

Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions: FY 2016

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Technical Notes

Survey Overview

Purpose. The Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions (Federal S&E Support Survey) is the only source of comprehensive data on federal S&E funding to individual academic and nonprofit institutions.

Data collection authority. The information from this congressionally mandated survey is collected under the authority of the National Science Foundation Act of 1950, as amended, and the America COMPETES Reauthorization Act of 2010.

Survey contractor. Synectics for Management Decisions, Inc.

Survey sponsor. The National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF).

Key Survey Information

Frequency. Annual.

Initial survey year. FY 1963.

Reference period. FY 2016.

Response unit. Federal agencies.

Sample or census. Census.

Population size. The survey is a census of all federal agencies that obligate money to academic or nonprofit institutions or consortia for S&E. In the survey cycle for data collection on FY 2016, the population is 19 federal agencies.

Sample size. Not applicable; the survey is a census.

Survey Design

Target population. The target population was all federal agencies that obligated money in FY 2016 to academic or nonprofit institutions or consortia for S&E R&D or for the construction or maintenance of R&D facilities. For FY 2016, there were 19 agencies. Twelve of the 19 agencies are department-level federal agencies (the Departments of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, the Interior, Justice [Office of Justice Programs], Labor, and Transportation), and 7 of the 19 are independent federal agencies (the

Agency for International Development, the Appalachian Regional Commission, the Environmental Protection Agency, the National Aeronautics and Space Administration, NSF, the Nuclear Regulatory Commission, and the Social Security Administration). Because multiple subdivisions of a federal department were in some cases requested to complete the survey, there were 57 agency-level respondents (2 federal departments, 48 department subdivisions, and 7 independent agencies) and 33 program-office-level respondents, for a total of 90 respondents.

Academic institutions are institutions of higher education in the United States that engage primarily in providing resident or accredited instruction for a not less than a 2-year program above the secondary school level that is acceptable for full credit toward a bachelor's degree or that provide not less than a 1-year program of training above the secondary school level that prepares students for gainful employment in a recognized occupation. Included are colleges of liberal arts; schools of arts and sciences; professional schools, as in engineering and medicine, including affiliated hospitals and associated research institutes; and agricultural experiment stations. Nonprofit institutions are private organizations, other than educational institutions, whose net earnings in no part benefit a private stockholder or individual or other private organizations created for the exclusive purpose of turning over their entire net earnings to such nonprofit organizations. Consortia are organizations formed by the membership of institutions from one or more types of performers (i.e., academic or nonprofit) to promote and support efforts to enhance knowledge in one or more disciplines. NSF has identified several consortia and classified them as either academic or nonprofit types based on the predominance of their membership at the time of identification. For FY 2016, there were 995 academic institutions and consortia and 995 nonprofit institutions and consortia.

Sample frame. This survey is a census. Its population is derived from the federal agencies identified in the Survey of Federal Funds for Research and Development as providing R&D or R&D plant obligations to academic or nonprofit organizations.

Sample design. Not applicable.

Data Collection and Processing Methods

Data collection. The Federal S&E Support Survey uses a Web-based data collection system, but some agencies submit files offline that the survey contractor enters into the data collection system. The FY 2016 survey cycle began with an e-mail to each agency to verify contact information for each agency-level survey point of contact. Data collection began 22 February 2017. Information was collected for the federal fiscal year 2016 (i.e., 1 October 2015 through 30 September 2016). The requested due date for data submissions was 28 April 2017. However, data collection is usually extended until all surveyed agencies have provided complete and final data.

Mode. Web-based data collection system. However, some agencies submit data offline. The FY 2016 Federal S&E Support Survey requested information from 57 departments, subdivisions, or independent agencies, but three (the Department of Agriculture's Agricultural Marketing Services, the Department of Health and Human Services' Agency for Toxic Substances and Disease Registry, and the Department of Homeland Security's U.S. Coast Guard) reported no funds, and one (the Department of the Interior's National Park Service) failed to submit data before NSF closed the collection period—if data are received, they will be published with the FY 2017 data. Of the remaining 53 respondents, 42 respondents (79%) submitted data through the Web-based data collection system, and 11 respondents (21%) submitted data offline.

