

**DIRECTORATE FOR SOCIAL, BEHAVIORAL
AND ECONOMIC SCIENCES (SBE)**

\$246,840,000
-\$24,330,000 / -9.0%

SBE Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual	
				Amount	Percent
Division of Behavioral and Cognitive Sciences (BCS)	\$94.35	-	\$85.14	-\$9.21	-9.8%
Division of Social and Economic Sciences (SES)	96.43	-	86.66	-9.77	-10.1%
National Center for Science and Engineering Statistics (NCSES)	54.23	-	52.11	-2.12	-3.9%
SBE Office of Multidisciplinary Activities (SMA)	26.16	-	22.93	-3.23	-12.4%
Total	\$271.17	-	\$246.84	-\$24.33	-9.0%

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 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 use. SBE researchers’ findings have the potential to help 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, graduate students, and post-doctoral research fellowships trains and prepares young scholars to develop rigorous and effective new ways to capitalize on the increasing 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 seed the next harvest of discoveries in the social, behavioral, and economic sciences.

NCSES, a federal statistical agency within SBE, provides statistical information about the United States’ science and engineering (S&E) enterprise, often with a global context. NCSES collects, analyzes, and disseminates data on research and development (R&D), the S&E workforce, the condition and progress of science, STEM education, and U.S. competitiveness in science, engineering, and technology R&D. NCSES is the Nation’s leading provider of statistical data on the S&E enterprise.

SBE’s FY 2021 Request is shaped by three guiding principles:

1. Support fundamental research that advances key national priorities. The research emphases include enhancing national security and preparedness; strengthening American infrastructure; creating new economic opportunities for populations adversely affected by change; and empowering American innovation through research in artificial intelligence (AI) with a focus on worker productivity and well-being in a growing range of work environments, including industries of the future (e.g. AI, future manufacturing); reliability of information networks; and improving quality of life for communities across the country.

2. Support NCSES, one of only thirteen principal statistical agencies across the federal government. Continued investment in NCSES supports NSF's mission by collecting and disseminating and serving as a clearinghouse for comprehensive and reliable data on R&D trends, educational pathways and experiences of and opportunities for the Nation's science and engineering workforce, measures of national competitiveness and innovation, and the condition and progress of STEM education in the United States.
3. Support and advance NSF's Big Ideas and other cross-directorate activities, particularly those for which understanding human perception, cognition, behavior, action, and adaptive strategies are necessary to produce transformative societal benefits.

SBE's FY 2021 Request of \$246.84 million will be used to prioritize and maximize support for investments in SBE's disciplinary and interdisciplinary programs as well as its support for NSF-wide activities.

The FY 2021 Request includes continued support for investments that integrate the social, behavioral, and economic sciences into multi-directorate and multi-disciplinary activities that address issues of major scientific, national, and societal importance. These priority investments include Secure and Trustworthy Cyberspace (SaTC); AI-related research; and fundamental research in data science and engineering.

At the FY 2021 Request level, SBE will continue to support foundational research in the Big Ideas including FW-HTF, URoL, HDR, and NNA.

The FW-HTF Big Idea 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 that comprises the intellectual underpinnings for FW-HTF, including the opportunities and constraints of human capability, AI, machine learning, information processing, decision-making, human adaptation to technology, responsible and ethical use of data, the effect of technological change on the workforce, and the development of industries of the future. SBE research in this domain supports efforts to improve lifelong learning and to integrate human values and social dynamics into the algorithms and technologies that are transforming modern life. SBE is partnering with CISE, ENG, OIA, and EHR on this Big Idea.

The URoL Big Idea includes foundational SBE research on topics such as 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. All NSF Directorates, OIA, and OISE participate in URoL.

Support for the HDR Big Idea includes SBE foundational research on machine learning, data analytics, computational simulations, technologies, human networks, and statistical methodologies. Understanding human dynamics is also critical in the area of cybersecurity and cyberinfrastructure. HDR encompasses a wide range of data-centered activities and SBE actively collaborates with CISE on many projects in this domain, such as the Partnership for Artificial Intelligence. More generally, SBE partners 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.

