



National Library of Medicine

CONGRESSIONAL JUSTIFICATION
FY 2023

Department of Health and Human Services
National Institutes of Health



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DEPARTMENT OF HEALTH AND HUMAN SERVICES

NATIONAL INSTITUTES OF HEALTH

National Library of Medicine (NLM)

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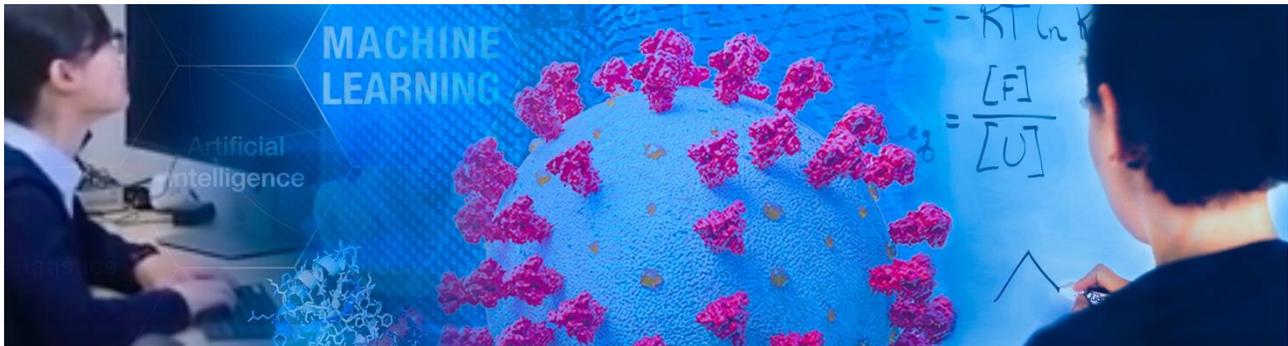
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Director's Overview

Mission

The National Library of Medicine (NLM) is a leader in biomedical informatics and computational health data science research, and the world's largest biomedical library. We lead innovation in the development of advanced tools for clinical data interpretation and decision-making through our cutting-edge research, training programs, and information services. We are distinctive within the National Institutes of Health (NIH) because of our substantial investment in sustainable biomedical information systems that make scientific literature, genomic, clinical, and other types of biomedical data readily available to those who need it.



Patricia Flatley Brennan, R.N., Ph.D.

NLM plays a vital role in biomedical discovery and the translation of biomedical research into practice. We build and employ powerful, sophisticated tools to collect, organize, search, and disseminate data that enable innovation to power new kinds of discovery. We are a library for the world, and our work forms the backbone of scientific communication. We make information and knowledge flow—ensuring that scientists, policymakers, clinicians, patients, and the public have access to biomedical information 24 hours a day, 7 days a week.

Advancing Science and Scientific Communication to Enhance Human Health

NLM's success is driven in large part by our ability to adapt to changes in science, technology, and society. Our genomic and literature resources are vital to helping scientists and clinicians understand biomedical processes and create diagnostic and therapeutic innovations. NLM's technological infrastructure bridged the gap between resources and action, and enabled a rapid response to the COVID-19 pandemic in the following ways:

- Accelerated access to coronavirus-related literature;
- Partnered with publishers to make coronavirus-related articles freely available;
- Created new literature search and retrieval strategies;
- Expedited deposits, access, and use of SARS-CoV-2 sequence data through our publicly available genetic databases;
- Engaged the public to address COVID-19 misinformation; and
- Conducted key computational research to enhance our understanding of the virus' evolution and its impact on human health.

In response to the pandemic, we reoriented our research programs, which resulted in the development of new methods to characterize the SARS-CoV-2 virus and make readily accessible sequence information. We also expanded our literature services, which promoted more rapid access to early COVID-19 related results and clinical guidelines. We shared the expertise of our scientific staff across major NIH and government-wide pandemic-related initiatives, and leveraged our Network of the National Library of Medicine (NNLM[®]) to support community-based engagement on COVID-19 testing for NIH's Rapid Acceleration of Diagnostics (RADx) advanced testing program, among other major NIH initiatives.

NLM continues to employ computational approaches to advance biomedical discovery and improve human health. Our work helps the scientific and public health communities derive additional knowledge from clinical text and the published literature; model biological systems; understand how viruses evolve and mutate; and extract knowledge from large-scale health databases and medical images. Our grantees conduct vital bioinformatics and data science research to support biomedical discovery and clinical care. We engage with other NIH Institutes and Centers, agencies across the government, and external stakeholders to strengthen NLM's infrastructure, reduce redundancy in our information services and operations, promote access to and preservation of our collection, and employ more efficient ways to engage with the public.

To protect our staff while maintaining continuity of operations during the COVID-19 pandemic, we engaged in new methods of work to support a remote-capable workforce and leveraged agile, team-oriented product and project management strategies. In FY 2021, we continued efforts to increase staff diversity, equity, and inclusion, and are active in supporting NIH's UNITE initiative to address structural racism within the NIH-supported and the greater scientific community.

Implementing Innovative and Sustainable Solutions

Increased investments in NLM programs and activities have allowed us to expand our research portfolio, enhance our information services, and improve our infrastructure to better serve our stakeholders.



Over the past six years, we have accelerated investments in NLM's intramural and extramural research programs. To build a data science savvy workforce, we have engaged young investigators at the intersection of biology, clinical knowledge, analytics, and visualization across our intramural and extramural research programs. We have funded groundbreaking data science and open science research needed to advance discovery and health. We have expanded extramural funding—nearly doubling the number of research project grants—and created the knowledge base to bring the power of data science to scientists, clinicians, and patients.

As the pace and complexity of biomedical research increases, so too does the demand for NLM's biomedical and genomic information services. Sustained investments in our information services have allowed us to increase capacity, improve functionality, and leverage modern cloud-based technologies. We have expanded our ability to connect digital objects of research resources, such as linking unique identifiers for genetic sequence records in our databases with the published literature. These investments have improved the resilience of our infrastructure and information services, and made research less expensive and more accessible by allowing researchers to bring analysis tools to the data on the cloud. Additionally, through NLM investments in cloud computing and advanced computational technology, we are achieving greater efficiencies in the fields of data science and health care by creating more reliable, secure, and modern computational platforms that foster appropriate and authorized global data sharing to enhance human health.

Accelerating Discovery and Engaging Stakeholders

Science is changing quickly, and NLM is continually adapting to changes in the data science landscape to identify and make new modes of scientific communication widely available. This requires reflecting on what is known, and anticipating what needs to be known as we build and maintain our research portfolio, resources, and services. Innovation in the use of computer algorithms is part of our effort to modernize indexing and annotation of journals in MEDLINE®, NLM's premier bibliographic database of journal articles in life sciences with a concentration on biomedicine. We work across the research lifecycle to improve the conduct of science in stable and effective ways to track and report it. These are ways we continue to fulfill our mission to maintain, preserve, and make accessible knowledge for medicine and health in perpetuity.

We advance NLM's mission by actively engaging and serving a range of stakeholders including the public, communities, librarians, clinicians, researchers, and public health experts. Leveraging 8,800 points of presence around the country through our NNLM, we provide data science librarian support to major academic medical schools and centers; bring trusted health information to communities; and provide highly respected community anchors to support awareness and engagement in major NIH initiatives such as the Community Engagement Alliance (CEAL) Against COVID-19 Disparities and *All of Us* Research Program.

Advancing NIH and Government-Wide Priorities

NLM advances and supports NIH and government-wide initiatives by contributing expertise to national priorities such as the COVID-19 pandemic response, improving health equity, advancing data science, artificial intelligence (AI), and open science.

We are gathering and sharing variant sequence data through the SARS-CoV-2 Sequencing for Public Health Emergency Response, Epidemiology, and Surveillance (SPHERES) initiative led by the Centers for Disease Control and Prevention (CDC); facilitating standards development by the Public Health Alliance for Genomic Epidemiology (PHA4GE) coalition; and analyzing sequencing data and generating reports for the NIH Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) Tracking Resistance and Coronavirus Evolution (TRACE) initiative. We are making SARS-CoV-2 sequence data freely available to researchers through our Sequence Read Archive (SRA), the world's largest publicly available repository of high-throughput sequencing data, and making these data available through commercial cloud platforms.

NLM is the NIH lead in a cross-government effort to ensure a data-driven response to the COVID-19 pandemic and prepare for future public health threats. In collaboration with the CDC, Office of the National Coordinator for Health Information Technology, and the White House Office of Science and Technology Policy, we are reviewing the effectiveness, interoperability, and connectivity of public health data systems, and efforts to advance public health data and analytics.

