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27TH ANNUAL HIGHWAY REPORT

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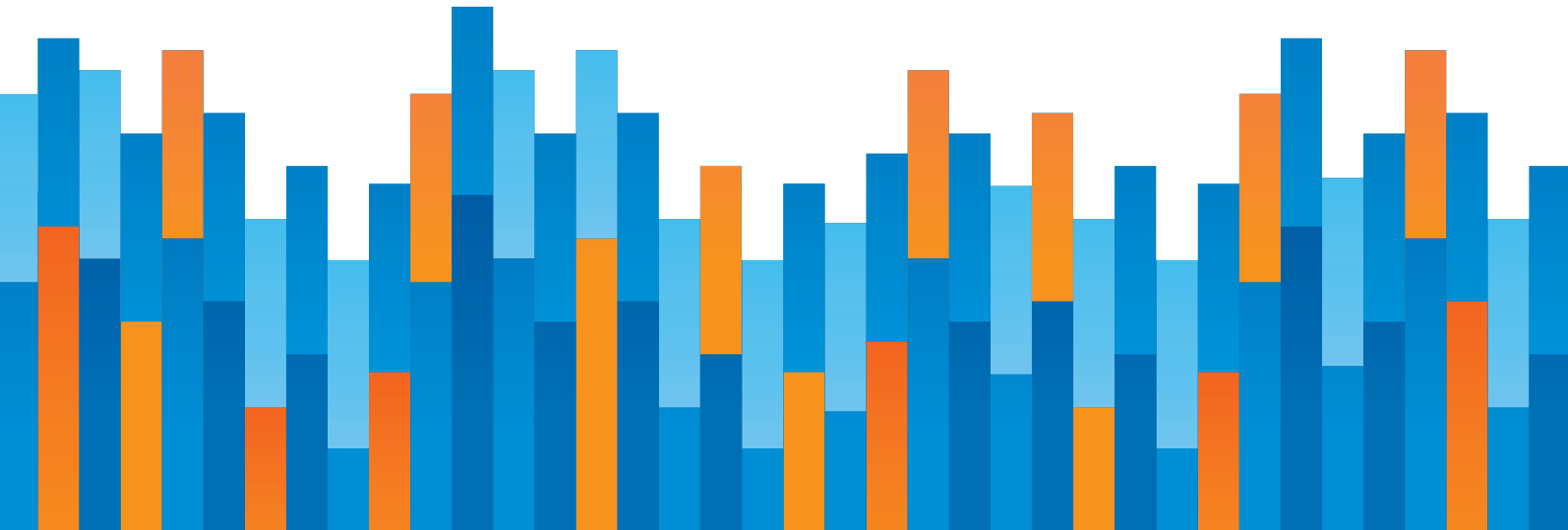

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PART 1

STATE HIGHWAY PERFORMANCE RANKINGS

Reason's *27th 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., who was 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 Truong Bui. 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 2020 and 2021 data. This year's leading states are Virginia, North Carolina, Tennessee, Georgia, and Connecticut**.** At the other end of the rankings are Alaska, New York, Hawaii, California, and Washington.

Similar to last year, the top-performing states are a mix of large and small states as well as states that are more urban and more rural (Tables 1, 2, 3, 4, and Figure 1). Five high-population states rank in the top 10 of the overall rankings: Virginia (1st), North Carolina (2nd), Tennessee (3rd), Georgia (4th), and Florida (8th). Numerous factors—terrain, climate, truck volumes, urbanization, system age, budget priorities, unit cost differences, state budget circumstances, and management/maintenance philosophies—all affect overall performance. Some categories in the report cannot be compared to previous years due to methodological changes that also impacted the overall rankings of some states. These methodological changes are fully explained in Part 2 and the appendix of this report. The remainder of this report reviews the statistics underlying these overall ratings in more detail.

TABLE 1: OVERALL HIGHWAY PERFORMANCE RANKINGS, 2020

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

TABLE 2: OVERALL HIGHWAY PERFORMANCE RANKINGS IN ALPHABETICAL ORDER, 2020	
State	**Overall**
Alabama	15
Alaska	50
Arizona	30
Arkansas	13
California	47
Colorado	43
Connecticut	5
Delaware	35
Florida	8
Georgia	4
Hawaii	48
Idaho	34
Illinois	29
Indiana	23
Iowa	31
Kansas	22
Kentucky	7
Louisiana	40
Maine	32
Maryland	24
Massachusetts	20
Michigan	27
Minnesota	12
Mississippi	18
Missouri	11
Montana	25
Nebraska	26
Nevada	21
New Hampshire	14
New Jersey	44
New Mexico	36
New York	49
North Carolina	2
North Dakota	9
Ohio	17
Oklahoma	45
Oregon	37
Pennsylvania	41
Rhode Island	42
South Carolina	6
South Dakota	28
Tennessee	3
Texas	19
Utah	10
Vermont	38
Virginia	1
Washington	46
West Virginia	39
Wisconsin	33
Wyoming	16

