National Center for Science and Engineering Statistics

InfoBrief

State Government R&D Expenditures Decline 4% in FY 2019; Health-Related R&D Declines 2%

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State government agency expenditures for research and development totaled $2.4 billion in FY 2019, down from $2.5 billion in FY 2018 (table 1). Although health-related R&D declined nearly 2% from FY 2018, it remains the largest function for state R&D with $1.1 billion in expenditures in FY 2019 (table 2). This InfoBrief presents summary statistics from the FY 2019 Survey of State Government Research and Development, sponsored by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation. Amounts reported do not include direct appropriations from state legislatures to universities, colleges, and private organizations. Unless otherwise noted, all data presented in this InfoBrief are in current dollars.

Table 1

State government R&D and R&D plant expenditures: FYs 2018–19

(Thousands of current dollars)

Characteristic	FY 2018	FY 2019	% change
All R&D and R&D plant expenditures	2,542,700	2,437,174	-4.2
All R&D plant expenditures	13,836	10,291	-25.6
All R&D expenditures	2,537,344	2,426,883	-4.4
Source of funds			
Federal government	532,150	560,856	5.4
State government and other nonfederal sources	2,005,194	1,866,027	-6.9
Performer			
Intramural[a]	635,483	676,171	6.4
Extramural	1,901,861	1,750,712	-7.9
Higher education institutions	1,080,933	1,024,317	-5.2
Companies and individuals	444,100	438,222	-1.3
Other	376,828	288,173	-23.5
Intramural by type of R&D			
Basic research	110,157	128,919	17.0
Applied research	502,823	524,336	4.3
Experimental development	22,502	22,916	1.8

Table 1

State government R&D and R&D plant expenditures: FYs 2018–19

(Thousands of current dollars)

Characteristic	FY 2018	FY 2019	% change
R&D project by government function			
Agriculture	131,385	136,396	3.8
Energy	397,037	323,154	-18.6
Environment and natural resources	422,890	452,270	6.9
Health	1,103,232	1,082,056	-1.9
Transportation	258,419	260,025	0.6
Other[b]	224,383	172,982	-22.9

[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(s):
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(s):
National Center for Science and Engineering Statistics, Survey of State Government Research and Development.

Table 2

State government expenditures for R&D, by state and function: FY 2019

(Thousands of current dollars)

State	Total	Agriculture	Energy	Environment and natural resources	Health	Transportation	Other
United States[a]	2,426,883	136,396	323,154	452,270	1,082,056	260,025	172,982
California	526,919	7,004	202,263	40,710	225,535	34,906	16,500
New York	448,502	10,612	51,408	33,457	315,479	8,843	28,703
Texas	233,030	1,229	0	9,798	204,709	17,295	0
Florida	170,509	11,725	557	52,486	90,373	15,367	0
Ohio	97,758	0	14,558	58,098	3,200	6,887	15,015
Pennsylvania	85,051	3,187	5,324	8,385	53,336	3,914	10,905
Connecticut	57,241	3,857	0	10,599	29,922	3,283	9,580
Washington	51,963	17,797	7,621	16,416	1,189	5,596	3,344
South Carolina	46,983	1,013	87	28,246	14,541	2,159	937
Oregon	44,223	1,639	4,550	19,897	6,000	5,412	6,726
Colorado	36,587	722	3,184	10,799	10,027	3,288	8,567
Louisiana	35,142	270	2,875	11,752	1,533	10,000	8,713
North Carolina	32,754	14,133	1,657	7,936	778	7,960	291
Maine	32,593	7,183	0	12,056	2,468	1,136	9,750
Virginia	29,951	2,765	350	7,211	3,183	12,890	3,552
Oklahoma	29,608	1,059	684	3,698	16,263	6,849	1,055
Maryland	29,108	358	1,182	1,626	22,521	1,735	1,687
Massachusetts	28,425	50	5,049	8,939	6,632	4,425	3,330
Nebraska	28,168	2,852	4	4,758	18,987	1,410	158
Kentucky	26,668	627	2,020	2,531	14,470	7,020	0
New Jersey	23,887	0	0	2,192	15,865	2,717	3,112
Arkansas	21,099	12,519	853	2,426	3,477	855	968
Minnesota	20,151	3,701	0	5,357	0	11,093	0
Alabama	19,763	0	256	9,404	1,080	3,602	5,422
Georgia	18,875	634	6,336	3,872	0	8,034	0
Idaho	17,828	5,349	0	8,365	338	3,339	437

