



State Government R&D Expenditures Increase 3.1% in FY 2016

by Christopher Pece¹

State government agency expenditures for research and development totaled \$2.3 billion in FY 2016, an increase of 3.1% from FY 2015 (table 1). Five state governments (California, New York, Texas, Florida, and Ohio) accounted for 64% of all state government R&D in FY 2016 (table 2). This InfoBrief presents summary statistics from the FY 2016 Survey of State Government Research and Development, sponsored by the National Science Foundation, National Center for Science and Engineering Statistics (NCSES).

The FY 2016 survey presents the most recent NCSES statistics of R&D activities performed and funded by state government agencies in each of the 50 states, as well as the municipal government of the District of Columbia. Survey data are available by state and by individual state agency. Further details are also available on R&D performer (intramural and extramural), source of funding, type of R&D (basic research, applied research, and experimental development), and R&D by government function (agriculture, energy, environment and natural resources, health, transportation, and other).

National Totals

State government agency R&D expenditures in FY 2016 totaled \$2.3 billion, of which 78% came from state

and other nonfederal sources (table 1). Seventy-three percent of the states' R&D expenditures went to extramural

R&D performers (i.e., performers other than state agencies) in FY 2016. Academic institutions were the

TABLE 1. State agency R&D and R&D plant expenditures: FYs 2015–16
(Thousands of current dollars)

Characteristic	FY 2015	FY 2016	% change
All R&D and R&D plant expenditures	2,282,136	2,342,383	2.6
All R&D plant expenditures	34,896	25,257	-27.6
All R&D expenditures	2,247,240	2,317,126	3.1
Source of funds			
Federal government	482,540	509,519	5.6
State government and other nonfederal sources	1,764,700	1,807,607	2.4
Performer			
Intramural ^a	585,026	635,546	8.6
Extramural	1,662,214	1,681,580	1.2
Academic institutions	915,042	868,260	-5.1
Companies and individuals	448,394	481,871	7.5
Other	298,778	331,449	10.9
Intramural by type of R&D			
Basic research	110,327	89,951	-18.5
Applied research	461,695	531,509	15.1
Experimental development	13,003	14,087	8.3
R&D project by government function			
Agriculture	102,116	109,191	6.9
Energy	383,146	368,028	-3.9
Environment and natural resources	416,121	437,315	5.1
Health	936,278	964,865	3.1
Transportation	246,570	264,596	7.3
Other ^b	163,009	173,130	6.2

^a Intramural performers include employees within the same state department or agency and services performed by others in support of internal R&D projects.

^b Includes government functions for corrections, criminal justice, education, forensic sciences, labor, public safety, and social services.

NOTE: R&D plant includes acquisition of land, facilities, major equipment, and major building renovations intended primarily for R&D use.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of State Government Research and Development.

TABLE 2. State agency expenditures for R&D, by state and performer: FY 2016
(Thousands of current dollars)

