



State Government R&D Expenditures Increase 7% in FY 2017; Health-Related R&D Up 13%

by Christopher Pece¹

State government agency expenditures for research and development totaled \$2.5 billion in FY 2017, an increase of 7% from FY 2016 (table 1). Of this amount, \$1.1 billion was directed toward health-related R&D projects. This was the first time that R&D expenditures for any state government function totaled more than \$1.0 billion. Five state governments (California, New York, Texas, Florida, and Ohio) accounted for 62% of all state government R&D in FY 2017. The same five governments constituted 64% of FY 2016 state government R&D. This InfoBrief presents summary statistics from the FY 2017 Survey of State Government Research and Development, sponsored by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation.

The FY 2017 survey presents the most recent NCSES statistics on 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

TABLE 1. State agency R&D and R&D facilities expenditures: FYs 2016–17
(Thousands of current dollars)

Characteristic	FY 2016	FY 2017	% change
All R&D and R&D plant expenditures	2,362,601	2,517,309	6.5
All R&D plant expenditures	25,257	23,022	-8.8
All R&D expenditures	2,337,344	2,494,287	6.7
Source of funds			
Federal government	510,039	541,249	6.1
State government and other nonfederal sources	1,827,305	1,953,038	6.9
Performer			
Intramural ^a	631,131	669,962	6.2
Extramural	1,706,213	1,824,325	6.9
Higher education institutions	890,999	1,039,814	16.7
Companies and individuals	483,665	450,127	-6.9
Other	331,549	334,384	0.9
Intramural by type of R&D			
Basic research	89,832	96,395	7.3
Applied research	527,212	551,993	4.7
Experimental development	14,087	21,574	53.1
R&D project by government function			
Agriculture	109,441	115,269	5.3
Energy	368,028	306,999	-16.6
Environment and natural resources	438,565	479,665	9.4
Health	982,392	1,114,112	13.4
Transportation	264,596	265,470	0.3
Other ^b	174,321	212,772	22.1

^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.

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

(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

Of the \$2.5 billion in state government agency R&D expenditures in FY 2017, 78% came from state and other nonfederal sources (table 1). The majority (73%) of state government agency R&D expenditures went to extramural R&D performers (i.e., performers other than state agencies). Higher education institutions were the primary recipients of these expenditures with 57% of all extramural funding,² followed by companies and individuals (25%). Intramural performers of R&D, the state agencies themselves, totaled \$670 million in FY 2017, a 6% increase from FY 2016.

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 \$23.0 million in FY 2017, a 9% decrease from the \$25.3 million reported in FY 2016. Eighty percent of all state government expenditures for R&D plant come from projects in California, Florida, Louisiana, New York, and Virginia.

State Governments' R&D Funding and Performance Overview

Individual state government expenditures on R&D (including funds from federal, state, and other sources) in FY 2017 varied from \$1.1 million in Vermont to \$512.4 million in California. Similarly, the federal funds for R&D projects received by state governments ranged from under \$1 million in New Hampshire, South Dakota, and

Vermont to more than \$150 million in New York. Combined, the five largest state governments to receive federal funds for R&D (New York, California, Texas, Florida, and South Carolina) accounted for 48% of the total \$541.2 million in federal funds provided to all state governments for R&D activities.

Intramural R&D Performance

Five states accounted for 66% of the \$670.0 million in expenditures for intramural R&D performed by all state agencies in FY 2017: New York (\$246.1 million), California (\$104.3 million), Florida (\$44.5 million), South Carolina (\$25.7 million), and Connecticut (\$20.0 million) (table 2). In FY 2017, 39% (\$263.6 million) of state agency intramural R&D performance was funded by the federal government. The share of federal funds in support of state government intramural R&D ranged considerably from as much as 92% in

TABLE 2. State agency expenditures for R&D and R&D plant, by state and performer, for the 10 states with the highest level of all R&D expenditures: FY 2017
(Thousands of current dollars)

State	All R&D expenditures ^a	Intramural performers ^b	Extramural performers ^c				R&D plant
			Total	Higher education institutions	Companies and individuals ^d	Other ^e	
United States ^f	2,494,287	669,962	1,824,325	1,039,814	450,127	334,384	23,023
California	512,447	104,344	408,103	160,183	155,882	92,038	3,450
New York	434,294	246,100	188,194	107,254	22,053	58,888	3,560
Texas	294,485	4,136	290,349	185,729	61,474	43,146	0
Florida	201,902	44,547	157,355	135,726	10,385	11,244	4,898
Ohio	109,022	3,221	105,801	33,792	69,304	2,705	0
Pennsylvania	92,505	9,101	83,405	44,191	1,881	37,333	0
Connecticut	53,636	20,047	33,589	12,006	20,094	1,490	0
North Carolina	44,884	19,865	25,019	8,507	16,127	386	0
Washington	43,614	14,516	29,098	13,966	7,394	7,738	1,000
New Jersey	37,415	1,800	35,615	33,799	303	1,512	0
All others	670,081	202,285	467,796	304,661	85,230	77,904	10,115

^a State R&D expenditures do not include R&D plant.