Response rate. 98%.

Data editing. Neither data editing nor coding are used for Federal S&E Support Survey data. The data are checked through both manual reviews and automated data checks that include a comparison of current-year obligations by category of support and the corresponding prior-year obligations. However, problems are referred to the agency that submitted the data for correction. Respondents' data are not changed by the survey contractor or NSF.

Imputation. None.

Weighting. None.

Variance estimation. Not applicable.

Survey Quality Measures

Sampling error. Not applicable.

Coverage error. Occasionally, small amounts (less than \$100,000) of R&D may be obligated to a university or college by an agency other than the ones listed above, and these amounts are not captured by this survey.

Nonresponse error. Agencies are encouraged to estimate information when actual data are unavailable. Although every attempt has been made to ensure complete response from the survey universe and for all items, it is possible there may be some item nonresponse. The survey instrument allows respondents to enter data or skip data fields. NCSSES assumes a blank field is zero for estimation purposes. There are several possible causes for nonresponse error for this survey, including data items incorrectly skipped by respondents, an incorrect assumption that blank fields indicate zeros, and incorrect estimates when data are unavailable.

Measurement error. The major source of nonsampling error in this survey is measurement error. Agencies are not always able to provide the precise information requested. For example, federal agencies are not always able to identify which branch of a university receives funding from them. Thus, complete disaggregation by actual university branch may not be feasible for some universities.

Other problems include agency difficulties in matching program descriptions with the proper funding category (e.g., R&D, facilities and equipment for instruction in S&E) in the federal S&E support database. At least one agency has said that the "general support for S&E" and "other S&E" categories are a catchall for programs that do not fit anywhere else. (See the "Report on the NSF Federal S&E Support Survey Issues Workshop" for the session held on 20 May 1999.)

Data Comparability

Data revisions. Annual data are available for FYs 1963–2016.¹ In some instances, prior-year data have been modified based on discrepancies noted during the consistency reviews of the data across years. To obtain accurate historical data, data users should use only the most recent publication, which incorporates corrections agencies have made in prior-year data.

Changes in survey coverage and population. Eight federal agencies supplied data for FYs 1963–67 (data collection began in 1965). The initial survey elicited information about academic institutions only. Additional agencies have been included in the years since then. The survey has been conducted annually since 1968. Information on nonprofit organizations was added in 1968.

- Beginning with the FY 2016 survey, the National Archives and Records Administration was dropped from the target population.
- Beginning with the FY 1999 survey, NSF no longer collects data for federally funded research and development centers (FFRDCs).
- Beginning with the FY 1998 survey, NSF collects S&E obligations for U.S. Service schools.
- Beginning with the FY 1993 annual report, NSF no longer publishes data collected for non-S&E support to universities and colleges.
- Since FY 1990, the Department of Defense (DOD) has reported research obligations separate from development obligations.
- Since FY 1990, NSF has not published data on detailed field of S&E for obligations in R&D and fellowship, traineeship, and training grant programs (FTTGs) to academic institutions.

Changes in questionnaire. A Web-based data collection system was developed for the FY 1998 survey cycle.

Changes in reporting procedures or classification.

- As of the FY 2016 cycle, the method of determining high-American Indian-enrollment (HAIE) and high-Hispanic-enrollment (HHE) institutions was corrected to use the official definitions per the National Center for Education Statistics' (NCES') Integrated Postsecondary Education Data System. Therefore, HAIE institutions include institutions of higher education that are not tribal colleges or universities and that have an enrollment of undergraduate students that is not less than 10% Native American students, and HHE institutions include institutions of higher education whose full-time-equivalent (FTE) enrollment of undergraduate students is at least 25% Hispanic. (Note: NCES determines FTE enrollment by calculating that approximately three part-time students are equivalent to one full-time student.) In FY 2015, the calculations were based on institutions' total enrollment.
- As of the FY 2013 cycle, the criteria used to determine nonprofit institutions for the Federal S&E Support Survey was broadened from Internal Revenue Code 501(c)(3) organizations to Internal Revenue Code 501(c) organizations.
- Starting with FY 2009 survey, survey information has been requested in actual dollars rather than rounded in thousands.