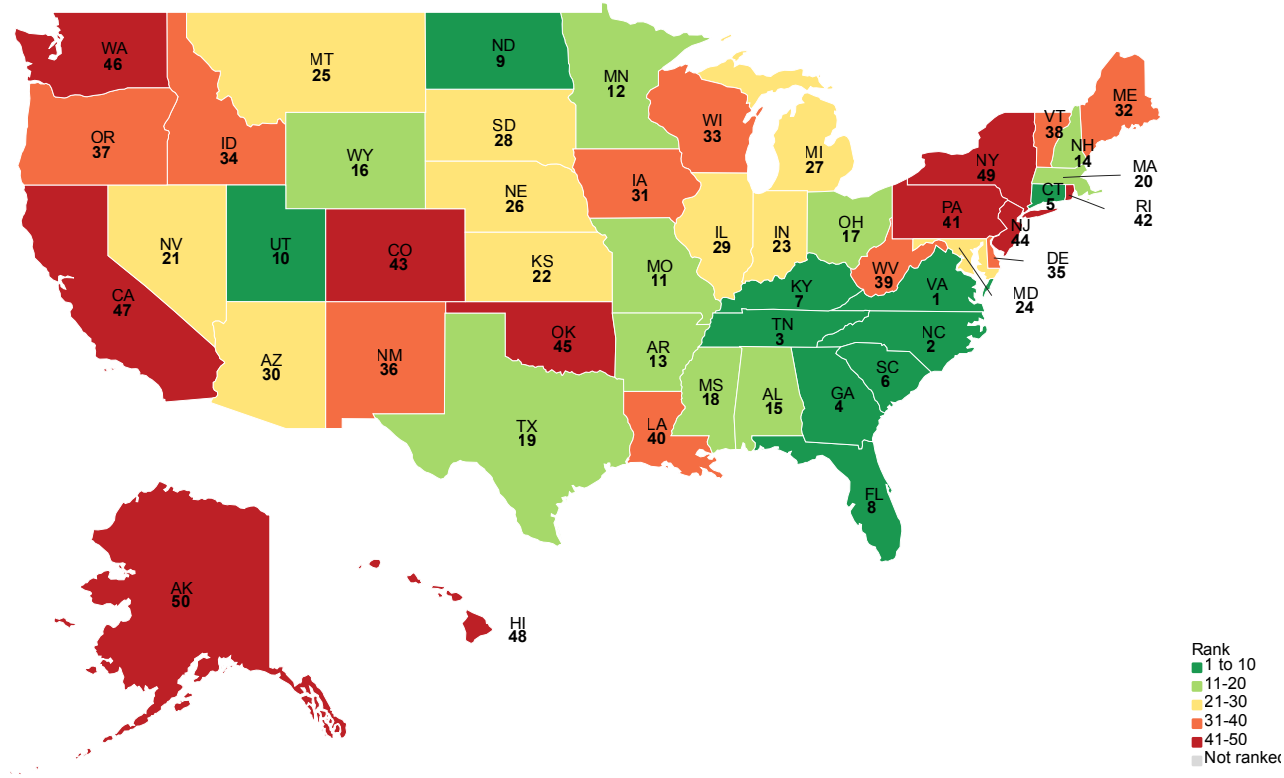
TABLE 3: HIGHWAY PERFORMANCE RANKINGS BY CATEGORY, 2020

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

TABLE 4: OVERALL HIGHWAY PERFORMANCE RANKING TRENDS, 2018-2020

State	Year			Change in Rank	
	2018	2019	2020	2019-2020	2018-2020
Alabama	19	28	15	13	4
Alaska	49	48	50	-2	-1
Arizona	23	29	30	-1	-7
Arkansas	9	17	13	4	-4
California	43	45	47	-2	-4
Colorado	38	37	43	-6	-5
Connecticut	35	31	5	26	30
Delaware	48	44	35	9	13
Florida	40	41	8	33	32
Georgia	26	14	4	10	22
Hawaii	42	47	48	-1	-6
Idaho	5	8	34	-26	-29
Illinois	37	40	29	11	8
Indiana	32	32	23	9	9
Iowa	20	22	31	-9	-11
Kansas	3	7	22	-15	-19
Kentucky	4	4	7	-3	-3
Louisiana	31	35	40	-5	-9
Maine	25	33	32	1	-7
Maryland	41	38	24	14	17
Massachusetts	47	43	20	23	27
Michigan	24	34	27	7	-3
Minnesota	15	18	12	6	3
Mississippi	8	15	18	-3	-10
Missouri	2	3	11	-8	-9
Montana	10	11	25	-14	-15
Nebraska	12	21	26	-5	-14
Nevada	27	20	21	-1	6
New Hampshire	29	19	14	5	15
New Jersey	50	50	44	6	6
New Mexico	16	27	36	-9	-20
New York	44	46	49	-3	-5
North Carolina	14	5	2	3	12
North Dakota	1	1	9	-8	-8
Ohio	13	24	17	7	-4
Oklahoma	34	36	45	-9	-11
Oregon	28	25	37	-12	-9
Pennsylvania	39	39	41	-2	-2
Rhode Island	46	49	42	7	4
South Carolina	6	23	6	17	0
South Dakota	11	9	28	-19	-17
Tennessee	7	10	3	7	4
Texas	18	16	19	-3	-1
Utah	17	6	10	-4	7
Vermont	30	13	38	-25	-8
Virginia	21	2	1	1	20
Washington	45	42	46	-4	-1
West Virginia	33	30	39	-9	-6
Wisconsin	22	26	33	-7	-11
Wyoming	36	12	16	-4	20

FIGURE 1: OVERALL HIGHWAY PERFORMANCE RANK, 2020



Despite several methodological changes, the overall rankings were not dramatically different from the previous version of the *Annual Highway Report*. However, the methodological changes did impact some states' overall rankings, so stakeholders should take some caution in making direct comparisons to overall rankings in previous years. In this report, eight states' overall ranking improved by double digits, while six states' overall rankings declined by 10 or more spots:

- **Florida improved 33 positions from 41st to 8th in the overall rankings,** as urbanized area congestion improved by 19 positions and urban Interstate pavement condition improved by 11 positions. The remaining change was influenced by how we calculated spending. Administrative disbursements improved by 15 positions.
- **Connecticut improved 26 positions from 31st to 5th in the overall rankings,** as rural arterial pavement condition improved by 19 positions. The remaining change was influenced by how we calculated spending. Capital disbursements improved by 31 positions, maintenance disbursements improved by 24 positions, and administrative disbursements improved by 14 positions.
- **Massachusetts improved 23 positions from 43rd to 20th in the overall rankings,** as rural Interstate condition improved by 21 positions. The remaining change was influenced by how we calculated spending. Capital disbursements improved by 39

positions, maintenance disbursements improved by 29 positions and administrative disbursements improved by 16 positions.

- **South Carolina improved 17 positions from 23rd to 6th in the overall rankings,** as rural Interstate pavement condition improved by 26 positions, urban Interstate pavement condition improved by 25 positions, and urban fatality rate improved by 12 positions.
- **Maryland improved 14 positions from 38th to 24th in the overall rankings.** Major categorical improvements were influenced by how we calculated spending. Capital disbursements improved by 16 positions, and maintenance disbursements improved by 15 positions.
- **Alabama improved 13 positions from 28th to 15th in the overall rankings,** as rural arterial pavement condition improved by 20 positions, and urbanized area congestion improved by 10 positions.
- **Illinois improved 11 positions from 40th to 29th in the overall rankings,** as a result of how we calculated spending. Administrative disbursements improved by 11 positions.
- **Georgia improved 10 positions from 14th to 4th in the overall rankings,** as urban Interstate condition improved by 11 positions. The remaining changes were influenced by how we calculated spending. Maintenance disbursements declined by 12 positions and capital disbursements declined by 11 positions.
- **Idaho declined 26 positions from 8th to 34th in the overall rankings**, as rural arterial pavement condition declined by 39 positions, rural Interstate pavement condition declined by 31 positions, and urban arterial pavement condition declined by 17 positions. The remaining changes were influenced by how we calculated spending. Capital disbursements declined by 23 positions and maintenance disbursements declined by 17 positions.
- **Vermont declined 25 positions from 13th to 38th in the overall rankings**, as rural Interstate pavement condition declined by 14 positions and urban fatality rate declined by 11 positions. The remaining changes were influenced by how we calculated spending. Capital disbursements declined by 14 positions and maintenance disbursements declined by 16 positions.
- **South Dakota declined 19 positions from 9th to 28th in the overall rankings**, as urban fatality rate declined by 25 positions and rural fatality rate declined by 15 positions. Maintenance disbursements declined by 26 positions, administrative disbursements declined by 19 positions, and capital disbursements declined by 14 positions.

- **Kansas declined 15 positions from 7th to 22nd in the overall rankings**, as urbanized area congestion declined by 12 positions.
- **Montana declined 14 positions from 11th to 25th in the overall rankings**, as rural fatality rate and urban fatality rate both declined by 10 positions. The remaining changes were influenced by how we calculated spending. Capital disbursements declined by 24 positions, maintenance disbursements declined by 28 positions and administrative disbursements declined by 11 positions.
- **Oregon declined 12 positions from 25th to 37th in the overall rankings**, as the state declined in six of the categorical rankings.

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 have made changes to some of our calculations. The changes are described in this section and the report's technical and quantitative metrics are detailed in the appendix.

Last year, the disbursement performance ratios were calculated by dividing the disbursements per lane-mile by the national averages. This year, instead of using the national averages, we use the expected disbursements per lane-mile for each state given its percent of urban lane-miles. We calculate these figures by performing a LOESS regression between the spending per lane-mile and the percent of urban lane-miles across 50 states. The disbursement performance ratios are then calculated by dividing the actual spending per lane-mile by the expected spending per lane-mile estimated by the regression. The reason for this change in calculating spending is that since urban roads tend to cost more than rural roads, urban states are expected to spend more per lane-mile than rural states to build and maintain their highway networks. Using the national averages to calculate the performance ratios would punish urban states and reward rural states. The change is intended to correct this bias.

