



Higher Education R&D Funding from All Sources Increased for the Third Straight Year in FY 2018

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Funding of higher education research and development increased across all funding sources in FY 2018, marking the third straight year of steady growth. Total R&D expenditures increased \$4.1 billion (5.5%) from FY 2017, reaching \$79.4 billion (table 1). Federal funding of R&D has increased in both current and constant dollars for three straight years, according to data from the Higher Education Research and Development (HERD) Survey. When adjusted for inflation, the three-year (FYs 2015–18) growth is 9.6% for total R&D and 5.3% for federally funded R&D (figure 1).

The HERD Survey is sponsored by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF). For more information on the survey, see “Data Sources, Limitations, and Availability.”

R&D Expenditures, by Source of Funding

Higher education R&D funded from federal government sources and from state and local government sources each increased about 4% in current dollars between FY 2017 and FY 2018

and by 11% and 12%, respectively, since FY 2015. Business funding grew 18% in the past three years. R&D funding from nonprofit organizations (29%), institutions’ own sources (23%), and all other sources (22%) had the largest percentage increases since FY 2015.²

The federal government funded 53% of higher education R&D in FY 2018, a percentage that has declined gradually since reaching 62% in FY 2011.³ In current dollars, federal funding increased by \$1.2 billion from FY 2011 to FY 2018, whereas institutions’ own funding rose by \$7.9 billion. Three other funding sectors—nonprofit organizations (\$1.6 billion), businesses (\$1.5 billion), and all other sources (\$1.4 billion)—grew more than federal sources over the same period (table 1).

Federal funding of higher education R&D expenditures in FY 2018 was \$42.0 billion, an increase of \$1.7 billion from FY 2017. The largest federal source was the Department of Health and Human Services (HHS)—which includes the National Institutes of Health—at \$22.9 billion, up \$1.3 billion from FY 2017 (table 2). HHS accounted for 55% of FY 2018 federal funding and

TABLE 1. Higher education R&D expenditures, by source of funds: FYs 2011–18 (Millions of current dollars)

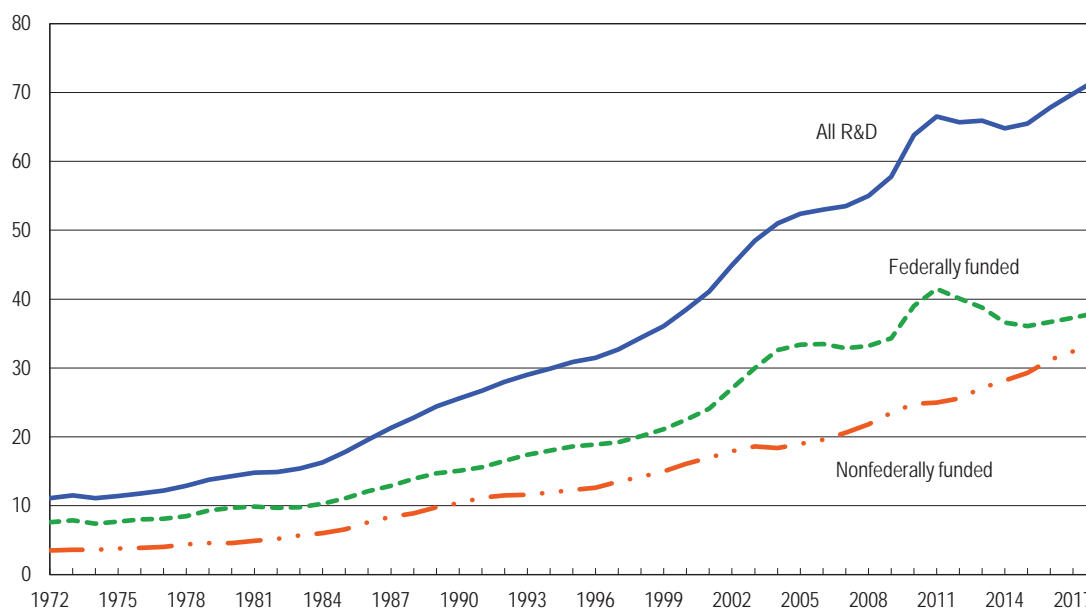
| Fiscal year | Source of funds | | | | | | |
|-------------|----------------------|--------------------|----------------------------|-------------------|----------|-------------------------|-------------------|
| | All R&D expenditures | Federal government | State and local government | Institution funds | Business | Nonprofit organizations | All other sources |
| 2011 | 65,274 | 40,769 | 3,851 | 12,580 | 3,183 | 3,854 | 1,038 |
| 2012 | 65,873 | 40,217 | 3,744 | 13,625 | 3,279 | 4,037 | 970 |
| 2013 | 67,145 | 39,510 | 3,706 | 14,974 | 3,515 | 3,903 | 1,537 |
| 2014 | 67,351 | 38,033 | 3,916 | 15,781 | 3,733 | 3,977 | 1,911 |
| 2015 | 68,695 | 37,913 | 3,864 | 16,638 | 4,008 | 4,235 | 2,037 |
| 2016 | 71,894 | 38,847 | 4,034 | 17,961 | 4,216 | 4,629 | 2,207 |
| 2017 | 75,328 | 40,308 | 4,172 | 19,008 | 4,429 | 5,134 | 2,278 |
| 2018 | 79,436 | 42,018 | 4,321 | 20,438 | 4,724 | 5,452 | 2,483 |

