



CONGRESSIONAL JUSTIFICATION FY 2023

Department of Health and Human Services National Institutes of Health



National Heart, Lung, and Blood Institute [THIS PAGE INTENTIONALLY LEFT BLANK]

DEPARTMENT OF HEALTH AND HUMAN SERVICES

NATIONAL INSTITUTES OF HEALTH

National Heart, Lung, and Blood Institute (NHLBI)

F	Y 2023 Budget Table of Contents	
	Director's Overview	. 3
	Fact Sheet	. 7
	Major Changes in the Fiscal Year 2023 President's Budget Request	. 9
	Budget Mechanism Table	10
	Appropriations Language	11
	Summary of Changes	12
	Budget Graphs	13
	Organizational Chart	14
	Budget Authority by Activity Table	15
	Justification of Budget Request	16
	Appropriations History	25
	Authorizing Legislation	26
	Amounts Available for Obligation	27
	Budget Authority by Object Class	28
	Salaries and Expenses	29
	Detail of Full-Time Equivalent Employment (FTE)	30
	Detail of Positions	31

Cover page: Bone marrow in a mouse model of sickle cell disease, showing widespread pathologic angiogenesis (arteries in green, sinusoids in red). *Photo credit: Shin-Young Park, Boston Children's Hospital and Harvard Medical School, Boston, MA*

[THIS PAGE INTENTIONALLY LEFT BLANK]

Director's Overview

The **National Heart, Lung, and Blood Institute (NHLBI)** supports research to reduce the burden of disorders that affect the vital interconnected biology of the heart, the lungs, blood, and sleep. Indeed, three of the Nation's leading causes of death (heart disease, chronic lung disease, and stroke), as well as COVID-19, fall within NHLBI's portfolio, making the Institute's research critical for reducing death and disability and improving quality of life for our citizens. To that end, the NHLBI takes a **life-course approach** to understand and enhance heart, lung, and blood health, as well as the restorative power of sleep, at every stage of life, from before birth through adulthood. In FY 2023, the NHLBI will continue to support a robust spectrum of basic to applied research to develop effective approaches for early diagnosis, treatment, and prevention of heart, lung, blood, and sleep disorders for all ages and populations of our diverse Nation.



Dr. Gary H. Gibbons, Director

Investing in Discovery Science to Improve Public Health

NHLBI recognizes that the path to medical breakthroughs often begins with research focused on understanding fundamental principles of biology. For example, based on an approach first developed and tested 20 years ago to map simple cellular pathways involved in yeast metabolism,^{1,2} researchers are now able to examine gene expression patterns in the human body, over time and in different organs. Recently, an NHLBI-funded team used this approach to identify genetic pathways involved in heart failure with preserved ejection fraction (HFpEF), a complex disease with few treatments.³ Such findings have set the stage for NHLBI's new **HeartShare** program, which is analyzing clinical, laboratory, and imaging data from patients with HFpEF to define its mechanisms. In addition, NHLBI's **Trans-Omics for Precision Medicine (TOPMed)** program is analyzing genomic and other data for clues to a variety of heart, lung, blood, and sleep disorders—and has assembled one of the world's largest, most diverse genomic databanks. (For more information, see Program Portrait on page 17

The path from a therapeutic target to a safe, effective therapy requires distinct resources and expertise. The NHLBI anticipates that the **Accelerating Medicines Partnership**[®] (AMP[®]), which brings together the National Institutes of Health (NIH), the U.S. Food and Drug Administration (FDA), and industry to rapidly develop new therapeutics, will include a project focused on heart failure. Working together, these partners will systematically analyze data from HeartShare, TOPMed, and other programs to identify potential drug targets, and advance these to drug development and testing. The NHLBI **Catalyze** program is also helping turn laboratory discoveries into novel interventions for heart, lung, blood, and sleep disorders. In addition to research funding, Catalyze provides academic investigators with technical assistance, training, and mentorship to prepare new drugs, diagnostics, and devices for testing in clinical trials. For example, one project is developing a robotic sensor to more precisely locate and silence the

¹ pubmed.ncbi.nlm.nih.gov/15499008/

² pubmed.ncbi.nlm.nih.gov/11340206/

³ pubmed.ncbi.nlm.nih.gov/33118835/

abnormal cardiac tissue that causes arrhythmias. (For more information, see Program Portrait on page 20.)

Reducing Chronic Disease Burden and Achieving Health Equity

Although NIH has fueled progress in reducing deaths from many **chronic diseases** over the past 50 years, that progress appears to be slowing, particularly for underserved and vulnerable populations. The NHLBI is amplifying its efforts to better understand and address social determinants of health (SDOH)—living conditions that influence our susceptibility and resilience to disease. Research shows that heart, lung, blood, and sleep disorders are sensitive to a variety of SDOH, from individual and household-level factors such as income and healthcare access, to more complex factors such as institutional racism and climate change—which is increasing air pollution, extreme weather, and wildfires in some communities.

With FY 2020 funding, the NHLBI expanded its support for initiatives to reduce health disparities by addressing SDOH. For example, an NHLBI-funded study launched in 2019 aims to identify the risk factors that contribute to high rates of chronic heart and lung diseases in rural America. The **RURAL** study is deploying a mobile examination unit equipped with the latest diagnostic technologies to examine participants living in rural Alabama, Kentucky, Louisiana, and Mississippi. The NHLBI also plans to expand efforts to understand and address the health needs of a growing segment of our society, **Asian Americans, Native Hawaiians, and Pacific Islanders** (AANHPI), including a new cohort study to examine how biological and social factors impact the health of AANHPI subgroups.

Another new program, **Disparities Elimination through Coordinated Interventions to Prevent and Control Heart and Lung Disease Risk (DECIPHER)**, is translating knowledge about SDOH into strategies to achieve health equity. DECIPHER supports projects that are testing new ways to bring evidence-based interventions into broader practice in communities with a high burden of heart and lung disease. The program funded its first six community-based projects in 2021. For example, in Louisiana, the program is investigating whether bringing heart health education sessions into Black churches can help community members reduce their risk of heart disease. In Colorado, researchers are testing whether they can improve asthma outcomes for children from low-income families by integrating school nurses and asthma navigators into the children's primary care, and by connecting the families to resources that address SDOH.

Improving Maternal Health through Evidence-Based Care across the Lifespan

The need for a life-course approach to health is evident in our Nation's high rates of maternal morbidity and mortality, especially in communities of color. Cardiovascular disease (CVD) is a leading cause of adverse pregnancy outcomes including deaths, which have increased nationally over the past decade. Over the same time period, pre-pregnancy hypertension among women aged 15-44 nearly doubled, with the highest rates among Black women and women from rural areas.⁴ NHLBI's **Chronic Hypertension and Pregnancy (CHAP) trial** is examining the benefits of medication to treat mild hypertension in pregnancy, which is typically deferred for severe hypertension.

⁴ pubmed.ncbi.nlm.nih.gov/33183896/

The Institute also has committed funding through 2027 for the **nuMOM2b Heart Health Study**, which is examining how pregnancy impacts a woman's future cardiovascular health. The study recently showed that early measures of metabolic health (such as blood sugar and fatty acid levels) predict a woman's risk of hypertension years after childbirth.⁵ NHLBI-funded research also suggests that improving a woman's CV health during pregnancy can improve the child's future CV health, too, with a robust association seen even in the preteen years.⁶ Such research reaffirms the value of **preserving and promoting maternal health**.

The NHLBI has established new programs that address heart, lung, blood, and sleep health during critical windows of a woman's life using implementation science—the study of how to bring proven interventions into wider practice. NHLBI's **Maternal Health Community Implementation Program** is testing community-based strategies in four U.S. regions where maternal death rates are high. Another effort, the **Early Intervention to Promote Cardiovascular Health of Mothers and Children (ENRICH)** program, will tap into existing federal home visiting programs that serve at-risk families to determine if adding a CV intervention will enhance maternal and early childhood outcomes for approximately 3,000 mother-child pairs.