NLM advances NIH's longstanding commitment to make available to the public the results of research it supports and conducts, including publications and scientific data. Our PubMed Central® (PMC) digital archive provides the public with access to the full text of nearly 7.5 million research articles. Through our launch of the NIH Preprint Pilot, we are increasing the

discoverability of preprints resulting from NIH-funded scientific research. Since June 2020, we have made more than 2,700 preprints reporting NIH-funded COVID-19 research publicly available in PMC and discoverable in PubMed®, a database containing more than 33 million citations and abstracts of biomedical literature. We are enhancing approaches to help NIH-funded scientists make scientific data and research products findable, accessible, interoperable, and reusable through our information services and data repositories. Nearly two-thirds of articles published in FY 2021 and deposited in PMC under the NIH Public Access Policy include associated supplemental material, such as datasets, images, tables, videos, or files. In FY 2021, we added nearly 38,000 new studies to ClinicalTrials.gov, our public registry of clinical trials studies, and added more than 5,000 protocols and statistical analysis plans to registered studies. We also made available results summaries for more than 7,000 completed studies. These are just a few examples of the ways in which we support NIH's efforts to promote research transparency and ensure that research findings are contributing to the enhancement of human health.

Future Initiatives

NLM will continue to lead the development of analytics that uncover new patterns and biomedical phenomena from large genetic and literature databases, create innovative ways to reach scientists and society with trustable health information, and develop health data literacy among scientists, clinicians, librarians, and consumers.

Priorities for FY 2023 include efforts to:

- **Accelerate biomedical and computational health data science.** Through increased investments in intramural and extramural research, NLM will create strategies to support efficient and accurate exploration of large biomedical databases, and generate new analytical methods and models to gain new insights from clinical data. We will continue to train the next generation of biomedical informatics and data science researchers through our university-based research training programs, and accelerate staff training in informatics, data science, and AI.
- **Support public accountability and open science.** We will leverage our expertise in creating high-quality, sustainable, and secure databases to make biomedical research information and data publicly accessible through NLM offerings including ClinicalTrials.gov, PMC, and SRA. We will make biomedical research information and data accessible to support the emerging needs of scientists, clinicians, and the public.
- **Modernize NLM's infrastructure and organization.** With the support and collaboration of NIH leadership and its Institutes and Centers, we will continue to build a 21st century digital library that offers literature, data, analytical models, and new approaches to scientific communications that are accessible, sustainable, and available 24 hours a day, 7 days a week. We will continue to modernize our computational research infrastructure, improve our operational and organizational efficiency, and facilitate scientific discovery to enhance human health.
- **Contribute to NIH- and government-wide priorities.** We will develop new ways to share and apply our scientific, policy, and program expertise in data science, data management, infrastructure, security, and workforce development to support priorities empowered by data science, AI, and open science. We will provide critical data management and guidance to support to NIH efforts such as health across the life span and the science of aging, including understanding why and how cells age.



The National Library of Medicine (NLM) is a global leader in biomedical informatics and computational health data science, and the world's largest biomedical library. As 1 of the 27 Institutes and Centers at NIH, NLM's research and information services support scientific discovery, health care, and public health.

A PLATFORM FOR BIOMEDICAL DISCOVERY

The 2017-2027 NLM strategic plan includes three goals:

1. Accelerate discovery and advance health through data-driven research;
2. Reach more people in more ways through enhanced dissemination and engagement; and
3. Build a workforce for data-driven research and health.

Implementation of the strategic plan enables NLM to support and respond to NIH-wide priorities and support discovery and public health globally.



Patricia Flatley Brennan, R.N., Ph.D.

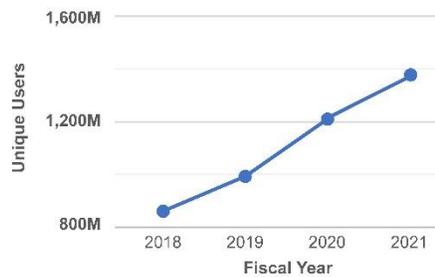
Director of the NLM since 2016, Dr. Brennan spearheaded the development of a 10-year strategic plan that envisions NLM as a platform for biomedical discovery and data-powered health. Combining her background in engineering, information technology, and clinical nursing practice, Dr. Brennan positions NLM and its world-class genomic databases, innovative information services, and vast literature resources to serve science and society, and to guide advances in data science and data-driven discovery.

Funding History



* Note: FY 2020 does not include \$10 million of supplemental funding from the Coronavirus Aid, Relief, and Economic Security (CARES) Act.
FY 2022 CR \$464M and FY 2023 budget request \$472M.

Annual Users of NLM Services



NLM CONDUCTS AND FUNDS RESEARCH

NLM's vibrant intramural research program conducts innovative research and training in computational biology and computational health sciences. NLM's extramural grants support original research projects and advanced training in biomedical informatics and data science.

Intramural Researchers at NLM



Develop computational methods to characterize functions of the non-coding part of the human genome.



Explore novel applications of artificial intelligence to advance interpretation of medical images to detect health issues such as eye disease.



Apply network analysis approaches to protein-protein interactions to predict interactions between individual molecules in human diseases.

Extramural Researchers Across the Nation



Apply artificial intelligence and machine learning to predict treatment effectiveness and inform personalized medicine approaches.



Leverage high-throughput sequencing data from wastewater and data from other sources for virus surveillance and public health protection.



Support natural language processing of medical record data to improve patient care and monitoring.

21st CENTURY LIBRARY

Every day, millions of scientists, health professionals, and members of the public use NLM's online information resources to translate research results into new treatments, access our collections, develop new products, inform clinical decision making, and improve public health.



The most heavily used biomedical literature citation database in the world, containing more than 33 million citations.



Digital archive of nearly 7.5 million freely accessible, full-text biomedical and life sciences journal articles, including more than 190,000 coronavirus-related articles and more than 2,700 preprint articles featuring NIH-funded research.



The world's largest clinical trial registry and results database, with nearly 400,000 registered clinical studies and more than 51,000 results summaries.



The world's largest publicly available repository for high-throughput sequencing data, comprising more than 50 petabytes of data which are also freely available through commercial cloud services.



NLM's trusted and authoritative source of consumer health information accessed by more than 400 million users annually.



NLM is the central coordinating body within HHS for clinical terminology standards for health data interoperability.

FUTURE INITIATIVES

NLM will continue to lead the development of analytics that uncover novel biomedical patterns from large genetic and literature databases, create innovative ways to reach scientists and society with trusted health information, and develop health data literacy among scientists, clinicians, librarians, and the public. NLM will:



Accelerate biomedical informatics and computational health data science. Through intramural and extramural research investments, NLM will create strategies to support efficient and accurate exploration of large biomedical databases, and generate new analytical methods and models to gain insights from clinical data.



Support public accountability and open science. NLM will leverage its expertise in creating high-quality, sustainable, and secure databases to make biomedical research information and data accessible to scientists, clinicians, and the public.

NLM-8

BIOMEDICAL INFORMATICS TRAINING

NLM funds research training programs in biomedical informatics and data science at 16 universities across the country that enroll approximately 200 predoctoral and postdoctoral trainees.



Grant supplemental funding allows training programs to work with library and information schools, and partner with minority-serving institutions to teach and apply data science research skills.

NLM also provides short-term research experiences for undergraduates interested in careers in biomedical informatics and data science.

OUTREACH AND ENGAGEMENT

NLM leverages its Network of the National Library of Medicine (NNLM®) of more than 8,800 academic health science libraries, hospital and public libraries, and community organizations to improve access to health information for all. NNLM offers training to support effective use of NLM information resources by librarians, health professionals, researchers, and the public. NNLM currently operates through seven regions across the United States.



Modernize NLM's infrastructure and organization. NLM will build a 21st century digital library that offers literature, data, analytical models, and new approaches to scientific communication that are accessible, sustainable, and available 24 hours a day, 7 days a week.



Contribute to NIH- and government-wide priorities. NLM will continue to share its scientific, policy, and program leadership and expertise in data science, data management, infrastructure, security, and workforce development to support U.S. priorities in economic competitiveness empowered by data science, artificial intelligence, and open science.

Major Changes in the Budget Request

Major changes in the FY 2023 President's Budget request for the National Library of Medicine (NLM) are briefly described below, by budget mechanism and activity detail. Note that there may be overlap between budget mechanism and activity detail; thus, these highlights will not sum to the total for NLM's FY 2023 President's Budget request, which is \$472.0 million, an increase of \$8.2 million over the FY 2022 CR level of \$463.8 million. Within the FY 2023 request level and informed by the *NLM Strategic Plan 2017-2027* and the *NIH Strategic Plan for Data Science*, NLM will pursue its highest priorities through strategic investments and careful stewardship of appropriated funds.

Extramural Programs (+\$1.3 million; total \$68.6 million):

With this increased level of funding, NLM will expand its graduate and post-doctoral biomedical informatics and data science training programs to 18 universities and launch 5 new summer research experience programs to attract talented undergraduate and post-baccalaureate students to bioinformatics and data science careers and enhance diversity. NLM will award an estimated 28 new research project grants in biomedical informatics and data science and maintain support for outreach and engagement efforts of the Network of the National Library of Medicine.

Intramural Programs (+\$6.6 million; total \$381.2 million):

NLM's intramural programs will continue to support research and training to develop and apply computational approaches to a broad range of information problems in biology, biomedicine, and human health. NLM will continue to enhance its information services and provide additional support for mission critical systems that are heavily used by researchers, clinicians, and the public. NLM will continue to support work to update and expand research use of clinical vocabularies and data interoperability standards that are increasingly important to NIH's data science efforts. NLM will continue to actively engage and serve the public, communities, librarians, clinicians, researchers, and public health experts through its outreach efforts.

