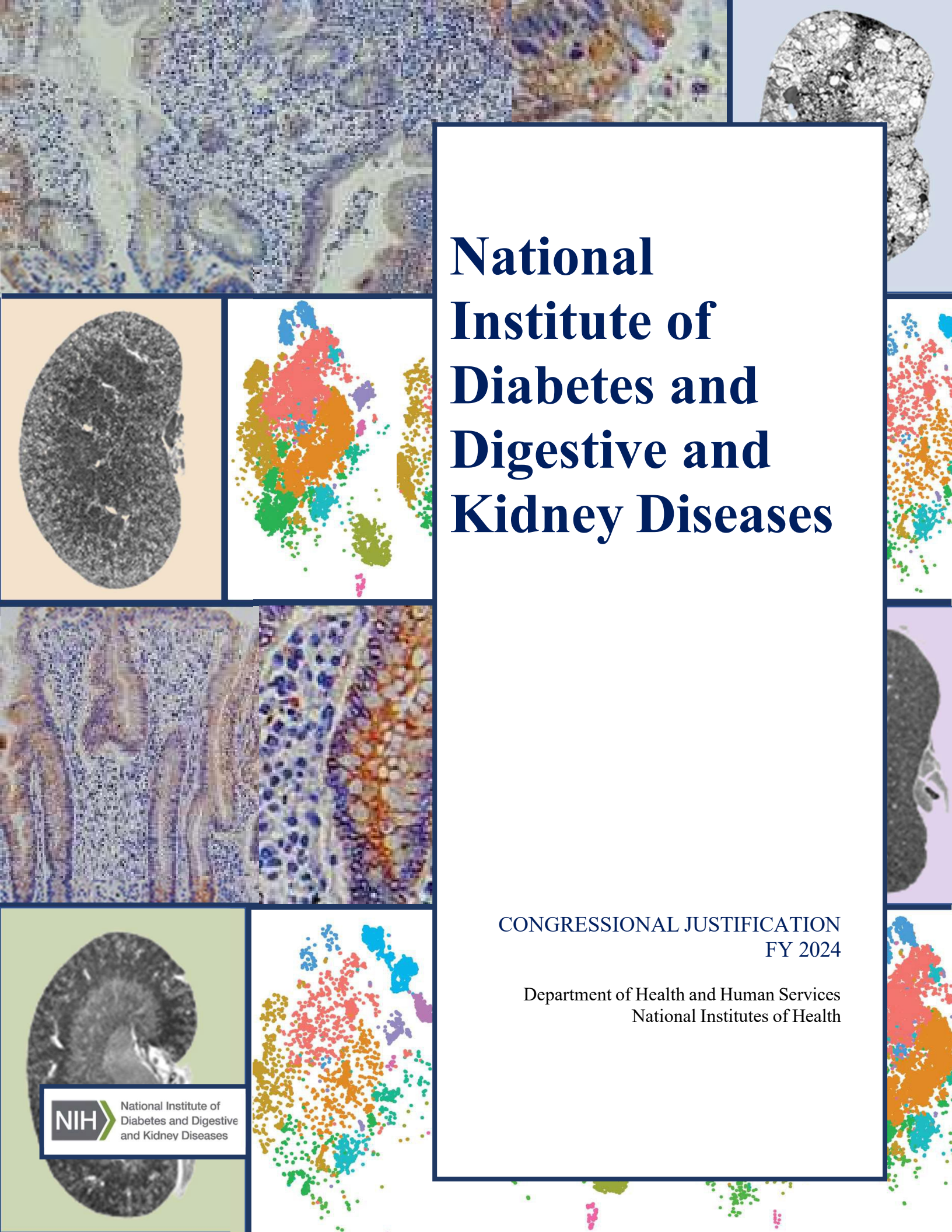

National Institute of Diabetes and Digestive and Kidney Diseases

CONGRESSIONAL JUSTIFICATION
FY 2024

Department of Health and Human Services
National Institutes of Health

NIH National Institute of Diabetes and Digestive and Kidney Diseases

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DEPARTMENT OF HEALTH AND HUMAN SERVICES

NATIONAL INSTITUTES OF HEALTH

National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)

FY 2024 Budget Table of Contents

General Notes

1. FY 2023 Enacted levels cited in this document include the effects of the FY 2023 HIV/AIDS transfer, as shown in the Amounts Available for Obligation table, pg 28.
2. Detail in this document may not sum to the subtotals and totals due to rounding.

Cover page images from NIDDK-supported research: (1) Reprinted from Cell, Volume 185, Issue 2, Rana N, Privitera G, Kondolf HC,…Pizarro TT, GSDMB is increased in IBD and regulates epithelial restitution/repair independent of pyroptosis, Pages 283-298.e17, Copyright 2022, with permission from Elsevier; (2) Reprinted by permission from Springer Nature Customer Service Centre GmbH: Springer Nature, Nature Genetics, Renal plasticity revealed through reversal of polycystic kidney disease in mice, Dong K, Zhang C, Tian X,…Somlo S, Copyright © 2021, The Author(s), under exclusive license to Springer Nature America, Inc.; and (3) Images provided by Dr. Aristidis Veves, Harvard University, and Dr. Manoj Bhasin, Emory University. Originally published in Theocharidis G, Thomas BE, Sarkar D,…Bhasin M. Single cell transcriptomic landscape of diabetic foot ulcers. Nat Commun 13: 181, 2022. Reprinted under the terms of the Creative Commons CC-BY license.

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Director's Overview

GRIFFIN P. RODGERS, M.D., M.A.C.P.
DIRECTOR OF NIDDK

The mission of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) is to support and conduct research to combat diabetes and other endocrine and metabolic diseases; liver and other digestive diseases; nutritional disorders; obesity; and kidney, urologic, and hematologic diseases. Our Institute's mission includes some of the most chronic, common, and costly diseases and conditions affecting the U.S. population, as well as other conditions that are less widespread but still devastating. Many of these diseases and conditions also place a disproportionate burden on ethnic and racial minority groups, underscoring the importance of pursuing research toward health equity. Diabetes affects an estimated 37.3 million people in the United States, greatly increasing the risk for many serious complications, such as heart disease and kidney failure.[1] Estimates of chronic kidney disease show that about 37 million Americans are affected, and over 809,000 people were treated for irreversible kidney failure in the United States in 2019.[2] Many urologic diseases, such as urinary incontinence, urinary tract infections, and benign prostatic hyperplasia, are also highly prevalent.[3] Digestive diseases accounted for an estimated 66.4 million ambulatory care visits to doctor's offices, outpatient hospital clinics, and emergency departments, as well as 16.7 million hospitalizations with digestive diseases as a primary or secondary diagnosis in 2019.[4] Nearly 42 percent of U.S. adults and nearly 20 percent of children and adolescents have obesity.[5] It is a strong risk factor for type 2 diabetes; fatty liver disease, including nonalcoholic steatohepatitis (NASH); and many other diseases. Cystic fibrosis and other genetic diseases within NIDDK's purview are less common, but still severe in their impacts. Building on emerging opportunities from past research investments and driven by a commitment to health equity, our Institute will continue its vigorous pursuit of research to combat the diseases and disorders within its mission, guided by the following priorities: maintain a vigorous investigator-initiated research portfolio, support pivotal clinical studies and trials, promote a steady and diverse pool of talented new investigators, foster exceptional research training and mentoring opportunities, and ensure knowledge dissemination through outreach and communications.

Addressing Health Disparities and Scientific Workforce Diversity in Pursuit of Health Equity

Many NIDDK mission diseases place disparate burdens on racial and ethnic minority groups, rural populations, and people with lower incomes. As emphasized in the Institute's recent Strategic Plan for Research,[6] we are committed to promoting the public good by addressing health disparities and working to achieve health equity. For example, NIDDK sponsored a workshop to propel research to develop interventions focused on social networks and structures

[1] www.cdc.gov/diabetes/data/statistics-report/index.html
[2] www.cdc.gov/kidneydisease/publications-resources/ckd-national-facts.html; adr.usrds.org/2021
[3] www.niddk.nih.gov/-/media/Files/Strategic-Plans/urologic/Urologic_Diseases_in_America41312.pdf
[4] www.cdc.gov/nchs/ahcd/index.htm; www.hcup-us.ahrq.gov/nisoverview.jsp
[5] www.cdc.gov/nchs/data/nhsr/nhsr158-508.pdf
[6] www.niddk.nih.gov/about-niddk/strategic-plans-reports/niddk-strategic-plan-for-research

to combat diabetes health disparities.[7] Another important workshop on interventions addressing structural racism to reduce kidney health disparities informed the development of recent initiatives on this critical topic.[8] NIDDK also supports research to promote organ and tissue donation among health disparity populations, and participates in an NIH-wide effort encouraging equitable dissemination and implementation of evidence-based interventions among underrepresented communities.[9] Results from the Institute's health disparities research show associations between historic practices of redlining (denying services to residents of specific neighborhoods or communities) and present-day diabetes mortality, a sobering finding that highlights the long-term impact of structural racism on health outcomes.[10] Another study on nonalcoholic fatty liver disease (NAFLD) in children, most of whom were of Hispanic ethnicity, showed that some genetic variants increase risk of disease, particularly its more severe form.[11] Other key insights are emerging from the Inflammatory Bowel Disease (IBD) Genetics Consortium, which expanded the scope of its genetic studies to include a more diverse array of ancestries.[12] NIDDK has also been a leader at providing its staff with tools for advancing racial and ethnic equity, such as through its pioneering Race Ahead program. The program empowers staff to make positive changes to promote equity, diversity, inclusion, and accessibility at NIDDK and beyond. The first cohort of Race Ahead staff have already put their new knowledge into practice, for example by creating a conference travel/registration fellowship to support scientists from diverse backgrounds.[13]

Future research will be informed by an important new Heath Disparities/Health Equity (HD/HE) Research Implementation Plan under development by the HD/HE Working Group of NIDDK's Advisory Council.[14] It will complement the Institute's Strategic Plan by identifying specific research opportunities that NIDDK could pursue to enhance its health equity research portfolio. Community and other stakeholder engagement is a critical part of both Plans to help ensure that our research benefits *all* populations. Such engagement has already benefitted many of our ongoing studies, and we recently spearheaded new initiatives on Stakeholder Engagement Innovation Centers for type 1 and type 2 diabetes to promote health equity.[15]

NIDDK also works to enhance diversity and inclusivity within its scientific workforce to ensure that research benefits from the best scientific minds and diverse insights. NIDDK supports several research training and early career development opportunities for individuals from diverse backgrounds. For example, we are continuing successful programs supporting educational activities to encourage high school students, undergraduate students, and junior faculty from diverse backgrounds to pursue research careers.[16] NIDDK is also enhancing career development

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[7] www.niddk.nih.gov/news/meetings-workshops/2022/social-component-diabetes-social-networks-structures

[8] www.niddk.nih.gov/news/meetings-workshops/2022/designing-interventions-address-structural-racism-reduce-kidney-health-disparities; grants.nih.gov/grants/guide/rfa-files/RFA-DK-22-014.html

[9] grants.nih.gov/grants/guide/rfa-files/rfa-dk-22-003.html; grants.nih.gov/grants/guide/pa-files/par-22-105.html

[10] Linde S, et al. Diabetes Care 45: 1772-1778, 2022.

