

Science and Engineering Research Facilities: Fiscal Year 2017

Michael T. Gibbons
Project Officer
Research and Development Statistics Program
(703) 292-4590

Technical Notes

Survey Overview

Purpose. Data are collected biennially through the congressionally mandated Survey of Science and Engineering Research Facilities (Facilities Survey) from the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF). The survey originated in 1986 in response to the U.S. Congress's concern about the state of research facilities at the nation's colleges and universities. NSF's 1984 reauthorization legislation, P.L. 99-159, mandated a data collection and analytic system to identify and assess the research facilities needs of academic institutions.

Data collection authority. The information is solicited under the authority of the National Science Foundation Act of 1950, as amended, and the America COMPETES Reauthorization Act of 2010. The Office of Management and Budget control number is 3145-0101, expiring on 31 August 2018.

Survey contractor. Westat.

Survey sponsor. The Facilities Survey is sponsored by NCSES within NSF.

Key Survey Information

Frequency. Biennial.

Initial survey year. 1986.

Reference period. FY 2017.

Response unit. Establishments.

Sample or census. Census.

Population size. A total of 575 in FY 2017.

Sample size. Not applicable.

Survey Design

Target population. The FY 2017 population consisted of 575 research-performing academic institutions in the United States. *Research-performing academic institutions* were defined as colleges and universities with \$1 million or more in research and experimental development expenditures in science and engineering (S&E), as determined by the FY 2016 Higher Education Research and Development (HERD) Survey from NCSES. Military institutions, U.S. Department of Veterans Affairs (VA) institutions, and federally funded research and development centers (FFRDCs) were excluded.

Sample frame. This survey is a census. The population is identified through the HERD Survey of the previous fiscal year.

Sample design. All eligible units are surveyed.

Data Collection and Processing Methods

Data collection. The FY 2017 survey was conducted by Westat under contract to NCSES. Surveys are distributed to coordinators at each institution. These institutional coordinators are individuals who are knowledgeable about the requested information and who collect the responses from various offices and submit the information to an NCSES contractor. The data collection period was October 2017 through April 2018.

Mode. Respondents could choose to respond to the survey through printing an Adobe PDF questionnaire from the Web and submitting a paper survey or by using the Web-based data collection system. Less than 1% of surveys were submitted on paper.

Response rates. See section “Survey Quality Measures” for unit and item response rates.

Data editing. Several procedures were used to clean and edit the data. For example, the Web survey contained numerous programmed edit checks that alerted respondents to inconsistent or missing data via edit messages. These included alerting respondents if their individual data did not sum to the total. Also, once respondents submitted their final data, a second set of edit checks was conducted. Finally, comparisons were made between an institution’s FY 2017 data and data from the previous survey. Respondents were contacted regarding any apparently inconsistent, missing, or unclear data.

Imputation. Imputation was used to account for unit and item nonresponse. Data reported in *Science and Engineering Research Facilities: Fiscal Year 2017* are imputed, except for the data on shared space and the condition of research space.

For most research space questions, a series of logistic regression models and linear regression models were developed and used to impute values for missing item data for institutions that responded to the survey, as well as for all items for the nonresponding institutions. The predicted values from these models were used to impute for the missing responses.

A set of core predictors was used for imputing most items. The core predictors were institutional control (public or private), highest degree granted (doctorate or nondoctorate), existence of a medical school, FY 2016 total R&D expenditures (overall), and total FY 2017 net assignable square feet (NASF) of S&E research space. In addition to the core predictors, regression models for specific survey items included data from responses to other survey items and to their FY 2015 data, where available.

The imputation rates ranged from 0.0% to 3.9%. The imputation rate for each survey item was calculated as the number of imputed cases divided by the number of institutions or projects that are eligible for the item. Imputation was conducted for unit nonresponse, which can impact imputation rates for items with low eligibility. Twenty-five percent of survey items that required imputation had an imputation rate at or below 2%.

Weighting. No weighting procedures were employed for FY 2017. Weights were used to account for unit nonresponse through FY 2011. Since FY 2013, imputation has been conducted for unit nonresponse, which simplifies the presentation of national totals in the various data files.

Variance estimation. Not applicable.

Survey Quality Measures

Sampling error. Not applicable.

Coverage error. No known coverage error because a complete list of eligible institutions meeting the population requirements was identified from the HERD Survey. Institutions were investigated individually to ensure there was no duplication.

Nonresponse error.

- *Unit nonresponse*—For the FY 2017 cycle, 98% (563 out of 575) of the academic institutions responded to the survey.
- *Item nonresponse*—The FY 2017 survey had limited item nonresponse. Nonresponse ranged from 0% to 2% for 99% of the items. The remaining three items had nonresponse rates ranging from 3% to 4%. Nonresponding institutions (unit nonrespondents) were not included in the calculations for item nonresponse.

Imputation was used to mitigate the error from item and unit nonresponses.

Measurement error. The most likely source of measurement error results from institutions estimating the requested data. Respondents may estimate their data for several reasons, including estimating data that are not included in the institution's database or because some figures are estimates by their nature (e.g., out-year budget figures).

Measurement error may also occur because institutions may define their database elements differently from the definitions used on the survey. For example, an institutional database may identify research space based on a primary-use criterion, whereas the survey requests that space be prorated according to all uses. The survey question on the condition of research space is a subjective question that may be rated differently across respondents.

