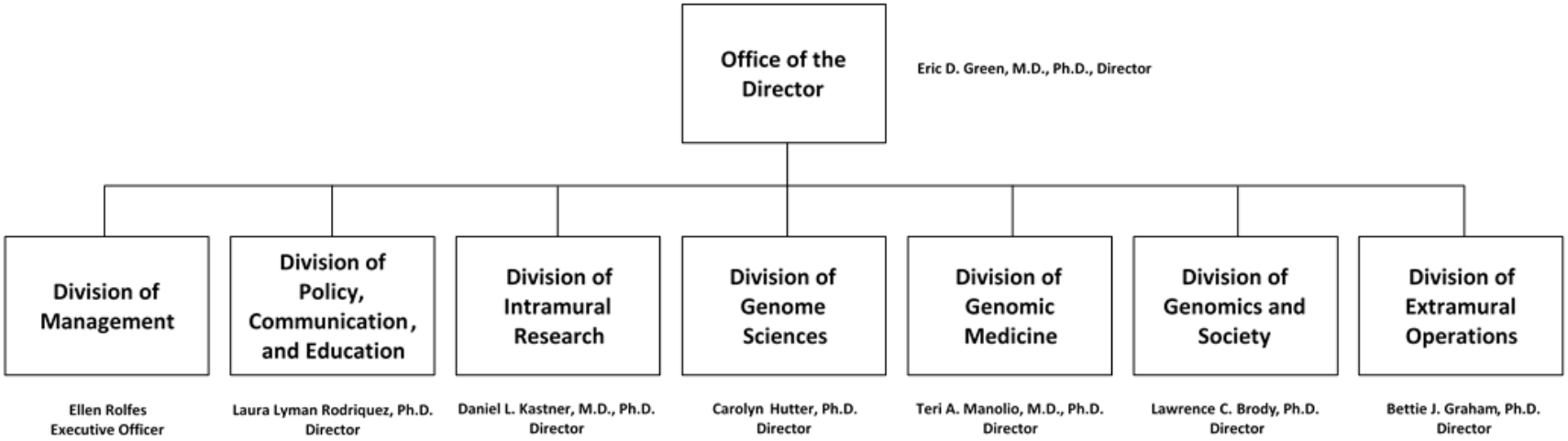
DEPARTMENT OF HEALTH AND HUMAN SERVICES

NATIONAL INSTITUTES OF HEALTH

National Human Genome Research Institute (NHGRI)

NATIONAL HUMAN GENOME RESEARCH INSTITUTE
Organizational Structure



NATIONAL INSTITUTES OF HEALTH

National Human Genome Research Institute

For carrying out section 301 and title IV of the PHS Act with respect to human genome research, **[**$575,579,000**]***$495,448,000*.

NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

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

Source of Funding	FY 2018 Final	FY 2019 Enacted	FY 2020 President's Budget
Appropriation	$556,881	$575,579	$495,448
Mandatory Appropriation: (non-add)			
Type 1 Diabetes	*(0)*	*(0)*	*(0)*
Other Mandatory financing	*(0)*	*(0)*	*(0)*
Rescission	0	0	0
Sequestration	0	0	0
Secretary's Transfer	-1,308	0	0
Subtotal, adjusted appropriation	$555,573	$575,579	$495,448
OAR HIV/AIDS Transfers	1,191	0	0
Subtotal, adjusted budget authority	$556,764	$575,579	$495,448
Unobligated balance, start of year	0	0	0
Unobligated balance, end of year	0	0	0
Subtotal, adjusted budget authority	$556,764	$575,579	$495,448
Unobligated balance lapsing	-23	0	0
Total obligations	$556,741	$575,579	$495,448

[1] Excludes the following amounts (in thousand) for reimbursable activities carried out by this account:
FY 2018 - $25,656 FY 2019 - $26,263 FY 2020 - $22,666

NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

Budget Mechanism - Total[1]

(Dollars in Thousands)

MECHANISM	FY 2018 Final		FY 2019 Enacted		FY 2020 President's Budget		FY 2020 +/- FY 2019 Enacted	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount
Research Projects:								
Noncompeting	186	$205,859	202	$212,112	236	$184,906	34	-$27,206
Administrative Supplements	*(42)*	19,798	*(43)*	20,000	*(20)*	8,956	*(-23)*	-11,044
Competing:								
Renewal	18	10,607	20	11,212	20	10,137	0	-1,075
New	57	30,801	60	32,208	18	27,166	-42	-5,042
Supplements	0	0	0	0	0	0	0	0
Subtotal, Competing	75	$41,408	80	$43,420	38	$37,303	-42	-$6,117
Subtotal, RPGs	261	$267,065	282	$275,532	274	$231,165	-8	-$44,367
SBIR/STTR	30	15,061	28	15,861	26	13,069	-2	-2,792
Research Project Grants	291	$282,126	310	$291,393	300	$244,234	-10	-$47,159
Research Centers:								
Specialized/Comprehensive	4	$8,867	3	$6,642	3	$6,215	0	-$427
Clinical Research	0	0	0	0	0	0	0	0
Biotechnology	21	50,768	23	53,620	22	46,748	-1	-6,872
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	25	$59,635	26	$60,262	25	$52,963	-1	-$7,299
Other Research:								
Research Careers	26	$3,516	24	$3,316	20	$2,976	-4	-$340
Cancer Education	0	0	0	0	0	0	0	0
Cooperative Clinical Research	0	0	0	0	0	0	0	0
Biomedical Research Support	0	0	0	0	0	0	0	0
Minority Biomedical Research Support	0	0	0	0	0	0	0	0
Other	49	37,289	49	39,624	40	35,364	-9	-4,260
Other Research	75	$40,805	73	$42,940	60	$38,340	-13	-$4,600
Total Research Grants	391	$382,566	409	$394,595	385	$335,537	-24	-$59,058
Ruth L Kirchstein Training Awards:	FTTPs		FTTPs		FTTPs		FTTPs	
Individual Awards	11	$472	15	$682	13	$578	-2	-$104
Institutional Awards	162	8,835	170	9,477	144	8,054	-26	-1,423
Total Research Training	173	$9,306	185	$10,159	157	$8,632	-28	-$1,527
Research & Develop. Contracts	6	$18,059	6	$19,000	5	$17,468	-1	-$1,532
(SBIR/STTR) (non-add)	*(0)*	*(30)*	*(0)*	*(30)*	*(0)*	*(144)*	*(0)*	*(114)*
Intramural Research	226	114,085	240	117,964	240	103,336	0	-14,628
Res. Management & Support	104	32,747	109	33,861	109	30,475	0	-3,386
Res. Management & Support (SBIR Admin) (non-add)	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(25)*	*(0)*	*(25)*
Construction		0		0		0		0
Buildings and Facilities		0		0		0		0
Total, NHGRI	330	$556,764	349	$575,579	349	$495,448	0	-$80,131

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

Major Changes in Fiscal Year 2020 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 2020 President's Budget request for NHGRI, which is $495.4 million, a decrease of $80.1 million from the FY 2019 Enacted level. The FY 2020 President's Budget reflects the Administration's fiscal policy goals for the Federal Government. Within that framework, NHGRI will pursue its highest research priorities through strategic investments and careful stewardship of appropriated funds.