[11] Goyal NP, et al. Hepatology doi:10.1002/hep.32570, 2022.

[12] www.ibdgenetics.org/

[13] www.niddk.nih.gov/about-niddk/meet-director/directors-update/2022-fall/news-around-niddk/#section3

[14] www.niddk.nih.gov/about-niddk/strategic-plans-reports/developing-inaugural-niddk-health-disparities-health-equity-research-implementation-plan

[15] grants.nih.gov/grants/guide/rfa-files/rfa-dk-22-001.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-22-019.html

[16] grants.nih.gov/grants/guide/rfa-files/rfa-dk-22-004.html; www.niddk.nih.gov/research-funding/research-programs/diversity-programs/research-training-opportunities-students/step-up

opportunities for scientists from diverse backgrounds to help them successfully compete for independent research funding.[17] While leading efforts to increase racial and ethnic diversity, we also support initiatives to attract new expertise to tackle our disease areas, including an innovative national program to attract physician scientists to pursue research careers.[18]

Research To Address the Lifetime Burden of Chronic Diseases

NIDDK remains committed to pursuing pioneering research to address the burden of chronic diseases for all people across the lifespan. Our Glycemic Observation and Metabolic Outcomes in Mothers and Offspring study is providing an unprecedented opportunity to improve the health of mothers and offspring by better understanding blood glucose levels throughout pregnancy and predicting which women may develop gestational diabetes.[19] Based on alarming data showing that people with type 2 diabetes diagnosed during youth have a high risk of developing complications at an early age, NIDDK supports urgently needed research to inform novel prevention and treatment approaches for this population.[20] Obesity is a risk factor for type 2 diabetes and other chronic diseases, so the Institute also supports research to prevent obesity in early life. For example, a recent study showed that a responsive parenting intervention that helped new parents prevent childhood obesity in their first-born children also had beneficial effects on the growth of their second-born children years later.[21] Building on such progress, NIDDK plans to support new research to characterize early-life risk factors for pediatric obesity.[22] We also plan to continue efforts that are providing critical insights about pediatric liver and kidney diseases to improve children's short- and long-term health.[23]

NIDDK research is critical for tackling emerging scientific areas and public health challenges that may worsen the already high burden of chronic diseases. For example, new research will focus on the urgent public health issue of increasing rates of new-onset diabetes in adults and children following SARS-CoV-2 infection.[24] The NASH Clinical Research Network conducts studies in children and adults to address increasing diagnoses of NAFLD concurrent with rising rates of overweight and obesity.[25] The Institute also supports a consortium to address the significant increase in the global burden of chronic kidney diseases of uncertain or non-traditional etiologies, and research to develop interventions to reduce opioid use in people on hemodialysis in response to the public health crisis of chronic pain and related opioid overuse.[26] NIDDK also supports research to combat HIV/AIDS and its associated comorbidities, coinfections, and complications relevant to NIDDK's mission.[27] In this endeavor, multi-

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[17] grants.nih.gov/grants/guide/rfa-files/rfa-dk-22-002.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-034.html

[18] grants.nih.gov/grants/guide/rfa-files/RFA-DK-21-019.html; grants.nih.gov/grants/guide/rfa-files/RFA-DK-22-006.html

[19] www.gomomsstudy.org/

[20] grants.nih.gov/grants/guide/rfa-files/rfa-dk-21-002.html; grants.nih.gov/grants/guide/rfa-files/RFA-DK-21-003.html

[21] Savage JS, et al. Obesity 30: 183-190, 2022.

[22] grants.nih.gov/grants/guide/rfa-files/RFA-DK-21-025.html

[23] childrennetwork.org/; grants.nih.gov/grants/guide/rfa-files/RFA-DK-22-504.html; grants.nih.gov/grants/guide/rfa-files/RFA-DK-22-505.html; grants.nih.gov/grants/guide/rfa-files/RFA-DK-22-010.html

[24] grants.nih.gov/grants/guide/rfa-files/RFA-DK-22-016.html

[25] jhuccs1.us/nash/

[26] grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-017.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-018.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-019.html; www.HOPEHDTrial.org

[27] grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-022.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-023.html

disciplinary teams—composed of HIV scientists and experts on NIDDK-related areas—allow for more in-depth analyses than would be possible if scientists worked independently. Such team-based, interdisciplinary science is critical for tackling many NIDDK diseases that are complex and often require differing expertise to tease apart underlying biological mechanisms of disease.

Investing in Foundational and Innovative Research Toward Developing Novel Prevention and Treatment Approaches

NIDDK investment in research to advance foundational knowledge has enhanced our understanding of diseases and led to dramatic improvements in prevention and treatment. For example, a new U.S. Food and Drug Administration (FDA)-approved treatment to alleviate the debilitating itching associated with a pediatric liver disease was based in part on ground-breaking research conducted by our Childhood Liver Disease Research Network.[28] Recent exciting clinical trial results with direct implications for patient care showed that two popular type 2 diabetes drugs outperformed two others in a head-to-head study, and that a "bionic pancreas" device that automates type 1 diabetes management improved blood glucose control in children and adults.[29] Looking ahead, NIDDK-supported research to tackle undiscovered areas of science can transform understanding of human disease and its management. For example, recent studies showed that a molecule produced during exercise may provide new therapeutic opportunities to capture the benefits of physical activity, and that the health benefits of dietary fiber depend on the fiber type, the amount, and the individual.[30] Additional new insights are expected from the Accelerating Medicines Partnerships® Common Metabolic Diseases program, which is adding substantial amounts of new data to understand the genes and pathways that underlie metabolic diseases, including type 1 and type 2 diabetes. Our new Liver Cirrhosis Network is poised to expand treatment options and transform clinical care for people with this potentially life-threatening condition. New insights from our bold Kidney Precision Medicine Project are shedding light on different types of kidney diseases and advancing precision medicine.[31]

NIDDK has invested resources in recent fiscal years by supporting critical research programs to address pressing public health needs. For example, NIDDK began soliciting applications for an innovative Stakeholder Engagement Innovation Center to provide research resources to educate investigators in partner- and community-engaged research and advance health equity in type 2 diabetes.[32] We also began a new multicenter clinical trial testing two different types of therapies as compared to supportive care alone for children who do not have a treatable cause for their liver failure.[33] Additionally, the Caring for OutPatiEnts after Acute Kidney Injury (COPE-AKI) consortium is developing and testing interventions to improve clinical outcomes among people surviving an episode of acute kidney injury.[34] NIDDK will continue to be guided by its recent Strategic Plan for Research to accelerate research progress and improve the health of people affected by diseases and conditions within our mission.

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[28] Shneider BL, et al. Hepatol Commun 6: 1922-1933, 2022.
[29] Nathan DM, et al. N Engl J Med 387: 1063-1074, 2022; Russell SJ, et al. N Engl J Med 387: 1161-1172, 2022.
[30] Li VL, et al. Nature 606: 785-790, 2022; Lancaster SM, et al. Cell Host Microbe 30: 848-862.e7, 2022.
[31] Patel J, et al. Clin J Am Soc Nephrol 17: 594-601, 2022; Menon R, et al. Kidney Int 101: 1116-1125, 2022.
[32] grants.nih.gov/grants/guide/rfa-files/rfa-dk-22-001.html
[33] www.pedsalf.com/
[34] grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-011.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-012.html

NATIONAL INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES

Griffin P. Rodgers, M.D., M.A.C.P.

Dr. Rodgers has been Director of NIDDK since 2007 and had served as Deputy Director since 2001. As a leading hematology investigator, he is widely recognized for his contributions to development of the first effective—and FDA-approved—therapy for sickle cell anemia.

Introduction to NIDDK Research

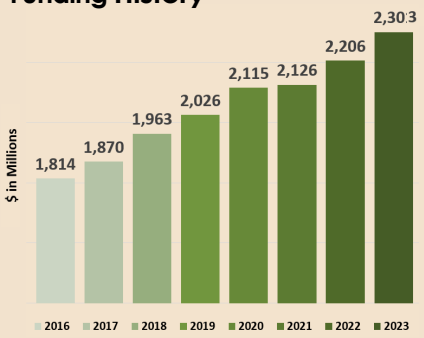
Established in 1950, NIDDK supports and conducts research on some of the most chronic, common, and costly conditions, including diabetes and other endocrine and metabolic diseases, liver and other digestive diseases, obesity, kidney diseases, urologic diseases, and hematologic (blood) diseases. The Diabetes, Endocrinology, and Metabolic Diseases program; the Digestive Diseases and Nutrition program; the Kidney, Urologic, and Hematologic Diseases program; and the NIDDK Intramural Research Program support basic, clinical, and translational research across the United States. NIDDK also supports research training and career development, as well as outreach efforts to patients, healthcare providers, and the public.

NIDDK Efforts to Address Health Disparities and Promote Health Equity

Many of the diseases in NIDDK's mission place disparate burdens on racial and ethnic minority groups, rural populations, and people with lower incomes. Examples of NIDDK's efforts to eliminate health disparities and advance health equity include:

- A Working Group of NIDDK's Advisory Council that is developing a Health Disparities and Health Equity Research Implementation Plan to identify specific research needs and opportunities.
- Stakeholder Engagement Innovation Centers for type 1 and type 2 diabetes to promote engagement of communities and individuals who experience diabetes-related health disparities.
- Clinical trials that aim to improve diabetes technology usage in individuals with type 1 diabetes from racial and ethnic underrepresented backgrounds.
- A new phase of the Inflammatory Bowel Disease (IBD) Genetics Consortium that is recruiting more participants from minority populations, providing a clearer picture of how genetics intersect with IBD risk across all populations.
- Researchers who developed a potential new way to diagnose kidney disease that eliminates race as a variable, an important step toward eliminating health disparities in estimating kidney function.
- A new consortium that will test community-engaged interventions to dismantle or mitigate the effects of structural racism in the care and outcomes of people living with kidney disease.
- Continued efforts to foster a diverse biomedical workforce through research training and career development programs. For example, Helping to Accelerate Research Potential (HARP) aims to provide opportunities and mentorship for current NIDDK grantees, especially postdoctoral scholars and junior faculty from diverse backgrounds.

