

U.S. National Science Foundation

Annual Evaluation and Evidence Plan

FY 2025



U.S. National Science Foundation

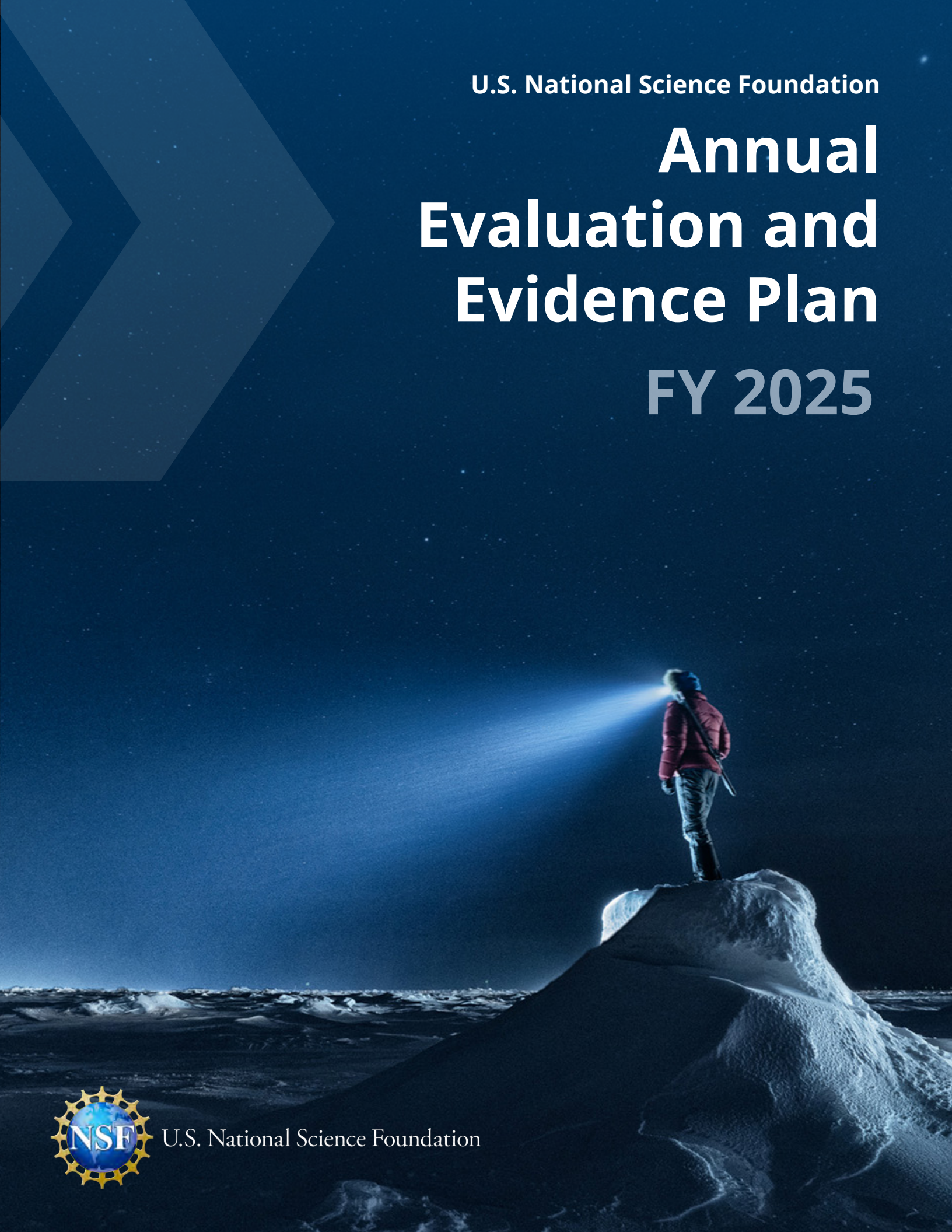


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Introduction

The U.S. National Science Foundation (NSF) was created “to promote the progress of science; to advance the national health, prosperity, and welfare; [and] to secure the national defense...” (Public Law 81-507, as amended). NSF seeks to achieve this mission through an [integrated strategy](#)¹ and is committed to evaluating the efficacy and efficiency of that strategy, leveraging evaluation and other evidence-building activities to help the agency achieve its mission.

This document presents NSF’s FY 2025 Annual Evaluation and Evidence Plan (AEEP), which describes the evaluations prioritized by NSF for FY 2025.

Section 1 presents the criteria used for selecting them.

Section 2 lists the highest priority evaluations that will begin or be ongoing in FY 2025 and provides overviews of the background and rationale, timeline, technical approach, data sources, expected challenges and mitigating strategies, and use and dissemination plans for each.

Section 3 provides a summary of progress, as of September 30, 2023, on ongoing, planned, and/or recently completed evaluations, including those described in this Annual Evaluation and Evidence Plan and prior Annual Evaluation Plans.



¹ The strategic goals are (1) Empower: Empower STEM talent to fully participate in science and engineering; (2) Discover: Create new knowledge about our universe, the world and ourselves; (3) Impact: Benefit society by translating knowledge into solutions; and (4) Excel: Excel at NSF operations and management.

The investments in NSF through the “CHIPS and Science Act” will help the United States remain a global leader in innovation.

On August 9, 2022, President Biden signed into law the “CHIPS and Science Act of 2022”, which authorized significant investments in scientific research and STEM workforce and education, as well as various evaluation activities with the purpose of ensuring that NSF investments are effectively achieving the goals of the Act.

The FY 2025 AEEP includes five significant evaluation activities, three of which (as indicated by a *) are in support of the “CHIPS and Science Act.”

