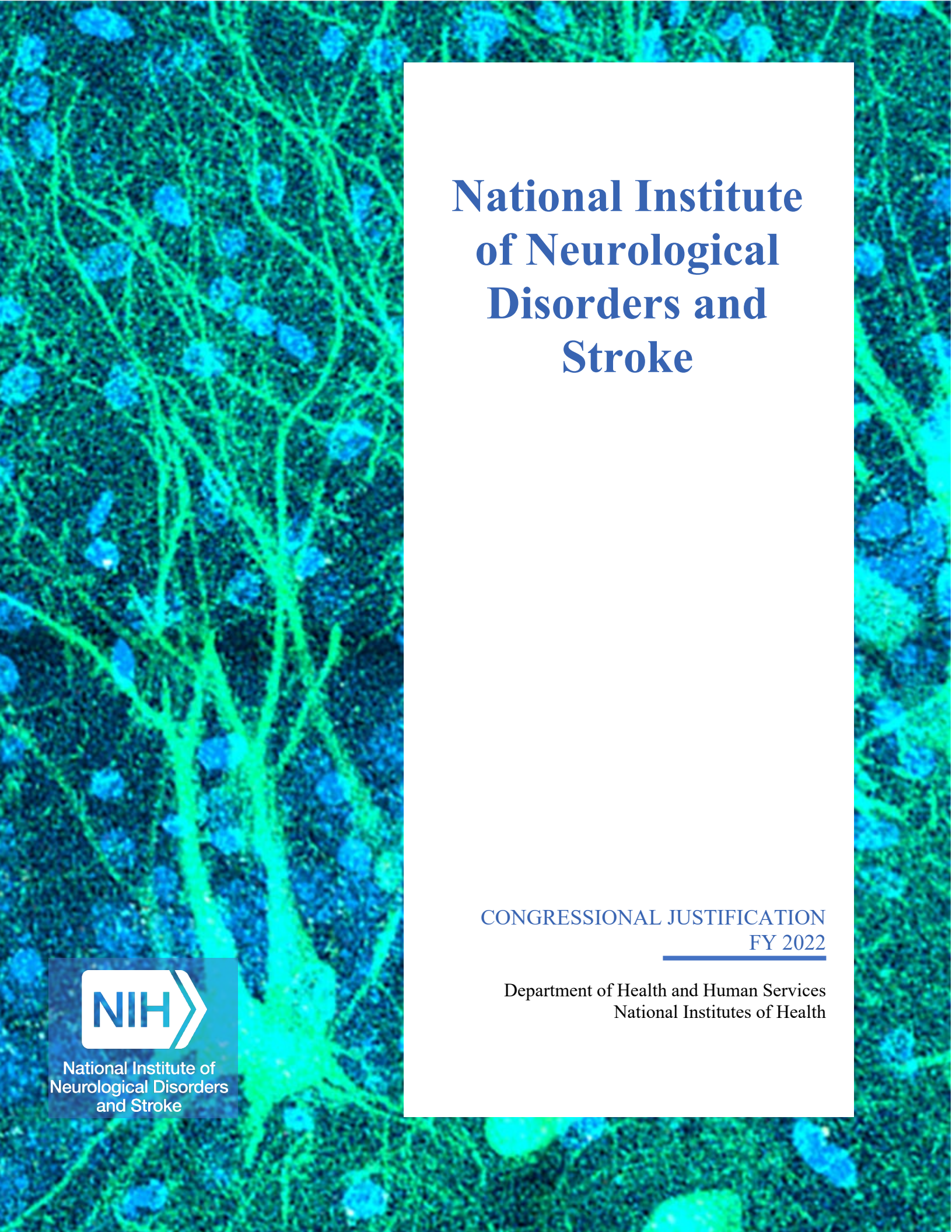


National Institute of Neurological Disorders and Stroke

CONGRESSIONAL JUSTIFICATION
FY 2022

Department of Health and Human Services
National Institutes of Health

NIH
National Institute of Neurological Disorders and Stroke

DEPARTMENT OF HEALTH AND HUMAN SERVICES

NATIONAL INSTITUTES OF HEALTH

National Institute of Neurological Disorders and Stroke (NINDS)

FY 2022 Budget Table of Contents Page No.

Director's Overview

Walter J. Koroshetz, M.D.
Director

The National Institute of Neurological Disorders and Stroke (NINDS) supports research that advances the diagnosis, prevention, and treatment of neurological disorders, that is, diseases of the brain, spinal cord, and neuromuscular system. Basic research to understand the brain in health and disease, which is the wellspring of both public and private sector progress, is at the core of this mission.

Chronic pain, dementias, stroke, traumatic brain injury (TBI), epilepsy, Parkinson's disease, multiple sclerosis, cerebral palsy, brain tumors, and other common neurological disorders affect millions of Americans of all ages. Hundreds of rare diseases collectively add to the enormous impact. Increasing the urgency for progress, brain disorders are rising as the population ages, the high prevalence of poorly controlled chronic pain drives the opioid crisis, and unacceptable health disparities persist despite progress against many neurological disorders. Furthermore, neurological complications of COVID-19 are common, and there is considerable concern, but much uncertainty, about long-term neurological disability.

The multiplicity of neurological diseases and the brain's complexity and sensitivity to disruption present formidable challenges to medical science. Despite these obstacles, since Congress established NINDS, research has produced remarkable progress in diagnosis, treatment, and prevention of neurological disorders. Advances in brain imaging, genetic testing, and other tools augment clinical diagnosis, often eliminating the years' long diagnostic odysseys that families endured in the past. Moreover, research has brought effective treatment options when before there were none—more than a dozen drugs reduce symptoms and slow the course of multiple sclerosis; treatments enable many people with Parkinson's disease to go about their lives for many years; and, similarly, physicians can offer better therapeutics for epilepsy, migraine, dystonia, and other neurological diseases. In the last few years, the first gene-targeted therapies have arrived for a few rare genetic disorders, with promising treatments for several others now in advanced testing. Deep brain stimulation (DBS) and other device therapies are under development for several diseases, building on successes for essential tremor, Parkinson's disease, and epilepsy. Combinations of devices, drugs, and rehabilitation, together with extraordinary persistence, have enabled a few people paralyzed by spinal cord injuries to stand and take their first steps. For stroke, data from the Centers for Disease Control and Prevention (CDC) show that the age adjusted death rate from stroke has declined by seventy percent over fifty years, saving millions of lives.[1] This demonstrates the cumulative impact of breakthroughs in emergency treatments and continuous progress in prevention over many years.

NINDS alone is not responsible for these advances, but the Institute's research has been pivotal, catalyzing progress across the public and private research landscape. Foremost among the Institute's contributions is support for basic research—every advance described above depended

[1] www.cdc.gov/mmwr/volumes/66/wr/mm6635e1.htm

on fundamental research to understand the healthy brain and what goes wrong in disease. Among the many other ways that NINDS spurs progress, laboratory proof-of-concept studies *"de-risk"* innovative therapeutic development strategies with long time horizons or a high risk of failure to attract private sector investment, as with recent breakthroughs in gene targeted therapies. Similarly, development of biomarkers and clinical outcome measures is often essential, as with the recent major advances in stroke treatment with clot retrieval devices, drugs for multiple sclerosis, and other innovations. Over forty years the NINDS Epilepsy Therapy Screening Program has provided standardized animal testing data, encouraging industry development of eleven drugs that are now on the market, and an NINDS program begun fifty years ago pioneered the now burgeoning field of therapeutic devices that interface with the nervous system. NINDS also stimulates progress via natural history of disease studies that guide clinical trials, epidemiological studies that identify modifiable risk factors, support for clinical trials on treatment and prevention, and development and dissemination of research resources and reagents. Perhaps most importantly for long term progress, NINDS supports training and career development for the nation's neuroscience research workforce.

Although neurological disorders present many longstanding challenges, emerging public health issues also demand NINDS attention. NINDS investment in foundational basic research, workforce training, research resources, data sharing, collaboration, and experimental rigor, as well as flexible, efficient, and effective programs on biomarkers, preclinical therapy development, and clinical trials position the Institute to respond as new challenges arise. In the National Alzheimer's Project Act (NAPA) and through targeted appropriations, Congress recognized the present and future public health impact of not only Alzheimer's disease (AD), but also Alzheimer's disease-related dementias (ADRDs). NINDS, working with the National Institute on Aging (NIA), leads an extensive program of NIH research on the ADRDs, which include vascular contributions to cognitive impairment and dementia (VCID), frontotemporal degeneration (FTD), Lewy body dementia (LBD), and mixed dementias. As the leading supporter of pain research, NINDS coordinates NIH Helping End Addiction Long-Term℠ (HEAL) initiative programs, also supported with targeted appropriations, that are developing non-addictive pain treatments which displace addictive drugs or are effective when opioids are not. NIH is accelerating the development of new pain treatments by increasing consultation with experts in clinical pain management and drug development and by leveraging established preclinical drug development programs and resources within NINDS and NIH's National Center for Advancing Translational Sciences (NCATS).

