY2017. Following Boston and New York are Philadelphia, Seattle, and Baltimore with NIH funding just below \$1 billion each. These five cities received approximately 25 percent of the total NIH funding.

FIGURE 2 Top Five US Cities in NIH Funding
In Billions of Dollars



Source: National Institutes of Health, "NIH Funding by Location and Organization," FY2018, 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 among the top 20 NIH funding recipients in the United States. Together

they received 1,466 awards and approximately \$855 million in funding. Their combined funding represents 30 percent of all funding in Massachusetts and 40 percent of all funding in Boston.

TABLE 2

Top 20 Recipients of NIH Funding
In Millions of Dollars

Rank	Organization Name	City	Awards	Funding
1	Johns Hopkins University	Baltimore, MD	1,347	\$ 675
2	University of California, San Francisco	San Francisco, CA	1,309	\$ 648
3	University of Michigan	Ann Arbor, MI	1,230	\$ 552
4	University of Pittsburgh	Pittsburgh, PA	1,127	\$ 537
5	University of Pennsylvania	Philadelphia, PA	1,145	\$ 511
6	Stanford University	Stanford, CA	1,059	\$ 505
7	Washington University	Saint Louis, MO	980	\$ 486
8	Duke University	Durham, NC	844	\$ 475
9	Massachusetts General Hospital	Boston, MA	906	\$ 466
10	Columbia University	New York, NY	904	\$ 465
11	University of California, San Diego	San Diego, CA	958	\$ 459
12	University of Washington	Seattle, WA	977	\$ 456
13	Yale University	New Haven, CT	971	\$ 454
14	University of North Carolina, Chapel Hill	Chapel Hill, NC	902	\$ 447
15	University of California, Los Angeles	Los Angeles, CA	842	\$ 410
16	Brigham and Women's Hospital	Boston, MA	560	\$ 389
17	Emory University	Atlanta, GA	730	\$ 350
18	Icahn School of Medicine at Mount Sinai	New York, NY	610	\$ 345
19	University of Wisconsin Madison	Madison, WI	623	\$ 320
20	Fred Hutchinson Cancer Research Center	Seattle, WA	271	\$ 306

Source: National Institutes of Health, "NIH Funding by Location and Organization," FY2018, BPDA Research Division Analysis.

