



## With Help from ARRA, Universities Report \$61 Billion in FY 2010 Total R&D; New Details from Redesigned Survey

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University spending on research and development in all fields increased 6.9% between FY 2009 and FY 2010 to \$61.2 billion, according to FY 2010 data from the National Science Foundation (NSF) Higher Education Research and Development (HERD) Survey (table 1).<sup>2</sup> When adjusted for inflation, higher education R&D rose by 6.0% in FY 2010.

This increase was due in large part to the \$2.7 billion in reported expenditures funded by the one-time American Recovery and Reinvestment Act of 2009 (ARRA).<sup>3</sup> As a result of ARRA, the percentage of academic R&D funded by the federal government rose to 61% in FY 2010, constituting \$37.5 billion of the \$61.2 billion total.

The FY 2010 data come from the first fielding of a redesigned and expanded academic R&D survey. Previously known as the Survey of R&D Expenditures at Universities and Colleges, the FY 2010 Higher Education R&D Survey contained several significant changes.<sup>4</sup> The most notable change to the survey was the inclusion of R&D within non-science and engineering (S&E) fields, such as business, educa-

tion, and law, into the overall reported totals. These non-S&E R&D totals had been collected since 2003 but were reported separately until now. With the revised survey design in 2010, the non-S&E totals are now combined with the S&E totals, although field-specific details are still available.

Unless otherwise indicated, references to dollar amounts or percentages for the remainder of this InfoBrief are in current dollars.

### R&D Expenditures by Field

Among the 10 broad fields collected, life sciences account for the largest share by far (\$34.9 billion of the \$61.2 billion total). Engineering was the next largest broad field with \$9.3 billion in reported R&D expenditures. Among subfields, medical sciences continued to hold the largest share of the total (31% or \$19.2 billion in FY 2010). All of the broad fields saw an increase in the reported expenditures between 2009 and 2010 except for social sciences, which declined by more than 4%. Some of this decline may be due to institutional changes in R&D field classifications, because non-S&E fields are now fully incorporated into the

survey totals. Some R&D previously reported as social sciences might now be reported in the non-S&E fields. In fact, R&D within non-S&E fields had the largest percentage increase of all of the broad fields from FY 2009 to FY 2010 (\$2.4 billion to \$2.9 billion).<sup>5</sup>

### R&D Spending by Federal Agency Sources

The largest source of federal funding to universities continues to be the Department of Health and Human Services (HHS), including its National Institutes of Health. In FY 2010, HHS funding represented 56% (\$21.1 billion) of the \$37.5 billion federally funded total (table 2). HHS serves as the primary federal funding source for medical research, contributing 94% to the \$12.1 billion total federally funded medical science expenditures. NSF contributed the next largest amount of the government-wide funding total in FY 2010 (\$4.7 billion). Its support was spread across a wide mix of fields. The Department of Defense (DOD) provided \$4.5 billion, almost half in support of engineering R&D. Of the \$3.2 billion listed from other agencies, the largest named sources were the Department of Education with \$602

TABLE 1. Higher education R&D expenditures, by R&D field: FY 2009–10  
(Millions of current dollars)

