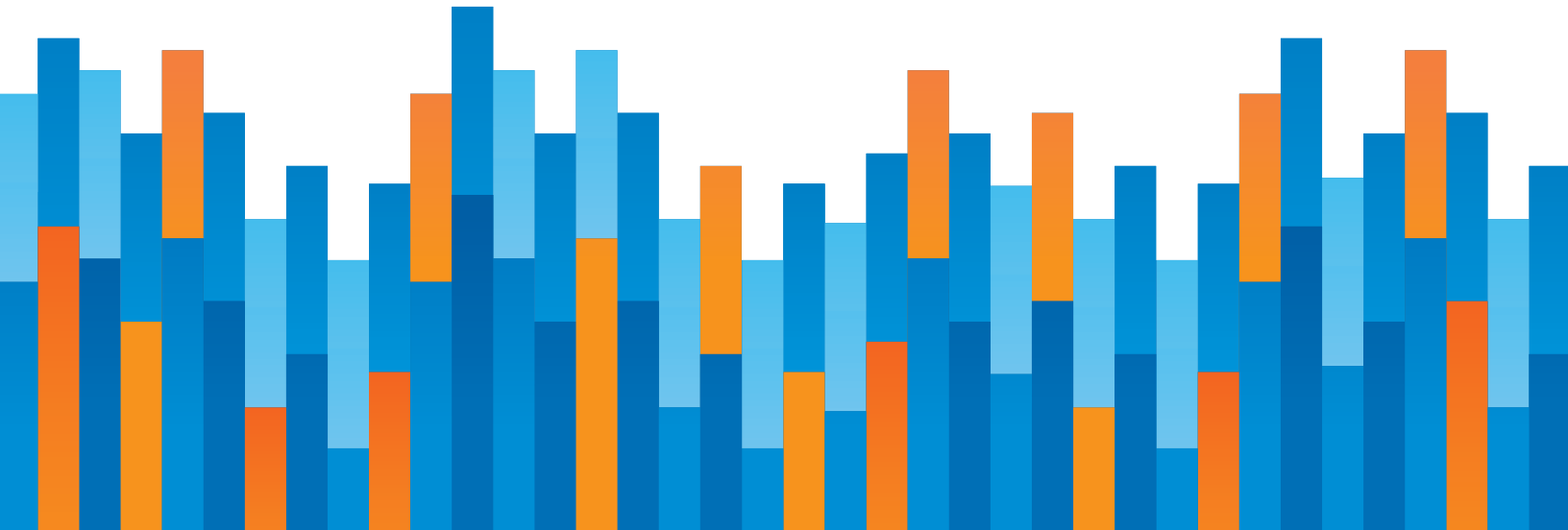
reason FOUNDATION

25TH ANNUAL HIGHWAY REPORT

by Baruch Feigenbaum, Spence Purnell, and Joseph Hillman

November 2020



Reason Foundation's mission is to advance a free society by developing, applying, and promoting libertarian principles, including individual liberty, free markets, and the rule of law. We use journalism and public policy research to influence the frameworks and actions of policymakers, journalists, and opinion leaders.

Reason Foundation's nonpartisan public policy research promotes choice, competition, and a dynamic market economy as the foundation for human dignity and progress. Reason produces rigorous, peer-reviewed research and directly engages the policy process, seeking strategies that emphasize cooperation, flexibility, local knowledge, and results. Through practical and innovative approaches to complex problems, Reason seeks to change the way people think about issues, and promote policies that allow and encourage individuals and voluntary institutions to flourish.

Reason Foundation is a tax-exempt research and education organization as defined under IRS code 501(c)(3). Reason Foundation is supported by voluntary contributions from individuals, foundations, and corporations. The views are those of the author, not necessarily those of Reason Foundation or its trustees.

TABLE OF CONTENTS

PART 1

STATE HIGHWAY PERFORMANCE RANKINGS

Reason's *25th Annual Highway Report* rates state highway systems on cost versus quality using a method developed in the early 1990s by David T. Hartgen, Ph.D., emeritus professor at the University of North Carolina at Charlotte. This method has since been refined by Hartgen, M. Gregory Fields, Ph.D ., Baruch Feigenbaum, and Spence Purnell. Since states have different budgets, system sizes, and traffic and geographic circumstances, their comparative performance depends on both system performance and the resources available. To determine relative performance across the country, state highway system budgets (per mile of responsibility) are compared with system performance, state by state. States with high ratings typically have better-than-average system conditions (good for road users) along with relatively low per-mile expenditures (good for taxpayers).

The following table shows the overall highway performance of the state highway systems using 2018 and 2019 data. This year's leading states are North Dakota, Missouri, Kansas, Kentucky, and Idaho**.** At the other end of the rankings are New Jersey, Alaska, Delaware, Massachusetts, and Rhode Island.

Unlike 2016, but similar to prior years, the top-performing states tend to be less populated and more rural. Very rural states may have a slight advantage (Tables 1, 2, 3, 4, and Figure

1). But a number of states with large urban areas also rank highly: Missouri (2nd), Tennessee (7th), Ohio (13th), North Carolina (14th), and Minnesota (15th). Although it is tempting to ascribe these ratings solely to geographic circumstances, a more careful review suggests that numerous other factors—terrain, climate, truck volumes, urbanization, system age, budget priorities, unit cost differences, state budget circumstances, and management/maintenance philosophies, just to name a few—are all affecting overall performance. The remainder of this report reviews the statistics underlying these overall ratings in more detail.

TABLE 1: OVERALL HIGHWAY PERFORMANCE RANKINGS, 2018

Overall	State
1	North Dakota
2	Missouri
3	Kansas
4	Kentucky
5	Idaho
6	South Carolina
7	Tennessee
8	Mississippi
9	Arkansas
10	Montana
11	South Dakota
12	Nebraska
13	Ohio
14	North Carolina
15	Minnesota
16	New Mexico
17	Utah
18	Texas
19	Alabama
20	Iowa
21	Virginia
22	Wisconsin
23	Arizona
24	Michigan
25	Maine
26	Georgia
27	Nevada
28	Oregon
29	New Hampshire
30	Vermont
31	Louisiana
32	Indiana
33	West Virginia
34	Oklahoma
35	Connecticut
36	Wyoming
37	Illinois
38	Colorado
39	Pennsylvania
40	Florida
41	Maryland
42	Hawaii
43	California
44	New York
45	Washington
46	Rhode Island
47	Massachusetts
48	Delaware
49	Alaska
50	New Jersey

TABLE 2: OVERALL HIGHWAY PERFORMANCE RANKINGS IN ALPHABETICAL ORDER, 2018

State	Overall
Alabama	19
Alaska	49
Arizona	23
Arkansas	9
California	43
Colorado	38
Connecticut	35
Delaware	48
Florida	40
Georgia	26
Hawaii	42
Idaho	5
Illinois	37
Indiana	32
Iowa	20
Kansas	3
Kentucky	4
Louisiana	31
Maine	25
Maryland	41
Massachusetts	47
Michigan	24
Minnesota	15
Mississippi	8
Missouri	2
Montana	10
Nebraska	12
Nevada	27
New Hampshire	29
New Jersey	50
New Mexico	16
New York	44
North Carolina	14
North Dakota	1
Ohio	13
Oklahoma	34
Oregon	28
Pennsylvania	39
Rhode Island	46
South Carolina	6
South Dakota	11
Tennessee	7
Texas	18
Utah	17
Vermont	30
Virginia	21
Washington	45
West Virginia	33
Wisconsin	22
Wyoming	36

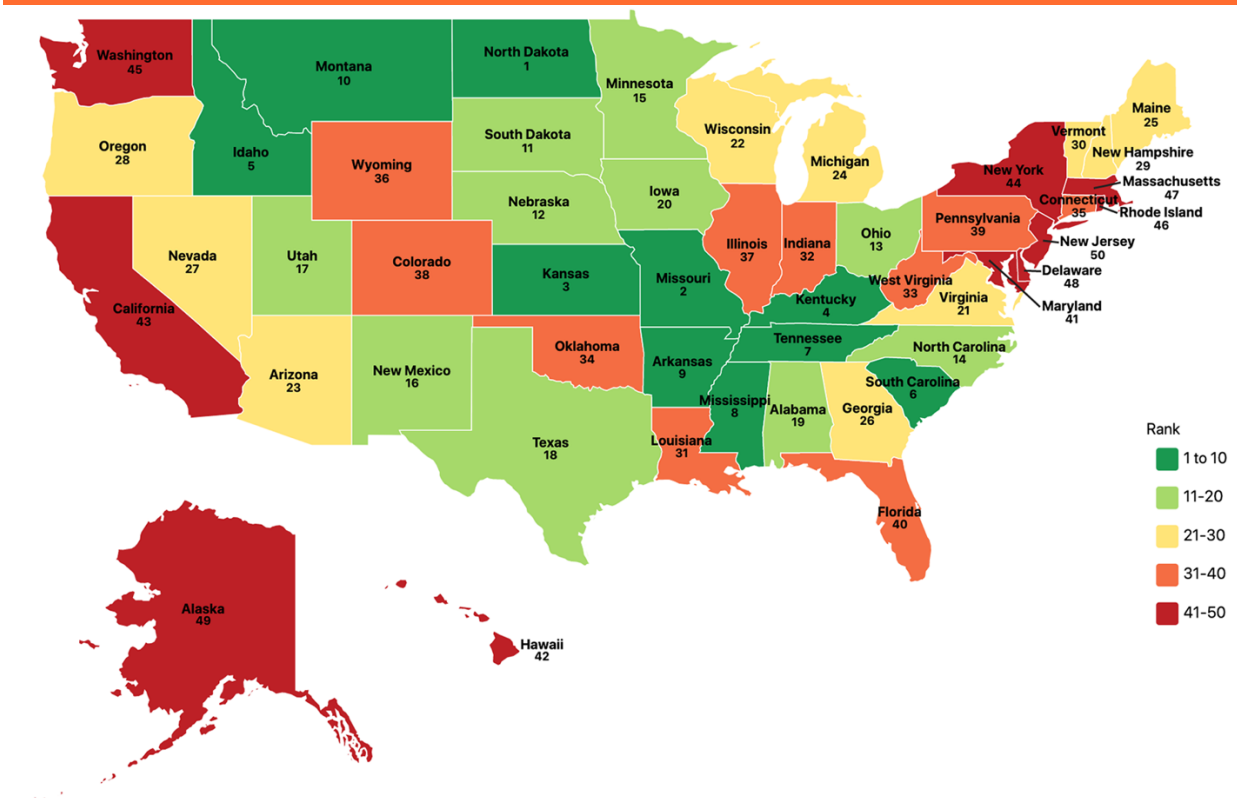
TABLE 3: HIGHWAY PERFORMANCE RANKINGS BY CATEGORY, 2018

State	Overall	Total Disbursements per Mile	Capital & Bridge Disbursements per Mile	Maintenance Disbursements per Mile	Admin Disbursements per Mile	Rural Interstate Pavement Condition	Urban Interstate Pavement Condition	Rural Arterial Pavement Condition	Urban Arterial Pavement Condition	Urbanized Area Congestion	Structurally Deficient Bridges	Overall Fatality Rate	Rural Fatality Rate	Urban Fatality Rate
Alabama	19	18	32	4	36	25	36	14	3	19	9	37	29	36
Alaska	49	48	49	46	42	48	17	50	21	5	38	44	46	49
Arizona	23	17	26	5	37	37	10	26	10	31	3	47	31	48
Arkansas	9	9	25	6	2	35	34	27	19	12	11	39	40	46
California	43	40	40	42	47	41	44	38	48	45	24	18	35	29
Colorado	38	26	28	34	40	47	33	16	30	37	18	29	30	33
Connecticut	35	42	43	38	31	1	12	35	29	28	26	12	7	27
Delaware	48	47	41	49	50	NA	47	1	20	50	8	24	48	17
Florida	40	45	47	41	33	9	14	3	1	34	6	40	38	43
Georgia	26	22	9	24	43	32	15	7	2	42	7	26	8	38
Hawaii	42	35	36	32	28	NA	49	48	38	4	22	23	50	47
Idaho	5	11	11	12	9	22	3	6	11	1	23	35	36	39
Illinois	37	37	42	31	19	21	32	36	26	49	32	15	16	22
Indiana	32	27	24	43	18	45	43	21	7	32	21	19	25	21
Iowa	20	25	34	19	16	18	27	43	31	2	48	16	15	7
Kansas	3	7	3	7	15	8	22	4	13	11	17	32	45	12
Kentucky	4	10	10	21	1	17	19	10	14	13	25	45	21	34
Louisiana	31	20	6	26	5	43	48	45	37	35	44	48	11	45
Maine	25	24	20	33	6	28	4	47	34	33	45	11	9	1
Maryland	41	46	45	44	29	27	41	22	35	47	15	7	1	24
Massachusetts	47	49	48	40	49	30	26	39	45	48	36	1	2	8
Michigan	24	15	19	22	20	42	46	17	39	26	41	14	6	25
Minnesota	15	19	14	30	23	33	35	24	6	36	14	2	3	4
Mississippi	8	2	8	3	12	31	23	23	27	9	37	49	42	42
Missouri	2	1	1	9	4	10	16	12	22	20	33	31	23	30
Montana	10	13	18	13	14	24	11	34	36	14	28	42	37	2
Nebraska	12	8	16	25	3	16	31	32	47	7	34	25	22	14
Nevada	27	30	33	20	41	20	24	2	5	18	2	27	41	37
New Hampshire	29	23	15	27	44	1*	1	30	25	27	35	22	34	18
New Jersey	50	50	50	50	48	36	45	46	44	40	29	3	4	23
New Mexico	16	16	2	1	38	23	18	28	33	17	20	41	27	50
New York	44	44	39	48	34	40	42	40	46	29	39	5	44	5
North Carolina	14	14	21	14	8	19	6	20	16	25	40	30	49	26
North Dakota	1	4	12	2	7	5	5	19	28	3	42	21	28	10
Ohio	13	21	22	16	21	29	29	18	42	21	19	13	5	15
Oklahoma	34	31	31	35	35	34	39	42	24	16	43	43	20	31
Oregon	28	34	29	28	32	11	25	13	18	38	16	38	43	19
Pennsylvania	39	43	37	39	30	38	40	33	32	43	46	28	10	32
Rhode Island	46	41	44	45	39	1	7	49	49	46	50	4	26	16
South Carolina	6	3	5	8	11	14	20	29	9	15	31	50	47	44
South Dakota	11	6	4	10	26	13	13	25	17	23	47	36	32	9
Tennessee	7	5	7	18	27	12	8	9	8	24	10	33	18	35
Texas	18	28	30	23	10	15	28	11	40	41	1	34	33	40
Utah	17	36	35	29	24	7	9	15	4	6	4	6	17	28
Vermont	30	33	27	37	45	5	1	44	23	30	5	10	12	3
Virginia	21	32	17	36	22	4	21	5	15	44	13	17	13	11
Washington	45	39	38	47	46	46	38	31	43	39	12	8	19	20
West Virginia	33	38	46	17	13	39	30	41	12	10	49	46	24	41
Wisconsin	22	29	13	11	25	44	37	37	41	22	27	9	14	13
Wyoming	36	12	23	15	17	26	50	8	50	8	30	20	39	6

TABLE 4: OVERALL HIGHWAY PERFORMANCE RANKING TRENDS, 2015-2018

State	Year			Change in Rank	
	2015	2016	2018	2016-2018	2015-2018
Alabama	17	10	19	-9	-2
Alaska	48	49	49	0	-1
Arizona	16	29	23	6	-7
Arkansas	29	32	9	23	20
California	42	43	43	0	-1
Colorado	31	36	38	-2	-7
Connecticut	46	44	35	9	11
Delaware	19	42	48	-6	-29
Florida	35	40	40	0	-5
Georgia	18	26	26	0	-8
Hawaii	47	47	42	5	5
Idaho	7	13	5	8	2
Illinois	28	28	37	-9	-9
Indiana	34	33	32	1	2
Iowa	15	31	20	11	-5
Kansas	2	6	3	3	-1
Kentucky	13	5	4	1	9
Louisiana	37	34	31	3	6
Maine	23	4	25	-21	-2
Maryland	40	39	41	-2	-1
Massachusetts	44	46	47	-1	-3
Michigan	32	30	24	6	8
Minnesota	25	22	15	7	10
Mississippi	11	25	8	17	3
Missouri	9	3	2	1	7
Montana	6	8	10	-2	-4
Nebraska	4	15	12	3	-8
Nevada	20	27	27	0	-7
New Hampshire	30	24	29	-5	1
New Jersey	50	50	50	0	0
New Mexico	24	21	16	5	8
New York	45	45	44	1	1
North Carolina	14	17	14	3	0
North Dakota	1	1	1	0	0
Ohio	26	18	13	5	13
Oklahoma	33	41	34	7	-1
Oregon	21	12	28	-16	-7
Pennsylvania	41	35	39	-4	2
Rhode Island	49	48	46	2	3
South Carolina	5	20	6	14	-1
South Dakota	3	14	11	3	-8
Tennessee	12	7	7	0	5
Texas	22	23	18	5	4
Utah	10	9	17	-8	-7
Vermont	39	19	30	-11	9
Virginia	27	2	21	-19	6
Washington	43	37	45	-8	-2
West Virginia	36	16	33	-17	3
Wisconsin	38	38	22	16	16
Wyoming	8	11	36	-25	-28

FIGURE 1: OVERALL HIGHWAY PERFORMANCE RANK, 2018



Despite some minor methodological changes, the overall rankings were not dramatically different from the previous version of the *Annual Highway Report*. However, five states' overall ranking improved by double digits, while six states' overall ranking declined by 10 or more spots:

- **Arkansas improved 23 positions from 32nd to 9th in the overall rankings,** as that state saw improvements in many categories with the most notable improvements in urban Interstate, urban arterial, and rural arterial pavement conditions.
- **Mississippi improved 17 positions from 25th to 8th in the overall ranking**, as the state improved in all categories except its urban fatality rate. The most notable improvement was a 14-position gain for urban Interstate pavement condition. Mississippi's ranking last year may have been an aberration, as the year prior the state ranked 11th in the overall ranking.
- **Wisconsin improved 16 positions from 38th to 22nd in the overall ranking**, as the state moved up 27 positions in the capital and bridge disbursements category and 7 positions in both the maintenance disbursement and rural arterial categories.