Most recently, NINDS has responded to the COVID-19 pandemic, focusing attention on the neurological complications of infection, whether caused directly by virus or indirectly by the body's response. Symptoms, such as fatigue, headache, pain, confusion, cognitive slowing, or dizziness, are common, both in the acute illness and in those who remain unwell weeks or months later. In the acute phase, severe problems including stroke, delirium, encephalitis, seizures, and, possibly, direct effects on brain respiratory control circuits may also occur. There are also reports of rare but debilitating cases of acute necrotizing hemorrhagic encephalopathy, transverse myelitis, Guillain Barre syndrome, and multi-system inflammatory syndrome in children. NINDS research on COVID-19 has included rapid supplements to existing grants, development of a database on neurological symptoms observed in patients, clinical studies in the Intramural Research Program, and clinical trials to assess potential treatments and address stroke

in COVID patients with the National Heart Lung and Blood Institute (NHLBI). NINDS also is working with NHLBI, National Institute of Allergy and Infectious Disease (NIAID), and other NIH Institutes and Centers to launch research to better understand and treat those persons with long term disabling symptoms after COVID infection.

NINDS has long established two priorities that are vital to Institute's mission across all programs: workforce diversity and health disparities. The extraordinary challenges of neurological disorders require engaging the nation's full talent pool. To that purpose, the NINDS Office of Programs to Enhance Neuroscience Diversity (OPEN) coordinates an array of programs at the individual, institutional, and community level, both within NINDS and jointly with other parts of the NIH. Among these, research supplements to promote diversity support underrepresented scientists from the high school to career development level via existing research grants; Institutional grants include Summer Research Experience Programs and the Blueprint ENDURE (Enhancing Neuroscience Diversity through Undergraduate Research Education) program; and the D-SPAN (Diversity Specialized Predoctoral to Postdoctoral Advancement in Neuroscience) Mentored Career Development Awards and the Faculty Development Award provide support at critical career transition points. NINDS also fosters networks for mentorship and considers whether investigators bring diverse perspectives as one factor in select pay decisions. Similarly, health equity is a priority throughout all Institute programs. Despite progress across all population groups, substantial disparities persist for racial and ethnic minority, rural, and socioeconomically disadvantaged populations for disorders that afflict young children, adults, and older Americans. Although the Institute has supported groundbreaking research, especially in stroke, that has characterized disparities and identified risk factors, the NINDS must now push forward to eliminate those disparities. Development of an NINDS strategic plan for health equity is now underway to guide the Institute forward.

The imperative for progress is evident every day to people affected by neurological disorders, their families, and the physicians who treat them. Although the unmet needs are immense, so are the opportunities for progress. The CDC reports that, despite considerable progress, more than 795,000 people in the United States still suffer strokes each year, with about 150,000 deaths and 7 million survivors, many with major disabilities.[2] However, the recent improvements in stroke emergency treatment expand the time window for effective intervention, opening opportunities to develop effective adjunct therapies that protect the brain. In dementia, VCID and Alzheimer's disease are so intertwined that most elderly people with dementia have a combination of the two, and the overall numbers are rising as the population ages. But emerging evidence suggests that interventions to prevent stroke, also a brain vascular disorder, may help prevent dementia, with recent clinical trial results adding to the evidence base. No existing therapies are effective for about a third of people with epilepsy, prevention of epilepsy is still elusive, and all anti-seizure drugs carry troublesome side effects. NINDS programs are reinvigorating their focus on drug resistant epilepsy and on preventing the development of epilepsy, building on advances in basic research. For hundreds of rare genetic neurological disorders, many of which affect infants and children, we know the gene mutations responsible, but have no disease modifying therapy. The new NINDS Ultra-Rare Gene Therapy (URGenT) Network will take advantage of recent progress in gene targeting technologies to rapidly develop tailored therapeutic interventions using precision medicine platforms for the treatment serious, life-threatening ultra-rare diseases

[2] www.cdc.gov/stroke/facts.htm

and blaze a wider path for genomic therapy in brain disorders. Likewise, basic research on the mechanisms that underlie chronic pain has identified many new targets for developing non-addictive drugs and devices, which NIH HEAL Initiative programs are aggressively targeting. Although the challenges of neurological diseases are daunting, opportunities for progress abound.

Looking forward long-term, the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative, supported by the 21st Century Cures Act and directed appropriations, is shaping a future in which we understand how dysfunctional brain circuits cause brain disorders and can precisely correct the problems. How information is processed in complex human brain circuits is largely a mystery, and this limits the effectiveness of diagnostic and therapeutic strategies to improve brain circuitry affected by neuro/mental/substance abuse disorders. Although the BRAIN Initiative's focus is on developing the tools to map brain circuits and monitor and modulate circuit activity in the normal brain, the technologies and foundational knowledge provide powerful means to combat brain diseases. The extent to which advances from BRAIN are already launching new approaches to study and treat neurological, mental health, and substance abuse disorders is encouraging. Based on the BRAIN Cell Census program, investigators are determining which specific brain cell types are affected by dementia, autism, and many other diseases. BRAIN technologies also offer the promise of targeting treatments precisely to these cells, as well as devices for decoding of speech directly from brain activity, restoring vision, and self-adjusting "closed-loop" electrical stimulation therapies, among many other possibilities. Given the power of these new technologies, the BRAIN Initiative has also integrated thought and research into ethics that guide their use. The BRAIN Initiative is providing a major thrust toward realizing the Institute's guiding vision: *a world that is free from the burden of neurological disorders*.

Overall budget policy: The FY 2022 President's Budget request for NINDS is $2,783.3 million, an increase of $272.4 million or 10.8 percent compared to the FY 2021 Enacted level. The NINDS request includes 21st Century Cures Act funding of $76.0 million for the BRAIN Initiative, an increase of $26.0 million from the FY 2021 Enacted level. The proposed increase in FY 2022 also includes an increase of $135.1 million for the HEAL Initiative accompanied by a $43.0 million increase in other NINDS opioid and pain research.

National Institute of Neurological Disorders and Stroke

Walter J. Koroshetz, M.D., became NINDS Director in 2015. He oversees scientific and administrative NINDS functions and holds leadership roles in NIH neuroscience initiatives. He previously was vice chair of neurology and director of stroke and neurointensive care at Massachusetts General Hospital, where he helped pioneer advanced brain imaging for stroke.

Mission

To seek fundamental knowledge about the brain and nervous system and to use that knowledge to reduce the burden of neurological disease.

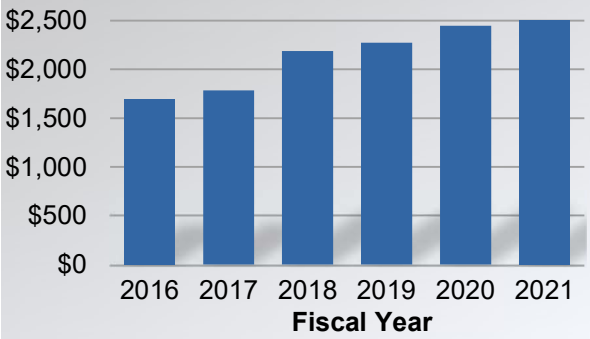
Neurological disorders include common and rare conditions that affect people of all ages. By some measures, they account for a greater burden than any other group of diseases.

NINDS

- Supports and performs basic, translational, and clinical neuroscience research, including studies to understand the nervous system in health and disease and to develop and test new and improved therapies.
- Funds and conducts research training and career development programs to ensure a vibrant, talented, and diverse neuroscience workforce.
- Disseminates neuroscience discoveries and their implications for health to the public, health professionals, researchers, and policy-makers.

NINDS Appropriations History

(Dollars in Millions)*



FY 2022 President's Budget: $ 2,783 million

*Includes funds from the 21st Century Cures Act

Facts and Figures

	2017	2018	2019	2020
FTEs	525	504	496	525
Research Project Grants[1]	745	980	896	1,013
Extramural Principal Investigators[2]	893	1,179	1,127	1,267
Extramural Early Stage Investigators[1,3]	88	127	145	160
Intramural Principal Investigators	48	45	47	51

[1] Competing awards only. [2] Includes Principal Investigators (PIs) and Multiple Principal Investigators (Contact PIs and MPIs). [3] Early Stage Investigators (ESIs) are within 10 years of their terminal research degree or end of postgraduate clinical training and have not received a substantial NIH independent research award.

Research Highlights

Through research supported and conducted by NINDS, researchers understand more about the nervous system and the diseases and conditions that affect it. NINDS has contributed to:

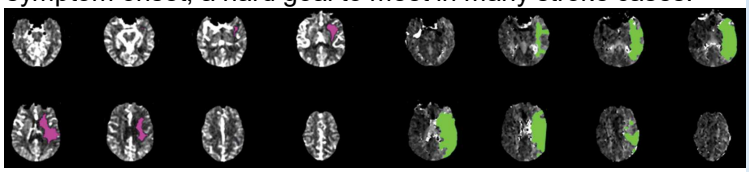
- Decades of decline in stroke deaths, due to advances in prevention and treatment including the clot-busting drug t-PA, clot retrieval devices, and innovative acute stroke imaging methods.
- New therapies for common and rare neurological disorders such as epilepsy, multiple sclerosis, migraine, spinal muscular atrophy, and muscular dystrophy.
- Devices that connect to the nervous system to restore functions lost or impaired due to disease or injury, including implanted brain stimulation therapies for Parkinson's disease, epilepsy, and spinal cord injury.
- Growing evidence for vascular contributions to dementia, which may inform new approaches to prevent cognitive decline and promote healthy brain aging.
- Cutting-edge tools for neuroscience research allowing studies to classify the many cell types in the human brain, map complex neural circuits, and observe brain activity in unprecedented detail.