The NNA Big Idea 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 the world. Changes in the Arctic provide new opportunities for commerce and new challenges for people and communities in the region. SBE's partnership with other NSF 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 2021 Request continues its commitment to broad and dynamic partnerships across the Foundation that address fundamental scientific questions with broad public impact. These partnership programs include BRAIN, NSF I-Corps™, SaTC, and Smart and Connected Communities. 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.

SBE will continue in FY 2021 to support the next generation of scholars poised to produce transformative and societally beneficial science. SBE provides support for early career investigators (CAREER); undergraduates (Research Experiences for Undergraduates); graduate students (Doctoral Dissertation Research Improvement Grants); and post-doctoral researchers (SBE Postdoctoral Research Fellowships (SPRF)).

Finally, SBE’s FY 2021 Request includes continued support for NCSES. Consistent with the President’s Management Agenda, SBE support will help NCSES modernize systems and data tools, including projects that will address requirements of the Foundations for Evidence-Based Policymaking Act of 2018, P.L. 115-435¹ (Evidence Act). SBE is also committed to supporting NSF’s transition to meeting other requirements associated with the Evidence Act, including having NCSES’ Division Director serve as the Foundation’s Statistical Official.

Major Investments

SBE Major Investments
(Dollars in Millions)

Area of Investment ^{1,2}	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual	
				Amount	Percent
Artificial Intelligence	\$12.25	-	\$20.44	\$8.19	66.9%
BRAIN Initiative	7.30	-	5.00	-2.30	-31.5%
NSF I-Corps™	0.50	-	0.47	-0.03	-6.0%
NCSES	54.23	-	52.11	-2.12	-3.9%
SaTC	4.00	-	3.80	-0.20	-5.0%
Strengthening American Infrastructure	-	-	6.00	6.00	N/A

¹ Major investments may have funding overlap and thus should not be summed.

² This table reflects this directorate's support for selected areas of investment. In other directorate narratives, areas of investment displayed in this table may differ and thus should not be summed across narratives.

- AI: SBE will increase support for AI research in FY 2021. 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 ethical, legal and societal implications (ELSI) of AI. SBE’s AI investment includes support for National AI Research and Development Institutes as well as other AI-related research as defined by the Networking and Information Technology R&D (NITRD) report published annually with

¹ www.congress.gov/115/plaws/publ435/PLAW-115publ435.pdf

the President’s Budget.

- BRAIN: 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 as well as new research at the interface of computational and engineering science, cognitive science, and education research. Specific investments include Integrative Strategies for Understanding Neural and Cognitive Systems and Collaborative Research in Computational Neuroscience, which is an activity in partnership with the National Institutes of Health, BIO, CISE, ENG, MPS, OISE, and several international research funding agencies.
- I-Corps™: In FY 2021, 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: SBE will sustain its investment in SaTC to support 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.
- Strengthening American Infrastructure: In FY 2021, SBE will support an investment that links experts on physical, computational, and material aspects of infrastructure design with scientists whose fundamental research explains how humans will—and will not—use infrastructure that we build. This approach to infrastructure is a critical component to building better, smarter, and more cost-effective roads, electric grids, and hospitals. Improving infrastructure in these ways can spur private-sector innovation, grow the economy, and is essential to national competitiveness.

Funding Profile

SBE Funding Profile			
	FY 2019 Actual Estimate	FY 2020 (TBD)	FY 2021 Estimate
Statistics for Competitive Awards:			
Number of Proposals	3,733	-	3,700
Number of New Awards	871	-	800
Funding Rate	23%	N/A	22%
Statistics for Research Grants:			
Number of Research Grant Proposals	2,651	-	2,700
Number of Research Grants	545	-	500
Funding Rate	21%	N/A	19%
Median Annualized Award Size	\$128,375	-	\$128,400
Average Annualized Award Size	\$153,798	-	\$153,800
Average Award Duration, in years	2.9	-	2.9

SBE supports investment in core research and education activities as well as research infrastructure.

