SF-83-1 SUPPORTING STATEMENT

for the

2017

Survey of Doctorate Recipients

TABLE OF CONTENTS

LIST OF ATTACHMENTS

2017 SURVEY OF DOCTORATE RECIPIENTS
SUPPORTING STATEMENT

A. JUSTIFICATION

This request is for a three-year renewal of the previously approved OMB clearance for the Survey of Doctorate Recipients (SDR). The SDR has historically served as a valuable source of information on U.S.-trained science, engineering, and health doctorate recipients. The SDR was last conducted in 2015 and the OMB clearance for the 2015 SDR expires August 31, 2018 (OMB No 3145-0020). Both the data collection instruments for the 2017 SDR and sample size are largely unchanged from the prior round. Each survey cycle and in 2017, new sample members who have earned their degree since the last SDR are added to the sample.

1. NECESSITY FOR INFORMATION COLLECTION

In 2010, the America COMPETES Reauthorization Act of 2010[1] established the National Center for Science and Engineering Statistics (NCSES) at the National Science Foundation (NSF) and directed NCSES to "...collect, acquire, analyze, report, and disseminate statistical data related to the science and engineering enterprise in the United States and other nations that is relevant and useful to practitioners, researchers, policymakers, and the public..." Information obtained through the SDR is critically important to NCSES's ability to measure the education and employment outcomes of scientists and engineers. Furthermore, the SDR and NCSES's National Survey of College Graduates (NSCG) are coordinated in both survey content and timing to form data collections that serve as the nation's only source of comprehensive information about the size and characteristics of the science and engineering (S&E) workforce.[2] These data are solicited under the authority of the NSF Act of 1950[3], as amended, and are central to the analysis presented in a pair of congressionally-mandated reports[4,5] published by NSF – *Science and Engineering Indicators* and *Women, Minorities, and Persons with Disabilities in Science and Engineering*. The latter report results from the Science and Engineering Equal Opportunities Act of 1980 that directs NSF to provide to Congress and the Executive Branch an "accounting and comparison by sex, race, and ethnic group and by discipline, of the participation of women and men in scientific and engineering positions."[6] The SDR and NSCG provide much of the information to meet this mandate. The coordinated designs of these two surveys were developed throughout the past two decades and are based on recommendations of the National Research Council's Committee on National Statistics (CNSTAT) report to NSF.[7]

SDR Background

The SDR provides education and employment-related information on scientists and engineers who were awarded a research doctoral degree from a U.S. institution in a science, engineering or health (SEH) field. A research doctorate is a doctoral degree that (1) requires completion of an original intellectual contribution in the form of a dissertation or an equivalent culminating project (e.g., a published manuscript) and (2) is not primarily intended as a degree for the practice of a profession.

[1] Section 505, Pub. L. No. 111-358. See Attachment A.
[2] The S&E workforce includes individuals with degrees or occupations in computer and mathematical sciences, life sciences, physical sciences, social sciences, engineering, and health sciences.
[3] See Attachment A.
[4] 42 U.S. Code § 1863(j)(1)
[5] 42 U.S. Code § 1885(a), 1885(d)
[6] 42 U.S. Code § 1885(d)
[7] National Research Council, Committee on National Statistics. 1989. *Surveying the Nation's Scientists and Engineers: A Data System for the 1990s.* Washington: National Academy Press.

The 2017 SDR is comprised of two sample components: 1) an existing panel of doctorate recipients from the prior survey cycle who remain less than 76 years of age and 2) a new cohort component that adds new doctorate recipients from academic years 2014 and 2015, also less than 76 years of age. The panel portion of the SDR provides information on the experienced stock of doctorate recipients. The new cohort sample from the two most recent doctorate award years provides important data on the early career experiences of new doctorate recipients with SEH degrees.

Since 2010, the SDR has included an international component of U.S.-trained doctorate recipients who received their degrees as of 2001. The redesigned 2015 SDR cycle used the doctorate records file (DRF) to significantly expand the SDR sample and this expanded sample allowed the international component to become representative of all academic years dating back to 1961. As in 2015, the 2017 SDR will field a sample of members predicted to reside either in or outside of the U.S. on the survey reference date of 1 February 2017. For example, based on the data from the 2014 and 2015 Survey of Earned Doctorates (SED), which is the frame for the 2017 SDR new cohort, 36% of U.S. SEH doctorates were awarded to temporary visa holders and 22% of them planned to leave the U.S. upon graduation.[8] Thus, the 2017 SDR will yield information about the educational, employment and demographic characteristics of U.S.-trained SEH doctorate recipients living and working both in the U.S. and abroad.

The 2015 SDR sample expansion from 47,000 to 120,000 was designed to support employment outcome estimates by the fine fields of degree (FFOD) captured in the SED. This expansion will be maintained in 2017 and will add 10,766 new sample members from the 2014 and 2015 SED cohorts. Originally, the SDR was designed to produce employment outcome estimates for various analytical domains defined by broad aggregated fields of degree. The redesigned sample approach stratifies by over 200 FFODs. The objective of the 2015 sample design was to meet new FFOD estimation goals and to maintain the traditional (historic) domain-level estimation goals. The details of the 2015 SDR sample redesign are found in Attachment B.

In addition, although the 2015 SDR and the 2017 SDR will align with the current FFOD taxonomy that is used in the SED, NCSES anticipates that the next cycle, 2019 SDR, will be based on the NCSES Taxonomy of Disciplines (TOD). The NCSES TOD will more closely align with the National Center for Education Statistics (NCES) Classification of Instructional Programs (CIP). Shifting the current SED/SDR FFOD taxonomy over to the new NCSES TOD will involve changes in the broad aggregations under the current FFOD taxonomy. For example, up to 9 of the fine fields will change places under the TOD's 3 broad fields of science, engineering, and health; under the TOD's 8 major fields, up to 11 fine fields will change categories. To aid in the transition to the NCSES TOD, the 2019 SDR trend data based on the new NCSES TOD will include 2017 data showing old versus new FFOD aggregations.