Budget Mechanism Table

NATIONAL INSTITUTES OF HEALTH National Library of Medicine

Budget Mechanism - Total¹

(Dollars in Thousands)

MECHANISM	FY 2021 Final		FY 2022 CR		FY 2023 President's Budget		FY 2023 +/- FY 2022 CR	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount
<u>Research Projects:</u>								
Noncompeting	79	\$26,413	79	\$26,413	91	\$31,844	12	\$5,430
Administrative Supplements	(6)	556	(6)	556	(2)	100	(-4)	-456
<u>Competing:</u>								
Renewal	5	1,819	5	1,819	1	531	-4	-1,288
New	31	10,737	31	10,737	27	8,874	-4	-1,863
Supplements	0	0	0	0	0	0	0	0
Subtotal, Competing	36	\$12,556	36	\$12,556	28	\$9,405	-8	-\$3,151
Subtotal, RPGs	115	\$39,525	115	\$39,525	119	\$41,349	4	\$1,824
SBIR/STTR	4	1,580	4	1,580	5	1,631	1	52
Research Project Grants	119	\$41,105	119	\$41,105	124	\$42,980	5	\$1,876
<u>Research Centers:</u>								
Specialized/Comprehensive	0	\$32	0	\$32	0	\$26	0	-\$6
Clinical Research	0	0	0	0	0	0	0	0
Biotechnology	0	0	0	0	0	0	0	0
Comparative Medicine	0	0	0	0	0	0	0	0
Research Centers in Minority Institutions	0	0	0	0	0	0	0	0
Research Centers	0	\$32	0	\$32	0	\$26	0	-\$6
<u>Other Research:</u>								
Research Careers	6	\$688	6	\$688	3	\$281	-3	-\$407
Cancer Education	0	0	0	0	0	0	0	0
Cooperative Clinical Research	0	0	0	0	0	0	0	0
Biomedical Research Support	0	0	0	0	0	0	0	0
Minority Biomedical Research Support	0	0	0	0	0	0	0	0
Other	45	25,476	45	25,476	50	25,289	5	-187
Other Research	51	\$26,164	51	\$26,164	53	\$25,570	2	-\$595
Total Research Grants	170	\$67,301	170	\$67,301	177	\$68,576	7	\$1,275
<u>Ruth L. Kirschstein Training Awards:</u>								
Individual Awards	9	\$384	9	\$384	7	\$325	-2	-\$59
Institutional Awards	0	0	0	0	0	0	0	0
Total Research Training	9	\$384	9	\$384	7	\$325	-2	-\$59
Research & Develop. Contracts <i>(SBIR/STTR) (non-add)</i>	0 (0)	\$277 (16)	0 (0)	\$222 (16)	0 (0)	\$229 (16)	0 (0)	\$7 (0)
Intramural Programs	572	371,487	638	374,592	638	381,197	0	6,605
Res. Management & Support <i>SBIR Admin. (non-add)</i>	87 (0)	21,297 (0)	103 (0)	21,288 (0)	103 (0)	21,671 (0)	0 (0)	383 (0)
Construction		0		0		0		0
Buildings and Facilities		0		0		0		0
Total, NLM	659	\$460,746	741	\$463,787	741	\$471,998	0	\$8,211

¹ All items in italics and brackets are non-add entries.

Appropriations Language

NATIONAL LIBRARY OF MEDICINE

For carrying out section 301 and title IV of the PHS Act with respect to health information communications, \$471,998,000: Provided, That of the amounts available for improvement of information systems, \$4,000,000 shall be available until September 30, 2024: Provided further, That in fiscal year 2023, the National Library of Medicine may enter into personal services contracts for the provision of services in facilities owned, operated, or constructed under the jurisdiction of the National Institutes of Health (referred to in this title as "NIH").

Summary of Changes

NATIONAL INSTITUTES OF HEALTH
National Library of Medicine

Summary of Changes

(Dollars in Thousands)

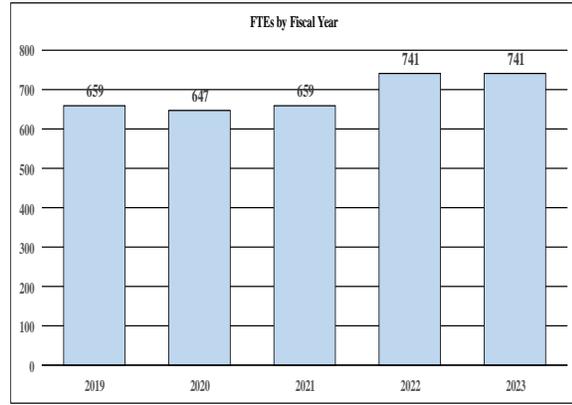
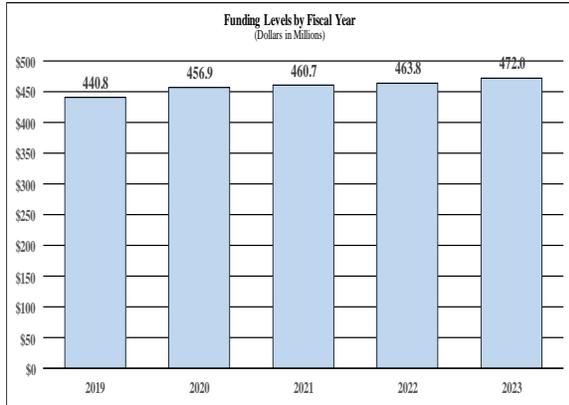
FY 2022 CR		\$463,787
FY 2023 President's Budget		\$471,998
Net change		\$8,211

CHANGES	FY 2022 CR		FY 2023 President's Budget		Built-In Change from FY 2022 CR	
	FTEs	Budget Authority	FTEs	Budget Authority	FTEs	Budget Authority
A. Built-in:						
1. Intramural Programs:						
a. Annualization of January 2022 pay increase & benefits		\$117,571		\$121,872		\$778
b. January FY 2023 pay increase & benefits		117,571		121,872		3,974
c. Paid days adjustment		117,571		121,872		-447
d. Differences attributable to change in FTE		117,571		121,872		0
e. Payment for centrally furnished services		3,734		3,809		75
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		253,287		255,516		5,140
Subtotal						\$9,520
2. Research Management and Support:						
a. Annualization of January 2022 pay increase & benefits		\$15,619		\$16,191		\$103
b. January FY 2023 pay increase & benefits		15,619		16,191		528
c. Paid days adjustment		15,619		16,191		-59
d. Differences attributable to change in FTE		15,619		16,191		0
e. Payment for centrally furnished services		1,651		1,684		33
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		4,017		3,795		88
Subtotal						\$694
Subtotal, Built-in						\$10,214

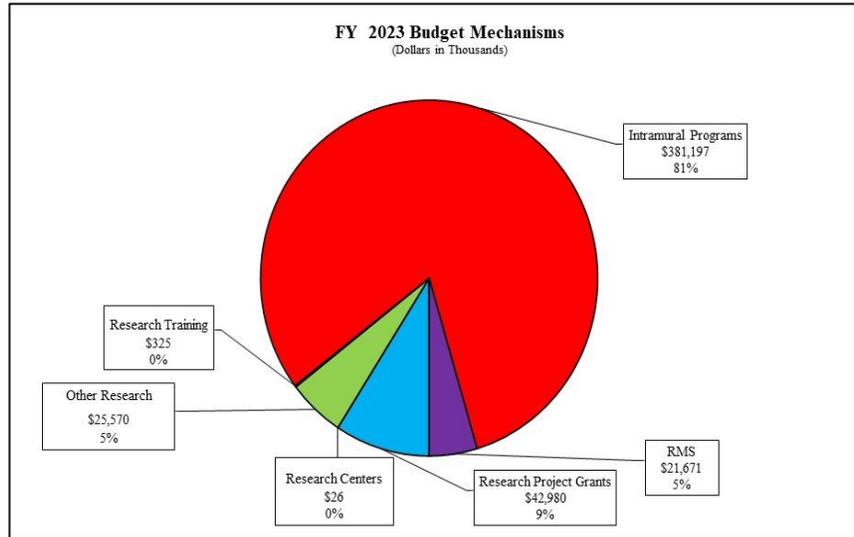
CHANGES	FY 2022 CR		FY 2023 President's Budget		Program Change from FY 2022 CR	
	No.	Amount	No.	Amount	No.	Amount
B. Program:						
1. Research Project Grants:						
a. Noncompeting	79	\$26,969	91	\$31,944	12	\$4,975
b. Competing	36	12,556	28	9,405	-8	-3,151
c. SBIR/STTR	4	1,580	5	1,631	1	52
Subtotal, RPGs	119	\$41,105	124	\$42,980	5	\$1,876
2. Research Centers	0	\$32	0	\$26	0	-\$6
3. Other Research	51	26,164	53	25,570	2	-595
4. Research Training	9	384	7	325	-2	-59
5. Research and development contracts	0	222	0	229	0	7
Subtotal, Extramural		\$67,908		\$69,130		\$1,222
6. Intramural Programs	<u>FTEs</u> 638	\$374,592	<u>FTEs</u> 638	\$381,197	<u>FTEs</u> 0	-\$2,914
7. Research Management and Support	103	21,288	103	21,671	0	-311
8. Construction		0		0		0
9. Buildings and Facilities		0		0		0
Subtotal, Program	741	\$463,787	741	\$471,998	0	-\$2,003
Total built-in and program changes						\$8,211