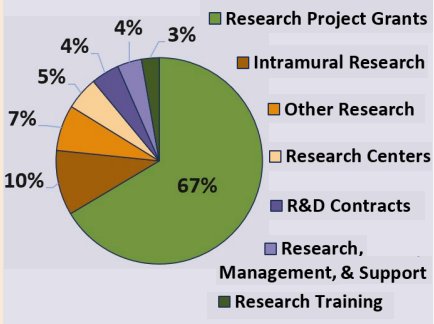
Funding History*



FY 2024 President's Budget Request (in millions): $2,303

*excludes mandatory T1D funding

FY 2022 Funding Support



Selected Current Activities

- NIDDK is supporting the Rare and Atypical Diabetes Network that could yield insight not only into rare forms of diabetes, but also into the heterogeneity of type 2 diabetes.
- The Human Pancreas Analysis Program is analyzing pancreata from people with and without diabetes at various stages of disease progression, making the data available to the research community, and providing knowledge to inform new strategies to reverse or prevent disease.
- The Physiology of the Weight Reduced State Clinical Trial Consortium is gaining insights into the causes of individual variability in maintenance of reduced weight over time.
- The Liver Cirrhosis Network is conducting research toward transforming clinical care for liver cirrhosis by identifying potentially effective treatment options beyond liver transplantation.
- The Hemodialysis Opioid Prescription Effort Consortium is developing interventions to reduce opioid use in people on hemodialysis.

NIDDK Recent Advances and Emerging Opportunities

NIDDK Recent Advances and Emerging Opportunities is an annual compendium that highlights recent advances from NIDDK-supported studies, along with personal stories of people who have given time and effort to participate in NIDDK-sponsored clinical research.

niddk.nih.gov/about-niddk/strategic-plans-reports

NIDDK at a Glance

Number of FTE Employees: 651

4-year average, FYs 2019–2022

2022 Research Project Grants*

Funded Principal Investigators: **828**

Competing Applications Awarded: **641**

*excludes mandatory T1D funding

2022 Paylines and Early Stage Investigators (ESIs*)

RO1 Payline: **16%**

ESI Payline: **25%**

ESI Renewal Payline: **19%**

Number of ESIs: **102**

*excludes new investigators who are not ESIs

Selected Recent Accomplishments

- A preliminary clinical study found that the oral medication verapamil may help preserve pancreatic insulin-producing beta cell health in people newly diagnosed with type 1 diabetes.
- Researchers have discovered that a molecule produced during exercise by various mammals, including people, can reduce food consumption and obesity in mice.
- Studies provided valuable insights into the gut microbiome, including how different types of fiber have specific effects on the microbiome and human health, and how the microbiome could keep the gut's immune system in check to prevent inflammation.
- A recent study showed that an intervention that teaches first-time parents how to interact constructively with their infant can be an important and effective childhood obesity prevention strategy for second-born siblings as well.
- A study in mice showed that kidney damage caused by autosomal dominant polycystic kidney disease can largely be reversed by activating the normal version of a faulty gene.

Selected Future Research Initiatives

New clinical studies will aim to understand the increasing rates of new-onset diabetes in adults and children following SARS-CoV-2 infection.

Research will characterize interactions between different pancreatic functions, shedding new light on type 1 diabetes progression and potential innovative approaches for therapy.

Studies will focus on identifying genes and their variants that play a role in IBD and understanding how they influence disease, so potential treatments can be developed.

A clinical study in children with Crohn's disease will aim to link pre-treatment characteristics and the ability to achieve complete healing after one year of anti-TNF therapy.

The next phase of the George M. O'Brien Kidney Centers will create innovation hubs to develop new and improved resources to advance kidney research.

Recent NIDDK Research Highlights

Type 2 diabetes medications made possible by NIDDK research provided cardiovascular health benefits in people with diabetes, and one of these drugs was also recently approved as a treatment for obesity.

Important findings are shedding new light on prevention and therapeutic strategies for diabetic foot ulcers and set the stage for further clinical studies.

Recent studies on inflammatory bowel disease have dug deeper into the genetics of the disease in diverse populations, offering potential pathways to better diagnosis and treatment.

A treatment for Alagille syndrome, a pediatric liver disease, was recently approved by the FDA based in a large part on research by NIDDK's Childhood Liver Disease Research Network.

Researchers found that people with kidney stones have a lower chance of relapse after stone removal when smaller, asymptomatic stones are removed during the surgery as well.

Major Changes in the Fiscal Year 2024 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 will not sum to the total change for the FY 2024 President's Budget. The FY 2024 President's Budget request for NIDDK, excluding mandatory funding for Type 1 Diabetes, is $2,303.1 million, the same as the FY 2023 Enacted level. In addition, the Budget proposes to reauthorize the Special Type 1 Diabetes Program through 2026, providing $250.0 million in 2024, $260.0 million in 2025, and $270.0 million in 2026. The FY 2024 President's Budget reflects the Administration's fiscal policy goals for the Federal Government. Within that framework, NIDDK will pursue its highest research priorities through strategic investments and careful stewardship of appropriated funds.

Research Project Grants (RPGs) (-$10.9 million; total $1,522.1 million): NIDDK will increase funding for non-competing RPGs by $11.3 million, including funding increasing non-competing awards at their full commitment level. Funding for competing RPGs is expected to decrease by $22.6 million, or 6.4 percent, relative to the FY 2023 Enacted level, resulting in 58 fewer grants compared to the FY 2023 Enacted level of 697 awards. These changes in funding are distributed across all programmatic areas and basic, translational or clinical research.

Research Centers (+$0.4 million; total $115.1 million): NIDDK will increase funding for Research Centers by 0.3 percent compared to the FY 2023 Enacted level. These increases are distributed across all programmatic areas and basic, translational or clinical research.

Other Research (+$0.7 million; total $163.5 million): NIDDK will increase funding for Other Research by 0.4 percent compared to the FY 2023 Enacted level. These increases are distributed across all programmatic areas and basic, translational or clinical research.

R&D Contracts (+$2.4 million; total $103.1 million): NIDDK will increase funding for R&D Contracts by 2.4 percent compared to the FY 2023 Enacted level. These increases are distributed across all programmatic areas and basic, translational or clinical research.

Intramural Research (+$6.5 million; total $244.3 million): NIDDK will increase funding for Intramural Research by 2.7 percent compared to the FY 2023 Enacted level. These increases will cover pay raises for intramural researchers and other inflationary costs, and are distributed across all programmatic areas and basic, translational or clinical research.

Research Management and Support (+$0.9 million; total $90.5 million): NIDDK will increase funding for Research, Management, and Support by 1.0 percent compared to the FY 2023 Enacted level. These increases will cover pay raises for RMS staff and other inflationary costs, and are distributed across all administrative support areas of basic, translational or clinical research.

NATIONAL INSTITUTES OF HEALTH

National Institute of Diabetes and Digestive and Kidney Diseases

Budget Mechanism*

(Dollars in Thousands)

Mechanism	FY 2022 Final		FY 2023 Enacted		FY 2024 President's Budget		FY 2024 +/- FY 2023	
	Number	Amount	Number	Amount	Number	Amount	Number	Amount
Research Projects:								
Noncompeting	2,110	$1,079,109	2,102	$1,096,150	2,077	$1,107,486	-25	$11,336
Administrative Supplements	*(143)*	$15,635	*(125)*	$13,000	*(120)*	$13,000	*-(5)*	$0
Competing:								
Renewal	115	$63,020	125	$71,776	121	$70,600	-4	-$1,176
New	525	$246,894	571	$281,198	517	$259,813	-54	-$21,385
Supplements	1	$137	1	$157	1	$160	0	$3
Subtotal, Competing	**641**	**$310,052**	**697**	**$353,131**	**639**	**$330,573**	**-58**	**-$22,558**
Subtotal, RPGs	2,751	$1,404,796	2,799	$1,462,281	2,716	$1,451,059	-83	-$11,222
SBIR/STTR	104	$68,305	108	$70,650	109	$71,000	1	$350
Research Project Grants	2,855	$1,473,100	2,907	$1,532,931	2,825	$1,522,059	-82	-$10,872
Research Centers								
Specialized/Comprehensive	87	$109,735	91	$114,641	91	$115,000	0	$359
Clinical Research	0	$0	0	$0	0	$0	0	$0
Biotechnology	0	$0	0	$0	0	$0	0	$0
Comparative Medicine	0	$50	0	$50	0	$50	0	$0
Research Centers in Minority Institutions	0	$0	0	$0	0	$0	0	$0
Research Centers	**87**	**$109,785**	**91**	**$114,691**	**91**	**$115,050**	**0**	**$359**
Other Research:								
Research Careers	482	$86,071	496	$88,571	495	$89,000	-1	$429
Cancer Education	0	$0	0	$0	0	$0	0	$0
Cooperative Clinical Research	0	$0	0	$0	0	$0	0	$0
Biomedical Research Support	0	$0	0	$0	0	$0	0	$0
Minority Biomedical Research Support	0	$227	0	$532	0	$532	0	$0
Other	110	$64,957	125	$73,743	124	$74,000	-1	$257
Other Research	**592**	**$151,256**	**621**	**$162,846**	**619**	**$163,532**	**-2**	**$686**
Total Research Grants	3,534	$1,734,141	3,619	$1,810,468	3,535	$1,800,641	-84	-$9,827
Ruth L Kirschstein Training Awards:	FTTPs		FTTPs		FTTPs		FTTPs	
Individual Awards	285	$13,748	280	$13,748	275	$13,748	-5	$0
Institutional Awards	751	$47,895	753	$50,762	750	$50,762	-3	$0
Total Research Training	**1,036**	**$61,643**	**1,033**	**$64,510**	**1,025**	**$64,510**	**-8**	**$0**
Research & Develop. Contracts	136	$98,811	140	$100,689	141	$103,120	1	$2,431
SBIR/STTR (non-add)	*(3)*	*($885)*	*(3)*	*($900)*	*(3)*	*($950)*	*(0)*	*($50)*
Intramural Research	377	$225,327	388	$237,831	438	$244,331	50	$6,500
Res. Management & Support	308	$86,310	318	$89,600	318	$90,496	0	$896
SBIR Admin. (non-add)		*($2)*		*($50)*		*($50)*		*($0)*
Total, NIDDK	**685**	**$2,206,231**	**706**	**$2,303,098**	**756**	**$2,303,098**	**50**	**$0**