- **South Carolina improved 14 positions from 20th to 6th in the overall rankings,** as the state made notable improvements in rural Interstate and rural arterial pavement conditions relative to other states.
- **Iowa improved 11 positions from 31st to 20th in the overall ranking**, as the state saw noticeable improvement in rural Interstate pavement condition and overall fatality rate.
- **Wyoming declined 25 positions from 11th to 36th in the overall rankings,** as the state's urban Interstate and arterial pavement conditions deteriorated. Wyoming now ranks 50th in both categories.
- **Maine declined 21 positions from 4th to 25th in the overall rankings,** as the state saw dramatic drops of 26, 40, and 26 positions for rural Interstate pavement, rural arterial pavement, and urbanized area congestion rankings, respectively. Maine's ranking last year may have been an aberration, as the year prior the state was 23rd in the overall ranking.
- **Virginia declined 19 positions from 2nd to 21st in the overall ranking**, as the state declined in most categories, with a prominent 20-position drop in its total disbursements per mile ranking. Virginia's ranking last year may have been an aberration, as the prior year the state was 27th in the overall ranking.
- **West Virginia declined 17 positions from 16th to 33rd in the overall rankings,** as that state saw large drops in numerous categories, most notably falling 43 and 36 positions, respectively, for the total disbursement and bridge and capital disbursement rankings. West Virginia's ranking last year may have been an aberration, as the prior year the state was 27th in the overall ranking.
- **Oregon declined 16 positions from 12th to 29th in the overall ranking**, as the state's urbanized area congestion levels rank fell 21 positions and its bridge and capital disbursement ranking fell 16 positions.
- **Vermont declined 11 positions from 19th to 30th in the overall ranking**, as the state dropped 20 positions in the urbanized area congestion ranking and 7 positions in the total disbursement ranking. Vermont's ranking last year may have been an aberration, as the year prior the state ranked 39th in the overall ranking.

PART 2

METHODOLOGICAL CHANGE

The *Annual Highway Report*'s goal is to provide an accurate, current evaluation of state highway systems. In order to meet that goal, we made one change to better measure disbursements. The change is described in this section, and the report's technical and quantitative metrics are detailed in the appendix:

- **Calculate disbursement rankings using an average of centerline-miles, lane-miles, and vehicle-miles traveled per lane-mile.** Centerline-miles are the length of the highway system (a five-mile road equals five centerline-miles). Lane-miles are the length of the highway system multiplied by the number of lanes on a highway (a five-mile road with two lanes equals 10 lane-miles while a five-mile road with six lanes equals 30 lane-miles). Vehicle-miles traveled per lane-mile are the total amount of miles traveled on the state highway system divided by the lane-miles in the state (100,000 vehicle-miles traveled per year divided by 200 miles of roadway equals 500 vehicle-miles traveled per lane).

  In previous years, we used centerline-miles because the cost of building the first mile of a highway from Point A to Point B (including right of way acquisition and pre-construction) is much more expensive than the cost to build an additional mile of that highway also from Point A to Point B. However, as more populated states widen their roadways and less populated states do not, the average width (number

of lanes) of a state roadway differs significantly from 2.06 in West Virginia to 3.66 in New Jersey.

As a result, last year we switched to lane-miles. However, to provide a richer dataset, this year we decided to measure disbursements in three ways: lane-miles that we used in last year's report, centerline-miles that we used in previous years' reports, and vehicle-miles traveled per lane-mile. While a centerline-miles ranking may favor rural, less-populated states, a vehicle-miles traveled per lane-mile ranking may favor urban, more-populated states. Therefore, we believe measuring disbursements in three ways will be an accurate, yet richer dataset.

We believe this change will improve the quality of the report. Next year, we will evaluate the results and may make additional changes if needed.

PART 3

BACKGROUND DATA

State highway system sizes range from approximately 1,000 miles to more than 80,000 miles. States with larger geographic areas and larger populations tend to have larger systems. Some states, such as North Carolina, maintain all of their roads on the state level, except for subdivision and other local roads. Other states, such as Florida, have robust county road systems. State-controlled highway mileage and state highway agency miles are not included in the rankings. They are included in this report as background information and are used to weight the financial data.

STATE-CONTROLLED MILES

State-controlled mileage encompasses the state highway systems, state agency toll roads, some ferry services, and smaller systems serving universities and state-owned properties. It includes the Interstate System, the National Highway System, and most federal aid system roads. Nationwide in 2018, 857,048 miles were under state control (Table 5, State-Controlled Highway Mileage), 43,641 miles more than in 2016 (813,407), the last time this assessment was completed. Small annual changes in state-controlled miles are to be expected as state systems are expanded to meet increasing needs. Often jurisdictions assume responsibility for mileage previously under state control. The smallest state-owned road systems are Hawaii (1,016 miles) and Rhode Island (1,201 miles); the largest are North Carolina (81,104 miles) and Texas (80,861 miles).

TABLE 5: STATE-CONTROLLED HIGHWAY MILEAGE

2018 Size	State	Mileage
1	North Carolina	81,104
2	Texas	80,861
3	Virginia	59,068
4	Pennsylvania	41,653
5	South Carolina	41,379
6	West Virginia	34,690
7	Missouri	33,991
8	Arkansas	29,804
9	Kentucky	28,245
10	Ohio	20,385
11	New Mexico	19,937
12	Idaho	18,110
13	Georgia	18,060
14	Illinois	16,739
15	Louisiana	16,707
16	New York	16,535
17	California	15,996
18	Washington	15,540
19	Montana	15,266
20	Tennessee	14,352
21	Minnesota	13,662
22	Oklahoma	13,412
23	Florida	12,193
24	Wisconsin	11,743
25	Indiana	11,507
26	Arizona	11,233
27	Alabama	11,086
28	Mississippi	11,014
29	Kansas	10,527
30	Nebraska	10,075
31	Colorado	9,891
32	Michigan	9,693
33	South Dakota	9,524
34	Iowa	9,520
35	Oregon	9,126
36	Maine	8,639
37	Alaska	8,452
38	North Dakota	7,463
39	Wyoming	7,241
40	Utah	6,278
41	Nevada	5,664
42	Delaware	5,508
43	Maryland	5,454
44	Connecticut	4,059
45	New Hampshire	4,009
46	Massachusetts	3,659
47	New Jersey	3,149
48	Vermont	2,628
49	Rhode Island	1,201
50	Hawaii	1,016
	U.S. Total	857,048
	Average	17,141

STATE HIGHWAY AGENCY (SHA) MILES

State highways are generally the Interstates and other major US-numbered and state-numbered roads (major and minor arterials). A few states also manage major portions of the rural road system (collectors and local roads). In 2018, 780,212 miles were the responsibility of the 50 state highway agencies (Table 6, State Highway Agency Mileage), 755 miles more than in 2016 (779,457), the last time this assessment was completed.

For calculating state rankings, we use an average ratio of centerline-miles, lane-miles and VMT as described in Part 2. In 2018, the 50 state highway agencies were responsible for 1,881,842 lane-miles. The average number of lanes *per mile* is 2.53 lanes, but a few states (Florida, New Jersey, California, and Massachusetts) manage significantly wider roads, averaging more than 3.0 lanes per mile.

TABLE 6: STATE HIGHWAY AGENCY MILEAGE, BY AVERAGE NUMBER OF LANES/MILE

2018 Size	State	SHA Miles	SHA Lane-Miles	Ratio
1	Florida	12,104	44,425	3.67
2	New Jersey	2,334	8,563	3.67
3	California	15,091	52,264	3.46
4	Massachusetts	3,006	9,564	3.18
5	Arizona	6,784	19,685	2.90
6	Maryland	5,164	14,827	2.87
7	Michigan	9,676	27,444	2.84
8	Georgia	17,946	49,339	2.75
9	Alabama	10,935	29,734	2.72
10	Utah	5,884	15,820	2.69
11	Tennessee	13,920	37,424	2.69
12	Illinois	15,900	42,094	2.65
13	Connecticut	3,719	9,839	2.65
14	Hawaii	946	2,497	2.64
15	Washington	7,051	18,458	2.62
16	Rhode Island	1,101	2,864	2.60
17	Mississippi	10,921	28,231	2.59
18	Indiana	11,135	28,752	2.58
19	Ohio	19,249	49,636	2.58
20	Iowa	8,893	22,821	2.57
21	Colorado	9,034	22,937	2.54
22	Nevada	5,404	13,716	2.54
23	Wisconsin	11,743	29,739	2.53
24	New York	15,079	38,152	2.53
25	Minnesota	11,733	29,240	2.49
26	Oklahoma	12,249	30,413	2.48
27	Idaho	4,982	12,315	2.47
28	New Mexico	11,953	29,500	2.47
29	Texas	80,455	196,528	2.44
30	Oregon	7,608	18,483	2.43
31	Louisiana	16,682	39,328	2.36
32	Wyoming	6,745	15,788	2.34
33	Kansas	10,288	24,005	2.33
34	North Dakota	7,393	17,204	2.33
35	South Dakota	7,752	17,952	2.32
36	Arkansas	16,467	37,951	2.30
37	Missouri	33,838	77,708	2.30
38	Vermont	2,628	5,999	2.28
39	Montana	11,023	25,185	2.28
40	Nebraska	9,945	22,558	2.27
41	Kentucky	27,671	62,216	2.25
42	Pennsylvania	39,730	88,265	2.22
43	Delaware	5,430	11,903	2.19
44	South Carolina	41,296	90,524	2.19
45	Virginia	59,020	128,377	2.18
46	North Carolina	80,011	172,887	2.16
47	New Hampshire	3,903	8,427	2.16
48	Maine	8,350	17,515	2.10
49	Alaska	5,633	11,736	2.08
50	West Virginia	34,408	71,0010	2.06
	U.S. Total	780,212	1,881,842	2.40
	Weighted Average	15,604	37,637	

PART 4

PERFORMANCE INDICATORS

The *Annual Highway Report* ranks each state in 13 categories. Four of the categories measure **spending**: Capital and Bridge Disbursements, Maintenance Disbursements, Administrative Disbursements, and Total Disbursements. The remaining nine categories measure **performance**. Four of the categories measure pavement quality: Rural Interstate Pavement Condition, Urban Interstate Pavement Condition, Rural Other Principal Arterial Pavement Condition, and Urban Other Principal Arterial Pavement Condition. One of the categories measures congestion: Urban Area Congestion. Four of the categories measure safety: Structurally Deficient Bridges, Overall Fatality Rate, Rural Fatality Rate, and Urban Fatality Rate.

The four spending categories are considered together, weighted equally, and then averaged to get one overall spending score. The nine performance categories are also considered together, weighted equally, and then averaged to get one overall performance score. Then the spending and performance composite scores are added together, weighted by the number of metrics, and averaged to create one total score for each state. Therefore, each measure, whether spending efficiency or system performance, is weighted equally.

This part of the report includes detailed data and trends for each category. Rankings include a table showing the state, the ranking and a composite score. Each ranking also includes a color-coded map with the composite score for each state.

CAPITAL AND BRIDGE DISBURSEMENTS

Capital and bridge disbursements are the costs to build new, and widen existing, highways and bridges. Capital and bridge disbursements for state-owned roads equal 50.8% of total disbursements, totaling $77.15 billion in 2018, about 7.5% more than was spent in 2016 ($71.75 billion), the last time this assessment was completed.

This year, we measure capital and bridge disbursements per state highway agency (SHA), lane-mile, and vehicle-mile traveled (VMT) per lane-mile. Last year, we measured them in lane-miles and in past years we measured them in centerline-miles. The average 2018 centerline-mile disbursement is $151,137, a 71.3% increase from 2016's $88,212 per mile. The average 2018 lane-mile disbursement is $46,805, a 27.6% increase from 2016's $36,681. The average 2018 disbursement per VMT is $28,290 (Table 7, Capital and Bridge Disbursements by State, 2018, Figure 2). This significant increase accelerates a decade-long trend of steady increase in spending. Since 2007, these per-mile disbursements have increased about 97%, while the Consumer Price Index (CPI) has increased about 22%.[1]

In 2018, Missouri, New Mexico, Kansas, South Dakota, and South Carolina reported the lowest capital and bridge expenditures. New Jersey, Alaska, Massachusetts, Florida, and West Virginia reported the highest expenditures. In terms of disbursements per lane-mile, the largest percentage shifts from 2016 to 2018 were West Virginia and Alabama (which increased per lane-mile expenditures by more than 105%) and Idaho and North Dakota (which decreased per lane-mile expenditures by more than 50%).

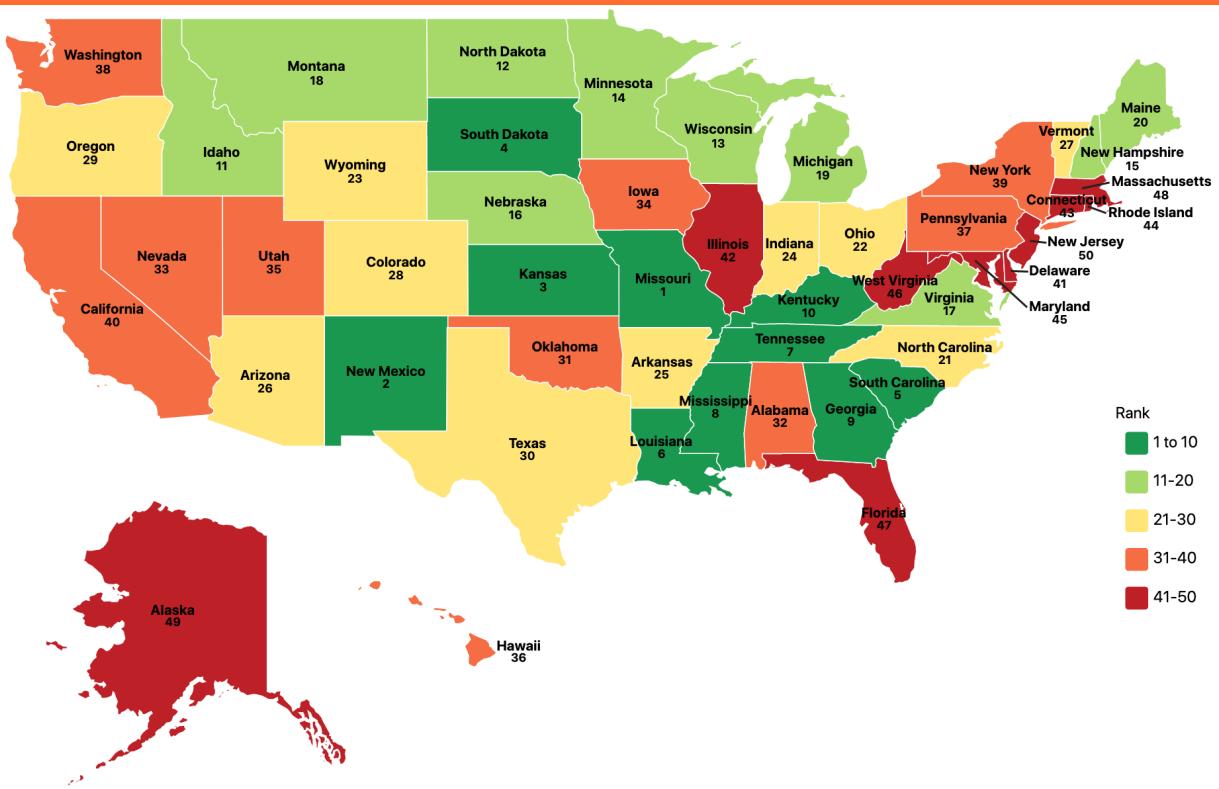
In terms of disbursements per SHA, the largest percentage shifts from 2016 to 2018 were West Virginia and California (which increased per lane-mile expenditures by 128% and 121%, respectively) and North Dakota and Wisconsin (which decreased per lane-mile expenditures by 52% and 37%, respectively). Some of the disbursements per state-controlled mile can vary widely from year to year—reflecting funding actions and project schedules.

1 "U.S. Consumer Price Index Data from 2013 to 2020." https://www.usinflationcalculator.com, Inflation Calendar, April 10, 2019. https://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/, 21 May 2020.