Building on Prior Research, Tools, and Talent to Combat COVID-19

Because COVID-19 can have severe effects on heart, lung, blood and sleep (HLBS) systems, and poses a higher risk for people who have pre-existing HLBS conditions, the NHLBI has played a significant role in the Nation's COVID-19 research response. To support research on COVID's short-and long-term effects on the body-including therapies to prevent the most severe effects and save lives-the NHLBI successfully leveraged a variety of prior investments, including clinical trial networks and community-based studies. NHLBI's trial networks were critical for rapidly standing up the NIH Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) program, which supports adaptive trials that can rapidly change direction or stop based on emerging data. NHLBI-funded trials have focused on potential treatments for moderate-to-severe COVID-19 and its effects on the respiratory and cardiovascular systems, including life-threatening blood clots. The ACTIV-4 anticoagulant trials found that a 2-week regimen of the blood thinner heparin reduced the need for organ support, such as mechanical ventilation, for moderately ill hospitalized patients, but not for critically ill patients in intensive care. Importantly, ACTIV and other NHLBI-supported trial networks also have demonstrated that some proposed treatments for COVID-19 do not work; for example, a trial launched in April 2020 found that hydroxychloroquine did not help hospitalized COVID-19 patients, a result confirmed by other trials internationally;⁷ another NHLBI-funded study found that convalescent plasma was not helpful for non-hospitalized patients.⁸

To address high rates of COVID-19 hospitalization and death in underserved and racial-ethnic minority communities, the NIH Director asked the NHLBI to partner with the National Institute

⁵ pubmed.ncbi.nlm.nih.gov/33619977/

⁶ pubmed.ncbi.nlm.nih.gov/33591345/

⁷ covid19treatmentguidelines.nih.gov/therapies/antiviral-therapy/chloroquine-or-hydroxychloroquine-and-or-azithromycin/

⁸ https://pubmed.ncbi.nlm.nih.gov/34407339/

on Minority Health and Health Disparities (NIMHD) to mobilize and expand existing community-based research partnerships though the NIH **Community Engagement Alliance** (CEAL) Against COVID-19 Disparities initiative. CEAL research teams, now active in more than 21 states, have worked with local leaders and health officials to ensure research inclusion and address vaccine hesitancy in Black, Latino, Native American, Asian American, and Pacific Islander communities—which have been historically excluded from, and wary of, medical research. Importantly, the NHLBI anticipates that beyond the pandemic, CEAL will provide a robust platform for research to reduce other pervasive health disparities and achieve health equity.

Thanks to a \$1.15 billion Congressional appropriation to NIH in December 2020 and NHLBI's lead role in understanding how COVID-19 damages the body's organs and tissues, the NHLBI was asked to lead an initiative to understand—and ultimately treat and prevent—its potential long-term effects, often called Long COVID. At the heart of this initiative, called **Researching COVID to Enhance Recovery (RECOVER)**, is a cohort expected to enroll tens of thousands of diverse individuals, including adults and children, from established NIH cohort studies and Long COVID clinics. (See the "Cross-Cutting Initiatives" section of the NIH FY 2023 Congressional Justification for more information.)

Training and Sustaining the Next Generation of Diverse Biomedical Researchers

As part of its commitment to improve health for *all* Americans, the NHLBI works to ensure that the pool of biomedical researchers reflects the Nation's talent and diversity. The Institute has an array of programs—including individual fellowships and institutional training programs—designed to support the mentorship and development of emerging investigators from underrepresented backgrounds. The NHLBI also invests about \$15 million annually in diversity supplement grants, which provide additional support for funded investigators to train and mentor underrepresented individuals at nearly any scientific career stage, from high school student to faculty. Recently, the NHLBI began offering diversity supplements to small business innovation research (SBIR) grantees who diversify their research teams.

To establish a pathway for diverse students to gain hands-on research experience, the NHLBI has leveraged research programs focused on diverse communities. For example, the **Strong Heart Study** (SHS)—a partnership with American Indian tribes in Arizona, Oklahoma, and the Dakotas—provides pathways for Native students to excel in biomedical research; indeed, an SHS co-principal investigator first joined the team as a student in an institutional training program. In Arizona, the NHLBI also supports the new **Data Warriors Fellowship**, a partnership between academic investigators and Intertribal Council of Arizona to train Native students in data science, indigenous data governance, and health disparities research.

Throughout the pandemic, NHLBI's support for heart, blood, lung, and sleep research has remained robust. Indeed, the Institute's investments during the pandemic—for example, the assembly of large networks to coordinate adaptive clinical trials and community-based research—are likely to pay dividends for many years into the future, as the Institute works to reduce the burden of heart, lung, blood, and sleep disorders for all Americans.









ABOUT THE NHLBI

- The NHLBI is the nation's leader in supporting research and training on the prevention and treatment of heart, lung, blood, and sleep disorders.
- We were established in 1948 to address rising rates of cardiovascular disease which includes heart disease and stroke and has been the nation's leading cause of death for 100 years.
- Our mission has expanded to lead NIH research efforts in lung diseases, including asthma and chronic obstructive pulmonary disease (COPD).
- We lead research on blood transfusion and blood diseases, such as sickle cell disease.
- In 1993, we became the home for the National Center on Sleep Disorders Research (NCSDR), which coordinates NIH programs related to sleep biology and disorders.
- NHLBI's research advances scientific knowledge, improves public health, and saves lives.



Current Major Initiatives

 The NHLBI Trans-Omics for Precision Medicine (TOPMed) program aims to harness data science to develop personalized therapies for people with heart, lung, blood, and sleep disorders. TOPMed has assembled one of the world's largest, most diverse collections of genomic, clinical, and environmental data, derived from participants in NIH-funded studies. The NHLBI BioData Catalyst, a secure cloudbased research ecosystem, hosts TOPMed and other large datasets and offers data analysis tools to support researchers.

• The NHLBI supports research to reduce maternal morbidity and mortality, especially among African American and American Indian/ Alaska Native women, who are at higher risk than white women. NHLBI's approach takes into account women's health across their lifespan before, during, and after their reproductive years.



Gary H. Gibbons, M.D., is director of the National Heart, Lung, and Blood Institute (NHLBI). He received his M.D. from Harvard Medical School and has served on the faculty at Harvard, Stanford University, and Morehouse School of Medicine in Atlanta. He received a 2021 Service to America Award.

Facts and Figures

Full-Time Staff**	863
RPG Awards**	916
Principal Investigators**	1,259
ESI Success Rates***	32.4%
K Award Success Rates***	37.7%

- Because COVID-19 affects heart, lung, and blood health, the NHLBI is leading clinical trials to identify life-saving treatments for people who get sick, as well as community engagement efforts to ensure that the hardest-hit communities are included in research and benefit from its findings.
- The NHLBI Catalyze Program helps researchers turn basic scientific discoveries into therapeutics, devices, and diagnostics ready for human testing.

Full-time staff, awards, and extramural principal investigators are FY 2021 data. * These success rates were averaged over 3 years (FY 2019-2021) and calculated as (# awards/# of percentiled applications x 100). For more about percentiles, see https://grants.nih.gov/grants/peer-review.htm#Summary.







Photos from the Jackson Heart, RURAL, and Strong Heart Studies.

Accomplishments in...

Heart Health

- For more than 70 years, the **Framingham Heart Study** (FHS) has uncovered risk factors and preventionstrategies for heart disease, and it is now examining links between heart and brain health.
- The SPRINT trial found that intensive blood pressure treatment can reduce the risk of death from cardiovascular disease among people over age 50. These findings helped change the 2017 national **hypertension guidelines**.
- Out-of-hospital cardiac arrest is often deadly. The ARREST trial showed that patients who received an advanced type of mechanical life support, extra corporeal membrane oxygenation (ECMO), early had improved survival rates (43%) compared with standard care (7%).
- The **Bench to Bassinet Program** supports research that has helped many children with congenital heart disease (CHD) thrive. It has amassed genomic data on 10,000+ patients and is being leveraged to conduct a 5-year study on **multisystem inflammatory syndrome in children** (**MIS-C**), a rare condition affecting some children with COVID-19, as part of the NIH CARING for Children with COVID effort.

Lung and Sleep Health

- Based on findings that unique types of asthma require unique therapies, the Precision Interventions for Severe and/or Exacerbation-Prone Asthma (PrecISE) Network is developing precision medicine approaches for severe asthma.
- In collaboration with federal and nonfederal partners, the NHLBI developed the **COPD National Action Plan**, which is guiding efforts to reduce the burden of COPD, especially in rural and underserved communities.
- Climate change and related environmental factors, such as pollution and wildfires, pose substantial threats to human health — for example, by increasing the risk and severity of asthma. The NHLBI is working with others

at NIH to support research on the **health impacts of** climate change.

• A newly released NIH **Sleep Research Plan** serves As a blueprint for sleep and circadian scientific priorities and collaborative research across federal agencies and external partners.