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

NATIONAL INSTITUTES OF HEALTH

Type 1 Diabetes

Budget Mechanism [*,1]

(Dollars in Thousands)

Mechanism	FY 2022 Final[2,3]		FY 2023 Enacted[3]		FY 2024 President's Budget		FY 2024 +/- FY 2023	
	Number	Amount	Number	Amount	Number	Amount	Number	Amount
Research Projects:								
Noncompeting	73	$73,444	99	$110,037	180	$180,875	81	$70,838
Administrative Supplements	*(1)*	$189	*(4)*	$5,000	*(20)*	$20,000	*(16)*	$15,000
Competing:								
Renewal	0	$174	0	$0	2	$2,000	2	$2,000
New	43	$30,597	36	$19,250	23	$28,200	-13	$8,950
Supplements	2	$16,769	0	$0	0	$0	0	$0
Subtotal, Competing	**45**	**$47,541**	**36**	**$19,250**	**25**	**$30,200**	**-11**	**$10,950**
Subtotal, RPGs	118	$121,174	135	$134,287	205	$231,075	70	$96,788
SBIR/STTR	19	$8,645	11	$5,163	18	$9,125	7	$3,962
Research Project Grants	137	$129,818	146	$139,450	223	$240,200	77	$100,750
Research Centers								
Specialized/Comprehensive	0	$0	0	$0	0	$0	0	$0
Clinical Research	0	$0	0	$0	0	$0	0	$0
Biotechnology	0	$0	0	$0	0	$0	0	$0
Comparative Medicine	0	$0	0	$0	0	$0	0	$0
Research Centers in Minority Institutions	0	$0	0	$0	0	$0	0	$0
Research Centers	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**
Other Research:								
Research Careers	2	$3,005	0	$0	12	$7,800	12	$7,800
Cancer Education	0	$0	0	$0	0	$0	0	$0
Cooperative Clinical Research	0	$2,000	0	$2,000	0	$2,000	0	$0
Biomedical Research Support	0	$0	0	$0	0	$0	0	$0
Minority Biomedical Research Support	0	$0	0	$0	0	$0	0	$0
Other	5	$6,627	0	$0	0	$0	0	$0
Other Research	**7**	**$11,632**	**0**	**$2,000**	**12**	**$9,800**	**12**	**$7,800**
Total Research Grants	144	$141,450	146	$141,450	235	$250,000	89	$108,550
Ruth L Kirschstein Training Awards:	FTTPs		FTTPs		FTTPs		FTTPs	
Individual Awards	0	$0	0	$0	0	$0	0	$0
Institutional Awards	0	$0	0	$0	0	$0	0	$0
Total Research Training	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**
Research & Develop. Contracts	0	$0	0	$0	0	$0	0	$0
SBIR/STTR (non-add)	*(0)*	*($0)*	*(0)*	*($0)*	*(0)*	*($0)*	*(0)*	*($0)*
Intramural Research	0	$0	0	$0	0	$0	0	$0
Res. Management & Support	0	$0	0	$0	0	$0	0	$0
SBIR Admin. (non-add)		*($0)*		*($0)*		*($0)*		*($0)*
Total, T1D	**0**	**$141,450**	**0**	**$141,450**	**0**	**$250,000**	**0**	**$108,550**

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

1 Figures reflect budget authority provided in each year. A portion of this budget authority will be carried over and obligated in later years.

2 Includes mandatory Type 1 Diabetes funding not obligated in FY 2022 and carried over into FY 2023.

3 FY 2022 and FY 2023 total reflects budget authority (in thousands) of $150,000 reduced by $8,550 for Budget Control Act sequestration.

NATIONAL INSTITUTES OF HEALTH

National Institute of Diabetes and Digestive and Kidney Diseases

For carrying out section 301 and title IV of the PHS Act with respect to diabetes and digestive and kidney disease, **[**$2,300,721,000**]***$2,303,098,000*.

NATIONAL INSTITUTES OF HEALTH
National Institute of Diabetes and Digestive and Kidney Diseases

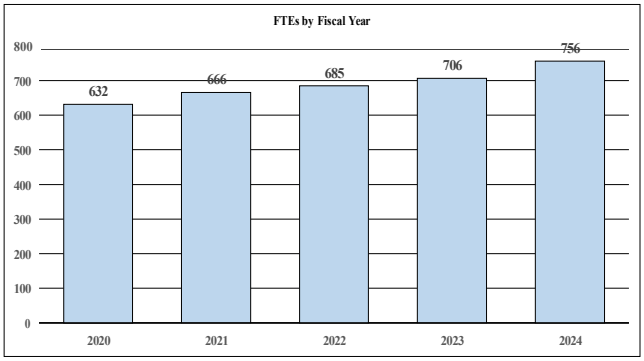
Summary of Changes
(Dollars in Thousands)

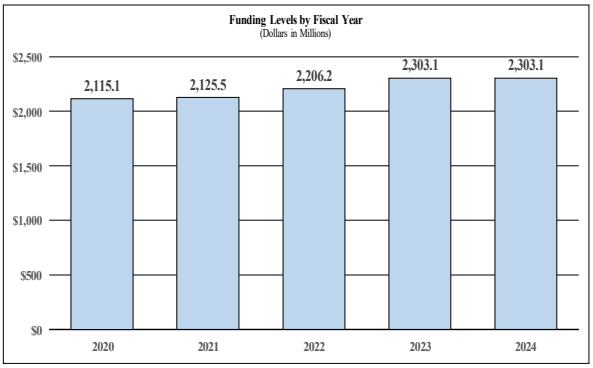
FY 2023 Enacted	$2,303,098
FY 2024 President's Budget	$2,303,098
Net change	$0

CHANGES	FY 2023 Enacted FTEs	FY 2023 Enacted Budget Authority	FY 2024 President's Budget FTEs	FY 2024 President's Budget Budget Authority	Built-In Change from FY 2023 Enacted FTEs	Built-In Change from FY 2023 Enacted Budget Authority
A. Built-in:						
1. Intramural Research:						
a. Annualization of FY 2023 pay and benefits increase		$97,584		$113,321		$1,502
b. FY 2024 pay and benefits increase		$97,584		$113,321		$4,506
c. Paid days adjustment		$97,584		$113,321		$378
d. Differences attributable to change in FTE		$97,584		$113,321		$9,351
e. Payment for centrally furnished services		$36,981		$37,573		$592
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		$103,266		$93,437		$804
Subtotal						$17,133
2. Research Management and Support:						
a. Annualization of FY 2023 pay and benefits increase		$59,543		$63,601		$953
b. FY 2024 pay and benefits increase		$59,543		$63,601		$2,860
c. Paid days adjustment		$59,543		$63,601		$245
d. Differences attributable to change in FTE		$59,543		$63,601		$0
e. Payment for centrally furnished services		$1,440		$1,463		$23
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		$28,617		$25,432		$247
Subtotal						$4,328
Subtotal, Built-in						$21,461

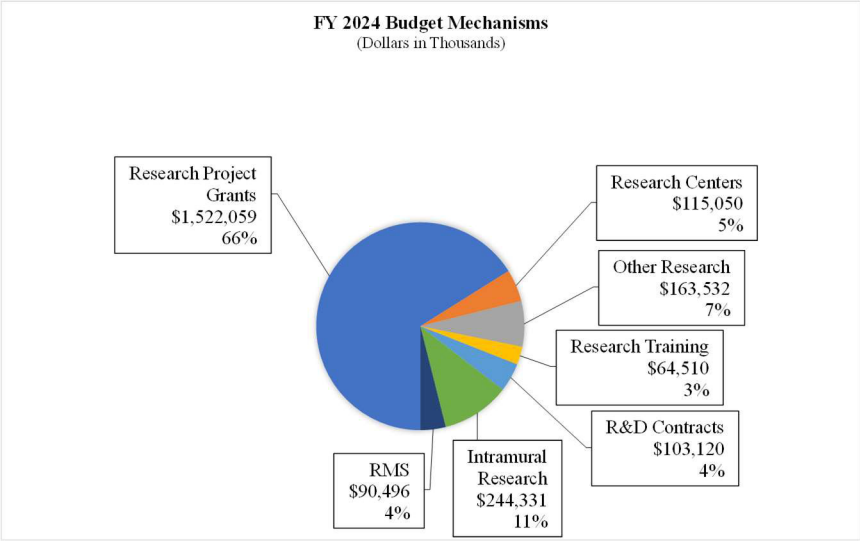
CHANGES	FY 2023 Enacted No.	FY 2023 Enacted Amount	FY 2024 President's Budget No.	FY 2024 President's Budget Amount	Program Change from FY 2023 Enacted No.	Program Change from FY 2023 Enacted Amount
B. Program:						
1. Research Project Grants:						
a. Noncompeting	2,102	$1,109,150	2,077	$1,120,486	-25	$11,336
b. Competing	697	$353,131	639	$330,573	-58	-$22,558
c. SBIR/STTR	108	$70,650	109	$71,000	1	$350
Subtotal, RPGs	2,907	$1,532,931	2,825	$1,522,059	-82	-$10,872
2. Research Centers	91	$114,691	91	$115,050	0	$359
3. Other Research	621	$162,846	619	$163,532	-2	$686
4. Research Training	1,033	$64,510	1,025	$64,510	-8	$0
5. Research and development contracts	140	$100,689	141	$103,120	1	$2,431
Subtotal, Extramural		$1,975,667		$1,968,271		-$7,396
6. Intramural Research	388	$237,831	438	$244,331	50	-$10,633
7. Research Management and Support	318	$89,600	318	$90,496	0	-$3,432
8. Construction		$0		$0		$0
9. Buildings and Facilities		$0		$0		$0
Subtotal, Program	706	$2,303,098	756	$2,303,098	50	-$21,461
Total built-in and program changes						$0

History of Budget Authority and FTEs:

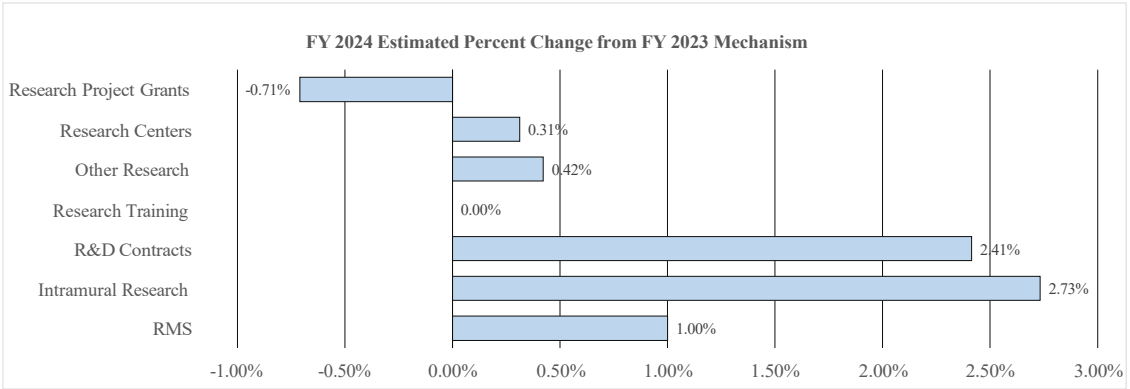




Distribution by Mechanism:



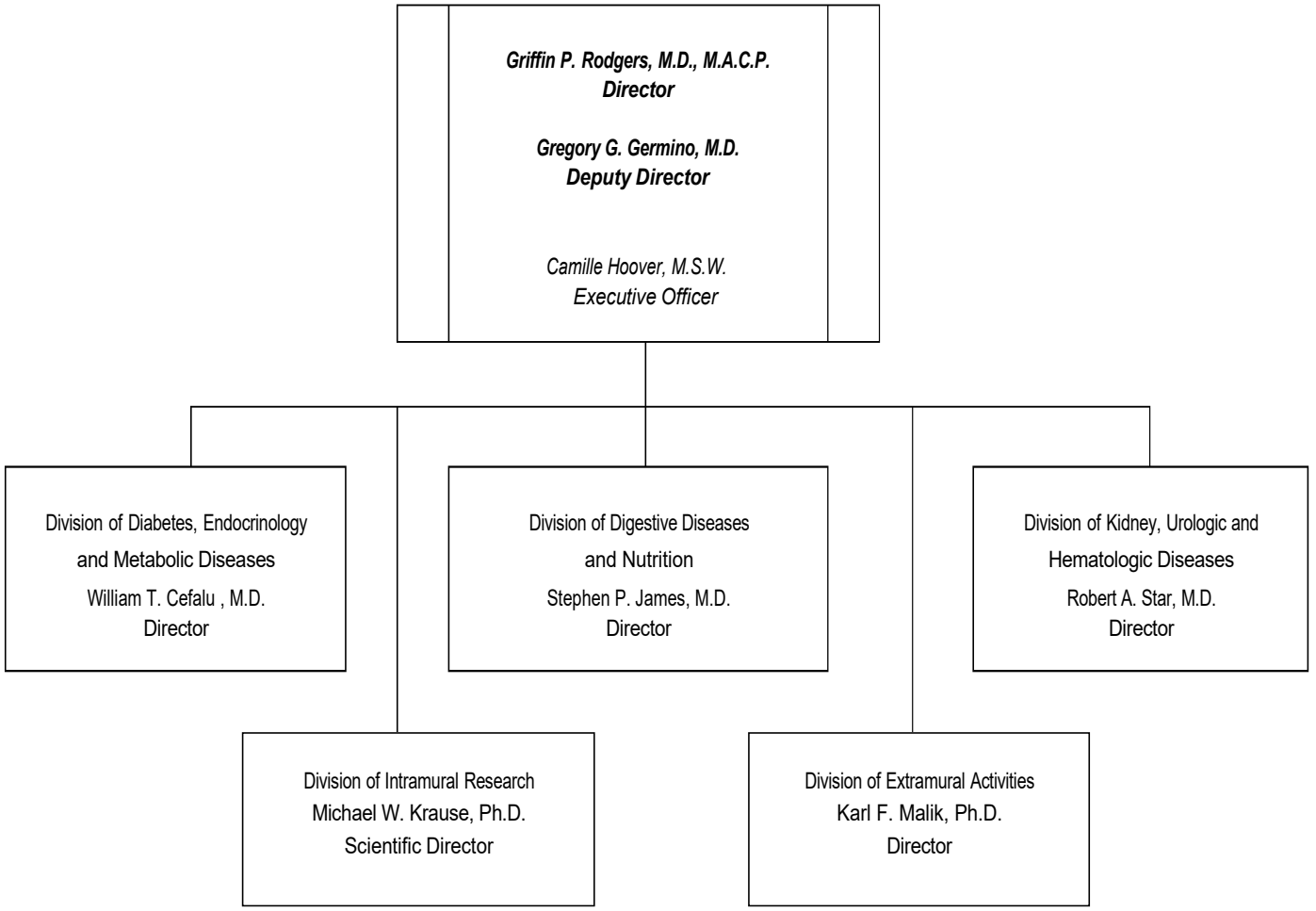
Change by Selected Mechanisms:



NATIONAL INSTITUTES OF HEALTH

National Institute of Diabetes and Digestive and Kidney Diseases

Organization Structure



NATIONAL INSTITUTES OF HEALTH
National Institute of Diabetes and Digestive and Kidney Diseases

Budget Authority by Activity *
(Dollars in Thousands)

	FY 2022 Final		FY 2023 Enacted		FY 2024 President's Budget		FY 2024 +/- FY 2023 Enacted	
Extramural Research	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**
Detail								
Diabetes, Endocrinology, and Metabolic Diseases		$683,793		$713,054		$710,385		-$2,669
Digestive Diseases and Nutrition		$681,743		$710,916		$708,254		-$2,662
Kidney, Urologic, and Hematologic Diseases		$529,058		$551,697		$549,632		-$2,065
(Type 1 Diabetes (mandatory funding)) [1]		*($141,450)*		*($141,450)*		*($250,000)*		*($108,550)*
Subtotal, Extramural		**$1,894,594**		**$1,975,667**		**$1,968,271**		**-$7,396**
Intramural Research	**377**	**$225,327**	**388**	**$237,831**	**438**	**$244,331**	**50**	**$6,500**
Research Management & Support	**308**	**$86,310**	**318**	**$89,600**	**318**	**$90,496**	**0**	**$896**
TOTAL	**685**	**$2,206,231**	**706**	**$2,303,098**	**756**	**$2,303,098**	**50**	**$0**

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

[1] Type 1 Diabetes FY 2022 and FY 2023 amounts reflect budget authority (in thousands) of $150,000 reduced by $8,550 for Budget Control Act sequestration.

Justification of Budget Request

National Institute of Diabetes and Digestive and Kidney Diseases

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

Budget Authority (BA):

	FY 2022 Final	FY 2023 Enacted	FY 2024 President's Budget	FY 2024 +/- FY 2023
BA	$2,347,681,000	$2,444,548,000	$2,553,098,000	$108,550,000
Type 1 Diabetes Mandatory:[35]	-$141,450,000	-$141,450,000	-$250,000,000	-$108,550,000
Labor/HHS	$2,206,231,000	$2,303,098,000	$2,303,098,000	$0
FTE	685	706	756	50

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

Overall Budget Policy: The FY 2024 President's Budget request is $2,303.1 million, excluding mandatory Type 1 Diabetes funding, the same as the FY 2023 Enacted level. This includes $5.0 million targeted to sustain the FY 2023 Enacted level for pain research across the NIDDK portfolio, as part of an NIH-wide initiative to increase research into opioids and pain management. In addition, the Budget proposes to reauthorize the Special Type 1 Diabetes Program through 2026, providing $250.0 million in 2024, $260.0 million in 2025, and $270.0 million in 2026.

Program Descriptions

Diabetes, Endocrinology, and Metabolic Diseases

The objectives of this program are to enhance the understanding of diabetes and other endocrine and metabolic disorders, and to develop and test prevention and treatment strategies. The program supports basic, clinical, and translational research, as well as research training, in areas that include type 1, type 2, and gestational diabetes; cystic fibrosis; obesity; energy balance; and endocrinology.

In FY 2024, NIDDK will continue to support foundational research that may lead to better ways to treat and prevent diseases associated with the endocrine system and metabolism, such as diabetes and obesity. Recent discoveries include the identification of a new complex of proteins, called Fabkin, which couples energy status with a metabolic response to regulate

[35] Type 1 Diabetes FY 2022 and FY 2023 amounts reflect budget authority of $150,000,000 reduced by $8,550,000 for Budget Control Act sequestration.

pancreatic insulin-producing beta cells.[36] This important discovery of Fabkin has revealed a promising new therapeutic target to combat metabolic diseases, including type 1 and type 2 diabetes. In other research, scientists identified short genetic sequences on microRNAs (miRNAs) that help determine which miRNAs are retained by the cell that produced them and which are released to affect other cells.[37] This knowledge could inform the development of therapies for diseases associated with miRNA dysfunction, such as type 2 diabetes and obesity. Another study found that groups of genetic variations that increase the risk of type 2 diabetes may also influence the risk of developing associated metabolic conditions—knowledge that could help advance personalized care.[38]

With FY 2024 resources, NIDDK will continue major clinical and translational research studies in diabetes, endocrinology, and metabolic diseases. In a study based on over 30 years of following participants in NIDDK's landmark Diabetes Control and Complications Trial and its follow up, the Epidemiology of Diabetes Interventions and Complications study, researchers showed for the first time, that risk of diabetic foot ulcers (DFU) is decreased by controlling blood glucose levels early and intensively in individuals with type 1 diabetes.[39] In another study, researchers used cutting-edge technologies to perform a large-scale single-cell analysis and identified a subset of cells that promote successful DFU healing.[40] Together, these findings are providing crucial new knowledge about DFU—a devastating complication of diabetes with limited treatment options—and set the stage for further clinical study in NIDDK's Diabetic Foot Consortium.[41] In other exciting research, a small clinical trial in people with newly diagnosed type 1 diabetes showed that addition of the oral drug verapamil to a standard insulin regimen delayed type

Human Pancreas Analysis Program

In type 1 diabetes, the body's immune system launches a misguided attack on the insulin-producing cells of the pancreas, destroying them and leading to a rise in blood glucose levels. Approaches to prevent or modify disease development are urgently needed. Progress in this area could be greatly facilitated by a deeper understanding of the physical and functional organization of the human pancreatic environment and the interactions between the pancreas and the immune system at the cellular and molecular level. To fill this knowledge gap, in 2016, NIDDK established the Human Pancreas Analysis Program (HPAP), a data-analysis component of the Human Islet Research Network. HPAP's initial aims were to procure pancreata from people with and without type 1 diabetes for extensive cellular analyses and to generate integrated molecular signatures of the human pancreas at various stages of disease progression. Another goal was to accumulate, analyze, and distribute high-value datasets to the research community through a searchable database called PANC-DB. The latest version of PANC-DB was released in May 2022, providing researchers with the ability to perform interactive analyses and comparative studies of diverse datasets, and serving as a model for open access data sharing. Based on HPAP's success, in 2018, NIDDK expanded the Program to include the study of pancreata recovered from donors with type 2 diabetes and related metabolic disorders to understand the molecular mechanisms responsible for pancreatic cell dysfunction. Both HPAP teams collect tissues from diverse donor populations to explore differences in how these diseases manifest in and affect populations with different backgrounds. Important insights are emerging from both efforts, including recent findings in which HPAP researchers used sophisticated single-cell analysis technologies to gain new knowledge about cellular and molecular underpinnings of type 1 and type 2 diabetes pathogenesis.[1] Data produced and new insights gained through HPAP are helping advance the common goals of diabetes researchers to improve understanding of disease origins and progression and may ultimately lead to new strategies to reverse or prevent disease.