Table 2

State government expenditures for R&D, by state and function: FY 2019

(Thousands of current dollars)

State	Total	Agriculture	Energy	Environment and natural resources	Health	Transportation	Other
Illinois	17,549	3,990	0	0	16	9,459	4,085
Wisconsin	17,474	3,518	0	6,060	1,141	3,755	3,000
Arizona	17,332	1,055	0	1,078	13,843	1,356	0
Missouri	15,056	1,154	0	11,968	104	1,830	0
Alaska	12,502	0	1,102	8,392	320	2,687	0
Indiana	12,357	142	268	0	600	8,496	2,851
Kansas	12,355	3,999	0	3,645	0	3,715	996
Mississippi	12,170	600	0	5,579	0	5,992	0
North Dakota	12,140	2,998	6,229	1,546	30	1,337	0
West Virginia	11,068	25	1,703	4,142	1,297	2,125	1,777
Iowa	9,387	0	0	3,798	61	5,191	337
Montana	8,794	3,133	0	4,147	312	821	383
New Hampshire	8,433	115	9	101	0	807	7,400
Michigan	8,023	1,247	0	1,556	88	5,132	0
Utah	7,986	0	0	4,538	13	3,435	0
Nevada	7,872	185	0	129	0	973	6,585
Tennessee	7,439	0	107	906	0	3,108	3,319
Hawaii	7,326	1,681	2,511	896	0	802	1,437
Wyoming	6,003	529	262	2,152	250	1,429	1,381
Rhode Island	5,512	49	0	3,508	150	1,225	581
District of Columbia	4,222	0	0	2,000	1,716	422	84
Delaware	3,826	0	24	2,701	0	1,101	0
New Mexico	3,586	0	83	2,109	0	1,377	17
South Dakota	2,953	1,691	40	0	0	1,223	0
Vermont	2,731	0	0	308	211	2,212	0

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

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

Source(s):
National Center for Science and Engineering Statistics, Survey of State Government Research and Development, FY 2019.

National Totals

Of the $2.4 billion in state government agency R&D expenditures in FY 2019, 77% came from state and other nonfederal sources; the remainder came from federal sources (table 1). Although state governments are both funders and performers of R&D, the majority (72%) of their expenditures support extramural R&D (i.e., performers other than state agencies). Higher education institutions were the primary recipients of these expenditures, receiving 59% of all extramural funding,[1] followed by companies and individuals (25%). Intramural performers of R&D, the state agencies themselves, totaled $676 million in FY 2019, an increase of 6% from the $635 million in FY 2018.

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 $10 million in FY 2019, down from $14 million reported in FY 2018. R&D plant expenditures are highly variable year to year and will increase or decrease as capital projects begin or end.

State Government R&D Funding and Performance

Overview

Although all state governments had R&D expenditures in FY 2019, the amounts are often concentrated in a handful of states. Specifically, six states (California, New York, Texas, Florida, Ohio, and Pennsylvania) accounted for 64% of all state government R&D expenditures (table 3). Expenditures also vary by state between intramural and extramural R&D. For example, 62% ($277 million) of New York's R&D expenditures are directed toward intramural performance, whereas 86% ($454 million) of California's R&D is directed toward extramural performers.