1. NSF’s Hybrid Workforce
2. Examination of potential differential outcomes in NSF’s merit review process
3. Process evaluation of NSF’s implementation of its Broader Impacts review criterion*
4. PreK-12 STEM Education and Workforce Development in Rural Areas*
5. NSF Regional Innovation Engines needs assessment and baseline evaluation*

Additional Research

In addition to the evaluations discussed in the AEEP, NSF invests in public policy research and produces policy-relevant statistics that build knowledge of the science, technology, engineering, and mathematics (STEM) enterprise. NSF’s “Science of Science: Discovery, Communication and Impact” program supports research focused on advancing knowledge and theory on the social science of scientific discovery; theories, models and data improving our understanding of scientific communication; and how science advances evidence-based policymaking and public value.

Through the “[Analytics for Equity](#)” initiative, NSF is piloting a new way to support social, behavioral, and economic sciences research that leverages federal data assets (ensuring privacy is protected and data are secure) and scientific advances in researching equity-related topics for greater public benefit. Led by NSF and in partnership with the White House Office of Science and Technology Policy (OSTP), the White House Office of Management and Budget (OMB), and other federal agencies, Analytics for Equity links interested researchers directly with federal agencies seeking to answer research questions captured in their Learning Agendas in five equity-related research themes.

The National Center for Science and Engineering Statistics (NCSES) is a principal statistical agency located within NSF. NCSES is responsible for statistical data on research and development; the science and engineering workforce; U.S. competitiveness in science, engineering, technology, and R&D; and the condition and progress of STEM education in the United States, resulting in products such as the Science and Engineering Indicators, Survey of Earned Doctorates, and Survey of Federal Funds for Research and Development.

Together, the evaluations in the AEEP and NSF’s broader investments in STEM policy research and statistics contribute to a robust understanding of the outcome and impacts of the nation’s support of the scientific and engineering enterprise.



Section 1

How NSF defines “significant evaluations”



Evaluation experts in NSF directorates and offices, and the Evaluation and Assessment Capability (EAC) section in NSF's Office of Integrative Activities, collaborate across NSF and with other interested parties to develop evaluation and evidence plans for significant evaluations that provide decision makers with the evidence and data they need to understand and improve program performance, outcomes, and impacts. EAC summarizes these plans in the agency's [Learning Agenda](#) and Annual Evaluation and Evidence Plans. The following are five criteria used to select evaluation questions:

- 1 Fill a knowledge gap:** the information sought is not available from existing sources, such as scholarly literature and evaluations supported by other agencies implementing similar efforts.
- 2 Have leadership support:** to prioritize the staff time and commit the resources that the work demands
- 3 Have potential to support upcoming decisions:** are likely to yield actionable and useful evidence in a timely fashion
- 4 Have potential for broad impacts:** will likely result in findings that are useful for a broad set of stakeholders, programs, or organizations
- 5 Are prioritized by NSF leadership:** respond to evolving requirements, Congressional mandates, and national and long-term strategic priorities

These criteria were assessed as follows:

- Individually, criteria 1-3 are necessary but not sufficient conditions
- Questions meeting criteria 1-4 are likely to be prioritized, absent resource constraints
- Criterion 5 is a sufficient condition to identify a question as significant

These criteria, and their use, may be revised as implementation of the Evidence Act and related legislation matures and as NSF responds to changing priorities and external events, such as those observed in recent years.



Section 2

Plans for highest priority evaluations



This section includes a brief study plan for each prioritized evaluation that will be ongoing or beginning in FY 2025. The plans show the alignment of these questions with [NSF's FY 2022-FY 2026 Strategic Plan](#) and [FY 2022-FY 2026 Learning Agenda](#) and classifies each evaluation by the “component of evidence” provided, as described in [OMB memorandum M-21-27](#). These plans also provide overviews of the background and rationale, timeline, technical approach, data sources, expected challenges and mitigating strategies, and use and dissemination plans.

NSF's prioritized evaluations described in this plan are:

- 1 NSF's Hybrid Workforce
- 2 Examination of potential differential outcomes in NSF's merit review process
- 3 Process evaluation of NSF's implementation of its Broader Impacts review criterion*
- 4 PreK-12 STEM Education and Workforce Development in Rural Areas*
- 5 NSF Regional Innovation Engines needs assessment and baseline evaluation*

As noted in Section 1, those marked with an asterisk are in support of the 2022 “CHIPS and Science Act”.



1

NSF's Hybrid Workforce

Strategic Plan Alignment	Strategic Goal 4 (Excel)
Learning Agenda Alignment	FY 2022-2 (COVID Pandemic)
Lead Unit	Division of Human Resources (HRM)
Timeline	FY 2024-FY 2025
Component of Evidence	Performance Measurement, Policy Analysis

Background and Rationale

In October 2022, NSF adopted a new telework and remote work policy that marked a transition from the agency's "maximum telework" posture established at the onset of the pandemic. Under this policy, positions are classified as either telework (which require a specified, minimum number of days of work to be performed at NSF headquarters per pay period) or remote (which do not require reporting to NSF headquarters on a regular basis). In September 2023, a revised policy was ratified that changed the in-person work requirement from two days per pay period to four days per pay period for most employees. The agency's hybrid work posture continues to evolve in response to changing conditions and [OPM guidance](#). The Hybrid Work Posture Evaluation Program is intended to assess the relationships between NSF's hybrid work environment and the agency's culture and workplace experience by providing NSF leadership access to a suite of relevant human capital data and insights related to five focus areas derived from the agency's overarching human capital goal, "Invest in people. Attract, empower and retain a talented and diverse workforce."

