DIRECTORATE FOR SOCIAL, BEHAVIORAL, AND ECONOMIC SCIENCES (SBE) **$230,076,000**
-$20,612,000 / -8.2%

SBE Funding
(Dollars in Millions)

	FY 2018 Actual	FY 2019 (TBD)	FY 2020 Request	Change over FY 2018 Actual Amount	Percent
Social and Economic Sciences (SES)	$87.05	-	$80.58	-$6.47	-7.4%
Behavioral and Cognitive Sciences (BCS)	86.60	-	78.97	-7.63	-8.8%
National Center for Science and Engineering Statistics (NCSES)	53.46	-	48.80	-4.66	-8.7%
SBE Office of Multidisciplinary Activities (SMA)	23.57	-	21.73	-1.85	-7.8%
Total	**$250.69**	**-**	**$230.08**	**-$20.61**	**-8.2%**

About SBE

SBE research occurs in core areas such as economics, neuroscience, and statistics, as well as multidisciplinary activities such as those described in NSF's 10 Big Ideas.

SBE researchers examine a wide range of fundamental questions about human brains, behaviors, and institutions. SBE provides approximately 62 percent of the federal funding for basic research at academic institutions in the social, behavioral, and economic sciences. This work strengthens knowledge that innovators in the private and public sector go on to apply. SBE researchers' findings have the potential to help to grow the economy, secure the homeland, improve the health and safety of American families, and increase the competitiveness of America's farms, offices, and factories.

SBE seeks to invest in the next generation of truly transformative and socially beneficial science. SBE support for early career investigators, undergraduates and post-doctoral research fellowships, trains and prepares young scholars to develop rigorous and effective new ways to capitalize on the growing availability of massive amounts of data to advance knowledge about human behavior—for example, to use and combine data from surveys, administrative records, brain imaging, and biospecimen analysis, as well as output from behavioral, environmental, and geographic sensors. As young scientists embark on their careers, they bring novel and far reaching ideas into play that can seed the next harvest of discoveries in the social, behavioral, and economic sciences.

NCSES, an organization within SBE, provides statistical information about the United States' Science and Engineering (S&E) enterprise. NCSES collects and analyzes data on research and development, the S&E workforce, the condition and progress of science, technology, engineering, and mathematics (STEM) education, and U.S. competitiveness in science, engineering, technology, and research and development. NCSES is the Nation's leading provider of statistical data on the S&E enterprise.

SBE's FY 2020 Request is shaped by four guiding principles:

1. Support fundamental research that advances key national priorities. Today, emphases include enhancing individual safety and national security, creating new economic opportunities for populations adversely affected by change, and empowering American innovation through research in such areas as human performance, productivity, worker well-being, information exchange, decision making, and evaluations of collective action and workflow effectiveness and efficiency in a growing range of work environments.
2. Continue to support and advance NSF's Big Ideas, particularly those for which human perceptions,

actions, and adaptive strategies are critical for interdisciplinary science to produce transformative social benefits;
3. Support NCSES; and
4. Invest in broad cross-directorate activities whose ability to improve quality of life depends on accurate and actionable knowledge of human perception, action, and ability.

As an example of SBE's partnerships, SBE will continue in FY 2020 to invest in the foundational research and engineering underlying the FW-HTF Big Idea. FW-HTF will engage research communities to explain how constantly evolving technologies are changing the world of work and the lives of workers, and how people can in turn shape those technologies to human benefit. SBE's existing disciplinary and interdisciplinary programs support basic research on opportunities and constraints of human capability, artificial intelligence, machine learning, information processing, decision-making, human adaption to technology, responsible and ethical use of data, and the effect of technological change on the workforce, all of which are intellectual underpinnings for FW-HTF. SBE research in this domain supports efforts to improve lifelong learning and to integrate human values and social dynamics into the algorithms and programs that are transforming modern life. SBE is partnering with CISE, ENG, OIA, and EHR in this Big Idea.

SBE's FY 2020 Request for the URoL Big Idea supports basic, foundational research on the neural mechanisms underlying human behavior, cognition, and social interactions; human genetic variation; the emergence of phenotype from gene-environment interactions; the human microbiome and its co-evolution with its human hosts; and the ethical and social implications and societal acceptance of new scientific technologies, such as tools for genetic engineering and synthetic biology.