Budget Graphs

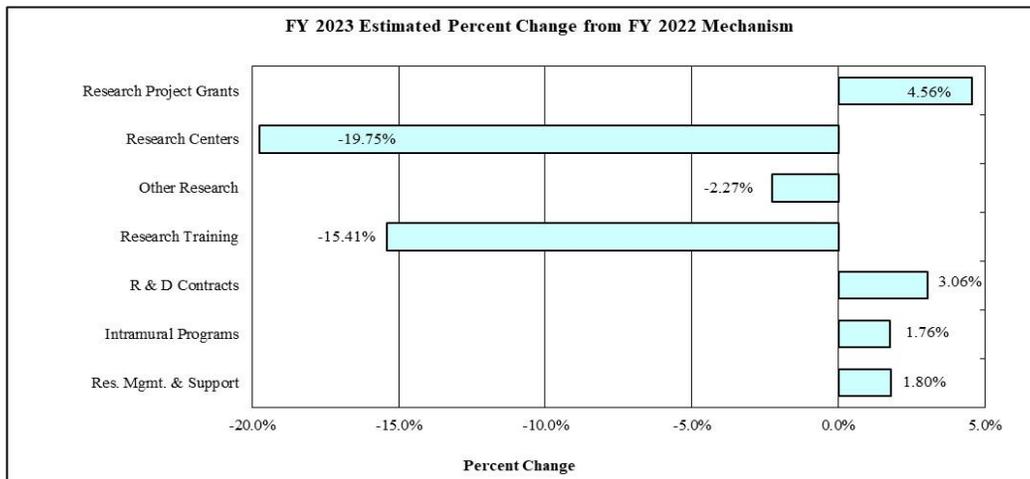
History of Budget Authority and FTEs:



Distribution by Mechanism:



Change by Selected Mechanisms:

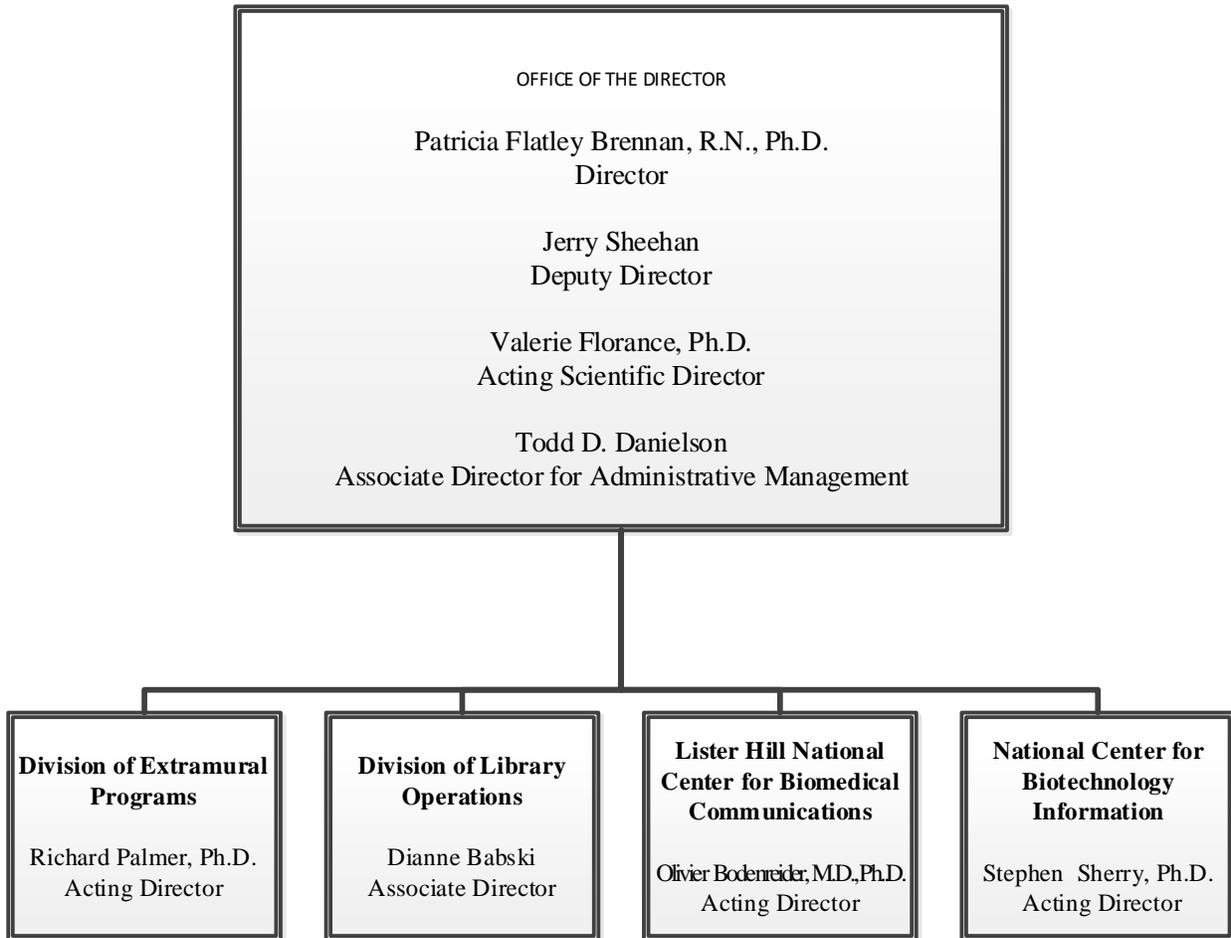


Organization Chart

NATIONAL INSTITUTES OF HEALTH

National Library of Medicine

ORGANIZATIONAL CHART



Budget Authority by Activity Table
NATIONAL INSTITUTES OF HEALTH
National Library of Medicine

Budget Authority by Activity¹
(Dollars in Thousands)

	FY 2021 Final		FY 2022 CR		FY 2023 President's Budget		FY 2023 +/- FY 2022 CR	
	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	<u>Amount</u>
Extramural Research								
Detail								
Health Information for Health Professionals and the Public		\$12,084		\$12,084		\$12,084		\$0
Informatics Resources for Biomedicine and Health		14,774		14,719		14,066		-653
Biomedical Informatics Research		41,105		41,105		42,980		1,876
Subtotal, Extramural		\$67,962		\$67,908		\$69,130		\$1,222
Intramural Programs	572	\$371,487	638	\$374,592	638	\$381,197	0	\$6,605
Research Management & Support	87	\$21,297	103	\$21,288	103	\$21,671	0	\$383
TOTAL	659	\$460,746	741	\$463,787	741	\$471,998	0	\$8,211

¹ Includes FTEs whose payroll obligations are supported by the NIH Common Fund.

Justification of Budget Request

National Library of Medicine

Authorizing Legislation: Section 301 and Title IV of the Public Health Service Act, as amended.

Budget Authority (BA):

	FY 2021 Final	FY 2022 Continuing Resolution	FY 2023 President's Budget	FY 2023 +/- FY 2022
BA	\$460,746,000	\$463,787,000	\$471,998,000	+\$8,211,000
FTE	659	741	741	0

Program funds are allocated as follows: Competitive Grants/Cooperative Agreements; Contracts; Direct Federal/Intramural and Other.

Overall Budget Policy: The FY 2023 President's Budget request for NLM is \$472.0 million, an increase of \$8.2 million over the FY 2022 CR level of \$463.8 million. Funds are included to sustain intramural research in computational health and computational biology and enhance NLM's most critical information services, including those that provide access to published biomedical literature, molecular biology and clinical data, and consumer health information. NLM will continue to build efficiency in processes that can be automated, such as indexing of journals in MEDLINE. NLM will award an estimated 28 new research project grants through its extramural programs. NLM will expand its graduate and post-doctoral training programs and launch new summer research experience programs in biomedical informatics and data science. NLM will continue its outreach programs that promote access and training in the effective use of NLM resources for scientists, clinicians, patients, and the public, while continuing to advance community engagement in the NIH Community Engagement Alliance (CEAL) Against COVID-19 Disparities and *All of Us* Research Program. NLM will also provide mission critical support for NIH- and government-wide priorities regarding data science goals, AI, and open science.

Program Descriptions

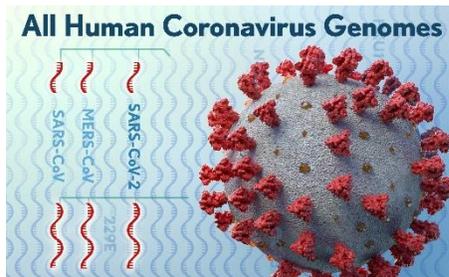
Intramural Programs

NLM's intramural programs encompass three major activities: 1) Intramural Research and Training; 2) Biomedical Information Services; and 3) Outreach and Engagement.