Table 3

State government expenditures for R&D, by state and performer type: FY 2019

(Thousands of dollars)

State	All R&D expenditures[a]	Intramural performers[b]	Extramural performers[c]			
			Total	Academic institutions	Companies and individuals[d]	Other[e]
United States[f]	2,426,883	676,171	1,750,712	1,024,317	438,222	288,173
Alabama	19,763	7,413	12,350	6,602	143	5,605
Alaska	12,502	8,921	3,582	816	2,412	353
Arizona	17,332	761	16,571	11,069	900	4,602
Arkansas	21,099	66	21,033	20,577	448	9
California	526,919	73,081	453,837	159,255	187,118	107,465
Colorado	36,587	11,901	24,686	11,714	12,536	435
Connecticut	57,241	24,680	32,561	12,121	18,862	1,578
Delaware	3,826	2,559	1,268	742	449	76
District of Columbia	4,222	1,889	2,334	882	1,252	200
Florida	170,509	50,605	119,904	72,946	4,606	42,353
Georgia	18,875	3,540	15,336	10,179	2,801	2,356
Hawaii	7,326	258	7,068	1,560	5,012	496
Idaho	17,828	6,710	11,119	7,096	182	3,840
Illinois	17,549	1,171	16,377	12,314	158	3,906
Indiana	12,357	168	12,189	11,273	917	0
Iowa	9,387	3,279	6,107	5,782	308	17
Kansas	12,355	998	11,357	9,557	42	1,758
Kentucky	26,668	2,038	24,630	20,153	4,477	0
Louisiana	35,142	10,974	24,168	21,247	2,706	215
Maine	32,593	3,051	29,541	3,209	23,393	2,940
Maryland	29,108	989	28,118	25,175	1,703	1,241
Massachusetts	28,425	8,798	19,627	8,960	9,123	1,545
Michigan	8,023	336	7,687	4,128	732	2,826
Minnesota	20,151	2,028	18,123	11,790	3,284	3,049
Mississippi	12,170	1,756	10,415	5,478	2,777	2,160
Missouri	15,056	8,242	6,813	5,233	1,430	151
Montana	8,794	2,994	5,801	4,974	661	165
Nebraska	28,168	770	27,398	25,379	579	1,439
Nevada	7,872	185	7,687	5,577	200	1,910
New Hampshire	8,433	132	8,301	760	7,060	481
New Jersey	23,887	2,796	21,091	15,454	819	4,817
New Mexico	3,586	900	2,686	1,403	1,033	249
New York	448,502	276,774	171,728	109,788	28,123	33,816
North Carolina	32,754	18,400	14,354	11,217	1,447	1,690
North Dakota	12,140	422	11,718	9,154	1,328	1,236

Table 3

State government expenditures for R&D, by state and performer type: FY 2019

(Thousands of dollars)

State	All R&D expenditures[a]	Intramural performers[b]	Extramural performers[c]			
			Total	Academic institutions	Companies and individuals[d]	Other[e]
Ohio	97,758	18,343	79,415	30,770	47,835	810
Oklahoma	29,608	1,685	27,922	20,227	1,261	6,435
Oregon	44,223	24,762	19,461	13,099	5,359	1,002
Pennsylvania	85,051	8,579	76,472	56,916	2,330	17,225
Rhode Island	5,512	2,767	2,745	556	1,623	567
South Carolina	46,983	28,876	18,107	4,550	770	12,787
South Dakota	2,953	361	2,592	1,635	600	356
Tennessee	7,439	1,711	5,729	5,363	203	163
Texas	233,030	3,856	229,175	197,243	30,914	1,018
Utah	7,986	5,046	2,939	1,538	1,402	0
Vermont	2,731	681	2,049	1,723	323	3
Virginia	29,951	10,734	19,218	15,785	2,540	893
Washington	51,963	19,987	31,976	18,756	5,057	8,163
West Virginia	11,068	2,868	8,200	8,048	0	153
Wisconsin	17,474	5,044	12,430	3,653	5,317	3,460
Wyoming	6,003	1,286	4,716	896	3,666	3,666

[a] State R&D expenditures do not include R&D plant.

[b] Intramural performers include a department's or agency's own employees who perform R&D and services performed by others in support of an internal R&D project.

[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.

Source(s):
National Center for Science and Engineering Statistics, Survey of State Government Research and Development, FY 2019.