The second major change we have made is with the congestion data. Last year, we developed the congestion rankings based on the annual peak hours lost in congestion per commuter collected from publicly available INRIX data. This year we switched to using the

annual delay in hours data from Texas A&M Transportation Institute's *Urban Mobility Report* (UMR). We no longer need to rely on the Census Bureau's American Community Survey to obtain the number of commuters for cities since the TTI's UMR includes these data. Also, we no longer need to estimate congestion hours for non-INRIX cities as the UMR dataset covers a sufficiently large sample of cities.

Finally, we replaced the Total Disbursements category with an Other Disbursements category, which includes law enforcement, safety, bonds, and interest payments but not the first three spending categories (Capital and Bridge Disbursements, Maintenance Disbursements, and Administrative Disbursements). The Total Disbursements category used to include the first three spending categories, and counting it twice over-weighted some of the disbursement data. In a similar manner, we replaced the Overall Fatality Rate category with an Other Fatality Rate to avoid over-weighting the Rural Fatality Rate and Urban Fatality Rate. The Rural and Urban Fatality Rate categories measure fatalities on rural and urban Interstates, freeways, and other primary arterials respectively, while the Other Fatality Rate measures fatalities only on minor arterials, collectors, and local roads in both rural and urban settings.

PART 3

BACKGROUND DATA

State highway system sizes range from fewer than 2,500 lane-miles to almost 200,000 lane-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 is not included in the rankings. It is included in this report as background information and is 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. A few states also manage major portions of the rural road system (collectors and local roads). The average number of lanes *per mile* is 2.42 lanes, but some states (Florida, New Jersey, California, and Massachusetts) manage significantly wider roads, averaging more than three lanes per mile.

Nationwide in 2020, there were 1,887,581 lane-miles under state control (Table 5, State-Controlled Highway Mileage by Lane-Miles), 2,996 lane-miles more than in 2019 (1,884,585), the last time this assessment was completed. The size of state-controlled highway systems increases due to population growth and migration. The size of state-controlled systems decreases as urbanized areas expand, and ownership and control of some state highways is transferred to county or city governments. Hawaii (2,477 miles) and Rhode Island (2,870 miles) have the fewest lane-miles under state control. Texas (198,465 miles) and North Carolina (173,653 miles) have the most.

TABLE 5: STATE-CONTROLLED HIGHWAY MILES, 2020

2020 Size	State	Lane-Miles
1	Texas	198,465
2	North Carolina	173,653
3	Virginia	128,989
4	South Carolina	90,552
5	Pennsylvania	88,322
6	Missouri	77,693
7	West Virginia	71,054
8	Kentucky	62,346
9	California	52,004
10	Ohio	49,681
11	Georgia	49,497
12	Florida	45,013
13	Illinois	42,169
14	Louisiana	40,154
15	New York	38,157
16	Arkansas	38,078
17	Tennessee	37,746
18	Oklahoma	30,407
19	Wisconsin	29,806
20	Alabama	29,707
21	New Mexico	29,430
22	Minnesota	29,176
23	Indiana	28,445
24	Mississippi	28,310
25	Michigan	27,366
26	Montana	25,211
27	Kansas	24,037
28	Colorado	23,022
29	Iowa	22,918
30	Nebraska	22,541
31	Arizona	20,046
32	Washington	18,450
33	Oregon	18,460
34	South Dakota	17,955
35	Maine	17,467
36	North Dakota	17,245
37	Utah	16,023
38	Wyoming	15,792
39	Maryland	14,928
40	Nevada	13,509
41	Idaho	12,272
42	Delaware	11,998
43	Alaska	11,754
44	Connecticut	9,827
45	Massachusetts	9,556
46	New Jersey	8,551
47	New Hampshire	8,453
48	Vermont	5,998
49	Rhode Island	2,870
50	Hawaii	2,477
	U.S. Total	1,887,581

As a result of overall population density and the geographic area of the state, some states have wider highways than others. To treat all states equally we use lane-miles as opposed to center-line miles in our calculations. (A highway that is six miles from end to end and four lanes wide is six centerline-miles and 24 lane-miles). Nationwide in 2020, there were 1,887,581 lane-miles under state control (Table 6, State-Controlled Highway Mileage by System Width). The widest systems are Florida (3.71 average lanes) and New Jersey (3.67 average lanes). The narrowest systems are West Virginia (2.06 lanes) and Alaska and Maine (2.09 lanes each).

TABLE 6: STATE-CONTROLLED HIGHWAY MILEAGE BY SYSTEM WIDTH, 2020

2020 Size	State	Ratio	Lane-Miles	Centerline Mileage
1	Florida	3.71	45,013	12,136
2	New Jersey	3.67	8,551	2,329
3	California	3.46	52,004	15,022
4	Massachusetts	3.19	9,556	2,997
5	Arizona	2.93	20,046	6,844
6	Maryland	2.87	14,928	5,207
7	Michigan	2.84	27,366	9,649
8	Georgia	2.76	49,497	17,923
9	Utah	2.73	16,023	5,875
10	Alabama	2.72	29,707	10,941
11	Tennessee	2.68	37,746	14,066
12	Illinois	2.65	42,169	15,894
13	Connecticut	2.65	9,827	3,715
14	Washington	2.62	18,450	7,052
15	Hawaii	2.61	2,477	949
16	Rhode Island	2.60	2,870	1,105
17	Mississippi	2.59	28,310	10,948
18	Indiana	2.58	28,445	11,029
19	Ohio	2.58	49,681	19,257
20	Iowa	2.57	22,918	8,905
21	Colorado	2.55	23,022	9,032
22	Wisconsin	2.54	29,806	11,747
23	New York	2.53	38,157	15,096
24	Nevada	2.52	13,509	5,354
25	Minnesota	2.49	29,176	11,694
26	Oklahoma	2.48	30,407	12,252
27	Idaho	2.47	12,272	4,968
28	New Mexico	2.47	29,430	11,921
29	Texas	2.46	198,465	80,720
30	Oregon	2.43	18,460	7,603
31	Louisiana	2.35	40,154	17,104
32	Wyoming	2.34	15,792	6,735
33	Kansas	2.33	24,037	10,297
34	North Dakota	2.33	17,245	7,412
35	South Dakota	2.32	17,955	7,751
36	Arkansas	2.31	38,078	16,454
37	Missouri	2.30	77,693	33,830
38	Montana	2.29	25,211	11,026
39	Vermont	2.28	5,998	2,628
40	Nebraska	2.27	22,541	9,939
41	Kentucky	2.25	62,346	27,690
42	Pennsylvania	2.22	88,322	39,713
43	Delaware	2.20	11,998	5,466
44	South Carolina	2.19	90,552	41,267
45	Virginia	2.18	128,989	59,247
46	New Hampshire	2.17	8,453	3,897
47	North Carolina	2.16	173,653	80,212
48	Maine	2.09	17,467	8,340
49	Alaska	2.09	11,754	5,637
50	West Virginia	2.06	71,054	34,422
	U.S. Total		1,887,581	781,297
	Average		37,752	15,626

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 Other Disbursements. The remaining nine categories measure **performance**. Four of the performance 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 performance categories measures traffic congestion: Urban Area Congestion. The four remaining categories measure safety: Structurally Deficient Bridges, Rural Fatality Rate, Urban Fatality Rate, and Other Fatality Rate.