National Institute of Neurological Disorders and Stroke

Recent accomplishments

Good outcomes for more patients and at later times after stroke than once thought possible.

Ischemic stroke, the most common stroke type in the US, is caused when a clot blocks a brain artery, risking permanent brain injury if blood flow is not restored. In 2018, an NINDS-funded clinical trial (DEFUSE 3) showed that brain imaging can identify stroke patients who can benefit from a procedure to remove brain clots up to 16 hours after symptom onset. Previously, the use of this procedure, called endovascular thrombectomy, was only approved for up to six hours after symptom onset, a hard goal to meet in many stroke cases.



Brain imaging shows stroke-affected areas. (Albers *et al*., N Engl J Med 2018)

Gene-targeted therapies for neurological disorders move from promise to reality.

NINDS research on disease causes and innovative genetic technologies is leading to new treatments targeting genes linked to neurological disorders. In 2016, the FDA approved nusinersen, an antisense oligonucleotide (ASO) for spinal muscular atrophy (SMA) and the first disease-modifying treatment for this progressive disease. This success was followed in 2019 by the first gene therapy for SMA, which delivers a functioning copy of the disease gene. NINDS has also advanced gene-targeted therapies in the pipeline for other neurological disorders, including amyotrophic lateral sclerosis (ALS), Huntington's disease, and spinocerebellar ataxia.

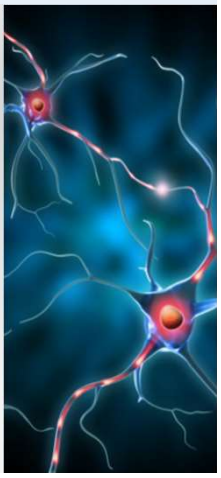
Trans-NIH neuroscience research

NINDS is a leading partner in trans-NIH neuroscience initiatives, reflecting the nervous system's role in many aspects of human health, development, and disease.

- The **Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative®** is accelerating basic neuroscience research and technologies to study complex brain circuits and functions.
- NINDS leads the **NIH Pain Consortium** and is a key partner in the **NIH Helping to End Addiction Long-term℠ (HEAL) Initiative**, an aggressive effort to develop and optimize treatments for opioid addiction and misuse and to develop non-addictive treatments for pain.
- NINDS and the National Institute on Aging (NIA) work together to advance research on **Alzheimer's Disease and Alzheimer's Disease-Related Dementias (ADRD)**.
- The **NIH Blueprint for Neuroscience Research** is a collaboration among NIH Institutes, Centers, and Offices to address cross-cutting needs for neuroscience research and research training.
- NINDS and the National Institute of Allergy and Infectious Diseases (NIAID) lead the trans-NIH **Myalgic Encephalomyelitis/ Chronic Fatigue Syndrome (ME/CFS)** working group.

Future Initiatives

- ***Health Disparities and Health Equity Research*** NINDS is committed to reducing the disproportionate burden of neurological disease borne by underserved groups of society. Guided by strategic planning with public input, NINDS will strengthen research on health disparities and health equity and minority, community, and global health.
- ***NINDS Ultra-rare Gene Therapy (URGenT) Network*** URGenT will support precision medicine therapy development for serious, life-threatening ultra-rare neurological diseases affecting fewer than 20 in one million people. Together, these diseases represent a large medical need without available treatments and with little incentive for therapy development.
- ***Accelerating Leading-edge Science in ALS (ALS^2)*** NINDS is partnering with the NIH Common Fund on an initiative to dramatically increase knowledge about the biology of ALS. The program solicits proposals for high-risk, high-reward research, including studies that use emerging research tools and bring new talent to ALS research.



Major Changes in the Fiscal Year 2022 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 mechanism and activity detail, and these highlights will not sum to the total change for the FY 2022 President's Budget request for NINDS, which is $2,783.3 million, an increase of $272.4 million from the FY 2021 Enacted level. Within the President's Budget request level, NINDS will pursue its highest research priorities through strategic investments and careful stewardship of appropriated funds.

Research Project Grants (RPGs) (+$220.6 million; total $2,043.7 million):
The NINDS budget reflects an increase of $215.8 million in the Research Project Grants portfolio, including SBIR/STTR awards. Competing RPGs are expected to increase by 87 grants in FY 2022 compared to the FY 2021 enacted level of awards.

Other Research (+$20.9 million; total $180.6 million):
The Other Research mechanism reflects an increase due to the increase in Other Research grants funded from HEAL Initiative funding. NINDS plans to increase its regular portfolio of Other Research as well.

Research Management and Support (+$9.7 million; total $105.1 million):
The NINDS budget reflects an increase of $9.7 million in Research Management and Support to provide additional staff and other support in recognition of recent increases in the NINDS grant portfolio.

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Budget Mechanism - Total[1,2]

(Dollars in Thousands)

MECHANISM	FY 2020 Final[3]		FY 2021 Enacted		FY 2022 President's Budget		FY 2022 +/- FY 2021 Enacted	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount
Research Projects:								
Noncompeting	2,092	$1,100,881	2,289	$1,205,975	2,473	$1,291,458	184	$85,482
Administrative Supplements	*(135)*	14,575	*(170)*	22,986	*(95)*	17,986	*(-75)*	-5,000
Competing:								
Renewal	104	61,931	106	62,526	107	63,636	1	1,110
New	899	500,852	800	440,052	888	575,372	88	135,320
Supplements	10	6,543	8	5,650	6	4,500	-2	-1,150
Subtotal, Competing	1,013	$569,327	914	$508,228	1,001	$643,508	87	$135,280
Subtotal, RPGs	3,105	$1,684,782	3,203	$1,737,190	3,474	$1,952,952	271	$215,762
SBIR/STTR	103	77,142	110	85,838	114	90,706	4	4,868
Research Project Grants	3,208	$1,761,925	3,313	$1,823,028	3,588	$2,043,658	275	$220,630
Research Centers:								
Specialized/Comprehensive	31	$34,077	33	$36,694	32	$34,688	-1	-$2,006
Clinical Research	0	0	0	0	0	0	0	0
Biotechnology	0	0	0	0	0	0	0	0
Comparative Medicine	0	0	0	237	0	237	0	0
Research Centers in Minority Institutions	0	100	0	0	0	0	0	0
Research Centers	31	$34,177	33	$36,931	32	$34,925	-1	-$2,006
Other Research:								
Research Careers	239	$44,337	261	$48,497	309	$50,831	48	$2,334
Cancer Education	0	0	0	0	0	0	0	0
Cooperative Clinical Research	1	4,508	1	1,852	1	2,000	0	148
Biomedical Research Support	0	0	0	0	0	0	0	0
Minority Biomedical Research Support	0	0	0	0	0	0	0	0
Other	229	107,121	231	109,391	296	127,816	65	18,425
Other Research	469	$155,966	493	$159,740	606	$180,648	113	$20,907
Total Research Grants	3,708	$1,952,067	3,839	$2,019,699	4,226	$2,259,230	387	$239,532
Ruth L Kirschstein Training Awards:	FTTPs		FTTPs		FTTPs		FTTPs	
Individual Awards	378	$17,766	383	$17,952	387	$18,469	4	$516
Institutional Awards	305	17,137	323	17,577	327	18,459	4	882
Total Research Training	683	$34,904	706	$35,529	714	$36,928	8	$1,399
Research & Develop. Contracts	117	$148,947	125	$134,560	132	$147,715	7	$13,155
(SBIR/STTR) (non-add)	*(3)*	*(1,048)*	*(5)*	*(1,093)*	*(3)*	*(1,126)*	*(-2)*	*(33)*
Intramural Research	300	219,606	314	225,723	351	234,297	37	8,574
Res. Management & Support	225	91,054	235	95,402	256	105,130	21	9,728
SBIR Admin. (non-add)	*(0)*	*(460)*	*(0)*	*(460)*	*(0)*	*(681)*	*(0)*	*(221)*
Construction		0		0		0		0
Buildings and Facilities		0		0		0		0
Total, NINDS	525	$2,446,577	549	$2,510,913	607	$2,783,300	58	$272,387

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

[2] Of which $70.0 million in FY 2020, $50.0 million in FY 2021, and $76.0 million in FY 2022 is derived by transfer from the NIH Innovation Account under the 21st Century Cures Act.

[3] Includes $6.1 million of 21st Century Cures Act funding not obligated in FY 2020 and carried over into FY 2021.

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

For carrying out section 301 and title IV of the PHS Act with respect to neurological disorders and stroke, [$2,463,393,000]$*2,219,298,000*.