Intramural R&D Performance

Six states accounted for 70% of the $676 million in expenditures for intramural R&D performed by all state agencies in FY 2019: New York ($277 million), California ($73 million), Florida ($51 million), South Carolina ($29 million), Oregon ($25 million), and Connecticut ($25 million) (table 3). In FY 2019, 42% ($284 million) of all state agency intramural R&D performance was supported by federal funds.[2] New York was recipient of the greatest share at 47% ($134 million) of all federal funds for state-agency performed R&D. South Carolina received the second-largest amount of federal funds used for state agency intramural R&D with $20 million.

The majority (78%) of state government intramural R&D performance in FY 2019 was directed toward applied research ($524 million), whereas basic research constituted approximately 19% ($129 million) of intramural R&D and experimental development was 3% ($23 million) (table 1). All state governments except Michigan and Nevada reported a portion of their intramural R&D as applied research.[3]

Extramural R&D Performance

Six states accounted for 65% of the total $1.8 billion in FY 2019 state government expenditures for extramural R&D performance: California ($454 million), Texas ($229 million), New York ($172 million), Florida ($120 million), Ohio ($79 million), and Pennsylvania ($76 million) (table 3). However, states varied in how they distributed extramural R&D. For example, Texas state agencies directed 86% of their extramural funding for R&D toward higher education institutions ($197 million) compared with 13% ($31 million) to companies and individuals. By comparison, California's distribution of extramural R&D funding is relatively balanced across the three sectors with 35% ($159 million) directed toward higher education, 41% ($187 million) toward companies and individuals, and 24%, ($107 million) toward other performers.

R&D by State Government Functions

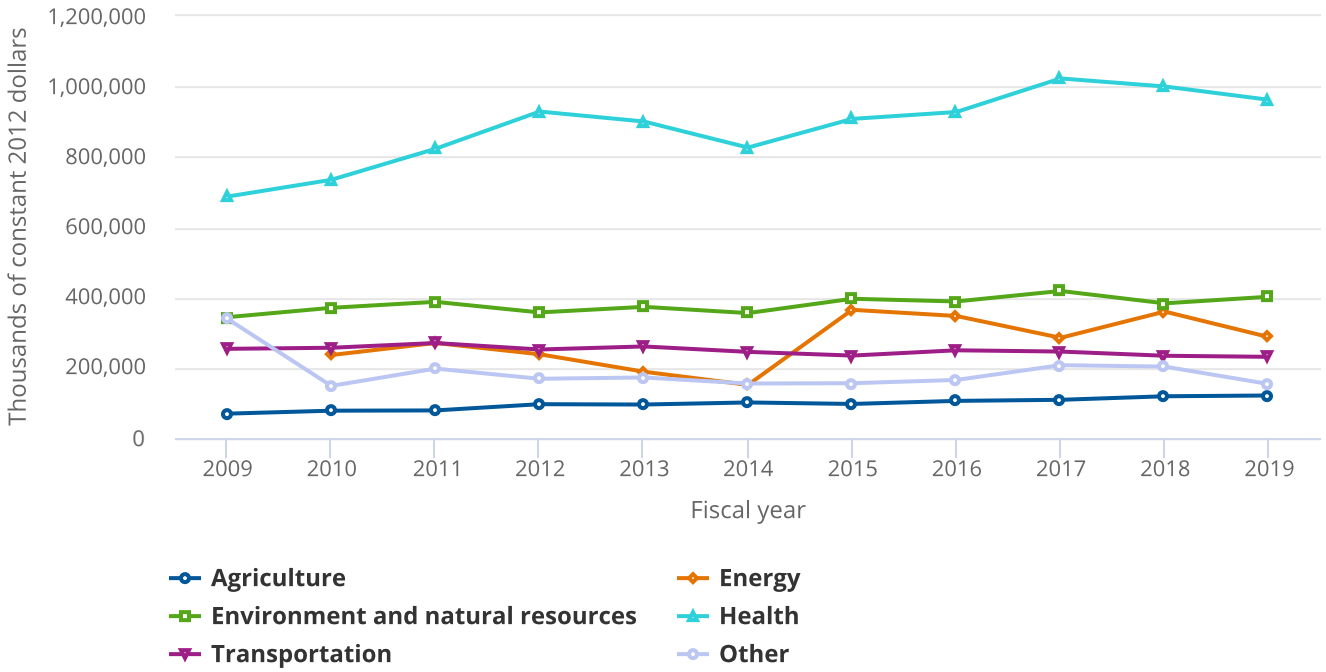
Whether performed by state agencies themselves or by others performers outside the agency, most states reported a broad mix of R&D projects related to state government functions: agriculture, energy, environment and natural resources, health, and transportation (table 2). Health-related R&D expenditures account for the largest share (45%) of state agencies' R&D. Although health-related R&D declined 2% in FY 2019, it had increased each year starting in FY 2014 to an all-time high in FY 2018. Environment and natural resources R&D expenditures accounted for 19% of total state government R&D expenditures in FY 2019. Transportation, agriculture, and all other projects' shares of total R&D expenditures in FY 2019 were 11%, 6%, and 7%, respectively. As a result of state government participation in the Federal Highway Administration Transportation Pooled Funding Program, all states received some federal funding to support transportation-related R&D projects.[4]