TABLE 7: CAPITAL AND BRIDGE DISBURSEMENTS BY STATE, 2018

2018 Rank	State	Z Score	Disbursement Per SHA	Disbursement Per Lane Mile	Disbursement Per VMT
1	Missouri	-2.27	$27,180	$11,780	$12,010
2	New Mexico	-2.08	$36,790	$8,940	$16,120
3	Kansas	-1.84	$46,830	$19,620	$14,970
4	South Dakota	-1.78	$28,090	$9,870	$22,410
5	South Carolina	-1.74	$29,470	$13,420	$21,430
6	Louisiana	-1.65	$51,580	$21,850	$17,190
7	Tennessee	-1.50	$80,800	$29,150	$13,830
8	Mississippi	-1.50	$65,030	$24,950	$17,440
9	Georgia	-1.47	$89,290	$32,270	$12,190
10	Kentucky	-1.46	$42,190	$18,380	$23,570
11	Idaho	-1.41	$85,620	$9,530	$24,090
12	North Dakota	-1.40	$35,690	$15,190	$26,770
13	Wisconsin	-1.36	$82,870	$32,720	$14,770
14	Minnesota	-1.35	$84,500	$29,120	$16,400
15	New Hampshire	-1.15	$71,490	$32,240	$20,260
16	Nebraska	-1.14	$54,940	$23,910	$26,050
17	Virginia	-1.09	$43,260	$19,870	$29,920
18	Montana	-1.01	$40,490	$12,800	$35,150
19	Michigan	-0.99	$127,270	$44,790	$12,030
20	Maine	-0.95	$52,720	$24,290	$29,780
21	North Carolina	-0.93	$47,930	$21,880	$31,660
22	Ohio	-0.88	$109,010	$39,920	$18,330
23	Wyoming	-0.87	$51,380	$20,450	$33,200
24	Indiana	-0.87	$117,000	$43,850	$15,980
25	Arkansas	-0.86	$72,890	$17,470	$32,730
26	Arizona	-0.83	$163,070	$33,940	$16,720
27	Vermont	-0.62	$79,840	$34,970	$28,560
28	Colorado	-0.60	$122,650	$44,120	$20,540
29	Oregon	-0.43	$121,500	$41,690	$25,090
30	Texas	-0.33	$102,010	$41,550	$29,100
31	Oklahoma	-0.32	$108,950	$40,070	$29,370
32	Alabama	-0.16	$146,870	$53,280	$22,570
33	Nevada	0.02	$141,080	$53,030	$26,920
34	Iowa	0.07	$123,940	$45,120	$33,120
35	Utah	0.07	$149,630	$52,160	$27,450
36	Hawaii	0.31	$203,780	$71,880	$17,710
37	Pennsylvania	0.32	$103,870	$44,600	$40,410
38	Washington	0.39	$248,150	$43,010	$28,060
39	New York	0.48	$192,050	$69,220	$23,450
40	California	0.84	$303,400	$82,650	$13,130
41	Delaware	1.08	$102,620	$46,150	$54,740
42	Illinois	1.25	$217,340	$77,980	$32,010
43	Connecticut	1.36	$243,550	$84,350	$28,670
44	Rhode Island	1.46	$234,550	$82,660	$32,240
45	Maryland	1.85	$299,850	$98,880	$25,900
46	West Virginia	2.50	$54,560	$26,220	$96,540
47	Florida	4.52	$552,000	$149,300	$30,120
48	Massachusetts	4.53	$584,450	$150,910	$26,310
49	Alaska	4.87	$126,260	$40,390	$129,620
50	New Jersey	10.93	$1,256,600	$253,860	$37,820
	Average		$151,138	$46,805	$28,289

FIGURE 2: CAPITAL AND BRIDGE DISBURSEMENTS PER STATE-CONTROLLED LANE-MILE



MAINTENANCE DISBURSEMENTS

Maintenance disbursements are the costs to perform routine upkeep, such as filling in potholes and repaving roads. Maintenance disbursements comprise about 16.8% of total disbursements, totaling $26.55 billion in 2018, up 13.8% from 2016 ($23.33 billion), the last time this assessment was completed.

This year we measure maintenance disbursements per SHA, lane-mile, and vehicle-miles traveled per lane-mile. Last year, we measured them in lane-miles, while in prior years we used centerline-miles. The average 2018 per-mile disbursement is $15,952 (Table 8, Maintenance Disbursements by State, 2018, Figure 3), up 33.7% from $11,929 in 2016. This increase maintains a generally steady spending trend over the last decade. Since 2007, these per-mile disbursements have increased about 54%, while the Consumer Price Index (CPI) has increased about 22%.[2]

In 2016, New Mexico, North Dakota, Mississippi, Alabama, and Arizona reported the lowest overall maintenance expenditures. New Jersey, Delaware, New York, Washington, and Alaska reported the highest overall expenditures. In terms of disbursements per lane-mile, the largest percentage shifts from 2016 to 2018 were Alabama and New Mexico with increases of 82% and 52%, respectively, and Idaho and Arkansas with decreases of 156% and 94%, respectively.

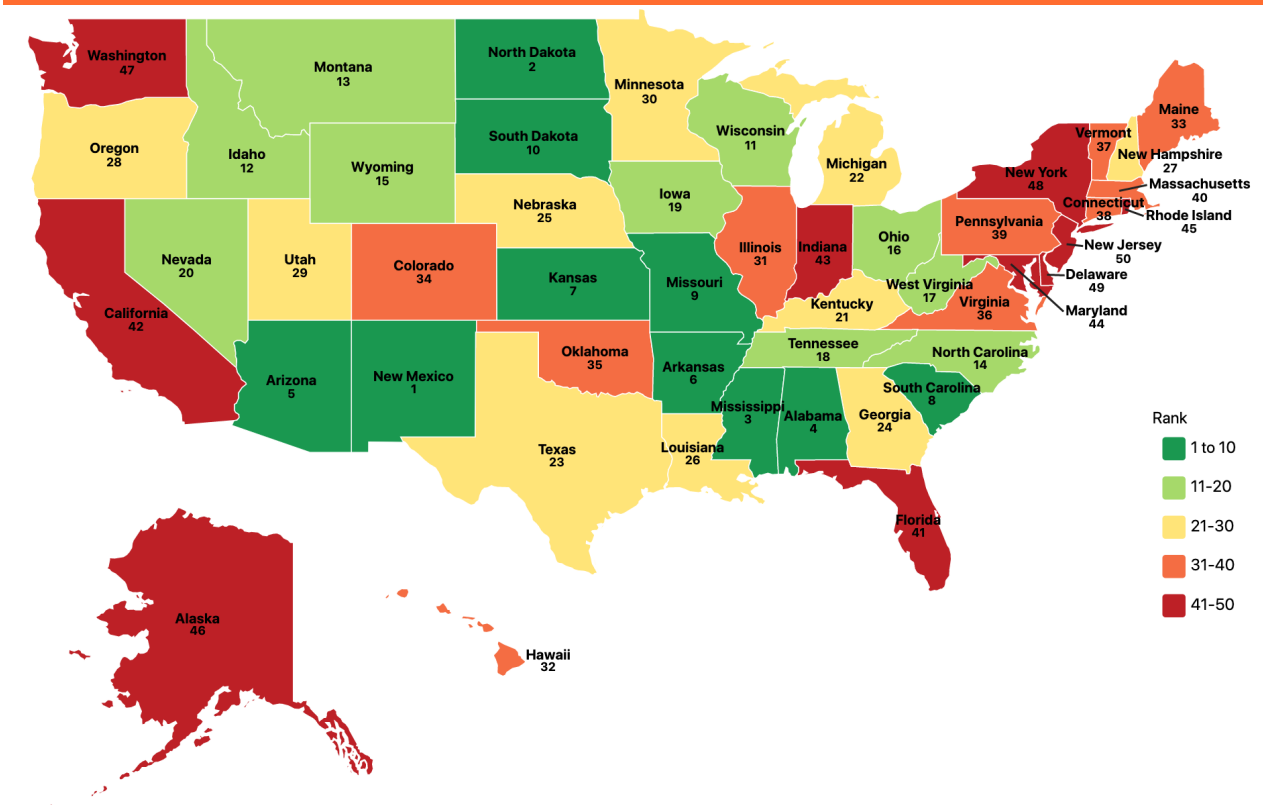
When using SHA miles, the largest percentage shifts from 2016 to 2018 were Alabama and Washington with increases of 458% and 300%, respectively, and Oklahoma and West Virginia, each with decreases of more than 30%. Some of the disbursements per state-controlled mile can vary widely from year to year—reflecting funding actions and project schedules.

[2] "U.S. Consumer Price Index Data from 2013 to 2019." https://www.usinflationcalculator.com.

TABLE 8: MAINTENANCE DISBURSEMENTS BY STATE, 2018

2018 Rank	State	Z Score	Disbursement Per SHA	Disbursement Per Lane-Mile	Disbursement Per VMT
1	New Mexico	-2.86	$4,069	$989	$1,782
2	North Dakota	-2.68	$3,871	$1,648	$2,903
3	Mississippi	-2.40	$10,470	$4,016	$2,807
4	Alabama	-2.25	$15,424	$5,595	$2,370
5	Arizona	-2.21	$22,341	$4,650	$2,291
6	Arkansas	-2.11	$12,515	$3,000	$5,619
7	Kansas	-2.01	$14,082	$5,898	$4,501
8	South Carolina	-1.90	$9,626	$4,382	$6,998
9	Missouri	-1.69	$15,090	$6,541	$6,667
10	South Dakota	-1.65	$11,437	$4,020	$9,123
11	Wisconsin	-1.63	$23,419	$9,248	$4,174
12	Idaho	-1.59	$27,669	$3,079	$7,784
13	Montana	-1.54	$11,718	$3,703	$10,170
14	North Carolina	-1.52	$13,207	$6,030	$8,724
15	Wyoming	-1.47	$14,253	$5,672	$9,210
16	Ohio	-1.46	$27,287	$9,992	$4,588
17	West Virginia	-1.46	$6,746	$3,242	$11,936
18	Tennessee	-1.42	$27,979	$10,094	$4,789
19	Iowa	-1.33	$24,969	$9,089	$6,672
20	Nevada	-1.32	$28,024	$10,534	$5,348
21	Kentucky	-1.32	$16,451	$7,168	$9,188
22	Michigan	-1.17	$37,622	$13,241	$3,555
23	Texas	-1.16	$25,366	$10,332	$7,236
24	Georgia	-1.08	$35,471	$12,820	$4,842
25	Nebraska	-1.08	$20,313	$8,840	$9,631
26	Louisiana	-0.94	$25,868	$10,956	$8,623
27	New Hampshire	-0.84	$28,273	$12,748	$8,010
28	Oregon	-0.65	$38,350	$13,160	$7,918
29	Utah	-0.45	$42,712	$14,889	$7,837
30	Minnesota	-0.23	$45,558	$15,700	$8,844
31	Illinois	-0.09	$51,047	$18,315	$7,518
32	Hawaii	0.19	$63,537	$22,413	$5,521
33	Maine	0.33	$30,145	$13,890	$17,026
34	Colorado	0.43	$57,297	$20,612	$9,594
35	Oklahoma	0.50	$48,803	$17,951	$13,158
36	Virginia	0.64	$29,124	$13,378	$20,142
37	Vermont	0.75	$43,253	$18,948	$15,473
38	Connecticut	1.00	$74,360	$25,753	$8,753
39	Pennsylvania	1.12	$45,794	$19,661	$17,818
40	Massachusetts	1.31	$108,328	$27,972	$4,877
41	Florida	1.66	$111,309	$30,106	$6,074
42	California	1.74	$116,491	$31,733	$5,040
43	Indiana	1.83	$82,730	$31,004	$11,299
44	Maryland	2.14	$103,216	$34,037	$8,917
45	Rhode Island	2.70	$99,506	$35,068	$13,679
46	Alaska	3.63	$42,374	$13,555	$43,501
47	Washington	4.65	$180,764	$31,331	$20,437
48	New York	5.38	$147,572	$53,190	$18,017
49	Delaware	6.60	$86,808	$39,040	$46,308
50	New Jersey	8.92	$338,380	$68,361	$10,186
	Average		$50,020	$15,952	$9,950

FIGURE 3: MAINTENANCE DISBURSEMENTS PER STATE-CONTROLLED LANE-MILE



ADMINISTRATIVE DISBURSEMENTS

Administrative disbursements typically include general and main-office expenditures in support of state-administered highways. They do not include project-related costs but occasionally include "parked" funds, which are funds from bond sales or asset sales awaiting later expenditure. Therefore, they can vary widely from year to year. Administrative disbursements comprise about 6.3% of total disbursements, totaling $9.52 billion in 2018, an increase of 8.1% from $8.81 billion in 2016, the last time this assessment was calculated.

This year, we measure administrative disbursements per SHA, lane-mile, and vehicle-miles traveled per lane-mile. Last year, we used lane-miles. In past years, we measured them in centerline-miles. The average 2018 per-mile disbursement is $6,443 (Table 9, Administrative Disbursements per State, 2018, Figure 4). The average disbursement per lane-mile increased 43% from 2016 ($4,501 disbursement per mile average), the last time this assessment was calculated. There is a generally steady increased spending trend over the last decade. Since 2007, these per-mile disbursements have increased about 65%, while the Consumer Price Index (CPI) has increased about 22%.[3]

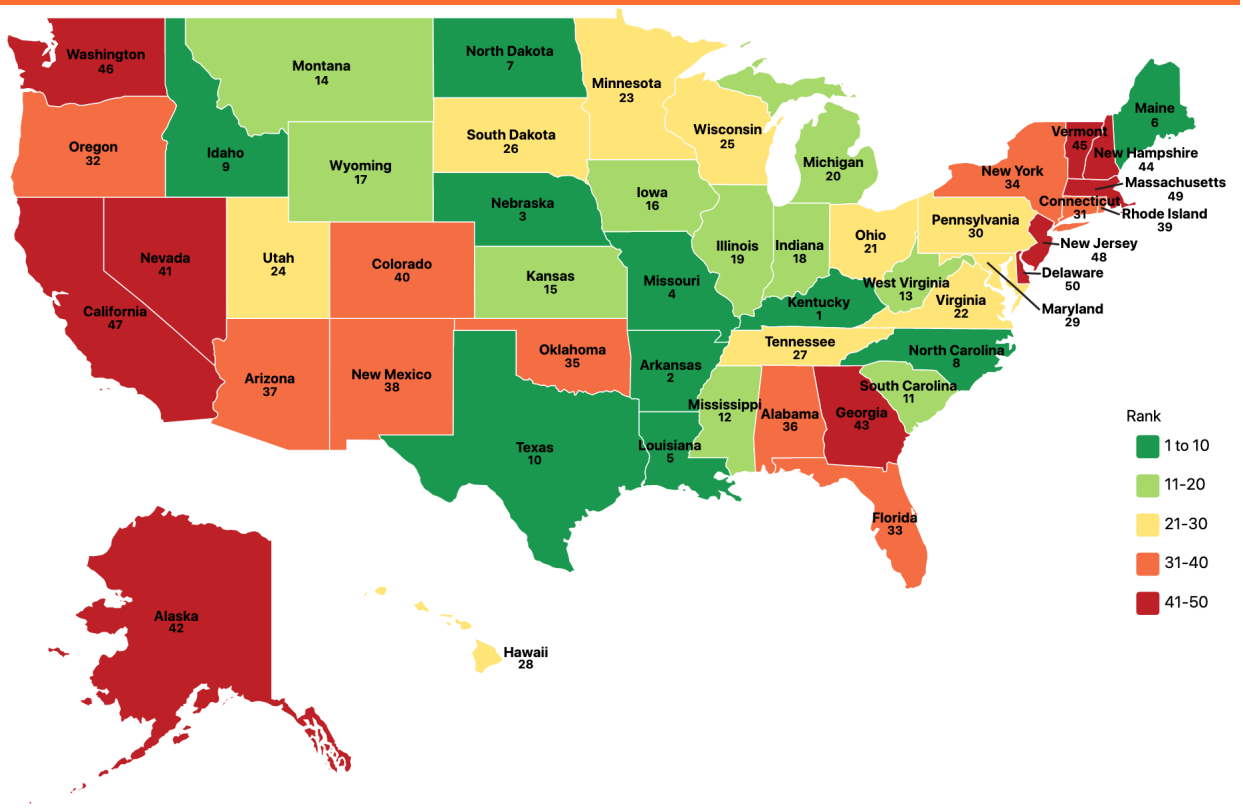
In 2018, Kentucky, Arkansas, Nebraska, Missouri, and Louisiana reported the lowest administrative expenditures. Delaware, Massachusetts, New Jersey, California, and Washington reported the highest expenditures. In terms of disbursements per lane-mile, the largest percentage shifts from 2016 to 2018 were New Hampshire and Colorado (both saw over 100% decreases) and Connecticut and Idaho (with increases of over 65%). In terms of disbursements per SHA, the largest percentage shifts from 2016 to 2018 were Washington and New Hampshire (which increased by 260% and 149%, respectively) and Connecticut and Wyoming (which decreased by 77% and 36%, respectively). Some of the disbursements per state-controlled mile can vary widely from year to year—reflecting funding actions and project schedules.

[3] "U.S. Consumer Price Index Data from 2013 to 2019." https://www.usinflationcalculator.com.