Intramural Research and Training

NLM researchers develop and apply computational approaches to a broad range of information problems in biology, biomedicine, and human health. NLM investigators conduct research and training activities to understand the function and evolution of genomes; use computational approaches to support analysis of biomedical images; and determine how gene proteins change their structures and functions. NLM researchers interpret written text from clinicians and

patients; develop methods to gain insights from large health databases; create and evaluate strategies to automate analysis of text; and use statistical methods to characterize the function and evolution of molecules. Investigators in NLM's intramural research program collaborate across NIH to generate new knowledge, methods, and tools that help scientists and clinicians better understand basic biology and the natural history of disease to enhance human health.



In FY 2021, NLM expanded its response to the COVID-19 pandemic by developing or applying computational methods to:

- Understand evolutionary patterns of coronaviruses and SARS-CoV-2;
- Calculate parameters that affected early growth of COVID-19 infection rates;
- Develop methods to anticipate complications in lung transplant patients who have COVID-19;
- Validate the prediction of risk for blood clots in COVID-19 patients; and
- Facilitate rapid access to published research on COVID-19.

NLM researchers are helping to characterize biological phenomena and predict functional consequences. Recent advances include the use of computational approaches to automate processing and analysis of data pertaining to genetic sequence information. NLM is also leading research to understand how viruses change over time, which may help identify which viruses will be the most significant to public health.

Using computational tools to derive meaning and patterns from clinical and claims data, NLM researchers are improving the use of biomedical terminologies—including drug, clinical, and specialized terminologies—by assuring consistency and integrity across various systems. Some of this computational work led to discerning from Medicare data the various effects that drugs have on health outcomes. NLM is also using artificial intelligence to advance interpretation of medical images. For example, in collaboration with the National Eye Institute, NLM researchers developed an automatic method to detect eye disease from images— augmenting human judgment with greater precision.

Understanding the Underlying Biology of a Pandemic

NLM is undertaking new research directions to characterize the interaction of viruses and human biology that affect human physiology.

Comparing hundreds of thousands of SARS-CoV-2 genomes, NLM researchers identified specific sites in virus proteins that contribute to virus adaptation and are signatures of variants of concern. NLM researchers quantitatively demonstrated the ongoing diversification of the virus and identified SARS-CoV-2 variants that are likely to be more dangerous.

NLM researchers are also studying an emerging class of proteins associated with many diseases including COVID-19, cancer, Alzheimer's, autoimmune disease, and bacterial infections. These proteins are unique because they respond to changes in their environments by changing their structures and functions. Ongoing studies to characterize how these proteins work could lead to the development of drugs that target disease-associated proteins.

Researchers at NLM are also developing a bioinformatics framework to detect and analyze human viruses in wastewater. Wastewater-based epidemiology has the potential to be a valuable early warning system to detect viral sequences excreted by individuals regardless of symptom presentation.

NLM's intramural research program offers a vibrant training environment, including long-term mentored research training and short-term rotations for clinicians. These opportunities allow mentored training in computational health and biology topics ranging from natural language understanding to clinical data mining to evolutionary genomics and protein structure. In FY 2021, NLM hosted 45 postdoctoral researchers, eight postbaccalaureate trainees, 16 summer interns, one postdoctoral fellow, three clinical fellows, and two visiting scientists. NLM created a new office of intramural training that provides centralized training and support to NLM trainees.

Biomedical Information Services

NLM's biomedical information services support scientific discovery and innovation through the collection, dissemination, and exchange of data and information critical to medicine and health. Each day, more than seven million people and computer information systems use NLM's web-based biomedical information services and download 270 terabytes of data. NLM accepts and processes more than 25 terabytes of data submitted by thousands of researchers and businesses every day. Growing demand requires that NLM regularly upgrade its services and use of modern technologies to improve operational efficiencies and accommodate the increasing volume and variety of data and information needed to support research and discovery. In FY 2021, NLM extended its migration to commercial cloud computing platforms to enable improved data security, support automated literature indexing processes, and enhance information services. NLM's ongoing pandemic response included repurposing or extending existing research resources for public health purposes. NLM made notable progress in advancing its work in health data standards, as well as outreach and engagement to promote use of NLM resources.

Improving Access to Biomedical Literature

NLM provides trusted biomedical information to millions of researchers, clinicians, students, and the public. Users can access NLM's flagship PubMed® database of citations to the biomedical literature in many ways, including through mobile devices and desktop computers. In FY 2021, NLM added more than 1.5 million citations to PubMed, increasing the total collection to more than 33 million bibliographic citations. NLM's PubMed also redesigned a structured search webpage to improve access to COVID-19 articles.

In FY 2021, NLM improved the transparency of procedures for publishers to apply to be a part of MEDLINE®, NLM's database of citations for biomedical literature. NLM launched a centralized MEDLINE website for a single point of access to information about policies, statistics, journal application, and review processes. NLM made significant progress in automated indexing to better serve users by applying computer algorithms to more rapidly process article titles and abstracts. In FY 2021, NLM accelerated indexing activities through automated practices for a subset of its more than 5,000 MEDLINE journals. This resulted in expanding automated indexing to include more than 400,000 citations from approximately 1,500 journals—facilitating researchers' ability to quickly access the literature and evaluate the usefulness of articles for their purposes. NLM also manages and provides access to a free, online repository of digitized biomedical resources spanning 10 centuries and originating from nearly every part of the globe. NLM's Digital Collection, searched by more than 300,000 people every year, includes books, manuscripts, still images, videos, maps, and other scholarly objects that support research and learning.

NLM leads the world in promoting free public access to the results of biomedical research through PubMed Central® (PMC), NLM’s full-text archive of biomedical literature. In addition, 10 other Federal agencies use PMC as the most efficient and effective means to disseminate journal articles reporting on research they fund. NLM added more than 900,000 full-text articles to PMC in FY 2021—expanding this archive to nearly 7.5 million articles. Additionally, NLM enhanced the value of articles deposited in PMC under the NIH Public Access Policy by linking many of them to associated datasets and making available nearly five million articles in machine-readable forms to permit automated analysis through natural language processing. Through the NIH Preprint Pilot, NLM is making preprints of NIH-supported COVID-19 research, that is, scientific articles not yet peer-reviewed, available through PMC, resulting in the addition of more than 2,700 preprints by the end of FY 2021. These preprints have been viewed more than 2.5 million times and represent a promising new form of scientific communication. Additionally, by partnering with commercial cloud providers, NLM made available four million articles from its PMC database to enhance machine access to the literature and drive impactful analyses and reuse. NLM also worked with the publishing community to provide free and unencumbered access to more than 190,000 coronavirus-related articles under the Public Health Emergency COVID-19 Initiative. These articles were accessed nearly 175 million times in FY 2021 to support ongoing public health emergency response efforts.

Expanded Access to Molecular Biology Data

NLM resources must keep pace with a changing world to advance science, enhance human health, and address current and emerging public health emergencies. Rapid and reliable access to molecular biology data, commonly referred to as “genomic data,” is essential to support research and translate discovery into insights. NLM maintains an array of more than 40 integrated molecular biology databases and bioinformatics tools that are freely accessible, enable biomedical research, and power new discoveries.

In FY 2021, NLM improved its high-value molecular biology resources to ensure efficient and comprehensive data collection, including content related to coronaviruses. Notably, more than 16.5 million Sequence Read Archive (SRA) records—more than 50 petabytes of genetic sequence data—were made available on 2 commercial cloud providers as part of the NIH Science and Technology Research Infrastructure for Discovery, Experimentation, and Sustainability (STRIDES) Initiative. NLM automated quality control reviews for submission to its database of Genotypes and Phenotypes (dbGaP) resulted in faster submission processing time. dbGaP provides controlled access to data from large-scale studies examining the relationship between genes (genotype information) and physical characteristics (phenotypes). The dbGaP infrastructure is also accelerating access to COVID-19 data by providing a standard authorization framework to more than 100 different studies under NIH’s Rapid Acceleration of Diagnostics (RADx) initiative. Additionally, with the support of NIH, NLM staff worked to reduce the burden on researchers’ access to data by providing subject matter expertise on the NIH Research Auth Service (RAS), a novel, single sign-on to NIH data research resources. NLM repurposed its research molecular databases to support public health, including food safety. In FY 2021, NLM worked with the U.S. Food and Drug Administration (FDA) and CDC to process genome sequence data for more than 255,000 samples through its Pathogen Detection Pipeline, resulting in more than 800 actions to protect consumers from foodborne illness.