Blood Health

- The **Cure Sickle Cell Initiative** is working to bring new gene-based therapies into clinical trials, and a collaboration with the Bill & Melinda Gates Foundation will help bring these cures to lowresource settings.
- The Recipient Epidemiology and Donor Evaluation Study (REDS), first launched 30+ years ago to help keep the blood supply safe from HIV, is now expanding the reachof antibody tests for COVID-19.
- For people with **hemophilia**, a rare genetic disorder that can cause severe bleeding, NHLBI-funded research helped develop factor replacement therapy the infusion of clotting proteins into the blood.

Health Disparities

- Modeled after FHS, the Jackson Heart Study (JHS) and Strong Heart Study are shedding light on heart disease riskin African Americans and American Indians, respectively. JHS has a new director as of September 2021.
- The newly established **Risk Underlying Rural Areas Longitudinal (RURAL) Cohort Study** seeks to understand the high rate of chronic heart and lung diseases in rural communities in the Southeastern U.S.
- The Disparities Elimination through Coordinated Interventions to Prevent and Control Heart and Lung Disease Risk (DECIPHeR) program is studying how to move evidence-based interventions into communities where the burden of chronic disease is high.

NHLBI'S COVID-19 RESPONSE

also co-leads the following:

Because COVID-19 impacts heart, lung, and blood health, the NHLBI has taken an all-hands-on-deck approach to address the pandemic. The NHLBI established the **Collaborating Network of Networks for Evaluating COVID-19 and Therapeutic Strategies (CONNECTS)** to test therapies that may slow or stop COVID-19 progression. CONNECTS has played a major role in identifying both effective and ineffective treatments through the NIH **Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) trials**. ACTIV-3 trials showed that monoclonal antibodies did not help hospitalized patients. ACTIV-4 trials found that blood thinners helped moderately ill patients but not those who were critically ill. The Institute

- The NIH Community Engagement Alliance (CEAL) Against COVID-19 Disparities network connects researchers with trusted community leaders across the country to reach people hardest hit by the pandemic, ensure research inclusion, and improve vaccine uptake and access.
- The NIH Researching COVID to Enhance Recovery (RECOVER) Initiative will follow tens of thousands of adults and children to help us understand Long COVID and other persistent complications that can follow SARS-CoV-2 infection.

Major Changes in the Fiscal Year 2023 President's Budget Request

Major changes by budget mechanism and/or budget activity detail are briefly described below. Note that there may be overlap between budget mechanisms and activity detail; and these highlights may not sum to the total change for the FY 2023 budget request for the NHLBI, which is \$3,823.0 million, an increase of \$158.2 million from the FY 2022 Continuing Resolution (CR) annualized level. In FY 2023, the overall increase of 4.3 percent is distributed across multiple programmatic areas including basic, translational, and clinical research. NHLBI is committed to the continuous support for key strategic priorities along with other scientific areas of the Institute's research portfolio. Within the framework of the administration's fiscal policy goals for the Federal Government, NHLBI will pursue its highest research priorities through strategic investments and careful stewardship of the appropriated funds.

Research Project Grants (RPGs) (\$125.6 million; total \$2,674.9 million):

NHLBI will increase funding for RPGs by 4.9 percent in FY 2023, which will fund 1,017 competing RPGs and 2,881 noncompeting RPG awards, and 182 awards to small businesses to stimulate research technology in key strategic areas.

Other Research (\$6.2 million; total \$222.4 million):

NHLBI will increase funding for Other Research by 2.9 percent, which is a \$6.2 million compared to the FY 2022 CR level. The increase will support major initiatives and are distributed across all programmatic areas and basic, translational or clinical research.

<u>Research and Development (R&D) Contracts (\$5.7 million; total \$377.5 million):</u> NHLBI will increase funding for Research and Development Contracts by 1.5 percent, which is a \$5.7 million increase compared to the FY 2022 CR Level of \$371.8 million. These increases are distributed across all programmatic areas and basic, translational or clinical research to continue stimulating research and development focused on strategic priorities and programmatic goals.

Intramural Research (IR) (\$12.6 million; total \$253.8 million):

NHLBI will increase funding for Intramural Research by 5.2 percent, which is a \$12.6 million increase compared to the FY 2022 CR Level of \$241.2 million. These increases are distributed across scientific and clinical research that leads to better understanding of biology and clinical pathology.

Research Management and Support (RMS) (\$6.5 million; total \$156.2 million):

NHLBI will increase funding for Intramural Research by 4.3 percent, which is a \$6.5 million increase compared to the FY 2022 CR level of \$149.7 million. These increases are distributed across all programmatic areas of RMS.

Budget Mechanism Table

NATIONAL INSTITUTES OF HEALTH

National Heart, Lung, and Blood Institute

Budget Mechanism * (Dollars in Thousands)

	EV 2021 E		EV 2022 CD		FY 2023 President's		EX 2022 + / EX 2022	
Mechanism	FY	2021 Final	F	4 2022 CR	Budget		FY 2023 +/- FY 2022	
	Number	Amount	Number	Amount	Number	Amount	Number	Amount
Research Projects:								
Noncompeting	2,860	\$1,847,817	2,863	\$1,846,193	2,881	\$1,921,535	18	\$75,342
Administrative Supplements	(136)	\$14,142	(79)	\$8,022	(0)	\$8,780	-79	\$758
Competing:								
Renewal	136	\$99,366	140	\$102,220	152	\$111,641	12	\$9,422
New	780	\$466,160	801	\$478,859	865	\$516,512	64	\$37,653
Supplements	0	\$0	0	\$0	0	\$0	0	\$0
Subtotal Competing	916	\$565,526	941	\$581,079	1,017	\$628,153	76	\$47,074
Subtotal, RPGs	3,776	\$2,427,485	3,804	\$2,435,293	3,898	\$2,558,468	94	\$123,174
SBIR/STTR	183	\$116,087	179	\$114,071	182	\$116,449	3	\$2,378
Research Project Grants	3,959	\$2,543,571	3,983	\$2,549,365	4,080	\$2,674,917	97	\$125,552
Research Centers								
Specialized/Comprehensive	6	\$16,329	6	\$13,796	6	\$13,136	0	-\$661
Clinical Research	0	\$0	0	\$0	0	\$0	0	\$0
Biotechnology	1	\$642	0	\$0	0	\$0	0	\$0
Comparative Medicine	0	\$455	0	\$455	0	\$445	0	-\$10
Research Centers in Minority Institutions	0	\$0	0	\$0	0	\$0	0	\$0
					-	¢12 501	, , , , , , , , , , , , , , , , , , ,	
Research Centers	7	\$17,426	6	\$14,251	6	\$13,581	0	-\$671
Other Research:	-	*125 054		*125 200	502	*125 55		\$2.452
Research Careers	/96	\$137,856	/84	\$135,308	/93	\$137,759	9	\$2,452
Cancer Education	0	\$0	0	\$0	0	\$0	0	\$0
Cooperative Clinical Research	39	\$10,718	39	\$10,268	35	\$9,283	-4	-\$984
Biomedical Research Support	0	\$0	0	\$0	0	\$0	0	\$0
Minority Biomedical Research Support	0	\$573	0	\$554	0	\$650	0	\$96
Other	142	\$78,458	126	\$70,080	129	\$74,680	3	\$4,600
Other Research	977	\$227,605	949	\$216,209	957	\$222,373	8	\$6,164
Total Research Grants	4,943	\$2,788,602	4,938	\$2,779,826	5,043	\$2,910,870	105	\$131,045
Ruth L Kirschstein Training Awards:	FTTPs		FTTPs		FTTPs		FTTPs	
Individual Awards	522	\$25,117	515	\$26,547	509	\$27,051	-6	\$504
Institutional Awards	1,426	\$91,647	1,406	\$95,687	1,413	\$97,505	7	\$1,818
Total Research Training	1,948	\$116,764	1,921	\$122,234	1,922	\$124,556	1	\$2,322
		, í	,		,	, , , , , , , , , , , , , , , , , , ,		<i>.</i>
Research & Develop. Contracts	597	\$373,240	581	\$371,785	572	\$377,505	-9	\$5,720
SBIR/STTR (non-add)	(4)	(\$2,679)	(6)	(\$4,234)	(5)	(\$6,000)	-(1)	(\$1,766)
Intramural Research	504	\$231,231	556	\$241,231	556	\$253,782	0	\$12,551
Res. Management & Support	359	\$143,863	410	\$149,736	410	\$156,247	0	\$6,511
SBIR Admin. (non-add)	(0)	(\$234)	(0)	(\$1,480)	(0)	(\$1,200)	(0)	-(\$280)
Construction		\$0		\$0		\$0		\$0
Buildings and Facilities		\$0		\$0		\$0		\$0
Total, NHLBI	863	\$3,653,700	966	\$3,664,811	966	\$3,822,961	0	\$158,150

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

Appropriations Language

NATIONAL HEART, LUNG, AND BLOOD INSTITUTE

For carrying out section 301 and title IV of the PHS Act with respect to cardiovascular, lung, and blood diseases, and blood and blood products, \$3,822,961,000.