State	All R&D expenditures		Intramural performers ^a		Extramural performers ^b		State	All R&D expenditures		Intramural performers ^a		Extramural performers ^b	
	Amount	Percent	Amount	Percent	Amount	Percent		Amount	Percent	Amount	Percent	Amount	Percent
United States ^c	2,317,126		635,546	27.4	1,681,580	72.6	Missouri	14,724		7,873	53.5	6,850	46.5
Alabama	24,799		11,439	46.1	13,360	53.9	Montana	17,990		2,676	14.9	15,315	85.1
Alaska	10,073		7,792	77.4	2,281	22.6	Nebraska	7,644		466	6.1	7,178	93.9
Arizona	15,680		5,939	37.9	9,741	62.1	Nevada	5,716		5	0.1	5,711	99.9
Arkansas	17,243		577	3.3	16,666	96.7	New Hampshire	1,521		368	24.2	1,153	75.8
California	573,989		94,756	16.5	479,233	83.5	New Jersey	30,483		1,704	5.6	28,780	94.4
Colorado	16,648		7,733	46.5	8,914	53.5	New Mexico	4,773		1,391	29.1	3,382	70.9
Connecticut	49,460		20,919	42.3	28,541	57.7	New York	404,833		237,318	58.6	167,515	41.4
Delaware	2,695		1,672	62.0	1,023	38.0	North Carolina	37,142		17,853	48.1	19,289	51.9
District of Columbia	4,060		1,380	34.0	2,680	66.0	North Dakota	8,470		588	6.9	7,882	93.1
Florida	156,058		44,255	28.4	111,803	71.6	Ohio	99,329		2,096	2.1	97,233	97.9
Georgia	13,093		2,304	17.6	10,790	82.4	Oklahoma	33,461		2,394	7.2	31,067	92.8
Hawaii	18,032		8,896	49.3	9,137	50.7	Oregon	24,831		10,188	41.0	14,643	59.0
Idaho	14,501		6,576	45.3	7,925	54.7	Pennsylvania	73,189		6,452	8.8	66,737	91.2
Illinois	16,935		1,251	7.4	15,684	92.6	Rhode Island	3,372		175	5.2	3,197	94.8
Indiana	13,029		620	4.8	12,409	95.2	South Carolina	30,512		24,854	81.5	5,658	18.5
Iowa	12,297		3,797	30.9	8,500	69.1	South Dakota	4,512		433	9.6	4,079	90.4
Kansas	6,392		2,818	44.1	3,574	55.9	Tennessee	7,040		2,732	38.8	4,309	61.2
Kentucky	29,411		697	2.4	28,714	97.6	Texas	255,133		4,290	1.7	250,843	98.3
Louisiana	27,268		12,536	46.0	14,732	54.0	Utah	31,466		18,168	57.7	13,298	42.3
Maine	11,430		2,970	26.0	8,459	74.0	Vermont	1,041		369	35.4	673	64.6
Maryland	26,448		328	1.2	26,120	98.8	Virginia	33,556		13,596	40.5	19,960	59.5
Massachusetts	23,433		12,614	53.8	10,819	46.2	Washington	35,183		14,446	41.1	20,737	58.9
Michigan	17,121		1,250	7.3	15,871	92.7	West Virginia	8,233		2,456	29.8	5,778	70.2
Minnesota	22,861		2,195	9.6	20,666	90.4	Wisconsin	13,442		5,783	43.0	7,659	57.0
Mississippi	2,339		191	8.2	2,149	91.9	Wyoming	4,234		1,369	32.3	2,865	67.7

^a Intramural performers include employees within the same state department or agency and services performed by others in support of internal R&D projects.

^b Extramural performers include academic institutions, companies and individuals, and other non-internal performers.

^c U.S. total reflects all 50 states and the District of Columbia.

NOTE: Detail may not add to total because of rounding.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of State Government Research and Development, FY 2016.

primary recipients of these expenditures (52% of all extramural funding in FY 2016, excluding direct state appropriations to colleges and universities), followed by companies and individuals (29% in FY 2016). Intramural performers, the state agencies themselves, performed \$636 million of R&D in FY 2016, a 9% increase from FY 2015.

Health-related R&D projects made up the largest share of state agencies' R&D expenditures (42% in FY 2016). R&D projects related to the environment and natural resources accounted for 19% of total state government R&D expendi-

tures in FY 2016. Energy, transportation, agriculture, and all other projects' shares of total R&D expenditures in FY 2016 were 16%, 11%, 5%, and 7%, respectively. Energy-related R&D decreased 4% from FY 2015. R&D projects related to environment and natural resources and to health increased by 5% and 3%, respectively, from FY 2015. Agriculture- and transportation- related R&D increased by 7% each.

Expenditures for R&D plant (construction projects, major building renovations, major equipment purchases, and land and building acquisitions intended primarily for R&D use) totaled \$25.3 million in

FY 2016, a 28% decrease from the \$34.9 million reported in FY 2015.

State Governments' Shares of R&D

Individual state government expenditures on R&D (including funds from federal, state, and other sources) in FY 2016 varied widely, ranging from \$1 million in Vermont to nearly \$575 million in California (table 2). Similarly, the range of state governments receiving federal funds for R&D projects ranged from under \$1 million in the District of Columbia, Maryland, New Hampshire, Utah, and Vermont to more than \$143 million in New York.

Combined, the five largest state governments to receive federal funds for R&D (New York, Texas, California, Florida, and South Carolina) accounted for 46% of the total \$510 million in federal funds provided to all state governments for R&D activities.

Intramural R&D Performance

Five states accounted for 66% of the \$636 million of intramural R&D performed by state agencies in FY 2016 (table 2): New York (\$237 million), California (\$95 million), Florida (\$44 million), South Carolina (\$25 million), and Connecticut (\$21 million). In FY 2016, 40% (\$254 million) of state agency intramural R&D performance was funded by the federal government. The share of federal support for intramural R&D ranged from nearly 100% in Oklahoma, Arkansas, and Illinois to less than 1% in Utah and Nevada.