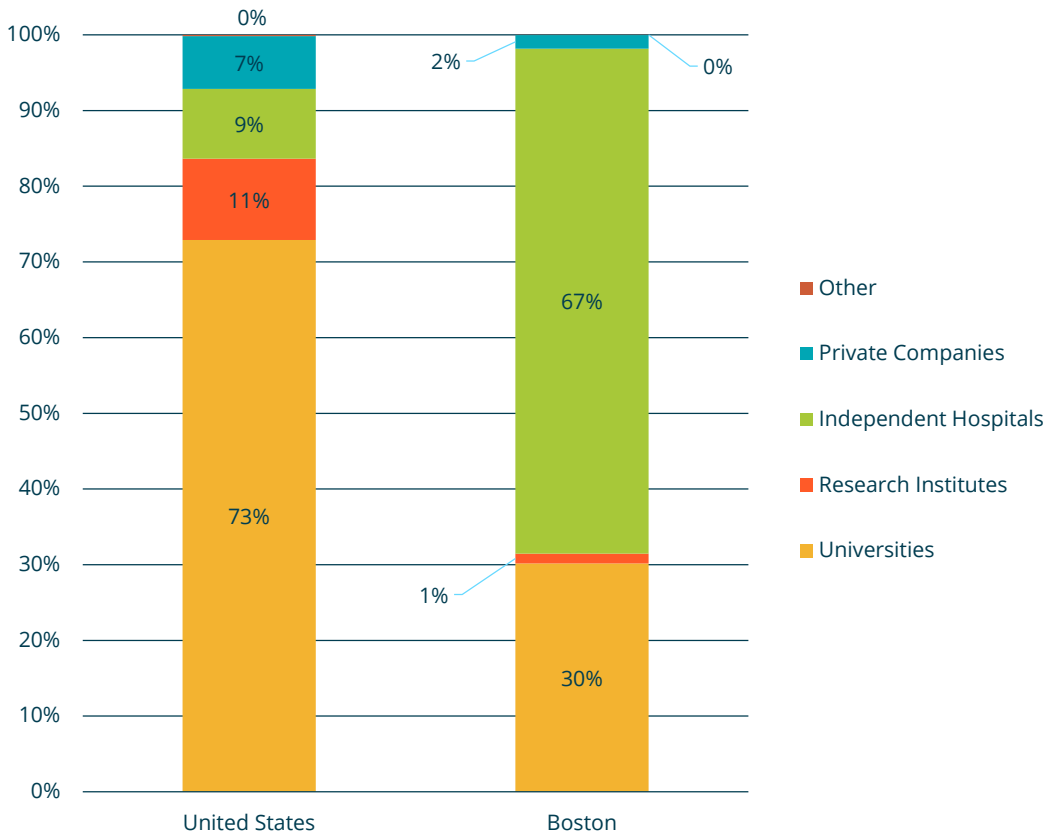
Funding By Organization Type

Nationally, 73 percent of NIH funding goes to universities and only 9 percent goes to hospitals. However, the majority of Boston's NIH funding is awarded to hospitals due to their integral role in advancing biomedical research in the United States. The 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 that received NIH funding are concentrated in the biotechnology and health care industries, but also include manufacturing and software companies. "Other" includes non-profit organizations, such as the Harvard Pilgrim Health Care Institute, which received about \$9 million in NIH funding.

FIGURE 2

NIH Funding by Type of Institution



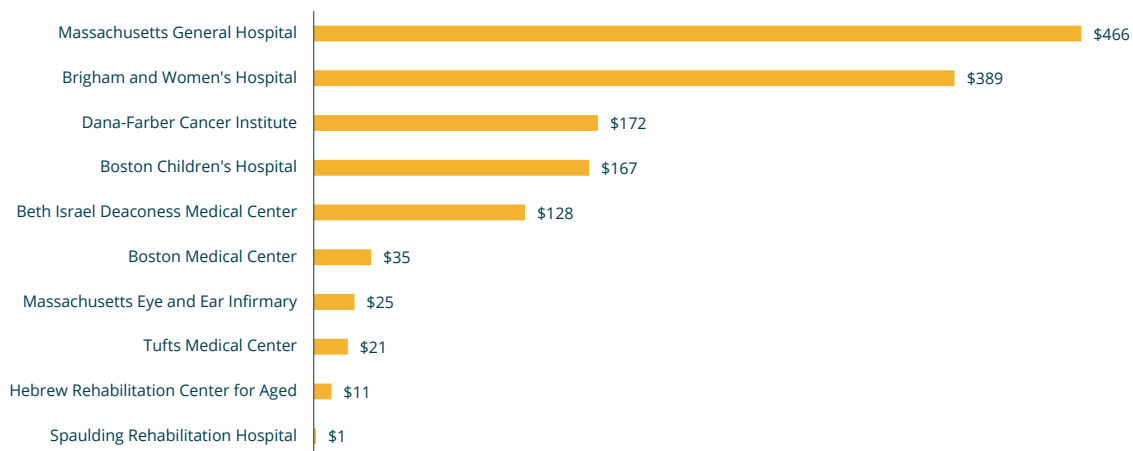
Source: National Institute of Health, "NIH Funding by Location and Organization," FY2018, BPDA Research Division Analysis.

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 City, demonstrating the NIH’s recognition of Boston’s hospitals as national leaders in health care and biomedical research. Ten Boston hospitals were granted 2,470

NIH awards and \$1.4 billion in funding, which represents 49 percent of all funding in Massachusetts and 67 percent of all funding in Boston. Among the top five NIH-funded hospitals in the country, Boston claims four, and among the top thirty NIH-funded hospitals in the country, Boston claims nine.

FIGURE 3 Top Boston Hospital in NIH Funding
In Millions of Dollars



Source: National Institute of Health, “NIH Funding by Location and Organization,” FY2018, BPDA Research Division Analysis.

Massachusetts General Hospital 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 33 percent of all grants to hospitals in Boston, and has remained Boston’s top NIH-funded hospital for 18 consecutive years. Massachusetts General Hospital conducts the largest hospital-based research program in the United States with over 8,500 researchers and 1.2 million square feet of research space, primarily in Boston and Charlestown.⁵ Within Massachusetts General

Hospital is the Massachusetts Eye and Ear Infirmary, which 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. The Longwood Medical Area is a sprawling campus of 22 medical institutions, including the Dana-Farber Cancer Institute, Boston Children’s Hospital, and Beth Israel Deaconess Medical Center. Harvard Medical School and Harvard School

of Public Health are also located in the Longwood Medical Area, making it an epicenter of medical training, research, and health care. The Longwood Medical Area has over 57,000 researchers, physicians, and contractors, and over 29,000 students.⁶