NIH INNOVATION ACCOUNT, CURES ACT

(INCLUDING TRANSFER OF FUNDS)

For necessary expenses to carry out the purposes described in section 1001(b)(4) of the 21st Century Cures Act, in addition to amounts available for such purposes in the appropriations provided to the NIH in this Act, [$404,000,000]*$496,000,000*, to remain available until expended: *Provided*, That such amounts are appropriated pursuant to section 1001(b)(3) of such Act, are to be derived from amounts transferred under section 1001(b)(2)(A) of such Act, and may be transferred by the Director of the National Institutes of Health to other accounts of the National Institutes of Health solely for the purposes provided in such Act: *Provided further*, That upon a determination by the Director that funds transferred pursuant to the previous proviso are not necessary for the purposes provided, such amounts may be transferred back to the Account: *Provided further*, That the transfer authority provided under this heading is in addition to any other transfer authority provided by law. (Department of Health and Human Services Appropriations Act, 2021.)

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Summary of Changes

(Dollars in Thousands)

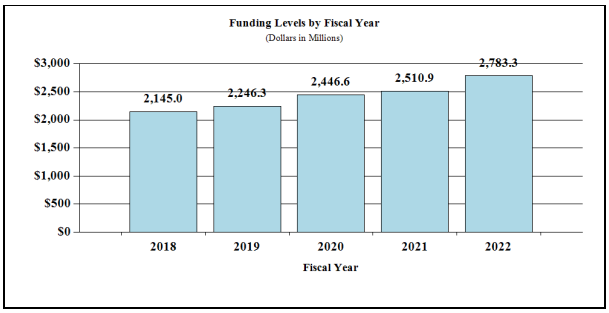
FY 2021 Enacted	$2,510,913
FY 2022 President's Budget	$2,783,300
Net change	$272,387

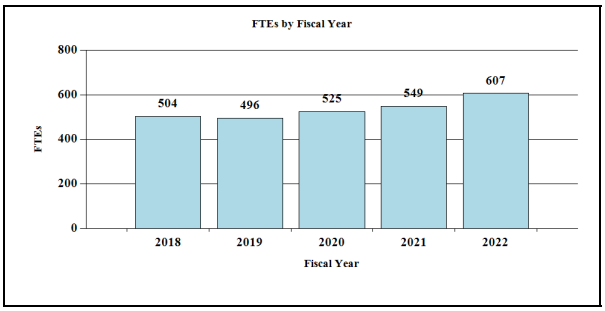
CHANGES	FY2021 Enacted		FY 2022 President's Budget		Built-In Change from FY 2021 Enacted	
	FTEs	Budget Authority	FTEs	Budget Authority	FTEs	Budget Authority
A. Built-in:						
1. Intramural Research:						
a. Annualization of January 2021 pay increase & benefits		$59,840		$67,559		$162
b. January FY 2022 pay increase & benefits		59,840		67,559		1,641
c. Paid days adjustment		59,840		67,559		0
d. Differences attributable to change in FTE		59,840		67,559		7,380
e. Payment for centrally furnished services		36,092		37,897		1,805
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		129,790		128,841		3,653
Subtotal						$14,640
2. Research Management and Support:						
a. Annualization of January 2021 pay increase & benefits		$42,208		$45,299		$112
b. January FY 2022 pay increase & benefits		42,208		45,299		1,170
c. Paid days adjustment		42,208		45,299		0
d. Differences attributable to change in FTE		42,208		45,299		3,899
e. Payment for centrally furnished services		7,457		7,830		373
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		45,738		52,001		1,188
Subtotal						$6,742
Subtotal, Built-in						$21,382

CHANGES	FY2021 Enacted		FY 2022 President's Budget		Program Change from FY 2021 Enacted	
	No.	Amount	No.	Amount	No.	Amount
B. Program:						
1. Research Project Grants:						
a. Noncompeting	2,289	$1,228,961	2,473	$1,309,444	184	$80,482
b. Competing	914	508,228	1,001	643,508	87	135,280
c. SBIR/STTR	110	85,838	114	90,706	4	4,868
Subtotal, RPGs	3,313	$1,823,028	3,588	$2,043,658	275	$220,630
2. Research Centers	33	$36,931	32	$34,925	-1	-$2,006
3. Other Research	493	159,740	606	180,648	113	20,907
4. Research Training	706	35,529	714	36,928	8	1,399
5. Research and development contracts	125	134,560	132	147,715	7	13,155
Subtotal, Extramural		$2,189,788		$2,443,873		$254,085
	FTEs		FTEs		FTEs	
6. Intramural Research	314	$225,723	351	$234,297	37	-$6,066
7. Research Management and Support	235	95,402	256	105,130	21	2,986
8. Construction		0		0		0
9. Buildings and Facilities		0		0		0
Subtotal, Program	549	$2,510,913	607	$2,783,300	58	$251,005
Total built-in and program changes						$272,387

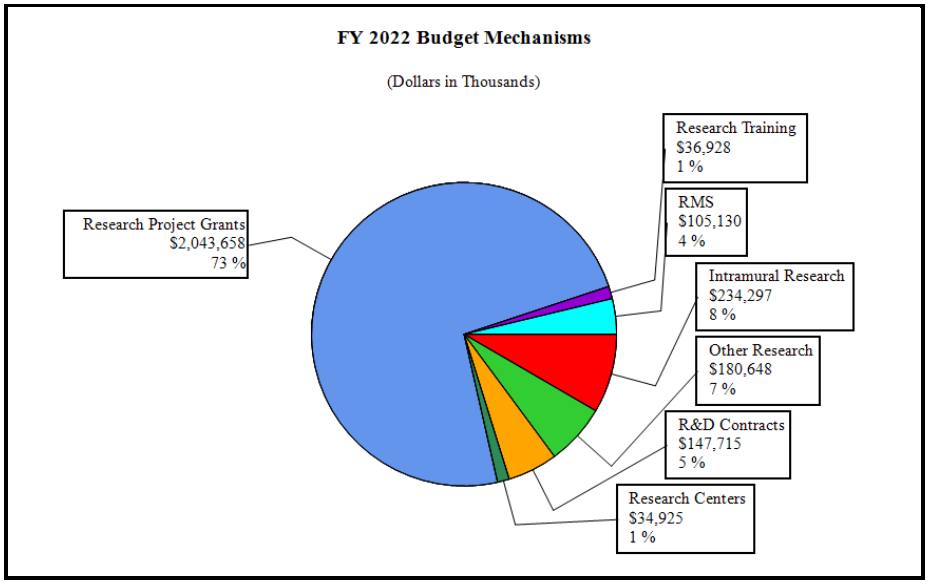
Fiscal Year 2022 Budget Graphs

History of Budget Authority and FTEs:

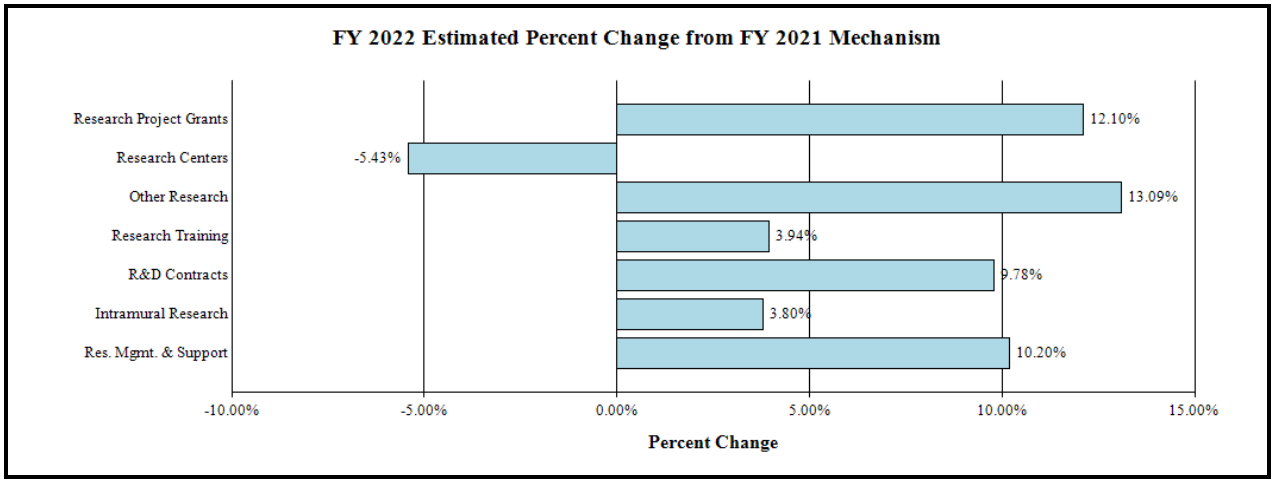




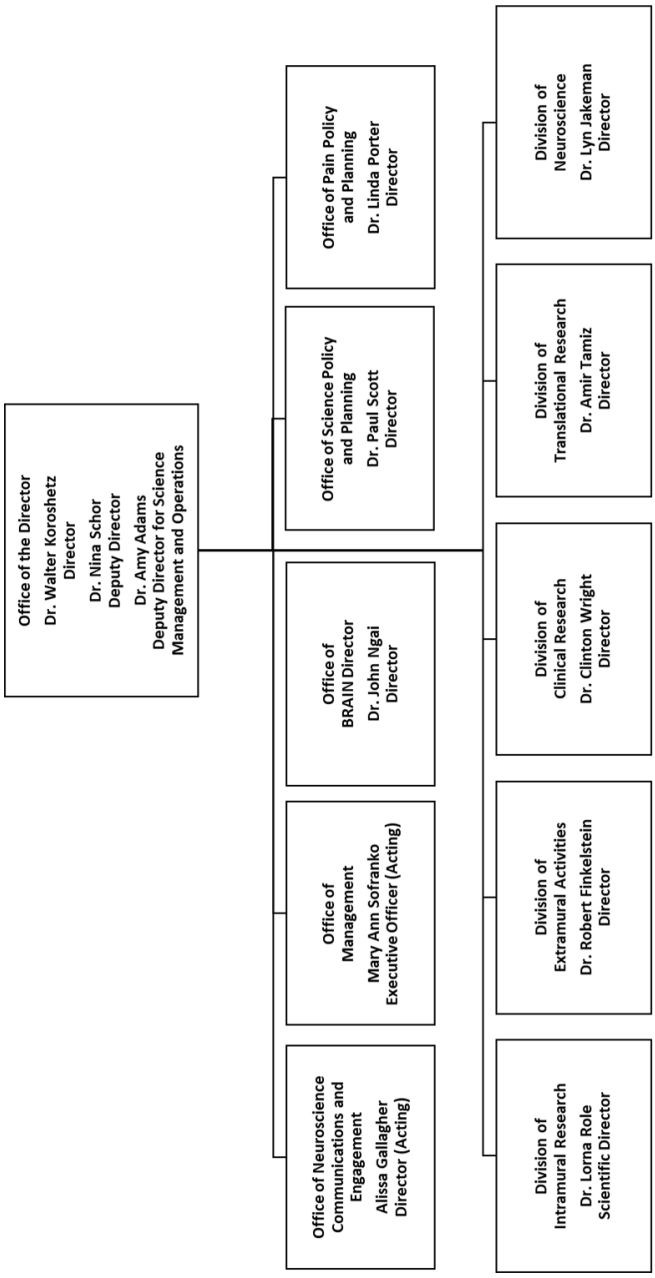
Distribution of Mechanism:



Change by Selected Mechanism:



NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke
Organizational Chart



NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Budget Authority by Activity[1]

(Dollars in Thousands)

	FY 2020 Final		FY 2021 Enacted		FY 2022 President's Budget		FY 2022 +/- FY 2021 Enacted	
Extramural Research	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**
Detail								
Division of Neuroscience		$1,481,227		$1,521,379		$1,617,666		$96,287
Division of Clinical Research		157,844		164,235		172,425		8,190
Division of Translational Research		156,703		160,178		171,175		10,997
Division of Extramural Activities		99,631		103,528		108,764		5,236
Opioid/Pain Research[2]		240,513		240,468		373,843		133,375
Subtotal, Extramural		**$2,135,918**		**$2,189,788**		**$2,443,873**		**$254,085**
Intramural Research	**300**	**$219,606**	**314**	**$225,723**	**351**	**$234,297**	**37**	**$8,574**
Research Management & Support	**225**	**$91,054**	**235**	**$95,402**	**256**	**$105,130**	**21**	**$9,728**
TOTAL	**525**	**$2,446,577**	**549**	**$2,510,913**	**607**	**$2,783,300**	**58**	**$272,387**

[1] Includes FTEs whose payroll obligations are

[2] Total for Opioid/Pain Research including IR and RMS is (in thousands) $266,321 in FY 2020, $270,295 in FY 2021, and $405,443 in FY 2022.

Justification of Budget Request

National Institute of Neurological Disorders and Stroke

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

Budget Authority (BA):

	FY 2020 Final	FY 2021 Enacted	FY 2022 President's Budget	FY 2022 +/- FY 2021
BA	$2,446,577,000	$2,510,913,000	$2,783,300,000	+$272,387,000
FTE	525	549	607	58

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

Program Descriptions

Division of Neuroscience (DON)

As the largest part of the NINDS extramural program, the Division of Neuroscience supports research on the normal brain, spinal cord, and nerves of the body; the mechanisms and consequences of neurological injury and disease; and the early development of diagnostics and treatments. Investigator-initiated research is the foundation for the DON portfolio. In addition, targeted programs focus on specific research topics and public health priorities that are not fully addressed through investigator-initiated research. DON programs also support research resources, core facilities, and scientific conferences. Examples of program areas include:

- **Basic neuroscience research**: Gaps in understanding normal nervous system development and function can form roadblocks to addressing neurological disorders. Research to fill those gaps enables unanticipated breakthroughs and is a critical part of the NINDS mission that is unlikely to receive sustained support from the private sector. Because basic research benefits from the freedom to follow scientific opportunity, investigator-initiated research makes up the majority of the NINDS basic research portfolio. NINDS also encourages fundamental basic research through a targeted initiative with set-aside funding. In neuroscience as in other fields, new research tools drive new discoveries. NINDS supports the development and application of tools and technologies for neuroscience research, and this is also a major focus of the NIH BRAIN initiative, in which NINDS is a leading partner.

- **Neurodegeneration:** NINDS leads NIH support for research on many neurodegenerative diseases. For example, programs for Parkinson's disease (PD) include the Morris K. Udall Centers of Excellence for Parkinson's Disease Research supporting collaborative studies on the causes of PD; the Parkinson's Disease Biomarkers Program (PDBP) to find biomarkers for PD and Lewy Body dementia (LBD); and the Accelerating Medicines Partnership for Parkinson's Disease, which leverages patient cohorts and resources from PDBP and other

programs for large-scale analyses to identify biomarkers and new targets for therapies. As part of the National Plan to Address Alzheimer's Disease, NINDS leads research on Alzheimer's Disease Related Dementias (ADRD), which include LBD, frontotemporal dementia, vascular contributions to cognitive impairment and dementia, and mixed etiology dementias. NINDS receives co-funding for ADRD research from the National Institute on Aging (NIA), which enables support for specific initiatives and an extended payline for meritorious proposals in this area.

- **Rare diseases**: Many rare diseases affect the nervous system, and research on these disorders often yields insights into more common diseases with shared mechanisms. NINDS supports investigator-initiated and targeted research on rare diseases and is a partner in the NIH Rare Diseases Clinical Research Network, funding consortia for lysosomal disorders, mitochondrial diseases, dystonia, and others. NINDS has enabled new treatments for rare neurological disorders, including the first gene-based, disease-modifying therapies for spinal muscular atrophy and muscular dystrophy. An ongoing NINDS initiative aims to fill gaps in clinical trial readiness for rare neurological and neuromuscular diseases with new therapies on the horizon. NINDS also is partnering with the NIH Common Fund to dramatically increase knowledge about amyotrophic lateral sclerosis (ALS), via the new Accelerating Leading-edge Science in ALS (ALS^2) initiative.

- **Myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS)**: Researchers do not yet understand the causes of ME/CFS, and diagnostic tests and treatments are not available. Along with the National Institute of Allergy and Infectious Diseases (NIAID) and other Institutes and Centers, NINDS supports ME/CFSnet, a network of collaborative research centers that aims to develop and

THE BRAIN RESEARCH THROUGH ADVANCING INNOVATIVE NEUROTECHNOLOGIES (BRAIN) INITIATIVE

Brain circuit dysfunction underlies the loss of memory and cognition in dementia, altered movement in Parkinson's disease and dystonia, seizures in epilepsy, persistence of chronic pain, and other neurological disorders. However, research tools have not been powerful enough to answer fundamental questions about how brain circuits work and what goes wrong in disease, impeding progress. The trans-NIH BRAIN Initiative exploits advances from many scientific and engineering disciplines to develop and apply tools that overcome these limitations, enabling researchers to identify all cell types in the brain, monitor thousands of cells in real time, precisely modulate brain circuits, and map intricate connections among nerve cells.

In 2014, the report BRAIN 2025: A Scientific Vision provided a vision, operating principles, goals, and milestones for the Initiative. Teams across NIH manage the program, led by NINDS and NIMH and coordinated with complementary programs in other agencies and the private sector. In 2019, an external BRAIN 2.0 group found progress to be so remarkable to warrant investment in larger scale, transformative projects that might propel neuroscience far into the future. These new projects will create a comprehensive parts list of human brain cell types, tools to access and modulate specific brain cell types, and complete wiring diagrams of the mouse brain and long-range nerve pathways in primate (including human) brains.

To date, the BRAIN Initiative has focused on the normal brain, anticipating that this will ultimately provide tools and knowledge to combat human brain diseases. The extent to which avenues are opening for progress against human disease is encouraging. New tools in development reveal precisely which human brain cells are affected by diseases, with the potential to direct treatment to them. Other examples include new approaches to deliver drugs to specific targets in the brain, self-tune deep brain stimulation therapy, decode movement or speech commands directly from brain activity, and improve the precision of noninvasive imaging.

Research at the frontiers of neuroscience raises potential ethical issues, requiring thoughtful consideration for anticipating and navigating the challenges arising from new brain technologies. The Initiative's Neuroethics Working Group provides leadership in this domain.

identify new diagnostics, biomarkers, and ways to stratify patients into subgroups based on clinical presentation. ME/CFSnet research suggests that immune dysregulation and differences in immune cell metabolism contribute to ME/CFS. NINDS also supports NIH funding opportunities to stimulate ME/CFS research and will be a lead participant in NIH strategic planning for ME/CFS, that began in Fall 2020.