NOTES: Because of rounding, detail may not add to total. Includes all institutions surveyed in the fiscal years shown.

SOURCE: National Center for Science and Engineering Statistics, National Science Foundation, Higher Education Research and Development Survey.

FIGURE 1. Higher education R&D expenditures, by source of funds: FYs 1972–2018

Billions of constant 2012 dollars



NOTES: Because of rounding, detail may not add to total. Includes all institutions surveyed in the fiscal years shown. Prior to FY 2003, totals did not include R&D expenditures in non-science and engineering fields.

SOURCE: National Center for Science and Engineering Statistics, National Science Foundation, Higher Education Research and Development Survey.

TABLE 2. Higher education R&D expenditures, by federal agency: FYs 2011–18
(Millions of current dollars)

| Source of funds | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | % change 2017–18 |
|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|---------------------|
| All R&D expenditures | 65,274 | 65,729 | 67,013 | 67,199 | 68,551 | 71,751 | 75,184 | 79,286 | 5.5 |
| From federal sources | 40,769 | 40,142 | 39,446 | 37,962 | 37,849 | 38,778 | 40,237 | 41,945 | 4.2 |
| DOD | 4,814 | 4,908 | 5,023 | 4,926 | 5,089 | 5,313 | 5,636 | 5,901 | 4.7 |
| DOE | 1,866 | 1,955 | 1,876 | 1,806 | 1,710 | 1,771 | 1,815 | 1,820 | 0.3 |
| HHS | 22,995 | 21,916 | 21,211 | 20,301 | 19,999 | 20,660 | 21,625 | 22,922 | 6.0 |
| NASA | 1,423 | 1,331 | 1,332 | 1,329 | 1,418 | 1,492 | 1,405 | 1,517 | 8.0 |
| NSF | 5,140 | 5,276 | 5,393 | 5,125 | 5,118 | 5,114 | 5,207 | 5,274 | 1.3 |
| USDA | 1,006 | 1,094 | 1,092 | 1,062 | 1,119 | 1,209 | 1,224 | 1,186 | -3.1 |
| All other | 3,524 | 3,663 | 3,519 | 3,413 | 3,396 | 3,221 | 3,324 | 3,326 | 0.1 |

DOD = Department of Defense; DOE = Department of Energy; HHS = Department of Health and Human Services; NASA = National Aeronautics and Space Administration; NSF = National Science Foundation; USDA = Department of Agriculture.

NOTES: This table includes only institutions reporting \$1 million or more in total R&D expenditures in FY 2017. Institutions reporting less than \$1 million in total R&D expenditures in FY 2017 completed a shorter version of the survey form in FY 2018 that did not include this question.

SOURCE: National Center for Science and Engineering Statistics, National Science Foundation, Higher Education Research and Development Survey.