The majority (84%) of state government intramural R&D performance is

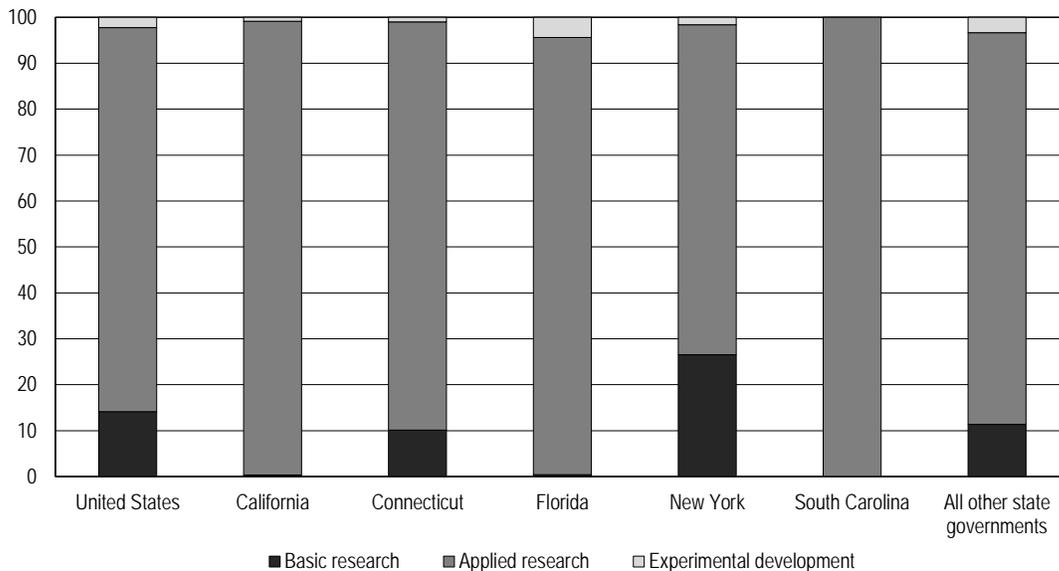
directed toward applied research (\$532 million), whereas basic research constitutes approximately 14% of intramural R&D and experimental development is 2% (figure 1). All state governments, except for Arkansas, Nebraska, and Nevada, reported a portion of their intramural R&D as applied research; 32 state governments reported some intramural R&D as basic research; and 24 reported some intramural R&D as experimental development. Eleven state governments reported all intramural R&D as applied research. New York’s intramural R&D (\$237 million) constitutes 37% of all state governments’ intramural R&D activities, with \$63 million directed toward basic research, \$170 million toward applied research, and \$4 million toward experimental development (figure 1).

Extramural R&D Performance

Five states accounted for 66% of the \$1.7 billion in FY 2016 state government funding for extramural R&D performance (table 2): Cali-

fornia (\$479 million), Texas (\$251 million), New York (\$168 million), Florida (\$112 million), and Ohio (\$97 million). However, states varied in how they funded extramural R&D. For example, Texas state agencies directed the majority of this funding toward academic institutions (\$158 million, or 63%), whereas Ohio state agencies directed the bulk of their funding for extramural performance toward companies and individuals (\$84 million). In addition to Texas, state agencies in California (\$195 million), Florida (\$41 million), New York, (\$93 million), and Pennsylvania (\$40 million) combined accounted for 61% of the total support to academic institutions (\$868 million) in FY 2016. Similarly, state agencies in California (\$187 million), Ohio (\$84 million), Texas (\$56 million), New York (\$38 million), and Connecticut (\$13 million) combined accounted for 78% of the total R&D support from state governments to companies and individuals (\$482 million) in FY 2016.

FIGURE 1. State government intramural R&D, by type: FY 2016
Percent



NOTE: U.S. total reflects all 50 states and the District of Columbia.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of State Government Research and Development, FY 2016.

R&D by State Agency Functions

Most states reported a broad mix of R&D projects related to state government functions: agriculture, energy, environment and natural resources, health, transportation, and other (table 3). All states reported R&D expenditures in at least two of these governmental function categories, and 17 states reported R&D expenditures across all functions in FY 2016. Some R&D functions are highly concentrated within a handful of states. For example, in FY 2016, a total of 37 state governments reported some expenditures for energy-related R&D, yet 90% of all state government R&D expenditures for energy-related R&D was concentrated in five states: California (\$251 million), New York (\$51 million), Ohio (\$15 million), Hawaii (\$8 million), and Georgia (\$6 million). Similarly, 35 states reported expenditures for health-related R&D in FY 2016, yet 83% of all state government agency expenditures on health-related R&D was reported by agencies in five states: New York (\$269 million), Texas (\$212 million), California

(\$200 million), Florida (\$72 million), and Pennsylvania (\$51 million).