Research Project Grants (RPGs) (-$44.4 million; total $231.2 million):
NHGRI will reduce funding for non-competing RPGs by at least 10 percent which is a $20.0 million decrease from FY 2020 committed levels. Competing RPGs are expected to decrease by 52 percent or 42 grants compared to the FY 2019 Enacted level of 80 awards, and the amount to support competing awards will be reduced by $6.1 million from FY 2019. These reductions are distributed across all programmatic areas and basic, translational or clinical research. The FY 2020 planned competing cohort includes the potential renewal of programs supported by large grant awards while also supporting investigator-initiated applications.

NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

Summary of Changes

(Dollars in Thousands)

FY 2019 Enacted	$575,579
FY 2020 President's Budget	$495,448
Net change	-$80,131

CHANGES	FY 2020 President's Budget FTEs	FY 2020 President's Budget Budget Authority	Change from FY 2019 Enacted FTEs	Change from FY 2019 Enacted Budget Authority
A. Built-in:				
1. Intramural Research:				
a. Annualization of January 2019 pay increase & benefits		$40,233		$41
b. January FY 2020 pay increase & benefits		40,233		126
c. Paid days adjustment		40,233		152
d. Differences attributable to change in FTE		40,233		0
e. Payment for centrally furnished services		18,686		-149
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		44,417		-14,798
Subtotal				-$14,628
2. Research Management and Support:				
a. Annualization of January 2019 pay increase & benefits		$15,165		$13
b. January FY 2020 pay increase & benefits		15,165		39
c. Paid days adjustment		15,165		57
d. Differences attributable to change in FTE		15,165		0
e. Payment for centrally furnished services		800		-89
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		14,509		-3,407
Subtotal				-$3,386
Subtotal, Built-in				-$18,014

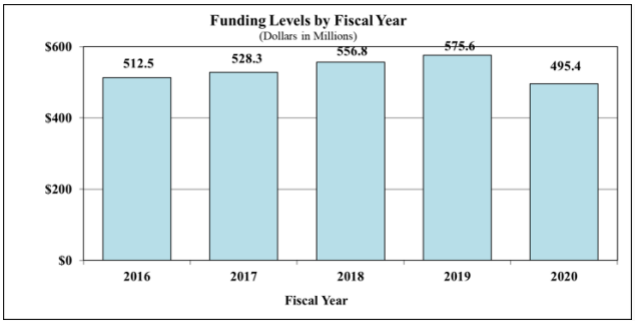
NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

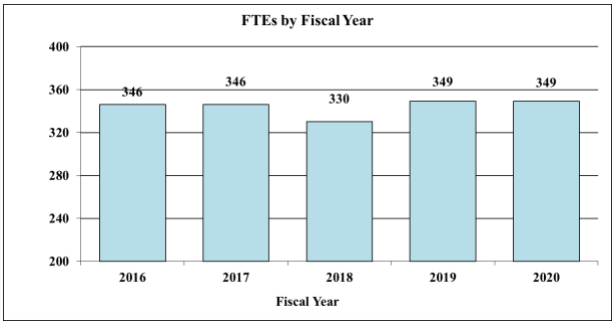
Summary of Changes - Continued

(Dollars in Thousands)

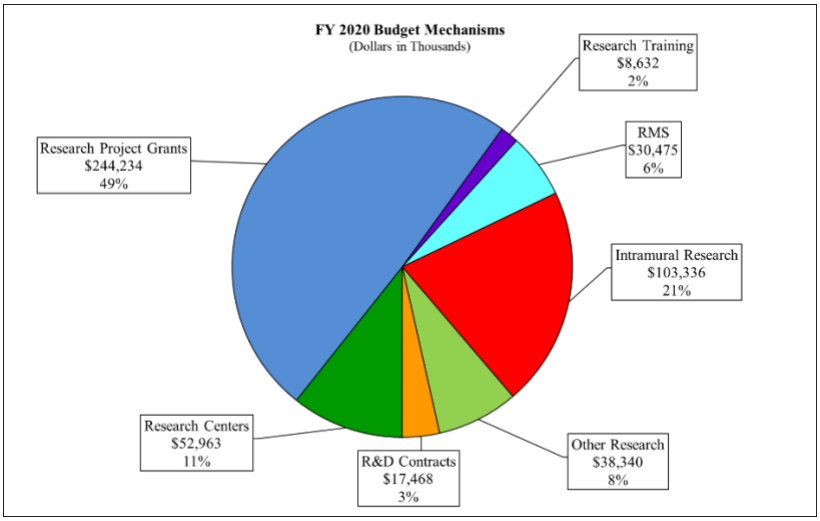
CHANGES	FY 2020 President's Budget		Change from FY 2019 Enacted	
	No.	Amount	No.	Amount
B. Program:				
1. Research Project Grants:				
a. Noncompeting	236	$193,862	34	-$38,250
b. Competing	38	37,303	-42	-6,117
c. SBIR/STTR	26	13,069	-2	-2,792
Subtotal, RPGs	300	$244,234	-10	-$47,159
2. Research Centers	25	$52,963	-1	-$7,299
3. Other Research	60	38,340	-13	-4,600
4. Research Training	157	8,632	-28	-1,527
5. Research and development contracts	5	17,468	-1	-1,532
Subtotal, Extramural		$361,637		-$62,117
	FTEs		FTEs	
6. Intramural Research	240	$103,336	0	$0
7. Research Management and Support	109	30,475	0	0
8. Construction		0		0
9. Buildings and Facilities		0		0
Subtotal, Program	349	$495,448	0	-$62,117
Total changes				-$80,131

History of Budget Authority and FTEs:

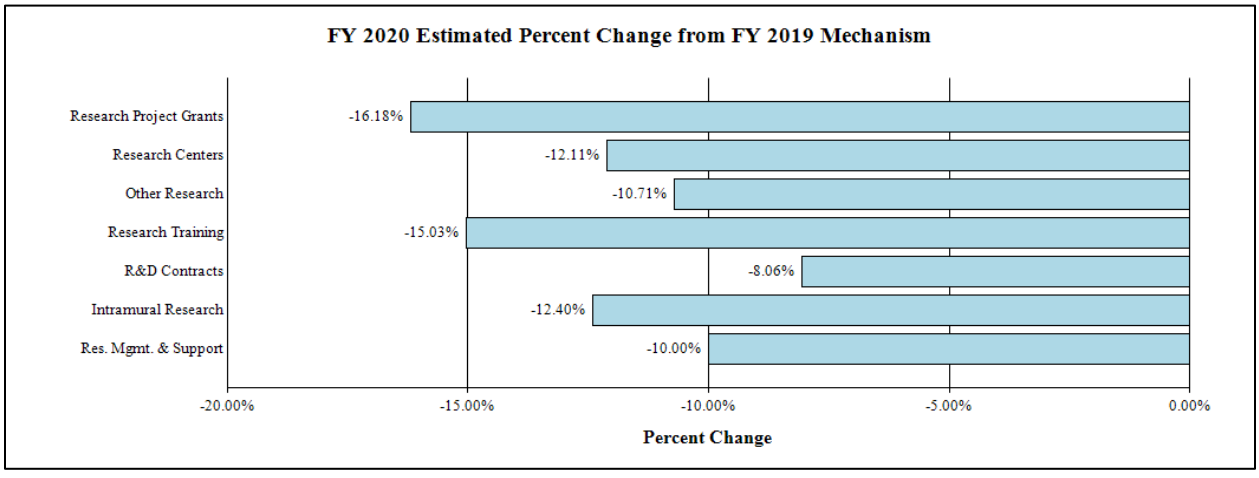




Distribution by Mechanism:



Change by Selected Mechanism:



NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

Budget Authority by Activity[1]

(Dollars in Thousands)

	FY 2018 Final		FY 2019 Enacted		FY 2020 President's Budget		FY 2020 +/- FY 2019 Enacted	
Program Activity	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**
Detail								
Understanding the Structure of Genomes		$31,366		$32,425		$27,738		-$4,686
Understanding the Biology of Genomes		84,635		87,493		75,027		-12,466
Using Genomics to Understand the Biology of Disease		137,637		142,289		122,377		-19,912
Using Genomics to Advance Medical Science		24,675		25,512		22,185		-3,327
Using Genomics to Improve the Effectiveness of Healthcare		14,846		15,349		13,259		-2,090
Bioinformatics, Computational Biology, and Data Science		151,547		156,661		134,016		-22,645
Education and Training		25,528		26,392		22,763		-3,629
Genomics and Society		53,781		55,597		47,607		-7,990
Subtotal, Program Activity*		**$524,017**		**$541,718**		**$464,973**		**-$76,745**
Extramural Research (non-add)	*(0)*	*(409,931)*	*(0)*	*(423,754)*	*(0)*	*(361,637)*	*(0)*	*(-62,117)*
Intramural Research (non-add)	**226**	*(114,085)*	**240**	*(117,964)*	**240**	*(103,336)*	**0**	*(-14,628)*
Research Management & Support	**104**	**$32,747**	**109**	**$33,861**	**109**	**$30,475**	**0**	**-$3,386**
TOTAL	**330**	**$556,764**	**349**	**$575,579**	**349**	**$495,448**	**0**	**-$80,131**

[1] Includes FTEs whose payroll obligations are supported by the NIH Common Fund.
* The detail programs listed above include both Extramural and Intramural funding.

NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

Authorizing Legislation

	PHS Act/ Other Citation	U.S. Code Citation	2019 Amount Authorized	FY 2019 Enacted	2020 Amount Authorized	FY 2020 President's Budget
Research and Investigation	Section 301	42§241	Indefinite	$575,579,000	Indefinite	$495,448,000
National Human Genome Research Institute	Section 401(a)	42§281	Indefinite		Indefinite	
Total, Budget Authority				$575,579,000		$495,448,000

NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

Appropriations History

Fiscal Year	Budget Estimate to Congress	House Allowance	Senate Allowance	Appropriation
2011	$533,959,000		$533,127,000	$516,028,000
Rescission				$4,531,033
2012	$524,807,000	$524,807,000	$505,783,000	$513,844,000
Rescission				$971,165
2013	$511,370,000		$512,920,000	$512,872,835
Rescission				$1,025,746
Sequestration				($25,742,690)
2014	$517,319,000		$513,881,000	$497,813,000
Rescission				$0
2015	$498,451,000			$499,356,000
Rescission				$0
2016	$515,491,000	$505,551,000	$526,166,000	$518,956,000
Rescission				$0
2017[1]	$513,227,000	$531,438,000	$534,516,000	$528,566,000
Rescission				$0
2018	$399,622,000	$536,774,000	$546,934,000	$556,881,000
Rescission				$0
2019	$512,979,000	$563,531,000	$575,882,000	$575,579,000
Rescission				$0
2020	$495,448,000			

[1] Budget Estimate to Congress includes mandatory financing.

Justification of Budget Request

National Human Genome Research Institute

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

Budget Authority (BA):

	FY 2018 Final	FY 2019 Enacted	FY 2020 President's Budget	FY 2020 +/- FY 2019
BA	$556,764,000	$575,579,000	$495,448,000	-$80,131,000
FTE	330	349	349	0

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

Director's Overview

Poised at *The Forefront of Genomics*®, the National Human Genome Research Institute (NHGRI) funds and conducts research that accelerates scientific and medical breakthroughs to improve human health. During its three decades of leadership in genomics, NHGRI has led the field through audacious research programs, beginning with the Human Genome Project, which have successfully developed and widely disseminated genomic technologies and knowledge. To prepare for its next phase of leadership in genomics, NHGRI is embarking on a two-year strategic planning process that will generate a '2020 vision for genomics.' NHGRI will use the resulting strategic vision to shape the Institute's research priorities as the field enters an era when genomic information and tools are rapidly integrated into medicine for the prevention, diagnosis, and treatment of disease. In FY 2020, as development of our strategic vision nears completion, NHGRI will begin updating our approaches for supporting cutting-edge basic and translational genomics research and for building a stronger foundation to integrate genomics into healthcare.

With the cost of sequencing a human genome now comparable to that of purchasing a laptop, routinizing genomic medicine is within our reach. The roughly million-fold reduction in genome sequencing cost witnessed over the last two decades has many of its roots in NHGRI's Genome Technology Program (GTP), which has supported key work leading to the profound decreases in the cost of DNA sequencing and the widespread commercialization and dissemination of new technologies. The increased accessibility of genome-sequencing technologies has revolutionized the study of human genomic variation and its relationship to disease.

NHGRI will continue to support research to improve genomic technologies and to decrease the cost of genome sequencing, thereby facilitating greater uptake of genomics in clinical settings. As one example, NHGRI has invested heavily in technology-development efforts to improve nanopore-based DNA sequencing. This highly innovative approach allows scientists to pass long strands of DNA or RNA directly through a minute opening (i.e., a nanopore) and measure

differences in electrical current that are associated with the different letters in DNA (i.e., the As, Cs, Ts, and Gs). Nanopore sequencing already produces longer contiguous stretches of DNA sequence than other technologies, and this is allowing scientists to decipher for the first time hard-to-sequence regions of the human genome that may have as-yet-unknown implications for disease. In FY 2020, NHGRI's novel technology-development initiatives and related small business grants will help to usher in the next generation of genome-sequencing technologies.