The performance ratio for each of the 13 categories is calculated individually (Tables 7-19, Figures 2-14) for each state by dividing the actual measure by the expected measure. For the four spending categories, the expected measure is determined by a LOESS regression that incorporates urbanization as explained in the Appendix. For the other nine categories, the expected measure is the national weighted average. States are ranked in each category based on the performance ratios they attain, with higher ratios indicating worse performance. For all categories, 1 is the best ranking and 50 is the worst. To determine the total ranking, all of a state's categorical ratios are added together, weighted equally, and then averaged to get one overall final ratio. Each measure, whether spending efficiency or system performance, is weighted equally, so each categorical score makes up 1/13 of the total score. Additional details on how the rankings are calculated are in the Appendix.

This part of the report includes detailed data and trends for each category. Rankings include a table showing the state, the ranking, and a score. Each ranking also includes a color-coded map with the 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 49.9% of total disbursements, totaling $78.87 billion in 2020—the same as what was spent in 2019.

Last year we measured capital and bridge disbursements per lane-mile. For 2018, we measured capital and bridge disbursements per centerline-mile, lane-mile, and vehicle-miles traveled (VMT) per lane-mile. In this analysis for 2020, we measure disbursements per lane adjusted for urbanization. For this process, we take the disbursement per lane-mile and divide it by the expected disbursement per lane-mile to get a ratio. The average 2020 lane-mile disbursement is $41,783, a 0.2% decrease from 2019's $41,850 (Table 7, Capital and Bridge Disbursements by State, 2020, Figure 2). This very small decrease bucks a decade-long

TABLE 7: CAPITAL AND BRIDGE DISBURSEMENTS, 2020

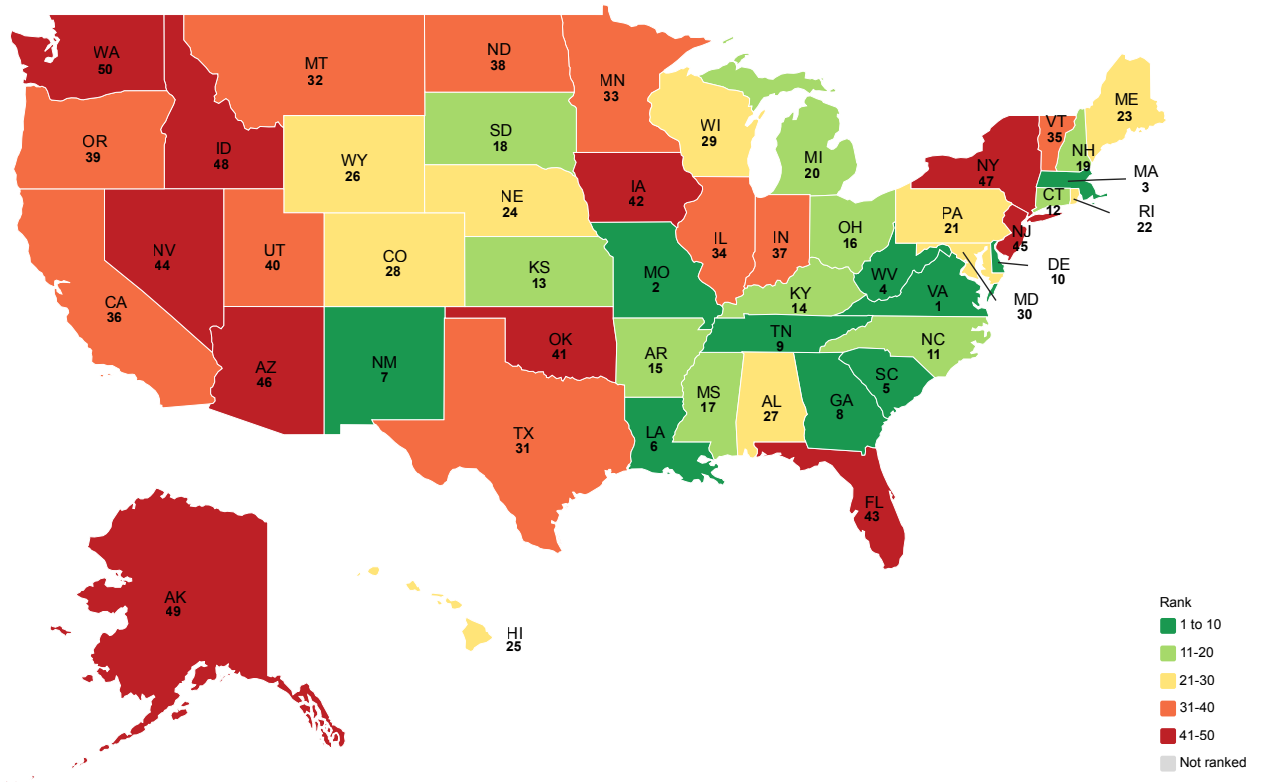
2020 Rank	State	Disbursement Per Lane-Mile	Expected Disbursement per Lane-Mile	Adjusted Ratio
1	Virginia	$11,862	$42,748	0.28
2	Missouri	$10,364	$30,406	0.34
3	Massachusetts	$91,830	$207,833	0.44
4	West Virginia	$12,820	$28,193	0.45
5	South Carolina	$21,016	$45,109	0.47
6	Louisiana	$22,084	$44,370	0.50
7	New Mexico	$14,794	$26,872	0.55
8	Georgia	$31,611	$56,314	0.56
9	Tennessee	$31,058	$52,898	0.59
10	Delaware	$49,325	$82,074	0.60
11	North Carolina	$27,897	$44,381	0.63
12	Connecticut	$94,435	$147,085	0.64
13	Kansas	$18,545	$27,958	0.66
14	Kentucky	$20,742	$30,817	0.67
15	Arkansas	$24,155	$35,260	0.69
16	Ohio	$39,661	$56,700	0.70
17	Mississippi	$25,031	$33,554	0.75
18	South Dakota	$13,696	$18,126	0.76
19	New Hampshire	$32,313	$37,664	0.86
20	Michigan	$53,110	$60,894	0.87
21	Pennsylvania	$43,217	$47,341	0.91
22	Rhode Island	$124,081	$132,030	0.94
23	Maine	$27,840	$29,198	0.95
24	Nebraska	$21,452	$22,276	0.96
25	Hawaii	$98,120	$99,817	0.98
26	Wyoming	$23,697	$23,913	0.99
27	Alabama	$46,715	$45,858	1.02
28	Colorado	$45,663	$43,457	1.05
29	Wisconsin	$46,455	$43,833	1.06
30	Maryland	$101,839	$94,042	1.08
31	Texas	$48,485	$44,236	1.10
32	Montana	$20,961	$19,047	1.10
33	Minnesota	$41,049	$36,827	1.11
34	Illinois	$74,606	$63,747	1.17
35	Vermont	$32,497	$26,905	1.21
36	California	$86,801	$71,250	1.22
37	Indiana	$54,635	$44,368	1.23
38	North Dakota	$21,820	$17,458	1.25
39	Oregon	$50,073	$38,506	1.30
40	Utah	$58,599	$45,052	1.30
41	Oklahoma	$44,728	$33,958	1.32
42	Iowa	$44,132	$33,116	1.33
43	Florida	$144,620	$108,485	1.33
44	Nevada	$51,121	$37,692	1.36
45	New Jersey	$344,386	$225,160	1.53

trend of steady increases in spending. Since 2007, total capital and bridge disbursements have increased about 26.1%, similar to the Consumer Price Index (CPI), which has increased about 27.4%.