| Field   | FY 2009 | FY 2010 | % change<br>2009–10 |
|---|---------|---------|---------------------|
| All R&D fields <sup>a</sup>                     | 57,289  | 61,235  | 6.9                 |
| Science   | 46,215  | 48,994  | 6.0                 |
| Computer sciences                               | 1,600   | 1,658   | 3.6                 |
| Environmental sciences                          | 2,923   | 2,990   | 2.3                 |
| Atmospheric sciences                            | 417     | 428     | 2.6                 |
| Earth sciences                                  | 1,020   | 1,085   | 6.4                 |
| Oceanography                                    | 1,078   | 1,022   | -5.2                |
| Environmental sciences, nec                     | 410     | 455     | 11.0                |
| Life sciences                                   | 32,779  | 34,903  | 6.5                 |
| Agricultural sciences                           | 3,056   | 2,984   | -2.4                |
| Biological sciences                             | 10,146  | 10,947  | 7.9                 |
| Medical sciences                                | 18,230  | 19,164  | 5.1                 |
| Life sciences, nec                              | 1,348   | 1,807   | 34.1                |
| Mathematical sciences                           | 547     | 599     | 9.5                 |
| Physical sciences                               | 4,283   | 4,625   | 8.0                 |
| Astronomy                                       | 578     | 573     | -0.9                |
| Chemistry                                       | 1,583   | 1,751   | 10.6                |
| Physics   | 1,870   | 2,003   | 7.1                 |
| Physical sciences, nec                          | 252     | 298     | 18.3                |
| Psychology                                      | 972     | 1,077   | 10.8                |
| Social sciences                                 | 2,081   | 1,993   | -4.2                |
| Economics                                       | 380     | 353     | -7.1                |
| Political sciences                              | 369     | 373     | 1.1                 |
| Sociology                                       | 408     | 416     | 2.0                 |
| Social sciences, nec                            | 924     | 852     | -7.8                |
| Sciences, nec                                   | 1,029   | 1,150   | 11.8                |
| Engineering                                     | 8,649   | 9,344   | 8.0                 |
| Aeronautical/astronautical engineering          | 614     | 625     | 1.8                 |
| Bioengineering/biomedical engineering           | 648     | 741     | 14.4                |
| Chemical engineering                            | 696     | 797     | 14.5                |
| Civil engineering                               | 980     | 1,064   | 8.6                 |
| Electrical engineering                          | 1,844   | 2,012   | 9.1                 |
| Mechanical engineering                          | 1,244   | 1,434   | 15.3                |
| Metallurgical/materials engineering             | 688     | 908     | 32.0                |
| Engineering, nec                                | 1,934   | 1,762   | -8.9                |
| Non-science and engineering <sup>a</sup>        | 2,425   | 2,897   | 19.5                |
| Business and management                         | 344     | 360     | 4.7                 |
| Communications, journalism, and library science | 107     | 157     | 46.7                |
| Education                                       | 916     | 987     | 7.8                 |
| Humanities                                      | 255     | 259     | 1.6                 |
| Law   | 108     | 96      | -11.1               |
| Social work                                     | 138     | 175     | 26.8                |
| Visual and performing arts                      | 73      | 64      | -12.3               |
| Non-science and engineering, nec                | 484     | 798     | 64.9                |

nec = not elsewhere classified.

<sup>a</sup> For FY 2009, the overall total and the total for non-science and engineering (S&E) are lower-bound estimates because the National Science Foundation did not attempt to estimate for nonresponse on the non-S&E R&D expenditures item. Non-S&E R&D data were provided by 97.4% of responding institutions in FY 2009.

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

million, the Department of Commerce with \$460 million, and the Department of Transportation with \$330 million.<sup>6</sup>

## R&D Spending by Nonfederal Sources

Universities themselves have long been the second largest source of their R&D funding, spending \$11.9 billion in FY 2010 and representing half of the total funded by nonfederal sources (table 3). The FY 2010 survey requested a new breakout of this internally funded R&D into three categories: direct internal funding for research, cost sharing on federal and nonfederal grants, and unrecovered indirect costs.<sup>7</sup> Of the \$11.9 billion, 52% (\$6.1 billion) was in the form of direct funding for faculty or student research projects, 9% (\$1.1 billion) was devoted to cost sharing, and almost 40% (\$4.7 billion) represented unrecovered indirect costs (figure 1).

Two other key changes to the FY 2010 survey were the addition of nonprofit organizations as a specific funding source and the request for a field breakdown for each of the nonfederal funding sources. Universities reported \$3.8 billion in nonprofit-funded R&D expenditures in FY 2010, the majority devoted to medical and biological sciences. State and local governments supplied \$3.9 billion of the total, with the majority of support going toward agricultural sciences, medical sciences, and engineering. Business, or for-profit organizations, funded \$3.2 billion of the academic R&D total, and also focused its funding on medical sciences and engineering projects. Finally, institution's own funding was primarily in support of biological and medical sciences. However, institutions also provided the largest funding source for the non-S&E fields of R&D (43% of the \$2.9 billion total spent on non-S&E R&D).