Sequencing DNA is just the beginning. Researchers must be able to store, access, and analyze the massive quantities of data that are now generated routinely by genome sequencing. Towards that end, NHGRI is advancing data science through its research portfolio that aims to address multifaceted data-analysis challenges in genome science and genomic medicine. To build infrastructure and tackle these challenges, NHGRI is funding the Genomic Data Science Analysis, Visualization, and Informatics Lab-space (AnVIL). This cloud-based, interoperable platform for data storage, analysis, and management is providing researchers more powerful abilities to access, integrate, and analyze very large genomic datasets, empowering the broader research community to gain new insights about human health and disease. In FY 2020, AnVIL grantees will coordinate with the NIH Data Commons efforts to produce highly functional and efficient tools that enable broad genomic data use among investigators.

Focusing on the need to inform genomic-medicine applications, NHGRI's Clinical Genome Resource (ClinGen) applies data-science approaches to harness the ever-growing collection of data and information from genomic-oriented disease studies. ClinGen's goal is to build an authoritative resource defining the clinical implications of genes and genomic variants across the human genome. Scientists have identified thousands of associations between genomic variants and disease, but lacking are standard methods for understanding and sharing the relevance of these associations for patient care. In FY 2020, ClinGen will continue to build its resource by convening experts from diverse disease areas to evaluate existing and emerging evidence about the health relevance of genes and genomic variants; developing machine-learning algorithms to improve the efficiency of characterizing genomic variants, thereby identifying connections between genomic information and disease more quickly and effectively; and working with regulatory agencies to ensure that ClinGen's methods are appropriate for patient care.

An important point to emphasize is that genomics is no longer solely within the realm of NHGRI. Rather, genomics has now become a core part of the research agenda for virtually every NIH Institute and Center. Within this new landscape, NHGRI aims to provide leadership that will create collaborative, interdisciplinary partnerships that move genomics into the healthcare ecosystem. In this spirit, NHGRI is co-funding the Clinical Sequencing Evidence-Generating Research Program with the National Cancer Institute and the National Institute on Minority Health and Health Disparities. This program includes embedding projects that explore the ethical, legal, and social implications of genomic medicine alongside the laboratory-based research. Such broad-based research efforts are enabling the responsible and effective introduction of genomics into medicine.

In a related initiative, NHGRI is focused on developing pathways to integrate genomic information into patient care through a new iteration of the Implementing Genomics in Practice (IGNITE) Network. Investigators in this network are conducting pragmatic clinical trials that

closely mirror real-life clinical experiences in diverse settings, allowing assessment of the clinical utility and cost-effectiveness of genomic-medicine interventions. In FY 2020, these clinical trials and other NHGRI genomic medicine programs will generate data to inform the development of clinical decision-support tools, healthcare provider training resources, and best practices for incorporating genomics into routine clinical care. This work will advance day-to-day and long-term efforts to facilitate healthcare provider and healthcare system readiness for the increasing role that genomics will have in medicine.

Advances in genomics research are transforming our understanding of human health and disease, and in FY 2020, NHGRI will continue accelerating breakthroughs to improve patient care and advance the public benefit of genomic advances.

Overall Budget Policy:

The FY 2020 President's Budget request is $495.4 million, a decrease of $80.1 million compared with the FY 2019 Enacted level. These reductions are distributed across all programmatic areas and basic, epidemiology, or clinical research.

Program Descriptions and Accomplishments

Understanding the Structure of Genomes: The GTP, described above in the Director's Overview, is NHGRI's central effort for improving scientists' ability to decipher the structures of genomes, including for diagnostic purposes. The GTP is dedicated to improving further genome-sequencing technologies, to continue the reductions in the cost of DNA sequencing, and to characterize the parts of the human genome that are still difficult to sequence.
The genome sequences produced by any DNA-sequencing methods have the most utility when a high-quality 'reference genome sequence' is available for comparison. It is for this reason that NHGRI supports renewed efforts to improve the reference sequence of the human genome. For many years, NHGRI has co-funded the Genome Reference Consortium with the Wellcome Trust and the National Center for Biotechnology Information, the goal of which is to develop a more accurate and refined reference sequence for the human genome. Based on feedback from the genomics research community, NHGRI will now fund a project to generate up to 350 additional high-quality genome sequences and to develop a 'pan-genome' reference sequence that aims to capture the genomic variation present in diverse ancestral populations that is not currently represented in the available reference sequence. These enhancements will allow investigators to assess more accurately the significance of genomic variation for traits and disease across a larger fraction of the human population. NHGRI will also fund the development of new informatics tools for making the enhanced reference sequence and tools for its use more accessible to investigators performing basic and clinical research.

Budget Policy: The FY 2020 President's Budget request for Understanding the Structure of Genomes is $27.7 million, a decrease of $4.7 million or 14.5 percent from the FY 2019 Enacted level. The GTP will continue to yield innovative genomic technologies intended to make orders-of-magnitude improvements in the ability to analyze genomes. NHGRI will also continue funding efforts to improve the human genome reference sequence, particularly to increase the ancestral diversity reflected in the reference sequence.

Understanding the Biology of Genomes: Understanding which parts of the human genome contribute to protecting health or conferring risk for disease relies on learning about the function of various parts of the genome. The Encyclopedia of DNA Elements (ENCODE) Project has been developing a catalog of all functional elements in the human genome, a resource that is critical for facilitating discoveries related to health and disease. To spur such advances, all ENCODE data are made freely and rapidly available for scientists around the world. For example, researchers are currently aiming to target a specific functional element in the genome (known as an "enhancer") for use in gene therapy clinical trials for the blood disorders beta thalassemia and sickle cell disease.[1] This enhancer was discovered using ENCODE data by a research study that illustrates how the ENCODE catalog can enable medical advances. In fact, there are now more than 2,200 scientific publications from research groups that have used ENCODE data for their studies.

The ENCODE Project, now in its fourth phase, is supporting Characterization Centers for the first time. These centers are characterizing candidate functional elements (e.g., enhancers, as in the example above, which regulate the expression of genes) in specific biological contexts, such as in different cell types. In FY 2020, ENCODE will continue identifying more functional elements in the human genome and will examine their roles in different cell and tissue types. The growing influence of genomics coupled with NHGRI's expertise in 'team science' projects has resulted in the Institute leading multiple NIH Common Fund programs. The Common Fund's Genotype-Tissue Expression (GTEx) Program is a prime example. GTEx began in 2010 with the goal of establishing a genomic dataset and accompanying tissue bank to allow scientists to study the relationship between genomic variation and gene expression in all major tissues. By 2017, much of the proposed work had come to fruition, with the journal *Nature* publishing a collection of papers that highlighted the major discoveries of the program.[2] The collective analyses include data generated using thousands of tissue samples, with the results revealing how gene regulation differs across individuals and tissue types. The GTEx biobank and dataset will be valuable for years to come, as it enables scientists to examine how genomic variants influence gene expression in different tissues and how they can affect human health. To date, over 1,000 researchers have requested access to GTEx data, and this number continues to grow over time.