SBE's FY 2020 Request for the HDR Big Idea supports foundational research on machine learning, data analytics, computational simulations, technologies, and statistical methodologies. Understanding human dynamics is also critical in the area of cybersecurity and cyberinfrastructure. The HDR Big Idea encompasses a wide range of data-centered activities and SBE actively collaborates with CISE on many projects in this domain—such as the new work with the Partnership for Artificial Intelligence (AI)[1] and a CISE-led workshop on responsible data science. More generally, SBE is partnering with CISE, EHR, MPS, ENG, and other directorates to build the knowledge required to convert unprecedented changes in computing power into transformative practices and usable technologies that can improve quality of life for all.

SBE in FY 2020 will continue to participate in the NNA Big Idea. NNA seeks to advance understanding and explanation of the rapid and complex environmental and social changes in the Arctic region, and to provide the tools and knowledge that will enable resilience in this important part of our world. Changes in this part of the world provide new opportunities for commerce and new challenges for people and places in the region. SBE's partnership with NSF's other directorates can help Americans more effectively understand and adapt to this new world. Specifically, SBE sciences are critical in understanding the opportunities, challenges, and adaptive capacities of individuals who, and communities that, will be affected by ongoing Arctic change.

In addition to its support of the NSF Big Ideas, SBE's FY 2020 Request continues its commitment to broad and dynamic partnerships across the foundation that address fundamental scientific questions with broad public impact. These activities include SaTC, UtB, and INFEWS. Today more than ever, understanding the human element is essential to safety, security, growth, and well-being. SBE is committed to supporting the science that will help America's innovators improve quality of life for all its citizens.

[1] www.nsf.gov\pubs\2019\nsf19018\nsf19018.jsp

Major Investments

SBE Major Investments
(Dollars in Millions)

Area of Investment	FY 2018 Actual	FY 2019 (TBD)	FY 2020 Request	Change over FY 2018 Actual Amount	Change over FY 2018 Actual Percent
Artificial Intelligence (AI)	$12.22	-	$10.32	-$1.90	-15.5%
INFEWS	2.50	-	2.00	-0.50	-20.0%
NCSES	53.46	-	48.80	-4.66	-8.7%
I-Corps™	0.50	-	0.50	-	-
SaTC	4.00	-	4.00	-	-
UtB	28.43	-	25.00	-3.43	-12.1%
Brain Initiative	*6.33*	*-*	*5.33*	*-1.00*	*-15.8%*

Major investments may have funding overlap and thus should not be summed.

- AI ($10.32 million): SBE will continue support for AI research. Key areas of investment include such activities as advancing machine learning (ML); developing natural language processing models; integrating ML advances using big data with learning mechanisms developed in cognitive science; developing new statistical inferences and algorithms for the analysis of large data sets; and understanding the legal and ethical implications of AI.

- INFEWS ($2.0 million): SBE will participate in this NSF-wide initiative to explore the interactions among food, energy, and water (FEW) systems. Specifically, SBE will support well-integrated interdisciplinary research efforts to understand, model, design, and manage these interconnected systems that involve social and behavioral processes (such as decision-making by and governance of individuals, organizations, and institutions) and their interactions with the FEW systems' various physical, chemical, and biological processes.

- I-Corps™ ($500,000): In FY 2020, SBE will support this multiyear effort to strengthen collaboration between SBE scientists in academia and the technological, entrepreneurial, and business communities and practitioners. SBE supports researchers in developing, implementing, and improving processes by which innovators can bring scientific advances to market and help scientists more effectively benefit the public.

- SaTC ($4.0 million): SBE will sustain its investment in SaTC to support the foundational research on human beings that can improve and strengthen efforts to increase cybersecurity. SBE research can contribute to society's attempts to build infrastructure that facilitates innovation at the same time that it protects individuals, families, communities, and a full array of private and public sector institutions.

- UtB ($25.0 million): SBE will continue support of research advancing an integrative and comprehensive understanding of the brain and its function in context and in action. Investments will support cognitive science, augmented intelligence, and neuroscience (including the BRAIN Initiative), as well as new research at the interface of computational and engineering science, cognitive science, and education research.