Program Monitoring and Evaluation

External Program Evaluations and Studies

- In FY 2020, NCSES is sponsoring a study with the National Academy of Sciences Committee on National Statistics related to transparency and reproducibility. NCSES hopes to use the outcome of this

study to help shape the Federal Statistical System’s approach to these topics in the future.

- Over FY 2020, NCSES is sponsoring and leading a study to inform the development of a virtual Research Data Center (RDC) for the Federal Statistical RDC system that can be used to inform the decision making of the Interagency Council on Statistical Policy. This study brings together various participants from different federal agencies and academia to NSF to link different data sets and provide training on those linked data sets—while building capacity for researchers and analysts inside and outside the Federal Statistical System.

Workshops and Reports

- In FY 2019, SBE’s Science of Science and Innovation Policy Program partnered with the Department of Defense to co-sponsor a National Academies of Science, Engineering, and Medicine (the National Academies) study, *Science and Innovation Leadership for the 21st Century: Challenges and Strategic Implications for the United States*. The National Academies ad hoc committee will explore the implications of the loss of U.S. economic capability and leadership relative to other countries on issues such as national security, unemployment or underemployment of the U.S. workforce, and international development and global stability. Its consensus report will provide findings and recommendations for research and federal government actions to address these challenges.
- In FY 2019, NCSES hosted a workshop for staff on key components of the Evidence Act relevant to NCSES and NSF. Workshop attendees explored NCSES’ alignment with the Evidence Act, the Federal Data Strategy,² and current information quality guidelines for statistical agencies. Breakout sessions provided a forum for NCSES staff and others in attendance to engage in more detailed and specific brainstorming around planning efforts, tactics, best practices, and lessons learned.
- In FY 2019, NCSES led a federal government workshop—as part of a community of practice—on R&D. The goal of the workshop was to engage this community on the definitions and different ways in which R&D is measured across NCSES surveys and publications.
- In FY 2020, SBE is funding an expert meeting to provide insight on the primary data science needs for SBE disciplines conducted by the National Academies. The meeting will serve to guide growth of the Human Networks and Data Science program within the BCS Division.
- In FY 2020, NCSES released the Summary Report for *Science and Engineering Indicators*, meeting its Congressional mandate. This biennial report to Congress provides a broad base of quantitative information about U.S. science, engineering, and technology.
- In FY 2020, NCSES released *Doctorate Recipients from U.S. Universities*.³ This annual report provides the major trends in doctoral education, organized into themes highlighting important questions about doctorate recipients.
- SES-Supported Workshops:
 - “Knowledge Convergence and Divergence in Team Performance.” During 2019-2021, this team science project will evaluate the pros and cons of convergence science in the context of the SaTC Socio-Technical Interdisciplinary Collaborations program. Interviews and surveys of the approximately 100 teams that were funded starting in 2013 will be conducted, measuring the success of these teams using such indicators as publications, future awards, and co-publication.
 - “Human Technology Partnerships and the Changing Nature of Work.” In the spring of 2020 in Evanston, IL, this workshop will help determine a research agenda to integrate the sciences of human organizing, technologies, and data science to meet challenges at the human-artificial intelligence interfaces in workplace contexts.
 - “NBER Summer Institute 2020.” The National Bureau of Economic Research presents sessions that outline new economic research, identify upcoming challenges for government and other programs, and report on evaluations of government programs in contexts ranging from aging; asset pricing;

² <https://strategy.data.gov/>

³ <https://nces.nsf.gov/pubs/nsf20301/>

big data and high-performance computing for financial economics; capital markets; children; corporate finance; crime; development of the American economy; economic growth; environment and energy; health care and health economics; household finance; labor studies; national security; productivity, development, and entrepreneurship; real estate; and risks of financial institutions.

- “SBE’s Major Surveys.” In 2020, the fourth in the series of meetings will take place that will focus on advances and challenges facing the collection of social, behavioral, and economic data from U.S. residents. In 2019, the meeting focused on data and respondent privacy, opportunities for collaborations across independent surveys, mode issues and opportunities for survey data collection (web, video interviews, etc.), interactions with stakeholders and data users, and increasing and addressing diversity among survey respondents.