NSF will collect and analyze data to assess the ways in which NSF's ability to attract, develop, engage, and retain a talented and diverse workforce has changed over time, including since the adoption of a hybrid workforce model.

Evaluation questions may include:

- Do hybrid designations affect NSF's ability to attract new talent, and if so, how?
- What effect does NSF's hybrid work posture have on employees' attitudes about their jobs and the organization?
- What relationship does NSF's hybrid work posture have to employee retention or turnover rates?
- How does the hybrid work posture affect inclusion and culture at NSF?



Technical Approach

NSF will use longitudinal data and descriptive statistics from 2017-2023 to characterize hiring, employee development, employee engagement, retention, and other human capital areas prior to and since implementation of NSF's telework/remote work posture. Trend analysis will be used to compare before and after the policy changes as well as other events such as NSF's move to its new headquarters building and the COVID-19 pandemic but will not be used in the study to make claims about causality. NSF will perform a data assessment to determine if, given the small sample sizes of some subgroups, inferential statistical analysis can be used to determine if the increased use of the hybrid/remote work designation is associated with changes in key human capital measures. NSF will conduct interviews or focus groups with NSF staff to elicit staff perceptions on benefits and challenges associated with NSF's hybrid work posture.

Data Sources

These analyses will rely on NSF administrative data on employees (including Federal employees and IPAs) and organizational units; human capital data such as applicant counts, hiring rates, turnover, and retention in different units; data from the Federal Employee Viewpoint Survey and pulse surveys administered by NSF Division of Human Resources; and information from interviews and/or focus groups on challenges and opportunities related to hybrid work.

Challenges and Mitigating Strategies

NSF anticipates challenges associated with small sample sizes for some subsets of NSF staff and low response rates for certain metrics, which may make it difficult to detect meaningful differences between groups. NSF will analyze the quality and comprehensiveness of administrative data and devise approaches to fill in data gaps as needed. During interviews, NSF will seek to determine if those approaches are reasonable and, if not, identify relevant factors to adjust analyses accordingly. A rigorous research design that would allow NSF to isolate each of the independent variables affecting the agency's work environment, organizational culture, and employee engagement is not practical and would present ethical concerns. However, as data trends emerge and challenge areas are identified, additional data elements, including qualitative data, will be collected and incorporated into the suite of data being monitored, tracked, and reported.

Use and Dissemination

The study will provide relevant information for each human capital focus area so that emerging trends can be identified and discussed by agency leadership. Results of baseline and recurring assessments will be shared regularly with NSF leadership and management to enable optimizing NSF's workplace policies, programs, and practices. Information gathered will be leveraged to inform other areas of inquiry, including quarterly human capital reports and agency reports required by OPM.

As data trends emerge and challenge areas are identified, additional data elements, including qualitative data, will be collected and incorporated into the suite of data being monitored, tracked, and reported. The evaluation program will also provide information about human capital programs and activities with potential to positively impact the data elements tracked and reported. This flexible approach to future stages of the evaluation is intended to ensure the agency has the information needed to understand the impact of NSF's evolving hybrid work posture and enable executives, managers, and HC leaders to develop strategies and make evidence-based decisions that improve hybrid work, the employee experience, and NSF's mission performance.



2

Examination of potential differential outcomes in NSF's merit review process

Strategic Plan Alignment

Strategic Goal 1 (Empower)

Learning Agenda Alignment

FY 2022-9 (Merit Review)

Lead Unit

Evaluation and Assessment Capability Section

Timeline

FY 2024-FY 2025

Component of Evidence

Foundational Fact Finding

Background and Rationale

NSF typically receives approximately 40,000 proposals every year, mostly from principal investigators (PIs) submitting to competitive grant programs. Proposals are reviewed and funding decisions made through a multi-step merit review process including peer review, program officer analysis and recommended outcome, and supervisory review and concurrence. Through the merit review process, NSF seeks to ensure that proposals are assessed in a fair, competitive, transparent, and in-depth manner, and that program portfolios are considered while making final decisions for the disposition of each proposal.

Preliminary findings from descriptive analysis of NSF administrative data show that, on average, the funding rate of proposals submitted by PIs from some racial and ethnic groups is lower than that of White PIs. However, this preliminary study used data from a period when a relatively high number of PIs did not provide demographic data and could not provide sufficient information to differentiate outcomes for subsets of demographic groups that are underrepresented in various science, technology, engineering, and mathematics (STEM) fields. Exploratory regression analysis suggests that these differences may be explained by other factors, such as PI experience and education. There are also factors not captured by these models, such as variability in the implementation of review processes across NSF.

In this study, NSF will expand on the prior descriptive analysis to analyze data from proposals submitted after NSF required PIs to submit demographic data¹ and to use standardized PI biographical sketches to understand the extent to which:

1. There are differential outcomes of the merit review process at NSF
2. Characteristics of individual PIs or investigator teams, field of study, proposal type, and implementation of the merit review process may be associated with any such differences

¹ At the end of fiscal year 2021, NSF began requiring that newly registered PIs respond to demographic questions about gender, ethnicity, race, and disability status, with a continued option of selecting, "Do not wish to provide." Beginning May 2022, NSF expanded the requirement to existing PIs who log in to start a new proposal or project report. NSF continues to see significant improvement in the reporting of demographic data.



Background and Rationale (continued)

Evaluation questions may include:

- Is there evidence of differential outcomes of the merit review process?
- If so, to what extent are differential outcomes associated with individual PI's gender, race/ethnicity, time since final degree, and professional rank?
- Do the presence, absence, or magnitude of differential outcomes vary by directorate, division, or disciplinary field?
- Are variations in (a) the implementation of the merit review process, (b) proposal type, and (c) funding mechanism associated with the presence, absence, or magnitude of differential outcomes?