Funding Profile

SBE Funding Profile

	FY 2018 Actual Estimate	FY 2019 (TBD)	FY 2020 Estimate
Statistics for Competitive Awards:			
Number of Proposals	4,130	-	4,100
Number of New Awards	943	-	900
Funding Rate	23%	N/A	22%
Statistics for Research Grants:			
Number of Research Grant Proposals	3,050	-	3,050
Number of Research Grants	592	-	550
Funding Rate	19%	N/A	18%
Median Annualized Award Size	$123,139	-	$123,000
Average Annualized Award Size	$140,765	-	$141,000
Average Award Duration, in years	2.6	-	2.6

SBE supports investment in core research and education activities as well as research infrastructure. In FY 2020, SBE will continue to fund research in areas such as the NSF Big Ideas, AI, UtB, and cybersecurity research while continuing to prioritize its disciplinary and interdisciplinary investigator-led research areas.

In FY 2020, SBE expects to award approximately 900 competitive grants, including an estimated 550 research grants

Program Monitoring and Evaluation

Workshops and Reports:
In FY 2018, NCSES funded a 27-month study by Committee on National Statistics (CNSTAT) of the National Academies of Sciences, Engineering, and Medicine (the National Academies). The study will have two components: (i) a panel study on transparency and reproducibility for NCSES statistics, and (ii) a workshop on the implications of convergence for measuring the S&E workforce and the S&E enterprise. The desired objective of the consensus panel is to enable NCSES to enhance the transparency and reproducibility of NSF's statistics by and for data users and to facilitate improvement of the statistical program workflow processes of the agency and its contractors. The results are expected to help NCSES improve its processes for producing indicators from its surveys and from blended data sources, and to help data users better understand and apply NCSES data. The desired objective of the workshop is to identify and discuss issues in measuring "convergence" and consider the implications of these issues for the S&E workforce and, more broadly, for the overall S&E enterprise. The results of the workshop are expected to improve NCSES's ability to take account of convergence in its statistical programs. The start-date for the grant was September 2018; the results from the workshop and the panel study are expected to be delivered in 2020.

As part of an existing SES-managed award, partially funded by NCSES, the Committee on National Statistics (CNSTAT) of the National Academies conducted a Consensus Panel Study to assess the NCSES approach to measuring the S&E workforce. The final report[2] from the study, which was delivered to NCSES in January 2018, spelled out several recommendations intended to improve the Center's ability to examine emerging S&E workforce issues while also allowing for stability in the estimation of key trends. Included

[2] www.nap.edu/catalog/24968/measuring-the-21st-century-science-and-engineering-workforce-population-evolving

among the Panel Study's recommendations were suggestions: (i) to accelerate the Center's efforts in developing sample designs that would facilitate the generation and analysis of longitudinal data on S&E workers; (ii) to enhance survey data related to the need for and acquisition of S&E skills and training; and (iii) to conduct research on optimal contacts, response modes, and incentives to improve the efficiency and effectiveness of the Center's S&E workforce surveys program. In response to recommendation (i), NCSES has developed longitudinal weights for its National Survey of College Graduates and has incorporated a longitudinal design into its Survey of Doctorate Recipients with plans to disseminate longitudinal data after the 2019 survey cycle. For recommendation (ii), NCSES has begun assessing the quality and accessibility of administrative data sources to supplement the labor market data collected in its surveys. In response to recommendation (iii), NCSES has conducted research examining data collection approaches to develop an optimal contact strategy for each of its surveys.

In response to requests for increased granularity in graduate student enrollment data, NCSES conducted an evaluation of its Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS). This evaluation included workshops with GSS stakeholders to determine data needs, studies to evaluate options for expanding the analytical capabilities of the survey, and site visits with educational institutions to determine the feasibility of collecting additional information. The result of this evaluation is the successful implementation of an improved GSS data collection effort that allows for the separate analysis of master's graduate student and doctoral graduate student enrollment data. In the past, it was not possible to use GSS data to examine graduate student enrollment by degree level.

Committees of Visitors (COV):

- In 2019, COVs will review BCS and SMA.
- In 2020, a COV will review SES.

The Performance chapter provides details regarding the periodic reviews of programs and portfolios of programs by external Committees of Visitors and directorate Advisory Committees. Please see this chapter for additional information.