Committees of Visitors (COV)

- In 2019, a COV assessed the BCS Division’s merit review process and presented their report to the SBE Advisory Committee in December 2019. The COV concluded that, “Program management, assessment processes, and stewardship of funds were effective and professional.” Based on feedback and recommendations from the COV concerning additional feedback to reviewers; the Division is evaluating best practices for helping researchers improve their proposals. In addition, and more broadly in response to other COV inputs, BCS is reviewing emerging areas of research, strategies for open science, and ways to optimize communication with both the research community and the general public.
- In FY 2020, a COV will review SES and SMA. Final results from the COV assessment are expected in FY 2020, with a formal presentation to the SBE AC in its fall 2020 meeting. Results of the 2020 COV, combined with the 2019 BCS COV assessment, will be used to inform the SBE Directorate’s consideration and review of merit review practices.

The Performance and Management 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 2019		
	Actual	FY 2020	FY 2021
	Estimate	(TBD)	Estimate
Senior Researchers	1,713	-	1,560
Other Professionals	332	-	300
Postdoctoral Associates	197	-	180
Graduate Students	1,478	-	1,350
Undergraduate Students	1,137	-	1,030
Total Number of People	4,857	-	4,420

DIVISION OF BEHAVIORAL AND COGNITIVE SCIENCES (BCS)

\$85,140,000
-\$9,210,000 / -9.8%

BCS Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual	
				Amount	Percent
Total	\$94.35	-	\$85.14	-\$9.21	-9.8%
Research	91.14	-	81.78	-9.36	-10.3%
Education	1.63	-	0.42	-1.21	-74.2%
Infrastructure	1.59	-	2.94	1.35	85.4%
Research Resources	1.59	-	2.94	1.35	85.4%

About BCS

BCS supports research that provides information, empirical data, and scientific theory that inform the understanding of pressing national issues. BCS-supported research addresses how thought and behavior respond to changing situations, environmental characteristics, and cultural differences, providing critical bases for improving disaster response and supporting key aspects of improved security and preparedness. In addition, BCS-funded activities help to understand the potential sources of bias in human interaction and examine how to improve technology performance in the context of interacting with humans.

BCS supports fundamental research that examines the sources of the human condition, the character of thinking and behavior. The programs examine these issues at multiple levels of analysis, ranging from genetics and brain activity to social, cultural, and environmental contexts. Core analyses of human language, perception, and cognition are critical to understanding human behavior and to the development of advanced technologies that support human functioning. BCS-supported research is essential to understanding and developing new approaches to learning, decision making, and problem solving for individuals and groups. For example, through its Science of Learning and Augmented Intelligence program, BCS research explores how new technologies, especially artificial intelligence, can enhance human cognition and productivity.

BCS manages infrastructure-related activities in Human Networks and Data Science, which seek to advance relevant analytical techniques and develop user-friendly, large-scale, next-generation data resources to improve quality of life for all Americans. These activities are complemented by active involvement in funding competitions and development of partnerships that support collaborative and cross-disciplinary projects that increase understanding of the human brain, mind, and behavior.

In general, about 80 percent of the BCS portfolio is available to support new research grants. The remaining 20 percent supports research grants made in prior years and the research infrastructure needed by this community.

DIVISION OF SOCIAL AND ECONOMIC SCIENCES (SES)

\$86,660,000
-\$9,770,000 / -10.1%

SES Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual	
				Amount	Percent
Total	\$96.43	-	\$86.66	-\$9.77	-10.1%
Research	89.37	-	81.24	-8.13	-9.1%
Education	0.89	-	0.38	-0.51	-57.3%
Infrastructure	6.17	-	5.04	-1.13	-18.3%
NNCI	0.40	-	-	-0.40	-100.0%
Research Resources	5.77	-	5.04	-0.73	-12.7%

About SES

SES supports foundational research and related programs that improve the delivery of essential goods and services across the country. These programs improve understanding of how individuals and organizations behave within a range of economic and social contexts; advance risk assessment and strategic planning in various areas of society; provide insights into social effects of disruptive technologies—providing the basic ideas that help individuals, communities, governments, and business adapt more effectively. In addition, SES-supported research helps develop more robust and trustworthy ways of conveying critical information to enhance understanding of complex systems that are the foundation of the Nation’s security and preparedness imperatives. SES coordinates the Ethical and Responsible Research program, supporting, along with other NSF directorates, the Online Ethics Center for Engineering and Science. SES research 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. This research has 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.