Inflation Adjusted 10-Year Time Series

Among all functions, health-related R&D has shown the largest change between FY 2009 and FY 2019 (figure 1). When adjusted for inflation,[5] health R&D expenditures increased 40%, from $687 million in FY 2009 to $962 million in FY 2019. During the same 10-year period, R&D expenditures related to agriculture and environment and natural resources increased 74% and 17%, respectively, whereas transportation decreased 9%, from $254.0 million in FY 2009 to $231 million in FY 2019. The energy function was not collected separately until FY 2010,[6] but it has shown increases in inflation-adjusted expenditures of 22% from FY 2010 to FY 2019.

Figure 1

State government expenditures for R&D, by function: FYs 2009–19



Note(s):
Gross domestic product implicit price deflators were used to convert current to constant dollars. Because of rounding, detail may not add to total. State R&D expenditures by function were surveyed beginning with the FY 2009 survey. State 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. Energy category was introduced with the FY 2010 and FY 2011 Survey of State Government Research and Development. Previously, energy-related R&D was reported primarily in the categories other and environment and natural resources.

Source(s):
National Center for Science and Engineering Statistics, Survey of State Government Research and Development.

Agency-Specific R&D Details

Of all 711 state agencies that responded to the survey in FY 2019, the largest 20, by total expenditures, accounted for 59% of all agency R&D expenditures (table 4). To illustrate how concentrated expenditures are for health-related R&D, these 20 agencies accounted for $898 million of the $1.1 billion in state agency health R&D, or 83% of the R&D funding total. Although most states invest in health-related R&D, it is still highly concentrated. The six largest health agencies reporting R&D expenditures in FY 2019 constitute 72% of all state government health-related R&D. State expenditures for energy-related R&D is even more concentrated: the California Energy Commission alone accounted for 51% of all state agencies' energy-related R&D expenditures. In the case of agriculture, the five largest agencies constitute 39% ($53 million) of all state government investment in agricultural R&D, while the five largest agencies in environment and natural resources and in transportation account for 36% ($161 million) and 35% ($90 million), respectively.[7]

Table 4

Individual state agency expenditures for R&D for the 20 largest agencies, by function: FY 2019

(Thousands of current dollars)