People Involved in SBE Activities

Number of People Involved in SBE Activities

	FY 2018 Actual Estimate	FY 2019 (TBD)	FY 2020 Estimate
Senior Researchers	1,416	-	1,300
Other Professionals	429	-	390
Postdoctoral Associates	167	-	150
Graduate Students	1,290	-	1,180
Undergraduate Students	1,076	-	990
Total Number of People	**4,378**	**-**	**4,010**

DIVISION OF SOCIAL AND ECONOMIC SCIENCES (SES) **$80,580,000**
-$6,470,000 / -7.4%

SES Funding
(Dollars in Millions)

	FY 2018 Actual	FY 2019 (TBD)	FY 2020 Request	Change over FY 2018 Actual Amount	Change over FY 2018 Actual Percent
Total	**$87.05**	**-**	**$80.58**	**-$6.47**	**-7.4%**
Research	**76.46**	**-**	**74.09**	**-2.37**	**-3.1%**
CAREER	2.27	-	2.50	0.23	10.1%
Education	**1.30**	**-**	**0.40**	**-0.90**	**-69.2%**
Infrastructure	**9.29**	**-**	**6.09**	**-3.20**	**-34.4%**
NNCI	0.40	-	-	-0.40	-100.0%
Research Resources	8.89	-	6.09	-2.80	-31.5%

About SES

SES supports research and related activities that improve understanding of economic and social institutions and how individuals and organizations behave within them. SES funds basic research on risk assessment and decision-making in vital areas of society; the ways in which changes in science and technology are affecting people—and when effects are negative, the work provides stronger foundations for effective adaptation. SES funds research on methods and statistics that are used across the sciences, government, education, and industry, to produce more comprehensive, rigorous, reliable, and usable inferences from the many types of data that are now available. Discipline-based programs like economics provide crucial insights pertinent to the social effects of innovation and disruptive technologies—providing the basic ideas that help individuals, communities, governments, and business adapt more effectively. SES also funds work to improve the effectiveness and efficiency of public policy provision and to enhance critical security and preparedness issues. SES coordinates the Cultivating Cultures of Ethical STEM (CCE-STEM) program, supporting, along with other NSF directorates, the Online Ethics Center for Engineering and Science. SES research also helps to clarify how organizations of all kinds can be more effective in increasingly competitive marketplaces and how individuals can find new opportunities to participate in America's evolving workforce.

In general, about 67 percent of the SES portfolio is available to support new research grants. The remaining 33 percent supports research grants made in prior years and the research infrastructure needed by this community.

DIVISION OF BEHAVIORAL AND COGNITIVE SCIENCES (BCS) **$78,970,000**
-$7,630,000 / -8.8%

BCS Funding
(Dollars in Millions)

	FY 2018 Actual	FY 2019 (TBD)	FY 2020 Request	Change over FY 2018 Actual Amount	Change over FY 2018 Actual Percent
Total	**$86.60**	**-**	**$78.97**	**-$7.63**	**-8.8%**
Research	**83.46**	**-**	**77.53**	**-5.93**	**-7.1%**
CAREER	2.34	-	2.50	0.16	6.8%
Education	**1.64**	**-**	**0.44**	**-1.20**	**-73.2%**
Infrastructure	**1.50**	**-**	**1.00**	**-0.50**	**-33.3%**
Research Resources	1.50	-	1.00	-0.50	-33.3%

About BCS

BCS supports research and related activities that advance fundamental understanding of human behavior and cognition. BCS's foundational research programs and activities support research in cognitive neuroscience; geography and spatial sciences; linguistics; archaeology; anthropology; social psychology; developmental sciences; perception, action and cognition; and the science of learning including augmented intelligence. Core programs are complemented by active involvement in competitions that support collaborative and cross-disciplinary projects that increase understanding of mind, brain, and society. Multiple programs support research on how artificial intelligence technologies can support or enhance human performance, and new methods in data science are being used to integrate complex and diverse data to better understand human behavior.

The division seeks to advance scientific knowledge and methods addressing perception, thought processes, language, learning, and social behavior across neural, individual, family, and group levels. BCS supports activities focusing on how human behavioral patterns develop and change across time and space. The division aims to increase basic understanding of geographic distributions and relationships, as well as the capabilities to explore them, with an emphasis on interactions among human and natural systems. BCS research is helping individuals, communities, and many people in the private and public sectors predict and address how people respond to stressors, how to improve methods for effective learning, how to support human performance using emerging technologies, how to effectively expand participation in the STEM workforce, how to enhance the quality of social interaction, and how to strengthen and improve how we anticipate and respond to critical issues in areas such as national security, terrorism, and global change.