SES supports widely used data infrastructure such as the Panel Study of Income Dynamics, the American National Election Studies, and the General Social Survey. These surveys are national resources for research and teaching and have become models for data collections in other fields.

In general, about 78 percent of the SES portfolio is available to support new research grants. The remaining 22 percent supports research grants made in prior years and the research infrastructure needed by this community.

**NATIONAL CENTER FOR SCIENCE AND ENGINEERING
STATISTICS (NCSES)**

\$52,110,000
-\$2,120,000 / -3.9%

NCSES Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual	
				Amount	Percent
Total	\$54.23	-	\$52.11	-\$2.12	-3.9%
Education	0.10	-	-	-0.10	-100.0%
Infrastructure	54.13	-	52.11	-2.02	-3.7%

About NCSES

NCSES is one of the federal government’s thirteen principal statistical agencies with a mission to provide statistics and analysis regarding the S&E enterprise. NCSES provides policymakers, researchers, and the public high-quality data and analysis on R&D, innovation, the education of scientists and engineers, and the S&E workforce. NCSES also supports research; the education and training of researchers; statistical methodology and data quality improvement efforts; and information compilation and dissemination to meet the statistical and analytical needs of a diverse user community.

The agency was originally created within NSF in 1950 as the Division of Science Resources Statistics. In 2010, the agency’s mandate was expanded and it was renamed as NCSES by Section 505 of the America COMPETES Reauthorization Act of 2010 (P.L. 111-358). The Act mandates that NCSES collect data on R&D trends, the science and engineering workforce, U.S. competitiveness, and the condition and progress of the Nation’s STEM education. This includes the preparation of two congressionally mandated biennial reports—*Science and Engineering Indicators*; and *Women, Minorities, and Persons with Disabilities in Science and Engineering*.

The FY 2021 Request supports NCSES’s core data collection and analytic activities, including nationally representative surveys of U.S. investment in R&D across all sectors of the economy, the education of scientists and engineers, and the science and engineering workforce. This also includes preparation of the aforementioned *Science and Engineering Indicators*; and *Women, Minorities, and Persons with Disabilities in Science and Engineering*. In FY 2021, NCSES will continue with initiatives related to

- studying the Skilled Technical Workforce (STW)—with emphasis on the STW’s current and potential future relevance to industries of the future such as, but not limited to AI, the bioeconomy, and future manufacturing;
- using of administrative and organic data to inform efforts to increase government effectiveness and efficiency through increased data integration; and
- maintaining systems and data collection efforts for modern federal statistics.

SBE OFFICE OF MULTIDISCIPLINARY ACTIVITIES (SMA)

\$22,930,000
-\$3,230,000 / -12.3%

SMA Funding
(Dollars in Millions)

	FY 2019 Actual	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual	
				Amount	Percent
Total	\$26.16	-	\$22.93	-\$3.23	-12.3%
Research	18.28	-	17.31	-0.97	-5.3%
Education	6.42	-	5.62	-0.80	-12.5%
Infrastructure	1.46	-	-	-1.46	-100.0%
Research Resources	1.46	-	-	-1.46	-100.0%

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 Sites, the Science of Science: Discovery, Communication, and Impact (SoS:DCI) program, and the SPRF program. SMA will play a major role in several crosscutting NSF investments in FY 2021: innovation, via I-Corps™; and interdisciplinary research and training, via activities such as the SPRF-Fundamental Research and Broadening Participation tracks. In addition, SMA’s SoS:DCI program is designed to increase the public value of scientific activity. 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.

In general, about 62 percent of the SMA portfolio is available to support new research grants. The remaining 38 percent supports research grants made in prior years.