Technical Approach

NSF will conduct a review of the literature on the empirical findings of differences in funding rates, differences in funding patterns, and similar empirical examinations of the merit review process. NSF will also conduct a descriptive analysis of characteristics of proposers (individuals or teams) of funded and unfunded proposals submitted to NSF to identify whether there are differences in funding rates among subgroups of proposers. This may include studies such as (1) statistical investigations of review ratings and funding patterns for different scientific fields, demographic groups, and other aspects of the review process, and (2) regressions to characterize and understand any differential patterns observed. If feasible, NSF may examine the extent to which eligibility restrictions based on geography, institution type, and/or career stage contribute to any observed funding demographic disparities across the agency's portfolio of investments as a whole.

Data Sources

This study will rely on NSF administrative data on PIs, proposals, reviewers, and award decisions; the National Center for Science and Engineering Statistics (NCSES) for nationally representative survey data on the characteristics of the scientific workforce (pending request and approval); biographical sketches submitted as part of NSF proposals; information on institutional characteristics from the Integrated Postsecondary Education Data System (IPEDS); bibliometric data from publication databases, and prior analyses of the merit review process.

Challenges and Mitigating Strategies

NSF anticipates challenges in identifying a definitive set of characteristics related to PIs, which could hamper descriptive analyses described above. To mitigate these difficulties, NSF will focus on proposals submitted after NSF required PIs to submit demographic data and to use standardized PI biographical sketches. The changes significantly improved the quality of demographic and educational data available for PIs and teams.

Use and Dissemination

The results of this evaluation will be critical to agency efforts to ensure the efficacy and equity of funding decisions and will support NSF in identifying potential areas of opportunity to increase participation of underrepresented groups. Work associated with this analysis will also inform the joint [NSB-NSF Commission on Merit Review](#), which seeks to “assess the efficacy of the current Merit Review policy and associated criteria and processes at supporting NSF’s mission to create new knowledge, fully empower diverse talent to participate in STEM, and benefit society by translating knowledge into solutions.”



3

Process evaluation of NSF's implementation of its Broader Impacts review criterion

Strategic Plan Alignment	Strategic Goal 1 (Empower)
Learning Agenda Alignment	FY 2022-9 (Merit Review)
Lead Unit	Evaluation and Assessment Capability Section
Timeline	FY 2024-FY 2025
Component of Evidence	Program evaluation

Background and Rationale

NSF receives approximately 40,000 proposals every year, mostly from PIs submitting to competitive grant programs. Proposals are reviewed and funding decisions made through a multi-step merit review process including peer review, program officer analysis and recommended outcome, and supervisory review and concurrence. NSF evaluates proposals using two criteria approved by the National Science Board (NSB): Intellectual Merit, which encompasses the potential to advance knowledge, and Broader Impacts, which encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The idea that research does and should have an impact on society is not new or unique to NSF. Broader Impacts have been considered in proposal evaluations since at least the 1960s and became a separate and distinct criterion in 1997. However, PIs and reviewers continue to express concerns about and confusion with the Broader Impacts review criterion despite NSF efforts to provide additional guidance.

NSF will examine:

1. How well NSF's Broader Impacts merit review criterion is understood across different organizational units and interested external parties
2. How NSF can improve the effectiveness of the application of the Broader Impacts merit review criterion.

Areas for study during the evaluation may include understanding:

1. Variations in interpretation of the Broader Impacts review criterion by PIs, reviewers, and/or NSF program staff
2. How the Broader Impact review criterion is assessed by external reviewers and how those assessments are factored into award recommendations and decisions by NSF program officers and Division Directors
3. Whether (and if so, how) such practices may vary across NSF
4. Perceptions among PIs, reviewers, and/or NSF program staff of how variations in interpretation and assessment may advance or hinder the merit review of proposals and ultimately support NSF's achievement of Broader Impacts across its programs



Technical Approach

This evaluation will depend on interviews and focus groups with NSF staff, leadership, NSB members, and external interested parties (e.g., PIs, proposal reviewers, and professional associations) to understand their perceptions of, and experiences with, NSF's Broader Impacts merit review criterion. NSF will also conduct a systematic literature review across relevant disciplines related to evidence-based practices for assessing the merit (both intellectual merit and broader impacts or related concepts) of proposals for sponsored research of the type funded by NSF (non-medical basic and use-inspired research and STEM education). The review will highlight practices across funders with similar review criteria, evidence for their efficacy, concerns about and considerations of the potential for bias, and effective strategies for mitigating concerns about bias and reviewer subjectivity.

Data Sources

This evaluation will rely on NSF administrative data; information from surveys, interviews and/or focus groups; bibliometric data from publication databases; reports from NSF Committees of Visitors assessing NSF's merit review process; prior analyses of the merit review process; and scholarly and grey literature directly related to the conduct of merit review at NSF.

Challenges and Mitigating Strategies

NSF anticipates that the quality of evidence drawn from the interviews and focus groups will depend on the skill of the team conducting the work to mitigate potential for bias and probe to collect the range of respondent perspectives and experiences. NSF will mitigate these challenges by using a team of experienced interviewers, a semi-structured interview approach that includes probes inviting respondents to support opinions with specific examples, and a small team to code responses using a standardized rubric for the analysis. NSF also anticipates challenges associated with recall bias for respondents, which will be mitigated by (1) providing participants with questions in advance, to give them sufficient time to consider their responses and (2) selecting participants in interviews and focus groups from individuals who have participated in NSF's merit review process within the past five years and early career scholars who have participated in NSF's merit review process in the past three years so that their experiences with the process are current and fresh in their minds. To the maximum extent possible, we will use other data sources, such as NSF administrative data and merit review surveys, to support interview respondents' interpretations, improve confidence in qualitatively coded data, and confirm cross-cutting themes and conclusions.