Summary of Changes

NATIONAL INSTITUTES OF HEALTH National Heart, Lung, and Blood Institute

Summary of Changes (Dollars in Thousands)

FY 2022 CR	\$3,664,811
FY 2023 President's Budget	\$3,822,961
Net change	\$158,150

	FY 2022		FY 202 F	Budget		Change from 2022 CR
CHANGES	FTEs	Budget Authority	FTEs	Budget Authority	FTEs	Budge Authority
<u>A. Built-in:</u>						
1. Inframural Research:						
a. Annualization of January 2022 pay increase & benefits		\$98,341		\$107,819		\$652
b. January FY 2023 pay increase & benefits		\$98,341		\$107,819		\$3,330
c. Paid days adjustment		\$98,341		\$107,819		-\$374
 Differences attributable to change in FTE 		\$98,341		\$107,819		\$0
e. Payment for centrally furnished services		\$37,564		\$38,315		\$751
f. Cost of laboratory supplies, materials, other expenses, and		\$105,326		\$107,647		\$2,322
Subtotal						\$6.681
2. Research Management and Support:						
a. Annualization of January 2022 pay increase & benefits		\$75,090		\$79,981		\$497
b. January FY 2023 pay increase & benefits		\$75,090		\$79,981		\$2,539
c. Paid days adjustment		\$75,090		\$79,981		-\$285
d. Differences attributable to change in FTE		\$75,090		\$79,981		\$0
e. Payment for centrally furnished services		\$2,050		\$2,091		\$41
f. Cost of laboratory supplies, materials, other expenses, and		\$72,595		\$74,175		\$1,579
non-recurring costs						\$4 373
Subtotal						\$ 4 ,372
Subtotal, Built-in						\$11,053
	FY	2022 CR	FY 202 F	3 President's Budget	Program FY 2	Change from 2022 CR
CHANGES	No.	Amount	No.	Amount	No.	Amoun
B. Program:						
1. Research Project Grants:						
a. Noncompeting	2,863	\$1,854,215	2,881	\$1,930,315	18	\$76,100
b. Competing	941	\$581,079	1,017	\$628,153	76	\$47,074
Subtotal RPGs	3 983	\$2 549 365	4 080	\$2 674 917	97	\$125.552
	5,505	\$2,5 19,500	.,000	\$2,07 1,717	27	0120,002
2. Research Centers	6	\$14,251	6	\$13,581	0	-\$671
3. Other Research	949	\$216,209	957	\$222,373	8	\$6,164
4. Research Training	1,921	\$122,234	1,922	\$124,556	1	\$2,322
5 Passarah and davalarment contracts	581	\$271 785	572	\$277 505	0	\$5 77(
Subtotal. Extramural	561	\$3,273,844	512	\$3,412,932	-9	\$139.088
, 		,		, ,		,
6. Intramural Research	556	\$241,231	556	\$253,782	0	\$5,870
7. Research Management and Support	410	\$149,736	410	\$156,247	0	\$2,139
8 Construction	1 1			\$0		\$(
8. Construction		\$0		50		
9. Buildings and Facilities		\$0 \$0		\$0 \$0		\$0
Onstruction Subtotal, Program	966	\$0 \$0 \$3,664,811	966	\$0 \$3,822,961	0	\$0 \$147,097

Budget Graphs

History of Budget Authority and FTEs:



Distribution by Mechanism:







NATIONAL INSTITUTES OF HEALTH NATIONAL HEART, LUNG, AND BLOOD INSTITUTE



Budget Authority by Activity Table

NATIONAL INSTITUTES OF HEALTH National Heart, Lung, and Blood Institute

Budget Authority by Activity *	
(Dollars in Thousands)	

	FY 20	21 Final	FY 2	022 CR	FY 2023 Bu	President's Idget	FY 2022 2022	3 +/- FY 2 CR
Extramural Research	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	Amount
Detail Center for Translation, Implementation		\$57,036		\$56,953		\$100,642		\$43,689
Sciences Heart and Vascular Diseases		\$1,953,714		\$1,950,877		\$2,008,731		\$57,854
Blood Diseases and Resources		\$774,489 \$493,367 \$3 278 606		\$773,304 \$492,650 \$3 273 844		\$796,299 \$507,260		\$22,935 \$14,610
Intramural Research	504	\$231,231	556	\$241,231	556	\$253,782	0	\$139,088
Research Management & Support	359	\$143,863	410	\$149,736	410	\$156,247	0	\$6,511
TOTAL	863	\$3,653,700	966	\$3,664,811	966	\$3,822,961	0	\$158,150

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

Justification of Budget Request

National Heart, Lung, and Blood Institute

Authorizing Legislation: Section 301 and Title IV of the Public Health Service Act, as amended. Budget Authority (BA) :

			FY 2023	
			President's	FY 2023 +/-
	FY 2021 Final	FY 2022 CR	Budget	FY 2022
BA	\$3,653,700,000	\$3,664,811,000	\$3,822,961,000	\$158,150,000
FTE	863	966	966	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 is \$3,823.0 million, an increase of \$158.2 million or 4.3 percent compared with the FY 2022 CR level. Included in this amount is an increase of \$30.0 million for the CEAL initiative, which will provide continued support to connect researchers to trusted leaders and organizations in communities hardest hit by COVID-19, helping them work together to ensure that the treatments and vaccines developed will work for everyone. In addition, the request includes an increase of \$50.0 million for health disparities research to support strategic initiatives, in chronic heart disease, pulmonary lung fibrosis, blood diseases and disorders, and community engagement to promote strategies to enhance education, awareness, access and inclusion of underserved communities in research in FY 2023. Increases are distributed across all programmatic, basic, epidemiologic, translation, and clinical research areas.

Program Descriptions and Accomplishments

Heart and Vascular Diseases: The cardiovascular disease (CVD) program supports research to advance understanding of and interventions for promoting heart and vascular health across the lifespan. It supports research aimed at preventing and treating pediatric and adult cardiovascular diseases, including heart attack and heart failure, stroke, complications of diabetes and obesity, high blood pressure, congenital heart disease, and other heart and vascular diseases.

NHLBI's CVD program continues to invest heavily in research to prevent and treat **heart failure (HF)**, a major cause of mortality, morbidity, and poor quality of life. HF develops when the heart cannot pump enough blood to meet the body's needs. In about half of patients who have HF, the heart pumps well, but does not fill sufficiently with blood. There are few effective medications for this complex condition, called HF with preserved ejection fraction (HFpEF). This need, coupled with new opportunities in data science, led the NHLBI to launch **HeartShare**, an effort to define mechanisms of HFpEF by analyzing clinical, laboratory, and

NHLBI-16

imaging data from 1,500 patients. Data from this new cohort will be integrated with existing NIH patient data and images housed within TOPMed and BioData Catalyst (See Program Portrait). These large datasets could help investigators discover new targets for therapy, and the NHLBI anticipates speeding this discovery through the Accelerated Medicines **Partnership** (AMP), a collaboration of NIH, FDA, and industry. In a related effort to address HF, the NHLBI recently completed its Big Data Analysis Challenge. This program sought new models and artificial intelligence (AI) tools to define different subtypes of heart failure, and some of the winning solutions are being folded into HeartShare's analyses.⁹ HeartShare thus brings together innovative data science, AI, and precision medicine approaches to meet the challenges of treating heart failure.