- **Epilepsy**: Since 2000, NINDS has worked with the scientific and patient communities to establish shared research priorities called the Benchmarks for Epilepsy Research, and in September 2020, NINDS began gathering broad input on updated Benchmarks to guide future research. The NINDS Centers without Walls program for epilepsy research was designed to address priorities outlined by the Benchmarks. The newest center investigates how specific gene variants cause epilepsy, which will inform precision diagnostics and treatments. Other centers have focused on genetic causes of epilepsy; sudden unexpected death in epilepsy; and strategies to prevent epilepsy after traumatic brain injury (TBI).

- **Other neurological disorders**: DON research includes studies on many more nervous system disorders and on mechanisms shared across diseases, with studies suggesting paths to new and improved treatments and diagnostics for conditions including hydrocephalus, spinal cord injury, TBI, and neuropathies, among others. Because neuroscience spans scientific disciplines, NINDS also works closely with other NIH Institutes in areas of complementary interest. For example, in addition to playing a leading role in the NIH HEAL Initiative^{SM}, NINDS is the lead NIH Institute for pain research and heads the NIH Pain Consortium, which includes 23 Institutes and Centers that support pain research. Other areas of collaboration include muscular dystrophies, brain tumor, neuroimmune conditions such as multiple sclerosis and nervous system infections, and developmental disorders such as cerebral palsy, autism, Fragile X Syndrome, and Down syndrome. In the largest genetic study to date on cerebral palsy, NINDS-funded investigators estimate that genetic causes account for up to 14 percent of cases. The results stand to inform new directions for research and treatment.

Budget Policy: The FY 2022 President's Budget request for the Division of Neuroscience is $1,617.7 million, an increase of $96.3 million, or 6.3 percent, from the FY 2021 Enacted level.

Division of Translational Research (DTR)

The NINDS Division of Translational Research leads extramural NINDS therapy development, through a suite of milestone-driven research programs and services designed to support all development stages for drugs, devices, and biologic therapies, from preclinical studies to first in human clinical trials. Translational research is failure-prone and poses risks for private sector investment. DTR programs help to remove these risks by advancing therapies to a point of readiness sufficient for industry interest, or in some cases, for testing in NINDS-funded clinical trials. In FY 2022, NINDS will support the following DTR programs.

- The **Blueprint Neurotherapeutics Network (BPN),** led by NINDS for the NIH Blueprint for Neuroscience Research, focuses on small molecule drug development and will expand in FY 2022 to include biologic therapies. The BPN has supported 30 projects across eight Institutes

and Centers since 2011. Three BPN compounds are in Phase II clinical trials, and the BPN and the HEAL Initiative[SM] supported the development of a non-narcotic analgesic for neuropathic pain that has received fast track designation from the FDA.

- The **Innovation Grants to Nurture Initial Translational Efforts (IGNITE)** program funds early-stage therapy development, such as validation of assays to evaluate proposed agents, demonstration that therapies have sufficient biological activity to warrant further investment, and development of model systems for early testing. IGNITE-supported therapies for epilepsy and Parkinson's disease have advanced to the BPN for later stage studies.

- The **Cooperative Research to Enable and Advance Translational Enterprises program (CREATE)** supports the development of biologic therapies, including large biological molecules, cell therapies, and gene therapies. Many therapies in CREATE are based on antisense oligonucleotides (ASOs) designed to modify the expression of specific genes, reflecting the promise of such precision medicine approaches for neurological diseases. A recent project led to a clinical trial of an ASO to treat ALS. The program is also poised to advance other new approaches, such as genome editing, for therapeutic use.

- The **Translational Neural Devices** program supports therapeutic and diagnostic device development for disorders of the nervous system, from preclinical studies through early stage clinical trials. Recent advances include devices that restore respiratory muscle function in spinal cord injury and stimulate the vagus nerve to engage neuromodulatory circuits and improve motor and sensory function after stroke. NINDS also manages device-related programs in the NIH HEAL and BRAIN initiatives and will jointly manage a new NIH Blueprint MedTech program.

- The **NINDS Biomarkers** program supports the development and validation of biomarkers that can aid clinical trials and treatment decisions. Projects focus on, for example, diagnostic biomarkers for MS, Parkinson's disease, Friedreich's ataxia, fibromyalgia,

ULTRA-RARE GENE THERAPY (URGenT) NETWORK

NINDS is establishing the URGenT Network to support the development of state-of-the-art gene-based therapies for ultra-rare diseases, which affect one or less than one in 50,000 people. Around 7,000 known rare and ultra-rare diseases affect 30 million people in the US. About 45 percent of rare diseases are neurological, and 90 percent of rare childhood disorders have major neurological effects. Many are life-threatening, and few have FDA-approved treatments. Combined, ultra-rare diseases represent a large medical need, but the small number of people with each condition makes research difficult and limits incentives for industry investment.

Most rare diseases have a genetic origin, and causal mutations in ultra-rare diseases are unique to very few people, sometimes to a single patient. Successful gene-based therapies for some genetic diseases, including spinal muscular atrophy, have fueled promise for the rarest of diseases, and reports of custom-designed treatments for individual patients have gained public attention. Such efforts present challenges for safety and efficacy research, regulatory approval, and business processes built around larger patient populations.

URGenT is a late-stage preclinical therapy development program that aims to address challenges of gene-targeting technologies, de-risk these approaches for industry adoption, and coordinate their entry into clinical trials. The program will facilitate ways to standardize and share resources, data, and best practices across diseases to make therapy development for ultra-rare diseases more efficient and accessible. Project selection for URGenT will rely on strong scientific criteria, and only projects that meet milestones for progress will advance through successive phases of support, allowing NINDS resources to go to the most promising approaches.

In implementing URGenT, NINDS will engage with researchers, patient groups, government agencies involved in healthcare (including the FDA), and others on ways to reliably and sustainably deliver new therapeutics to patients with ultra-rare disorders.

and an imaging method that could triage patients with stroke due to large vessel occlusion. NINDS also leads a biomarker program for pain conditions as part of the HEAL Initiative[SM].

- The **Epilepsy Therapy Screening Program (ETSP)** screens candidate compounds from academia and industry in standardized animal models and has contributed to 11 drugs approved for common and rare forms of epilepsy, most recently Epidiolex (cannabidiol) for seizures in Lennox-Gastaut and Dravet syndromes and Xcopri (cenobamate) for partial onset seizures. The program aims to advance new treatments for drug-resistant epilepsy, epilepsy syndromes, and disease prevention and modification. The ETSP served as a model for the **Preclinical Screening Platform for Pain (PSPP)**, led by DTR for the HEAL Initiative[SM].

- The **NIH Countermeasures Against Chemical Threats (CounterACT)** program, funded through the NIH Office of the Director, develops medical countermeasures for toxic exposures after a chemical emergency. Several new drug candidates have moved to advanced development, including one FDA-approved for reducing seizures after nerve agent exposure. CounterACT is part of the NIH Biodefense Program led by NIAID.

- **NINDS SBIR/STTR** programs support research by small businesses to develop therapies, diagnostics, and research tools relevant to the NINDS mission. Several DTR programs, as well as the NIH BRAIN and HEAL initiatives, include SBIR/STTR funding opportunities.

Budget Policy: The FY 2022 President's Budget request for the Division of Translational Research is $171.2 million, an increase of $11.0 million, or 6.9 percent, from the FY 2021 Enacted level.

Division of Clinical Research (DCR)

The Division of Clinical Research supports clinical trials infrastructure and large-scale clinical research, including early and advanced phase clinical trials, comparative effectiveness research, and epidemiological studies, for neurological conditions across the lifespan. To optimize clinical research, DCR enforces milestones for progress and provides resources to improve patient access and recruitment. DCR also develops clinical research initiatives and provides expertise in clinical trial design and statistics to researchers and the Institute. NINDS clinical networks and approaches to improve the efficiency and quality of clinical trials have served as models for other NIH programs, including the Early Phase Pain Investigation Clinical Network (EPPIC-Net), led by NINDS for the HEAL Initiative[SM]. Recent DCR-supported studies have informed advances in understanding, treating, and preventing neurological disorders, in areas including stroke, epilepsy, Parkinson's disease, MS, vascular risk factors for dementia, and others. NINDS also quickly deployed support for infrastructure and research to collect data on neurologic aspects of COVID-19. In FY 2022, major DCR programs will include:

- **StrokeNet** provides support and infrastructure for clinical trials on stroke treatment, prevention, and recovery and rehabilitation through 25 regional centers and more than 400 hospitals across the United States. Fourteen trials have been conducted or are ongoing through the network since it was established in 2014, generating results that inform clinical care for stroke patients. StrokeNet's first trial for pediatric stroke aims to determine whether intense rehabilitation incorporating constraint-induced movement therapy improves upper

extremity motor function in babies who have had a perinatal stroke.

- The **Network for Excellence in Neuroscience Clinical Trials (NeuroNext)** supports Phase II clinical trials to gather critical information about investigational treatments prior to larger later-stage trials, as well as studies to discover and validate measures of disease and treatment responses that can serve as biomarkers. Since 2011, NeuroNEXT has supported ten studies of biomarkers or therapies for a range of common and rare neurological disorders.