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

^c Extramural performers are those outside the department or agency who perform R&D.

^d Companies and individuals include individuals under contract for research projects.

^e Other includes federal government; nonprofit organizations; city, county, regional, or other local governments; and other state governments.

^f 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 2017.

Vermont, 87% in Maryland, 83% in Oklahoma, 83% in Montana, and 82% in Idaho to as low as 4% in New Jersey, 2% in Utah, and no federal funding to support intramural R&D activities in Illinois, Nevada, and Rhode Island.

The majority (82%) of state government intramural R&D performance is directed toward applied research (\$552.0 million), whereas basic research constitutes approximately 14% of intramural R&D and experimental development is 3% (figure 1). All state governments, except for Hawaii, Nebraska, and Nevada, reported a portion of their intramural R&D as applied research; 27 state governments reported some intramural R&D as basic research; and 31 reported some intramural R&D as experimental development. Thirteen state governments reported all of their intramural R&D as applied research. New York's intramural R&D constitutes 37% of all state governments' intramural R&D activities, with \$67.6 million directed toward

basic research, \$174.9 million toward applied research, and \$3.6 million toward experimental development.

Extramural R&D Performance

Five states accounted for 63% of the total \$1.8 billion in FY 2017 state government expenditures for extramural R&D performance: California (\$408.1 million), Texas (\$290.3 million), New York (\$188.2 million), Florida (\$157.4 million), and Ohio (\$105.8 million). However, states varied in how they funded extramural R&D. For example, Texas state agencies directed 64% of this funding toward higher education institutions (\$185.7 million) compared with 21% (\$61.5 million) to companies and individuals. By comparison Ohio state agencies directed 66% of their funding for extramural performance toward companies and individuals (\$69.3 million) and 32% (\$33.8 million) to higher education.

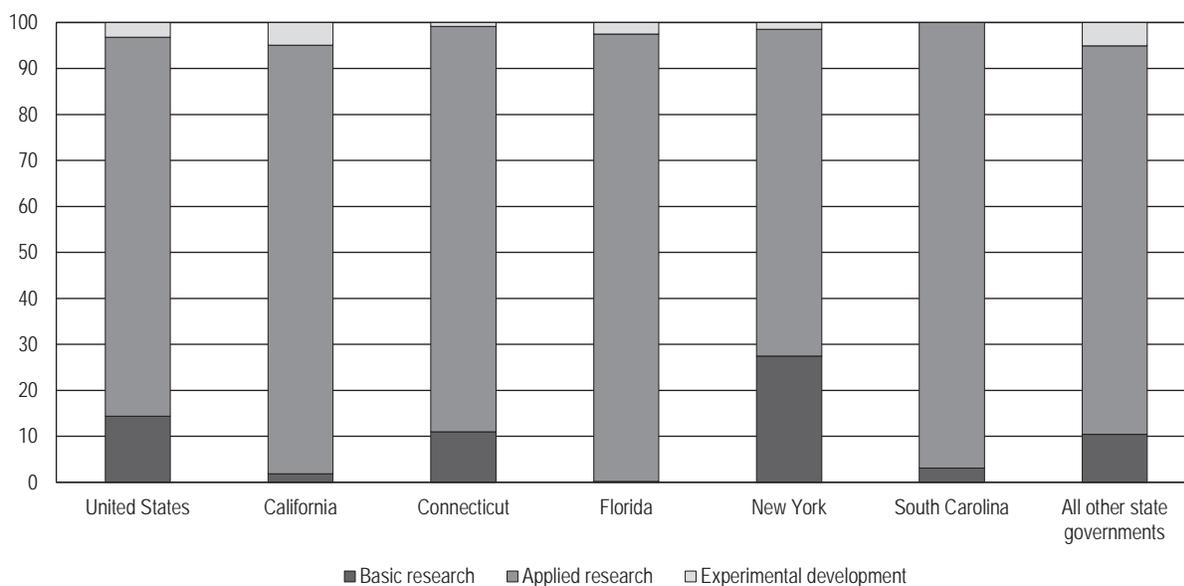
In addition to Texas, state agencies in California (\$160.2 million), Florida

(\$135.7 million), New York, (\$107.3 million), and Pennsylvania (\$44.2 million) combined accounted for 61% of the total support to higher education institutions (\$1.0 billion) in FY 2017. Similarly, state agencies in California (\$155.9 million), Ohio (\$69.3 million), Texas (\$61.5 million), New York (\$22.1 million), and Connecticut (\$20.1 million) combined accounted for 73% of the total R&D support from state governments to companies and individuals (\$450.1 million) in FY 2017.