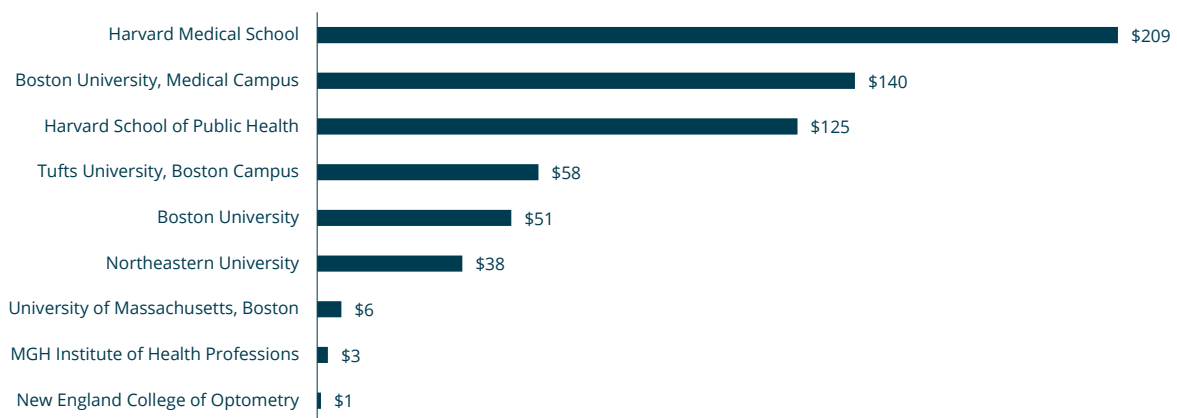
The powerhouse institutions in the Longwood area brought in over \$1.22 billion of Boston's NIH funds in FY2018, which exceeds NIH funding received by 44 states.

Education

Boston is also a world-renowned center of higher education. Nine of Boston's higher education institutions received 1,269 awards and \$638 million in NIH funding, which represent 22 percent of all funding in Massachusetts and 30 percent of all funding in Boston. Boston's success in biomedical research stems from the city's well-educated labor force. Among residents over the age of 25, 47 percent of Bostonians have a Bachelor's degree or higher, compared to 31 percent of Americans.⁷ As of the academic year 2018-2019, there were 136,255 students enrolled in undergraduate and graduate programs in 29 colleges and universi-

ties located in Boston.⁸ Boston, with less than 10 percent of Massachusetts' population, has about 23 percent of Massachusetts' students enrolled in undergraduate and graduate programs.⁹ Companies, hospitals, and research institutes located in Boston benefit from the prevalence of scholars at prestigious educational institutions. Likewise, prospective students and graduates are attracted to Boston for the partnerships established between educational institutions and the surrounding advanced industries involved with biotechnology, science, and health care.

FIGURE 4 Boston's NIH Grant Recipients In Higher Education
In Millions of Dollars



Source: National Institute of Health, "NIH Funding by Location and Organization," FY2018, BPDA Research Division Analysis.

Private Companies

Aldatu Biosciences is located at the Pagliuca Harvard Life Lab at the Harvard Business School in Allston. Aldatu Biosciences has been awarded numerous grants for the research and development of a HIV drug resistance genotyping method to prescribe effective medications to patients.¹⁰ Aldatu Biosciences received over \$3.9 million in NIH funding for FY2018.

Located in the West End, ExQor Technologies is a biotechnology company that received approximately \$1.3 million in NIH funding for FY2018. ExQor Technologies uses bio-nanotechnology to develop treatments primarily for patients affected by Alzheimer's disease. ExQor's patented technology offers a new form of noninvasive drug delivery and may also serve as an imaging agent to support diagnoses.¹¹

Emulate, located in the Seaport District, focuses on understanding human biology and identifying drug targets. Emulate collaborates with other biotechnology and biopharmaceutical companies to advance technology in disease research and drug development.¹² Emulate received over \$1.2 million in NIH funding for FY2018.

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.¹³ Arietis received over \$1.2 million in NIH funding for FY2018.

Located in the Financial District, Pathmaker Neurosystems is a biotechnology company that received approximately \$1 million in NIH funding for FY2018. Pathmaker Neurosystems focuses on the research and development of non-invasive treatments for neuromotor disorders, and has developed products that treat paralysis and muscle weakness.¹⁴

Founded in Boston, Lyndra is a biopharmaceutical company currently located in Watertown. Lyndra's research focuses on the development of long-acting oral medications that can reduce the burden associated with daily medications.¹⁵ Lyndra received over \$9.1 million in NIH funding in FY2018.