- **Strategies to Innovate EmeRgENcy Care Clinical Trials Network (SIREN),** led by NINDS and the National Heart Lung and Blood Institute (NHLBI), conducts clinical trials in emergency care for neurologic, cardiac, respiratory, and hematologic conditions. Ongoing trials are testing treatments for TBI and for improving neurological outcomes after cardiac arrest with coma. To aid NIH in combatting the coronavirus pandemic, SIREN rapidly implemented a trial of outpatient convalescent plasma for preventing COVID-19 progression.

- The **NINDS Common Data Elements (CDE) Program** works with researchers, industry, nonprofit, other Federal agencies and, professional organizations to develop data standards for neurological disorders, to foster collaboration and data sharing across studies and improve data quality and integrity. The program has developed CDEs for 23 disease areas, including many with pediatric standards, as well as a common set for use across diseases.

- The **Office of Global Health and Health Disparities** within DCR directs NINDS support for research on health disparities and minority, community, and global health. An ongoing strategic planning process will guide and strengthen new NINDS investments in these areas.

Budget Policy: The FY 2022 President's Budget request for the Division of Clinical Research is $172.425 million, an increase of $8.190 million, or 5.0 percent, from the FY 2021 Enacted level.

Division of Extramural Activities (DEA)

The DEA leads NINDS efforts in research training and career development, workforce diversity initiatives, and enhancing neuroscience rigor and reproducibility research. These include:

- The **Office of Training and Workforce Development** directs NINDS extramural programs for research training and career development, including fellowships and mentored awards for individuals and grants for programs at academic institutions. Complementing NIH-wide programs, NINDS initiatives meet unique training needs across career stages in neuroscience research and include national programs for child neurologists and neurosurgeons who wish to pursue research and career development awards for advanced trainees launching independent projects. In addition, the NINDS Landis Mentor Award promotes excellent mentorship in neuroscience research by recognizing and providing funds to dedicated, effective mentors.

- The **Office of Programs to Enhance Neuroscience Workforce Diversity (OPEN)** promotes diversity in neuroscience research, with programs designed to address barriers to the participation and inclusion of underrepresented groups and individuals with disabilities or from disadvantaged backgrounds. OPEN programs span the research career pipeline, from neuroscience outreach to grades K-12, to funding opportunities and mentoring networks

targeting critical career transition points. In addition, NINDS is an integral partner in the NIH Common Fund's Faculty Institutional Recruitment for Sustainable Transformation (FIRST) program to create cultures of inclusive excellence at NIH-funded institutions.

- The **Office of Research Quality** promotes rigor and transparency in neuroscience research and its efforts have been instrumental to policies set by NIH and research journals to improve rigor in experimental design and require transparent reporting in publications. To address needs for training in rigorous research practices, the office is developing a comprehensive educational platform for use by academic institutions and researchers at all career stages.

Budget Policy: The FY 2022 President's Budget request for the Division of Extramural Activities is $108.8 million, an increase of $5.2 million, or 5.1 percent, from the FY 2021 Enacted level.

Intramural Research Program (IRP)

The NINDS IRP conducts research and research training on the NIH campus and hosts core facilities providing access to state-of-the-art research technologies. The Program spans basic, translational, and clinical research in neuroscience, neurology, and neurosurgery.

- More than 150 laboratories from NINDS and 10 other Institutes conduct neuroscience research at NIH, creating a rich environment for innovative, multidisciplinary studies. Many of these laboratories are housed together in the Porter Neuroscience Research Center, a space designed to encourage collaboration. NINDS has been a leader in coordinating intramural neuroscience researchers' return to work during the SARS-CoV-2 pandemic.

- NINDS clinical research benefits from the NIH Clinical Center, a hospital solely devoted to clinical investigation. NINDS leads a multisystem study on post-infectious ME/CFS to identify clinical and biological markers and disease mechanisms. Additional clinical studies focus on neurologic aspects of COVID-19, epilepsy, multiple sclerosis, neurodegenerative diseases, brain tumors, movement disorders, and other areas; and they include early trials for drugs, devices, and gene therapy. Through the NIH Undiagnosed Diseases Program, NINDS helps find the causes of puzzling neurological cases referred to the Clinical Center. NINDS also works with two local emergency departments on studies of acute stroke and TBI.

- The unique resources of the IRP enable innovative studies that bridge basic and clinical neuroscience to answer fundamental questions about the nervous system and its diseases. IRP investigators have recently received prestigious research awards: Richard Youle, Ph.D., received the 2021 Breakthrough Prize in Life Sciences for showing how mutations in the genes PINK1 and Parkin harm the brain; Sonja Scholz, M.D., Ph.D., received the American Neurological Association's 2020 Soriano Lectureship for her use of advanced genetics to study neurodegenerative disorders; and Michael Ward, M.D., Ph.D., is a new awardee of the Chan Zuckerberg Initiative's Neurodegeneration Challenge Network. A new IRP program will incentivize more high risk, high reward collaboration across basic and clinical research. NINDS also joined NIA to establish a new Center for Alzheimer's and Related Dementias.

Budget Policy: The FY 2022 President's Budget request for the Intramural Research Program is $234.3 million, an increase of $8.6 million, or 3.8 percent, from the FY 2021 Enacted level.

Research Management and Support (RMS)

RMS activities provide administrative, budgetary, logistical, and scientific support in the review, award, and monitoring of research grants, training awards, and research and development contracts. RMS also encompasses strategic planning, coordination, and evaluation of NINDS programs, regulatory compliance, and liaison with other Federal agencies, Congress, and the public, as well as activities to communicate research advances and disseminate information about neurological disorders to the public. For example, in 2021, NINDS will launch an update of its Mind Your Risks public health campaign, based on growing evidence linking high blood pressure and the risk of developing dementia. The campaign aims to reach at-risk audiences with messages on the importance of controlling hypertension to prevent stroke and possibly dementia.

Budget Policy: The FY 2022 President's Budget request for NINDS Research Management and Support is $105.1 million, an increase of $9.7 million, or 10.2 percent, from the FY 2021 Enacted level.

NIH Helping to End Addiction Long-term℠ (HEAL) Initiative

NINDS is a leading partner in the NIH HEAL Initiative℠, launched in 2018 as an aggressive, trans-agency effort to speed scientific solutions to stem the national opioid crisis. HEAL focuses on improving prevention and treatment for opioid misuse and addiction and enhancing pain management, including through the development of nonaddictive alternatives to opioid pain medications. NINDS leads HEAL programs for the preclinical discovery and development of new medications and devices to treat acute and chronic pain conditions, and for evaluating the effectiveness of therapies in clinical trials. Many of these programs build on NINDS and other NIH programs and infrastructure for basic, translational, and clinical research. They include:

- **Discovery and Validation of Novel Targets for Safe and Effective Pain Treatment:** to find new targets for pain treatment development
- **Preclinical Screening Platform for Pain (PSPP):** to provide a platform to profile non-opioid, nonaddictive pain therapeutics in validated models relevant to human pain conditions
- **Optimization of Non-addictive Therapies to Treat Pain:** to accelerate promising small molecule and biologic candidate therapies towards clinical trials
- **Discovery and Validation of Biomarkers, Biomarker Signatures, and Endpoints for Pain Indications:** to find biomarkers and endpoints for pain to facilitate the development of non-opioid pain therapeutics from discovery through Phase II clinical trials
- **Early Phase Pain Investigation Clinical Network (EPPIC-Net):** to provide academic and industry researchers with infrastructure for early phase clinical trials of novel pain treatments
- **Translational Devices to Treat Pain:** to support preclinical development and demonstration of safety and effectiveness for therapeutic and diagnostic devices
- **Pain Management Effectiveness Research Network:** to compare the effectiveness of existing nonaddictive pain therapies or existing or new prevention and management approaches

Budget Policy: The FY 2022 President's Budget request for NINDS HEAL funding is $405.4 million, an increase of $135.1 million, or 50.0 percent, from the FY 2021 Enacted level. NINDS HEAL funding for FY 2022 includes $373.8 million for extramural research, $20.0 million for intramural research, and $11.6 million for RMS.

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Appropriations History

Fiscal Year	Budget Estimate to Congress	House Allowance	Senate Allowance	Appropriation
2013	$1,624,707,000		$1,629,631,000	$1,626,365,349
Rescission				$3,252,731
Sequestration				($81,632,357)
2014	$1,642,619,000		$1,631,703,000	$1,587,982,000
Rescission				$0
2015	$1,608,461,000			$1,605,205,000
Rescission				$0
2016	$1,660,375,000	$1,656,334,000	$1,694,758,000	$1,696,139,000
Rescission				$0
2017[1]	$1,695,180,000	$1,751,049,000	$1,803,306,000	$1,783,654,000
Rescission				$0
2018[2]	$1,355,998,000	$1,853,011,000	$1,904,666,000	$2,188,149,000
Rescission				$0
2019[2]	$1,838,556,000	$2,228,780,000	$2,275,580,000	$2,274,413,000
Rescission				$0
2020[2]	$2,026,031,000	$2,385,571,000	$2,490,494,000	$2,444,687,000
Rescission				$0
2021[2]	$2,245,110,000	$2,465,110,000	$2,526,245,000	$2,513,393,000
Rescission				$0
2022[2]	$2,783,300,000			

[1] Budget Estimate to Congress includes mandatory financing.
[2] Includes funds derived by transfer from the NIH Innovation Account under the 21st Century Cures Act.