Changes in reporting.

Since data were first collected for FY 1963, there have been some changes in reporting. The most recent of these changes include the following:

- As of FY 2016, 22 nonprofit institutions were reclassified as academic institutions, and 1 nonprofit institution was reclassified as an academic consortium. The 22 nonprofit institutions that were changed to branches of academic institutions were the California State University San Marcos Corporation, the Clemson University Research Foundation, the Florida Solar Energy Center, the Foundation for California Community Colleges, the

Georgia Tech Applied Research Corporation, the Immune Disease Institute (from 1986–2012, when it closed), the Joint Oceanographic Institutions, the Michigan Biotechnology Institute (from 2007 on), the Ohio Agricultural Research and Development Center, the Pennington Biomedical Research Foundation, the Research Foundation for the State University of New York, the Research Foundation of the City University of New York, the Rush University Medical Center, the San Jose State University Research Foundation, the Skidaway Institute of Oceanography (from 2013 on), the South Carolina Research Foundation, the Space Telescope Science Institute, the Texas A&M Research Foundation, the University Corporation at Monterey Bay, the Virginia Tech Applied Research Corporation, the West Virginia University Research Corporation, and the Western Kentucky University Research Foundation. The nonprofit reclassified as an academic consortium was the New York Structural Biology Center. One nonprofit institution (the Charlotte-Mecklenburg Hospital Authority, doing business as Carolinas HealthCare System) was deactivated because it is a special district local government public authority. Two nonprofit institutions were reinstated after having been deleted during the FY 2015 cycle (the Interstate Shellfish Sanitation Conference and the National Conference on Interstate Milk Shipments). All these changes were also applied retroactively; because of those changes, data were revised, replacing previously published data.

- In a September 2015 agreement, Yeshiva University transferred financial and operational responsibility for the Albert Einstein College of Medicine to Montefiore Health System, a nonprofit institution. However, for the FY 2016 survey, the Albert Einstein College of Medicine is reported as an independent academic institution.
- During the FY 2016 cycle, corrections for FY 2015 data were received from three agencies: the Administration for Children and Families reported corrections for one academic (Temple University) and one nonprofit institution (Child Trends), the National Institute of Standards and Technology reported correction for two institutions (Georgia Tech Applied Research Corporation and Georgia Tech Research Corporation), and the Domestic Nuclear Detection Office reported corrections for six institutions—in this case, the data for all six were reported under the wrong category of support, and the data for one (Georgia Tech Research Corporation) were revised (the other five—Alabama A&M University, Texas A&M University-College Station, University of California-Berkeley, University of Minnesota-Twin Cities, and University of Texas at Dallas). As a result of those changes, data were revised, replacing previously published data.
- As of FY 2015, two institutions were reclassified from nonprofit institutions to academic institutions (Cold Spring Harbor Laboratory and Erikson Institute), two institutions were reclassified from nonprofit institutions to academic consortia (Association of Universities for Research in Astronomy and Oak Ridge Associated Universities), five institutions were reclassified from nonprofit consortia to academic consortia (Consortium of Universities for the Advancement of Hydrologic Sciences, Consortium of Universities of the Washington Metropolitan Area, Marine Environmental Sciences Consortium, Southeastern Universities Research Association, and Southwestern Ohio Council for Higher Education), and six institutions were reclassified from nonprofit consortia to nonprofit institutions (Center for Regional Economic Competitiveness, International Anesthesia Research Society, Maricopa Integrated Health System, Patuxent Partnerships Inc., Saint Alphonsus Regional Medical Center, Inc., and Vaccine Research Institute of San Diego); these changes were also applied retroactively.