Budget Policy: The FY 2020 President's Budget request for Understanding the Biology of Genomes is $75.0 million, a decrease of $12.5 million or 14.2 percent from the FY 2019 Enacted level. In FY 2020, funds will allow ENCODE investigators to delve more deeply into identifying the influences of functional genomic elements on human health.

Using Genomics to Understand the Biology of Disease: Many of NHGRI's basic science programs aim to improve our understanding of the human genome, which in turn contributes to a better understanding of how the genome plays a role in human health and disease. These programs develop the technologies, approaches, and knowledge that allow researchers to explore directly which genomic variants influence disease. This notion is illustrated by NHGRI's Centers for Mendelian Genomics (CMGs) program, a key part of the Institute's Genome Sequencing Program (GSP). The CMGs use genome sequencing and analysis to discover the

[1] www.businesswire.com/news/home/20180516005404/en/, http://ir.crisprtx.com/news-releases/news-release-details/crispr-therapeutics-submits-first-clinical-trial-application

[2] www.nature.com/collections/dcfzxywzby

genomic basis for as many rare Mendelian diseases (those caused by changes in a single gene) as possible. To date, these centers have discovered more than 4,500 disease-gene associations through sequencing the genomes of over 48,000 individuals.

NHGRI has long funded Centers of Excellence in Genome Sciences (CEGS), which are designed to provide transformative advances in genomics. Each CEGS engages an interdisciplinary team of researchers that develops highly innovative genomic approaches to address important biological and biomedical research problems. A recent addition to the CEGS program is the Center for Genome Editing and Recording, which is creating technologies to detect, alter, and record the sequence and output of the genome in individual cells and tissues using CRISPR-Cas genome-engineering technology. This work will develop methods to alter any base in the genome with a high level of accuracy, which will enable researchers to identify disease-relevant genes and new therapeutic targets.

Budget Policy: The FY 2020 President's Budget request for Using Genomics to Understand the Biology of Disease is $122.4 million, a decrease of $19.9 million or 14.0 percent from the FY 2019 Enacted level. In FY 2020, the CEGS program and the GSP will contribute to innovative advancements in genomic tools and approaches for elucidating the genomic basis of human disease.

Program Portrait: Connecting Genomic Variation to Human Disease

FY 2019 Level: $84.4 million
FY 2020 Level: $71.6 million
Change: -$12.8 million

The genomes from two random people differ from one another at roughly 3-5 million positions, and there are over 100 million specific places in the human genome that are now known to vary among people. Understanding how to connect this genomic variation to human disease and disease outcomes is one of the most challenging problems in genomics today. Through genome-wide association studies, many genomic variants have been statistically associated with an increased risk for, or protection against, a certain disease or disease severity. However, many questions remain unanswered about the function, biochemical impact, significance, and clinical actionability of these identified variants. NHGRI provides leadership for several large-scale projects within the Institute's portfolio and through the NIH Common Fund, aiming to understand how genomic variation influences human disease.

NHGRI supports a robust portfolio of research programs to advance our understanding of the biological and medical relevance of genomic variation. Signature efforts in this portfolio include the Encyclopedia of DNA Elements (ENCODE) and Clinical Genome Resource (ClinGen) consortia. ENCODE focuses on identifying and characterizing regions of the human genome that are biologically functional, while ClinGen curates information and data about the clinical relevance and actionability of genomic variants. Both consortia involve a network of highly productive investigators with growing expertise in genomics and genomic medicine. ENCODE data have been used as part of studies reported in 3,000 scientific publications to date, while ClinGen researchers have catalogued over 10,000 human genomic variants. NHGRI has also prioritized studying variation in non-coding and regulatory regions of the human genome through the Non-Coding Variants (NoVa) and Genomics of Gene Regulation (GGR) programs, respectively. By focusing on variants in traditionally understudied regions of the human genome (i.e., those that do not directly code for proteins), NoVa and GGR aim to understand the biomedical implications of variants found in all parts of the human genome.

NHGRI's historical strength in leading highly collaborative, 'team science' projects has resulted in the Institute's co-leadership of three major programs supported through the NIH Common Fund designed to link genomic variation to biological function and disease. The Genotype-Tissue Expression (GTEx) project uses gene-expression data

collected from over 40 different human tissue types to gain a quantitative understanding of how genomic variation and gene expression are related. The Knockout Mouse Phenotyping Project (KOMP2), currently in its second phase, is generating a large, critical resource of mouse 'gene-knockout' models and corresponding phenotypic characteristics. By FY 2020, KOMP2 will have generated at least 3,000 strains of mice genetically engineered to lack one specific gene. These mice strains are providing a valuable resource for the entire biomedical research community. Finally, the Undiagnosed Diseases Network, which involves investigators from 17 sites across the country and works to find diagnoses and effective treatments for patients with unsolved medical conditions, is regularly discovering previously unknown genomic contributors to rare human diseases.

In FY 2019, NHGRI is launching the Variation, Function, and Disease (VFD) program, which will develop new technologies and novel approaches for studying genomic variation in the context of human disease. Research within VFD will examine how variants in disease-associated genomic regions lead to disease manifestation and how this information might be used in medical practice. VFD grants will support research that is both generalizable (i.e., useful for understanding multiple diseases) and comprehensive (i.e., examining variants located in all regions of the human genome). NHGRI envisions that VFD will empower researchers to make advances in functional genomics, technology development, data integration and analysis, and genomic medicine, thereby enabling medical breakthroughs to benefit human health.

Using Genomics to Advance Medical Science: The Electronic Medical Records and Genomics (eMERGE) Network develops tools and approaches for using genomic information coupled with data in electronic medical records (EMRs) to study human health and disease. Now in its third phase, eMERGE will develop electronic phenotyping algorithms for sifting through data in EMRs to identify relevant traits and diseases. By FY 2020, eMERGE investigators will have developed 27 such phenotyping algorithms and deployed them to analyze the EMRs of all participants. These algorithms are key for extracting useful data from EMRs for use in genomic and precision medicine research. Indeed, through this and other paradigm-setting approaches, eMERGE has set the stage for NIH's *All of Us* Research Program to develop and scale methods for studying the data collected from its one million (or more) participants.

The eMERGE Network is also working to integrate genomic information into EMRs, so as to improve genetic-risk assessment as well as the prevention, diagnosis, and treatment of disease. By October 2018, eMERGE generated clinical reports for 25,000 participants who had their genomes sequenced through the program and will now evaluate how best to return the resulting genomic information to patients, families, and healthcare providers.

ClinGen's efforts are also instrumental for the productive implementation of genomics in healthcare. In addition to the work highlighted in the Director's Overview, ClinGen is partnering with the American Society of Hematology and the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development to assemble expert curation panels that will focus on the genomics of myeloid malignancies, inherited platelet disorders, brain malformations, mitochondrial disorders, and maturity onset diabetes of the young. Through this and other initiatives, ClinGen embodies the multidisciplinary nature of NHGRI's research portfolio and demonstrates the Institute's commitment to collaborative projects that advance biomedical research across disease areas.