2. USES OF INFORMATION

SDR data are used broadly in assessing the characteristics and supply of the nation's SEH personnel resources for educational institutions, private industry, and professional organizations, as well as federal, state, and local governments. NSF/NCSES uses the information to prepare congressionally mandated biennial reports, such as *Women, Minorities and Persons with Disabilities in Science and Engineering* and *Science and Engineering Indicators*. The SDR data also have been used extensively in the policy and planning activities of NSF and the National Institutes of Health, a collaborating agency. Other federal agencies, such as the Departments of Commerce, Agriculture, Energy, and the National Aeronautics and Space Administration, request and make use of the SDR data for a variety of purposes. Educational institutions often use SDR data in establishing and modifying

[8] The SED gathers information yearly from all new research doctorates awarded by U.S. institutions. Detailed information about the SED can be found at http://www.nsf.gov/statistics/srvydoctorates/.

scientific and technical curricula, while various private industries often use the information to develop recruitment and remuneration policies.

Policymakers, researchers, and other data users also use combined information from both the SDR and NSCG to answer questions about the number, employment, education, and characteristics of the S&E workforce. Because these surveys provide nationally representative data that policymakers and researchers use to address questions on topics such as employment of foreign-born or foreign-degreed scientists and engineers, the transition from higher education to the workforce, the role and importance of postdocs as research personnel, diversity in both education and employment, the implications of an aging cohort of scientists and engineers as baby boomers reach retirement age, and information on long-term trends in the S&E workforce.

Findings from the 2017 SDR will enable NCSES to continue reporting employment patterns of recent SEH doctorate recipients, as well as more experienced doctorate recipients in the labor market. The expanded sample enables NCSES to produce reliable estimates of employment outcomes by the fine fields of degrees used in the SED. The SDR data are made available through published reports, the Scientists and Engineers Statistical Data System (SESTAT), public use data files, and licenses for restricted-use data files. The online data tool, available at https://ncsesdata.nsf.gov/sestat/sestat.html, allows users to create customized data tabulations with a user-specified subject area. The SDR public-use files are available for download through the NCSES data downloads web page at https://ncsesdata.nsf.gov/datadownload/.

Uses for Policy Discussion

SDR data are used in policy discussions of the executive and legislative branches of Government, the National Science Board, NSF management, the National Academy of Sciences, professional associations, and other private and public organizations. NSF's Education and Human Resources Directorate uses SDR data in the evaluation and development of programs, and other NSF research directorates use SDR to analyze SEH employment pathways.

A few recent specific examples of the use of the SDR data and the integrated SDR and NSCG data are:

- A chapter in the book *The Science and Technology Labor Force: The Value of Doctorate Holders and Development of Professional Careers* used SDR data to describe the science and engineering labor force in the U.S.[9];
- The National Science Board (NSB) used combined NSCG and SDR data in its investigation to develop national policies for the S&E workforce[10];
- The Committee for Equal Opportunity in Science and Engineering (CEOSE), an advisory committee to NSF and other government agencies, established under 42 U.S.C. §1885c, has been charged by the U.S. Congress with advising NSF in assuring that all individuals are empowered and enabled to participate fully in science, mathematics, engineering and technology. Every two years CEOSE prepares a congressionally mandated report that makes extensive use of NSCG and SDR data to highlight key areas of concerns relating to students, educators, and technical professionals;
- The importance of information on the S&E workforce to inform public policy can be seen in discussions of the NSB's Task Group on Science, Technology, Engineering, and Math (STEM) Innovators. The task

[9] L. Gokhberg et al. (eds.), The Science and Technology Labor Force, Science, Technology and Innovation Studies: Switzerland, Springer International Publishing, 2016, pp77-119.
[10] http://nsf.gov/nsb/publications/2015/nsb201510.pdf and http://www.nsf.gov/nsb/documents/2003/nsb0369/nsb0369.pdf

group used NSCG and SDR data to inform its deliberations about the S&E workforce and these data were part of the final report[11];

- Information from the SDR was presented at the Organisation for Economic Co-operation and Development (OECD) conference in December 2012, "Understanding and improving the contribution of doctoral graduates to innovation and the economy: Developing the statistical evidence"[12]; and
- The Educational Testing Service (ETS) and Council of Graduate Schools (CGS) used SDR and NSCG data to examine national benchmarks for career outcomes of master's and doctoral degree recipients by specific field.[13]

Uses by NSF/NCSES

The SDR data were used extensively in the latest versions of the congressionally mandated biennial reports *Science and Engineering Indicators, 2016* and *Women, Minorities and Persons with Disabilities in Science and Engineering, 2015*. In addition, the forthcoming detailed statistical tables that will accompany the *Women, Minorities and Persons with Disabilities in Science and Engineering, 2017 Digest* includes 2015 SDR data.

NSF/NCSES used the SDR data and the combined SDR and NSCG data in recent reports such as:

- *Science and Engineering State Profiles*, June 2016
- *Employment Decisions of U.S. and Foreign Doctoral Graduates: A Comparative Study*, December 2014
- *Unemployment among Doctoral Scientists and Engineers Remained Below the National Average in 2013*, September 2014
- Data Tables: *Survey of Doctorate Recipients, 2013*, September 2014
- Data Tables: *Survey of Doctorate Recipients, 2010*, May 2014
- *Unemployment among Doctoral Scientists and Engineers Increased but Remained Below the National Average*, April 2014
- *Characteristics of Scientists and Engineers in the United States: 2008*, June 2013
- *Employment and Educational Characteristics of Scientists and Engineers*, January 2013
- *International Mobility and Employment Characteristics among Recent Recipients of U.S. Doctorates*, October 2012
- *Racial and Ethnic Diversity among U.S.-Educated Science, Engineering, and Health Doctorate Recipients: Methods of Reporting Diversity*, January 2012
- *Academic Institutions of Minority Faculty with Science, Engineering, and Health Doctorates*, October 2011
- *The End of Mandatory Retirement for Doctoral Scientists and Engineers in Postsecondary Institutions: Retirement Patterns 10 Years Later*, December 2010

All NSF/NCSES publications can be accessed on the NCSES website at http://www.nsf.gov/statistics.