- As of FY 2014, the obligations of the Department of Transportation (DOT), Office of the Assistant Secretary for Research and Technology's University Transportation Centers were moved from R&D to Other S&E; this change was also applied to FYs 2005–13.
- As of FY 2014, all data for Texas A&M Engineering Experiment Station and Texas A&M AgriLife Research were moved from nonprofit institutions to academic institutions (set as branches of Texas A&M University).
- After the close of the FY 2013 data cycle, the Department of Health and Human Services (HHS) National Institutes of Health (NIH) revised its data for FYs 2009–12.
- After the close of the FY 2013 data cycle, NSF revised its data for FYs 1999–2012.
- MITRE Corporation data prior to FY 2011 include obligations for FFRDCs that it administers.
- For FYs 2009 and 2010, data from the HHS Centers for Disease Control and Prevention were excluded due to their poor quality.
- After the close of the FY 2009 data cycle, the HHS Health Resources and Services Administration revised its FY 2008 and FY 2009 data.
- After the close of the FY 2009 data cycle, the Department of Education (ED) revised its FY 2008 and FY 2009 data.
- Data for FY 2009 and FY 2010 include American Recovery and Reinvestment Act of 2009 obligations.
- After the close of the FY 2007 survey cycle, DOD discovered a programming error that was made during the FY 2005 survey cycle and caused each advanced technology development dollar to be reported twice: as advanced technology development and as major systems development. Data for FYs 2005–07 were revised.
- Between FY 2006 and FY 2007, the National Aeronautics and Space Administration's (NASA's) R&D obligations decreased for two reasons: (1) in FY 2007, NASA excluded projects that were operational in nature that were not excluded in FY 2006, and (2) there was an overall decrease in obligations between FY 2006 and FY 2007, which accounts for the remainder of the decrease.
- In FY 2004, NASA implemented a full-cost budget approach, which includes all direct and indirect costs for procurement, personnel, travel, and other infrastructure-related expenses relative to particular programs and projects. Data for FY 2004 and later years may not be directly comparable to data for FY 2003 and earlier years.
- For the FY 2003 survey cycle, the Department of Homeland Security (DHS) could not provide S&E obligations (with the exception of the U.S. Coast Guard) broken down into the categories shown in this report.

- Because the U.S. Coast Guard, formerly part of DOT, moved under DHS in FY 2003, its data were not part of the FY 2003 detailed statistical tables. The U.S. Coast Guard's overall S&E obligations for FY 2003 are as follows:
 - Total academic S&E, \$2,159,000
 - Academic R&D, \$1,824,000
 - Academic R&D plant, \$335,000
 - Nonprofit R&D, \$924,000
- Beginning in FY 2000, NASA reclassified the Space Station as a physical asset and Space Station research as equipment and also transferred funding for the program from R&D to R&D plant. According to NASA, this classification change had a negligible impact on the data reported in this report for FY 2000. However, this classification change was reflected in the FY 2001 academic totals, which showed an R&D plant increase for NASA nearly five times over the FY 2000 R&D plant total.
- Beginning with the FY 1999 survey cycle, NSF determined that federal agencies would no longer report obligations to academic or nonprofit FFRDCs. Obligations to FFRDCs were deleted from all previous years shown in this report.
- Beginning with the FY 1996 survey cycle, NSF determined that federal agencies would no longer report obligations for fields of S&E.
- Since FY 1994, NSF has collected data on DOD development dollars in two categories: advanced technology development and major systems development. These categories better differentiate between that part of the federal R&D budget that supports "science and key enabling technologies" (including military and nondefense applications) and the part that primarily concerns "testing and evaluation of large technical systems prior to production" (of mostly defense-related systems).
- Before FY 1993, NSF published data on a seventh obligations category (see "Categories of Support") covering non-S&E activity. At that time, however, ED made major software modifications to the automated system from which its federal S&E data were produced. The revamped coding structure introduced major trend differences for the department's institution data. Consequently, because ED accounted for 91% (\$5.9 billion) of the total federal support for non-S&E activity (\$6.5 billion) for FY 1993, NSF no longer publishes non-S&E totals. To explain ED's downward academic R&D trend between FY 1993 and FY 1994 (from \$95 million to \$49 million), the agency stated that academic R&D programs in FY 1994 either were not funded, did not have an S&E component, or received reductions in funding.
- As of FY 1990, DOD reports research separately from development. DOD states that more than 90% of its development obligations reported for universities and colleges are performed at university-administered laboratories that are separate from academic departments. Furthermore, DOD states that much of its development obligations are for major systems development, that such obligations differ from its obligations for advanced technology development, and that DOD total development obligations are therefore not comparable with development obligations at other federal agencies.