TABLE 2. Federally funded higher education R&amp;D expenditures, by federal agency and R&amp;D field: FY 2010

(Millions of current dollars)

| Field                       | All agencies | DOD   | DOE   | HHS    | NASA  | NSF   | USDA | Other <sup>a</sup> |
|-----------------------------|--------------|-------|-------|--------|-------|-------|------|--------------------|
| All R&D fields              | 37,488       | 4,486 | 1,552 | 21,094 | 1,476 | 4,734 | 954  | 3,192              |
| Computer sciences           | 1,175        | 429   | 44    | 84     | 19    | 479   | 3    | 118                |
| Environmental sciences      | 2,014        | 230   | 134   | 87     | 309   | 710   | 70   | 475                |
| Life sciences               | 21,686       | 664   | 197   | 18,586 | 80    | 695   | 767  | 698                |
| Agricultural sciences       | 956          | 20    | 53    | 85     | 7     | 95    | 526  | 169                |
| Biological sciences         | 7,564        | 238   | 100   | 6,277  | 37    | 513   | 189  | 211                |
| Medical sciences            | 12,066       | 371   | 30    | 11,324 | 35    | 54    | 32   | 218                |
| Life sciences, nec          | 1,100        | 35    | 14    | 899    | 1     | 32    | 20   | 99                 |
| Mathematical sciences       | 419          | 76    | 15    | 42     | 6     | 237   | 4    | 39                 |
| Physical sciences           | 3,380        | 524   | 532   | 592    | 559   | 1,040 | 7    | 126                |
| Psychology                  | 760          | 53    | 1     | 549    | 14    | 75    | 4    | 65                 |
| Social sciences             | 897          | 91    | 9     | 298    | 10    | 139   | 39   | 311                |
| Sciences, nec               | 439          | 109   | 32    | 91     | 8     | 128   | 3    | 67                 |
| Engineering                 | 5,732        | 2,236 | 575   | 581    | 462   | 1,058 | 46   | 776                |
| Non-science and engineering | 984          | 74    | 13    | 185    | 11    | 173   | 12   | 516                |

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; nec = not elsewhere classified; USDA = U.S. Department of Agriculture.

<sup>a</sup> Includes all other agencies reported.

NOTE: Not all subfields reported in this table.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

TABLE 3. Nonfederally funded higher education R&amp;D expenditures, by sources of funds and R&amp;D field: FY 2010

(Millions of current dollars)

| Field                       | All nonfederal | State and local government | Business | Nonprofit organizations | Institution funds | All other sources |
|-----------------------------|----------------|----------------------------|----------|-------------------------|-------------------|-------------------|
| All R&D fields              | 23,747         | 3,854                      | 3,209    | 3,764                   | 11,897            | 1,023             |
| Computer sciences           | 483            | 71                         | 79       | 43                      | 266               | 23                |
| Environmental sciences      | 976            | 172                        | 128      | 108                     | 510               | 58                |
| Life sciences               | 13,216         | 2,148                      | 1,817    | 2,487                   | 6,126             | 638               |
| Agricultural sciences       | 2,028          | 856                        | 136      | 118                     | 859               | 59                |
| Biological sciences         | 3,383          | 499                        | 326      | 664                     | 1,756             | 138               |
| Medical sciences            | 7,098          | 712                        | 1,282    | 1,585                   | 3,106             | 412               |
| Life sciences, nec          | 707            | 80                         | 72       | 120                     | 406               | 29                |
| Mathematical sciences       | 180            | 32                         | 11       | 17                      | 115               | 5                 |
| Physical sciences           | 1,244          | 121                        | 124      | 165                     | 785               | 49                |
| Psychology                  | 317            | 51                         | 17       | 50                      | 191               | 8                 |
| Social sciences             | 1,096          | 200                        | 67       | 226                     | 564               | 38                |
| Sciences, nec               | 711            | 122                        | 64       | 72                      | 437               | 16                |
| Engineering                 | 3,612          | 689                        | 821      | 313                     | 1,648             | 140               |
| Non-science and engineering | 1,912          | 248                        | 80       | 283                     | 1,255             | 47                |