[11] http://www.nsf.gov/nsb/publications/2010/nsb1033.pdf
[12] http://www.oecd.org/sti/inno/CDH%20final%20conference%20report.pdf
[13] http://www.ets.org/c/19574/19089_PathwaysReptqp.pdf

Uses by Researchers and Analysts

SDR and the combined SDR and NSCG data are presented at conferences and professional meetings by NCSES staff and survey contractor staff, such as the annual meeting of the Association for Institutional Research, the American Association for Public Opinion Research, the American Educational Research Association, and the Joint Statistical Meetings. Examples of these presentations are as follows:

- *NCSES, Pathways through Universities and Graduate Schools into Careers – NCSES S&E Workforce Surveys,* American Educational Research Association, April 2016.
- *Balancing Timeliness, Data Quality and Cost – by Optimizing Data Collection Strategies*, Joint Statistical Meetings, August 2014.
- *Belt and Suspenders: Evaluating the Efficacy of Sending Initial Contacts via Email Only vs. Letter-Plus-Email to Online Responders in the Survey of Doctorate Recipients*, American Association for Public Opinion Research, May 2014.
- *A "Green" Appeal: Efficacy Evaluation of Assigning Sample Members that Prefer the USPS Mail Mode to the Online Mode in the 2013 Survey of Doctorate Recipients*, American Association for Public Opinion Research, May 2014.
- *Preparing Graduate Students for Non-Academic Careers*, American Association of Physics Teachers Meeting, January 2014.
- *OECD/UNESCO Institute for Statistics/Eurostat Careers of Doctorate Holders (CDH) Project*, The Organisation for Economic Co-operation and Development, December 2012.
- *Integration of the National and International 2008 SDR: Bridging Effects and Expected Improvements to the Time Series Data*, Joint Statistical Meetings, August 2012.
- *Development of the Sample Design for the International Survey of Doctorate Recipients*, Joint Statistical Meetings, August 2012.
- *Migration Patterns of U.S. Trained Doctorate Holders (A Longitudinal Study)*, Joint Statistical Meetings, August 2012.
- *Utilizing a Logistic Regression Approach for Weighting Adjustment in a Longitudinal Dataset*, Joint Statistical Meetings, August 2012.
- *Coping with Missing Data: Assessing Methods for Logically Assigning Race and Ethnicity*, American Association for Public Opinion Research, May 2012.
- *Science and Engineering Doctorate Recipients as Adjunct Faculty: New Findings from the Survey of Doctorate Recipients*, American Educational Research Association, April 2012.
- *An Investment in Goodwill or Encouraging Delays? Examining the Effects of Incentives in a Longitudinal Study*, Federal Committee on Statistical Methodology Annual Meeting, January 2012.

Since 2007, NCSES has distributed more than 3,500 copies of SDR public-use files (2003, 2006, 2008, 2010, and 2013 survey cycles), as well as over 5,100 copies of the combined SDR and NSCG data's public-use files (1993-2013 survey cycles). There are currently 50 active SDR restricted-use licenses. Additional licensing requests for the SDR are pending review and approval by NCSES. Selected citations of SDR are as follows:

- *Education and Academic Career Outcomes for Women of Color in Science and Engineering*, Seeking Solutions: Maximizing American Talent by Advancing Women of Color in Academia: A Conference Report, forthcoming. *How Big of a Problem is Analytic Error in Secondary Analyses of Survey Data?* PLoS One, 11(6): 2016.

- *Biomedical science postdocs: an end to the era of expansion,* FASEB Journal 30 (January) 2016.
- *How Much Does It Cost to be a Scientist?* Journal of Technology Transfer, 41(3): 469-505, 2016.
- *Stability and Longevity in the Publication Careers of U.S. Doctorate Recipients*. PLoS One, 11(4): 2016.
- *A Decade Beyond the Doctorate: The Influence of a US Postdoctoral Appointment on Faculty Career, Productivity, and Salary*. Higher Education, 70(4): 667-687, 2015.
- *Not Equal For All: Gender And Race Differences in Salary for Doctoral Degree Recipients*. Research in Higher Education, 56(7): 645-672, 2015.
- *The Bachelor's to Ph.D. STEM Pipeline No Longer Leaks More Women than Men: A 30-Year Analysis,* Frontiers in Psychology. 6:37. doi: 10.3389/fpsyg.2015.00037.
- *University Patenting: A Comparison of 300 Leading Universities Worldwide*. Journal of Technology Transfer, 40(2): 318-345, 2015.
- W*hat Predicts Whether Foreign Doctorate Recipients from U.S. Institutions Stay in The United States: Foreign Doctorate Recipients in Science and Engineering Fields from 2000 to 2010*. Higher Education, 70(1): 105-126, 2015.
- *Storm Clouds on the Career Horizon for Ph.D.'s*. Issues in Science and Technology, 31(4): 74-77, 2015.
- *Beyond Skills: An Integrative Approach to Doctoral Student Preparation for Diverse Careers*. The Canadian Journal of Higher Education, 44(3): 54-67, 2014.
- *Is It All Worth It? The Experiences of New PhD's on the Job Market, 2007-2010*. Cambridge: National Bureau of Economic Research, Inc., 2014.
- *The Determinants of the Internationalization Speed of Portuguese University Spin-Offs: An Empirical Investigation*. Journal of International Entrepreneurship, 12(3): 270-308, 2014.
- *The Ones Who Got Away*. Nature, 513(7516): 20-22, 2014.
- *Women in Academic Science. A Changing Landscape,* Psychological Science in the Public Interest, 15(3): 75-141, 2014.
- *Interdisciplinary Research and the Early Career: The Effect of Interdisciplinary Dissertation Research on Career Placement and Publication Productivity of Doctoral Graduates in the Sciences,* Research Policy, 42(5): 1152-1164, June 2013.
- *Comparing Research Productivity across Disciplines and Career Stages,* Journal of Comparative Policy Analysis, 15(2): 141-163, April 2013.
- *Increasing the Visibility of Women of Color in Academic Science and Engineering: Professional Society Data.* New Directions for Higher Education, 2013(163): 7-21, 2013.
- *Contributions of Foreign-Born Faculty to Doctoral Education and Research.* New Directions for Higher Education, 2013(163): 89-98, 2013.
- *Beyond Anecdotes: A Quantitative Examination of Black Women in Academe*. The Review of Black Political Economy, July 2012.
- *Disparities in Publication Patterns by Gender, Race and Ethnicity Based on a Survey of a Random Sample of Authors.* Scientometrics, 2012 (November): 1-20.
- *Education and Career Outcomes for Women of Color in Academia*, National Academies' Conference Seeking Solutions: Maximizing American Talent by Advancing Women of Color in Academia, 2012.