TABLE 9: ADMINISTRATIVE DISBURSEMENTS BY STATE, 2018

2018 Rank	State	Z Score	Disbursement Per SHA	Disbursement Per Lane-Mile	Disbursement Per VMT
1	Kentucky	-2.69	$1,171	$510	$654
2	Arkansas	-2.56	$2,228	$534	$1,000
3	Nebraska	-2.54	$1,937	$843	$918
4	Missouri	-2.46	$2,340	$1,014	$1,034
5	Louisiana	-2.36	$3,175	$1,345	$1,058
6	Maine	-2.27	$2,829	$1,304	$1,598
7	North Dakota	-2.20	$2,775	$1,181	$2,081
8	North Carolina	-2.13	$3,185	$1,454	$2,104
9	Idaho	-2.11	$6,726	$748	$1,892
10	Texas	-2.10	$4,856	$1,978	$1,385
11	South Carolina	-2.08	$3,199	$1,456	$2,325
12	Mississippi	-2.05	$5,353	$2,053	$1,435
13	West Virginia	-2.04	$1,890	$908	$3,344
14	Montana	-2.01	$3,411	$1,078	$2,960
15	Kansas	-1.95	$5,416	$2,268	$1,731
16	Iowa	-1.89	$6,408	$2,333	$1,712
17	Wyoming	-1.85	$4,476	$1,781	$2,892
18	Indiana	-1.56	$9,796	$3,671	$1,338
19	Illinois	-1.24	$12,067	$4,330	$1,777
20	Michigan	-1.20	$13,503	$4,752	$1,276
21	Ohio	-0.78	$14,718	$5,390	$2,475
22	Virginia	-0.71	$8,365	$3,843	$5,786
23	Minnesota	-0.68	$15,231	$5,249	$2,957
24	Utah	-0.65	$15,623	$5,446	$2,867
25	Wisconsin	-0.57	$15,402	$6,082	$2,745
26	South Dakota	-0.41	$9,386	$3,299	$7,487
27	Tennessee	-0.40	$17,313	$6,246	$2,964
28	Hawaii	-0.39	$19,835	$6,997	$1,724
29	Maryland	-0.25	$21,640	$7,136	$1,869
30	Pennsylvania	-0.10	$14,073	$6,042	$5,476
31	Connecticut	-0.07	$21,454	$7,430	$2,525
32	Oregon	0.23	$21,024	$7,214	$4,341
33	Florida	0.38	$30,739	$8,314	$1,677
34	New York	0.63	$26,053	$9,391	$3,181
35	Oklahoma	0.66	$21,471	$7,898	$5,789
36	Alabama	0.76	$25,754	$9,342	$3,957
37	Arizona	0.90	$35,868	$7,465	$3,679
38	New Mexico	0.97	$21,733	$5,279	$9,520
39	Rhode Island	1.51	$32,019	$11,284	$4,402
40	Colorado	1.65	$31,380	$11,288	$5,254
41	Nevada	1.98	$31,980	$12,021	$6,103
42	Alaska	2.16	$16,387	$5,242	$16,823
43	Georgia	2.16	$36,294	$13,118	$4,955
44	New Hampshire	2.29	$28,216	$12,723	$7,994
45	Vermont	2.36	$26,754	$11,720	$9,571
46	Washington	2.37	$51,422	$8,913	$5,814
47	California	3.12	$56,936	$15,510	$2,463
48	New Jersey	4.00	$75,725	$15,298	$2,279
49	Massachusetts	6.85	$93,662	$24,185	$4,217
50	Delaware	11.34	$60,559	$27,235	$32,305
	Average		$19,875	$6,443	$4,154

FIGURE 4: ADMINISTRATIVE DISBURSEMENTS PER STATE-CONTROLLED LANE-MILE



The Difference Between Maintenance and Administrative Disbursements

Certain disbursement data can be counted in one of several categories. One example is benefits (vacation, health care, etc.) of state department of transportation maintenance workers. Certain states such as New Jersey count the benefits as a maintenance disbursement since the employees are conducting routine highway maintenance. Other states such as Connecticut count the benefits as an administrative disbursement since benefits are an administrative expense. As a result, it is important to look at both the individual disbursement categories and disbursements as a whole, as states have some leeway in their classification of certain expenditures.

TOTAL DISBURSEMENTS

Since capital and bridge, maintenance, and administrative disbursements make up the majority of expenditures (74.6% in 2018), this report measures them individually and collectively. Total Disbursements include those three funding categories, plus three others: Highway Law Enforcement and Safety, Interest, and Bond Retirement. In total, the 50 states disbursed about $151.8 billion for state-owned roads in 2018, a 9.2% increase from $139.0 billion in 2016, the last time this assessment was completed.

This year, we measure average state disbursement per SHA, lane-mile, and vehicle-miles traveled per lane-mile. Last year, we measured average state disbursements per lane-mile. In past years, we measured them in centerline-miles. The average 2018 per mile disbursement is $94,870 per lane-mile and $308,558 per SHA, up 33.4% (from $71,117 per lane-mile) and 80.4% (from $171,035 per SHA) from 2016. These increases are significantly higher than in previous years. Since 2007, these per-mile disbursements have increased about 130%, while the Consumer Price Index (CPI) has increased about 22%.[4]

In 2018, Missouri, Mississippi, South Carolina, North Dakota, and Tennessee reported the lowest expenditures. New Jersey, Massachusetts, Alaska, Delaware, and Maryland reported the highest per-mile expenditures. In terms of disbursements per lane-mile, the largest percentage shifts from 2016 to 2018 were Idaho and North Dakota (with increases of more than 70% and 45%, respectively) and Alabama and West Virginia (with decreases of more than 60%).

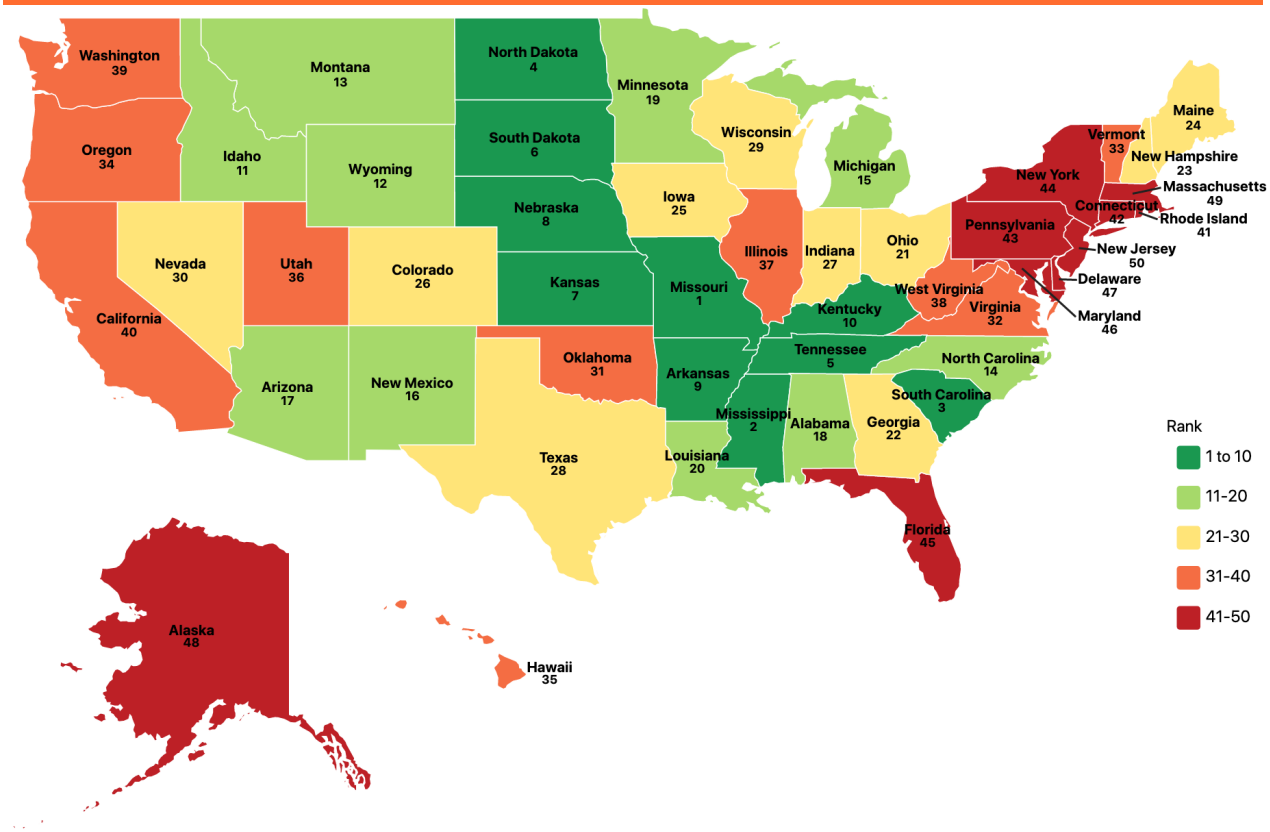
In terms of disbursements per SHA, the largest percentage shifts from 2016 to 2018 were Washington and Oregon (which increased by 146% and 89%, respectively) and North Dakota and Kentucky (which decreased by 45% and 22%, respectively). Some of the disbursements per state-controlled mile can vary widely from year to year—reflecting funding actions and project schedules.

[4] "U.S. Consumer Price Index Data from 2013 to 2019." https://www.usinflationcalculator.com

TABLE 10: TOTAL DISBURSEMENTS BY STATE, 2018

2018 Rank	State	Z Score	Disbursement per SHA	Disbursement per Lane Mile	Disbursement Per VMT
1	Missouri	-2.10	$60,571	$26,257	$26,759
2	Mississippi	-1.98	$92,741	$35,574	$24,867
3	South Carolina	-1.98	$46,293	$21,076	$33,656
4	North Dakota	-1.93	$47,253	$20,115	$35,445
5	Tennessee	-1.87	$128,677	$46,421	$22,026
6	South Dakota	-1.70	$53,966	$18,968	$43,044
7	Kansas	-1.65	$102,264	$42,833	$32,684
8	Nebraska	-1.53	$85,030	$37,003	$40,316
9	Arkansas	-1.52	$98,223	$23,547	$44,102
10	Kentucky	-1.42	$80,255	$34,969	$44,824
11	Idaho	-1.42	$159,626	$17,765	$44,907
12	Wyoming	-1.35	$76,041	$30,261	$49,137
13	Montana	-1.35	$62,315	$19,694	$54,086
14	North Carolina	-1.31	$74,738	$34,122	$49,368
15	Michigan	-1.22	$237,808	$83,698	$22,471
16	New Mexico	-1.21	$117,328	$28,502	$51,393
17	Arizona	-1.17	$284,460	$59,205	$29,175
18	Alabama	-1.16	$201,622	$73,139	$30,980
19	Minnesota	-1.11	$187,741	$64,697	$36,447
20	Louisiana	-1.11	$131,730	$55,793	$43,911
21	Ohio	-1.07	$201,063	$73,628	$33,809
22	Georgia	-1.06	$221,257	$79,969	$30,205
23	New Hampshire	-1.01	$148,948	$67,162	$42,200
24	Maine	-0.98	$97,150	$44,766	$54,870
25	Iowa	-0.89	$171,777	$62,530	$45,899
26	Colorado	-0.88	$219,751	$79,052	$36,795
27	Indiana	-0.85	$239,002	$89,568	$32,642
28	Texas	-0.84	$163,901	$66,761	$46,755
29	Wisconsin	-0.78	$215,185	$84,970	$38,353
30	Nevada	-0.50	$235,642	$88,579	$44,967
31	Oklahoma	-0.29	$213,242	$78,437	$57,491
32	Virginia	-0.26	$110,010	$50,535	$76,085
33	Vermont	-0.16	$179,239	$78,520	$64,122
34	Oregon	-0.14	$263,028	$90,259	$54,307
35	Hawaii	-0.10	$374,574	$132,132	$32,548
36	Utah	0.04	$293,391	$102,274	$53,831
37	Illinois	0.43	$357,791	$128,373	$52,697
38	West Virginia	0.72	$67,120	$32,259	$118,757
39	Washington	1.06	$583,723	$101,175	$65,994
40	California	1.07	$681,141	$185,549	$29,470
41	Rhode Island	1.11	$438,564	$154,558	$60,290
42	Connecticut	1.36	$495,676	$171,664	$58,343
43	Pennsylvania	1.76	$275,551	$118,305	$107,215
44	New York	2.18	$565,644	$203,876	$69,058
45	Florida	2.66	$884,395	$239,203	$48,259
46	Maryland	3.35	$799,894	$263,777	$69,103
47	Delaware	3.87	$313,457	$140,970	$167,214
48	Alaska	3.91	$199,094	$63,688	$204,392
49	Massachusetts	4.71	$1,264,325	$326,464	$56,918
50	New Jersey	11.69	$2,825,682	$570,856	$85,056
	Average		$308,558	$94,870	$53,945

FIGURE 5: TOTAL DISBURSEMENTS PER STATE-CONTROLLED LANE-MILE



RURAL INTERSTATE PAVEMENT CONDITION

Rural Interstates are typically four- to six-lane highways connecting urban areas. One measurement of roadway condition is pavement condition. In most states road pavement condition is measured using special machines that determine the roughness of road surfaces. A few states continue to use visual ratings, which are then converted to roughness. In 2018, about 1.89% of U.S. rural Interstates—598 miles out of 29,186—were reported to be in poor condition. (Table 11, Percent Rural Interstate Mileage in Poor Condition, 2018, Figure 6). This is a slight improvement from 2016, the last time this assessment was completed, when 566 miles out of 28,820 (about 1.96%) of rural Interstate pavement was rated poor.

Rural Interstate mileage in poor condition varies widely by state. In 2018, two states reported no poor mileage (Connecticut and Rhode Island) and 14 more reported less than 1% poor mileage. On the other hand, three states (Alaska, Colorado, and Washington) reported more than 5% poor mileage. The three states together have about 7% of U.S. rural Interstate mileage (2,079 miles of 29,044), but have 32% of the poor-condition mileage.

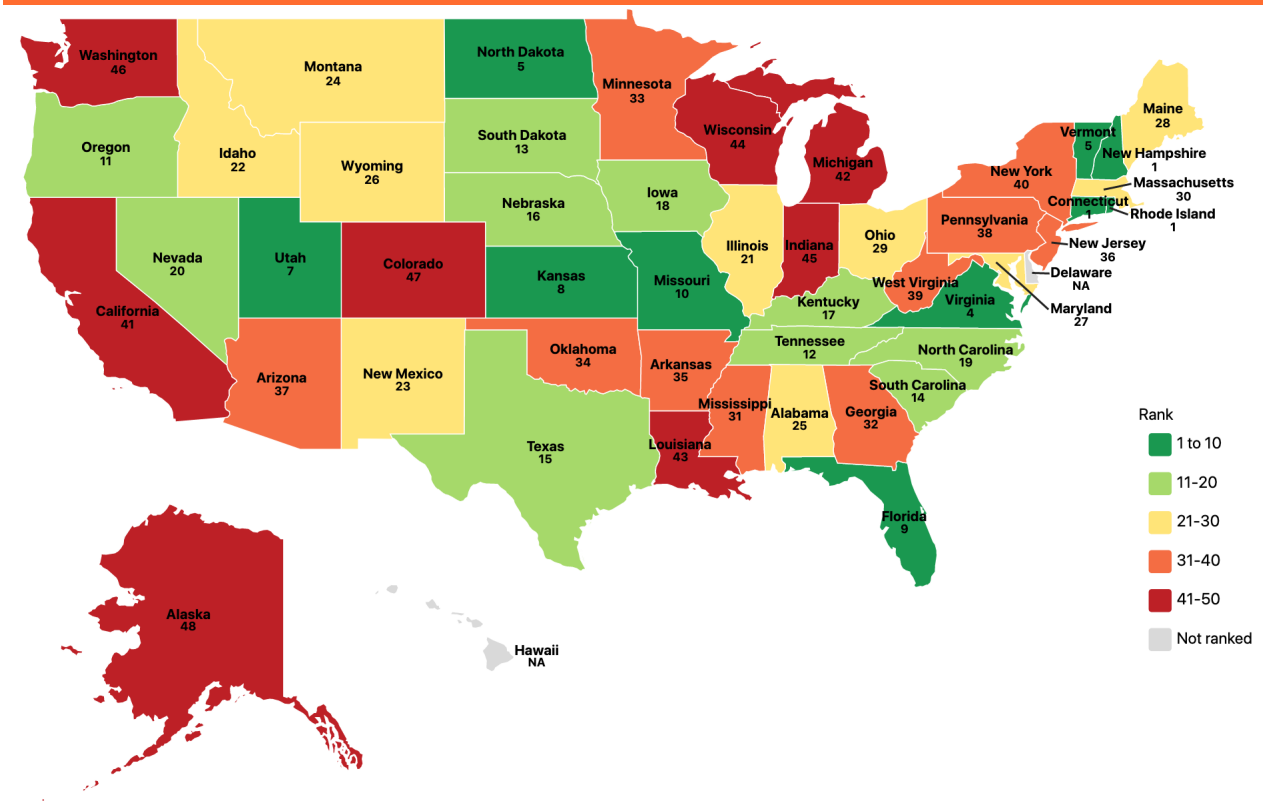
Delaware and Hawaii are the only states with no rural mileage in their Interstate systems.