Use and Dissemination

This evaluation will address the requirement in Section 10341(a) of the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act (Pub. L. 117-167, title III, §10341(a), 2022) to "assess how the Broader Impact review criterion is applied across NSF and to make recommendations for improving the effectiveness of its application to achieve the goals established in section 526 of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Reauthorization Act of 2010" (America COMPETES Reauthorization Act) and as amended in the American Innovation and Competitiveness Act of 2017¹.

¹ The goals listed in the Act are: (1) Increased economic competitiveness of the United States; (2) Development of a globally competitive STEM workforce; (3) Increased participation of women and underrepresented minorities in STEM; (4) Increased partnerships between academia and industry; (5) Improved Pre-K-12 STEM education and teacher development; (6) Improved undergraduate STEM education; (7) Increased public scientific literacy; and (8) Increased national security.



4

PreK-12 STEM Education and Workforce Development in Rural Areas

Strategic Plan Alignment

Strategic Goals 1 (Empower) and 3 (Impact)

Learning Agenda Alignment

FY 2022-1 (Missing Millions)

Lead Unit

Division of Research on Learning in Formal and Informal Settings (DRL)

Timeline

FY 2023-FY 2025

Component of Evidence

Foundational fact finding and policy analysis

Background and Rationale

Section 10514 (“National Academies Evaluation”) of the CHIPS and Science Act of 2022 (Pub. L. 117-167) provides that “the Director shall enter into an agreement with the National Academies under which the National Academies agree to conduct an evaluation and assessment that:

1. Evaluates the quality and quantity of current Federal programming and research directed at examining STEM education for students in prekindergarten through grade 12 and workforce development in rural areas
2. In coordination with the Federal Communications Commission, assesses the impact that the scarcity of broadband connectivity in rural communities, and the affordability of broadband connectivity, have on STEM and technical literacy for students in prekindergarten through grade 12 in rural areas
3. Assesses the core research and data needed to understand the challenges rural areas are facing in providing quality STEM education and workforce development
4. Makes recommendations for action at the Federal, State, and local levels for improving STEM education, including online STEM education, for students in prekindergarten through grade 12 and workforce development in rural areas
5. Makes recommendations to inform the implementation of programs in sections 10512 and 10513”



Technical Approach

An ad hoc committee of the National Academies of Science, Engineering, and Medicine (NASEM) will conduct a consensus study that addresses the points described above. NASEM will select members to ensure a balanced committee that provides the expertise, perspective, objectivity, and diversity necessary to meet the requirements of the study; may include members of the Academy; and meets the Academy's policies on conflicts of interest and independence. The committee will gather information via open public meetings; submissions from interested outside parties; reviews of relevant scientific and technical literature; and investigations by committee members and NASEM staff. The committee's final report will be reviewed by independent experts to ensure it:

1. Addresses the charge
2. Provides evidence-based findings
3. Is impartial and objective. Further details are available on the [National Academies website](#)

Further details are available on the [National Academies website](#).

Use and Dissemination

As provided by the CHIPS and Science Act of 2022, (Sec. 10514(b)), the National Academies will “submit to the NSF Director a report on [this] study...including the National Academies’ findings and recommendations”.



5

NSF Regional Innovation Engines needs assessment and baseline evaluation

Strategic Plan Alignment	Strategic Goal 3 (Impact)
Learning Agenda Alignment	FY 2022-7 (Partnership)
Lead Unit	Directorate for Technology, Innovation and Partnerships (TIP)
Timeline	FY 2025-FY 2026
Component of Evidence	Foundational fact finding

Background and Rationale

The NSF Regional Innovation Engines (NSF Engines) program was authorized in the CHIPS and Science Act of 2022. The NSF Engines program aims to catalyze robust partnerships rooted in scientific and technological innovation to positively impact the economy within a geographic region; advance national competitiveness in key technology areas; and address national, societal, and geostrategic challenges. Each NSF Engine can receive up to \$160 million over 10 years to support the development of diverse regional coalitions to engage in use-inspired research and development, translation of innovation to society, and workforce development — with the goal of establishing sustainable regional innovation ecosystems throughout the United States.

Ultimately, NSF seeks to understand how the socioeconomic and technological outcomes between regions with an NSF Engine compare to those from similar regions without NSF Engine awards. During the first stage of this evaluation, NSF will:

1. Conduct a needs assessment and baseline evaluation of this important new NSF initiative
2. Construct well-matched comparison regions to better inform future programming decisions and assess the socioeconomic and technological outcomes of NSF Engines funding

Technical Approach

A mixed-methods evaluation approach will be used. This will include a descriptive analysis of societal, economic, and technological capabilities of the regions of service associated with each NSF Engine, which will be used in identifying comparison regions. Descriptive analyses of the individuals and partner organizations participating in, and the programmatic activities happening under, NSF Engines will also be conducted.



Technical Approach (continued)

In addition, qualitative data will be collected from focus groups, interviews, and listening sessions with the NSF Engines program leadership team and associated stakeholders to better understand the progress being made in developing sustainable regional innovation ecosystems, particularly advances in use-inspired R&D, translation of research to the market and society, and workforce development including new jobs. Once collected, these qualitative data will assist in the interpretation of quantitative findings. Data collected will be used to establish baselines as well as measure changes and progress over time.