The NHLBI is also making progress in helping patients who suffer from HF and atrial fibrillation (AFib), the most common cardiac arrhythmia. **NHLBI's Catheter Ablation Versus Antiarrhythmic Drug Therapy for AF (CABANA)** is the largest clinical trial to date comparing ablation (a procedure to destroy arrhythmic cardiac tissue) versus drug therapy for patients with HF and AFib. The study found that ablation improved survival, freedom from AFib recurrence, and quality of life compared to drug therapy.¹⁰

The NHLBI is also working to improve survival after **out-of-hospital cardiac arrest**, which has a 90 percent fatality rate. The phase 2 ARREST trial examined the potential to treat such patients with extracorporeal membrane oxygenation (ECMO), which uses a machine

TOPMed: Powering Precision Medicine for All with Diverse Genomic Data

The NHLBI developed the Trans-Omics for Precision Medicine (TOPMed) program to advance precision medicine by exploring genomic and other factors underlying complex diseases. TOPMed has banked over 180.000 whole genome sequences from ethnically diverse participants from more than 85 longterm cohort studies of heart, lung, blood, and sleep-related disorders. TOPMed is integrating these genomic data with other molecular data, as well as behavioral, environmental, and clinical measures that have been collected over decades. These types of connections will enable researchers to unravel complex risk factors for disease and develop more targeted and personalized therapies. For example, TOPMed data were recently used to identify genetic and non-genetic factors affecting how airway cells respond to SARS-CoV-2 (the virus that causes COVID-19) infection,¹ and to compare airway responses to SARS-CoV-2 with other coronaviruses, generating data that may help explain the unusual severity of COVID-19 relative to other coronavirus diseases. Nearly 3.5 petabytes (i.e., 3.5 million gigabytes) of data from TOPMed and other programs are made available to researchers through NHLBI's BioData Catalyst, a cloudbased platform that provides tools and a secure workspace for analyzing large datasets. Importantly, the TOPMed dataset represents one of the most diverse genomic reference panels available, with nearly 60 percent of samples coming from individuals of non-European ancestry. This diversity, combined with the high-quality and deeply integrated clinical and molecular data, make TOPMed a valuable resource to advance precision medicine approaches for heart, lung, blood, and sleep disorders. pubmed.ncbi.nlm.nih.gov/33883027/

outside the body to oxygenate and pump blood. When provided to patients as soon as they arrived at the hospital, ECMO improved survival and neurologic function at six months compared to standard-of-care.¹¹

⁹ https://www.nhlbi.nih.gov/grants-and-training/funding-opportunities-and-contacts/NHLBI-heart-failure-data-challenge

¹⁰ pubmed.ncbi.nlm.nih.gov/33554614/

¹¹ pubmed.ncbi.nlm.nih.gov/33197396/

The Institute is also **investing in AI technology** to improve CVD screening and treatment. Familiar tests, such as cholesterol and blood pressure measurements, help predict a patient's risk of future heart problems, but a newer test called coronary artery calcium (CAC) imaging is even more accurate; it uses a specialized CT scan to measure calcium build-up in the heart's arteries. CAC imaging requires specialized skills and equipment, but NHLBI-funded researchers have developed an AI system that can measure CAC in routine CT chest scans **to predict CVD outcomes** years later.¹² This information can help patients and physicians make treatment decisions earlier. AI is also being used to improve early diagnosis of **congenital heart disease** (CHD), the most common birth defect. While ultrasound can detect CHD, this requires an expert eye; in clinical practice, prenatal ultrasound fails to identify CHD in 60-70 percent of cases. Using about 1,300 prenatal echocardiograms and ultrasounds, researchers were able to train AI systems to detect CHD with a sensitivity of 90-95 percent, about the same as expert clinicians.¹³

NHLBI's **Pediatric Heart Network** (PHN) has been at the forefront of pediatric cardiology research for two decades. With nine clinical hubs and affiliated sites across the country, the PHN continues to support new studies, invest heavily in training, and work with collaborators and families to improve outcomes and quality of life for children and adults with CHD. After a recent clinical trial that compared and ultimately validated the use of two medications for **Marfan syndrome**—a rare genetic connective tissue disorder that can affect the heart—researchers conducted a follow-up study to determine what contributed to the trial's high retention and adherence rates. In addition to partnering with a large patient-focused organization (Marfan Foundation), strategies at the most successful PHN hubs included asking for family feedback on trial procedures and using a smartphone app to remind participants to take their medications.¹⁴ The PHN recently began an observational study of **Multisystem inflammatory syndrome in children (MIS-C)**, a rare but potentially serious complication of SARS-CoV-2 infection in young people. The study has enrolled more than 800 children who will be followed for 5 years to gain insights into MIS-C, its risk factors, and potential interventions.¹⁵

The NHLBI is also leading efforts to reduce **CVD health disparities**, and to improve the **heart health of women.** For example, the NHLBI recently launched the **RURAL** cohort study to better understand the high burden of heart and lung disease among the 60 million Americans who live in rural areas. In addition, the new **ENRICH** program is investigating whether incorporating heart-healthy lifestyle interventions into federally sponsored home visiting programs can reduce CVD and its risk factors in mothers and their children (0-5 years old) living with low income, in low-resource rural or urban communities, or in U.S. regions with a high burden of CVD. The NHLBI also recognizes the need to advance science and health equity for the Nation's diverse **Asian American, Native Hawaiian, and Pacific Islander populations** (AANHPI).¹⁶ Thus, the Institute plans to lead a collaborative effort with other NIH Institutes, Centers, and Offices to support a large multi-center cohort study of AANHPI individuals to help inform prevention and treatment of high-burden diseases in these populations. The CVD

¹² pubmed.ncbi.nlm.nih.gov/33514711/

¹³ pubmed.ncbi.nlm.nih.gov/33990806/

¹⁴ pubmed.ncbi.nlm.nih.gov/32820647/

¹⁵ covidmusicstudy.com/study-results/

¹⁶ nhlbi.nih.gov/events/2021/identifying-research-opportunities-asian-american-native-hawaiian-and-pacific-islander

program also continues to invest in established cohort studies, such as the **Jackson Heart Study** (JHS), the nation's largest and longest-running study of cardiovascular health in African Americans. In 2021, after a rigorous search, the Institute announced a new JHS director who will bring to the study significant experience in community-engaged research; she is also the first female director in the study's 23-year history.¹⁷

Additionally, the NHLBI is leading efforts to reduce the disparate impact of **COVID-19 on racial/ethnic minority groups**. The **Collaborative Cohort of Cohorts for COVID-19 Research (C4R)** study includes over 50,000 adults recruited from 14 existing NHLBI cohort studies—including the Jackson Heart Study, the Strong Heart Study of American Indians, and Hispanic Community Health Study/Study of Latinos. C4R will explore the risk factors that influence the severity and long-term health impacts of COVID-19.

Budget Policy:

The FY 2023 President's Budget request for NHLBI heart and vascular disease research is \$2,008.7 million, an increase of \$57.9 million or 3 percent compared with the FY 2022 CR level.

Lung Diseases: The lung diseases program supports research on the causes, diagnosis, prevention, and treatment of lung diseases and sleep disorders, while also training the next generation of pulmonary researchers. Some areas covered include asthma, chronic obstructive pulmonary disease (COPD), cystic fibrosis, sleep-disordered breathing, acute lung injury, pediatric lung diseases, pulmonary fibrosis and other rare lung disorders, including lymphangioleiomyomatosis (LAM) and sarcoidosis.

NHLBI's lung program supports a robust portfolio from discovery science to clinical research, including the **Progenitor Cell Translational Consortium** (PCTC), which translates advances in progenitor cell biology into clinical applications. Progenitor cells are early descendants of stem cells and serve as valuable models to study disease mechanisms and potential therapies. Through the PCTC, investigators have used single cell RNA sequencing to build a detailed **atlas of cell types in the developing and adult lung** in mice. Recently, these investigators charted key steps in the development of the alveoli, the tiny air sacs required for gas exchange.¹⁸ Their findings shed light on potential pathways for repairing the lungs after injury or disease, which could lead to new therapeutics.

To address COPD, the NHLBI is implementing the national **COPD National Action Plan** developed with the Institute's partners in 2017. The Institute has established an online system to track the plan's progress, and continues to support research to better understand mechanisms of this complex disease and to develop effective interventions. Using **TOPMed** data, researchers recently performed a large-scale, multi-ethnic whole genome sequence analysis of patients with COPD, and found an association with 22 new genes, including 3 genes involved in metabolizing phosphorus,¹⁹ which is critical for cellular energy stores. Through its **Learn More Breathe Better** [®] program, the NHLBI also supports community organizations working to raise COPD awareness, including a new effort to reach rural healthcare providers in the **Appalachian region**.

¹⁷ https://www.nhlbi.nih.gov/news/2021/nhlbi-announces-new-director-jackson-heart-study

¹⁸ pubmed.ncbi.nlm.nih.gov/33707239/

¹⁹ pubmed.ncbi.nlm.nih.gov/33057025/

Finally, NHLBI's new **Air You Wear Challenge** aims to stimulate the development of lighter, more portable oxygen devices for the more than 1.5 million Americans who use supplemental oxygen for COPD and other conditions.

The NHLBI also continues to invest in precision medicine approaches to treat **asthma**, which affects 1 in 13 Americans, up to 10 percent of whom have severe asthma. To rapidly evaluate

multiple therapies for severe asthma, the NHLBI established the **PrecISE clinical trial network**, which is testing six therapies, including two immunotherapy drugs, that are tailored to each trial participant based on their unique biomarker profile. PrecISE is enrolling 650 teens and adults with severe asthma at 30 sites nationally.