3. CONSIDERATION OF USING IMPROVED TECHNOLOGY

The 2017 SDR will collect data using three modes:

1. Self-administered online (or web) surveys (including access from mobile devices);
2. Paper self-administered questionnaires (mail); and
3. Computer-assisted telephone interviews (CATI).

Prior to the 2003 survey cycle, SDR data were collected by first mailing paper questionnaires to sample members, then following up with nonrespondents by telephone. In the 2003 SDR, the tri-mode data collection effort that included mail, CATI, and web was tested and has been fully implemented in all of the rounds since then (2006, 2008, 2010, 2013, and 2015) and the 2017 survey cycle will continue this protocol.

In addition, participation via an online survey has increased steadily since the 2006 cycle, increasing from 47% in 2006 to 81% in 2015. Of the respondents who answered the 2015 survey question regarding future mode preference, 83% indicated a preference for the online survey. Analysis indicates that the online mode results in higher response rates, as well as more complete survey and contacting data, than the mail questionnaire mode.

For returning sample members, the 2017 SDR will honor mode preferences reported in the 2015 SDR but also emphasize the efficiency of completing the survey via the web. Based on the 2015 SDR, we anticipate that approximately half of the new cohort will be started in the online survey mode. Similar to the 2015 survey cycle, over 81% of the 2017 survey responses are expected to be completed in the online mode. As in 2015, the 2017 online survey will be configured for use on mobile devices (e.g., smartphones and tablets) to ensure that the respondent experience is optimized regardless of the screen size or browser used to access the survey.

The 2017 data collection effort will continue the use of a comprehensive case management system (CMS) to track data captured across the three modes (web, mail, CATI) with additional features added to the system. The additional features support an adaptive design data collection strategy for quickly prioritizing cases and real-time response rate calculations particularly by the location of the residency of sample members. Optical scanning will be used to capture mail questionnaires after keying and these images will be stored in a database for archival purposes.

4. EFFORTS TO IDENTIFY DUPLICATION

Some overlap exists between the SDR and NCSES's Early Career Doctorates Survey (ECDS) (OMB Control # 3145-0235) in their target population and content. Regarding target population overlap, the ECDS has a 2-stage sampling design and builds its frame by obtaining employee lists from U.S. academic institutions, Federally Funded Research and Development Centers, and NIH Intramural Research Programs. These lists target individuals who received their first doctorate within the last ten years, in any field, in the U.S. or abroad. In contrast, the SDR excludes doctorate holders who only earned professional doctorates, non-S&E doctorates, or S&E doctorates from institutions outside the United States. Overall, an estimated 140,000 doctorates in the 2015 SDR target population (~ 15%) were represented among the population of U.S.-trained early career doctorates who are in the ECDS target population. As a result, approximately 4% (n=263) of the 2015 Pilot ECDS sample members were also sampled for the 2015 SDR.

Regarding content overlap, the ECDS collects substantially more information about respondent work experiences, especially about postdoc experiences, professional activities and achievements, funding, work-life balance, and future career plans. Thus, the ECDS is unique in providing a comprehensive survey and comparison of U.S.-trained and non-U.S. trained early career doctorates employed in U.S. academic and federal government research sectors. In contrast, the SDR is unique in representing employment, work activities, and years of experience

among all U.S.-trained SEH doctorate recipients up to age 76 regardless of where they currently reside or work, including those working outside of academe and those residing outside of the U.S. The SDR represents U.S. doctorate recipients working full or part time in all employment sectors throughout their career including those who are not working due to retirement or other reasons.
Because the ECDS collects substantially more information than the SDR, the 2017 ECDS will attempt to contact all sample members, even those identified as having been in the 2017 SDR. Given the tripling of the ECDS sample for the 2017 survey compared to the Pilot ECDS sample size, we expect the sample overlap between the 2017 ECDS and the 2017 SDR to be approximately 900 cases (4% of the ECDS sample and 0.7% of the SDR sample). NCSES staff will work together with the survey contractors to identify sample members selected for both surveys. The 2017 ECDS sample members identified as having been in the 2017 SDR will receive a letter from the NSF prior to the start of ECDS data collection. The letter will clarify they are being asked to participate in two NCSES surveys, SDR and ECDS, and request their participation in both.

Overlap also exists between the SDR and the NCSES's NSCG in their target population and in survey content. The NSCG and the SDR both capture estimates of the roughly 1 million U.S-trained SEH doctorates; however, the NSCG also covers an estimated 165,000 foreign-trained SEH doctorates residing in the United States. Unlike the NSCG, the SDR collects detailed information from U.S. trained SEH doctorate recipients working in post-secondary academic institutions including their academic position, faculty rank, tenure status, and reasons for taking a postdoc, if in a postdoctoral position. The NSCG collects information on veteran status, attainment of certifications and licenses, financial support for education, and community college enrollment, none of which are collected in the SDR.

Based on the 2015 SDR sample, approximately 300 individuals may be selected for both the 2017 NSCG and the 2017 SDR. Due to the content differences between the surveys, the relatively small number of expected duplicates, and the operational challenges of the deduplication process, NCSES will not de-duplicate individuals selected for participation in both the SDR and NSCG.

5. EFFORTS TO MINIMIZE BURDEN ON SMALL BUSINESS

Not applicable. The SDR collects information from individuals only.