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Authorizing Legislation

	PHS Act/ Other Citation	U.S. Code Citation	2021 Amount Authorized	FY 2021 Enacted	2022 Amount Authorized	FY 2022 President's Budget
Research and Investigation	Section 301	42§241	Indefinite	$2,510,913,000	Indefinite	$2,783,300,000
National Institute of Neurological Disorders and Stroke	Section 401(a)	42§281	Indefinite		Indefinite	
Total, Budget Authority				$2,510,913,000		$2,783,300,000

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Amounts Available for Obligation[1]
(Dollars in Thousands)

Source of Funding	FY 2020 Final	FY 2021 Enacted	FY 2022 President's Budget
Appropriation[2]	$2,444,687	$2,513,393	$2,783,300
OAR HIV/AIDS Transfers	1,890	-2,480	0
Subtotal, adjusted budget authority	$2,446,577	$2,510,913	$2,783,300
Unobligated balance, start of year	1,761	6,122	0
Unobligated balance, recovery of prior year obligations	0	461	0
Unobligated balance, end of year[3]	-6,122	0	0
Subtotal, adjusted budget authority	$2,442,216	$2,517,496	$2,783,300
Unobligated balance lapsing	3	0	0
Total obligations	$2,442,219	$2,517,496	$2,783,300

[1] Excludes the following amounts (in thousands) for reimbursable activities carried out by this account:
FY 2020 - $21,040 FY 2021 - $23,000 FY 2022 - $23,665

[2] Of which $70.0 million in FY 2020, $50.0 million in FY 2021, and $76.0 million in FY 2022 is derived by transfer from the NIH Innovation Account under the 21st Century Cures Act.

[3] Reflects 21st Century Cures Act funding not obligated in FY 20, and carried over into FY 21.

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Budget Authority by Object Class[1]

(Dollars in Thousands)

	FY 2021 Enacted	FY 2022 President's Budget	FY 2022 +/- FY 2021 Enacted
Total compensable workyears:			
Full-time equivalent	549	607	58
Full-time equivalent of overtime and holiday hours	0	0	0
Average ES salary	$199	$205	$5
Average GM/GS grade	12.6	12.6	0.0
Average GM/GS salary	$131	$134	$4
Average salary, Commissioned Corps (42 U.S.C. 207)	$111	$114	$3
Average salary of ungraded positions	$150	$154	$4

	OBJECT CLASSES	FY 2021 Enacted	FY 2022 President's Budget	FY 2022 +/- FY 2021
	Personnel Compensation			
11.1	Full-Time Permanent	38,918	45,747	6,828
11.3	Other Than Full-Time Permanent	26,164	26,759	595
11.5	Other Personnel Compensation	2,180	2,229	50
11.7	Military Personnel	431	443	12
11.8	Special Personnel Services Payments	8,995	9,200	205
11.9	**Subtotal Personnel Compensation**	**$76,688**	**$84,378**	**$7,690**
12.1	Civilian Personnel Benefits	25,003	28,114	3,111
12.2	Military Personnel Benefits	356	366	10
13.0	Benefits to Former Personnel	0	0	0
	Subtotal Pay Costs	**$102,048**	**$112,858**	**$10,810**
21.0	Travel & Transportation of Persons	580	1,191	610
22.0	Transportation of Things	289	294	5
23.1	Rental Payments to GSA	1	1	0
23.2	Rental Payments to Others	52	53	1
23.3	Communications, Utilities & Misc. Charges	640	651	12
24.0	Printing & Reproduction	3	3	0
25.1	Consulting Services	60,075	62,757	2,682
25.2	Other Services	47,948	48,452	504
25.3	Purchase of goods and services from government accounts	173,376	181,755	8,379
25.4	Operation & Maintenance of Facilities	2,454	2,488	34
25.5	R&D Contracts	34,795	42,594	7,798
25.6	Medical Care	252	262	9
25.7	Operation & Maintenance of Equipment	4,184	4,257	73
25.8	Subsistence & Support of Persons	0	0	0
25.0	**Subtotal Other Contractual Services**	**$323,084**	**$342,564**	**$19,480**
26.0	Supplies & Materials	14,672	14,934	262
31.0	Equipment	9,897	10,075	178
32.0	Land and Structures	4,438	4,518	80
33.0	Investments & Loans	0	0	0
41.0	Grants, Subsidies & Contributions	2,055,209	2,296,158	240,949
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	**$2,408,865**	**$2,670,442**	**$261,577**
	Total Budget Authority by Object Class	**$2,510,913**	**$2,783,300**	**$272,387**

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

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Salaries and Expenses

(Dollars in Thousands)

OBJECT CLASSES	FY 2021 Enacted	FY 2022 President's Budget	FY 2022 +/- FY 2021
Personnel Compensation			
Full-Time Permanent (11.1)	$38,918	$45,747	$6,828
Other Than Full-Time Permanent (11.3)	26,164	26,759	595
Other Personnel Compensation (11.5)	2,180	2,229	50
Military Personnel (11.7)	431	443	12
Special Personnel Services Payments (11.8)	8,995	9,200	205
Subtotal Personnel Compensation (11.9)	**$76,688**	**$84,378**	**$7,690**
Civilian Personnel Benefits (12.1)	$25,003	$28,114	$3,111
Military Personnel Benefits (12.2)	356	366	10
Benefits to Former Personnel (13.0)	0	0	0
Subtotal Pay Costs	**$102,048**	**$112,858**	**$10,810**
Travel & Transportation of Persons (21.0)	$580	$1,191	$610
Transportation of Things (22.0)	289	294	5
Rental Payments to Others (23.2)	52	53	1
Communications, Utilities & Misc. Charges (23.3)	640	651	12
Printing & Reproduction (24.0)	3	3	0
Other Contractual Services:			
Consultant Services (25.1)	59,322	61,990	2,669
Other Services (25.2)	47,948	48,452	504
Purchases from government accounts (25.3)	107,614	111,962	4,348
Operation & Maintenance of Facilities (25.4)	2,454	2,488	34
Operation & Maintenance of Equipment (25.7)	4,184	4,257	73
Subsistence & Support of Persons (25.8)	0	0	0
Subtotal Other Contractual Services	**$221,522**	**$229,149**	**$7,627**
Supplies & Materials (26.0)	$14,672	$14,934	$262
Subtotal Non-Pay Costs	**$237,758**	**$246,275**	**$8,517**
Total Administrative Costs	**$339,805**	**$359,133**	**$19,327**

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Detail of Full-Time Equivalent Employment (FTE)

OFFICE/DIVISION	FY 2020 Final			FY 2021 Enacted			FY 2022 President's Budget		
	Civilian	Military	Total	Civilian	Military	Total	Civilian	Military	Total
Division of Clinical Research									
Direct:	17	-	17	19	-	19	20	-	20
Reimbursable:	1	-	1	1	-	1	1	-	1
Total:	18	-	18	20	-	20	21	-	21
Division of Extramural Activities									
Direct:	58	-	58	60	-	60	61	-	61
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	58	-	58	60	-	60	61	-	61
Division of Intramural Research									
Direct:	282	4	286	296	4	300	332	5	337
Reimbursable:	14	-	14	14	-	14	14	-	14
Total:	296	4	300	310	4	314	346	5	351
Division of Neuroscience									
Direct:	44	-	44	46	-	46	53	-	53
Reimbursable:	4	-	4	4	-	4	4	-	4
Total:	48	-	48	50	-	50	57	-	57
Division of Translational Research									
Direct:	24	-	24	27	-	27	31	-	31
Reimbursable:	3	-	3	3	-	3	3	-	3
Total:	27	-	27	30	-	30	34	-	34
Office of the Director									
Direct:	74	-	74	75	-	75	83	-	83
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	74	-	74	75	-	75	83	-	83
Total	521	4	525	545	4	549	602	5	607
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
2018	12.5
2019	12.6
2020	12.6
2021	12.6
2022	12.6

NATIONAL INSTITUTES OF HEALTH
National Institute of Neurological Disorders and Stroke

Detail of Positions[1]

GRADE	FY 2020 Final	FY 2021 Enacted	FY 2022 President's Budget
Total, ES Positions	1	1	1
Total, ES Salary	197,300	199,273	204,653
General Schedule			
GM/GS-15	57	66	68
GM/GS-14	78	82	96
GM/GS-13	98	102	113
GS-12	60	62	63
GS-11	19	21	22
GS-10	2	2	2
GS-9	14	15	15
GS-8	5	6	6
GS-7	6	5	5
GS-6	1	1	1
GS-5	3	3	3
GS-4	3	3	3
GS-3	1	1	1
GS-2	3	3	3
GS-1	0	1	1
Subtotal	350	373	402
Commissioned Corps (42 U.S.C. 207)			
Assistant Surgeon General	0	0	0
Director Grade	0	0	0
Senior Grade	0	0	0
Full Grade	4	4	5
Senior Assistant Grade	0	0	0
Assistant Grade	0	0	0
Subtotal	4	4	5
Ungraded	206	209	209
Total permanent positions	358	364	398
Total positions, end of year	561	587	617
Total full-time equivalent (FTE) employment, end of year	525	549	607
Average ES salary	197,300	199,273	204,653
Average GM/GS grade	12.6	12.6	12.6
Average GM/GS salary	129,249	130,541	134,066

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