Given that climate change and other environmental factors, such as air pollution and wildfires, increase the risk and severity of asthma and other lung diseases, the NHLBI supports a number of efforts to reduce the health impacts of climate change. For example, the AIRHEALTH study is investigating how acute and chronic exposures to air pollution lead to cardiopulmonary disease. The Lung Health Cohort, the RURAL study, and other NHLBI cohort studies include measures to investigate the impact of environmental health on personal health. The NHLBI also participates in the Human Health Exposure Analysis Resource (HHEAR) program, which provides services for researchers to add or expand exposure analysis in their studies.

A **lung transplant** can be effective for patients with end-stage lung disease. Although the survival rate for lung transplantation is lower than for other organs, the NHLBI has supported encouraging advances in the field over the past year. A phase I clinical trial of regadenoson, a drug typically used to prepare heart patients for

NHLBI Catalyze: Speeding Translation from Bench to Bedside

Translating discoveries from bench to bedside is critical if gains in research are to improve public health. However, navigating the complex path of pre-clinical development and testing is often a challenge for academic researchers, which can prevent potential therapeutics from reaching human trials. The NHLBI Catalyze program is designed to provide coordinated and comprehensive services to investigators working to develop therapeutic and diagnostic technologies across the spectrum of heart, lung, blood, and sleep disorders. The program uses milestonebased funding, as well as expert guidance, to help coordinate all stages of pre-clinical drug evaluation and testing. Catalyzesponsored projects are also encouraged to partner with business accelerators that have expertise in commercializing medical products. The program also emphasizes developing researchers' entrepreneurial skills, helping to further grow the pool of researchers capable of bringing new drugs and devices to market. Catalyze has supported 14 projects to date, including an effort to develop a novel small-molecule therapeutic for opioid-induced respiratory distress (OIRD), a frequent cause of opioid deaths. The investigators have received support from an industry partner and held a pre-clinical meeting with the FDA 1 year ahead of schedule.

an X-ray to measure blood flow, has shown promising results in preventing lung graft failure.²⁰ Another small study has shown that patients given a high dose of the diabetes drug sitagliptin, in addition to standard medications, had lower rates of graft-versus-host disease, where the graft launches an immune attack on the body.²¹ To build on this momentum, the Institute is

²⁰ pubmed.ncbi.nlm.nih.gov/32503727/

²¹ pubmed.ncbi.nlm.nih.gov/33406328/

assembling a multi-site Lung Transplant Consortium that will coordinate clinical research to improve lung transplant outcomes.

The **National Center of Sleep Disorders Research (NCSDR)**, housed within NHLBI, supports research on sleep and circadian biology, and coordinates sleep research across federal agencies. In 2020, the Institute named a new NCSDR director, who has been working with her colleagues across NIH and stakeholder communities to develop a new **NIH Sleep Research Plan**. An emerging focus of study is the role that **sleep plays at different life stages**, including infancy, and how early sleep patterns might impact later health outcomes. A recent study showed that the well-known association between lack of sleep and obesity seen in adults can begin in infancy; during the first six months of life, infants who slept less were more likely to be overweight.²² Such research highlights the need to better understand the linkages between obesity and sleep.

Budget Policy:

The FY 2023 President's Budget request for NHLBI lung disease research is \$796.3 million, an increase of \$22.9 million or 3 percent compared with the FY 2022 CR level.

Blood Diseases and Resources: The blood program is a leader in research on the causes, prevention, and treatment of non-cancerous blood diseases. The program also helps ensure the adequacy and safety of the nation's blood supply and supports scientific advances in stem cell biology and new gene and cell-based therapies to repair and regenerate human tissues and organs.

The NHLBI has a legacy of supporting research that has improved health outcomes for people with **sickle cell disease** (SCD), an inherited blood disorder that can lead to chronic pain, organ failure, and premature death. New medications and other interventions have improved life expectancy and quality of life for the approximately 100,000 people with SCD in the U. S. Moreover, recent progress in **gene therapy** is allowing researchers to tackle SCD at its molecular roots—specifically, inherited mutations in the gene encoding adult hemoglobin (Hb), which is needed for red blood cells to transport oxygen. Approaches to replace, repair, or compensate for the adult Hb gene are being tested in clinical trials, and early results are promising. For example, a pilot trial found that gene therapy to reactivate a fetal form of Hb reduced the number of pain crises and need for transfusions among six patients with severe SCD followed for six months.²³ Because risks of gene therapy include immune reactions or cell abnormalities that could lead to cancer, the NHLBI has been working closely with researchers to enhance screening and monitoring of trial participants to reduce those risks.

The Institute is also supporting more immediate efforts to relieve suffering for people with SCD. For example, the **SCD Implementation Consortium** is investigating strategies to bring proven treatments for SCD into broader practice. The NHLBI is also leveraging the NIH **Helping to End Addiction Long-termSM (HEAL)** initiative to systematically determine the most effective approaches to improve **SCD pain management**. Many of these SCD-focused domestic efforts and findings are also being shared with resource-limited parts of the world, such as sub-Saharan

²² pubmed.ncbi.nlm.nih.gov/34676870/

²³ pubmed.ncbi.nlm.nih.gov/33283990/

Africa, which has the highest SCD burden worldwide. NHLBI's **Sickle Pan-African Research Consortium** has shown that widespread newborn screening for SCD is feasible in sub-Saharan countries, and has identified opportunities and barriers for achieving sustainability.²⁴ These efforts hold lessons for improving newborn screening programs in the U.S.; while all states mandate screening for SCD, some have reported gaps in follow-up counseling and care.

During the COVID-19 pandemic, the high need for blood transfusions to treat critically ill patients, combined with intermittent lockdowns, emphasized the importance of maintaining a robust national blood supply. The NHLBI supports a large research portfolio in **transfusion medicine**, including the **Recipient Epidemiology and Donor Evaluation Study (REDS)**, a multicenter program that aims to strengthen the blood supply and improve transfusions. Given that blood donors are diverse in blood type and other characteristics that can affect transfusion therapies, it is important that the national blood supply is balanced and well maintained. A new genome-wide study looking at donated blood samples identified 27 genetic variables that could influence the shelf-life of stored blood.²⁵ Further research on these variables could advance donor screening and storage policies and improve transfusion outcomes. The portfolio also includes clinical trials to improve transfusion, such as the **American Trial Using Tranexamic Acid in Thrombocytopenia (**A-TREAT). This trial will examine whether a pro-clotting drug can reduce bleeding in patients with low platelets (the cells that form blood clots) due to chemotherapy or bone marrow transplantation.

Budget Policy:

The FY 2023 President's Budget request for this research program is \$507.3 million, an increase of \$14.6 million or 3 percent compared with the FY 2022 CR level.

Center for Translation Research and Implementation Sciences (CTRIS): This program was established in 2014 to help plan, foster, and support research to ensure the successful integration of evidence-based interventions within clinical and public health settings, such as health centers, worksites, communities, and schools.

The COVID-19 pandemic provided a stark reminder of how **social determinants of health** can contribute to **health disparities**; for example, demographic groups that tend to have large numbers of essential workers, higher density housing, and lower access to healthcare saw the worst infection rates and outcomes. To reach those Americans hardest hit by the pandemic, the NHLBI worked with the NIMHD to establish the NIH **Community Engagement Alliance (CEAL) Against COVID-19 Disparities**. CEAL connects researchers with community-based organizations and trusted leaders to help communities fight COVID-19—by participating in research and by supporting vaccination and other preventive health measures. CEAL research teams have developed a variety of innovative approaches to community engagement. For example, teams in Michigan and North Carolina held contests that invited community members to develop poems, songs, graphics, and videos encouraging their neighbors to mask up and get vaccinated. The CEAL network, now active in 21 U.S. regions, provides a model and lessons learned to address other long-standing health disparities.

²⁴ pubmed.ncbi.nlm.nih.gov/33652550/

²⁵ pubmed.ncbi.nlm.nih.gov/34014839/

NHLBI's **DECIPHER** program addresses health disparities through implementation science. In 2020, the program began funding several projects to test new ways of delivering proven interventions for heart and lung disease to high-risk communities. One project has researchers working with 24 community mental health program sites in Michigan and Maryland to test evidence-based CVD interventions in **people with serious mental illness** (SMI). People with SMI comprise five percent of the U.S. population and as a group, they experience a mortality rate two times higher with death 10-20 years earlier than the national average. Other DECIPHER projects are working with communities to improve hypertension control, increase use of smoking cessation programs, and reduce asthma attacks in children.