- During the FY 1987 survey cycle, DOD determined that some funds reported in prior years as R&D obligations to The Johns Hopkins University Applied Physics Lab (APL) were more appropriately classified as other S&E. Data for FYs 1984–86 were revised, but DOD was unable to revise data for earlier years. In FY 2009, APL accounted for more than 90% of DOD’s total S&E funding of \$522 million to Johns Hopkins University.
- Beginning in FY 1978, two laboratories that were formerly considered academically administered FFRDCs became part of their respective institutions APL (Johns Hopkins University) and the Applied Research Laboratory (Pennsylvania State University). Data for these laboratories are included in academic figures beginning in FY 1978.
- Draper Laboratories separated from the Massachusetts Institute of Technology as of FY 1974 to become an independent nonprofit institution; data for this laboratory are included in the Massachusetts Institute of Technology’s figures prior to FY 1974.

Definitions

The terms used throughout the survey have remained relatively unchanged from the FY 1971 survey cycle to the present. However, for the FY 2016 cycle, the definitions of basic research, applied research, development, and R&D plant were aligned more closely to the definitions used by the Office of Management and Budget (<https://www.whitehouse.gov/omb>) in the July 2016 version of Circular A-11. These definitions are also comparable to those used in the Survey of Federal Funds for Research and Development (Federal Funds Survey, <https://www.nsf.gov/statistics/srvyfedfunds/>).

Facilities and equipment for instruction in S&E include all programs whose principal purpose is to provide support for construction, acquisition, renovation, modification, repair, or rental of facilities, land, works, or equipment for use in instruction in S&E.

If the instructional facilities are part of a larger facility devoted to other purposes as well, the funds should be distributed among the categories of support involved as appropriate. In general, the other category most likely to be involved is R&D plant.

FTTGs include all fellowship, traineeship, and training grant programs that are directed primarily toward the development and maintenance of the scientific and technical manpower. The total amounts pertaining to such awards (stipends and cost-of-education allowances) are reported in terms of the institution at which the recipient performs research or studies.

Excluded are projects that support research and educational institutes, seminars, and conferences, such as teacher-training activities provided through teacher institutes, short courses, research participation, and in-service seminars; activities aimed at the development of educational techniques and materials for use in S&E training; and programs that provide special opportunities for increasing the scientific knowledge and experience of precollege and undergraduate students. These activities are either reported under other S&E, or they are not reported if they are not S&E-related.

General support for S&E includes activities that provide support for nonspecific or generalized purposes related to scientific research and education. Such projects are generally oriented toward academic departments, institutes, or institutions as a whole. “General support” implies a spectrum of varying types of support. At one extreme is support provided without any specification of purpose other than that funds be used for scientific activities. Another kind of general support is to be found in projects that provide funds for activity within a specified field of S&E but without specifying an explicit purpose. The distinguishing feature of general support for S&E projects is that they permit a significant

measure of freedom as to purpose (e.g., research, faculty support, education, or institutional support). It is intended that among the projects to be reported under this category are projects awarded through the following agency programs:

- NIH Minority Biomedical Research Support for Undergraduate Colleges
- NIH Minority Biomedical Support Grants

Other programs consistent with the above guidelines may also be reported under this category.

R&D activities are defined as creative and systematic work undertaken to increase the stock of knowledge—including knowledge of people, culture, and society—and to devise new applications using available knowledge.

For reporting R&D activities, the following are included:

- Administrative expenses for R&D, such as the operating costs of research facilities and equipment and other overhead costs.