State	Disbursement Per Lane-Mile	Expected Disbursement per Lane-Mile	Adjusted Ratio	2020 Rank
46	Arizona	$68,623	$44,429	1.54
47	New York	$103,205	$65,611	1.57
48	Idaho	$49,130	$26,779	1.83
49	Alaska	$65,303	$31,277	2.09
50	Washington	$97,951	$46,867	2.09

In 2020, Virginia, Missouri, Massachusetts, West Virginia, and South Carolina reported the lowest capital and bridge expenditure ratios, after adjusting for urbanization. Washington, Alaska, Idaho, New York, and Arizona reported the highest expenditure ratios. The 2020 capital and bridge disbursements ratios by state cannot be compared to previous years, as the methodology has changed. Some of the disbursements per state-controlled lane-mile can vary widely from year to year reflecting funding actions and project schedules.

FIGURE 2: CAPITAL AND BRIDGE DISBURSEMENTS PER STATE-CONTROLLED LANE-MILE, 2020



MAINTENANCE DISBURSEMENTS

Maintenance disbursements are the costs to perform routine upkeep, such as filling in potholes and repaving roads. Maintenance disbursements comprise about 17.4% of total disbursements, totaling $27.46 billion in 2020, the same as in 2019, the last time this assessment was completed.

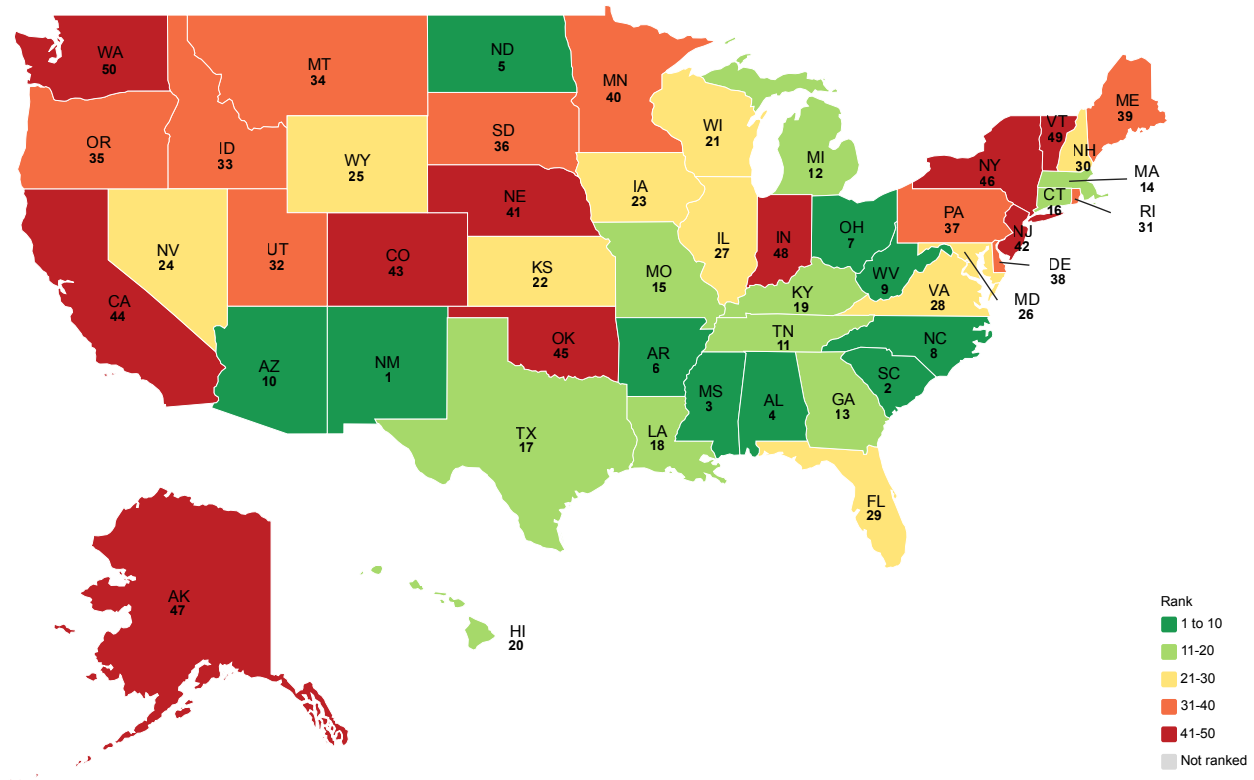
Last year we measured maintenance disbursements per lane-mile. For 2018, we measured maintenance disbursements per centerline-mile, lane-mile, and vehicle-miles traveled (VMT) per lane-mile. In this analysis for 2020 we measure disbursements per lane adjusted for urbanization. For this process, we take the disbursement per lane-mile and divide it by the expected disbursement per lane-mile to get a ratio. The average 2020 per-mile disbursement is $14,546 (Table 8, Maintenance Disbursements by State, 2020, Figure 3), a decrease of 8.8% from $15,952 in 2019. This decrease bucks a generally steady spending trend over the last decade. Since 2007, total maintenance disbursements have increased 37.3%, while the Consumer Price Index (CPI) has increased about 27.4%.

TABLE 8: MAINTENANCE DISBURSEMENTS, 2020

2020 Rank	State	Disbursement Per Lane-Mile	Expected Disbursement per Lane-Mile	Adjusted Ratio
1	New Mexico	$1,792	$9,220	0.19
2	South Carolina	$4,254	$16,234	0.26
3	Mississippi	$4,390	$12,148	0.36
4	Alabama	$6,897	$16,519	0.42
5	North Dakota	$1,794	$4,281	0.42
6	Arkansas	$5,449	$12,745	0.43
7	Ohio	$9,663	$21,904	0.44
8	North Carolina	$7,330	$15,961	0.46
9	West Virginia	$4,710	$9,853	0.48
10	Arizona	$8,054	$15,984	0.50
11	Tennessee	$10,695	$19,805	0.54
12	Michigan	$13,851	$24,093	0.57
13	Georgia	$12,463	$21,677	0.57
14	Massachusetts	$32,754	$55,504	0.59
15	Missouri	$6,606	$10,874	0.61
16	Connecticut	$27,111	$43,125	0.63
17	Texas	$10,590	$15,870	0.67
18	Louisiana	$10,806	$15,945	0.68
19	Kentucky	$7,810	$11,057	0.71
20	Hawaii	$24,263	$33,584	0.72
21	Wisconsin	$11,730	$15,707	0.75
22	Kansas	$7,981	$9,742	0.82
23	Iowa	$9,907	$11,988	0.83
24	Nevada	$11,569	$13,604	0.85
25	Wyoming	$6,737	$7,743	0.87
26	Maryland	$28,196	$32,391	0.87
27	Illinois	$22,024	$25,285	0.87
28	Virginia	$13,718	$15,311	0.90
29	Florida	$33,231	$35,350	0.94
30	New Hampshire	$13,048	$13,595	0.96
31	Rhode Island	$39,515	$40,095	0.99
32	Utah	$16,115	$16,214	0.99
33	Idaho	$9,193	$9,175	1.00
34	Montana	$5,328	$5,160	1.03
35	Oregon	$15,805	$13,884	1.14
36	South Dakota	$5,492	$4,652	1.18
37	Pennsylvania	$20,322	$17,140	1.19
38	Delaware	$37,525	$30,019	1.25
39	Maine	$14,387	$10,323	1.39
40	Minnesota	$19,146	$13,297	1.44
41	Nebraska	$9,975	$6,893	1.45
42	New Jersey	$86,817	$59,094	1.47
43	Colorado	$23,212	$15,564	1.49
44	California	$44,831	$27,639	1.62
45	Oklahoma	$23,123	$12,292	1.88
46	New York	$50,333	$25,961	1.94
47	Alaska	$22,572	$11,258	2.00
48	Indiana	$32,316	$15,938	2.03
49	Vermont	$19,557	$9,236	2.12
50	Washington	$56,839	$16,935	3.36

In 2020, New Mexico, South Carolina, Mississippi, Alabama, and North Dakota reported the lowest overall maintenance expenditure ratios, after adjusting for urbanization. Washington, Vermont, Indiana, Alaska, and New York reported the highest overall expenditure ratios. The 2020 Maintenance Disbursements ratios by state cannot be compared to previous years, as the methodology has changed. Some of the disbursements per state-controlled lane-mile can vary widely from year to year reflecting funding actions and project schedules.