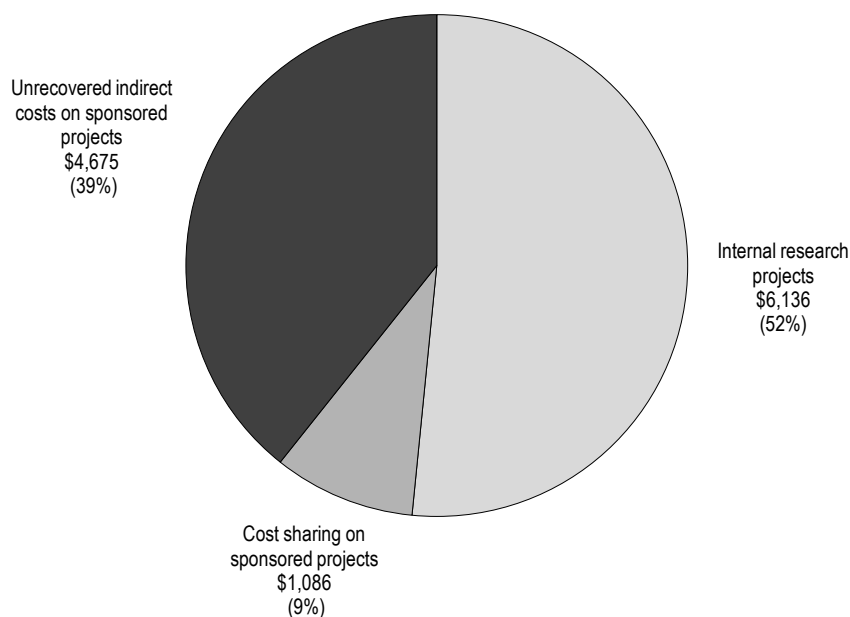
nec = not elsewhere classified.

NOTE: Not all subfields reported in this table.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

FIGURE 1. Institutionally funded higher education R&D expenditures, by type: FY 2010

(Millions of current dollars)



SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

## R&D by Character of Work

For the first time, the HERD survey asked institutions to categorize their expenditures by basic research, applied research, or development. The question provided definitions and examples to aid institutions in this classification. This represented a major change in reporting; previously the survey requested only the percentage of the total devoted to basic research.

Of the \$61.2 billion spent on academic R&D in FY 2010, 67% was categorized as basic research, 25% as applied research, and 9% as development (table 4). The percentage classified as basic is a substantial decrease from the 74%–76% reported for each year of the past decade. Many factors may be responsible for this decrease, including the addition of non-S&E R&D to the total and the explicit inclusion of clinical trials and research training grants

as R&D. However, based on explanations provided by many institutions, the most important factor was the change to the survey question. Because the question requested actual expenditures for the three different categories rather than a single percentage and provided examples of projects for each category, some institutions worked to improve the estimation they had been using.<sup>8</sup>

The proportion of basic research, applied research, and development was virtually the same for both public and private institutions; however, bachelors and masters (nondoctoral) institutions reported a lower percentage of their \$1 billion total as basic research (57%) when compared with doctoral institutions (67%).

## R&D Spending for Top 25 Performers

Beginning with FY 2010, each institution campus headed by its own administration (i.e., a campus level president or chancellor) was asked to report separately. Previously institutional rankings were based on a mix of reporting conventions. Some institutions were ranked on the basis of multi-campus totals. For others, their independent campus totals were ranked individually.

Of the 742 institutions surveyed, the top 25 in terms of R&D expenditures in all fields accounted for 35% of total academic R&D spending (table 5).

Despite the changes to the survey, there was remarkable consistency in the institutions comprising the top 25 in 2009 and 2010.

The University of Colorado dropped from the top 25 in FY 2010 due to the survey's reporting unit changes. The University of Colorado's R&D expenditures are now divided between

TABLE 4. Higher education R&D expenditures, by character of work, highest degree granted, and institutional control: FY 2010

(Percent)

| Type of institution and control | All R&D expenditures (current \$millions) | Basic research | Applied research | Development |
|---------------------------------|---|----------------|------------------|-------------|
| All institutions                | 61,235                                    | 66.5           | 24.9             | 8.6         |
| Doctorate                       | 60,220                                    | 66.7           | 24.8             | 8.5         |
| Nondoctorate                    | 1,015                                     | 57.0           | 31.2             | 11.8        |
| Public                          | 41,180                                    | 66.5           | 25.0             | 8.5         |
| Private                         | 20,055                                    | 66.6           | 24.7             | 8.8         |