6. CONSEQUENCES OF LESS FREQUENT DATA COLLECTION

Conducting the SDR on a less frequent basis would prohibit NSF/NCSES from meeting its congressional mandate to produce a report that contains an accurate accounting and comparison, by sex, race, and ethnic group and by discipline, of the participation of women and men in scientific and engineering occupations. The SDR data are central to the analysis presented in a pair of congressionally mandated reports - *Science and Engineering Indicators* and *Women, Minorities, and Persons with Disabilities in Science and Engineering*. Since these reports are published on a biennial schedule, they rely on the availability of updated data on the science and engineering workforce every two years. The impact of not being able to meet this congressional mandate is that government, business, industry, and universities would have less recent data to use as a basis for formulating the nation's science and engineering policies.

A less frequent data collection would also impact SDR data quality. Follow-up surveys every two years enable analyses of changes in the S&E workforce when individuals move in and out of S&E occupations over both business and life cycles. To ensure the availability of current national S&E workforce data, the SDR has been coordinated with the NSCG on a biennial basis since 1993. The degradation of either component jeopardizes the integrity and value of these combined surveys to provide comprehensive information on the S&E workforce.

Conducting the survey less frequently would make it more difficult and costly to locate sampled persons given the mobility of the doctorate population. The impact is likely to be a higher attrition rate, higher potential for nonresponse bias, and less reliable cross-sectional and longitudinal estimates.

7. SPECIAL CIRCUMSTANCES

Not applicable. This data collection does not require any one of the reporting requirements listed.

8. FEDERAL REGISTER ANNOUNCEMENT AND CONSULTATIONS OUTSIDE THE AGENCY

Federal Register Announcement

In response to the Federal Register Notice for the SDR that appeared on September 19, 2016 (See Attachment C), one public comment was received by the closing date of November 18, 2016. The comment was in support of renewing the SDR and "releasing the survey data in a more timely and predictable manner." NCSES acknowledged receipt and thanked the person for their comment.

In response to the Federal Register Notice for the SDR that appeared on April 12th, 2017, seven public comments were received by the closing date of May 12th. One comment was from an anonymous individual requesting that we include foreign-trained doctorates in the SDR to fully examine this highly trained segment of our workforce. The Executive Director of the American Educational Research Association (AERA) commented positively on the expansion of the survey and urges that education research be included as a fine field of study in the SDR frame. However, concern was expressed over the large reduction in carrying forward the 2013 sample that failed to include 31,000 of its 47,000 sampled cases. The remaining comments also addressed this concern about the sample design implemented in 2015 and carried forward in the 2017 cycle. Those comments were submitted by Dr. Ginther from the University of Kansas, Dr. Kahn from Boston University, Dr. Shauman from the University of California-Davis, Dr. Weinberg from Ohio State University, and Dr. Weinberger from the University of California-Santa Barbara. The concerns were related to their ongoing longitudinal studies of SEH doctorates in the academic sector about academic career pathways for women and underrepresented minorities. No mention of research outside of this sector was expressed in these comments.

We acknowledge the concerns raised by the comments regarding the use of SDR data for longitudinal research to examine academic pathways. The motivation for the SDR sample design change is to produce reliable cross-sectional estimates of employment outcomes at the fine field of study level and the benefits resulting from this change include a refreshed sample that provides a richer source of data and greater opportunities to address longitudinal research interests moving forward, albeit gradually. NCSES's current efforts focus on developing an efficient, effective, and sustainable longitudinal design for the SDR.

The process we use to define the eligible SDR fine fields is motivated by a congressional mandate to provide an accurate accounting of individuals in the science and engineering workforce. NCSES's definition of the science and engineering workforce includes individuals educated in science, engineering, or health fields and does not include individuals educated in education fields such as education research.

Consultations Outside the Agency

Evaluation of the NCSES Effort to Measure the S&E Workforce Population. The National Research Council's Committee on National Statistics (CNSTAT), at the request of NCSES, has convened an expert panel to review, assess, and provide guidance on NCSES's effort to measure the U.S. S&E workforce population. Given the evolving data needs of NCSES stakeholders, NCSES would like to develop a framework for measuring the

S&E workforce that will enable the flexibility to examine emerging issues related to this unique population while allowing for stability in the estimation of trend data. This framework would provide direction for numerous survey design issues related to measuring the S&E workforce population including content, data sources, survey methodology, data collection, processing, integration, dissemination, and outreach.

At the end of its review, the panel will issue a report with findings, recommendations, and priorities for improving the relevance, accuracy, timeliness, and cost-effectiveness of approaches to providing measures the S&E workforce for the next decade and beyond. This report is expected to provide the details, direction, and guidance necessary for NCSES to develop a robust and flexible framework for measuring the S&E workforce over the coming decades.

The CNSTAT Panel Members are as follows:

Rita Colwell *(co-chair)*
University of Maryland and Johns Hopkins University

James House *(co-chair)*
University of Michigan

Jennifer Sue Bond
Council on Competitiveness

Geoff Davis
Verily

Don Dillman
Washington State University

Richard Freeman
Harvard University

Jack Gambino
Statistics Canada

Maresi Nerad
University of Washington

Randy Olsen
Ohio State University

Willie Pearson
Georgia Institute of Technology

Keith Rust
Westat

Nora Cate Schaeffer
University of Wisconsin

James Wagner
University of Michigan

Yu Xie
Princeton University

Meetings and Workshops on Redesign Activities. Since 2013, a series of Human Resources Expert Panel (HREP) meetings and workshops have been held on various issues related to sample design and survey methodology for the NCSES demographic workforce surveys (SDR, ECDS and NSCG). HREP advises NCSES on priorities and strategies for ongoing activities to improve the relevance of current and future statistics produced by NCSES's Human Resources Statistics (HRS) program. HREP members are broadly representative of stakeholders with an interest in S&E human resources, such as:

- Current data users, including NCSES restricted-use data licensees
- Potential data users
- Policy makers from various levels of government
- Professional organizations and foundations, such as the American Institute of Physics (AIP), Council of Graduate Schools (CGS), and the American Association for the Advancement of Science (AAAS)
- Research organizations that use human resources data such as the National Bureau for Economic Research (NBER) and the National Academy of Sciences (NAS)
- Current respondents to the surveys/projects conducted by HRS

- Large and small institutions of higher education, including both public and private institutions
- Industry representatives
- Human resources professionals

For the 2015 SDR and NSCG survey rounds:

- Two HREP meetings were held in August 2013 and January 2014 with the following goals:
  - To enrich the HRS understanding of how the education and careers of the S&E workforce traditionally come together and are evolving; and
  - To identify salient characteristics of the evolving S&E education/career pathways that can be addressed or incorporated into HRS surveys.