76% of the increase in overall federal funding from FY 2017 to FY 2018. The Department of Defense (\$265 million increase), the National Aeronautics and Space Administration (\$112 million increase), and the National Science Foundation (\$67 million increase) together accounted for most of the remaining federally funded expenditure increases. R&D expenditures funded by the Department of Energy increased by \$5 million from FY 2017, while those funded by the Department of Agriculture declined 3.1% or \$38 million.

R&D expenditures funded by universities' own sources reached \$20.4 billion in FY 2018. This amount accounted for 26% of total higher education R&D and

55% of total nonfederal funding. Both percentages are virtually unchanged since FY 2016 and remain the largest since the advent of the survey. Almost two-thirds of institutional spending (\$13.3 billion) came from direct funding of R&D activities through the universities' own research accounts (figure 2). Unrecovered indirect costs (the amount of indirect costs that are not reimbursed to the institution for externally funded R&D) were \$5.5 billion in FY 2018, and cost-sharing commitments were \$1.6 billion. All these totals increased from FY 2017, resulting in a 7.5% growth in overall institutional support. Part of this increase and similar increases in recent years is attributable to universities' efforts to identify R&D expenditures

that were not previously captured in their accounting systems.

Foreign sources of R&D funding are also collected in the HERD survey. Around \$1.3 billion in foreign funds supported R&D at higher education institutions in FY 2018. These stemmed from the following foreign sources:

- Businesses: \$546.3 million
- Nonprofit organizations: \$273.2 million
- Foreign governments: \$253.1 million
- Higher education institutions: \$117.9 million
- All other sources: \$67.9 million

FIGURE 2. Institutionally funded R&D expenditures, by source: FYs 2011–18
Billions of current dollars



NOTE: Includes all institutions surveyed in the fiscal years shown.

SOURCE: National Center for Science and Engineering Statistics, National Science Foundation, Higher Education Research and Development Survey.

R&D Expenditures, by Field

R&D expenditures in science increased \$3.3 billion (5.6%) from FY 2017, reaching \$62.3 billion. Engineering R&D expenditures (\$12.4 billion) increased 3.8% and non-science and engineering (\$4.6 billion) increased 7.5% (table 3). Two-thirds of the overall growth in R&D expenditures for FY 2018 stemmed from increases in the life sciences subfields of biological and biomedical sciences (up \$819 million to \$14.6 billion) and health sciences (up \$1.9 billion to \$25.9 billion). A large portion of this R&D is conducted by medical schools (\$27.9 billion) and through clinical trials (\$3.0 billion).⁴ The HHS funding increases noted previously were a large contributor to the life sciences R&D growth.

Several of the subfields with the largest percentage increases are those added to the survey in FY 2016, such as industrial and manufacturing engineering (46%), materials science (12%), and anthropology (9%).⁵ The subfields of sciences, not elsewhere classified (nec) and engineering, nec declined further as universities try to more accurately report their expenditures by R&D field.

R&D Expenditures, by Type of Cost

Of the \$79.3 billion in total FY 2018 R&D expenditures, higher education institutions identified \$61.0 billion in direct costs and \$18.3 billion in indirect costs (table 4). Salaries, wages and fringe benefits paid to R&D personnel (\$34.8 billion) accounted for the largest portion. Other direct costs, including (but not limited to) travel, tuition,

waivers, computer usage fees, supplies, and services, such as consulting, amounted to over \$17.6 billion. Institutions also passed R&D funding totaling \$6.3 billion in FY 2018 expenditures to other universities (\$3.5 billion) or other organizations excluding contractors or other vendors (\$2.8 billion) as part of their direct costs.⁶ Nearly \$12.8 billion of facilities and administrative costs were reimbursed from external R&D sponsors. Another \$5.5 billion was identified as unrecovered indirect costs.⁷

Top University Research Performers Remain the Same

The top 30 institutions in terms of R&D expenditures accounted for 42% of the total spent on R&D within the higher education sector in FY 2018, the same share as in FYs 2016 and 2017 (table 5). The same 30 institutions from FYs 2016 and 2017 were again the top university R&D performers in FY 2018. Few institutions moved more than a couple of spots in the rankings from FY 2017. New York University dropped from number 18 in FY 2017 to number 24 in FY 2018, which is very similar to its number 23 ranking in FY 2016. The University of California, Los Angeles rose 6 positions to number 6 after identifying several R&D expenditure categories that were previously miscategorized, as well as receiving increased funding from various federal and non-federal sources.