In general, about 86 percent of the BCS portfolio is available to support new research grants. The remaining 14 percent supports research grants made in prior years and the research infrastructure needed by this community.

NATIONAL CENTER FOR SCIENCE AND ENGINEERING STATISTICS (NCSES) **$48,800,000**
-$4,660,000 / -8.7%

NCSES Funding
(Dollars in Millions)

	FY 2018 Actual	FY 2019 (TBD)	FY 2020 Request	Change over FY 2018 Actual Amount	Percent
Total	**$53.46**	**-**	**$48.80**	**-$4.66**	**-8.7%**
Education	**0.10**	**-**	**-**	**-0.10**	**-100.0%**
Infrastructure	**53.36**	**-**	**48.80**	**-4.56**	**-8.5%**

About NCSES

NCSES was established within NSF by Section 505 of the America COMPETES Reauthorization Act of 2010 (P.L. 111-358). The Act provides NCSES with the legislative mission to "…serve as the central federal clearinghouse for the collection, interpretation, analysis, and dissemination of objective data on science, engineering, technology, and research and development." NCSES is mandated to collect statistical data on research and development trends, the science and engineering workforce, U.S. competitiveness, and the condition and progress of the Nation's STEM education. NCSES also support research using the data it collects and on methodologies in areas related to the work of the Center. As a part of its service to the nation, NCSES supports the education and training of researchers in the use of its own and other large-scale, nationally representative data sets.

As one of the thirteen principal federal statistical agencies, NCSES has primary responsibility for statistics regarding the S&E enterprise. NCSES designs, supports, and directs a coordinated collection of periodic national surveys and performs a variety of other data collections and research, providing policymakers, researchers, and other decision-makers with high quality data and analysis on R&D, innovation, the education of scientists and engineers, and the S&E workforce. The work of NCSES involves survey development, methodological and quality improvement efforts, data collection, analysis, information compilation, dissemination, web access, and customer service to meet the statistical and analytical needs of a diverse user community. It prepares two congressionally mandated biennial reports—*Science and Engineering Indicators and Women, Minorities, and Persons with Disabilities in Science and Engineering*.

The FY 2020 Request supports NCSES's core data collection and analytic activities that includes nationally-representative surveys of U.S. investment in research and development (across all sectors of the economy), the education of scientists and engineers, and the science and engineering workforce. This includes the preparation of the aforementioned *Science and Engineering Indicators, and Women, Minorities, and Persons with Disabilities in Science and Engineering*. In FY 2020, NCSES will continue with initiatives related to the use of administrative and organic data, and to maintain systems and data collection efforts.

SBE OFFICE OF MULTIDISCIPLINARY ACTIVITIES (SMA) **$21,726,000**
-$1,848,000 / -7.8%

SMA Funding
(Dollars in Millions)

	FY 2018 Actual	FY 2019 (TBD)	FY 2020 Request	Change over FY 2018 Actual Amount	Change over FY 2018 Actual Percent
Total	**$23.57**	**-**	**$21.73**	**-$1.85**	**-7.8%**
Research	**15.98**	**-**	**14.69**	**-1.30**	**-8.1%**
CAREER	0.64	-	-	-0.64	-100.0%
Education	**6.50**	**-**	**5.95**	**-0.55**	**-8.5%**
Infrastructure	**1.09**	**-**	**1.09**	**-**	**-**
Research Resources	1.09	-	1.09	-	-

About SMA

SMA provides a focal point for the wide range of activities that cut across SBE and NSF disciplinary boundaries. SMA supports research that seeks to improve the effectiveness of the scientific workforce. It also supports Research Experiences for Undergraduates (REU) Sites, and SBE Postdoctoral Research Fellowships (SPRF). SMA will play a major role in several crosscutting NSF investments in FY 2020: UtB; cybersecurity, via SaTC; innovation, via I-Corps™; and interdisciplinary research and training, via activities such as the SPRF-Fundamental Research (SPRF-FR) and Broadening Participation (SPRF-BP) tracks. While all SBE divisions pursue interdisciplinary work, SMA assists with seeding multidisciplinary activities for the future, such as leveraged and targeted co-funding directed towards national, NSF, and directorate priorities.