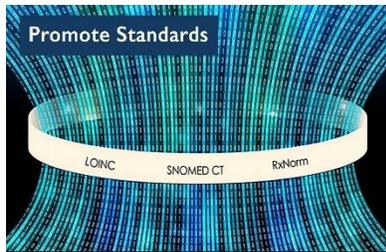
NLM enhanced research and accelerated the response to the COVID-19 pandemic by improving specialized SARS-CoV-2 virus resources for search and analysis by adding graphic interfaces and supporting data retrieval based on viral lineage. Through continued participation in the SARS-CoV-2 Sequencing for Public Health Emergency Response, Epidemiology, and Surveillance (SPHERES) consortium with the CDC, NLM helped improve understanding of SARS-CoV-2 transmission by providing easy and reliable large-scale access to the rapidly growing set of SARS-CoV-2 GenBank® genomes. NLM's participation in NIH's Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) Tracking Resistance and Coronavirus Evolution (TRACE) initiative included the development of novel data processes and analysis methodologies to support weekly tracking of the frequency of SARS-CoV-2 sequence mutations and variants, including predictions about variants that may have an impact on therapeutics. NLM also worked with the Public Health Alliance for Genomic Epidemiology (PHA4GE) to develop a sample metadata standard for SARS-CoV-2 sequence data.

Public Accountability for Clinical Trials

The COVID-19 pandemic underscores the importance of having a reference repository of research studies for clinical care. NLM's ClinicalTrials.gov is the world's largest publicly accessible database of privately and publicly funded clinical studies. In FY 2021, NLM added information about nearly 38,000 new clinical research studies, nearly 7,000 of which were COVID-19 studies, including more than 5,000 listed with the World Health Organization. NLM also added more than 7,000 new results summaries in FY 2021. Making this information visible to the scientific community and the public improves transparency, accountability, and encourages public trust in science. With the support of NIH, NLM continued its ClinicalTrials.gov modernization effort with enhancements to its technical infrastructure. NLM involved stakeholders in this effort through a webinar attended by more than 900 participants, engagement with the NLM Board of Regents Public Service Working Group, and user research with more than 70 participants representing numerous relevant stakeholder groups.

Consumer Health Information

While NLM's biomedical information services are accessible to the public, NLM's MedlinePlus® is specifically designed to meet consumers' health information needs. Available in English and Spanish, MedlinePlus offers trusted, authoritative information for patients and families about a broad variety of health conditions, medical tests, drugs, and supplements, along with links to other credible sources of information. More than 400 million users accessed MedlinePlus in FY 2021. A companion to MedlinePlus, MedlinePlus Connect, provides direct, tailored access to MedlinePlus resources automatically through electronic health records (EHRs), patient portals, and other health information technology (IT) systems to deliver information from MedlinePlus to patients and providers at the point of care. In FY 2021, MedlinePlus Connect seamlessly responded to more than 153 million electronic requests from health IT systems. A related NLM offering, NIH MedlinePlus Magazine, provides the public with information about NIH-supported research and trusted health information. In FY 2021, NIH MedlinePlus Magazine migrated to a digital-only distribution platform reaching 36,000 subscribers and averaging 250,000 visitors each month, while also making print copies available as needed. The magazine is witnessing consistent growth with a 50 percent increase in performance.



Standards and Terminologies for Health Data Interoperability

NLM works across the NIH, the Federal government, and the health care delivery system to support the development, maintenance, and dissemination of health data standards that promote interoperability among EHR systems, as well as other clinical and research information systems. In FY 2021, NLM expanded three clinical language systems used for clinical terminology, laboratory tests and observations, and drug names to include terms and codes associated with SARS-CoV-2 and COVID-19. Through the addition of 10,177 new Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT[®]) and 1,740 Logical Observation Identifiers, Names and Codes (LOINC[®]) codes—more than 175 of which are COVID-19-related—NLM is directly supporting stakeholders' ability to provide high-quality interoperable clinical and laboratory information. In addition, the new LOINC COVID-19-related terms help identify and codify laboratory data in support of FDA and CDC initiatives to standardize COVID-19 testing and report vaccination status. NLM updated drug names in RxNorm to include COVID-19 vaccines receiving FDA emergency use authorization and select COVID-19 investigational drugs. NLM launched the COVID-19 Vaccines and Medications in RxNorm webpage to make it easier for users to identify published COVID-19 vaccines and medications. In collaboration with the Office of the National Coordinator for Health Information Technology and Centers for Medicare & Medicaid Services, NLM continued enhancements to make it easier for clinicians and researchers to use harmonized sets of terms from these standards to measure quality of care related to COVID-19. NLM continues to provide and enhance NIH's Common Data Elements (CDE) Repository, a freely available source of standard, structured, machine-readable definitions of data elements, standard variables, and measures used in NIH-funded clinical research. NLM developmental enhancements to the CDE Repository continue to improve the user experience and facilitate COVID-19 data services.

Leveraging NLM's Network to Support NIH Research in Communities

Major engagement programs and activities are enabled by NLM's Network of the National Library of Medicine (NNLM). The NNLM provides a human connection in communities across the United States to advance health equity through information, and increase community engagement in NIH research programs.

Approximately 90 percent of the U.S. population lives in a county with at least one NNLM member while 93 percent of minority populations live in a county with at least one NNLM member.

NLM's support of NIH's Community Engagement Alliance (CEAL) Against COVID-19 Disparities leverages the NNLM to combat COVID-19 misinformation. NLM's Spanish language videos created to support CEAL are among the most popular NLM YouTube content.

NNLM's longstanding partnership with NIH's *All of Us* Research Program has resulted in more than 280 programs on wellness, health, and digital literacy conducted with 252 diverse community partners—reaching more than 31,000 people. NLM activities attract new, diverse partners to increase engagement in precision medicine programs to reach populations underrepresented in biomedical research. For example, NNLM partnered with local organizations serving underserved populations to provide a series of training videos to deliver community-based digital health literacy skills training.

NLM's Environmental Health Information Partnership (EnHIP) advances health equity and builds capacity on college campuses and in communities. From 2004-2020, 22 EnHIP member institutions completed 139 projects in 19 states. In FY 2021, four member institutions initiated engagement and outreach projects on COVID-19, health literacy, environmental health, and data science.

Outreach and Engagement

NLM's outreach and engagement activities foster innovation, and raise awareness and support for the use of NIH and NLM information, data resources, and physical collections. Much of this outreach is conducted through the NLM-supported Network of the National Library of Medicine (NNLM®), a network of trusted ambassadors that leverages more than 8,800 academic health science libraries, hospital and public libraries, and community organizations to carry out regional and national programs.

In FY 2021, NLM reorganized the NNLM to more effectively serve the diversity of communities throughout the United States. After a national solicitation and competitive review, NLM awarded five-year cooperative agreements to each of seven institutions selected to serve as Regional Medical Libraries, and four institutions selected as NNLM National Coordinating Offices. Additionally, a new National Evaluation Center provides innovative frameworks and evidence-based evaluation tools and practices to ensure that programming provided by the NNLM meets community needs. In FY 2021, 1,731 NNLM health information access activities engaged 89,453 participants across 45 states, the District of Columbia, Guam, and the U.S. Virgin Islands. NNLM outreach activities on long-term research and clinical trials support the NIH Community Engagement Alliance (CEAL) Against COVID-19 Disparities and NIH *All of Us* Research Program engagement priorities.

Budget Policy: The FY 2023 President's Budget estimate for NLM's Intramural Programs is \$381.2 million, an increase of \$6.6 million from the FY 2022 CR level of \$374.6 million. NLM will continue to support critical research and training in computational health and biology at current levels. Informed by the needs of NLM, NIH, and the broader biomedical research community, research priorities will incorporate activities to understand the function and evolution of genomes; use computational approaches to support analysis of biomedical images; discover how gene proteins change their structures and functions; develop methods to gain insights from large health databases; create and evaluate strategies to automate analysis of text; and use statistical methods to characterize the function and evolution of molecules. NLM will prioritize investments to improve molecular biology databases and bioinformatics tools, including the SRA, and other high-priority information services, such as ClinicalTrials.gov and PMC. It will seek additional efficiencies in its information services, including through use of automation of processes for journal indexing. NLM will also continue to support tools for updating and disseminating clinical terminology standards that support interoperability of electronic health data and advanced integration and analysis of genomic, clinical research, and observational health data. NLM will continue its outreach programs that promote access and training in the effective use of biomedical and health information through engagement with broad sets of stakeholders in the public and private sectors.

Extramural Programs

NLM's extramural programs encompass three major activities: 1) Biomedical Informatics Research and Training; 2) Informatics Resources for Biomedicine and Health; and 3) Health Information for Health Professionals and the Public.

Biomedical Informatics Research and Training

NLM's research grants advance fundamental and applied biomedical informatics and data science research, and develop novel computational approaches for biomedical research. In FY 2021, NLM funded 204 awards to investigators across the country, including 22 co-funded with

Research on Artificial Intelligence Applications in Support of Scientific Discovery and Clinical Care

NLM funds research that is reimagining health care delivery with artificial intelligence (AI) and advancing AI methods and approaches. Technologies powered by AI have the potential to improve health outcomes, improve clinical decision making, and reduce medical errors. Making appropriate use of AI in clinical care also requires research to develop and test these techniques.