Data Sources, Limitations, and Availability

The fiscal year referred to throughout this report is the academic fiscal year.

For most institutions, FY 2018 represents 1 July 2017 through 30 June 2018. The higher education R&D expenditures data were collected from a census of 915 universities and colleges that grant a bachelor's degree or higher and expended at least \$150,000 in R&D in FY 2018. To reduce respondent burden, the HERD Survey was revised in FY 2012 to request abbreviated data from institutions reporting less than \$1 million in R&D expenditures during the previous fiscal year. The totals shown in this InfoBrief, except for those from table 1 and the two figures, exclude expenditures from 269 institutions that completed a short-form version of the survey. The institutions completing the short-form survey accounted for \$151 million (0.2%) of total higher education R&D expenditures in FY 2018.

The amounts reported include all funds expended for activities specifically organized to produce research outcomes and sponsored by an outside organization or separately accounted for using institution funds. R&D expenditures at university-administered federally funded research and development centers (FFRDCs) are collected in a separate survey, the FFRDC Research and Development Survey, available at <https://www.nsf.gov/statistics/ffrdc/>.

The full set of data tables and technical information from this survey are available at <https://ncesdata.nsf.gov/herd/2018/>.

TABLE 3. Higher education R&D expenditures, by R&D field: FYs 2017–18
(Thousands of current dollars)

| Field | 2017 | 2018 | % change 2017–18 |
|--|------------|------------|---------------------|
| All R&D fields | 75,184,396 | 79,285,866 | 5.5 |
| Science | 58,967,933 | 62,293,566 | 5.6 |
| Computer and information sciences | 2,193,432 | 2,401,405 | 9.5 |
| Geosciences, atmospheric sciences, and ocean sciences | 3,150,721 | 3,161,640 | 0.3 |
| Atmospheric science and meteorology | 623,509 | 608,079 | -2.5 |
| Geological and earth sciences | 1,086,492 | 1,134,428 | 4.4 |
| Ocean sciences and marine sciences | 1,098,636 | 1,058,656 | -3.6 |
| Geosciences, atmospheric sciences, and ocean sciences, nec | 342,084 | 360,477 | 5.4 |
| Life sciences | 43,129,461 | 45,843,545 | 6.3 |
| Agricultural sciences | 3,281,166 | 3,320,947 | 1.2 |
| Biological and biomedical sciences | 13,735,572 | 14,554,100 | 6.0 |
| Health sciences | 23,997,218 | 25,938,262 | 8.1 |
| Natural resources and conservation | 689,391 | 769,376 | 11.6 |
| Life sciences, nec | 1,426,114 | 1,260,860 | -11.6 |
| Mathematics and statistics | 701,007 | 753,197 | 7.4 |
| Physical sciences | 5,049,186 | 5,237,556 | 3.7 |
| Astronomy and astrophysics | 648,264 | 667,103 | 2.9 |
| Chemistry | 1,793,423 | 1,876,128 | 4.6 |
| Materials science | 228,176 | 255,930 | 12.2 |
| Physics | 2,152,701 | 2,203,732 | 2.4 |
| Physical sciences, nec | 226,622 | 234,663 | 3.5 |
| Psychology | 1,240,530 | 1,262,689 | 1.8 |
| Social sciences | 2,557,259 | 2,746,565 | 7.4 |
| Anthropology | 111,041 | 121,012 | 9.0 |
| Economics | 434,924 | 464,977 | 6.9 |
| Political science and government | 414,049 | 443,172 | 7.0 |
| Sociology, demography, and population studies | 551,056 | 607,283 | 10.2 |
| Social sciences, nec | 1,046,189 | 1,110,121 | 6.1 |
| Sciences, nec | 946,337 | 886,969 | -6.3 |
| Engineering | 11,918,807 | 12,373,843 | 3.8 |
| Aerospace, aeronautical, and astronautical engineering | 991,026 | 1,011,811 | 2.1 |
| Bioengineering and biomedical engineering | 1,220,105 | 1,339,652 | 9.8 |
| Chemical engineering | 935,352 | 933,523 | -0.2 |
| Civil engineering | 1,302,996 | 1,360,174 | 4.4 |
| Electrical, electronic, and communications engineering | 2,727,207 | 2,846,600 | 4.4 |
| Industrial and manufacturing engineering | 353,132 | 515,034 | 45.8 |
| Mechanical engineering | 1,537,098 | 1,629,349 | 6.0 |
| Metallurgical and materials engineering | 736,773 | 763,667 | 3.7 |
| Engineering, nec | 2,115,118 | 1,974,033 | -6.7 |
| Non-S&E | 4,297,656 | 4,618,457 | 7.5 |
| Business management and business administration | 726,266 | 786,056 | 8.2 |
| Communication and communications technologies | 203,255 | 171,314 | -15.7 |
| Education | 1,377,102 | 1,487,388 | 8.0 |
| Humanities | 498,597 | 513,085 | 2.9 |
| Law | 223,841 | 268,330 | 19.9 |
| Social work | 235,514 | 251,367 | 6.7 |
| Visual and performing arts | 125,355 | 137,364 | 9.6 |
| Non-S&E, nec | 907,726 | 1,003,553 | 10.6 |