Data Sources

The mixed-methods evaluation will rely on NSF administrative data and surveys of NSF Engines awardees, participants, partnering organizations, and other interested groups. In addition, qualitative data will be gathered through interviews, focus groups, and listening sessions with each NSF Engine's leadership team; partner organization representatives; R&D, translation, and workforce development participants; and community members. Lastly, the study will use regional, macro-economic data to identify comparison regions with similar baseline characteristics to assess the socioeconomic and technological outcomes resulting from the NSF Engines program. This mixed-methods, multi-layered approach will help ensure the accuracy of the evaluation of the NSF Engines program even if external shocks resulting in significant economic impacts occur.

Challenges and Mitigating Strategies

This evaluation faces at least two limitations related to identifying comparison regions and participant response rates. First, NSF anticipates challenges in being able to attribute socioeconomic and technological differences between regions with NSF Engines awards and those without NSF Engines awards. NSF plans to address this challenge through a partnership with the Purdue Center for Regional Development to define a set of regional baseline characteristics to identify well-matched comparison regions. In cases where comparable regions cannot be identified for studying the differential effects between the control and treatment groups, at a minimum, the approach being adopted would enable the measurement of growth across all the variables/indicators of interests in the regions where awards have been made. The Evaluation and Assessment Capability section of NSF's Office of Integrative Activities and the National Center for Science and Engineering Statistics will provide additional guidance and expertise.

Second, proposed surveys, interviews, and focus groups will place burden on NSF Engines participants, and NSF anticipates challenges with obtaining high response rates to enable robust inferences. NSF will seek to address this challenge by collaborating with NSF Engines leadership teams as well as other interested groups to clearly communicate the benefits of participating in the data collection efforts. NSF will also auto-fill some of the responses on the survey (for example, fields such as award ID, cohort, region, and other data fields that NSF could obtain from administrative records) to reduce the burden placed on the respondents to the greatest extent possible.

Use and Dissemination

Findings will be used by NSF to measure the progress of the program, improve program design, and inform how and where to invest future NSF Engines resources. In addition, findings will be shared with the program's regional and national interested parties to better inform decision making processes that may impact regional and U.S. global competitiveness in key technology focus areas as well as solutions to national, societal, and geostrategic challenges, and to better understand how to transform regional innovation. Lastly, as permitted, they will also be disseminated to other federal government agencies that have place-based innovations programs.



Section 3

Updates on evaluations and other evidence-building activities

EPSCoR

GRANTED

Convergence
Accelerator

NSF's Hybrid
Workplace

Partnerships

COVID pandemic

Missing Millions



1

Established Program to Stimulate Competitive Research (EPSCoR) (COMPLETED)

Source: FY 2022, FY 2023, and FY 2024 Annual Evaluation Plans

Background

EPSCoR seeks to foster sustainable improvements in research and development (R&D) capacity in the 28 jurisdictions that individually received 0.75% or less of total NSF funding over the most recent five-year period. EPSCoR uses multiple investment strategies to support this goal, including (1) supporting academic institution research infrastructure, (2) co-funding meritorious proposals reviewed by other NSF programs that also satisfy EPSCoR criteria, and (3) promoting interaction between NSF and the EPSCoR community through workshops and other outreach activities. NSF EPSCoR seeks to expand its capacity to generate and use evidence to monitor program progress in increasing academic research competitiveness through its three funding strategies.

Study progress

NSF EPSCoR is continuing to refine and implement a cohesive research competitiveness evaluation framework for the program. The evaluation framework draws upon recommendations from:

1. A [Government Accountability Office \(GAO\) report](#) on EPSCoR with a finding that participating jurisdictions received more federal research funding after joining the program
2. A [study published in FY 2022](#) that helped to develop a flexible framework to explore, define, and measure research competitiveness
3. The [August 2022 Envisioning the Future of NSF EPSCoR report](#) conducted by a subcommittee of the NSF Committee on Equal Opportunities in Science and Engineering (CEOSE). The Envisioning the Future of NSF EPSCoR report builds on programmatic data as well as prolonged engagement with EPSCoR's external interested parties to better understand the impacts of the program's investment strategies and identify new opportunities for increased success. This process provided an opportunity for NSF EPSCoR and its community to deeply and collaboratively assess how EPSCoR can work most effectively with its jurisdictional partners to achieve their shared goals in the context of the nation's changing STEM research landscape. The report produced 8 recommendations and 19 suggestions for assessing EPSCoR's contributions to increasing academic research competitiveness across EPSCoR jurisdictions.

Key results

Findings from the August 2022 report informed the development of two new EPSCoR funding opportunities: [program \(NSF 23-582\)](#) after its final proposal submission deadline in August 2023.

1. [EPSCoR Collaborations for Optimizing Research Ecosystems Research Infrastructure Improvement Program \(E-CORE RII; NSF 23-587\)](#) to support jurisdictions in building capacity in one or more targeted research infrastructure cores that underlie the jurisdiction's research ecosystem
2. [EPSCoR Research Incubators for STEM Excellence Research Infrastructure Improvement Program \(E-RISE RII; NSF 23-588\)](#) to support the incubation of research teams and products in a scientific topical area that links to research priorities identified in the submitting jurisdiction's approved Science and Technology Plan. The reports also informed NSF's decision to sunset [EPSCoR's Research Infrastructure Improvement Track-1 program \(NSF 23-582\)](#) after its final proposal submission deadline in August 2023

Further plans

Findings and outcomes from these three reports have provided NSF EPSCoR with evaluative input that NSF is now acting on through program changes described above. NSF has therefore paused further evaluations for EPSCoR.