TABLE 11: PERCENT RURAL INTERSTATE MILEAGE IN POOR CONDITION

2016 Rank	State	Percent Rural Interstate Mileage in Poor Condition
1	Connecticut	0.00
1	New Hampshire	0.00*
1	Rhode Island	0.00
4	Virginia	0.30
5	Vermont	0.40
5	North Dakota	0.40
7	Utah	0.44
8	Kansas	0.47
9	Florida	0.56
10	Missouri	0.59
11	Oregon	0.61
12	Tennessee	0.62
13	South Dakota	0.68
14	South Carolina	0.73
15	Texas	0.75
16	Nebraska	0.97
17	Kentucky	0.99
18	Iowa	1.03
19	North Carolina	1.07
20	Nevada	1.11
21	Illinois	1.13
22	Idaho	1.15
23	New Mexico	1.19
24	Montana	1.19
25	Alabama	1.23
26	Wyoming	1.24
27	Maryland	1.41
28	Maine	1.43
29	Ohio	1.56
30	Massachusetts	1.56
31	Mississippi	1.73
32	Georgia	1.86
33	Minnesota	1.87
34	Oklahoma	2.02
35	Arkansas	2.05
36	New Jersey	2.22
37	Arizona	2.30
38	Pennsylvania	2.33
39	West Virginia	2.51
40	New York	2.77
41	California	2.97
42	Michigan	3.41
43	Louisiana	3.42
44	Wisconsin	3.52
45	Indiana	4.41
46	Washington	6.29
47	Colorado	6.79
48	Alaska	11.78
	Delaware	N/A
	Hawaii	N/A
	Average	1.89

* New Hampshire's rural Interstate mileage data are from 2016.

FIGURE 6: PERCENT OF RURAL INTERSTATES IN POOR CONDITION



URBAN INTERSTATE PAVEMENT CONDITION

The urban Interstates consist of major multi-lane highways in urbanized areas. The pavement condition of the urban Interstate system worsened from 2016 to 2018, increasing from 5.18% in poor condition to 5.23% (Table 12, Percent Urban Interstate Mileage in Poor Condition, 2018, Figure 7). In 2018, 1,003 of the 19,161 miles of urban Interstates were rated as poor, as compared to 958 poor-condition miles out of 18,505 miles in 2016, the last time this assessment was completed.

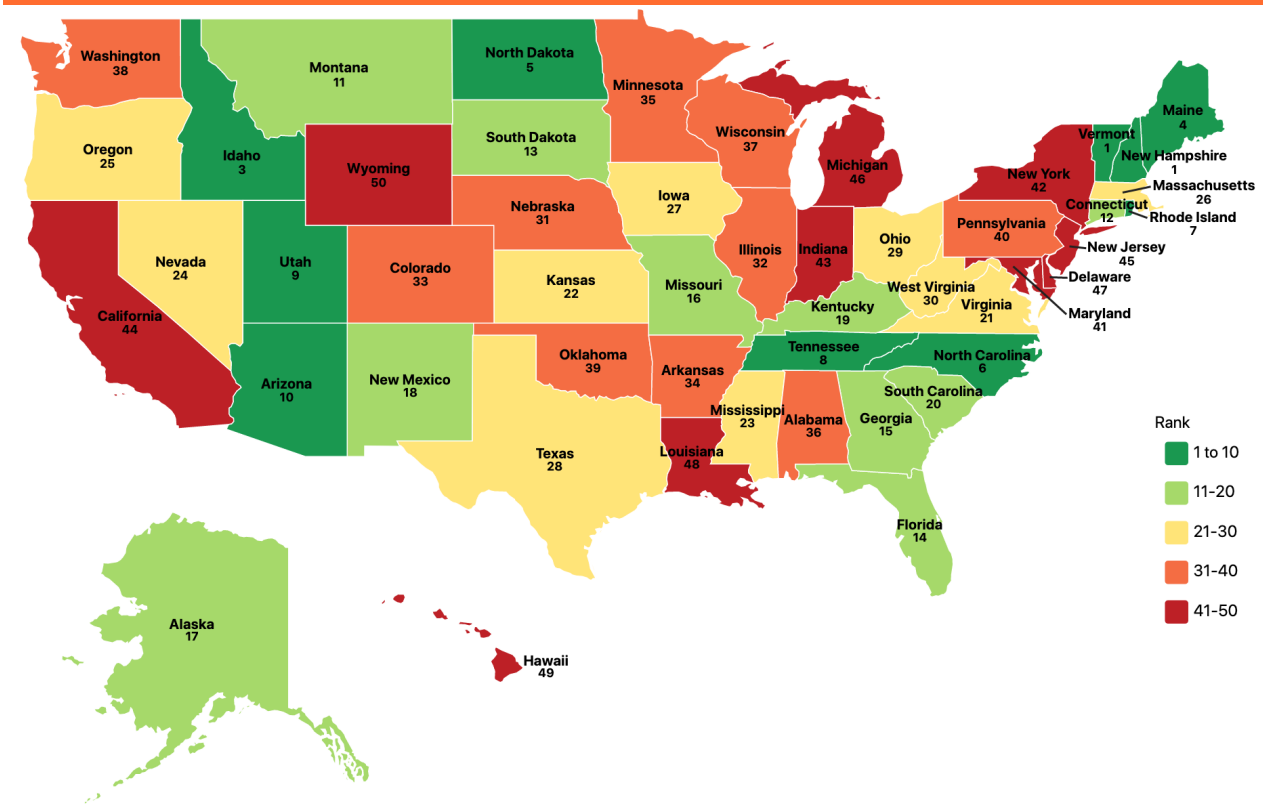
Between 2016 and 2018, the percentage of poor urban Interstate mileage increased in 18 states, decreased in 26 states and remained about the same in six states. The percent of poor mileage changed less than one percentage point in 25 states. Arkansas and California led the states in reducing poor-condition mileage (by 4.5 and 3.7 percentage points, respectively) while Wyoming and Illinois led the states in increasing poor-condition mileage (by 31.0 and 4.2 percentage points, respectively).

The condition of urban Interstate miles also varies widely by state. In 2018, two states (New Hampshire and Vermont) reported no poor mileage. The bottom three states (Wyoming, Hawaii, and Louisiana) reported more than 10% of their mileage to be in poor condition. These three states, collectively, only have about 4.4% of the urban Interstate mileage in the U.S. (841 of 19,161 miles) but have over 12% of the poor mileage (120 of 1003 miles).

TABLE 12: PERCENT URBAN INTERSTATE MILEAGE IN POOR CONDITION

2018 Rank	State	Percent Urban Interstate Mileage in Poor Condition
1	New Hampshire	0.00
1	Vermont	0.00
3	Idaho	1.08
4	Maine	1.15
5	North Dakota	1.64
6	North Carolina	1.89
7	Rhode Island	1.92
8	Tennessee	1.97
9	Utah	1.98
10	Arizona	2.00
11	Montana	2.04
12	Connecticut	2.20
13	South Dakota	2.27
14	Florida	2.31
15	Georgia	2.39
16	Missouri	2.42
17	Alaska	2.53
18	New Mexico	2.56
19	Kentucky	2.60
20	South Carolina	2.63
21	Virginia	2.88
22	Kansas	2.99
23	Mississippi	3.16
24	Nevada	3.23
25	Oregon	3.42
26	Massachusetts	3.54
27	Iowa	3.64
28	Texas	3.79
29	Ohio	3.97
30	West Virginia	4.26
31	Nebraska	4.48
32	Illinois	4.89
33	Colorado	4.93
34	Arkansas	5.16
35	Minnesota	5.23
36	Alabama	5.32
37	Wisconsin	5.79
38	Washington	6.27
39	Oklahoma	6.32
40	Pennsylvania	6.60
41	Maryland	6.80
42	New York	7.30
43	Indiana	7.60
44	California	8.44
45	New Jersey	9.04
46	Michigan	9.21
47	Delaware	9.76
48	Louisiana	12.75
49	Hawaii	20.00
50	Wyoming	36.63
	Average	5.10

FIGURE 7: PERCENT OF URBAN INTERSTATES IN POOR CONDITION



RURAL OTHER PRINCIPAL ARTERIAL PAVEMENT CONDITION

Rural Other Principal Arterials (ROPA) are two- to four-lane roadways connecting different cities or regions. The condition of major rural arterials improved slightly from 2016 to 2018, by about 0.13 percentage points. Overall, about 1.23% of the ROPA system—1,068 miles out of 86,926—was reported to be in poor condition (Table 13, Percent Rural Other Principal Arterial Mileage in Poor Condition, 2018, Figure 8). This compares with about 1.36% (1,173 of 86,113 miles) in 2016, the last time this assessment was completed. (It should be noted that as cities grow, the urbanized area around them grows as well. As this occurs, roads near cities are often reclassified from rural to urban. If these roads were in good condition already, their reclassification has the effect of increasing the percentage of rural roads in poor condition.)

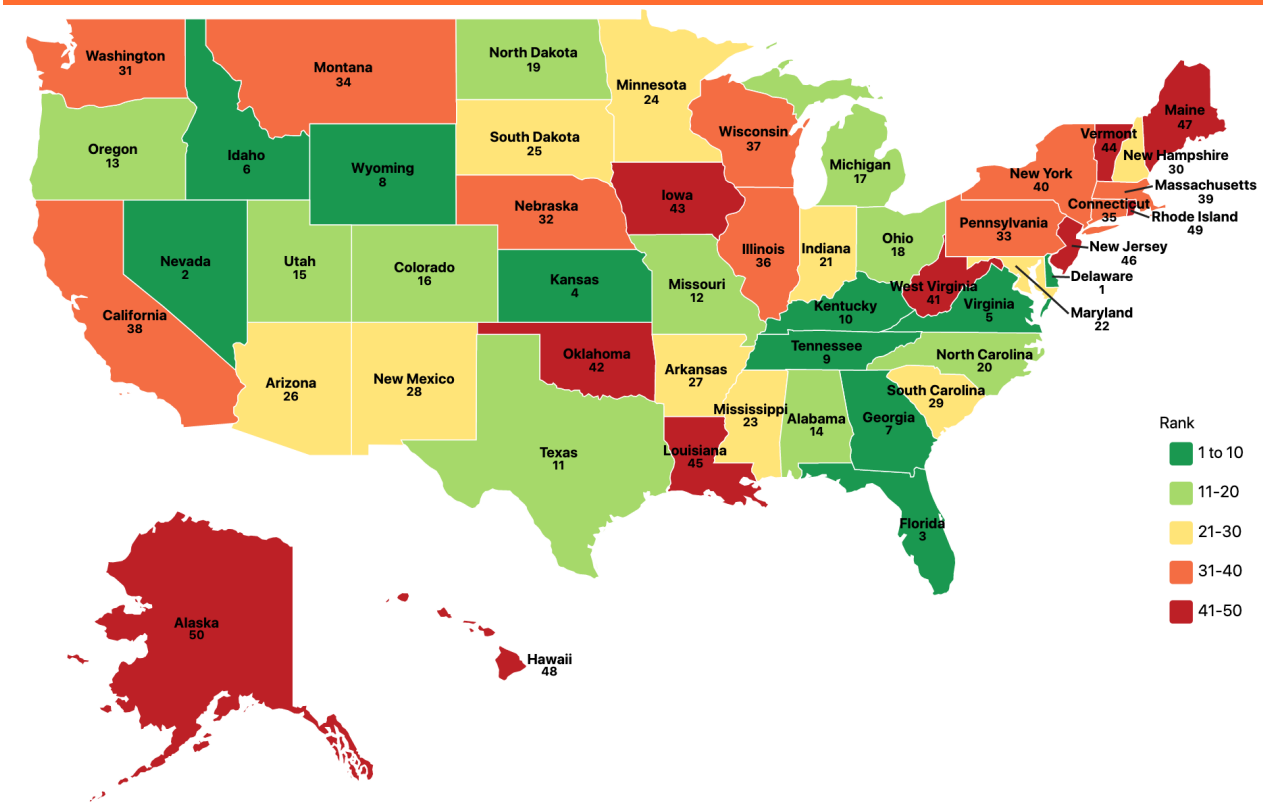
Between 2016 and 2018 most states saw minor changes in ROPA pavement condition. Forty-one states saw decreases/increases of poor condition mileage of one percentage point or less, with 22 states seeing decreases, 16 states seeing increases, and three states seeing no change. Of the remaining nine states, five had changes of less than 2%. However, the percentage of the ROPA system in poor condition in Massachusetts, Arkansas, and Wisconsin decreased by 3.2, 2.2, and 2.1 points, respectively, while the poor mileage in Maine increased by 5.3 points.

TABLE 13: PERCENT RURAL OTHER PRINCIPAL ARTERIAL MILEAGE IN POOR CONDITION

2018 Rank	State	Percent Rural Other Principal Arterial Mileage in Poor Condition
1	Delaware	0.00
2	Nevada	0.07
3	Florida	0.15
4	Kansas	0.27
5	Virginia	0.31
6	Idaho	0.32
7	Georgia	0.34
8	Wyoming*	0.35
9	Tennessee	0.36
10	Kentucky	0.41
11	Texas	0.42
12	Missouri	0.43
13	Oregon	0.49
14	Alabama	0.54
15	Utah	0.60
16	Colorado	0.70
17	Michigan	0.70
18	Ohio	0.72
19	North Dakota	0.82
20	North Carolina	0.83
21	Indiana	0.88
22	Maryland	0.94
23	Mississippi	1.01
24	Minnesota	1.07
25	South Dakota	1.09
26	Arizona	1.11
27	Arkansas	1.12
28	New Mexico	1.15
29	South Carolina	1.23
30	New Hampshire	1.24
31	Washington	1.29
32	Nebraska	1.46
33	Pennsylvania	1.58
34	Montana	1.62
35	Connecticut	1.64
36	Illinois	1.70
37	Wisconsin	1.74
38	California	1.89
39	Massachusetts	1.90
40	New York	1.93
41	West Virginia	2.01
42	Oklahoma	2.13
43	Iowa	2.36
44	Vermont	2.74
45	Louisiana	3.67
46	New Jersey	5.00
47	Maine	5.67
48	Hawaii	6.41
49	Rhode Island	13.54
50	Alaska	22.55
	Average	2.05

One state, Delaware, reported zero poor condition ROPA mileage in 2018. Twenty-two additional states reported 1% or less ROPA mileage in poor condition. On the other hand, four states (Alaska, Rhode Island, Hawaii, and Maine) reported more than 5% of their ROPA mileage to be in poor condition. These four states have just over 1.7% of the U.S. ROPA mileage, but 16.8% of the mileage that is in poor condition. Alaska's ROPA system has the most significant problem, accounting for 10.1% of all the poor ROPA mileage in the country.

FIGURE 8: PERCENT OF RURAL OTHER PRINCIPAL ARTERIAL MILEAGE IN POOR CONDITION



URBAN OTHER PRINCIPAL ARTERIAL PAVEMENT CONDITION

Urban Other Principal Arterials (UOPA) are four- to eight-lane roadways connecting different parts of an urban region. Overall, about 14.1% of the UOPA system—8,985 miles out of 63,903—was reported to be in poor condition (Table 13, Percent Urban Other Principal Arterial Mileage in Poor Condition, 2018, Figure 9). This is a 0.1-point increase from 2016 where 14.0 % or 8,713 miles out of 62,363 miles were in poor condition. Overall urban arterial pavement condition is in much worse condition than rural arterials, rural Interstates, or urban Interstates, with the percent in poor condition at 2.05% 1.89%, and 5.10%, respectively.

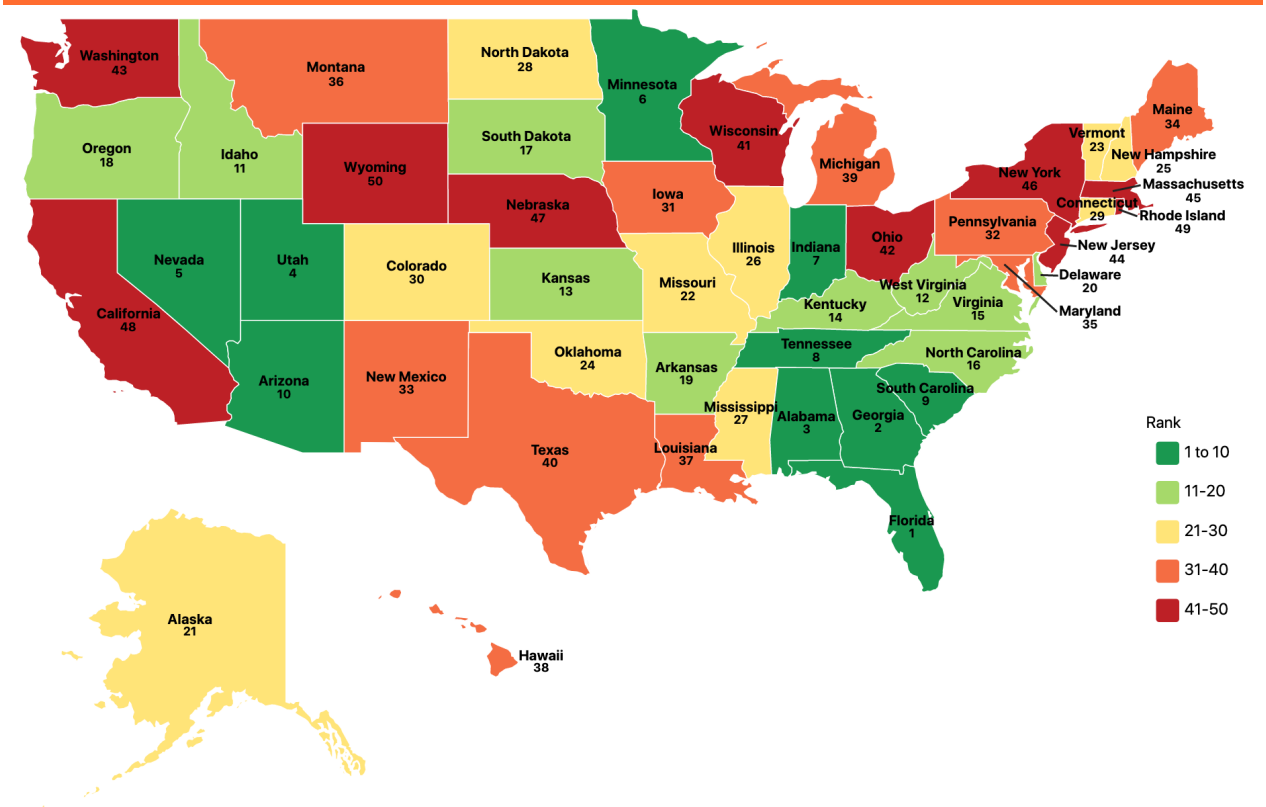
The percent UOPA mileage in poor condition varies drastically by state, from Florida with 2.2% to Wyoming at 42.67%. Nine states reported less than 5% of UOPA miles in poor condition. On the other hand, eight states (Wyoming, Rhode Island, California, Nebraska, New York, Massachusetts, New Jersey, and Washington) reported more than 20% of their UOPA mileage to be in poor condition. These eight states have 24.8% of the U.S. ROPA mileage, but 46.5% of the mileage that is in poor condition.