  HREP Members attending the August 2013 and January 2014 Workshops were as follows:

  Nathan Bell
  Associate Director, Education Research & Policy
  American Educational Research Association

  Roman Czujko
  Director, Statistical Research Center
  American Institute of Physics

  Ronni Denes
  President and Executive Director
  New Jersey SEEDS

  Catherine Didion
  Senior Program Officer
  National Academy of Engineering
  Director, Committee on Women in S&E
  National Academies

  Earnestine Psalmonds Easter
  Program Director, Division of Graduate Education
  National Science Foundation

  Cary Funk
  Senior Researcher
  Pew Research Center

  Donna Ginther
  Professor of Economics
  University of Kansas

  Brian Hartz
  Vice President of Client Services
  TORQworks

  Beverly Karplus Hartline
  Vice Chancellor for Research and Graduate Studies
  Montana Tech

  Cheryl Leggon
  Associate Professor, School of Public Policy
  Georgia Institute of Technology

  Sharon Levin
  Professor of Economics
  University of Missouri, St. Louis

  Duncan McBride
  Program Director, Division of Undergrad Ed.
  National Science Foundation

  Catherine Millett
  Research Scientist
  Educational Testing Service

  Cathee Johnson Phillips
  Executive Director
  National Postdoctoral Association

  George Wimberly
  Director, Professional Development/Social Justice
  American Educational Research Association

- A third HREP meeting was held in June 2014. The objectives of this meeting were to become better informed about:

- Research questions and policy issues concerning job mobility, occupational change, and career pathways that currently engage researchers and policymakers, particularly as these questions and issues relate to the S&E workforce;
- How survey data are used to study the research questions and policy issues, and the limitations of these data;
- Best practices for collecting occupational history data in the context of longitudinal study designs;
- To identify other important characteristics of occupational history that can be incorporated into HRS surveys.

HREP Members attending the June 2014 Workshop were as follows:

Jake Bartolone
Senior Research Scientist
National Opinion Research Center

Kirk Doran
Assistant Professor of Economics
University of Notre Dame

Donna Ginther
Professor of Economics
University of Kansas

Shulamit Kahn
Associate Professor of Public Policy & Law
Boston University

Morris Kleiner
Professor of Public Affairs/Industrial Relations
University of Minnesota

Iourii Manovskii
Associate Professor of Economics
University of Pennsylvania

Erika McEntarfer
Supervisory Economist
U.S. Census Bureau

Donna Rothstein
Research Economist
Bureau of Labor Statistics

Hal Salzman
Professor of Planning and Public Policy
Rutgers, The State University of New Jersey

Marc Scott
Associate Professor of Applied Statistics
New York University

John Skrentny
Professor of Sociology
University of California at San Diego

Albert Sumell
Associate Professor of Economics
Youngstown State University

Omari Swinton
Assistant Professor of Economics
Howard University

John Bound
Professor of Economics
University of Michigan

Charlie Brown
Professor of Economics
University of Michigan

Pamela Herd
Professor of Public Affairs and Sociology
University of Wisconsin-Madison

Sheila Kirby
Senior Fellow
National Opinion Research Center

Cheryl Leggon
Associate Professor, School of Public Policy
Georgia Institute of Technology

Audrey Light
Professor of Economics
Ohio State University

Mike Pergamit
Senior Fellow
Urban Institute

Jeff Strohl
Senior Research Fellow
Georgetown University

Josh Trapani
Director of Policy Analysis
Association of American Universities

- A fourth (ad hoc) HREP of Sampling Statisticians was held in December 2014. The objectives of this meeting were:
  - To discuss sample redesign options for fielding a 2015 cycle of the SDR that is based on the SED fine fields of degree (FFOD) as the sampling strata.
  - To determine which sampling design approach is optimal to implement and meet the new estimation goals for employment outcomes of doctorates in the FFODs.

  The Statistical Experts attending the December 2014 meeting were as follows:

  Rachel Harter
  Senior Research Statistician
  RTI

  Frauke Kreuter
  Professor in the Joint Program in Survey Methodology (JPSM)
  The University of Maryland, USA, and
  Professor of Statistics
  Ludwig-Maximilians-Universität, Germany

  Michael Larsen
  Associate Professor in the Department of Statistics and Biostatistics Center
  George Washington University

  Jill Montaquila
  Associate Research Professor in JPSM
  The University of Maryland, and
  Associate Director of the Statistical Staff and Senior Statistician
  Westat

For the 2017 SDR survey round:

- A fifth HREP meeting was held in October 2016. The objectives of this meeting were:
  - To introduce the 2015 SDR sample redesign which increased the sample to 120,000 and stratified the population by the fine field of degree (FFOD) defined by the Survey of Earned Doctorates (SED) for purposes of reporting;
  - Discuss the 2015 and 2017 redesign goals and methods;
  - Discuss the 2015 SDR data collection and estimation results; and
  - To obtain feedback on the 2015 redesign challenges including:
    - Doctoral fine field dynamics and estimation goals for subsequent cycles,
    - Maintaining the SDR sample size and its completion rates, and
    - Building and maintaining longitudinal cohorts.

HREP Members attending the October 2016 Workshop were as follows:

F. Jay Breidt
Professor of Statistics
Colorado State University

Patrick J. Cantwell
Chief, Decennial Statistical Studies Division
U.S. Census Bureau

Kimberlee Eberle-Sudré
Senior Policy Analyst
Association of American Universities

Donna Ginther
Director of Center for Science Technology & Economic Policy
University of Kansas

Rachel Harter
Senior Research Statistician
RTI International

Donsig Jang
Vice President and Director, Center for Excellence in Survey Research
NORC at the University of Chicago

Thomas Krenzke
Associate Director of Statistical Staff
Westat

Cheryl Leggon
Associate Professor, School of Public Policy
Georgia Institute of Technology

Jean Opsomer
Department Chair, Statistics
Colorado State University

Ed Robinson
Mathematical Statistician
Bureau of Labor Statistics

Adam Safir
Chief, Division of Consumer Expenditure Surveys
Bureau of Labor Statistics

Michael Sinclair
Senior Fellow
Mathematica Policy Research Inc.