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

TABLE 5. Twenty-five institutions reporting the largest FY 2010 R&D expenditures in all fields, by source of funds: FY 2010  
(Millions of current dollars)

| Rank | Institution  | All R&D expenditures | Federal government | local government | Business | Nonprofit organizations | Institution funds | All other sources |
|------|--|----------------------|--------------------|------------------|----------|-------------------------|-------------------|-------------------|
|      | All institutions                                     | 61,235               | 37,488             | 3,854            | 3,209    | 3,764                   | 11,897            | 1,023             |
|      | Leading 25 institutions                              | 21,519               | 13,683             | 1,043            | 1,423    | 1,555                   | 3,324             | 488               |
| 1    | Johns Hopkins U., The <sup>a</sup>                   | 2,004                | 1,737              | 10               | 68       | 91                      | 77                | 21                |
| 2    | U. MI-Ann Arbor                                      | 1,184                | 748                | 3                | 39       | 48                      | 339               | 8                 |
| 3    | U. WI Madison  | 1,029                | 545                | 97               | 12       | 131                     | 208               | 36                |
| 4    | U. WA Seattle  | 1,023                | 830                | 23               | 92       | NA                      | 44                | 34                |
| 5    | Duke U.  | 983                  | 514                | 27               | 234      | 90                      | 113               | 4                 |
| 6    | U. CA, San Diego                                     | 943                  | 580                | 35               | 68       | 102                     | 111               | 47                |
| 7    | U. CA, Los Angeles                                   | 937                  | 539                | 26               | 54       | 91                      | 156               | 70                |
| 8    | U. CA, San Francisco                                 | 936                  | 515                | 28               | 51       | 129                     | 137               | 76                |
| 9    | Stanford U.  | 840                  | 593                | 23               | 61       | 81                      | 79                | 2                 |
| 10   | U. PA  | 836                  | 642                | 34               | 39       | 60                      | 60                | 0                 |
| 11   | U. Pittsburgh main campus                            | 822                  | 595                | 12               | 10       | 22                      | 184               | 0                 |
| 12   | Columbia U. in the City of New York                  | 807                  | 572                | 12               | 36       | 67                      | 95                | 25                |
| 13   | U. MN Twin Cities                                    | 786                  | 426                | 65               | 28       | 70                      | 177               | 20                |
| 14   | PA State U. University Park and Hershey Medical Ctr. | 770                  | 465                | 63               | 64       | 38                      | 139               | 1                 |
| 15   | U. NC Chapel Hill                                    | 755                  | 546                | 10               | 26       | 57                      | 117               | 0                 |
| 16   | OH State U.  | 755                  | 400                | 106              | 120      | 29                      | 83                | 16                |
| 17   | Cornell U.   | 750                  | 448                | 67               | 23       | 71                      | 139               | 2                 |
| 18   | Washington U. St. Louis                              | 696                  | 469                | 19               | 37       | 46                      | 90                | 35                |
| 19   | U. CA, Berkeley                                      | 694                  | 313                | 68               | 86       | 87                      | 121               | 20                |
| 20   | TX A&M U.  | 690                  | 288                | 139              | 47       | 18                      | 191               | 6                 |
| 21   | U. FL  | 682                  | 280                | 99               | 23       | 20                      | 252               | 8                 |
| 22   | U. CA, Davis   | 680                  | 332                | 60               | 37       | 87                      | 160               | 3                 |
| 23   | MA Institute of Technology                           | 677                  | 458                | 0                | 103      | 69                      | 12                | 35                |
| 24   | Yale U.  | 624                  | 476                | 7                | 19       | 39                      | 69                | 14                |
| 25   | GA Institute of Technology                           | 616                  | 372                | 10               | 46       | 12                      | 171               | 5                 |

NA = not available.

<sup>a</sup> The Johns Hopkins University includes the Applied Physics Laboratory, with \$1,080 million in total R&D expenditures in FY 2010.

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 Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

its campuses at Boulder (ranked 62), Denver (ranked 48), and Colorado Springs (ranked 323). The other institution no longer in the top 25 was the University of Texas M.D. Anderson Cancer Center, which moved to number 27 for FY 2010. Yale University and Georgia Institute of Technology were new additions to the top 25 in 2010, ranked 24 and 25, respectively.

## Cost Categories of R&D Expenditures

The FY 2010 survey asked institutions to report for the first time the portions of their total R&D expenditures devoted

to salaries, wages and fringe benefits versus other types of costs. Institutions reported 42% of the R&D expenditures, or \$25.9 billion, were for salaries, wages, and fringe benefits (figure 2). Twenty-five percent (\$15.1 billion) represented the indirect costs associated with sponsored projects (both recovered and unrecovered). Almost \$5 billion (8%) was reported as passed through to other recipients for collaborative R&D projects.