TABLE 14: PERCENT URBAN OTHER PRINCIPAL ARTERIAL MILEAGE IN POOR CONDITION

2018 Rank	State	Percent Urban Other Principal Arterial Mileage in Poor Condition
1	Florida	2.20
2	Georgia	2.68
3	Alabama	2.95
4	Utah	3.40
5	Nevada	3.56
6	Minnesota	4.23
7	Indiana	4.51
8	Tennessee	4.52
9	South Carolina	4.61
10	Arizona	5.02
11	Idaho	5.02
12	West Virginia	5.05
13	Kansas	5.14
14	Kentucky	5.21
15	Virginia	5.56
16	North Carolina	6.11
17	South Dakota	6.20
18	Oregon	6.80
19	Arkansas	7.05
20	Delaware	7.51
21	Alaska	7.91
22	Missouri	8.18
23	Vermont	8.87
24	Oklahoma	9.29
25	New Hampshire	9.42
26	Illinois	10.86
27	Mississippi	11.06
28	North Dakota	11.11
29	Connecticut	11.52
30	Colorado	11.80
31	Iowa	11.98
32	Pennsylvania	13.01
33	New Mexico	13.10
34	Maine	13.18
35	Maryland	15.58
36	Montana	15.75
37	Louisiana	16.12
38	Hawaii	16.36
39	Michigan	16.58
40	Texas	16.70
41	Wisconsin	17.02
42	Ohio	17.04
43	Washington	21.73
44	New Jersey	23.24
45	Massachusetts	23.47
46	New York	24.89
47	Nebraska	26.32
48	California	28.59
49	Rhode Island	32.10
50	Wyoming	42.67
	Average	12.06

Between 2016 and 2018 most states saw minor changes in UOPA pavement condition. Twenty-one states saw decreases/increases of poor condition mileage of one percentage point or less, with 13 states seeing decreases, and eight states seeing increases. Of the remaining states, 11 had changes of less than 2% and 13 had changes of less than 5%. However, the percentage of the UOPA system in poor condition in South Dakota, Arkansas, Oklahoma, and Idaho decreased by 12.8, 9.2, 7.5, and 5.6 points, respectively, while the poor mileage in Wyoming increased by 32.3 points.

FIGURE 9: PERCENT OF URBAN OTHER PRINCIPAL ARTERIAL MILEAGE IN POOR CONDITION



URBANIZED AREA CONGESTION

There is no universally accepted definition of traffic congestion. In reporting to the federal government, the states have in the past used peak-hour traffic volume-to-capacity (V/C) ratios, as calculated in the Transportation Research Board's *Highway Capacity Manual*, as a congestion measure. Through 2009, the Federal Highway Administration (FHWA) summed up these V/C calculations to determine the state mileage in various V/C categories. Since 2009, however, these tables have not been published by FHWA. Instead, FHWA has been reporting periodic statistics based on travel delays from mobile devices, but only for selected regions and roads, not for states.

The past two *Annual Highway Reports* use data directly from the INRIX *Global Traffic Scorecard*. This report uses 2019 congestion data.[5] The metric selected was the "*peak hours spent in congestion per auto commuter annually*." This measure is taken directly from the INRIX *Scorecard* and uses real-time traffic data. For 2019, Inrix defines Hours Lost In Congestion as, "The total number of hours lost in congestion during peak commute periods compared to free-flow conditions." (The INRIX data, which are computed only for selected cities, are extended to all U.S. metropolitan areas and then rolled up by state. See the Appendix for details.)

TABLE 15: ANNUAL PEAK HOURS SPENT IN CONGESTION PER AUTO COMMUTER

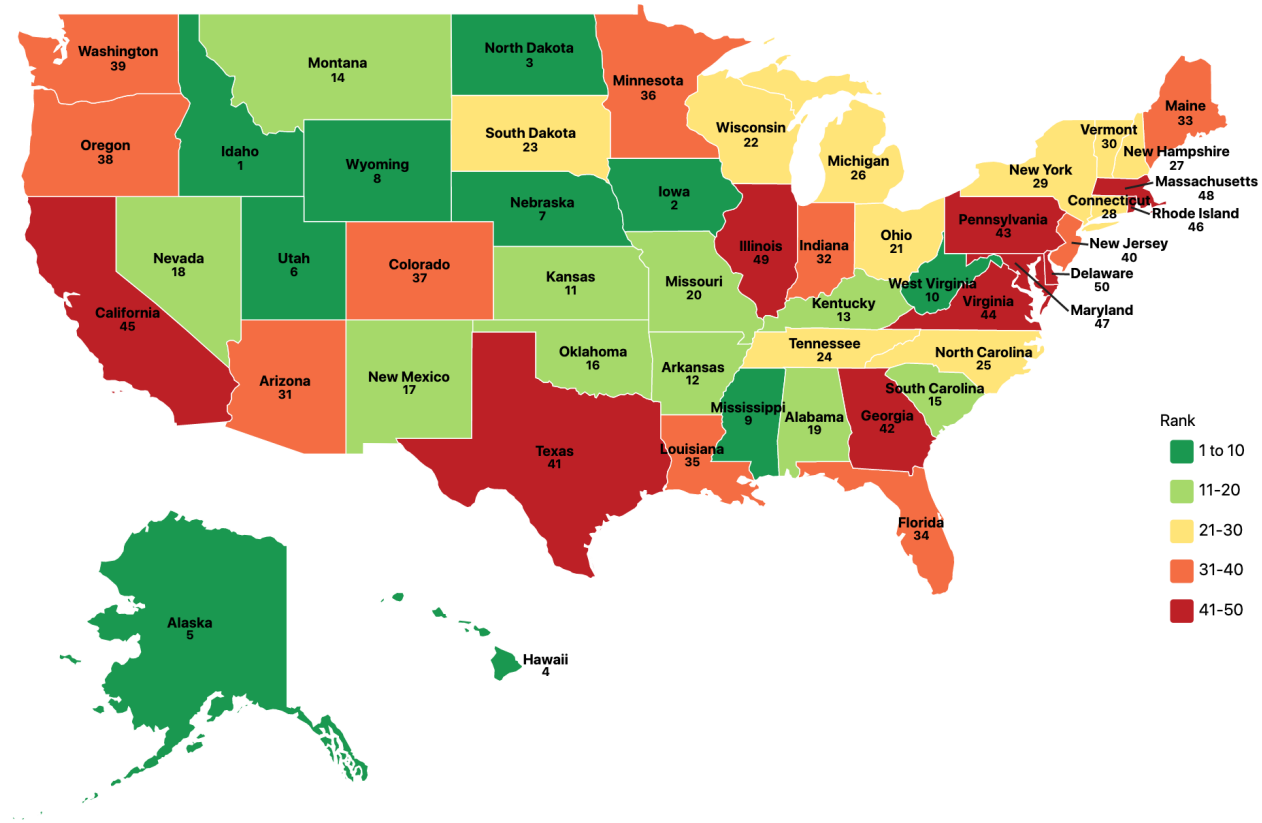
2019 Rank	State	Peak Hours Spent in Congestion per Auto Commuter
1	Idaho	3.40
2	Iowa	4.20
3	North Dakota	5.40
4	Hawaii	6.90
5	Alaska	7.20
6	Utah	7.40
7	Nebraska	7.60
8	Wyoming	8.90
9	Mississippi	9.20
10	West Virginia	9.30
11	Kansas	10.70
12	Arkansas	12.60
13	Kentucky	13.20
14	Montana	13.30
15	South Carolina	13.80
16	Oklahoma	14.90
17	New Mexico	15.10
18	Nevada	16.00
19	Alabama	18.50
20	Missouri	18.90
21	Ohio	19.30
22	Wisconsin	20.30
23	South Dakota	20.80
24	Tennessee	23.20
25	North Carolina	24.80
26	Michigan	24.90
27	New Hampshire	25.30
28	Connecticut	25.50
29	New York	29.90
30	Vermont	30.60
31	Arizona	32.60
32	Indiana	36.50
33	Maine	38.80
34	Florida	40.40
35	Louisiana	40.80
36	Minnesota	43.20
37	Colorado	43.90
38	Oregon	44.50
39	Washington	49.50
40	New Jersey	51.70
41	Texas	54.00
42	Georgia	56.00
43	Pennsylvania	58.10
44	Virginia	60.90
45	California	62.50
46	Rhode Island	69.30
47	Maryland	96.80
48	Massachusetts	102.60
49	Illinois	112.00
50	Delaware	116.40
	Average	33.43

[5] Cookson, Graham and Bob Pishue. "2018 INRIX Global Traffic Scorecard." INRIX. February 2019. http://inrix.com/scorecard/. 12 April 2019.

In 2019, the average annual peak hours spent in congestion in the urbanized areas across the United States was 33.43 hours (see Table 14, Peak Hours Spent in Congestion per Auto Commuter, Figure 10). Annual peak hours spent in congestion range from 3.40 in Idaho to 116.40 in Delaware. The congestion problem is primarily concentrated in the major cities of just a few states.

Commuters in 10 states spent fewer than 10 hours sitting in peak-hour congestion in 2019. Commuters in 31 states spent fewer than 35 hours sitting in peak-hour congestion. The bottom 19 states exceed the U.S. congestion delay average, but their totals skew the average peak hours spent in congestion upward. Commuters in the bottom 11 states spent more than 50 hours per year in traffic congestion, with commuters in the bottom three states (Delaware, Illinois, and Massachusetts) spending over 100 hours per year in traffic congestion.

FIGURE 10: PEAK HOURS SPENT IN AUTO CONGESTION PER COMMUTER



STRUCTURALLY DEFICIENT BRIDGES

Federal law mandates the uniform inspection of all bridges for structural and functional adequacy at least every two years; bridges rated "deficient" are eligible for federal repair dollars. The National Bridge Inventory (NBI) is the source of the bridge data below, although we use summaries provided in *Better Roads* (see Appendix). Since the NBI contains some recent inspections and some as old as two years, the age of the "average" inspection is about one year old. So, a "December 2019" summary from the NBI would represent, on average, bridge condition as of 2018.

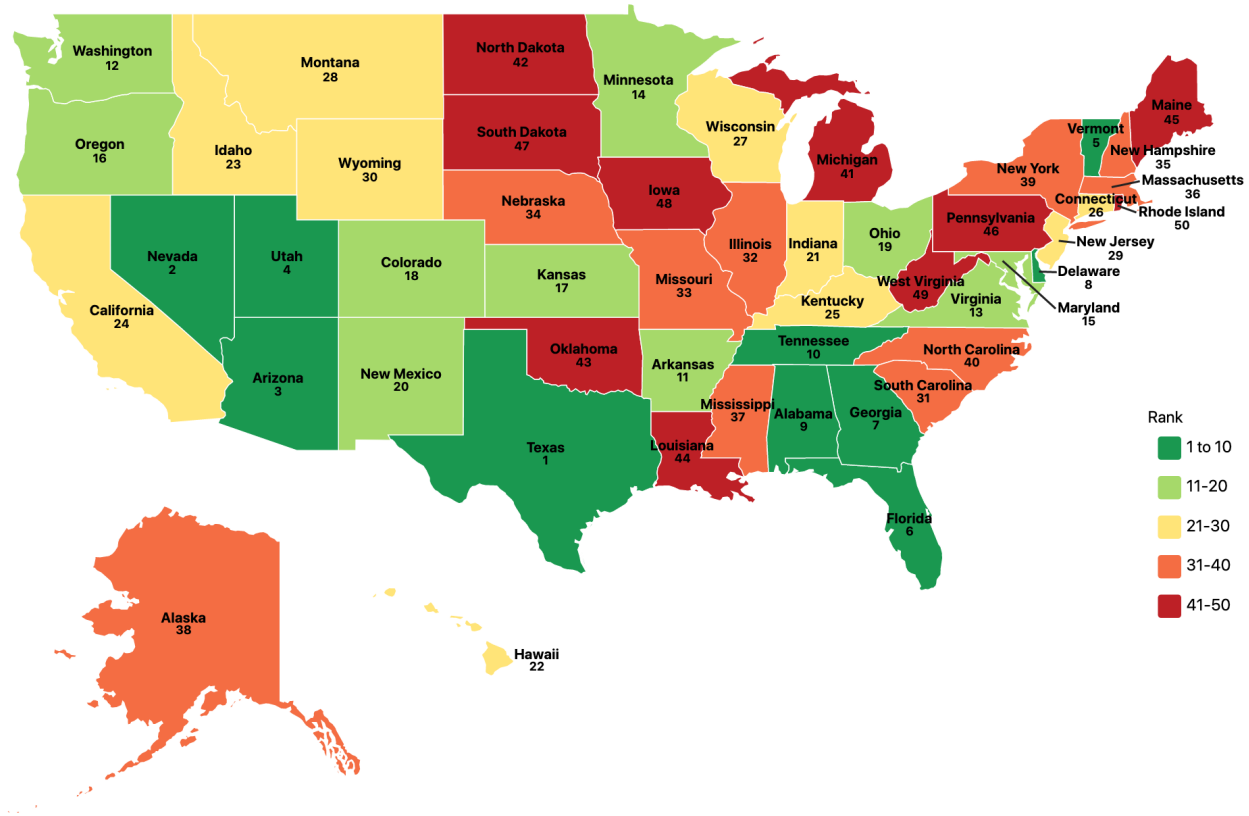
The condition of the nation's highway bridges in 2019 improved slightly from 2018, the last time this assessment was completed. Of the 613,517 highway bridges reported, 46,771 (7.62%) were rated deficient for 2019 (Table 15, Percent of Structurally Deficient Bridges, 2019, Figure 11). This represents a 1.24% improvement over 2018 when 54,254 of 612,408 (8.86%) were rated as deficient.

Three states reported less than 2% of their bridges to be structurally deficient: Texas, Nevada, and Arizona at 1.28%, 1.36%, and 1.81%, respectively. One state reported more than 20% of its bridges as structurally deficient: Rhode Island at 23.08%. The majority of states (45) reported at least some improvement in the percentage of structurally deficient bridges between 2017 and 2019, with Nebraska, Missouri, and Kansas seeing the most improvement (5.9, 4.0, and 3.3 percentage points, respectively). Of the five states that reported a higher percentage of deficient bridges, only one saw increases of more than one percentage point: Hawaii at 1.05% (from 5.81% to 6.86%).