FIGURE 3: MAINTENANCE DISBURSEMENTS PER STATE-CONTROLLED LANE-MILE, 2020



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 compose about 6.4% of total disbursements, totaling $10.08 billion in 2020, the same amount as in 2019, the last time this assessment was completed.

Last year, we measured administrative disbursements per lane-mile. For 2018, we measured administrative disbursements per centerline-mile, lane-mile, and vehicle-miles traveled (VMT) per lane-mile. In this analysis for 2020 we measure disbursements per lane adjusted for urbanization. For this process, we take the disbursement per lane-mile and divide it by the expected disbursement per lane-mile to get a ratio. The average 2020 per

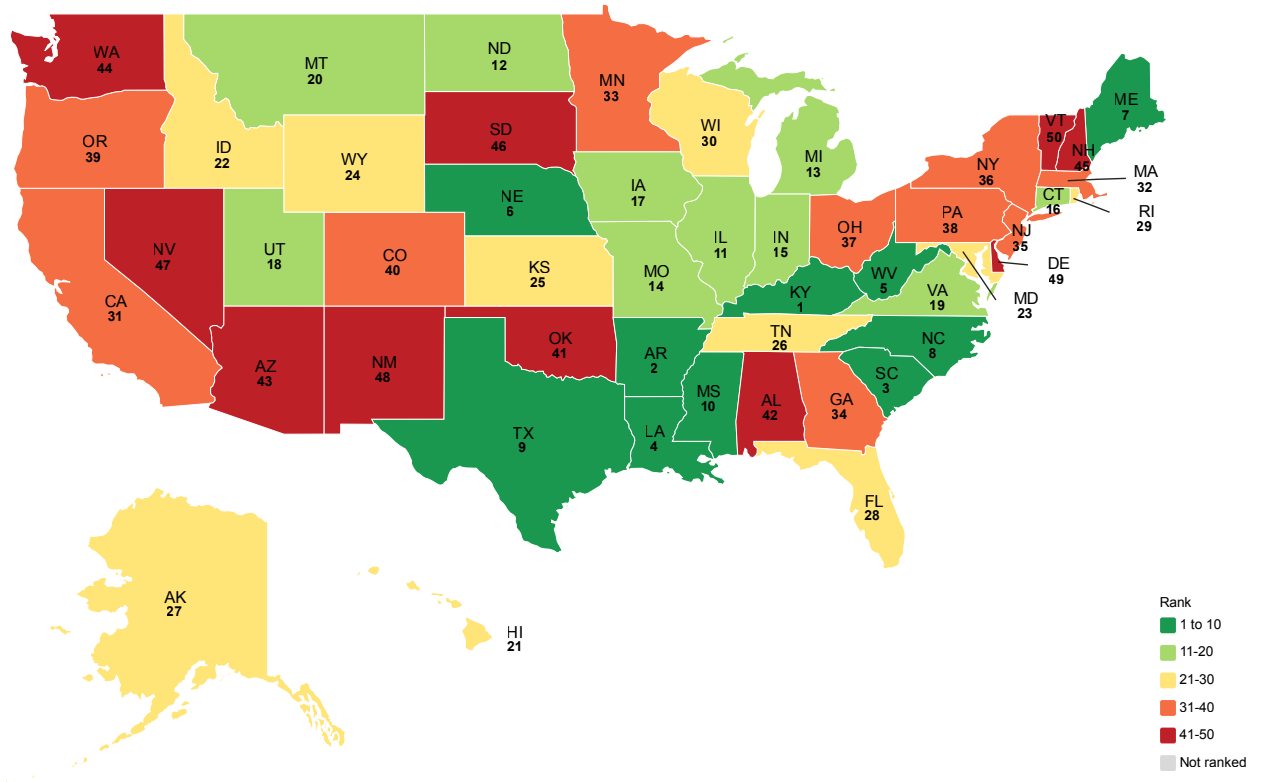
TABLE 9: ADMINISTRATIVE DISBURSEMENTS, 2020

2020 Rank	State	Disbursement Per Lane-Mile	Expected Disbursement per Lane-Mile	Adjusted Ratio
1	Kentucky	$552	$4,871	0.11
2	Arkansas	$1,030	$5,492	0.19
3	South Carolina	$1,399	$7,184	0.19
4	Louisiana	$1,339	$6,817	0.20
5	West Virginia	$932	$4,434	0.21
6	Nebraska	$852	$3,442	0.25
7	Maine	$1,305	$4,605	0.28
8	North Carolina	$2,158	$6,940	0.31
9	Texas	$2,178	$6,617	0.32
10	Mississippi	$2,135	$5,267	0.41
11	Illinois	$4,248	$9,973	0.43
12	North Dakota	$1,177	$2,623	0.45
13	Michigan	$4,648	$9,516	0.49
14	Missouri	$2,349	$4,805	0.49
15	Indiana	$3,760	$6,773	0.56
16	Connecticut	$8,093	$14,256	0.57
17	Iowa	$3,009	$5,208	0.58
18	Utah	$4,211	$7,175	0.59
19	Virginia	$3,709	$6,278	0.59
20	Montana	$1,751	$2,895	0.60
21	Hawaii	$7,574	$12,313	0.62
22	Idaho	$2,644	$4,195	0.63
23	Maryland	$7,959	$12,054	0.66
24	Wyoming	$2,669	$3,716	0.76
25	Kansas	$3,361	$4,394	0.76
26	Tennessee	$6,234	$7,986	0.78
27	Alaska	$3,881	$4,942	0.79
28	Florida	$10,006	$12,686	0.79
29	Rhode Island	$12,424	$13,652	0.91
30	Wisconsin	$6,046	$6,473	0.93
31	California	$11,159	$10,813	1.03
32	Massachusetts	$17,528	$16,692	1.05
33	Minnesota	$6,209	$5,696	1.09
34	Georgia	$9,780	$8,559	1.14
35	New Jersey	$20,337	$17,397	1.17
36	New York	$12,183	$10,225	1.19
37	Ohio	$12,329	$8,648	1.42
38	Pennsylvania	$10,700	$7,428	1.44
39	Oregon	$8,664	$5,875	1.47
40	Colorado	$9,679	$6,391	1.51
41	Oklahoma	$8,132	$5,322	1.53
42	Alabama	$11,328	$7,280	1.56
43	Arizona	$11,191	$6,998	1.60
44	Washington	$16,216	$7,384	2.20
45	New Hampshire	$12,942	$5,794	2.23
46	South Dakota	$6,326	$2,738	2.31
47	Nevada	$13,614	$5,797	2.34
48	New Mexico	$10,672	$4,210	2.53
49	Delaware	$29,795	$11,506	2.59
50	Vermont	$13,545	$4,216	3.21

lane-mile disbursement is $5,342 (Table 9, Administrative Disbursements per State, 2020, Figure 4). The average disbursement per lane-mile decreased 0.2% from 2019 ($5,351 disbursement per lane-mile), the last time this assessment was completed. This change, while technically a decrease, is in line with a generally steady spending trend over the last decade. Since 2007, total administrative disbursements have increased about 27.4%, the same amount as the Consumer Price Index (CPI) which has also increased about 27.4%.