Data Comparability

Changes in survey coverage and population. No changes.

Changes in questionnaire.

- The definition of research was updated to align with the one used in the HERD Survey. This updated definition mirrors the one provided in the Frascati Manual 2015, an international document published by the Organisation for Economic Co-operation and Development that provides guidelines for collecting and reporting data on R&D. This update was not intended to alter the definition of space to be reported.
- Fields of science and engineering (S&E): The disciplines of “Fishing and fisheries sciences and management” and “Forestry” were moved from the S&E field of Agricultural sciences to Natural resources and conservation to better coordinate field totals in national academic surveys.
- Shared research space: A new question on this topic was added to clarify whether the research space reported in question 2 is shared among fields or also used for other purposes (Question 6).

- New construction project start date: A more specific definition for start date was provided. This was expected to make reporting of projects by fiscal year more consistent, which may help eliminate duplicate reports across cycles (Questions 10, 10B, and 14).
- New construction completion costs: A sentence was added to the definition to clarify that reported completion costs should include all costs whether they occur before or after the project start date (Questions 10, 10D, and 14).
- A reminder note was added to the bottom of the “Individual Project Form for Question 10” indicating that a survey help desk is available.

Changes in reporting procedures or classification. No changes.

Definitions

Completion costs include planning, site preparation, construction, fixed equipment, nonfixed equipment that costs \$1 million or more, and building infrastructure, such as plumbing, lighting, air exchange, and safety systems either in the building or within 5 feet of the building foundation.

Current research program commitments include current faculty and staff (or those to whom offers have been made or grants awarded, regardless of whether research has begun) and programs that have been approved.

Deferred projects are those that (1) are not funded and (2) are not scheduled for FY 2018 or FY 2019. They do not include projects planned for developing new programs or expanding current programs. Deferred projects are limited to only those projects whose prorated cost was estimated to be \$250,000 or more for at least one field of S&E.

Gross square feet (GSF) is the floor area of a structure within the outside faces of the exterior walls.

Institutional control is defined for academic institutions as private or public.

Institutional funds and other sources include the following examples: operating funds, endowments, tax-exempt bonds and other debt financing, indirect costs recovered from federal grants or contracts, and private donations.

Medical school is a school that awards a doctor of medicine degree or a doctor of osteopathic medicine degree.

Net assignable square feet (NASF) is the sum of all areas on all floors of a building assigned to, or available to be assigned to, an occupant for a specific use, such as research or instruction. NASF is measured from the inside faces of walls.

New construction is the construction of a new building or additions to an existing building. New construction is limited to only those projects whose prorated cost was estimated to be \$250,000 or more for at least one field of S&E.

Repairs and renovations are activities such as fixing up facilities in deteriorated condition, capital improvements on facilities, conversion of facilities, and building out shell (unfinished) space. They include any repairs or renovations to existing space that are performed in combination with new construction projects. They do not include building additions, which are reported in this survey under

new construction. Repairs and renovations are limited to only those projects whose prorated cost was estimated to be \$250,000 or more for at least one field of S&E.

Research is all research and experimental development (R&D) activities of an institution that are separately accounted for. These R&D activities comprise creative and systematic work undertaken to increase the stock of knowledge—including knowledge of humankind, culture and society—and to devise new applications of available knowledge. This research can be funded by an institution, the federal government, a state government, foundations, corporations, or other sources.

Research space is the NASF of space in buildings within which research activities take place. Research facilities are located within buildings. A building is a roofed structure for permanent or temporary shelter of persons, animals, plants, materials, or equipment. Structures should be included if they are (1) attached to a foundation, (2) roofed, (3) serviced by a utility, exclusive of lighting, and (4) a source of significant maintenance and repair activities. Research space includes controlled-environment space, such as clean, cold, or white rooms; technical and laboratory support space, such as equipment areas, preparation areas, darkrooms, carpentry and machine shops, and storage areas; laboratories, including computer labs and behavior observation rooms; core laboratories that serve other laboratories; laboratories and associated support areas used for research animals, including procedure rooms, bench space, animal production colonies, holding rooms, germ-free rooms, surgical facilities, and recovery rooms; housing facilities for research animals and associated maintenance areas, including cage rooms, stalls, wards, isolation rooms, exercise rooms, feed storage rooms, cage-washing rooms, and holding and storage areas; space for clinical trial research; offices, to the extent that they are used for research activities, including administrative activities for a specific research project; space with fixed (built-in) equipment, such as fume hoods; space with nonfixed equipment costing \$1 million or more each, such as MRI equipment; and space that is leased by the responding institution.

Research space does not include space for the fields of law, business administration and management, humanities, history, the arts, or education; libraries, unless they are dedicated to a specific research project; animal field buildings sheltering animals that do not directly support research or that are not subject to government regulations concerning humane care and use of laboratory animals; FFRDCs; in-kind space used by faculty, staff, or other persons from the institution but administered by other organizations, such as research facilities at non-university hospitals or VA hospitals; space administered by the institution but leased to another organization; and outdoor areas, such as fish ponds or planting fields.

Question 2 contains the following additional information about research space: research space is equivalent to functional category 2 (Research) for facilities inventory systems based on the U.S. Department of Education Facilities Inventory and Classification Manual (FICM classification), the Western Interstate Commission for Higher Education (WICHE classification), and the National Association of College and University Business Officers (NACUBO classification).