[1]Fasolino M, et al. Nat Metab 4: 284-299, 2022; Wu M, et al. Cell Rep 37: 109919, 2021.

[36] Prentice KJ, et al. Nature 600: 720-726, 2022.
[37] Garcia-Martin R, et al. Nature 601: 446-451, 2022.
[38] DiCorpo D, et al. Diabetes Care 45: 674-683, 2022.
[39] Boyko EJ, et al. Diabetes Care 45: 357-364, 2022.
[40] Theocharidis G, et al. Nat Commun 13: 181, 2022.
[41] grants.nih.gov/grants/guide/rfa-files/rfa-dk-22-509.html; grants.nih.gov/grants/guide/rfa-files/RFA-DK-21-505.html

1 diabetes progression, promoted function of beta cells, and lowered insulin requirements.[42] Verapamil is already FDA-approved for treating high blood pressure, and thus holds promise as a future type 1 diabetes treatment. In another study with translational potential, researchers bioengineered a microgel technology that eliminates the need for immune-suppressing drugs after islet transplantation in animal models of type 1 diabetes, representing a promising approach toward improving cell-based, curative therapy in people.[43]

Budget Policy: The FY 2024 President's Budget request for this program is $710.4 million, a decrease of $2.7 million or -0.4 percent compared to the FY 2023 Enacted level. With FY 2024 resources, NIDDK will continue major diabetes clinical trials. NIDDK will also continue pilot and feasibility studies to foster innovative strategies to address barriers for use of diabetes self-management education and support; continue the Rare and Atypical Diabetes Network that could yield insight not only into rare forms of diabetes, but also into the heterogeneity of type 2 diabetes; continue a clinical trial consortium characterizing the physiological mechanisms underlying individual variability in maintenance of reduced weight over time; and support research on type 2 diabetes and youth.[44] In FY 2024, NIDDK will continue funding for research centers to advance basic and clinical research relevant to diabetes and to cystic fibrosis and other genetic metabolic diseases. NIDDK will also continue to fund translational research and support health information dissemination activities to bring scientific discoveries in diabetes and obesity to real-world medical practice and other community settings, along with other efforts as part of an overall balanced research program.

Digestive Diseases and Nutrition

The objectives of this program are to enhance understanding of liver and other digestive diseases, nutrition, and obesity, and to develop and test strategies for disease prevention and treatment. This program supports basic, clinical, and translational research, as well as research training; fundamental studies of the digestive system; disease-targeted research involving the esophagus, stomach, small intestine, large intestine and anorectum, liver and biliary system, and pancreas; studies relevant to nutrition; and research on obesity.

In FY 2024, NIDDK will continue to support research aimed at combating diseases associated with the digestive system. For example, researchers revealed an unexpected function for a protein called gasdermin B in the proliferation (increase in number) and locomotion of intestinal cells, pointing to its possible role in promoting intestinal healing in people with IBD and illuminating potential new avenues for treatment.[45] Researchers also discovered that messages exchanged through a network of immune and esophageal cells may be important in determining whether people with eosinophilic esophagitis—a chronic disorder of the digestive system—go on to develop a more severe form of the disease.[46] This knowledge can advance personalized care.

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[42] Xu G, et al. Nat Commun 13: 1159, 2022.
[43] Lei J, et al. Sci Adv 8: eabm9881, 2022.
[44] grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-032.html; https://www.atypicaldiabetesnetwork.org/; grants.nih.gov/grants/guide/rfa-files/rfa-dk-19-017.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-19-018.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-21-002.html; grants.nih.gov/grants/guide/rfa-files/RFA-DK-21-003.html
[45] Rana N, et al. Cell 185: 283-298, 2022.
[46] Shoda T, et al. Gastroenterology 162: 439-453, 2022.

In other recent studies, scientists gained important biological insights into what sets a form of diarrhea with high intestinal bile acid levels apart from other less severe forms of chronic diarrhea, and identified a set of cells in the mouse that sense the properties of gut contents and regulate gastrointestinal motility in response.[47] These discoveries may inform future development of novel therapeutic strategies.

Related to research on liver diseases, studies conducted by NIDDK's NASH Clinical Research Network in children and adults with NAFLD have linked genetic risk factors and outcomes to disease stage, with severe, later-stage disease associated with a higher risk of complications and death. These findings add to the evidence base informing clinical care for this disease, which is increasingly common in the United States and around the globe.[48] In research related to obesity, scientists found that bariatric surgical procedures, including gastric bypass surgery and sleeve gastrectomy, led to significantly more weight loss than nonsurgical care for people with severe obesity.[49] This study provides important information that people with severe obesity and their health care providers can use when considering bariatric surgery. In research related to nutrition, scientists discovered how gut sensory cells called neuropod cells discern nutritive sugars from non-caloric artificial sweeteners to guide an animal's preference for sugar over sweetener.[50] These findings lay the foundation for future research to determine how other nutritional stimuli such as fats and proteins are sensed by the gut and transmitted to the brain to influence food choices, and also raises the possibility that interventions could be developed to help people reduce sugar intake. Advances such as these will pave the way for improving the health of people affected by digestive diseases, nutritional disorders, and obesity.

Liver Cirrhosis Network

Cirrhosis describes a condition in which the liver has been inflamed and damaged by chronic disease, resulting in scarring and loss of function over time. Many forms of chronic liver disease can cause cirrhosis, such as viral hepatitis, nonalcoholic fatty liver disease, disease from excessive alcohol consumption, autoimmune liver diseases, and genetic types of disease. Cirrhosis places people at increased risk of developing complications, including liver cancer. Some racial and ethnic groups are disproportionately burdened by cirrhosis and its complications. Scientists are seeking to develop treatments to repair existing liver damage and restore liver function, ideally before the liver is irreparably damaged and a transplant is required. To address this critical area, in 2021, NIDDK established a Liver Cirrhosis Network to conduct clinical and translational research toward expanding treatment options and transforming clinical care for this potentially life-threatening condition. Network scientists are working in collaboration with a diverse population of adult study participants, some of whom have been underrepresented in past studies despite being at higher risk for cirrhosis. Plans for future research include an observational study that will collect a vast constellation of data in study participants, including clinical, behavioral, genetic, metabolic, microbiome, biomarker, and social determinants of health data, as well as information on risk factors in racial/ethnic groups that experience a disproportionate burden of cirrhosis. This information will be applied toward understanding what drives the progression of cirrhosis from multiple causes, which can point to possible treatment approaches. The Network also plans to study whether statins, which are drugs commonly taken for high cholesterol, can protect against cirrhosis progression. The goal of the Network's studies is to usher in a new era of cirrhosis management, with a wider array of effective treatment options beyond liver transplantation.

[47] Camilleri M, et al. Gut doi:10.1136/gutjnl-2022-327471, 2022. Treichel AJ, et al. Gastroenterology 162: 535–547.e13, 2022.
[48] Sanyal AJ, et al. N Engl J Med 385: 1559-1569, 2021; Goyal NP, et al. Hepatology doi:10.1002/hep.32570, 2022.
[49] Arterburn DE, et al. Ann Surg 274: e1269-e1276, 2021.
[50] Buchanan KL, et al. Nat Neurosci 25: 191-200, 2022.

Budget Policy: The FY 2024 President's Budget request for this program is $708.3 million, a decrease of $2.7 million or -0.4 percent compared to the FY 2023 Enacted level. In FY 2024, NIDDK will continue major clinical research networks to help understand and treat liver diseases, including the Drug-induced Liver Injury Network to collect and analyze cases of severe liver injury caused by prescription drugs, over-the-counter drugs, and alternative medicines, such as herbal products and supplements. The Institute will also continue supporting the Consortium for the Study of Chronic Pancreatitis, Diabetes and Pancreatic Cancer to conduct key studies on chronic pancreatitis and factors that increase the risk of pancreatic cancer in children and adults with chronic pancreatitis, pancreatogenic diabetes, and newly diagnosed diabetes.[51] NIDDK will also use FY 2024 funds to continue the IBD Genetics Consortium to shed light on the underlying causes of IBD and enhance our ability to detect and treat this disease.[52] Research on intestinal stem cells and the lymphatic system in digestive health and disease, which can benefit a variety of digestive diseases, will continue in FY 2024, along with other efforts, such as support for centers focused on digestive diseases research, as part of an overall balanced research program.

Kidney, Urologic, and Hematologic Diseases

The objectives of this program are to increase the understanding of diseases and disorders of the kidneys, urinary tract, and blood (hematologic), and to develop and test prevention and treatment strategies. Basic, clinical, and translational research, as well as research training, are supported in the areas of chronic kidney disease (CKD), diabetic kidney disease, end-stage renal disease (ESRD or kidney failure), polycystic kidney disease, and many other kidney diseases; urinary incontinence, benign prostatic hyperplasia, interstitial cystitis/painful bladder syndrome, stones, impotence, congenital urologic disorders, and urinary tract infections; and disorders of the blood and blood-forming organs, including sickle cell disease, Cooley's anemia, hemochromatosis, and the anemia of inflammation and chronic disease.