In 2020, Kentucky, Arkansas, South Carolina, Louisiana, and West Virginia reported the lowest administrative expenditure ratios, after adjusting for urbanization. Vermont, Delaware, New Mexico, Nevada, and South Dakota reported the highest expenditures ratios. The 2020 Administrative Disbursement ratios by state cannot be compared to previous years, as the methodology has changed. Some administrative disbursements per state-controlled lane-mile can vary widely from year to year reflecting funding actions and project schedules.

FIGURE 4: ADMINISTRATIVE DISBURSEMENTS PER STATE-CONTROLLED LANE-MILE, 2020



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 Delaware count the benefits as an administrative disbursement since benefits are an administrative expense. Not surprisingly, of the two states, New Jersey ranks in the bottom 10 in Maintenance Disbursements and Delaware has a bottom 10 ranking in Administrative Disbursements. 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.

OTHER DISBURSEMENTS

Other disbursements include funds for law enforcement, safety, bonds, and interest payments. Since they include interest payments, they can vary widely from year to year. For 2020, other disbursements make up 26% of total funding. Even though this is a new category for 2020, this analysis also calculated other disbursements for 2019, finding a similar 26.2% of total spending.

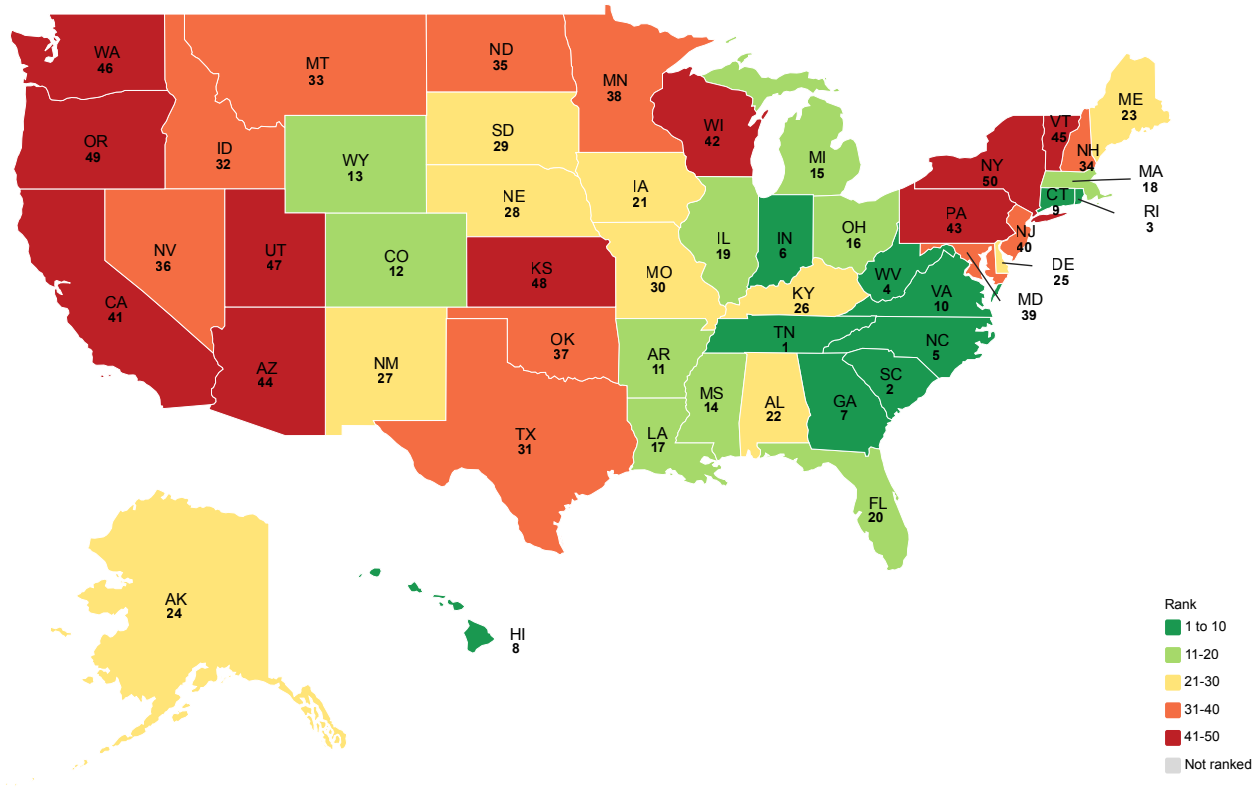
This is the first year we are measuring other disbursements. For this process, we take the disbursement per lane-mile and divide it by the expected disbursement per lane-mile to get a ratio. The average 2020 per lane-mile disbursement is $21,908 (Table 10, Other Disbursements per State, 2020, Figure 5).

In 2020, Tennessee, South Carolina, Rhode Island, West Virginia, and North Carolina reported the lowest other expenditure disbursement ratios, after adjusting for urbanization. New York, Oregon, Kansas, Utah, and Washington reported the highest expenditure ratios. Some of the other disbursements per state-controlled lane-mile can vary widely from year to year reflecting funding actions and project schedules.

TABLE 10: OTHER DISBURSEMENTS, 2020

2020 Rank	State	Disbursement Per Lane-Mile	Expected Disbursement per Lane-Mile	Adjusted Ratio
1	Tennessee	$923	$28,924	0.03
2	South Carolina	$805	$12,228	0.07
3	Rhode Island	$44,015	$147,775	0.30
4	West Virginia	$2,420	$7,916	0.31
5	North Carolina	$3,741	$11,647	0.32
6	Indiana	$4,435	$12,501	0.35
7	Georgia	$12,951	$35,798	0.36
8	Hawaii	$25,438	$67,223	0.38
9	Connecticut	$76,242	$191,093	0.40
10	Virginia	$5,581	$12,941	0.43
11	Arkansas	$4,733	$10,856	0.44
12	Colorado	$5,789	$13,148	0.44
13	Wyoming	$2,634	$5,652	0.47
14	Mississippi	$4,869	$10,286	0.47
15	Michigan	$20,957	$41,283	0.51
16	Ohio	$18,676	$36,484	0.51
17	Louisiana	$6,412	$12,255	0.52
18	Massachusetts	$204,258	$385,105	0.53
19	Illinois	$22,602	$42,392	0.53
20	Florida	$54,002	$86,644	0.62
21	Iowa	$6,343	$10,129	0.63
22	Alabama	$8.843	$13,588	0.65
23	Maine	$5,702	$8,418	0.68
24	Alaska	$6,827	$9,395	0.73
25	Delaware	$31,747	$42,076	0.75
26	Kentucky	$7,035	$9,188	0.77
27	New Mexico	$5,872	$7,238	0.81
28	Nebraska	$3,923	$4,733	0.83
29	South Dakota	$2,114	$2,284	0.93
30	Missouri	$8,454	$8,998	0.94
31	Texas	$13,668	$13,170	1.04
32	Idaho	$7,747	$7,190	1.08
33	Montana	$3,062	$2,841	1.08
34	New Hampshire	$12,649	$11,625	1.09
35	North Dakota	$2,141	$1,875	1.14
36	Nevada	$13,720	$11,633	1.18
37	Oklahoma	$12,641	$10,426	1.21
38	Minnesota	$14,286	$11,365	1.26
39	Maryland	$75,610	$55,712	1.36
40	New Jersey	$686,275	$444,323	1.54
41	California	$64,691	$41,607	1.55
42	Wisconsin	$20,958	$13,275	1.58
43	Pennsylvania	$28,019	$16,652	1.68
44	Arizona	$19,739	$11,483	1.72
45	Vermont	$13,285	$7,255	1.83
46	Washington	$31,787	$15,640	2.03
47	Utah	$25,772	$12,134	2.12
48	Kansas	$20,324	$7,797	2.61
49	Oregon	$33,859	$11,860	2.85
50	New York	$209,216	$42,523	4.92