nec = not elsewhere classified; S&E = science and engineering.

NOTES: This table includes only institutions reporting \$1 million or more in total R&D expenditures in FY 2017. Institutions reporting less than \$1 million in total R&D expenditures in FY 2017 completed a shorter version of the survey form in FY 2018 that did not include this question.

SOURCE: National Center for Science and Engineering Statistics, National Science Foundation, Higher Education Research and Development Survey.

TABLE 4. Higher education R&D expenditures, by type of cost: FY 2018

(Millions of dollars)

| Type of cost | R&D expenditures |
|--------------------------------------|------------------|
| All costs | 79,286 |
| Direct costs | 60,986 |
| Salaries, wages, and fringe benefits | 34,767 |
| Software purchases | 122 |
| Capitalized equipment | 2,146 |
| Passed through to subrecipients | 6,344 |
| Other direct costs | 17,607 |
| Indirect costs | 18,300 |
| Recovered | 12,765 |
| Unrecovered | 5,535 |

NOTES: This table includes only institutions reporting \$1 million or more in total R&D expenditures in FY 2017. Institutions reporting less than \$1 million in total R&D expenditures in FY 2017 completed a shorter version of the survey form in FY 2018 that did not include this question.

SOURCE: National Center for Science and Engineering Statistics, National Science Foundation, Higher Education Research and Development Survey.

TABLE 5. Thirty institutions reporting the largest FY 2018 R&D expenditures in all fields: FYs 2016–18

(Millions of current dollars)

