National Center for Science and Engineering Statistics: Data and Data Innovations for the US Science and Engineering Enterprise

Priorities for the 117th Congress and 2021-2025 Administration

The National Center for Science and Engineering Statistics (NCSES) is the principal federal statistical agency providing data on the state of science, technology, engineering and mathematics; collecting essential data on STEM education and the science and engineering workforce; and supporting data innovations and solutions for the future.

NCSES needs strong NSF leadership support and staffing resources to –

- Expand its data portfolio on the science and technology enterprise
- Develop innovative services to link, analyze, and disseminate data to support scientifically sound, statistically rigorous research to generate insights that can improve American society
- Collaborate broadly with national and international scientific communities to support innovation and create knowledge to improve the future

The NCSES also needs attention to its budget and budget structure.

Mission, Scope, and Products

The National Center for Science and Engineering Statistics (NCSES), within the National Science Foundation (NSF), an independent government agency, is the nation's principal source of statistics about the science and engineering enterprise and provides data to help understand the nation's ability to work at the leading edge of scientific and engineering discoveries. One of the nation's 13 principal federal statistical agencies, NCSES serves as the central Federal clearinghouse for the collection, interpretation, analysis, and dissemination of data on research and development; the science and engineering workforce; U.S. competitiveness in science, engineering, technology, and research and development; and the condition and progress of U.S. STEM education. Formerly the Division of Science Resources

Statistics, NCSES was renamed when its mission was expanded under Section 505 of the America COMPETES Reauthorization Act of 2010.

NCSES has an annual budget of about $65 million and a staff of 53 professionals. NCSES designs, supports, and directs a coordinated collection of periodic national surveys and analytic research studies that provide policymakers, businesses, researchers, and other decision makers high quality information about the US science and engineering enterprise, placed in a global context. NCSES also supports research, research infrastructure, and training to link, analyze, protect, and disseminate large-scale nationally representative data sets, including NCSES data. NCSES engages in methodological research in areas related to its work.

Science and Engineering Indicators, a congressionally mandated report providing high-quality data and analysis on the conditions of the nation's science and engineering enterprise, is prepared by NCSES under the guidance of the National Science Board (NSB). This high-profile publication, published and delivered by the NSB to the President and Congress biennially, is highly anticipated and used by policymakers, industry leaders, university administrators, current and potential students, parents, finance companies, and economic development entities, among others. It also enjoys visibility internationally as an accessible and reliable source of data on US science.

Opportunity: Broaden NSF leadership

As the Federal Statistical Agency that sits within the premier U.S. science organization of NSF and works closely with the NSB, NCSES has a unique opportunity to be at the forefront of recently mandated transformations in how data are collected, analyzed, stored, protected, linked, and disseminated. The Foundations for Evidence-Based Policymaking Act of 2019 (Evidence Act) and the Federal Data Strategy require, facilitate, and encourage the federal government to better use data to support evidence-based policy decisions. Such work requires significant research to develop and test methodologies and forms of infrastructure to be built. No statistical agency, including NCSES, currently has the wherewithal needed to get the job done. But, with appropriate resource levels and located in NSF, an agency with the singular mission of the "health of science," it can facilely assume this responsibility and mobilize scientific and technological experts and innovators as sources of support.

The Evidence Act directs the NCSES Director to serve as the NSF's Statistical Official and establishes Advisory Committee on Data for Evidence Building, on which the NCSES director serves. The report that led to the Evidence Act, The Promise of Evidence-Based Policymaking, recommended the establishment of "a National Secure Data Service to facilitate access to data for evidence building while ensuring privacy and transparency in how those data are used." The NSF has been proposed as a home for such a service. There is every reason to give this high consideration.

Among the work to be carried out to support evidence-based policy making is analyze currently available data and study their potential to be cross-linked for additional insights; launch data collections and acquisitions into new and important areas of study; developing cross-agency and public-private partnerships to increase the quality, utility, and accessibility of data; and expand data sharing and linkages to make existing data more complete and useful.

NCSES is uniquely poised to lead in these efforts because it can readily collaborate with the most accomplished scientists in computer science, social and behavioral sciences, mathematics and statistics to bring to bear cutting-edge solutions and techniques to harvest large-scale data as well as

administrative and survey data; develop secure and accessible data hubs for storing, linking and analyzing data; and develop new methods for protecting confidentiality and disseminating data for policy and research purposes.

These efforts have the additional benefit that they facilitate reproducible science and transparency and adhere to the missions of NCSES and NSF. NCSES' parent organization being NSF also serves to ensure the independence and integrity of the operations of such a service.

Another area of significant opportunity relates to NCSES' potentially essential role in monitoring the diversity of the scientific workforce, collecting data on equity and inclusion within the federal scientific workforce, and in the work of federal scientific agencies, including in their funding. The *Combating Sexual Harassment in Science Act of 2019* envisioned a federal data system on such issues. NCSES is the natural home for this function. This bill was introduced by Congresswomen Eddie Bernice Johnson in 2019 and will likely be reintroduced for consideration again this coming term.