R&D by State Government 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). Health-related R&D projects made up the largest share of state agencies' R&D expenditures (45% in FY 2017). R&D projects related to the environment and natural resources accounted for 19% of total state government R&D expenditures

FIGURE 1. State agency intramural R&D, by type, for the five states with the highest level of intramural R&D: FY 2017
Percent



NOTES: U.S. total reflects all 50 states and the District of Columbia. 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 2017.

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 2017
(Thousands of current dollars)

State	Total	Agriculture	Energy	Environment and natural resources	Health	Transportation	Other
United States ^a	2,494,287	115,269	306,999	479,665	1,114,112	265,470	212,772
California	512,447	6,696	184,568	61,785	203,218	35,516	20,665
New York	434,294	9,015	55,855	25,508	284,862	10,837	48,218
Texas	294,485	688	0	16,409	251,174	26,214	0
Florida	201,902	15,855	717	52,812	118,405	14,113	0
Ohio	109,022	0	15,282	61,864	5,677	12,016	14,184
Pennsylvania	92,505	1,687	100	7,740	47,614	2,715	32,650
Connecticut	53,636	3,894	0	9,546	27,209	3,516	9,471
North Carolina	44,884	15,384	215	6,534	11,825	7,396	3,530
Washington	43,614	11,949	8,198	15,079	0	4,852	3,536
New Jersey	37,415	0	0	2,488	28,254	6,673	0
All others	670,083	50,101	42,064	219,900	135,874	141,622	80,518

^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 2017.

in FY 2017. Energy, transportation, agriculture, and all other projects' shares of total R&D expenditures in FY 2017 were 12%, 11%, 5%, and 8.5%, respectively. Although R&D expenditures for most government functions increased from FY 2016, energy-related R&D decreased 17% from \$368 million in FY 2016.

All states reported R&D expenditures in at least two of these government function categories, and 13 states reported R&D expenditures across all functions in FY 2017. Some R&D functions are highly concentrated within a handful of states. For example, in FY 2017, a total of 32 state governments reported some expenditures for energy-related R&D, yet 89% of all state government R&D expenditures for energy-related R&D was concentrated in five states: California (\$184.6 million), New York (\$55.9 million), Ohio (\$15.3 million), Washington (\$8.2 million), and North Dakota (\$8.1 million). Similarly, 35 states reported

expenditures for health-related R&D in FY 2017, yet 81% of all state government agency expenditures on health-related R&D was reported by agencies in five states: New York (\$284.9 million), Texas (\$251.2 million), California (\$203.2 million), Florida (\$118.4 million), and Pennsylvania (\$47.6 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, 35 states reported some R&D expenditures for agriculture, but the five states with the most agriculture expenditures—namely, Florida, North Carolina, Washington, Arkansas, and New York—make up 53% of all state government spending on agriculture-related R&D. All states except Arkansas and Illinois reported some

R&D expenditures on environment and natural resources. However, the five states with the most environment and natural resources expenditures—Ohio, California, Florida, South Carolina, and New York—accounted for 48% of the total in FY 2017. Transportation-related R&D projects were conducted by all state governments with California, Texas, Virginia, Florida, and Ohio accounting for 39% of the transportation-related R&D total.

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 2017 survey, and 536 of the 571 selected agencies (94%) responded to the survey. Puerto Rico agencies did not report to the survey for FY 2017. Data for the FY 2017 survey were collected for NCSES by the U.S. Census Bureau under an interagency agreement.

Most states' fiscal year begins on 1 July and ends the following 30 June. For example, FY 2017 begins on 1 July 2016 and ends on 30 June 2017. 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 periods 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 \$1.0 billion in FY 2017 expenditures reported by state agencies to support R&D performance by academic institutions differs from the figure reported by universities and colleges in FY 2017 (\$4.2 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. 2017. *Higher Education Research and Development: Fiscal Year, 2017*. 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 avail-

able in the full set of detailed tables from this survey in the report *State Government Research and Development: FY 2017*, at <https://www.nsf.gov/statistics/srvystaterd/#tabs-2>. Individual detailed tables from the FY 2017 survey may be available in advance of the full report. For further information, contact the author.

Notes

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2. State agency expenditures directed toward higher education institutions under this survey do not include direct state appropriations to colleges and universities.