Boston: Leader of a Regional Powerhouse

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 University and Massachusetts Institute of Technology. In FY2018, institutions located in Cambridge received 636 NIH awards for \$381 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 University and Massachusetts Institute of Technology, as well as five hospitals affiliated with Harvard University, located in Boston.¹⁶ Massachusetts also received more than \$2.88 billion in NIH funding in FY2018, allocated among 5,367 awards. Massachusetts led the country in NIH funding per capita at \$425 – 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 health care and quality of life for years to come, Boston has earned the most NIH funding of any city in the United States for the 24th year in a row.

NIH funding is the foundation that allows Boston's dramatic breakthroughs in science and medicine. The following are just a few examples of the outstanding work achieved through the support of Boston's NIH funding in FY2018:

Scientists at Harvard Medical School discovered tunnels from skull bone marrow to brain lining that provide routes for cells responding to strokes and other brain disorders. Scientists hope that this preliminary discovery will lead to other discoveries in

the different types of cells that travel through such tunnels to respond to disorders.¹⁷

Researchers at Brigham and Women's Hospital and Harvard Medical School discovered a genetic mutation that slows the metabolism of sugar, limiting glucose absorption among carriers. This discovery could provide insights into medications that mimic the effect of this mutation, potentially improving treatments for patients affected by diabetes, heart disease, and obesity.¹⁸

Scientists at Boston University School of Medicine and Boston Medical Center have found that opioid overdose treatments using methadone and buprenorphine are associated with lower mortality rates. Scientists hope that these findings will provide greater opportunities in treatment inventions and policy reforms.¹⁹

Citations

1. National Institutes of Health, "Mission Goals," last modified July 27, 2017. <http://www.nih.gov/about-nih/what-we-do/mission-goals>.
2. National Institutes of Health, "Institutes at NIH," last modified October 19, 2018. <https://www.nih.gov/institutes-nih/list-nih-institutes-centers-offices>.
3. National Institutes of Health, "Budget," last modified April 11, 2018 <http://www.nih.gov/about-nih/what-we-do/budget>.
4. National Institutes of Health, "Frequently Asked Questions American Recovery & Reinvestment Act of 2009 (ARRA)," last modified October 14, 2011. https://grants.nih.gov/recovery/faqs_recovery.html.
5. Massachusetts General Hospital, "The Massachusetts General Hospital Research Institute by the Numbers," <http://www.massgeneral.org/research/about/facts.aspx>.
6. Medical Academic and Scientific Community Organization, "Longwood Medical Area Fact Sheet," https://www.masco.org/system/files/downloads/thelma/lma_factsheet_10.30.18.pdf.
7. U.S. Census Bureau, 2013-2017 American Community Survey, BPDA Research Division Analysis.
8. Department of Neighborhood Development, University Accountability Ordinance Data, excluding the Massachusetts Institute of Technology, BPDA Research Division Analysis.
9. U.S. Census Bureau, 2013-2017 American Community Survey, BPDA Research Division Analysis.
10. Aldatu Biosciences, "Our Solution," <https://aldatubio.com/solution/>.
11. ExQor Technologies, "ExQor," <https://exqor.com/>.
12. Emulate, "Products," <https://emulatebio.com/products/>.
13. Arietis Pharma, "Technology," <https://arietis.org/technology/>.
14. Pathmaker Neurosystems, "MyoRegulator™ PM-2200," <https://pmneuro.com/r-d/myoregulator-pm-2200/>.
15. Lyndra, "Lyndra Therapeutics," <https://lyndra.com/>.
16. Broad Institute, "This is Broad," <https://www.broadinstitute.org/about-us>.
17. National Institutes of Health, "Researchers unearth secret tunnels between the skull and the brain," <https://www.nih.gov/news-events/news-releases/researchers-unearth-secret-tunnels-between-skull-brain>.
18. National Institutes of Health, "Gene mutation points to new way to fight diabetes, obesity, heart disease," <https://www.nih.gov/news-events/news-releases/gene-mutation-points-new-way-fight-diabetes-obesity-heart-disease>.
19. National Institutes of Health, "Methadone and buprenorphine reduce risk of death after opioid overdose," <https://www.nih.gov/news-events/news-releases/methadone-buprenorphine-reduce-risk-death-after-opioid-overdose>.