In FY 2024, NIDDK will continue to support foundational research focused on kidney, urologic, and hematologic diseases. For example, a recent study showed that one type of white blood cell may have an important role in accelerating kidney fibrosis in CKD, while another study linked a different white blood cell type to accelerated cyst growth in a mouse model of cystic kidney disease.[53] These novel insights about progression of different forms of kidney diseases could inform ways to protect against disease onset and progression. Other recent research showed that, in early stages of polycystic kidney disease (PKD) in mice, kidney damage can be reversed by reactivating an inactive gene.[54] Although kidney damage was once considered almost invariably permanent, this exciting study demonstrates that gene therapy approaches may one day be able not just to slow disease progression in people with PKD, but potentially to reverse it. Future research could also build on key results in which scientists developed a potential new way to diagnose kidney disease that eliminates the use of race as a variable, representing an important, evidence-based step toward eliminating health disparities in estimating kidney function.[55]

[51] www.dmscro.org/cpdpc
[52] www.ibdgenetics.org/
[53] Doke T, et al. Nat Immunol 23: 947-959, 2022; Song CJ, et al. J Am Soc Nephrol 33: 747-768, 2022.
[54] Dong K, et al. Nat Genet 53: 1649-1663, 2021.
[55] Hsu C-Y, et al. N Engl J Med 385: 1750-1760, 2021; Inker LA, et al. N Engl J Med 385: 1737-1749, 2021.

In other research that can positively influence patient care, a small study found that people with symptomatic kidney stones have a lower chance of future relapse after stone removal when smaller, asymptomatic kidney stones are also removed during the same surgery.[56] These findings could lead to new recommendations for asymptomatic kidney stone removals that may decrease the need for future stone removal surgeries. In hematology-related research, a study in mice suggested that it may be possible to treat hemochromatosis—a disorder in which extra iron builds up in the body to harmful levels—by inhibiting a protein called NCOA4 that contributes to the overabsorption of iron. Eliminating the protein from intestinal cells protected the animals from iron overload, while still allowing sufficient iron absorption to meet their needs, suggesting that NCOA4 is a novel therapeutic target.[57] To encourage future innovations in urology and hematology research, NIDDK supports the Stimulating Urology Interdisciplinary Team Opportunity Research (SUITOR) and Stimulating Hematology Investigation: New Endeavors (SHINE) programs.[58]

Kidney Precision Medicine Project

Acute kidney injury (AKI) and chronic kidney disease (CKD) impose a significant public health and financial burden; however, only a few drug therapies are available for CKD, and none exist for AKI. Research suggests that neither CKD nor AKI are singular diseases; rather, there are specific subgroups that are driven by different biological pathways. Thus, a better understanding of the biological pathways that lead to the diversity of kidney diseases is needed to drive development of effective individualized treatments. NIDDK's Kidney Precision Medicine Project (KPMP), which began in 2017, is a bold research program that is charting a course toward more personalized care for people with kidney diseases through detailed analysis of human kidney biopsies.[1] This includes identifying new molecular "markers" to reveal differences among cells and tissues to define specific kidney structures. These markers will help establish a complex kidney atlas that can classify and locate different cell types, cell states, and molecules involved in the progression of kidney diseases and may then be linked to important clinical outcomes. The kidney tissue atlas will help scientists better understand the cellular and molecular diversity of kidney diseases and define specific disease subgroups, which can inform clinical decision making by people with kidney diseases and their doctors. Because the kidney biopsy procedure carries risk, ethical and participant safety considerations have been a primary concern. As such, patients have been a critical part of the research design process in KPMP, helping to address issues such as participant recruitment, ethics, biopsy safety, and data-sharing strategies.[2] Major advances already emerging from KPMP include publication of a reference kidney atlas, providing the foundation of a new framework for the classification of kidney diseases.[3] Over time, results and resources from KPMP are expected to improve scientists' understanding of human kidney diseases and catalyze the development of new, personalized therapies.

[1] www.kpmp.org/
[2] Tuttle KR, et al. Clin J Am Soc Nephrol 16: 660-668, 2021.
[3] Hansen J, et al. Sci Adv 8: eabn4965, 2022.

Budget Policy: The FY 2024 President's Budget request for this program is $549.6 million, a decrease of $2.1 million or -0.4 percent compared to the FY 2023 Enacted level. In FY 2024, NIDDK plans to continue supporting research programs related to kidney diseases, such as the COPE-AKI program described above; the Chronic Kidney Diseases of UnceRtain Etiology in Agricultural Communities (CURE) Research Consortium to address chronic kidney diseases of uncertain or non-traditional etiologies; and the Hemodialysis Pain Reduction Effort

[56] Sorensen MD, et al. N Engl J Med 387: 506-13, 2022.
[57] Das NK, et al. Blood 139: 2547-2552, 2022.
[58] grants.nih.gov/grants/guide/pa-files/pas-22-074.html; grants.nih.gov/grants/guide/pa-files/pas-22-096.html

Consortium to develop interventions to reduce opioid use in people on hemodialysis.[59] NIDDK also plans to continue its support of research networks focused on enhancing understanding of glomerular diseases, urologic chronic pelvic pain syndrome, and lower urinary tract symptoms. Centers focused on kidney, urologic, and hematologic research will receive continued funding in FY 2024, along with other efforts as part of an overall balanced research program.

Special Statutory Funding Program for Type 1 Diabetes Research

Complementing efforts of the Diabetes, Endocrinology, and Metabolic Diseases program, the overarching goal of the Special Diabetes Program (SDP) is to foster a deeper understanding of type 1 diabetes, toward improved treatment, prevention, and cure of the disease and its complications through basic, clinical, and translational research. The program has six scientific goals: 1) identifying genetic and environmental causes of type 1 diabetes; 2) preventing or reversing the disease; 3) developing cell replacement therapy; 4) improving management and care; 5) preventing or reducing diabetes complications; and 6) attracting new talent and applying new technologies to research. The proposed increase in the SDP budget for FY 2024 would enable NIDDK to continue ongoing research consortia and clinical trials networks toward meeting their long-term scientific goals, and allow NIDDK to pursue new research opportunities discussed at a March 2022 SDP planning meeting.[60] Such opportunities include research to identify mechanisms that promote earlier development of heart disease in people with type 1 diabetes compared to people without diabetes, advance the science of integrating medical and social care interventions to improve outcomes and health equity in individuals with type 1 diabetes, and better understand the pathophysiologic processes leading to progressive diabetic kidney disease toward discovering novel targets for treatment.

Research supported by the SDP is yielding important advances that are improving the health and quality of life of people with type 1 diabetes. For example, recent clinical trial results showed that a novel bionic pancreas device, which uses next-generation technology to deliver insulin automatically, improved blood glucose control in both children and adults.[61] The Bionic Pancreas requires less user input than other closed-loop technologies, making it a promising tool for reducing the unrelenting burden of managing type 1 diabetes. To ensure that emerging management technologies benefit all people, NIDDK is supporting research to improve technology adoption in individuals from underrepresented backgrounds with type 1 diabetes.[62] Future plans include supporting new research to characterize interactions between different pancreatic compartments to shed new light on type 1 diabetes progression, and to continue a new consortium studying people with type 1 diabetes and impaired awareness of hypoglycemia to help tailor treatment strategies.[63] NIDDK also plans to continue a program to ensure that a robust pipeline of talented new investigators embark on successful careers in type 1 diabetes research, and a career development program to attract physician scientists to type 1 diabetes

[59] grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-011.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-012.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-017.html; grants.nih.gov/grants/guide/rfa-files/RFA-DK-20-018.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-20-019.html; www.hopehdtrial.org/

[60] www.niddk.nih.gov/-/media/Files/Research-Areas/DMICC_MeetingSummary_03082022_508.pdf

[61] Russell SJ, et al. N Engl J Med 387: 1161-1172, 2022.

[62] grants.nih.gov/grants/guide/rfa-files/rfa-dk-21-018.html

[63] grants.nih.gov/grants/guide/rfa-files/rfa-dk-22-022.html; grants.nih.gov/grants/guide/rfa-files/RFA-DK-21-020.html; grants.nih.gov/grants/guide/rfa-files/RFA-DK-21-036.html

research.[64]

Budget Policy: The FY 2024 President's Budget request for the Special Statutory Funding Program for Type 1 Diabetes Research proposes to reauthorize the program through 2026, providing $250.0 million in FY 2024, an increase of $108.6 million or 76.7% as compared to the FY 2023 Enacted level, $260.0 million in FY 2025, and $270.0 million in FY 2026.

Intramural Research

The objective of the Institute's Intramural Research Program (IRP) is to conduct basic, translational, and clinical biomedical research related to diabetes and other endocrine and metabolic diseases; digestive diseases, including liver diseases and nutritional disorders; obesity; kidney diseases; and hematologic diseases. Intramural research is conducted in the Institute's laboratories and clinical facilities in Bethesda, Maryland, as well as in Phoenix, Arizona, where a long-standing research relationship with American Indian communities in the region has led to important scientific advances in diagnosing and treating type 2 diabetes and obesity. Recently, IRP researchers reported findings from a case study that identified how a misguided autoimmune reaction to the parathyroid hormone (PTH) receptor can cause PTH resistance, a condition that can cause serious disruptions of the body's mineral levels.[65] These results could have important implications for PTH resistance treatment and suggest that people with an autoimmune-associated form of the condition may benefit from immune-suppressing therapies. Other studies have provided new insights into human health and disease, including processes regulating gene activity during maturation of neurons, as well as processes that cells use to repair breaks in DNA strands.[66] In FY 2024, the Intramural Research Program will continue to advance research in these and other areas.

Budget Policy: The FY 2024 President's Budget request for this program is $244.3 million, an increase of $6.5 million or 2.7 percent compared to the FY 2023 Enacted level.

Research Management and Support

Research Management and Support (RMS) activities provide administrative, budgetary, logistical, and scientific support in the review, award, and monitoring of research grants, research training awards, and research and development contracts. RMS functions also encompass strategic planning, coordination, and evaluation of the Institute's programs; regulatory compliance; international coordination; and liaison with other Federal agencies, Congress, and the public. Through RMS activities, NIDDK continues its administrative support of meritorious basic, clinical, and translational research and research training efforts, and continues its communication of research-based health information to patients, health professionals, and the public.[67]

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[64] grants.nih.gov/grants/guide/rfa-files/RFA-DK-19-026.html; grants.nih.gov/grants/guide/rfa-files/rfa-dk-21-019.html

[65] Mandl A, et al. N Engl J Med 385: 1974-1980, 2021.

[66] Chen D, et al. Nat Commun 12: 6366, 2021; Liu L, et al. Mol Cell 82: 177-189.e4, 2022.

[67] www.niddk.nih.gov/health-information

Budget Policy: The FY 2024 President's Budget request for this program is $90.5 million, an increase of $0.9 million or 1.0 percent compared to the FY 2023 Enacted level.