State	Total	Agriculture	Energy	Environment and natural resources	Health	Transportation	Other
United States[a]	2,426,883	136,396	323,154	452,270	1,082,056	260,025	172,982
Cancer Prevention and Research Institute (Texas)	201,159	0	0	0	201,159	0	0
Institute for Regenerative Medicine (California)	184,983	0	0	0	184,983	0	0
Energy Commission (California)	165,441	0	165,441	0	0	0	0
Mental Health, Office of (New York)	156,275	0	0	0	156,275	0	0
Health, Department of (Florida)	89,163	0	0	0	89,163	0	0
Development Services Agency (Ohio)	85,775	0	14,558	53,616	3,200	0	14,400
Health, Department of (New York)	82,781	368	0	2,211	80,202	0	0
Roswell Park Cancer Institute (New York)	71,920	0	0	0	71,920	0	0
Energy Research and Development Authority (New York)	53,547	0	38,192	10,935	0	4,420	0
Fish and Wildlife Conservation Commission (Florida)	52,150	0	0	52,150	0	0	0
Health, Department of (Pennsylvania)	46,293	0	0	0	46,293	0	0
Economic Development, Department of (New York)	39,780	246	5,352	356	5,367	0	28,458
Public Utilities Commission, Executive Division (California)	37,222	0	36,822	0	0	0	400
Transportation, Department of (California)	34,906	0	0	0	0	34,906	0
Technology Institute (Maine)	27,746	6,858	0	36,822	0	0	400
Innovation Inc. (Connecticut)	26,858	0	0	0	17,813	0	9,045
Natural Resources, Department of (South Carolina)	26,063	0	0	26,063	0	0	0
Community and Economic Development, Department of (Pennsylvania)	21,600	1,000	5,000	0	5,000	0	10,600

Table 4

Individual state agency expenditures for R&D for the 20 largest agencies, by function: FY 2019

(Thousands of current dollars)

State	Total	Agriculture	Energy	Environment and natural resources	Health	Transportation	Other
Environmental Health Hazard Assessment, Office of (California)	17,563	0	0	0	17,563	0	0
Health and Human Services (Nebraska)	18,563	0	0	0	18,563	0	0
All other agencies	987,094	127,923	57,790	298,269	184,554	220,698	100,328

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

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

Source(s):
National Center for Science and Engineering Statistics, Survey of State Government Research and Development, FY 2019.

Data Sources and Limitations

Data presented in this InfoBrief are in current dollars, unless specifically cited that they have been adjusted for inflation. All 50 states and the District of Columbia participated in the FY 2019 survey, and 711 of the 747 selected agencies (95%) responded to the survey. Puerto Rico agencies did not report to the survey for FY 2019. Data for the FY 2019 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 2018 begins on 1 July 2017 and ends on 30 June 2018. 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 (12 months) periods as defined by the states.

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 $1.1 billion in FY 2019 expenditures reported by state agencies to support R&D performance by academic institutions differs from the figure reported by universities and colleges in the NCSES Higher Education R&D Survey for expenditures on R&D activities funded from state and local government sources.

State- and agency-specific data not available in this InfoBrief are available in the full set of data tables from this survey in the report *State Government Research and Development: FY 2019* at https://ncses.nsf.gov/pubs/nsf21301/.

Notes

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

2 Data on intramural R&D by source of funds are available in data table 5, available at https://ncses.nsf.gov/pubs/nsf21301/.

3 Data for state government expenditures for intramural R&D, by state and type of R&D (i.e., basic research, applied research, and experimental development) are available in data table 7, available at https://ncses.nsf.gov/pubs/nsf21301/.

4 Data on federal funding for R&D by federal department or agency are available in data table 16, available at https://ncses.nsf.gov/pubs/nsf21301/.

5 Gross domestic product implicit price deflators were used to convert current to constant 2012 dollars. Data on federal fiscal year, historical figures, 1953–2018 can be found in Office of Management and Budget. 2019. *Budget of the U.S. Government, Fiscal Year 2020.* Historical Tables (Table 10.1). Available at https://www.govinfo.gov/features/budget-fy2020. Data on projections for 2019–21 can be found in Office of Management and Budget. 2020. Economic and Budget Analyses. In *Analytical Perspectives, Budget of the U.S. Government, Fiscal Year 2021.* Available at https://www.whitehouse.gov/wp-content/uploads/2020/02/ap_2_assumptions_fy21.pdf.

6 The energy category was introduced with the FY 2010 and FY 2011 Survey of State Government Research and Development. Previously, energy-related R&D was reported primarily in the other category, and to some degree in the environment and natural resources category.

7 Data on individual state agency expenditures by function are available in data table 21, available at https://ncses.nsf.gov/pubs/nsf21301/.

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