Survey Design and Methodology Consultations. Over the past two years, NCSES staff engaged in outreach and collaboration efforts with the Census Bureau, NCES, and other agencies on various areas of survey design. Below are some examples of NCSES's outreach and collaboration efforts related to adaptive design.

- To address the increasing nonresponse trends for governmental surveys, NCSES funded research to examine contact strategies for the NCSES surveys with principal investigators for this research from the University of Nebraska - Lincoln.
- NCSES, Census Bureau, and NCES staff:
  - attended meetings of the Adaptive Design Interagency Working Group established by the OMB Office of Statistical and Science Policy in 2014.
  - participated in a topic-contributed session on adaptive design at the 2015 Federal Committee on Statistical Methodology (FCSM) research conference in December 2015.
  - participated in a topic-contributed panel at the 2015 AAPOR annual conference in May 2015. The panel topic was "Innovation in Federal Surveys – Opportunities, Progress, and Challenges."
- Ongoing collaboration between NCSES and the Census Bureau on adaptive design led to NCES requesting that Census Bureau and NCSES staff present a seminar at NCES focused on data quality and adaptive design. This outreach has led to NCES's adoption of data monitoring metrics with an eye towards future adaptive design research and experimentation opportunities.

9. PAYMENT OR GIFTS TO RESPONDENTS

Incentives for the SDR began during the 2003 cycle, and have continued for all subsequent cycles. Described below are the NSF/NCSES plans to offer both early and late-stage incentives.

Non-U.S. residing sample members will not be sent the early or late-stage incentive offer even if they are otherwise eligible. Additionally, sample members determined to work for the National Science Foundation will be excluded from the incentive offer.

Proposed Plan for the 2017 SDR

Early-Stage Incentive. The early-stage incentive will target two types of sample members: 1) those who have only responded after being incentivized in prior rounds and 2) new cohort sample members who are recent graduates (earning their degree in 2014 or 2015).

Early incentives will be offered to each sample component as described below:

1. Sample members who have historically only responded after receiving an incentive will be offered a monetary incentive in the first contact to encourage a faster response and to reduce the costs associated with follow-up contacts. The rationale for this approach is based on the 2013 and 2015 SDR. An examination of the 2013 response of sample members who consistently only participated after receiving an incentive in the past survey cycles shows 69.7% completed the 2013 survey after receiving a late-stage request for survey participation with an incentive offer, while only 37.6% completed at this stage without an incentive. In 2015, all sample members who only responded previously after receiving an incentive were sent an incentive with their first survey request. Of the cases from this group, 81.5% completed the 2015 survey.

   Four subgroups of the 2015 panel will be eligible for an early incentive offer in the 2017 SDR:

   i. Sample members who were in both the 2013 and 2015 rounds and who participated in 2013 with an incentive, but did not participate in 2015 when they did not receive an incentive.

   ii. Sample members who were in both the 2013 and 2015 rounds and who participated in 2013 with an incentive, but did not participate in 2015 until they received a late-stage incentive.

   iii. Sample members who were in both the 2013 and 2015 rounds and who participated in 2015, being assigned in 2015 to the group receiving the early incentive (based on their participation and incentive history).

   iv. Sample members that were part of the 2015 expansion sample cohort and only participated in the 2015 after receiving an incentive.

2. For the new cohort sample members, incentive experiments conducted in 2006 and 2008 indicate that offering a prepaid incentive in the second contact is a cost-effective way of encouraging survey response, and analysis in 2010 indicated the monetary incentive had a positive effect on response. In the 2015 cycle, new cohort sample members in the U.S. were offered an incentive with the second request for survey participation. This resulted in 57.0% of the new cohort sample receiving the incentive offer. Of these early incentivized new cohort cases, 85.8% completed the survey. Furthermore, preliminary review of check cashing behavior shows that only half of those sent the incentive accepted it. Given the efficacy of the 2015 SDR new cohort incentive strategy, the proposal for the 2017 SDR is to offer a monetary incentive to the new cohort members in the second contact (i.e., those that do not respond to the initial contact).

Late-Stage Incentive. The overall strategy for the late-stage incentive is to ensure that all sample members who remain nonrespondents midway through the field period will have a probability of receiving a monetary incentive. In the plan used for the 2008 through 2015 SDR, a higher probability of selection for the incentive was given to more challenging cases in key analytic domains with relatively lower response rates. This strategy was designed to improve the accuracy of survey estimates, and ideally, mitigate nonresponse bias.

Preliminary 2015 SDR results show that late-stage eligible cases offered the incentive achieved a survey response rate of 56.5% versus 51.5% for late-stage incentive eligible cases not offered the incentive. Although this higher yield was not substantial, it achieved the goal of increasing the response rate among the more challenging cases in key analytic domains with relatively lower response rates in this late stage of data collection. Based on these results and findings from past cycles, we propose to continue this strategy for the 2017 cycle.

To allocate limited resources for the monetary incentive to late-stage survey nonrespondents most effectively, NSF/NCSES will conduct an analysis of the characteristics of the remaining nonrespondents using a logistic regression model and/or Mahalanobis distance measure. This analysis will help to determine which types of sample members should receive additional incentive to mitigate response bias of those residing in the U.S. The cases with lowest response propensity or those that contribute the most towards mitigating bias will be selected for the incentive (See section B.5 for further details on the adaptive design goals and monitoring metrics). The volume of late-stage response cases to be incentivized will be determined based on the available budget.

Also, during the late-stage data collection phase, any nonrespondents selected for an early-stage incentive but were not sent their incentive because of locating or mailing address problems, will be issued or reoffered the incentive. Nonrespondents who were successfully sent the incentive during the early-stage phase will receive a non-incentivized late-stage treatment.