The NHLBI also supports programs to train early-career researchers in community engagement and implementation science, while delivering real benefits to patients. For example, the **Hope for SCD Challenge** called for college teams to work together to come up with innovative solutions—such as digital tools, video games, and mobile devices—to help people with SCD live longer, healthier lives. One of the winning concepts, a trivia game about SCD, is now being tested to see how well it improves knowledge among patients, caregivers, and healthcare providers.²⁶

Budget Policy:

The FY 2023 President's Budget request for CTRIS is \$100.6 million, an increase of \$43.7 million or 76.7 percent compared with the FY 2022 CR level.

Intramural Research: The NHLBI Division of Intramural Research (DIR), located at the NIH campus in Bethesda, Maryland, performs robust scientific and clinical research leading to a better understanding of biology and pathology of heart, lung, and blood systems. The research portfolio is broad, encompassing the basic principles of molecular, cellular, and organ-level biology and their relationship to disease, and goes all the way to conducting clinical trials and training.

DIR investigators are playing a significant role in federal research efforts to **address COVID-19**. One DIR group has designed a peptide (protein fragment) that can bind to and inactivate triglycerides (fat molecules in blood) to treat heart disease and other conditions. The group is now applying their expertise to design a peptide capable of inactivating SARS-CoV-2. Another group uses biophysics to study enzymes that control or modify DNA, and has also expanded its efforts to support a pandemic-related project. The team is studying how such enzymes regulate the complex replication process of SARS-CoV-2 to help improve antiviral therapies.²⁷ Another group is leveraging their expertise on biomarkers of tissue injury to support research that could lead to early predictive markers of COVID-19 outcomes.

DIR investigators also continue to lead innovative research in the treatment and prevention of heart, lung, blood and sleep disorders. For example, researchers working on **SCD** have found that damaged DNA fragments from mitochondria (the powerhouses within our cells) can trigger

²⁶ nhlbi.nih.gov/news/2021/innovating-sickle-cell-disease-education-models

²⁷ nihrecord.nih.gov/2021/08/06/neuman-lab-looks-examine-coronavirus-inhibitors

inflammation in patients with SCD, and could serve as a marker of disease progression.²⁸ Another group is continuing to improve bone marrow transplantation (BMT) for patients with SCD, while collaborating with academic institutions to assess the long-term health effects of BMT and other curative therapies on the heart, lung, and kidney—organs that when damaged are associated with early death in adults with SCD.

Finally, DIR has established a new branch to investigate how and why health and disease differ among diverse populations. The **Epidemiology and Community Health Branch** will investigate these questions using the NIH Clinical Center's resources for deep phenotyping— the analysis of detailed, molecular data related to a person's health. This new branch will complement and strengthen NHLBI's broader efforts to study and improve population health, especially in diverse populations.

Budget Policy:

The FY 2023 President's Budget request for NHLBI intramural research is \$253.8 million, an increase of \$12.6 million or 5.2 percent compared with the FY 2022 CR level.

Research Management and Support (RMS): RMS activities include administrative and technical functions that support and enhance the effectiveness of the Institute's research investments. This includes providing administrative, budgetary, logistical, and scientific support in the review, award, and monitoring of research grants and clinical trials, training awards, and research and development contracts. RMS functions also encompass strategic planning, trans-NHLBI and NIH coordination, evaluation of the Institute's programs, regulatory compliance, international coordination, interactions with other Federal agencies and Congress, and dissemination of research findings to the public.

Budget Policy:

The FY 2023 President's Budget request for RMS at NHLBI is \$156.2 million, an increase of \$6.5 million or 4.3 percent compared with the FY 2022 CR level.

²⁸ pubmed.ncbi.nlm.nih.gov/33661274/

Appropriations History

NATIONAL INSTITUTES OF HEALTH National Heart, Lung, and Blood Institute

Appropriations History

Fiscal Voor	Budget Estimate House		Senate	Annronriation	
	to Congress	Allowance	Allowance	Appropriation	
2014	\$3,098,508,000		\$3,077,916,000	\$2,988,605,000	
Rescission				\$0	
2015	\$2,987,685,000			\$2,997,870,000	
Rescission				\$0	
2016	¢2.071.000.000	¢2.025.072.000	¢2 125 510 000	¢2 115 529 000	
2016	\$3,071,900,000	\$3,033,062,000	\$3,133,319,000	\$3,115,538,000	
Rescission				\$0	
2017^{1}	\$3,113,533,000	\$3,190,474,000	\$3.242.685.000	\$3.206.589.000	
Rescission	\$5,115,555,000	\$3,130,171,000	\$5,212,000,000	\$0,200,200,000	
				ψυ	
2018	\$2,534,803,000	\$3,256,521,000	\$3,322,774,000	\$3,383,201,000	
Rescission	·)))	<i>•- , ,- ,- , ,</i>	<i>+-)-))</i>	\$0	
2019	\$3,112,032,000	\$3,423,604,000	\$3,490,171,000	\$3,488,335,000	
Rescission				\$0	
2020	\$3,002,696,000	\$3,658,822,000	\$3,694,771,000	\$3,624,258,000	
Rescission				\$0	
Supplemental				\$103,400,000	
2021	\$2 208 004 000	\$3 655 428 000	\$2 728 207 000	\$2 664 811 000	
2021 Decesion	\$5,298,004,000	\$5,055,428,000	\$5,728,507,000	\$5,004,811,000	
Rescission				D O	
2022	\$3,845.681.000	\$3,866.828.000	\$3,841.998.000	\$3,664.811.000	
Rescission				\$0	
				÷-	
2023	\$3,822,961,000				

¹ Budget Estimate to Congress includes mandatory financing.

Authorizing Legislation

NATIONAL INSTITUTES OF HEALTH National Heart, Lung, and Blood Institute

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	\$3,664,811,000	Indefinite	\$3,822,961,000
National Heart, Lung, and Blood Institute	Section 401(a)	42§281	Indefinite		Indefinite	
Total, Budget Authority				\$3,664,811,000		\$3,822,961,000

Amounts Available for Obligation

NATIONAL INSTITUTES OF HEALTH National Heart, Lung, and Blood Institute

Amounts Available for Obligation¹

(Dollars in Thousands)

			FY 2023
Source of Funding	FY 2021 Final	FY 2022 CR	President's
			Budget
Appropriation	\$3,664,811	\$3,664,811	\$3,822,961
Mandatory Appropriation: (non-add)			
Type 1 Diabetes	(\$0)	(\$0)	(\$0)
Other Mandatory financing	(\$0)	(\$0)	(\$0)
Secretary's Transfer	-\$11,003	\$0	\$0
Subtotal, adjusted appropriation	\$3,653,808	\$3,664,811	\$3,822,961
OAR HIV/AIDS Transfers	-\$108	\$0	\$0
Subtotal, adjusted budget authority	\$3,653,700	\$3,664,811	\$3,822,961
Unobligated balance, start of year	\$0	\$0	\$0
Unobligated balance, end of year (carryover)	\$0	\$0	\$0
Subtotal, adjusted budget authority	\$3,653,700	\$3,664,811	\$3,822,961
Unobligated balance lapsing	-\$131	\$0	\$0
Total obligations	\$3,653,569	\$3,664,811	\$3,822,961

¹ Excludes the following amounts (in thousands) for reimbursable activities carried out by this account: FY 2021 - \$20,206 FY 2022 - \$20,206 FY 2023 - \$20,206

Budget Authority by Object Class

NATIONAL INSTITUTES OF HEALTH National Heart, Lung, and Blood Institute

Budget Authority by Object Class¹ (Dollars in Thousands)