TABLE 16: PERCENT STRUCTURALLY DEFICIENT BRIDGES, 2019

2019 Rank	State	Percent Structurally Deficient Bridges
1	Texas	1.28
2	Nevada	1.36
3	Arizona	1.81
4	Utah	2.16
5	Vermont	2.38
6	Florida	2.64
7	Georgia	3.32
8	Delaware	3.94
9	Alabama	4.27
10	Tennessee	4.32
11	Arkansas	4.56
12	Washington	4.61
13	Virginia	4.64
14	Minnesota	5.00
15	Maryland	5.11
16	Oregon	5.17
16	Kansas	5.17
18	Colorado	5.38
19	Ohio	5.57
20	New Mexico	5.79
21	Indiana	6.24
22	Hawaii	6.86
23	Idaho	7.03
24	California	7.04
25	Kentucky	7.07
26	Connecticut	7.21
27	Wisconsin	7.38
28	Montana	7.41
29	New Jersey	8.06
30	Wyoming	8.21
31	South Carolina	8.46
32	Illinois	8.48
33	Missouri	8.63
34	Nebraska	8.85
35	New Hampshire	8.98
36	Massachusetts	9.22
37	Mississippi	9.39
38	Alaska	9.74
39	New York	10.03
40	North Carolina	10.18
41	Michigan	10.65
42	North Dakota	10.77
43	Oklahoma	10.99
44	Louisiana	13.01
45	Maine	13.14
46	Pennsylvania	16.58
47	South Dakota	16.71
48	Iowa	19.38
49	West Virginia	19.87
50	Rhode Island	23.08
	Average	7.94

FIGURE 11: PERCENT STRUCTURALLY DEFICIENT BRIDGES



OVERALL FATALITY RATE

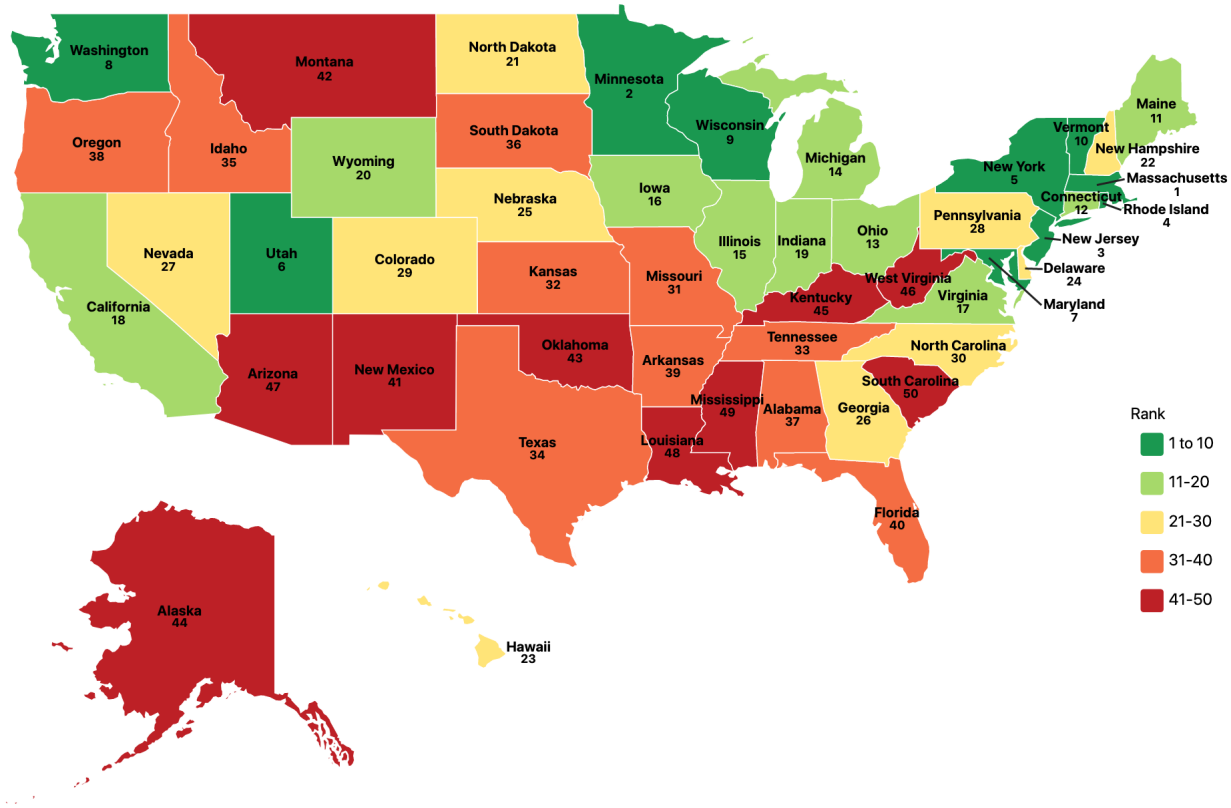
The fatality rate is an important overall measure of each state's road performance. The overall fatality rate measures fatalities on all roadways in the state. The nation's highway fatality rate improved from 1.18 in 2016, the last time this assessment was completed, to 1.13 in 2018, (Table 17, Overall Fatality Rate Per 100 Million Vehicle-Miles, 2018, Figure 12). The fatality rate has increased over the last several years after a decades-long downward trend. While there is no one cause, distracted driving appears to be the biggest contributor. In 2018, 36,529 fatalities were reported, fewer than the 37,434 fatalities reported in 2016, as VMT (vehicle-miles of travel) increased to 3.24 trillion from 3.17 trillion in 2018.

For 2018, Massachusetts reported the overall lowest fatality rate, 0.54, while South Carolina reported the highest, 1.83. Most states (35 of 50) reported a decrease in their fatality rate compared to 2016, led by Iowa, Kentucky, and Idaho, which improved by 0.25, 0.23, and 0.17 points, respectively. Four states saw their fatality rates stay the same. Eleven states saw their fatality rates increase, led by West Virginia, South Dakota, and Rhode Island, reporting a 0.13, 0.12, and 0.1 point increase, respectively.

TABLE 17: OVERALL FATALITY RATE PER 100 MILLION VEHICLE-MILES, 2018

2018 Rank	State	Fatality Rate Per 100 Million Vehicle-Miles
1	Massachusetts	0.54
2	Minnesota	0.63
3	New Jersey	0.73
4	Rhode Island	0.74
5	New York	0.76
6	Utah	0.81
7	Maryland	0.84
8	Washington	0.88
9	Wisconsin	0.89
10	Vermont	0.93
11	Maine	0.93
12	Connecticut	0.93
13	Ohio	0.93
14	Michigan	0.95
15	Illinois	0.96
16	Iowa	0.96
17	Virginia	0.96
18	California	1.02
19	Indiana	1.05
20	Wyoming	1.06
21	North Dakota	1.07
22	New Hampshire	1.07
23	Hawaii	1.07
24	Delaware	1.09
25	Nebraska	1.10
26	Georgia	1.14
27	Nevada	1.17
28	Pennsylvania	1.17
29	Colorado	1.17
30	North Carolina	1.19
31	Missouri	1.20
32	Kansas	1.26
33	Tennessee	1.28
34	Texas	1.29
35	Idaho	1.30
36	South Dakota	1.34
37	Alabama	1.34
38	Oregon	1.37
39	Arkansas	1.41
40	Florida	1.41
41	New Mexico	1.43
42	Montana	1.43
43	Oklahoma	1.44
44	Alaska	1.46
45	Kentucky	1.46
46	West Virginia	1.51
47	Arizona	1.53
48	Louisiana	1.53
49	Mississippi	1.63
50	South Carolina	1.83
	Average	1.14

FIGURE 12: OVERALL FATALITY RATE PER 100 MILLION VEHICLE-MILES, 2016



RURAL FATALITY RATE

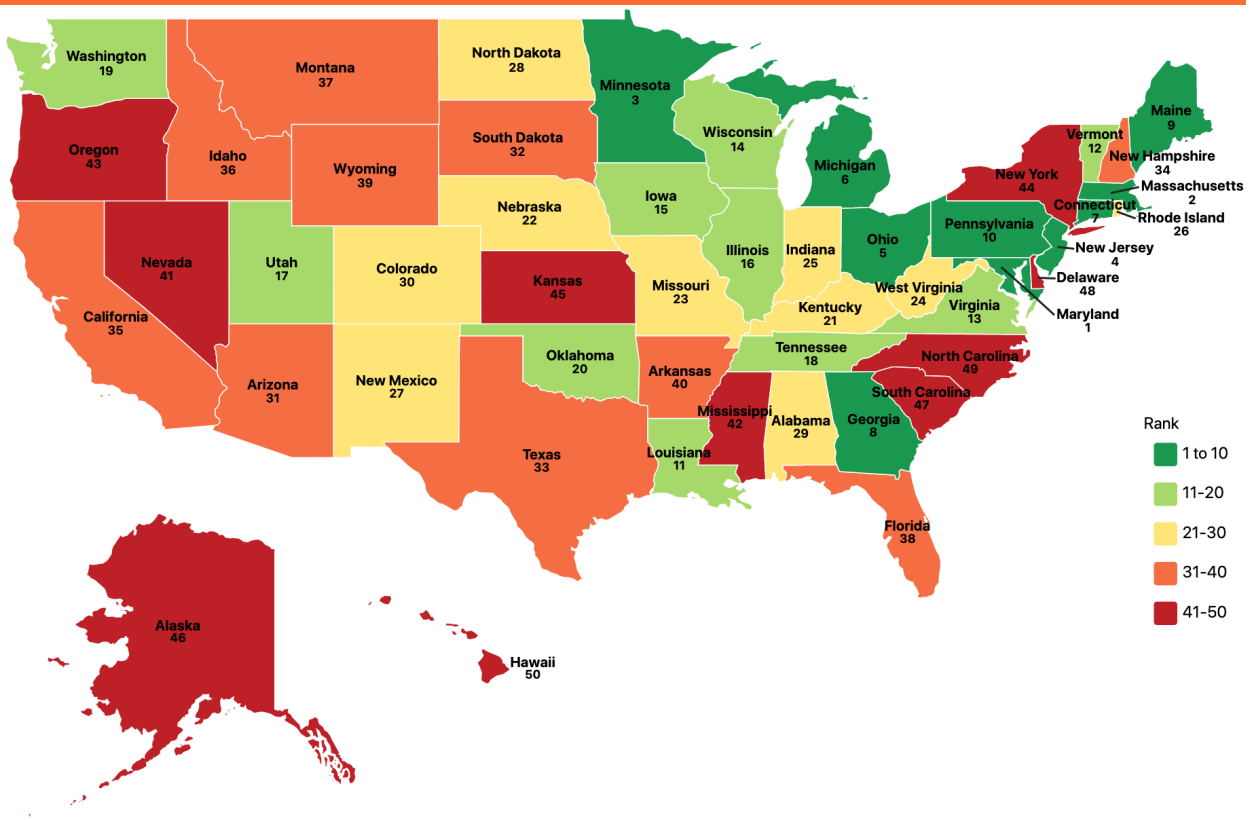
The rural fatality rate measures fatalities on all rural arterials in the state. The nation's rural highway fatality rate improved from 1.71 in 2016 to 1.36 in 2018 (Table 18, Rural Fatality Rate Per 100 Million Vehicle-Miles, 2018, Figure 13). The last several years saw the rural fatality rate increase after a decades-long downward trend. While there is no one cause, distracted driving appears to be the biggest contributor. In 2018, 6,654 rural fatalities were reported, fewer than the 8,032 rural fatalities reported in 2018, as rural VMT (vehicle-miles of travel) increased to 0.49 trillion from 0.47 trillion in 2016.

For 2018, Maryland reported the lowest rural fatality rate, 0.32, while Hawaii reported the highest, 6.6. Most states (34 of 50) reported a decrease in their rural fatality rate compared to 2016, led by Florida and North California, which improved 5.47 and 2.35 points, respectively. Thirteen states saw their fatality rate increase, with Delaware and Rhode Island reporting the largest rate increases of 1.05 and 0.82 points, respectively. Three states—Michigan, Ohio, and Arkansas—saw no change in their rural fatality rate.

TABLE 18: FATALITY RATE PER 100 MILLION RURAL VEHICLE-MILES, 2016

2018 Rank	State	Fatality Rate Per 100 Million Rural Vehicle-Miles
1	Maryland	0.32
2	Massachusetts	0.49
3	Minnesota	0.58
4	New Jersey	0.59
5	Ohio	0.69
6	Michigan	0.70
7	Connecticut	0.73
8	Georgia	0.78
9	Maine	0.80
10	Pennsylvania	0.82
10	Louisiana	0.82
12	Vermont	0.84
13	Virginia	0.93
14	Wisconsin	0.97
15	Iowa	0.98
16	Illinois	1.01
17	Utah	1.06
18	Tennessee	1.07
19	Washington	1.09
20	Oklahoma	1.14
21	Kentucky	1.16
22	Nebraska	1.20
23	Missouri	1.22
24	West Virginia	1.28
25	Indiana	1.30
26	Rhode Island	1.32
27	New Mexico	1.39
28	North Dakota	1.41
29	Alabama	1.43
30	Colorado	1.45
31	Arizona	1.46
32	South Dakota	1.50
33	Texas	1.54
33	New Hampshire	1.54
35	California	1.56
35	Idaho	1.56
37	Montana	1.59
38	Florida	1.60
39	Wyoming	1.69
40	Arkansas	1.72
41	Nevada	1.73
41	Mississippi	1.73
43	Oregon	1.84
44	New York	1.93
45	Kansas	2.00
46	Alaska	2.02
47	South Carolina	2.15
48	Delaware	2.21
49	North Carolina	3.59
50	Hawaii	6.60
	Average	1.42

FIGURE 13: FATALITY RATE PER 100 MILLION RURAL VEHICLE MILES, 2016



URBAN FATALITY RATE

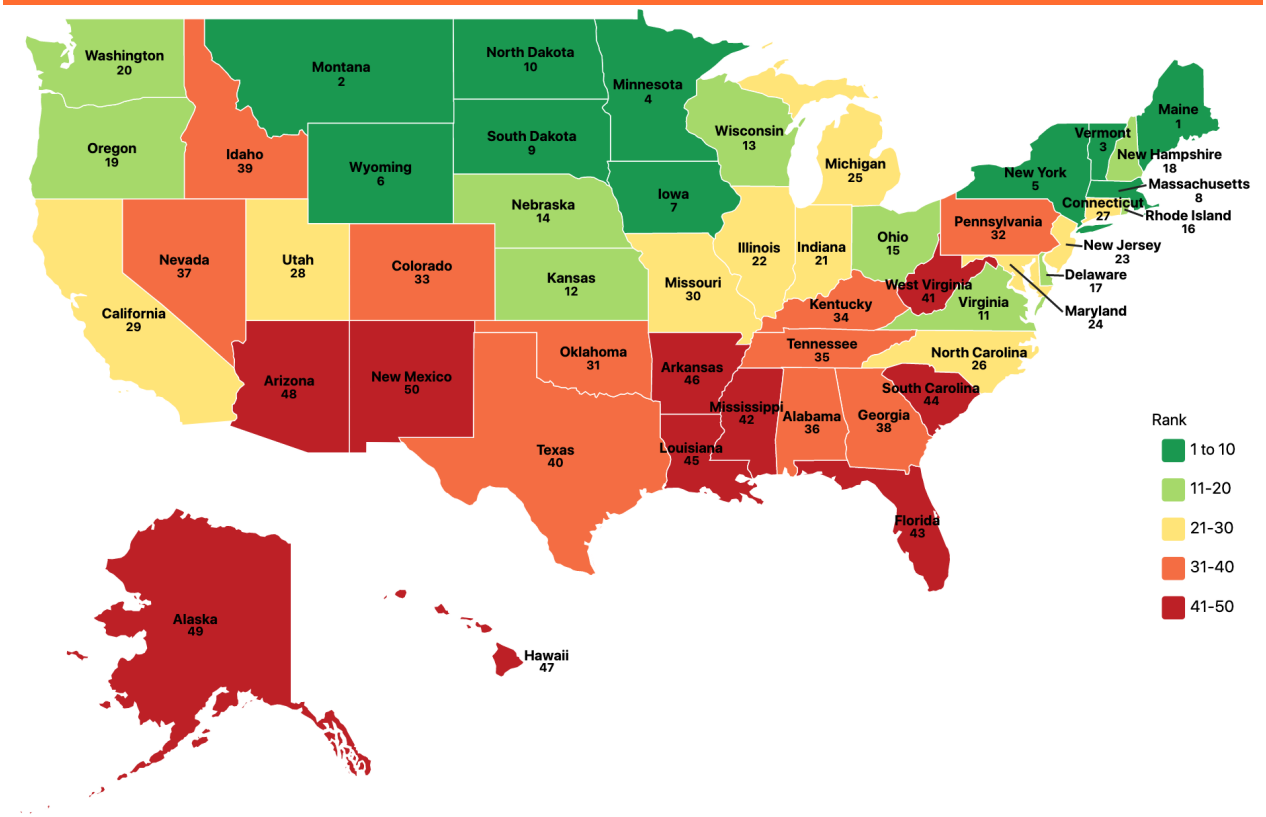
The urban fatality rate measures fatalities on all urban arterials in the state. The nation's urban highway fatality rate worsened slightly from 0.77 in 2016 to 0.78 in 2018, (Table 19, Urban Fatality Rate Per 100 Million Vehicle-Miles, 2018, Figure 14). The urban fatality rate has increased over the last several years after a decades-long downward trend. While there is no one cause, distracted driving appears to be the biggest contributor. In 2018, 10,777 urban fatalities were reported, more than the 9,917 urban fatalities reported in 2016, as urban VMT (vehicle-miles of travel) increased to 1.31 trillion from 1.29 trillion in 2016. There were more urban fatalities in 2018 than in any year since 2007.

For 2016, Maine reported the lowest urban fatality rate, 0.14, while New Mexico reported the highest, 1.58. Twenty-seven states reported an increase in their urban fatality rates compared to 2016, led by Mississippi, Alaska, and Idaho, which worsened 1.06, 0.5 and 0.38 points, respectively. Twenty-three states saw their fatality rate decrease, led by Wyoming, Kansas, and Montana, which improved by 0.63, 0.48, and 0.32 points, respectively.