Excluded from R&D activities are

- Investments in physical assets such as major equipment and facilities that support R&D programs. These investments should generally be reported under physical assets, discussed under R&D plant.
- Routine product testing, quality control, collection of general-purpose statistics, routine monitoring, and evaluation of an operational program (when that program is not R&D). Spending of this type should generally be reported as non-investment activities.
- Training of scientific and technical personnel should be reported as conduct of education and training.
- *Research* is systematic study directed toward fuller scientific knowledge or understanding of the subject studied. Research is classified as either basic or applied according to the objectives of the sponsoring agency. Basic research is defined as experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts. Basic research may include activities with broad or general applications in mind, such as the study of how plant genomes change, but should exclude research directed toward a specific application or requirement, such as the optimization of the genome of a specific crop species. Basic research represents DOD Budget Activity 1. Applied research is defined as original investigation undertaken to acquire new knowledge. Applied research is, however, directed primarily toward a specific practical aim or objective. Applied research represents DOD Budget Activity 2.
- *Research equipment* is any item (or interrelated collection of items comprising a system) of nonexpendable tangible property or software having a useful life of more than 2 years and an acquisition cost of \$500 or more that is used wholly or in part for research. Research equipment is included under R&D.

Development is creative and systematic work, drawing on knowledge gained from research and practical experience, which is directed at producing new products or processes or improving existing products or processes. Like research, experimental development will result in gaining additional knowledge.

For reporting experimental development activities, the following are included:

- The production of materials, devices, and systems or methods, including the design, construction, and testing of experimental prototypes.
- Technology demonstrations, in cases where a system or component is being demonstrated at scale for the first time, and it is realistic to expect additional refinements to the design (feedback R&D) following the demonstration. However, not all activities that are identified as “technology demonstrations” are R&D.

Excluded from the experimental development category are

- User demonstrations where the cost and benefits of a system are being validated for a specific use case. This includes low-rate initial production activities.
- Pre-production development, which is defined as nonexperimental work on a product or system before it goes into full production, including activities such as tooling and development of production facilities. For example, exclude activities and programs that are categorized as “Operational Systems Development” in DOD’s budget activity structure. Activities and programs of this type should generally be reported as investments in other major equipment.
- Note: For DOD agencies, development is divided into two categories: advanced technology development (Budget Activity 3) and major systems development (Budget Activities 4–6).

R&D plant is defined as materials for use in R&D activities including the following:

- R&D facilities;
- Intellectual property (e.g., software or applications);
- Major fixed equipment, such as reactors, wind tunnels, and particle accelerators; and
- Major moveable equipment, such as mass spectrometers, research vessels, DNA sequencers, and other major moveable instruments.

Amounts include acquisition of, construction of, major repairs to, or alterations in structures, works, equipment, facilities, or land for use in R&D activities at federal or nonfederal installations and housing for R&D personnel at remote locations.

Excluded from the R&D plant category are the following:

- Costs of expendable or movable equipment (e.g., simple spectrometers or standard microscopes), personal computers, and office furniture and equipment; and
- Costs of predesign studies (e.g., those undertaken before commitment to a specific facility).

These excluded costs are reported under “total conduct of research and development.”

Obligations for **foreign R&D plant** are limited to federal funds for facilities that are located abroad and used in support of foreign R&D.

If the R&D facilities are to be a larger facility devoted to other purposes as well, the funds should be distributed among the categories of support involved as appropriate. In general, another category that would be involved is facilities and equipment for instruction in S&E.

Other S&E include all academic S&E activities that cannot be meaningfully assigned to one of the five categories previously set forth. Among the types of activities to be included in this category are support for scientific conferences and symposia, teacher institutes, and activities aimed at increasing the scientific knowledge of precollege and undergraduate students.

Note(s)

¹ Data from this survey are published annually in the series Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions (<https://www.nsf.gov/statistics/fedsupport>). Data from this survey are also available in the Academic Institutional Profiles (<https://ncesdata.nsf.gov/profiles/>).

In summer 2018, access to the data for major data elements will be available for FY 1963 onward in the new easy-to-use interactive data tool on the NCSES website (<https://ncesdata.nsf.gov/ids/>). Users can create custom tables about federal S&E funding to academic and nonprofit institutions by federal agency and type of support.

Access to the data through FY 2015 is currently available in WebCASPAR, one of the NCSES data systems, at <https://ncesdata.nsf.gov/webcaspar/>. The WebCASPAR system will continue to operate without updates through the end of 2018, at which point the system will become inaccessible to users.