NLM-funded researchers are working to:

- Employ AI to prevent disease and improve health through activities such as mining medical records and real-time data from wearables to ensure preventive care is tailored to the individual.
- Develop AI approaches for early disease detection and intervention, and understand the relationship between neighborhood design and chronic disease.
- Use deep learning algorithms to interpret images and detect conditions from cancer to eye disease.
- Advance decision support for trauma resuscitation in critical care settings to improve clinician performance, reduce errors, and prevent adverse outcomes.
- Create bioinformatics analysis systems that identify therapeutic resistance and predict patients at risk of treatment failure.
- Analyze EHR data to provide estimated outcomes for treatment strategies and decision making.
- Minimize dangerous and costly pharmacy dispensing errors.
- Develop new AI methods to analyze images from journal articles and large-scale single-cell datasets with multiple data types to advance scientific discovery.
- Investigate the limits of deep learning when utilizing "noisy data," which can help the broader scientific community understand the most effective ways to employ AI tools in research.

other NIH Institutes and Centers. NLM-funded researchers develop methods to capture, analyze, visualize, integrate, and curate biomedical data to support discovery and decision-making. Active NLM-supported research projects are developing statistical methods for clinical data analysis, advancing visualization methods to support clinical decision making, and developing new machine learning methods. In FY 2021, NLM-funded researchers:

- Applied artificial intelligence and machine learning to predict treatment effectiveness and inform personalized medicine approaches.
- Leveraged high-throughput sequencing data from wastewater, and data from other sources, for virus surveillance and public health protection.
- Supported natural language processing of medical record data to improve patient care and monitoring.

University-based training program for biomedical informatics and data science

NLM is a leading funder of Ph.D.-level training in biomedical informatics and data science. NLM's university-based research training program supports 16 universities across the country—enrolling nearly 200 predoctoral and postdoctoral fellows and trainees. NLM trainees are emerging as major leaders in diversity, equity, and inclusion for biomedical informatics. In FY 2021, NLM reopened the competition for its university-

based training program with a new emphasis on original basic or applied research with one or more of the following biomedical application domains: health care or clinical informatics; translational bioinformatics; clinical research informatics; public health informatics; and

consumer health informatics. This program encourages institutions to diversify student and faculty populations to enhance participation of individuals underrepresented in the biomedical, clinical, behavioral, and social sciences research enterprise. NLM also provides awards to sponsor short-term research experiences for undergraduates and others interested in careers in biomedical informatics and data science. In addition, in FY 2021, NLM supported two NIH National Research Service Award predoctoral fellowships, one focused on developing new methods to automatically detect surgical errors and the other to address complexity in heterogeneous health data.

Informatics Resources for Biomedicine and Health

The NLM Information Resource Grants to Reduce Health Disparities support projects that bring useful and understandable health information to populations affected by health disparities, as well as their health care providers. In FY 2021, NLM awarded two grants to reduce health disparities by: 1) increasing access to and dissemination of information resources on heart and blood vessel disease for Puerto Ricans; and 2) developing an accessible informed consent app-based toolkit for people who are deaf and hard of hearing, and want to participate in research. NLM's Grants for Scholarly Works in Biomedicine and Health supports the work of health professionals, public health officials, biomedical researchers, and health science historians. In FY 2021, NLM awarded five grants for scholarly works about: the Great Epizootic (flu) of 1872; race and representation in law, politics, and the biosciences; race, retail and risk in urban African American communities; translation of genomic medicine in the 21st century; and the impact of complementary therapies on well-being over the past one hundred years.

Health Information for Health Professionals and the Public

The NLM Extramural Program oversees cooperative agreements that fund the NNLM to improve the health of the Nation by training U.S. health professionals to access biomedical information, enhancing individuals' access to trusted health information, and building capacity for data management and science at health sciences libraries. In FY 2021, NLM issued a funding opportunity that supports the NNLM *All of Us* Program Center to serve as the coordinating center responsible for the engagement, programs, partnerships, activities, and trainings offered by NNLM in support of the NIH *All of Us* Research Program.

Budget Policy: The FY 2023 President's Budget request includes \$69.1 million for NLM's Extramural Programs, an increase of \$1.2 million from the FY 2022 CR level of \$67.9 million. NLM will continue to accept investigator-initiated applications through NIH parent-grant announcements, as well as applications submitted to NLM's own funding announcements. In FY 2023, NLM will support noncompeting grants at the previously committed level. NLM expects to award an estimated 28 competing research project grants and will aim to support early stage and new investigators at success rates comparable to those of established investigators submitting new applications. It will expand its university-based research training programs in biomedical informatics and data science from 16 to 18 universities across the country, with a total anticipated total enrollment of 170 predoctoral and postdoctoral trainees. It will launch new summer research experience programs at five universities to attract a diverse set of talented undergraduate and post-baccalaureate students to bioinformatics and data science careers. NLM will continue to support its unique resource grant programs and career transition programs. Through its cooperative agreement for the NNLM, NLM will continue to support efforts to

advance community engagement in CEAL and the *All of Us* Research Program, and to retain support for its engagement and training programs.

Research Management and Support

NLM's research management and support (RMS) activities provide administrative, budgetary, communications, and logistical support for NLM programs to ensure strategic planning and evaluation; regulatory compliance; policy development; international coordination; and partnerships with other Federal agencies, Congress, the private sector, and the public. In FY 2021, NLM created a new Office of the Scientific Director to provide oversight of its intramural research program and reorganized NLM's Lister Hill National Center for Biomedical Communications to better align NLM investments with key research priorities. NLM also expanded its data science training program for all NLM staff, which has become a model for data science workforce development across government.

Budget Policy: The FY 2023 President's Budget request includes \$21.7 million for NLM's RMS activities, an increase of \$0.4 million from the FY 2022 CR level of \$21.3 million. RMS will support NLM-wide planning and evaluation, including implementation and updating of NLM's strategic plan. It will also support enhancement of NLM's critical physical and information systems security infrastructure, policy development and administration functions, and improved coordination of trans-NLM and trans-NIH efforts in data science.

Conclusion: NLM is a platform for biomedical data discovery and data-powered health. Through its research, information services, and engagement activities, NLM keeps pace with a changing world to advance science to enhance human health. Researchers, clinicians, and the public will continue to require access to the vast wealth of biomedical knowledge that NLM makes available. This work is essential to improve the health of the Nation.



Appropriations History

**NATIONAL INSTITUTES OF HEALTH
National Library of Medicine**

Appropriations History

Fiscal Year	Budget Estimate to Congress	House Allowance	Senate Allowance	Appropriation
2014	\$382,252,000		\$387,912,000	\$327,723,000
Rescission				\$0
2015	\$372,851,000			\$336,939,000
Rescission				\$0
2016	\$394,090,000	\$341,119,000	\$402,251,000	\$394,664,000
Rescission				\$0
2017 ¹	\$395,684,000	\$407,086,000	\$412,097,000	\$407,510,000
Rescission				\$0
2018	\$373,258,000	\$413,848,000	\$420,898,000	\$428,553,000
Rescission				\$0
2019	\$395,493,000	\$433,671,000	\$442,230,000	\$441,997,000
Rescission				\$0
2020	\$380,463,000	\$463,599,000	\$465,837,000	\$456,911,000
Rescission				\$0
Supplemental				\$10,000,000
2021	\$415,665,000	\$460,841,000	\$471,789,000	\$463,787,000
Rescission				\$0
2022	\$474,864,000	\$486,769,000	\$476,074,000	\$463,787,000
Rescission				\$0
2023	\$471,998,000			

¹ Budget Estimate to Congress includes mandatory financing.

Authorizing Legislation

NATIONAL INSTITUTES OF HEALTH National Library of Medicine

Authorizing Legislation

	PHS Act/ Other Citation	U.S. Code Citation	2022 Amount Authorized		FY 2022 CR	2023 Amount Authorized	FY 2023 President's Budget
Research and Investigation	Section 301	42§241	Indefinite	}	\$463,787,000	Indefinite	\$471,998,000
National Library of Medicine	Section 401(a)	42§281	Indefinite			Indefinite	
Total, Budget Authority					\$463,787,000		\$471,998,000

Amounts Available for Obligation

**NATIONAL INSTITUTES OF HEALTH
National Library of Medicine**

Amounts Available for Obligation ¹
(Dollars in Thousands)

Source of Funding	FY 2021 Final	FY 2022 CR	FY 2023 President's Budget
Appropriation	\$463,787	\$463,787	\$471,998
Secretary's Transfer	-\$1,392	\$0	\$0
Subtotal, adjusted appropriation	\$462,395	\$463,787	\$471,998
OAR HIV/AIDS Transfers	-\$1,649	\$0	\$0
Subtotal, adjusted budget authority	\$460,746	\$463,787	\$471,998
Unobligated balance, start of year	\$2,620	\$3,000	\$0
Unobligated balance, end of year (carryover)	-\$3,000	\$0	\$0
Subtotal, adjusted budget authority	\$460,366	\$466,787	\$471,998
Unobligated balance lapsing	-\$283	\$0	\$0
Total obligations	\$460,083	\$466,787	\$471,998