2

Convergence Accelerator (CA) (COMPLETED)

Source: FY 2022 and FY 2023 Annual Evaluation Plans

Background

The [NSF Convergence Accelerator](#) is a unique organizational structure within NSF that seeks to:

1. Accelerate use-inspired convergence research and its transition into practice
2. Build team capacity to pursue exploratory, high-risk projects. Spanning topics that vary yearly, the CA speeds use-inspired research into practice through a two-phase process beginning with a team convergence and proof-of-concept period that includes training for grantees to prepare them to transition their research ideas into investment-ready deliverables. At the end of Phase 1, teams participate in a formal NSF pitch and proposal process, which is used to select teams for Phase 2, in which teams focus on developing sustainable and impactful project deliverables. By the end of Phase 2, teams are expected to provide deliverables that impact societal needs at scale and are sustainable beyond NSF support.

Study progress

NSF conducted a descriptive study to better understand the key characteristics of PIs and teams that participated in the CA program from FY 2019 through FY 2021 and how those characteristics changed over that period. The study results have been published in [a report available on the NSF Web site](#).¹

Key results

Key findings of the descriptive study include:

1. Geographic participation in the program increased from FY 2019 through FY 2021. In FY 2019, institutions in 27 states submitted proposals and institutions from 21 states received awards; by the end of the first three years, those had broadened to 40 and 27, respectively.
2. The size of teams increased as projects moved from Phase 1 to Phase 2, from a mean of 14 individuals and 3 institutions to a mean of 50 individuals and 5 institutions. This is compatible with the hypothesis that teams develop new partnerships during Phase 1 and collaborate toward a more sustainable deliverable.
3. Partnerships became more institutionally diverse as projects moved from Phase 1 to Phase 2. In Phase 1, 48% of proposals included at least one non-academic partner, while in Phase 2, 57% of proposals included at least one private sector institution, 38% included at least one nonprofit institution, and 37% had both a private sector and nonprofit partner.
4. While institutions of higher education were by far the majority in both phases of CA projects, the fraction of projects led by other institution types grew from 9% to 28% in the transition from Phase 1 to Phase 2.

Further plans

The evaluation report underscored the need to develop further measures for the CA program. NSF has developed the following programmatic concepts, for which measures are being designed: team characteristics, collaboration, convergence, and dynamics; partnerships and engagement; organizational sustainability; product development; and experiences and satisfaction with the CA program. The CA program has developed five complementary surveys to gather relevant data on these concepts from teams at multiple project stages, including individual and group entrance; a mid-year assessment; and exit. The results will inform future program evaluations and evolution of the CA program.

¹ Wyhof, Annie, Michael Lee, Claire Lecornu, Mia Thomas, Shay Moore, Christa Reid, Dylan Solden, and Roland Stephen. 2023. Convergence Accelerator Summary Report: Descriptive characteristics from 2019 to 2021. Alexandria, VA: National Science Foundation.



3

Partnerships (ONGOING)

Source: FY 2022 and FY 2023 Annual Evaluation Plans

Background

Building partnerships is a high priority for NSF, as evidenced by two consecutive Agency Priority Goals (APGs for FY 2018-19 and FY 2020-21) focused on developing a partnerships strategy; the National Science Board's [Vision 2030 report](#); and the new Directorate for Technology, Innovation, and Partnerships (TIP). NSF engages in direct partnerships with other federal agencies, industry, private foundations, non-governmental organizations, and foreign science agencies with shared interests; NSF stimulates indirect partnerships through awards for collaborative research and education activities involving participants who span multiple sectors. NSF has prioritized evaluation activities that complement other ongoing learning efforts (such as conducting a landscape study) to reap the greatest benefits from partnerships. This study is the second of several conducted to learn about the efficacy of NSF's partnership strategy and identify ways to improve it.

Study progress

The team completed a literature review of direct industry partnerships, along with their benefits to investigators and the corresponding research fields. This literature review enabled the team to update a previous formulation of a relevant partnership logic model. The former model was based solely on interviews, while the updated model brings in evidence found in the literature. This logic model guided the creation of interview protocols and will be updated based on the findings from interviews.

The team conducted initial interviews with NSF and industry staff (including fewer than 9 non-federal individuals) involved in programs being studied. Based on these interviews and the literature review, the team developed protocols for interviews of principal investigators and received OMB clearance for their use.

The team also developed a counterfactual approach and identified projects for the comparison group. They then employed a combination of machine and human resources to describe each of the projects in a quantitative way via the proposals and annual report along a series of dimensions believed to be relevant to capturing the features of the research. This coding was used to determine the comparison groups for the interviews. Once OMB approval was obtained, the team began treatment and comparison project interviews.

Key results

The literature review focused on identifying key elements of strong and sustainable partnerships and the benefits that may be expected to arise from them. Key elements noted include joint decision making; coordinated activities and combined resources between industry and academic partners; and monitoring and accountability systems to monitor activities and partnerships. The study found that strong and sustainable partnerships provide benefits to the research enterprise itself, including increased funding and improved resource allocation; access to technology and to industry human capital; and more opportunities for practical training for students and postdocs. Such partnerships also led to more innovative research; dissemination of information to a broad and diverse audience; acceleration of the transition from basic research to products and services; and an enhanced STEM workforce.

The findings from the literature review informed a revised logic model that guides the rest of the planned evaluation; coding protocols and bibliometric search parameters for further document analysis; and the development of interview protocols and the areas on which to focus with both the treatment and counterfactual groups. The revised logic models brought in key evidence from the literature on industry partnerships to inform the interview protocols. The logic model will be updated based on evidence gathered via the interviews.