TABLE 19: FATALITY RATE PER 100 MILLION URBAN VEHICLE-MILES

2018 Rank	State	Fatality Rate Per 100 Million Urban Vehicle-Miles
1	Maine	0.14
2	Montana	0.21
3	Vermont	0.25
4	Minnesota	0.29
5	New York	0.32
6	Wyoming	0.40
7	Iowa	0.43
8	Massachusetts	0.44
8	South Dakota	0.44
10	North Dakota	0.48
11	Virginia	0.49
12	Kansas	0.50
12	Wisconsin	0.50
14	Nebraska	0.55
14	Ohio	0.55
16	Rhode Island	0.59
17	Delaware	0.61
18	New Hampshire	0.63
19	Oregon	0.64
19	Washington	0.64
21	Indiana	0.66
22	Illinois	0.71
23	New Jersey	0.72
23	Maryland	0.72
25	Michigan	0.76
25	North Carolina	0.76
27	Connecticut	0.77
28	Utah	0.81
28	California	0.81
30	Missouri	0.85
31	Oklahoma	0.86
32	Pennsylvania	0.88
33	Colorado	0.92
34	Kentucky	0.93
34	Tennessee	0.93
36	Alabama	0.98
37	Nevada	1.04
38	Georgia	1.05
39	Idaho	1.06
39	Texas	1.06
41	West Virginia	1.07
42	Mississippi	1.12
43	Florida	1.15
44	South Carolina	1.17
45	Louisiana	1.21
46	Arkansas	1.23
47	Hawaii	1.30
48	Arizona	1.44
49	Alaska	1.54
50	New Mexico	1.58
	Average	0.78

FIGURE 14: FATALITY RATE PER 100 MILLION URBAN VEHICLE–MILES



ABOUT THE AUTHORS

Baruch Feigenbaum is the senior managing director of transportation policy at Reason Foundation, a non-profit think tank advancing free minds and free markets. Feigenbaum has a diverse background researching and implementing surface transportation policy issues including revenue and finance, congestion pricing, managed lanes public-private partnerships, highways operations, transit planning and operations, automated vehicles, intelligent transportation systems, and land use.

Feigenbaum has testified before Congress on funding, financing, and high-speed rail. He has appeared on NBC Nightly News and CNBC. His work has been featured in the *Washington Post* and *The Wall Street Journal*. He is a frequent contributor to the *Atlanta Journal-Constitution*.

Feigenbaum is involved with various transportation organizations. He is a member of the Transportation Research Board Intelligent Transportation Systems Committee, secretary of the Bus Transit Committee, and chairs the Bus Transit Conference Subcommittee. He is president of the Transportation and Research Forum, a reviewer for the *Journal of the American Planning Association* (*JAPA*), and a contributor to *Planetizen*.

Prior to joining Reason, Feigenbaum handled transportation issues on Capitol Hill for Representative Lynn Westmoreland. He earned his master's degree in transportation planning with a focus in engineering from the Georgia Institute of Technology.

Spence Purnell is a policy analyst at Reason Foundation, where he works on pension reform, transportation issues, Florida policy issues, and economic development.

Prior to joining Reason, Purnell worked as director of business development at Florida startup Dealers United and as an analyst for the state of Florida's Executive Office of the Governor (Florida Gubernatorial Fellowship).

Purnell graduated from Stetson University with a bachelor's degree in political science and is working on an MPA at Florida State, where his research has focused on database infrastructure and analytics, economic development, and policy evaluation methods.

Joseph Hillman is a transportation policy research intern at Reason Foundation. Previously, he was an external affairs intern at the Cato Institute, a strategic initiatives associate at Americans for Tax Reform, and an intern on Capitol Hill. Hillman received his bachelor's degree in history and political science at the George Washington University and will matriculate to the University of Michigan Law School in the fall of 2020.

APPENDIX: TECHNICAL NOTES

This brief technical appendix summarizes the definitions and sources of the data used in this assessment. The discussion is based on the assumption that comparative cost-effectiveness requires data on system condition or performance, information on the costs to operate and improve the system, and an understanding of the relationship between economic activity and tax revenues.

This report relies heavily on the *Highway Statistics* series, which is compiled by the Federal Highway Administration (FHWA) from data reported by each state. We also use bridge condition data from the National Bridge Inventory and highway fatality rates reported by each state, and for congestion, we use data from INRIX Research and the *American Community Survey*. This assessment compares states with one another based on self-reported data. In general, we use the data as posted in the various data tables. We do not attempt to audit the data; instead, we assume the data to be correct. However, in cases where the data are clearly incorrect, we make appropriate adjustments to the data and footnote the changes made.

MEASURES OF MILEAGE

In general, larger highway systems require more resources to build and maintain than smaller systems. Accordingly, it is important to weight systems so that states can be compared accurately. In this study, mileage is the basic measure for bringing the states to a common baseline. Highway width is also important in differentiating system size (number of lanes), as more pavement generally requires more resources. This study does not rank states based on the size of their highway systems. However, it does use average highway width differences, as derived from state highway agency lane width measures, to measure overall financial performance.

***"State-Owned" Highway Mileage*:** In each state, the "state-owned" highway system consists of the State Highway System and other systems such as toll roads, state parks, universities, prisons, medical facilities, etc. Each state's responsibility for roads varies. In some, for instance North Carolina, the state is responsible for every roadway except subdivision streets, while in others, such as New Jersey, the state is responsible primarily for the major multiple-lane roads. In addition, other features such as bridges also vary, with some states having many and others few.

The source of data for the state-owned mileage is Table HM-10, *Highway Statistics 2018* (https://www.fhwa.dot.gov/policyinformation/statistics/2018/) and includes both state highway agency mileage and other jurisdiction mileage controlled by the state.

***State Highway Agency (SHA) Mileage*:** The total numbers of miles and lane-miles for the SHA system are available for each state. From these data, the average lane-miles per centerline-mile is calculated and then used to weight overall financial performance. The source of data for SHA mileage is Table HM-81, Highway Statistics 2018 (https://www.fhwa.dot.gov/policyinformation/statistics/2018/).

DISBURSEMENTS FOR STATE-OWNED HIGHWAYS

There are several types of disbursements for state-administered highways: capital and bridge work, maintenance and highway services, administration, research and planning, law enforcement and safety, interest (on bond payments), and bond retirement. Disbursement data are collected for the first three categories (Capital and Bridge Disbursements, Maintenance Disbursements, Administrative Disbursements) as well as for the total expenditures (Total Disbursements). Disbursements by state-administered agencies fund

the state highway agency, other toll and turnpike state agencies, and state universities, parks, prisons, etc.

The source of all these data is Table SF-4, Highway Statistics 2018 (https://www.fhwa.dot.gov/policyinformation/statistics/2018/). These disbursements are divided by lane-miles under state control, centerline-miles, and lane-miles per vehicle-miles traveled to create three expenditure numbers. Each of these values is weighted at one-third. Then, since these numbers cannot be averaged together accurately, we assign each state a Z-score based on its value. The national average is the weighted average, obtained by summing the financial numbers for all states, then dividing by the sum of all state-administered mileage. Since large per-mile expenditures are also a burden on taxpayers, the states are ranked inversely by this measure, with the highest per-mile expenditures rated the lowest.

***Capital and Bridge Disbursements and Maintenance Disbursements*:** "Capital" actions are those intended to reconstruct or improve the system, whereas "maintenance" actions are those intended to preserve or repair the system, but not improve it. However, the definitions of these categories vary somewhat between the states. Most states use private sector contracts to build and reconstruct the system, although in some cases they may also use their own workforces for some projects. Most states also conduct maintenance largely with agency forces, and the work is generally light in character, but many also conduct some major repairs such as thick overlays using contracted forces from the private sector.

***Administrative Disbursements*:** Administrative disbursements are intended to include all non-project-specific disbursements, and typically include most main-office and regional-office costs, research, planning, and similar activities. Sometimes this category also includes bond restructurings and other non-project-specific financial actions. As a result, administrative disbursement can sometimes vary widely from year to year.

***Total Disbursements*:** Total disbursements represent total state outlays for state-administered roads, and include several categories not detailed above. Usually, states disburse about 2% to 3% less in funds than they collect, the difference resulting from timing differences and delays in project completion. However, states sometimes collect revenues that are not immediately expended, such as major bond sales, which show up as major increases in "receipts" without a similar increase in disbursements. And sometimes, later-year disbursements can be higher than receipts as states transfer money into projects without increasing revenues.

MEASURES OF SYSTEM CONDITION

There are nine measures of highway system condition: Rural Interstate Poor-Condition Mileage, Urban Interstate Poor-Condition Mileage, Rural Other Principal Arterial (ROPA) Poor-Condition Mileage, Urban Other Principal Arterial (UOPA) Poor-Condition Mileage, Urbanized Area Congestion, Structurally Deficient Bridges, Fatality Rate, Rural Fatality Rate, and Urban Fatality Rate.

***Poor Condition Mileage*:** Perhaps no measure is more fundamental to road performance than road condition. There are numerous ways of defining road condition, but the one used for the U.S. higher-road system is the International Roughness Index (IRI), a measure of surface "bumpiness" in inches of vertical deviation per mile of length. The states use a variety of procedures in gathering these data, but most use mechanical or laser equipment driven over the road system. They often supplement these data with detailed information on road distress features, but this information is not generally used in federal reporting. A few states, however, still use visual ratings as the basis of their reports. Lower "roughness index" scores equate to a smoother road. Roads classified as poor typically have visible bumps and ruts leading to a rough ride. Long, smooth sections (greater than one mile in length) tend to dampen out short rough ones, so if a state has long, smooth sections in its database it can report very little "rough mileage" as a percent of the system.

The source of road roughness data is Table HM-64, *Highway Statistics 2018* (https://www.fhwa.dot.gov/policyinformation/statistics/2018/), which shows miles by roughness, for several functional classes, for each state. This mileage is then converted into a percent to account for different sizes of systems (rural Interstate, urban Interstate, and rural other principal arterials) in each state. The national average is the weighted average, obtained by dividing the sum of all poor-rated mileage by the sum of all state-administered mileage.

***Rural Interstate Poor-Condition Mileage*:** Rural Interstate mileage is all mileage outside of urban areas. By convention, Interstate sections with an IRI roughness of greater than 170 inches of roughness per mile (about three inches of vertical variation per 100 feet of road) are classified as "poor" in most reports. By comparison, sections with less than 60 inches of roughness per mile (about one inch of vertical deviation per 100 feet) would be classified as "excellent." (Delaware and Hawaii have no rural Interstate mileage and are not rated on this measure).

***Urban Interstate Poor-Condition Mileage*:** Urban Interstate mileage is all mileage inside census-defined urban areas. It is calculated the same way as rural Interstate mileage is calculated. The IRI cutoff for urban Interstates is the same as for rural Interstates: 170 inches per mile or higher for "poor" mileage.

***Rural Other Principal Arterial Poor-Condition Mileage*:** Rural other principal arterials (ROPAs) are the major inter-city or regional connectors, off the Interstate system. They can be US-numbered and state-numbered roads, and sometimes toll roads or parkways. This system is generally a top priority of most state highway agencies because of its importance to the economic competitiveness of the state. By convention, ROPA sections with an IRI greater than 220 inches per mile of roughness (about four inches of vertical deviation per 100 feet) are classified as "poor" in most reports. The cutoff is higher than for Interstates since speeds on these roads are typically lower, resulting in a smoother trip.

Urban Other Principal Arterial Poor-Condition Mileage: Urban other principal arterials (UOPAs) are the major connectors within an urban area, off the Interstate system. They can be US-numbered and state-numbered roads, and sometimes toll roads or parkways. The IRI cutoff for urban other principal arterials is the same as for rural principal arterials: 220 inches per mile or higher for "poor" mileage.

Urbanized Area Congestion: The Urbanized Area Congestion metric is measured as the "average number of hours lost in congestion during peak hours compared to free flow conditions." Peak commute is defined as the most congested portion of the morning and afternoon commute periods. Free flow is defined as the highest average speed over the previous 24 hours. Hours lost in congestion captures the intensity of traffic in a given city. In other words, it compares how fast traffic would move from one destination to another (which destinations are chosen is defined further by Inrix) during free flow periods compared to speed during peak periods.

Three data sources are required to calculate the current metric: the 2019 INRIX *Global Traffic Scorecard* and its supporting materials (http://inrix.com/scorecard/), the *2018 American Community Survey* (https://www.census.gov/acs/www/data/data-tables-and-tools/index.php) and Table HM-74 from the FHWA *Highway Statistics* series (https://www.fhwa.dot.gov/policyinformation/statistics/2018/)

The INRIX *Global Traffic Scorecard* provides 2019 empirical congestion data for more than 900 cities in 43 countries, including 286 cities in the U.S. Data items include the Hours Lost in Congestion metric for each city. The *American Community Survey* data used are the Means

of Transportation data for workers 16 years and over (Table S0802). These data are used to calculate the number of auto commuters (the workers 16 years and older who drove alone or carpooled, with the carpoolers being divided by the average carpool occupancy rate of 2.2).[6] Table HM-74 (Daily Vehicle-Miles of Travel (DVMT) by Measured Pavement Roughness/Present Serviceability Rating) includes data on all urbanized areas in the U.S. (i.e., those with populations above 50,000). The DVMT data for multi-state urbanized areas are apportioned by state and the percentages of the DVMT in each state are calculated based on total reported DVMT.

Using *American Community Survey* data as the base table, the INRIX city data are linked to the ACS metro areas. The DVMT percentages for the multi-state cities are now linked to the base table.

The Hours Lost in Congestion metric is calculated for each non-INRIX metro based on national averages of groupings of the numbers of auto commuters. (We use national averages rather than state averages because the number of data points for the individual states is most often inadequate for a good average.) The metric is then weighted by the number of auto commuters. A pivot table-like tool is used to sum the Hours Lost in Congestion metric and the Auto Commuters totals by state. Finally, the former is divided by the latter to get the state's Peak Hours Spent in Congestion figure.

Structurally Deficient Bridges: As a result of several major bridge disasters in the 1960s and 1970s, states are required to inspect bridges biennially (every year if a bridge is rated structurally deficient) and maintain uniform records of inspections.

This data source, titled the *National Bridge Inventory* (NBI), provides information on deficient bridges. Since the NBI contains a mixture of bridges inspected at different times, some as long ago as two years, the "average" inspection age is about one year. So, an October 2019 summary from the *Inventory* would represent, on average, bridge condition as of October 2018.

While deficient bridge data are in the NBI, we use the annual summary of bridge deficiencies prepared by *Better Roads*, a trade publication, as our source. This summary, published since 1979, contains very recent information, gathered from each state shortly before the end of each calendar year, using a proprietary survey sent to state bridge

[6] Polzin, Steve and Alan Pisarski. "Commuting in America 2013." American Association of State Highway and Transportation Officials. January 2014. Accessed 12 April 2019.

engineers. The 2019 *Better Roads Bridge Inventory* (http://www.equipmentworld.com/2019-better-roads-bridge-inventory-2-year-decline-in-deficient-u-s-bridges-snapped/) contains data collected through October 2019.

Overall Fatality Rate: Road safety is a very important measure of system performance, and fatality rates are a key measure of safety. The overall state fatality rate has long been seen as a measure of state performance in road safety.

The fatality rate includes two components: a count of fatalities and a measure of travel, i.e., vehicle-miles. The sources of each are Tables FI-20 and VM-2, *Highway Statistics 2018* (https://www.fhwa.dot.gov/policyinformation/statistics/2018/). Table FI-20 provides a count of fatalities by state and highway functional class and Table VM-2 provides an estimate of annual vehicle-miles of travel for each state by functional class. The national average fatality rates are the weighted averages across the states.

Rural Fatality Rate: The Rural Fatality Rate applies to all rural arterials. It is calculated in the same manner as the Overall Fatality Rate.

Urban Fatality Rate: The Urban Fatality Rate applies to all urban arterials. It is calculated in the same manner as the Overall Fatality Rate.

Overall Ratings

The overall ratings for each state are developed in several steps:

- First, the relative performance of each state on each of 13 performance measures is determined by computing each state's "performance ratio." This is defined as the ratio of each state's measure to the weighted U.S. mean for the measure. The mathematical structure is as follows:

  M_{is} = Measure "i" for state "s" (e.g., percent of rural Interstates in poor condition, for North Carolina)

  R_{is} = Performance Ratio for measure "i", state "s"
  = M_{is}/**M,** where **M** is the weighted average of M_{is} across the 50 states.

- The four financial performance ratios are combined to calculate the average financial performance. The performance ratios are adjusted for the average lane-miles of each state's system for an accurate comparison:

  Financial Performance (FP) for state "s" = $((\sum_{1}^{4} R_{is})/4)^* (\mathbf{L}/L_s)$

  where L_s is the average SHA lanes-per-mile for measure "i" for state "s", and **L** is the weighted average of the SHA lanes-per-mile, over 50 states.

- The nine system performance ratios (eight for Delaware and Hawaii, which have no rural Interstates) are combined to calculate the average system performance:

  System Performance (SP) for state "s" = $(\sum_{1}^{7} R_{is})/9$

- Then, financial performance and system performance are combined into an overall performance measure:

  Overall Performance for state "s" = (FP*4 + SP*7)/13

  In lieu of 9 and 13, Delaware and Hawaii use 8 and 12 since they have no rural Interstates. In final weighting, all metrics are weighted equally.

Since several state agencies are included in each state's reports, this report should *not* be viewed as a cost-effectiveness comparison of the state highway departments. Instead, it should be viewed as an assessment of how the state, as a whole, is managing the state-owned roads.