The five state governments with the most R&D expenditures for agriculture, environmental and natural resources, and transportation were somewhat less concentrated in their shares of the respective national totals than were the states with the largest shares of energy R&D and health R&D. For instance, 37 states reported some R&D expenditures for agriculture, but the five largest states—namely, Florida (\$17 million), Washington (\$12 million), North Carolina (\$12 million), Arkansas (\$8 million), and California (\$7 million)—make up 52% of all state government spending on agriculture-related R&D. In the case of environment and natural resources, all states except Illinois and South Dakota reported some R&D expenditures. However, five states accounted for 46% of the total in FY 2016: California (\$58 million), Florida (\$51 million), Ohio (\$46 million), South Carolina (\$25 million), and New York (\$21 million). Transportation-

related R&D projects were conducted by all state governments except for Massachusetts, with California (\$38 million), Texas (\$28 million), Virginia (\$17 million), Minnesota (\$13 million), and Florida (\$13 million) accounting for 41% of total transportation-related R&D expenditures.

Data Sources and Limitations

Data presented in this InfoBrief are in current dollars and have not been adjusted for inflation. All 50 states, and the District of Columbia participated in the FY 2016 survey, and 589 of the 621 selected agencies (95%) responded to the survey. Puerto Rico agencies did not report to the survey for FY 2016. Data for the FY 2016 survey were collected for NCSES by the U.S. Census Bureau under an inter-agency agreement.

Most states' fiscal year begins on 1 July and ends the following 30 June. For example, FY 2016 begins on 1 July 2015 and ends on 30 June 2016.

TABLE 3. State agency expenditures for R&D, by state and function of R&D, for the 10 states with the highest levels of R&D expenditures: FY 2016
(Thousands of current dollars)

State	Total	Agriculture	Energy	Environment and natural resources	Health	Transportation	Other
United States ^a	2,317,126	109,191	368,028	437,315	964,865	264,596	173,130
California	573,989	7,475	251,116	57,770	199,523	38,341	19,763
New York	404,833	4,885	50,959	21,339	269,493	10,571	47,587
Texas	255,133	1,761	0	13,099	212,223	28,049	0
Florida	156,058	17,066	2,371	51,313	72,374	12,933	0
Ohio	99,329	200	14,931	46,303	7,565	12,713	17,617
Pennsylvania	73,189	1,587	2,604	9,043	51,365	3,889	4,700
Connecticut	49,460	3,943	240	10,527	26,313	2,370	6,068
North Carolina	37,142	12,225	1,970	5,490	6,900	6,865	3,693
Washington	35,183	12,386	1,917	11,992	0	5,607	3,282
Virginia	33,556	3,142	549	7,583	3,724	16,692	1,866
All others	599,254	44,520	41,372	202,855	115,386	126,566	68,555

^a U.S. total reflects all 50 states and the District of Columbia.

NOTES: Includes state agency funding from all sources for both intramural and extramural performance. Detail may not add to total because of rounding.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of State Government Research and Development, FY 2016.

There are, however, five exceptions to the 30 June fiscal year end: New York (ends 31 March), Texas (ends 31 August), and Alabama, Michigan, and the District of Columbia (ends 30 September). Data presented in this InfoBrief are for each of the respective fiscal year period as defined by each state.

Terms such as state, state government, and state agencies have equivalent meaning and are used interchangeably throughout this InfoBrief. The amounts reported here are for R&D expenditures of state government departments, agencies, public authorities, institutions, and other dependent entities that operate separately or somewhat autonomously from the central state government. State government R&D totals can display considerable volatility between survey years due to several national and

state-specific factors. Large changes are not unusual, especially for discretionary spending items such as R&D. Amounts reported do not include direct appropriations from state legislatures to universities, colleges, and private organizations. As a result, the \$868 million in FY 2016 expenditures reported by state agencies to support R&D performance by academic institutions differs from the figure reported by universities and colleges in FY 2016 (\$4.0 billion) for expenditures on R&D activities that were funded from state and local government sources. (See National Science Foundation, National Center for Science and Engineering Statistics. 2016. *Higher Education Research and Development: Fiscal Year 2016*. Data Tables. Alexandria, VA. Available at <https://www.nsf.gov/statistics/srvyherd/#tabs-2>.)

State- and agency-specific data not available in this InfoBrief will be available in the full set of detailed tables from this survey in the report *State Government Research and Development: FY 2016*, at <https://www.nsf.gov/statistics/srvystaterd/#tabs-2>. Individual detailed tables from the FY 2016 survey may be available in advance of the full report. For further information, contact the author.

Note

1. Christopher Pece, Research and Development Statistics Program, National Center for Science and Engineering Statistics, National Science Foundation, 2415 Eisenhower Ave, Suite W14200, Alexandria, VA 22314 (cpece@nsf.gov; 703-292-7788).