| Rank | Institution | 2016 | 2017 | 2018 | % change 2017–18 |
|------|---|--------|--------|--------|------------------|
| | All institutions | 71,751 | 75,184 | 79,286 | 5.5 |
| | Leading 30 institutions | 30,157 | 31,548 | 33,451 | 6.0 |
| 1 | Johns Hopkins U. ^a | 2,431 | 2,562 | 2,661 | 3.9 |
| 2 | U. Michigan, Ann Arbor | 1,436 | 1,530 | 1,601 | 4.6 |
| 3 | U. California, San Francisco | 1,294 | 1,409 | 1,596 | 13.2 |
| 4 | U. Pennsylvania | 1,296 | 1,374 | 1,442 | 4.9 |
| 5 | U. Washington, Seattle | 1,278 | 1,348 | 1,414 | 4.9 |
| 6 | U. California, Los Angeles | 1,038 | 1,077 | 1,318 | 22.4 |
| 7 | U. California, San Diego | 1,087 | 1,133 | 1,265 | 11.6 |
| 8 | U. Wisconsin-Madison | 1,158 | 1,193 | 1,206 | 1.0 |
| 9 | Harvard U. | 1,077 | 1,123 | 1,173 | 4.5 |
| 10 | Duke U. | 1,056 | 1,127 | 1,168 | 3.6 |
| 11 | Stanford U. | 1,066 | 1,110 | 1,158 | 4.3 |
| 12 | U. North Carolina, Chapel Hill | 1,045 | 1,102 | 1,136 | 3.1 |
| 13 | Cornell U. | 974 | 984 | 1,072 | 8.9 |
| 14 | U. Pittsburgh, Pittsburgh | 890 | 940 | 1,007 | 7.1 |
| 15 | Yale U. | 882 | 951 | 990 | 4.1 |
| 16 | Massachusetts Institute of Technology | 946 | 952 | 964 | 1.3 |
| 17 | U. Minnesota, Twin Cities | 910 | 922 | 955 | 3.6 |
| 18 | Columbia U. in the City of New York | 837 | 893 | 948 | 6.1 |
| 19 | U. Texas M. D. Anderson Cancer Center | 852 | 888 | 930 | 4.7 |
| 20 | Texas A&M U., College Station and Health Science Center | 893 | 905 | 922 | 1.8 |
| 21 | Pennsylvania State U., University Park and Hershey Medical Center | 826 | 855 | 909 | 6.3 |
| 22 | Georgia Institute of Technology | 791 | 804 | 892 | 10.9 |
| 23 | U. Southern California | 703 | 764 | 892 | 16.7 |
| 24 | New York U. | 810 | 918 | 888 | -3.3 |
| 25 | Ohio State U. | 818 | 864 | 875 | 1.2 |
| 26 | U. Florida | 791 | 801 | 865 | 7.9 |
| 27 | Washington U., Saint Louis | 741 | 754 | 816 | 8.2 |
| 28 | Northwestern U. | 713 | 752 | 806 | 7.2 |
| 29 | U. California, Berkeley | 774 | 771 | 797 | 3.3 |
| 30 | U. California, Davis | 742 | 738 | 789 | 6.8 |

^a Johns Hopkins University includes Applied Physics Laboratory, with \$1,521 million in total R&D expenditures in FY 2018.

NOTES: Because of rounding, detail may not add to total. Institutions ranked are geographically separate campuses headed by a campus-level president or chancellor.

SOURCE: National Center for Science and Engineering Statistics, National Science Foundation, Higher Education Research and Development Survey.

Notes

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2. All other sources includes those not reported in the five provided fields (U.S. federal government, state and local government, business, nonprofit organizations, and institutional funds). It includes such sources as funds from foreign governments, foreign or other U.S. universities, and gifts designated by donors for research.

3. FY 2011 was the peak year for higher education R&D expenditures funded by the American Recovery and Reinvestment Act of 2009. For more details on those expenditures, see the NCSES InfoBrief *Higher Education R&D Expenditures Resume Slow*

Growth in FY 2013 (<https://nsf.gov/statistics/2015/nsf15314/>), and table 12 in the HERD FY 2014 data tables (<https://ncesdata.nsf.gov/herd/2014/>).

4. In FY 2018, 156 institutions reported R&D conducted by their medical schools. 178 institutions reported R&D expenditures for Phase I, Phase II, or Phase III clinical trials with human patients. For more information, please see the HERD questionnaire and technical notes at <https://www.nsf.gov/statistics/srvyherd/>.

5. Substantive changes were made to the field list and classification structure for the FY 2016 survey to coordinate the categories with other NCSES surveys. Several fields were renamed, such as medical sciences to health sciences, and some disciplines were moved to different subfields to achieve comparability across surveys. In particular, many of the disciplines listed under life sciences, not elsewhere classified were moved

to health sciences. In addition, four new subfields were added: natural resources and conservation under life sciences, materials science under physical sciences, anthropology under social sciences, and industrial and manufacturing engineering under engineering. These changes primarily affect trends in the revised subfields and do not significantly affect the broad field trends. For complete details on the changes, see Technical Notes, Appendix A in the HERD FY 2016 data tables (<https://ncesdata.nsf.gov/herd/2016/>).

6. For more details on expenditures passed through to subrecipients, see tables 4, 73–76, and 84 at <https://ncesdata.nsf.gov/herd/2018/>.

7. For more information on the definitions and collection of these fields, please see the HERD questionnaire and technical notes at <https://www.nsf.gov/statistics/srvyherd/>.