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Appropriations History

Fiscal Year	Budget Estimate to Congress [1]	House Allowance	Senate Allowance	Appropriation
2015	$1,893,336,000			$1,899,681,000
2016	$1,938,133,000	$1,921,388,000	$1,975,162,000	$1,968,357,000
2017	$1,966,310,000	$1,962,093,000	$2,041,652,000	$2,020,595,000
Sequestration				($10,350,000)
2018	$1,599,534,000	$1,899,733,000	$1,935,597,000	$2,120,797,000
2019	$1,965,434,000	$2,144,333,000	$2,180,892,000	$2,179,823,000
2020	$1,896,493,000	$2,129,027,000	$2,155,327,000	$2,264,314,000
2021	$2,074,211,000	$2,132,498,000	$2,169,021,000	$2,281,975,000
2022	$2,360,748,000	$2,238,625,000	$2,217,136,000	$2,353,926,000
Sequestration				($8,550,000)
2023	$2,347,530,000	$2,283,489,000	$2,290,798,000	$2,450,721,000
Sequestration				($8,550,000)
2024	$2,553,098,000			

[1] Includes mandatory funding for Type 1 Diabetes

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Authorizing Legislation

	PHS Act/ Other Citation	U.S. Code Citation	2023 Amount Authorized	FY 2023 Enacted	2024 Amount Authorized	FY 2024 President's Budget
Research and Investigation	Section 301	42§241	Indefinite	$2,303,098,000	Indefinite	$2,303,098,000
National Institute of Diabetes and Digestive and Kidney Diseases	Section 401(a)	42§281	Indefinite		Indefinite	
Total, Budget Authority				$2,303,098,000		$2,303,098,000

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Amounts Available for Obligation [1]

(Dollars in Thousands)

Source of Funding	FY 2022 Final	FY 2023 Enacted	FY 2024 President's Budget
Appropriation	$2,203,926	$2,300,721	$2,303,098
Mandatory Appropriation: (non-add)			
Type 1 Diabetes	*($150,000)*	*($150,000)*	*($250,000)*
Type 1 Diabetes Sequestration	*-($8,550)*	*-($8,550)*	*($0)*
Subtotal, adjusted appropriation	$2,203,926	$2,300,721	$2,303,098
OAR HIV/AIDS Transfers	$2,305	$2,377	$0
Subtotal, adjusted budget authority	**$2,206,231**	**$2,303,098**	**$2,303,098**
Unobligated balance lapsing	-$56	$0	$0
Total obligations	$2,206,175	$2,303,098	$2,303,098

[1] Excludes the following amounts (in thousands) for reimbursable activities carried out by this account:
FY 2022 - $4,506 FY 2023 - $6,000 FY 2024 - $6,000

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Budget Authority by Object Class[1]
(Dollars in Thousands)

		FY 2023 Enacted	FY 2024 President's Budget	FY 2024 +/- FY 2023
Total compensable workyears:				
	Full-time equivalent	706	756	50
	Full-time equivalent of overtime and holiday hours	1	1	0
	Average ES salary	$211	$223	$11
	Average GM/GS grade	12.5	12.5	0.0
	Average GM/GS salary	$125	$132	$7
	Average salary, Commissioned Corps (42 U.S.C. 207)	$118	$124	$6
	Average salary of ungraded positions	$132	$139	$7
	OBJECT CLASSES	**FY 2023 Enacted**	**FY 2024 President's Budget**	**FY 2024 +/- FY 2023**
	Personnel Compensation			
11.1	Full-Time Permanent	$51,615	$56,554	$4,939
11.3	Other Than Full-Time Permanent	$45,243	$52,378	$7,135
11.5	Other Personnel Compensation	$4,648	$5,095	$447
11.7	Military Personnel	$1,101	$1,161	$60
11.8	Special Personnel Services Payments	$15,008	$15,008	$0
11.9	**Subtotal Personnel Compensation**	**$117,615**	**$130,196**	**$12,581**
12.1	Civilian Personnel Benefits	$39,343	$46,548	$7,205
12.2	Military Personnel Benefits	$169	$178	$9
13.0	Benefits to Former Personnel	$0	$0	$0
	Subtotal Pay Costs	**$157,127**	**$176,922**	**$19,795**
21.0	Travel & Transportation of Persons	$1,011	$1,010	-$1
22.0	Transportation of Things	$297	$295	-$2
23.1	Rental Payments to GSA	$0	$0	$0
23.2	Rental Payments to Others	$0	$0	$0
23.3	Communications, Utilities & Misc. Charges	$177	$175	-$2
24.0	Printing & Reproduction	$13	$13	$0
25.1	Consulting Services	$52,212	$52,377	$165
25.2	Other Services	$34,700	$28,343	-$6,357
25.3	Purchase of Goods and Services from Government Accounts	$160,786	$158,143	-$2,643
25.4	Operation & Maintenance of Facilities	$320	$318	-$2
25.5	R&D Contracts	$19,561	$20,031	$470
25.6	Medical Care	$1,250	$1,300	$50
25.7	Operation & Maintenance of Equipment	$5,227	$5,226	-$1
25.8	Subsistence & Support of Persons	$0	$0	$0
25.0	**Subtotal Other Contractual Services**	**$274,056**	**$265,738**	**-$8,318**
26.0	Supplies & Materials	$13,104	$12,095	-$1,009
31.0	Equipment	$4,525	$3,889	-$636
32.0	Land and Structures	$1,300	$1,300	$0
33.0	Investments & Loans	$0	$0	$0
41.0	Grants, Subsidies & Contributions	$1,851,478	$1,841,651	-$9,827
42.0	Insurance Claims & Indemnities	$0	$0	$0
43.0	Interest & Dividends	$10	$10	$0
44.0	Refunds	$0	$0	$0
	Subtotal Non-Pay Costs	**$2,145,971**	**$2,126,176**	**-$19,795**
	Total Budget Authority by Object Class	**$2,303,098**	**$2,303,098**	**$0**

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

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Salaries and Expenses

(Dollars in Thousands)

Object Classes	FY 2023 Enacted	FY 2024 President's Budget	FY 2024 +/- FY 2023
Personnel Compensation			
Full-Time Permanent (11.1)	$51,615	$56,554	$4,939
Other Than Full-Time Permanent (11.3)	$45,243	$52,378	$7,135
Other Personnel Compensation (11.5)	$4,648	$5,095	$447
Military Personnel (11.7)	$1,101	$1,161	$60
Special Personnel Services Payments (11.8)	$15,008	$15,008	$0
Subtotal, Personnel Compensation (11.9)	**$117,615**	**$130,196**	**$12,581**
Civilian Personnel Benefits (12.1)	$39,343	$46,548	$7,205
Military Personnel Benefits (12.2)	$169	$178	$9
Benefits to Former Personnel (13.0)	$0	$0	$0
Subtotal Pay Costs	**$157,127**	**$176,922**	**$19,795**
Travel & Transportation of Persons (21.0)	$1,011	$1,010	-$1
Transportation of Things (22.0)	$297	$295	-$2
Rental Payments to Others (23.2)	$0	$0	$0
Communications, Utilities & Misc. Charges (23.3)	$177	$175	-$2
Printing & Reproduction (24.0)	$13	$13	$0
Other Contractual Services			
Consultant Services (25.1)	$52,112	$52,275	$163
Other Services (25.2)	$34,700	$28,343	-$6,357
Purchase of Goods and Services from Government Accounts (25.3)	$93,945	$90,507	-$3,438
Operation & Maintenance of Facilities (25.4)	$320	$318	-$2
Operation & Maintenance of Equipment (25.7)	$5,227	$5,226	-$1
Subsistence & Support of Persons (25.8)	$0	$0	$0
Subtotal Other Contractual Services	**$186,304**	**$176,669**	**-$9,635**
Supplies & Materials (26.0)	$13,104	$12,095	-$1,009
Subtotal Non-Pay Costs	**$200,906**	**$190,257**	**-$10,649**
Total Administrative Costs	**$358,033**	**$367,179**	**$9,146**

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National Institute of Diabetes and Digestive and Kidney Diseases

Detail of Full-Time Equivalent Employment (FTE)

Office	FY 2022 Final			FY 2023 Enacted			FY 2024 President's Budget		
	Civilian	Military	Total	Civilian	Military	Total	Civilian	Military	Total
Division of Extramural Activities									
Direct:	67	1	68	70	-	70	70	-	70
Total:	67	1	68	70	-	70	70	-	70
Office of the Director									
Direct:	147	1	148	150	1	151	150	1	151
Total:	147	1	148	150	1	151	150	1	151
Division of Diabetes, Endocrinology, and Metabolic Diseases									
Direct:	30	-	30	32	-	32	32	-	32
Reimbursable:	3	-	3	3	-	3	3	-	3
Total:	33	-	33	35	-	35	35	-	35
Division of Digestive Diseases and Nutrition									
Direct:	30	1	31	31	1	32	31	1	32
Total:	30	1	31	31	1	32	31	1	32
Division of Kidney, Urologic, and Hematologic Diseases									
Direct:	28	-	28	30	-	30	30	-	30
Total:	28	-	28	30	-	30	30	-	30
Division of Intramural Research Programs									
Direct:	373	4	377	382	6	388	432	6	438
Total:	373	4	377	382	6	388	432	6	438
Total	678	7	685	698	8	706	748	8	756

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

FISCAL YEAR	Average GS Grade
2020	12.0
2021	12.0
2022	12.5
2023	12.5
2024	12.5

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Detail of Positions[1]

GRADE	FY 2022 Final	FY 2023 Enacted	FY 2024 President's Budget
Total, ES Positions	1	1	1
Total, ES Salary	$203,700	$211,322	$222,807
General Schedule			
GM/GS-15	67	68	70
GM/GS-14	75	75	77
GM/GS-13	119	119	122
GS-12	73	76	85
GS-11	35	37	44
GS-10	1	2	2
GS-9	24	26	29
GS-8	10	11	15
GS-7	13	16	16
GS-6	2	3	4
GS-5	3	3	4
GS-4	2	2	2
GS-3	0	0	0
GS-2	1	1	1
GS-1	0	0	0
Subtotal	425	439	471
Commissioned Corps (42 U.S.C. 207)			
Assistant Surgeon General	0	0	0
Director Grade	4	3	3
Senior Grade	3	3	3
Full Grade	1	1	1
Senior Assistant Grade	1	1	1
Assistant Grade	0	0	0
Subtotal	9	8	8
Ungraded	280	289	309
Total permanent positions	430	443	475
Total positions, end of year	715	737	789
Total full-time equivalent (FTE) employment, end of year	685	706	756
Average ES salary	$203,700	$211,322	$222,807
Average GM/GS grade	12.5	12.5	12.5
Average GM/GS salary	$120,597	$125,110	$131,909

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