Further plans

This study is still in progress, but the timeline has been extended due to significant delays in obtaining Paperwork Reduction Act (PRA) approval from OMB. PRA approval was recently received, and interviews with the participants and comparison group participants have started. Work in FY 2024 will include completing and analyzing the interviews, analyzing external data and bibliometric data, and conducting the final analysis and writing the final report. In addition, NSF anticipates that results will be disseminated to NSF program officers, NSF leadership, and other interested parties in FY 2024.



4

Missing Millions (ONGOING)

Source: FY 2023 Annual Evaluation Plan

Background

NSB's [Vision 2030 report](#) notes that “women and underrepresented minorities remain inadequately represented in S&E relative to their proportions in the U.S. population.” NSF awards more than \$1 billion to broadening participation programs each year. These include programs focused on broadening participation; programs placing an emphasis on broadening participation; and programs that support research that contributes to these efforts by engaging students, post-docs, and early career faculty. Programs vary in the strategies used to broaden participation—including scholarships, fellowships, mentorships, research experiences, and other interventions targeting individuals, teams, networks, and institutions. This study will contribute useful evidence that helps NSF bolster the efficacy of its initiatives to broaden participation and reduce inequities in how it delivers programs to its communities.

Study progress

NSF is developing a new internal use dashboard to assist NSF in monitoring progress toward achieving its broadening participation goals as evidenced by extant data on the demographic, institutional, and geographic diversity of those engaged in the NSF merit review process (proposers and awardees). This dashboard will provide internal NSF users with visualizations and interactive tools to better understand underrepresented groups in NSF's portfolio of investments. The target user is predominately senior leadership, responsible for advancing diversity, equity, inclusion, and accessibility (DEIA) work. Plans for the dashboard include providing users access to a wide range of empirical indicators to explore each of 3 domains (demographic diversity, institutional diversity, and geographic diversity). After developing user personas (informed by focus groups with NSF staff) and high-fidelity wireframes, the team is in active dashboard and data pipeline development. As part of this project, NSF has also identified a few postdoctoral and graduate fellowship programs to conduct an auxiliary analysis on the characteristics of applicants and fellows.

Key results

None at this time. This study is in progress and on schedule.

Further plans

NSF anticipates dissemination of the dashboard and descriptive fellowships report in Q3 FY2024. There are no further plans beyond this study.



5

GRANTED needs assessment and baseline study (ONGOING)

Source: FY 2024 Annual Evaluation Plan

Background

PIs from emerging and developing research institutions may lack support to identify potential funding opportunities, prepare the documentation required for Federal grant submissions, and manage Federal awards. This may put individuals from such institutions at a disadvantage relative to their peers at institutions with more institutional support, hinder their participation in the STEM workforce, and limit the benefits to the Nation of their scientific talents. NSF's Growing Research Access for Nationally Transformative Equity and Diversity (GRANTED), a new initiative in FY 2023, focuses on addressing these systemic barriers by improving research support and service capacity at emerging, developing, and underserved research institutions (hereafter, "target institutions"). NSF will conduct a needs assessment and baseline evaluation of this important new NSF initiative.

Study progress

NSF issued a Dear Colleague Letter calling for proposals for conferences, symposia, and workshops centered around one or more of the three primary themes of GRANTED (enhancing practices and processes within the research enterprise, strengthening the research enterprise workforce, and partnering with national and regional professional societies to translate effective practices into diverse institutional and organizational contexts). Major outcomes from these conferences will inform the design of future program activities and the evaluation being undertaken. NSF is completing the award process for the first 25 projects under this funding opportunity. NSF has also developed a refined logic model to map GRANTED program activities to desired outcomes and modify the proposed evaluation questions and approaches to provide baseline information for assessing progress under the logic model.

Further plans

This evaluation is still in the preparation phase. NSF anticipates focusing the first stages of the evaluation on:

1. A literature review to identify measures of research capacity and examine findings regarding how research capacity impacts grant submissions and management capabilities
2. An analysis to examine the current landscape of research supports and services in higher-education institutions in the United States



6

NSF's Hybrid Workplace (REVISED)

Source: FY 2024 Annual Evaluation Plan

Background

From March 2020 to October 2023, NSF operated under a maximum telework posture, with most staff working remotely on a nearly full-time basis. NSF is moving forward with a long-term approach to supporting a hybrid workforce, which the agency anticipates will include a mix of onsite and remote staff. NSF seeks to understand what outcomes related to agency merit review, external outreach and engagement, and other program-related operations are associated with the hybrid workforce model and what adjustments NSF staff have made to accommodate these changes.

Further plans

This evaluation has been revised due to changes in NSF's hybrid workforce model. The revised evaluation plan is presented in [section 2 of this document](#).



7

COVID pandemic (CANCELLED)

Source: FY 2023 and FY 2024 Annual Evaluation Plans

Background

The COVID-19 pandemic disrupted NSF operations and disrupted NSF-funded projects. Concerns about COVID-driven disruptions on the scientific enterprise—and on the careers of those most at risk (such as early career and female scientists)—were voiced at NSF and beyond (Cui, Ding, and Zhu 2021; NASEM 2021; Myers et al. 2020, Morgan et al. 2021). NSF used administrative data to monitor key indicators (such as proposals received by gender) and leveraged its deep community connections to hear from external stakeholders regarding problems encountered and strategies used to address them. What emerged was a complex picture that requires careful assessment. Building a deeper understanding of this complexity is an important step in developing or revising interventions to:

1. Address any inequities that may have been exacerbated or introduced during the pandemic
2. Reinforce positive outcomes observed
3. Prepare for future disruptions

Further plans

This evaluation has been deprioritized. Understanding the impact of COVID-19 on the scientific enterprise has emerged as an active research area supported by NSF grant funding and other sponsors. Limited evaluation resources have therefore been redeployed to other high-priority research questions.





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