Budget Policy: The FY 2020 President's Budget request for Using Genomics to Advance Medical Science is $22.2 million, a decrease of $3.3 million or 13.0 percent from the FY 2019 Enacted level. With FY 2020 funds, ClinGen and other initiatives will advance the abilities of healthcare providers to use genomics in their practices.

Using Genomics to Improve the Effectiveness of Healthcare: We are entering an era in which genomic medicine will be rapidly integrated into healthcare. In anticipation of this, NHGRI is developing and supporting projects that will ensure that genomic medicine is effectively and equitably integrated across various clinical settings. The Clinical Sequencing Evidence-Generating Research Program (CSER) represents a second phase of the Institute's effort to assess rigorously the clinical utility of genome sequencing and to facilitate the integration of genomic, clinical, and healthcare-utilization data in real-world settings to inform clinical decision making. To focus on the barriers of using genome sequencing in underserved and underrepresented populations and in a broad range of clinical settings, at least 60 percent of CSER research participants are being recruited from underserved and underrepresented groups and healthcare systems. CSER's first phase culminated in numerous advances, including creating models for genomics-oriented informed consent tailored to the care setting and forming recommendations to improve the consistency of genomic-variant interpretation.

The Undiagnosed Diseases Network (UDN), another NIH Common Fund program led by NHGRI, is designed to accelerate discovery and innovation in the way patients with previously undiagnosed conditions are diagnosed and treated. As of September 2018, UDN had received over 2,700 applications, accepted 1,179 participants for evaluation at one of its 12 clinical sites, and made 237 diagnoses. Through these successful diagnoses, UDN is advancing laboratory and clinical research for rare and previously uncharacterized diseases, enhancing collaborations among highly specialized researchers and clinicians at different institutions, and sharing the resulting data with the scientific community to ensure dissemination of the acquired knowledge.

In the area of pediatric research, the Newborn Sequencing in Genomic Medicine and Public Health (NSIGHT) Program has explored the feasibility, benefits, and challenges of incorporating genome sequencing into clinical care during the newborn period. Through its work, NSIGHT has demonstrated ways in which newborn genome sequencing can save lives by increasing the speed of diagnosis. In 2017, the work of an NSIGHT grantee was featured in *Time* magazine for his use of rapid genome sequencing to provide diagnoses and suggest treatment options for critically ill infants in the neonatal intensive care unit.[3] Notably, this group recently set a Guinness World Record for the fastest diagnosis based on genome sequencing: 19.5 hours.[4]

NHGRI also wants to ensure that healthcare providers are prepared for the role that genomics will soon play in patient care. NHGRI is leading efforts to be ready for this transition by developing genomics-oriented tools and resources for healthcare providers, in addition to facilitating the development of best practices for incorporating genomics into medicine. For example, the NHGRI-supported Global Genetics and Genomics Community Resource (G3C) recently launched a new case study focusing on familial hypercholesterolemia (FH). FH is an inherited disorder that is often undiagnosed and predisposes families to high cholesterol and premature cardiovascular disease. The new FH case study, which consists of simulated, videotaped patient interactions for online learning by healthcare professionals, informs providers about how to recognize and manage patients (and their families) who might have this condition.

[3] www.time.com/4951200/genetic-testing-providing-hope-babies-ailments/

[4] www.sandiegouniontribune.com/news/health/sd-no-rady-record-20180209-story.html

The G3C resource is an example of how the Institute is creating tools to facilitate the integration of genomics into clinical care.

Budget Policy: The FY 2020 President's Budget request for Using Genomics to Improve the Effectiveness of Healthcare is $13.3 million, a decrease of $2.1 million or 13.6 percent from the FY 2019 Enacted level. Using FY 2020 funds, NHGRI programs will continue studies to pilot the implementation of genomics in routine healthcare.

Program Portrait: Implementing Genomics in Practice (IGNITE) Network

FY 2019 Level: $12.8 million
FY 2020 Level: $11.5 million
Change: -$1.3 million

The routine incorporation of genomic information into clinical practice is fundamental to the full realization of genomic medicine. Making this truly routine requires that genomic testing and associated analyses be widely accessible, that providers and patients have familiarity with genomic information, and that reasonable reimbursement for genomic services occurs with relative ease. To establish the best ways to reach these goals, NHGRI launched the Implementing Genomics in Practice (IGNITE) network in FY 2013. IGNITE aims to expand and connect existing genomic medicine implementation studies, develop new collaborative genomic medicine implementation projects in diverse settings, and generate evidence on the overall effectiveness of genomic medicine compared to standard medical approaches. Implementation projects within IGNITE have focused on tasks such as incorporating genomic data into patients' electronic health records, improving provider familiarity and comfort with using genomic medicine in patient care, and encouraging patients to be actively involved with clinical decisions involving their genomic information. Consistent with NHGRI's strong data-sharing ethos – and that of the entire genomics community – the IGNITE network is committed to the rapid and broad dissemination of data and findings.

The initial set of six studies funded in the first phase of IGNITE has grown into a consortium that involves 272 partners and 11 affiliate sites across the United States. To date, 127 scientific publications have resulted from IGNITE studies at these institutions, which serve a range of patient populations in varying healthcare settings. The inclusion of diverse patient populations and healthcare settings in IGNITE will be important for efforts to ensure equitable access to genomic medicine, thereby helping to mitigate any racial and/or ethnic, geographic, or socioeconomic health disparities that could be introduced as genomic medicine is integrated into healthcare. Such efforts will also improve the applicability of the studies to all sectors of the population and strengthen the research outcomes.

The second phase of IGNITE, which commenced in FY 2019 and will continue in FY 2020, will involve the launch of pragmatic clinical trials (PCTs) to further explore the utility and performance of genomic medicine in real-world settings. IGNITE II leverages the strong network of investigators developed in the program's first phase to design collaborative clinical trials, which will explore important areas such as pharmacogenomic-based drug prescribing and risk reduction for genetically susceptible populations. The specific interventions and implementation strategies chosen for the PCTs in IGNITE II have been selected, in part, based on the successful pilots from IGNITE's first phase. IGNITE investigators will now work with an independent Protocol Review Committee (including experts in genomic medicine, bioethics, and clinical trial design) to prioritize the specific medical interventions to study in the PCTs. Each approved PCT will recruit at least 50 percent of its participants from low-resource and/or traditionally underrepresented settings (e.g., rural community hospitals) rather than large academic medical centers. Furthermore, the IGNITE II trials will recruit either 35 percent or 75 percent of their participants from racial or ethnic minority populations. The current plans for IGNITE II aim to include approximately 15,000 patients across two or three clinical trials. The IGNITE investigators will also continue to develop novel data-infrastructure and -analysis tools, such as those pioneered in the program's first phase, and will work to make their findings and resources accessible to the broader research community. Ultimately, the resources and medical routines that emerge from the IGNITE PCTs will facilitate the implementation of genomic medicine across a wider range of clinical settings within the highly variable healthcare systems in the United States.