Incentive Costs

According to this plan, a $30 prepaid incentive would be offered for the 2017 SDR, as was done for the 2008 through 2015 SDR. The total cost of incentives in the 2015 SDR was $260,000. In 2017, it is expected to cost $266,000. The complete incentive plan for 2017 is in section B3.4.

10. ASSURANCE OF CONFIDENTIALITY

NCSES and its contractors are fully committed to protecting the confidentiality of all survey respondents. SDR data will be collected under the authority of America COMPETES Reauthorization Act of 2010, the Confidential Information Protection and Statistical Efficiency Act (CIPSEA) of 2002, and the Federal Cybersecurity Enhancement Act of 2015. Cover letters and survey questionnaires to each selected respondent will advise them that the information they provide is confidential (see Attachment D – Draft 2017 SDR Questionnaire and Attachment E – Draft 2017 SDR Survey Mailing Materials). The same notice of confidentiality will be used in the introduction to the CATI interview and will be displayed prior to the start of the survey in the online instrument. In addition, the CATI interviewers will inform the respondents of the voluntary nature of their response and that the data will be used for statistical purposes only.

Standard data collection procedures incorporate numerous safeguards for protecting the data and must conform to a detailed security plan approved by NCSES. While collecting SDR data, the information that could identify a sample member is separated from data about that person. Each sample member is assigned a unique identifier, and this identifier is used to store identifying information (such as name, address, etc.) in a separate, secure database apart from the survey response database. SDR contractors and NCSES staff receive annual CIPSEA training to reinforce their legal obligations to protect the privacy and confidentiality of the SDR data; staff must sign data use agreements annually to acknowledge this legal obligation.

Completed SDR hard copy questionnaires and other contact materials will be housed in a secure storage room at the contractor's production facility. Only authorized staff – and only when necessary for data collection activities – will have access to hard copy materials from the SDR file room. The contractor's electronic systems will be on a secure local area network (LAN), and all contractor systems for storage of electronic survey data will be secure by design and will be protected by passwords available only to authorized study staff.

The contractor will implement systems to make certain that data collected via the online questionnaire are secure. First, access to the online instrument will be allowed only with a valid Personal Identification Number (PIN) and password correctly entered in combination. Second, data will be transmitted by the Secure Sockets Layer (SSL) protocol that employs powerful encryption during transmission through the Internet. If a respondent keeps an online survey open without any activity, the online server will close the connection after a short period of inactivity, both preserving the data up to the break-off point and preventing unauthorized persons from completing the questionnaire. The online survey system will place authentication information and response data on physically separate servers, a strategy that provides an extra layer of security to protect response data. Both development and production servers will be backed up nightly as required by the contractor's disaster recovery plan.

NCSES and its contractors will analyze and make available SDR tabulations only in aggregate form and will take all measures necessary to assure that the identity of individuals or organizations will not be disclosed in either its statistical tabulations or in the SDR public-use micro-data files.

11. JUSTIFICATION FOR SENSITIVE QUESTIONS

No questions of a sensitive nature are asked in this data collection.

12. ESTIMATE OF RESPONDENT BURDEN

A statistical sample of 124,580 persons, identified as having a doctorate in an SEH field from a U.S. academic institution will be selected for the 2017 SDR. This sample will include approximately 110,000 individuals residing in the U.S. and 15,000 residing abroad. The amount of time to complete the questionnaire may vary depending on an individual's circumstances; however, on average it will take approximately 25 minutes to complete the survey. Assuming a 75% response rate (93,435 respondents), the total burden for the 2017 SDR is estimated to be 38,932 hours.

The total cost to respondents for the 38,932 burden hours is estimated to be $1,871,851. This is based on an estimated median annual salary of $100,000 per full-time employed SDR respondent from the 2015 SDR data. Assuming a 40-hour workweek over 52-weeks of employment, this annual salary corresponds to an hourly rate of $48.08.

13. COST BURDEN TO RESPONDENTS

Not applicable. This survey will not require respondents to purchase equipment, software, or to contract out services.

14. COST BURDEN TO THE FEDERAL GOVERNMENT

The total estimated cost to the Government for the 2017 SDR is approximately $12.6 million, which includes survey cycle costs, and NCSES staff costs to provide oversight and coordination with the NSCG for analytic purposes. The estimate for survey cycle costs is approximately $12.0 million, which is based on sample size; length of questionnaire; CATI and online data collection technology; administrative, overhead, design, printing,

mail and telephone data collection costs; incentive payments; critical items data retrieval; data keying and editing; data quality control; imputation for missing item responses; weighting and estimating sampling error; file preparation and delivery; preparation of documentation and final reports; analysis, and tabulations. The NCSES staff costs are estimated at $562,500 (based on $150,000 annual salary of 1.5 FTE for 2.5 years).

15. REASON FOR CHANGE IN BURDEN

The increase in burden expected in 2017 is a result of the slight increase in the number of sample members (increase of 4,580). Questionnaire length and survey response rate are both expected to remain unchanged.

16. SCHEDULE FOR INFORMATION COLLECTION AND PUBLICATION

There are no plans to use any complex analytical techniques in NCSES publications using these data. Normally, SDR data are presented as cross-tabulations of the data in reports and other data releases. The time schedule for 2017 data collection and publication is currently estimated as follows:

Data Collection (Mail, CATI, online)	June 2017 – January 2018
Coding and Data Editing	July 2017 – May 2018
Final Edited/Weighted/Imputed Data File	June 2018
SDR InfoBrief	Fall 2018
SDR Detailed Statistical Tables	Fall 2018
SDR Public Use File	Fall 2018

17. DISPLAY OF OMB EXPIRATION DATE

The OMB Expiration Date will be displayed on the 2017 SDR questionnaire; in the online survey version, it will be included on the informed consent page of the online survey and available in a help screen accessible at any point in the online survey; in the telephone interview, it will be read to sample members during the introductory informed consent.

18. EXCEPTION TO THE CERTIFICATION STATEMENT

Not Applicable.