Challenges

- NCSES faces a chronic, long-term and serious shortage of full-time equivalent federal staff (FTE) trained in survey statistics and methodology, statistical analysis, data science, data communications, and data management.
    - ✓ In 2020, the agency had 53 FTEs to manage its entire $65 million statistical, analytic, and data dissemination program.
    - ✓ NCSES must rely on contractor support to conduct a significant portion of its current work activities, which hampers the development of in-house expertise , dampens the ability to create innovative data solutions, and reduces the potential to expand its data portfolio.
- The NCSES budget has remained flat, in real terms, over the past 6 years; meanwhile circumstances surrounding data acquisition and protection have greatly changed, policy and data requirements have increased, and contract support and data collection costs have risen.
- Staffing and budget constraints prevent NCSES from pursuing critical opportunities, such as:
    - ✓ Linking data and conducting rigorous analyses of currently available data (e.g., education, workforce, and business-related questions on the impact of COVID-19).
    - ✓ Launching data collections and acquisitions into new and important areas of study, such as the skilled technical workforce and the economic contribution of household innovation.
    - ✓ Reviewing, testing, and transforming its survey instruments to keep pace with changes in areas of science (e.g., education research with high doctorate production remains absent from the *Survey of Doctorate Recipients* and *Survey of Graduate Students and Postdoctorates in Science and Engineering*) and changes in composition of the scientific workforce (slowed processes for incorporating sexual orientation and gender identity beyond planned scheduling and despite measures used in other statistical agencies).
    - ✓ Developing or participating in cross-agency and public-private partnerships that would increase the quality, utility, and accessibility of data.
    - ✓ Expanding data sharing and linkages to make existing data more complete and useful and sufficiently available in restricted form.

- NCSES's stature and responsibilities as a federal statistical agency within NSF needs to be consistently reaffirmed with the NSF Director and NSF senior leadership.

Priorities

- Staffing:
  - Address staffing shortfalls by increasing NCSES's FTE allocation for permanent staff
  - Allow increased FTE allocation to also include rotational scientists in statistics, survey methods, and data science
- Support NCSES leadership efforts:
  - Promote the NCSES Director's efforts to coordinate and meet the needs of the Federal Data Strategy and the requirements of the Evidence Act
  - Provide NCSES greater authority over its administrative and technology functions (e.g. hiring, budget, and information technology)
  - Facilitate direct access of the NCSES Director to the NSF Director. NCSES' direct participation in meetings of senior Foundation officials will allow better coordination between the Foundation's and NCSES's activities and strategies
- Expand NCSES data portfolio:
  - The science and technology landscape is ever changing. NCSES data collections and acquisitions have not been able to keep up with the need to describe, let alone support research, to sufficiently inform policies in this unique and important arena.
  - Areas to expand include, but are not limited to, information on the skilled technical workforce and data related to small business and academic R&D and innovation.
  - Ensure NCSES collaborates with the national and international science communities on global policy data needs.
- Facilitate innovative data solutions to change the nation's ability to collect, link, store, analyze and protect Federal data assets by:
  - Supporting innovative data systems and solutions to facilitate research of these data assets and meet requirements of the Evidence Act
  - Conducting research and development efforts to design and implement a secure data center (the Data Hub)
  - Promoting reproducible and transparent research on the U.S. S&E enterprise
- Budget:
  - Address shortfalls in budget from the past 6 years by increasing its budget allocation. The NCSES budget has lost purchasing power over this time, hampering the agency's ability to conduct its current work and to lead innovative change.

Endorsing Organizations/Individuals

American Educational Research Association
American Statistical Association
Consortium of Social Science Associations
Council of Professional Associations on Federal Statistics (COPAFS)

Supporting materials

- *Principles and Practices for a Federal Statistical Agency: Sixth Edition*. National Academies of Sciences, Engineering, and Medicine. 2017.

Key reports:

- Science and Engineering Indicators (congressionally mandated)
- Women, Minorities, and Persons with Disabilities in Science and Engineering (congressionally mandated)
- National Patterns of R&D Resources
- Doctorate Recipients from U.S. Universities

Shorter analytical products:

- U.S. Businesses Invest $55 Billion in R&D Directed at New Business Areas and New Product Lines
- State Government R&D Expenditures Decline 4% in FY 2019; Health-Related R&D Declines 2%
- Federal Obligations for S&E Support to HBCUs in FY 2018 Increase 3.8% from Previous Year
- Graduate Enrollment in Science, Engineering, and Health Rose 3% in 2018

Extensive data access systems, data tables, and microdata:

- NCSES Survey Data
- Science and Engineering Degrees, by Race and Ethnicity of Recipients: 2008–18
- Survey of Federal Funds for Research and Development Fiscal Years 2018–19
- Data Access--Public Use and Restricted Files

Other materials:

- *Amstat News*, *Large Budget Increases for Agency Survey Mask Budget and Staff Challenges*
- CNN, *The US was once the uncontested world leader in science and engineering. That's changed, according to a federal report*
- *The New York Times*, *The Bleak Job Landscape of Adjunctopia for Ph.D.'s*
- *University of FL News*, *University of Florida ranks 15th among public universities with $865 million in 2018 research expenditures*
- *All Together*, *HBCUs Begin Largest-Ever Effort to Codify Their Success*
- *Science News*, These 6 Graphs Show that Black Scientists are Underrepresented at Every Level

For other federal statistical agency priorities, please visit https://www.amstat.org/ASA/Science-Policy-and-Advocacy/home.aspx#resources or https://copafs.org/activities-initiatives/. For any questions on these documents, or to have your organization added as an endorsing or supporting organization, please contact Steve Pierson (pierson@amstat.org) or Paul Schroeder paul.schroeder@copafs.org. For this document specifically, Felice Levine, executive director for the American Educational Research Association, should also be contacted: flevine@aera.net.