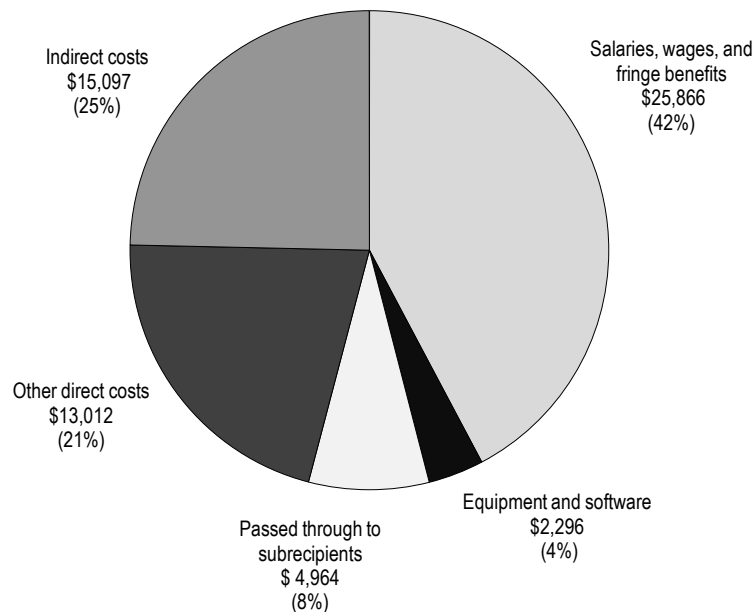
## Data Sources, Limitations, and Availability

The higher education R&D expenditures data presented in this InfoBrief

were obtained from 742 universities and colleges that grant bachelors or higher degrees and expended at least \$150,000 in R&D in the survey period. The amounts reported include all funds expended for activities specifically organized to produce research outcomes and sponsored by an outside organization or separately budgeted using institution funds. R&D expenditures at university-administered federally funded research and development centers (FFRDCs) are collected in a separate survey. Data from the FFRDC R&D Survey are available at <http://www.nsf.gov/statistics/ffrdc/>.

FIGURE 2. Higher education R&D expenditures, by type of cost: FY 2010

(Millions of current dollars)



SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

The full set of detailed tables from this survey will be available in the report Higher Education Research and Development: Fiscal Year 2010 at <http://www.nsf.gov/statistics/rdexpenditures/>. Individual detailed tables from the 2010 survey may be available in advance of publication of the full report. For further information, please contact the author.

## Notes

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2. The fiscal year referred to throughout this report is the academic fiscal year; for most institutions FY 2010 represents the period 1 July 2009 through 30 June 2010.

3. Two changes to the survey's definition of R&D also contributed to the R&D increase, to a lesser extent: the explicit inclusion of clinical trials and research training grants. The true effect these changes had on the total is unknown because the survey did

not request totals for either of these categories prior to FY 2010, but it is estimated to be fairly small given the size of the overall increase.

4. A listing of each of the changes is provided in the FY 2010 Higher Education R&D Survey questionnaire, [http://www.nsf.gov/statistics/srvyherd/surveys/srvyherd\\_2010.pdf](http://www.nsf.gov/statistics/srvyherd/surveys/srvyherd_2010.pdf).

5. Some of this increase can be attributed to the change in survey methodology for FY 2010. Imputed R&D is now distributed among both S&E and non-S&E fields for those institutions who did not complete the survey in FY 2010, and the imputed total for non-S&E R&D expenditures was \$99 million. In previous years only S&E R&D was imputed.

6. A complete listing of other agency sources will be provided in the forthcoming detailed statistical tables report; see "Data Sources, Limitations, and Availability."

7. Unrecovered indirect costs are the portion of indirect costs incurred as a result of conducting sponsored research that are not reimbursed by the project sponsor. Direct cost sharing refers to the portion of direct project costs paid for by the institution on an externally funded project. This amount is negotiated and agreed upon with the sponsor at the time of the project award. The data provided for these categories are kept confidential at the institutional level and only reported in aggregate form.

8. Many institutions also opted not to complete this question on the FY 2010 survey because of the additional detail requested. The breakdown was imputed for these institutions based on the proportions reported by their peer institutions.



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