¹ Excludes the following amounts (in thousands) for reimbursable activities carried out by this account:
FY 2021 - \$12,791 FY 2022 - \$24,791 FY 2023 - \$22,791

Budget Authority by Object Class

NATIONAL INSTITUTES OF HEALTH National Library of Medicine

Budget Authority by Object Class¹ (Dollars in Thousands)

	FY 2022 CR	FY 2023 President's Budget	FY 2023 +/- FY 2022
Total compensable workyears:			
Full-time equivalent	741	741	0
Full-time equivalent of overtime and holiday hours	1	1	0
Average ES salary	\$200	\$208	\$8
Average GM/GS grade	11.9	11.9	0.0
Average GM/GS salary	\$115	\$120	\$5
Average salary, Commissioned Corps (42 U.S.C. 207)	\$125	\$130	\$5
Average salary of ungraded positions	\$182	\$190	\$7
OBJECT CLASSES	FY 2022 CR	FY 2023 President's Budget	FY 2023 +/- FY 2022
Personnel Compensation			
11.1 Full-Time Permanent	\$51,916	\$53,859	\$1,943
11.3 Other Than Full-Time Permanent	\$42,031	\$43,604	\$1,573
11.5 Other Personnel Compensation	\$2,473	\$2,565	\$93
11.7 Military Personnel	\$103	\$107	\$4
11.8 Special Personnel Services Payments	\$1,933	\$2,005	\$72
11.9 Subtotal Personnel Compensation	\$98,455	\$102,139	\$3,684
12.1 Civilian Personnel Benefits	\$34,673	\$35,860	\$1,187
12.2 Military Personnel Benefits	\$62	\$64	\$2
13.0 Benefits to Former Personnel	\$0	\$0	\$0
Subtotal Pay Costs	\$133,190	\$138,063	\$4,873
21.0 Travel & Transportation of Persons	\$333	\$340	\$7
22.0 Transportation of Things	\$191	\$195	\$4
23.1 Rental Payments to GSA	\$61	\$63	\$1
23.2 Rental Payments to Others	\$142	\$145	\$3
23.3 Communications, Utilities & Misc. Charges	\$325	\$332	\$7
24.0 Printing & Reproduction	\$10	\$10	\$0
25.1 Consulting Services	\$60,071	\$58,525	-\$1,546
25.2 Other Services	\$69,844	\$71,220	\$1,376
25.3 Purchase of Goods and Services from Government Accounts	\$80,453	\$81,660	\$1,207
25.4 Operation & Maintenance of Facilities	\$792	\$792	\$0
25.5 R&D Contracts	\$239	\$239	\$0
25.6 Medical Care	\$1	\$1	\$0
25.7 Operation & Maintenance of Equipment	\$15,822	\$16,170	\$348
25.8 Subsistence & Support of Persons	\$0	\$0	\$0
25.0 Subtotal Other Contractual Services	\$227,221	\$228,607	\$1,386
26.0 Supplies & Materials	\$4,672	\$4,775	\$103
31.0 Equipment	\$24,739	\$25,283	\$544
32.0 Land and Structures	\$2,702	\$2,761	\$59
33.0 Investments & Loans	\$0	\$0	\$0
41.0 Grants, Subsidies & Contributions	\$70,201	\$71,423	\$1,222
42.0 Insurance Claims & Indemnities	\$0	\$0	\$0
43.0 Interest & Dividends	\$1	\$1	\$0
44.0 Refunds	\$0	\$0	\$0
Subtotal Non-Pay Costs	\$330,597	\$333,935	\$3,338
Total Budget Authority by Object Class	\$463,787	\$471,998	\$8,211

¹ Includes FTEs whose payroll obligations are supported by the NIH Common Fund.

Salaries and Expenses

NATIONAL INSTITUTES OF HEALTH

National Library of Medicine

Salaries and Expenses

(Dollars in Thousands)

Object Classes	FY 2022 CR	FY 2023 President's Budget	FY 2023 +/- FY 2022
<u>Personnel Compensation</u>			
Full-Time Permanent (11.1)	\$51,916	\$53,859	\$1,943
Other Than Full-Time Permanent (11.3)	\$42,031	\$43,604	\$1,573
Other Personnel Compensation (11.5)	\$2,473	\$2,565	\$93
Military Personnel (11.7)	\$103	\$107	\$4
Special Personnel Services Payments (11.8)	\$1,933	\$2,005	\$72
Subtotal, Personnel Compensation (11.9)	\$98,455	\$102,139	\$3,684
Civilian Personnel Benefits (12.1)	\$34,673	\$35,860	\$1,187
Military Personnel Benefits (12.2)	\$62	\$64	\$2
Benefits to Former Personnel (13.0)	\$0	\$0	\$0
Subtotal Pay Costs	\$133,190	\$138,063	\$4,873
Travel & Transportation of Persons (21.0)	\$333	\$340	\$7
Transportation of Things (22.0)	\$191	\$195	\$4
Rental Payments to Others (23.2)	\$142	\$145	\$3
Communications, Utilities & Misc. Charges (23.3)	\$325	\$332	\$7
Printing & Reproduction (24.0)	\$10	\$10	\$0
<u>Other Contractual Services</u>			
Consultant Services (25.1)	\$60,071	\$58,525	-\$1,546
Other Services (25.2)	\$69,844	\$71,220	\$1,376
Purchase of Goods and Services from Government Accounts (25.3)	\$68,841	\$70,048	\$1,207
Operation & Maintenance of Facilities (25.4)	\$792	\$792	\$0
Operation & Maintenance of Equipment (25.7)	\$15,822	\$16,170	\$348
Subsistence & Support of Persons (25.8)	\$0	\$0	\$0
Subtotal Other Contractual Services	\$215,370	\$216,755	\$1,386
Supplies & Materials (26.0)	\$4,672	\$4,775	\$103
Subtotal Non-Pay Costs	\$221,043	\$222,553	\$1,510
Total Administrative Costs	\$354,232	\$360,616	\$6,384

Detail of Full-Time Equivalent Employment (FTE)

NATIONAL INSTITUTES OF HEALTH National Library of Medicine

Detail of Full-Time Equivalent Employment (FTE)

Office	FY 2021 Final			FY 2022 CR			FY 2023 President's Budget		
	Civilian	Military	Total	Civilian	Military	Total	Civilian	Military	Total
Office of the Director/Administration									
Direct:	58	-	58	72	-	72	72	-	72
Reimbursable:	11	-	11	11	-	11	11	-	11
Total:	69	-	69	83	-	83	83	-	83
National Center for Biotechnology Information									
Direct:	260	1	261	298	1	299	298	1	299
Reimbursable:	12	-	12	13	-	13	13	-	13
Total:	272	1	273	311	1	312	311	1	312
Lister Hill National Center for Biomedical Communications									
Direct:	33	-	33	40	-	40	40	-	40
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	33	-	33	40	-	40	40	-	40
Division of Library Operations									
Direct:	266	-	266	286	-	286	286	-	286
Total:	266	-	266	286	-	286	286	-	286
Division of Extramural Programs									
Direct:	18	-	18	20	-	20	20	-	20
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	18	-	18	20	-	20	20	-	20
Division of Library Operations									
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	-	-	-	-	-	-	-	-	-
Total	658	1	659	740	1	741	740	1	741
Includes FTEs whose payroll obligations are supported by the NIH Common Fund.									
FTEs supported by funds from Cooperative Research and Development Agreements.	0	0	0	0	0	0	0	0	0
FISCAL YEAR	Average GS Grade								
2019	11.8								
2020	11.8								
2021	11.9								
2022	11.9								
2023	11.9								

Detail of Positions

NATIONAL INSTITUTES OF HEALTH National Library of Medicine

Detail of Positions¹

GRADE	FY 2021 Final	FY 2022 CR	FY 2023 President's Budget
Total, ES Positions	5	5	5
Total, ES Salary	978,248	1,000,552	1,041,575
General Schedule			
GM/GS-15	19	22	22
GM/GS-14	51	54	54
GM/GS-13	135	164	164
GS-12	107	117	117
GS-11	18	18	18
GS-10	0	0	0
GS-9	23	23	23
GS-8	30	30	30
GS-7	5	5	5
GS-6	1	1	1
GS-5	1	1	1
GS-4	2	2	2
GS-3	1	1	1
GS-2	2	2	2
GS-1	3	3	3
Subtotal	398	443	443
Commissioned Corps (42 U.S.C. 207)			
Assistant Surgeon General	0	0	0
Director Grade	0	0	0
Senior Grade	1	1	1
Full Grade	0	0	0
Senior Assistant Grade	0	0	0
Assistant Grade	0	0	0
Subtotal	1	1	1
Ungraded	269	306	306
Total permanent positions	397	479	479
Total positions, end of year	673	755	755
Total full-time equivalent (FTE) employment, end of year	659	741	741
Average ES salary	195,650	200,110	208,315
Average GM/GS grade	11.9	11.9	11.9
Average GM/GS salary	112,738	115,308	120,036

¹ Includes FTEs whose payroll obligations are supported by the NIH Common Fund.