		FY 2022 CR	FY 2023 President's Budget	FY 2023 +/- FY 2022
Total co	mpensable workyears:			
	Full-time equivalent	966	966	0
	Full-time equivalent of overtime and holiday hours	1	1	0
	Average ES salary	\$201	\$208	\$8
	Average GM/GS grade	12.8	12.8	0.0
	Average GM/GS salary	\$128	\$133	\$5
	Average salary Commissioned Corps (42 U.S.C. 207)	\$120	\$125	\$4
	Average salary of ungraded positions	\$120	\$153	\$6
	OBJECT CLASSES	FY 2022 CR	FY 2023 President's Budget	FY 2023 +/- FY 2022
	Personnel Compensation			
11.1	Full-Time Permanent	\$70,888	\$77,323	\$6,435
11.3	Other Than Full-Time Permanent	\$40,073	\$43,778	\$3,705
11.5	Other Personnel Compensation	\$5 465	\$5 772	\$308
11.5	Military Personnel	\$1,862	\$1,996	\$133
11.7	Special Personnel Services Payments	\$1,002	\$1,978	\$874
11.0	Subtotal Personnel Compensation	\$129 392	\$140 846	\$11 454
12.1	Civilian Personnel Benefits	\$42,563	\$45 292	\$2 729
12.1	Military Personnel Benefits	\$1.477	\$1.663	\$186
12.2	Benefits to Former Personnel	\$1,477	\$1,005	\$180
15.0	Subtotal Pay Costs	\$0 \$173.431	\$0 \$187 800	\$0 \$14 369
21.0	Travel & Transportation of Persons	\$861	\$107,000	\$19
22.0	Transportation of Things	\$549	\$561	\$12
22.0	Rental Payments to GSA	ربون ۵۷	\$0	\$12
23.1	Rental Payments to Others	\$0 \$0	\$0	\$0 \$0
23.2	Communications Utilities & Miss. Changes	\$0 \$247	\$0	\$0 \$0
23.5	Drinting & Depreduction	\$347 \$2	ອວ ວ 4 ¢ວ	50
24.0	Computing & Reproduction	\$2 \$06.007	\$2 \$104.175	\$0 \$2 160
25.1	Other Services	\$90,007	\$104,175	\$6,109
23.2	Durches of Cools and Services from Community	\$116,534	\$127,017	\$8,005
25.3	Accounts	\$199,583	\$205,190	\$5,608
25.4	Operation & Maintenance of Facilities	\$323	\$324	\$1
25.5	R&D Contracts	\$128,566	\$132,917	\$4,351
25.6	Medical Care	\$2,069	\$2,154	\$85
25.7	Operation & Maintenance of Equipment	\$24,381	\$26,814	\$2,432
25.8	Subsistence & Support of Persons	\$0	\$0	\$0
25.0	Subtotal Other Contractual Services	\$569,283	\$598,591	\$29,308
26.0	Supplies & Materials	\$13,837	\$14,149	\$312
31.0	Equipment	\$5,398	\$5,676	\$277
32.0	Land and Structures	\$997	\$1,019	\$22
33.0	Investments & Loans	\$0	\$0	\$0
41.0	Grants, Subsidies & Contributions	\$2,900,104	\$3,013,926	\$113,822
42.0	Insurance Claims & Indemnities	\$0	\$0	\$0
43.0	Interest & Dividends	\$3	\$3	\$0
44.0	Refunds	\$0	\$0	\$0
	Subtotal Non-Pay Costs	\$3,491,380	\$3,635,161	\$143,781
	Total Budget Authority by Object Class	\$3,664,811	\$3,822,961	\$158,150

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

Salaries and Expenses

NATIONAL INSTITUTES OF HEALTH

National Heart, Lung, and Blood Institute

Salaries and Expenses (Dollars in Thousands)

		FY 2023	FY 2023 +/- FY 2022	
Object Classes	FY 2022 CR	President's		
		Budget		
Personnel Compensation				
Full-Time Permanent (11.1)	\$70,888	\$77,323	\$6,435	
Other Than Full-Time Permanent (11.3)	\$40,073	\$43,778	\$3,705	
Other Personnel Compensation (11.5)	\$5,465	\$5,772	\$308	
Military Personnel (11.7)	\$1,862	\$1,996	\$133	
Special Personnel Services Payments (11.8)	\$11,104	\$11,978	\$874	
Subtotal, Personnel Compensation (11.9)	\$129,392	\$140,846	\$11,454	
Civilian Personnel Benefits (12.1)	\$42,563	\$45,292	\$2,729	
Military Personnel Benefits (12.2)	\$1,477	\$1,663	\$186	
Benefits to Former Personnel (13.0)	\$0	\$0	\$0	
Subtotal Pay Costs	\$173,431	\$187,800	\$14,369	
Travel & Transportation of Persons (21.0)	\$861	\$880	\$19	
Transportation of Things (22.0)	\$549	\$561	\$12	
Rental Payments to Others (23.2)	\$0	\$0	\$0	
Communications, Utilities & Misc. Charges	\$247	¢254	¢o	
(23.3)	\$347	\$554	φο	
Printing & Reproduction (24.0)	\$2	\$2	\$0	
Other Contractual Services				
Consultant Services (25.1)	\$96,007	\$104,175	\$8,169	
Other Services (25.2)	\$118,354	\$127,017	\$8,663	
Purchase of Goods and Services from	\$107 505	\$115.034	\$7 529	
Government Accounts (25.3)	\$107,505	\$115,054	\$7,527	
Operation & Maintenance of Facilities (25.4)	\$323	\$324	\$1	
Operation & Maintenance of Equipment (25.7)	\$24,381	\$26,814	\$2,432	
Subsistence & Support of Persons (25.8)	\$0	\$0	\$0	
Subtotal Other Contractual Services	\$346,570	\$373,364	\$26,794	
Supplies & Materials (26.0)	\$13,837	\$14,149	\$312	
Subtotal Non-Pay Costs	\$362,165	\$389,309	\$27,144	
Total Administrative Costs	\$535,596	\$577,110	\$41,513	

Detail of Full-Time Equivalent Employment (FTE)

NATIONAL INSTITUTES OF HEALTH National Heart, Lung, and Blood Institute

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
Division of Intramural Research	176	14	400	525	14	520	525	14	520
	4/0	14	490	525	14	339	525	14	339
Reimbursable:	14	-	14	17	-	1/	17	-	17
lotal:	490	14	504	542	14	226	542	14	556
Office of the Director									
Direct:	108	1	109	117	1	118	117	1	118
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	108	1	109	117	1	118	117	1	118
Division of Blood and Resources									
Direct:	20	1	21	27	1	28	27	1	28
Total:	20	1	21	27	1	28	27	1	28
Division of Lung Disassas									
Division of Lung Diseases	21		21	20		20	20		20
	51	-	51	30	-	30	30	-	20
lotal:	31	-	31	38	-	38	38	-	38
Center for Translation Research and Implementation									
Science									
Direct:	8	-	8	12	-	12	12	-	12
Total:	8	-	8	12	-	12	12	-	12
Division of Cardiovascular Sciences									
Direct:	101	1	102	114	1	115	114	1	115
Total:	101	1	102	114	1	115	114	1	115
Division of Extramural Research Activities									
Direct:	88	_	88	99	_	99	99	_	99
Total:	88	-	88	99	-	99	99	-	99
Tatal	946	17	962	040	17	066	040	17	066
Includes ETEs where normall chlications are summaria	d hy the M		003 n Eund	949	17	900	242	17	900
ETEs supported by funds from Cooperative Research	u by the N		n runa.						
and Development Agreements	0	0	0	0	0	0	0	0	0
FISCAL YEAR				Ave	rage GS G	rade			
2019	12.7								
2020	12.7								
2021	12.7								
2022	12.8								
2023	12.8								

Detail of Positions

NATIONAL INSTITUTES OF HEALTH National Heart, Lung, and Blood Institute

Detail	of	Positions ¹
--------	----	-------------------------------

GRADE	FY 2021 Final	FY 2022 CR	FY 2023
			President's Budget
Total, ES Positions	2	2	2
Total, ES Salary	\$392,475	\$401,404	\$416,424
General Schedule			
GM/GS-15	98	108	108
GM/GS-14	157	172	172
GM/GS-13	178	195	195
GS-12	70	85	85
GS-11	37	47	47
GS-10	0	0	0
GS-9	33	38	38
GS-8	3	3	3
GS-7	3	3	3
GS-6	0	0	0
GS-5	3	3	3
GS-4	5	5	5
GS-3	4	4	4
GS-2	2	2	2
GS-1	1	1	1
Subtotal	594	666	666
Commissioned Corps (42 U.S.C.			
207)			
Assistant Surgeon General	1	1	1
		_	
Director Grade	5	5	5
Senior Grade	6	6	6
Full Grade	5	5	5
		0	
Senior Assistant Grade	0	0	0
Assistant Grade	0	0	0
Subtotal	17	17	17
Ungraded	250	281	281
	200	201	201
Total permanent positions	613	685	685
Total positions, end of year	863	966	966
Total full time equivalent (ETE)			
employment end of year	863	966	966
Average ES solory	\$106 220	¢200 702	¢200.212
Average GM/GS grada	\$190,238	\$200,702	\$200,212 12 9
Average GM/GS galam	\$122.7	12.0 \$120.102	12.0 \$122.070
Average Unito's salary	\$125,080	مارمير	\$152,979

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