Bioinformatics, Computational Biology, and Data Science: The NHGRI Computational Genomics and Data Science Program supports research and development of data science methods, resources, and tools that facilitate the use of genomic data for biomedical research and clinical care. The program supports widely used genomic informatics platforms and data resources, including the Alliance of Genome Resources (AGR). The AGR aims to establish an integrated resource of model organism databases to enhance comparative genomic studies and to facilitate access to the collective information provided by the individual databases, which are used widely and help researchers use model organisms to better understand human biology and disease.

NHGRI's GSP is also supporting major data-science initiatives. For example, NHGRI recently funded three GSP analysis centers to conduct rigorous data-science studies with the data being generated by the GSP. The centers will develop innovative approaches and analysis tools for researchers to use in finding and characterizing genomic variants.

Budget Policy: The FY 2020 President's Budget request for Bioinformatics, Computational Biology and Data Science is $134.0 million, a decrease of $22.6 million or 14.5 percent from the FY 2019 Enacted level. These funds will support the AGR and the data-analysis efforts of the GSP.

Genomics Education and Training: NHGRI is committed to fostering the next generation of genomics researchers and supports training programs in genome sciences and in the ethical, legal, and social implications (ELSI) of genomics. This includes institutional training grants, the Diversity Action Plan (DAP), individual fellowships, and career development awards. NHGRI currently funds 20 institutional training grants, which allow universities to operate training programs to support young scientists at different career stages. These programs support trainees with coursework, research opportunities, and mentoring in a variety of research areas, including genome sciences, genomic medicine, ELSI research, and computational genomics.

Budget Policy: The FY 2020 President's Budget request for Genomics Education and Training is $22.8 million, a decrease of $3.6 million or 13.8 percent from the FY 2019 Enacted level. With these funds, NHGRI will continue supporting genomics at the undergraduate, graduate, and post-graduate levels.

Program Portrait: Developing the Genomics Workforce of the Future

FY 2019 Level: $24.4 million
FY 2020 Level: $24.3 million
Change: -$0.1 million

NHGRI is committed to developing the next generation of professionals who will lead research in genome sciences, genomic medicine, and the ethical, legal, and social implications (ELSI) of genomics. This enhanced genomics workforce will, in turn, drive breakthroughs in preventing, diagnosing, and treating both rare and common diseases. NHGRI-led workforce development is multifaceted and includes institutional training grants, individual fellowships, and career development awards. Grantees funded by NHGRI can also incorporate Diversity Action Plans (DAP) into their research programs, as a means of increasing the participation of underrepresented groups in genomics research. In FY 2020, NHGRI will continue to prioritize funding for investigators who are early in their careers as well as those from traditionally underrepresented groups; in addition, the Institute will debut a new program to encourage creative approaches to genomics through Genomic Innovator Awards.

Central to NHGRI's portfolio for research training and career development are institutional training grants that support predoctoral students, medical students, and postdoctoral fellows at universities across the country. NHGRI currently funds a network of 20 institutional training grants, which are focused on genome sciences, genomic medicine, and ELSI research. Beyond training grants, NHGRI provides individual support for trainees and early stage investigators through fellowship and career development awards. Outstanding individuals pursuing research in genome sciences or genomic medicine (with interests in cross-disciplinary training, technology development, or quantitative sciences) are eligible for these awards. Currently, 37 early stage investigators are supported through either individual fellowships or career awards from NHGRI.

Workforce development opportunities are also available for researchers and clinicians through other NHGRI-sponsored programs, such as the Centers of Excellence in ELSI Research (CEER) program. The CEER program helps scientists cultivate practical skills in ethics and policy development in addition to expertise in research and teaching. Additionally, DAP programs, which are designed to increase the number of scientists in the genomics workforce from underrepresented groups, are in place at nine institutions. These DAP programs complement NHGRI's broader research efforts by cultivating new and diverse talent for the future genomics workforce. Training opportunities for students at multiple stages of education are also available within NHGRI's Intramural Research Program. The latter includes a robust summer internship program that reflects the Institute's commitment to diversity and inclusion, with roughly 35 percent of participants coming from underrepresented groups.

NHGRI also has a strong tradition of leading groundbreaking projects that bring together researchers with diverse areas of expertise to form highly interdisciplinary consortia. An exciting new NHGRI program is providing the opportunity for outstanding members of these consortia to branch out as independent investigators. Specifically, the Genomic Innovator Award aims to support the creative work by early career investigators who have made important contributions to consortia-based projects, but who may not have yet emerged as fully independent researchers with projects that they themselves lead. The Genomic Innovator Award will give the funded investigators the freedom to pursue new areas of genomics research, thereby empowering them to become genomic leaders and key elements of the future genomics workforce.

Genomics and Society: NHGRI is mandated by the Congress to dedicate five percent of its budget to studying the ELSI of genomics research, with a goal of enabling the responsible incorporation of genomics into society. One way that NHGRI leverages its ELSI research investment is by embedding projects into major research consortia, such as CSER, eMERGE, NSIGHT, and IGNITE. This strategy enables projects to investigate rigorous and empiric research questions, as well as to assess normative principles relevant to the implementation of genomic medicine.

NHGRI's sustained investment in ELSI research has produced a specialty area of genomics, yielding a robust body of literature and associated data and research tools. The planned Center for ELSI Resources and Analysis (CERA), to be funded in FY 2019, will provide ELSI investigators with a new infrastructure for sharing their research tools and products. The new center will also serve as a resource that curates and synthesizes ELSI research accomplishments, highlights new areas of study, and provides broader access to and dissemination of these findings. This resource will benefit genomics most directly, but also promises to facilitate bioethics research in other areas of biomedicine.

Budget Policy: The FY 2020 President's Budget request for Genomics and Society is $47.6 million, a decrease of $8.0 million or 14.4 percent from the FY 2019 Enacted level. These funds will be used by NHGRI to support investigator-initiated ELSI research projects as well as those embedded in different consortia. The CERA will provide a new capability for ELSI researchers to share their methods and results.

NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

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

		FY 2019 Enacted	FY 2020 President's Budget	FY 2020 +/- FY 2019
Total compensable workyears:				
	Full-time equivalent	349	349	0
	Full-time equivalent of overtime and holiday hours	0	0	0
	Average ES salary	$188	$188	$0
	Average GM/GS grade	12.6	12.6	0.0
	Average GM/GS salary	$113	$113	$0
	Average salary, grade established by act of July 1, 1944 (42 U.S.C. 207)	$122	$126	$4
	Average salary of ungraded positions	$153	$153	$0
	OBJECT CLASSES	**FY 2019 Enacted**	**FY 2020 President's Budget**	**FY 2020 +/- FY 2019**
	Personnel Compensation			
11.1	Full-Time Permanent	20,439	20,516	78
11.3	Other Than Full-Time Permanent	16,002	16,063	61
11.5	Other Personnel Compensation	790	793	3
11.7	Military Personnel	752	778	25
11.8	Special Personnel Services Payments	4,355	4,371	17
11.9	**Subtotal Personnel Compensation**	**$42,337**	**$42,521**	**$183**
12.1	Civilian Personnel Benefits	12,210	12,441	231
12.2	Military Personnel Benefits	423	437	14
13.0	Benefits to Former Personnel	0	0	0
	Subtotal Pay Costs	**$54,970**	**$55,398**	**$428**
21.0	Travel & Transportation of Persons	2,039	1,484	-555
22.0	Transportation of Things	129	90	-38
23.1	Rental Payments to GSA	0	0	0
23.2	Rental Payments to Others	0	0	0
23.3	Communications, Utilities & Misc. Charges	437	327	-110
24.0	Printing & Reproduction	21	16	-4
25.1	Consulting Services	301	216	-85
25.2	Other Services	24,905	17,120	-7,785
25.3	Purchase of goods and services from government accounts	70,215	64,200	-6,016
25.4	Operation & Maintenance of Facilities	589	418	-171
25.5	R&D Contracts	1,096	545	-550
25.6	Medical Care	1,117	784	-333
25.7	Operation & Maintenance of Equipment	1,939	1,398	-541
25.8	Subsistence & Support of Persons	53	37	-16
25.0	**Subtotal Other Contractual Services**	**$100,215**	**$84,718**	**-$15,497**
26.0	Supplies & Materials	7,109	5,030	-2,079
31.0	Equipment	5,907	4,217	-1,691
32.0	Land and Structures	0	0	0
33.0	Investments & Loans	0	0	0
41.0	Grants, Subsidies & Contributions	404,753	344,168	-60,585
42.0	Insurance Claims & Indemnities	0	0	0
43.0	Interest & Dividends	0	0	0
44.0	Refunds	0	0	0
	Subtotal Non-Pay Costs	**$520,609**	**$440,050**	**-$80,559**
	Total Budget Authority by Object Class	**$575,579**	**$495,448**	**-$80,131**

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

NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

Salaries and Expenses
(Dollars in Thousands)

OBJECT CLASSES	FY 2019 Enacted	FY 2020 President's Budget	FY 2020 +/- FY 2019
Personnel Compensation			
Full-Time Permanent (11.1)	$20,439	$20,516	$78
Other Than Full-Time Permanent (11.3)	16,002	16,063	61
Other Personnel Compensation (11.5)	790	793	3
Military Personnel (11.7)	752	778	25
Special Personnel Services Payments (11.8)	4,355	4,371	17
Subtotal Personnel Compensation (11.9)	**$42,337**	**$42,521**	**$183**
Civilian Personnel Benefits (12.1)	$12,210	$12,441	$231
Military Personnel Benefits (12.2)	423	437	14
Benefits to Former Personnel (13.0)	0	0	0
Subtotal Pay Costs	**$54,970**	**$55,398**	**$428**
Travel & Transportation of Persons (21.0)	$2,039	$1,484	-$555
Transportation of Things (22.0)	129	90	-38
Rental Payments to Others (23.2)	0	0	0
Communications, Utilities & Misc. Charges (23.3)	437	327	-110
Printing & Reproduction (24.0)	21	16	-4
Other Contractual Services:			
Consultant Services (25.1)	301	216	-85
Other Services (25.2)	24,905	17,120	-7,785
Purchases from government accounts (25.3)	55,315	49,511	-5,804
Operation & Maintenance of Facilities (25.4)	589	418	-171
Operation & Maintenance of Equipment (25.7)	1,939	1,398	-541
Subsistence & Support of Persons (25.8)	53	37	-16
Subtotal Other Contractual Services	**$83,102**	**$68,700**	**-$14,402**
Supplies & Materials (26.0)	$7,109	$5,030	-$2,079
Subtotal Non-Pay Costs	**$92,835**	**$75,647**	**-$17,188**
Total Administrative Costs	**$147,805**	**$131,045**	**-$16,760**

NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

Detail of Full-Time Equivalent Employment (FTE)

OFFICE/DIVISION	FY 2018 Final			FY 2019 Enacted			FY 2020 President's Budget		
	Civilian	Military	Total	Civilian	Military	Total	Civilian	Military	Total
Division of Extramural Operations									
Direct:	15	-	15	15	-	15	15	-	15
Reimbursable:	1	-	1	1	-	1	1	-	1
Total:	16	-	16	16	-	16	16	-	16
Division of Genome Sciences									
Direct:	10	-	10	12	-	12	12	-	12
Reimbursable:	4	-	4	4	-	4	4	-	4
Total:	14	-	14	16	-	16	16	-	16
Division of Genomic Medicine									
Direct:	10	-	10	11	-	11	11	-	11
Reimbursable:	2	-	2	2	-	2	2	-	2
Total:	12	-	12	13	-	13	13	-	13
Division of Genomics and Society									
Direct:	3	-	3	4	-	4	4	-	4
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	3	-	3	4	-	4	4	-	4
Division of Intramural Research									
Direct:	188	6	194	199	6	205	199	6	205
Reimbursable:	30	3	33	32	3	35	32	3	35
Total:	218	9	227	231	9	240	231	9	240
Division of Management									
Direct:	40	-	40	41	-	41	41	-	41
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	40	-	40	41	-	41	41	-	41
Division of Policy, Communications and Education									
Direct:	13	-	13	14	-	14	14	-	14
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	13	-	13	14	-	14	14	-	14
Office of the Director									
Direct:	5	-	5	5	-	5	5	-	5
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	5	-	5	5	-	5	5	-	5
Total	321	9	330	340	9	349	340	9	349
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**								
2016	12.6								
2017	12.5								
2018	12.6								
2019	12.6								
2020	12.6								

NATIONAL INSTITUTES OF HEALTH
National Human Genome Research Institute

Detail of Positions[1]

GRADE	FY 2018 Final	FY 2019 Enacted	FY 2020 President's Budget
Total, ES Positions	2	2	2
Total, ES Salary	376,949	376,949	376,949
GM/GS-15	36	37	37
GM/GS-14	30	32	32
GM/GS-13	61	64	64
GS-12	41	44	44
GS-11	16	18	18
GS-10	1	1	1
GS-9	2	2	2
GS-8	14	15	15
GS-7	1	1	1
GS-6	0	0	0
GS-5	0	0	0
GS-4	0	0	0
GS-3	2	2	2
GS-2	0	0	0
GS-1	0	0	0
Subtotal	204	216	216
Grades established by Act of July 1, 1944 (42 U.S.C. 207)	0	0	0
Assistant Surgeon General	0	0	0
Director Grade	5	5	5
Senior Grade	2	2	2
Full Grade	0	0	0
Senior Assistant Grade	1	1	1
Assistant Grade	0	0	0
Subtotal	8	8	8
Ungraded	126	133	133
Total permanent positions	214	226	226
Total positions, end of year	340	359	359
Total full-time equivalent (FTE) employment, end of year	330	349	349
Average ES salary	188,474	188,474	188,474
Average GM/GS grade	12.6	12.6	12.6
Average GM/GS salary	113,541	113,378	113,378

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