FIGURE 5: OTHER DISBURSEMENTS PER STATE-CONTROLLED LANE-MILE, 2020



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 2020, about 2.10% of U.S. rural Interstates—609 miles out of 29,199—were reported to be in poor condition (Table 11, Percent Rural Interstate Mileage in Poor Condition, 2020, Figure 6). This is similar to 2019, the last time this assessment was completed, when 586 miles out of 29,232 (about 2.00%) of rural Interstate pavement was rated poor.

Between 2019 and 2020, the percentage of poor rural Interstate mileage decreased in 22 states, increased in 19 states and remained about the same in seven states. The percent of poor mileage changed less than one percentage point in 37 of the states. South Carolina, Massachusetts, and Minnesota led the states in decreasing poor-condition mileage (by 3.26, 2.13, and 1.49 percentage points, respectively) while Colorado, California, and Alaska led the states in increasing poor-condition mileage (by 2.15, 1.47, and 1.46, respectively).

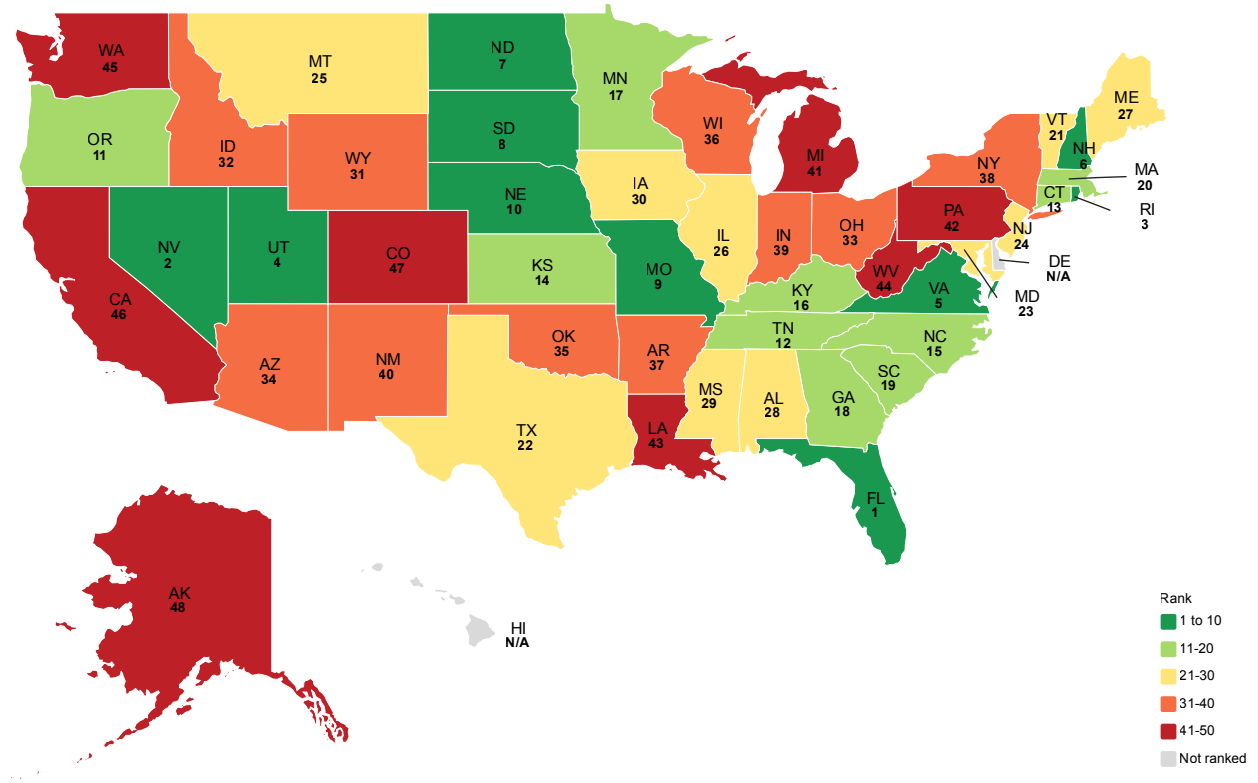
TABLE 11: PERCENT RURAL INTERSTATE MILEAGE IN POOR CONDITION, 2020

2020 Rank	State	Percent Rural Interstate Mileage in Poor Condition
1	Florida	0.15
2	Nevada	0.18
3	Rhode Island	0.27
4	Utah	0.30
5	Virginia	0.35
6	New Hampshire	0.35
7	North Dakota	0.38
8	South Dakota	0.44
9	Missouri	0.55
10	Nebraska	0.62
11	Oregon	0.66
12	Tennessee	0.67
13	Connecticut	0.73
14	Kansas	0.74
15	North Carolina	0.77
16	Kentucky	0.80
17	Minnesota	0.89
18	Georgia	0.91
19	South Carolina	0.95
20	Massachusetts	1.04
21	Vermont	1.14
22	Texas	1.24
23	Maryland	1.24
24	New Jersey	1.29
25	Montana	1.32
26	Illinois	1.34
27	Maine	1.39
28	Alabama	1.49
29	Mississippi	1.49
30	Iowa	1.55
31	Wyoming	1.58
32	Idaho	2.08
33	Ohio	2.17
34	Arizona	2.22
35	Oklahoma	2.36
36	Wisconsin	2.63
37	Arkansas	2.65
38	New York	2.73
39	Indiana	2.76
40	New Mexico	2.81
41	Michigan	3.00
42	Pennsylvania	3.03
43	Louisiana	3.07
44	West Virginia	3.44
45	Washington	4.10
46	California	4.52
47	Colorado	8.32
48	Alaska	9.63
	Delaware	N/A
	Hawaii	N/A
	Weighted Average	2.09

Rural Interstate mileage in poor condition varies widely by state. In 2020, every state reported at least some poor mileage, as opposed to 2019 when four states reported no poor mileage (Connecticut, New Hampshire, New Jersey, and Rhode Island). Nineteen states reported less than 1% poor mileage. On the other hand, two states (Alaska and Colorado) reported more than 5% poor mileage. The two states together have about 5.6% of U.S. rural Interstate mileage (1,630 miles of 29,199) but have 18% of the poor-condition mileage.

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

FIGURE 6: PERCENT OF RURAL INTERSTATES IN POOR CONDITION, 2020



URBAN INTERSTATE PAVEMENT CONDITION

The urban Interstates consist of major multi-lane highways in urbanized areas. The pavement condition of the urban Interstate system improved from 2019 to 2020, decreasing from 4.97% in poor condition to 4.77% (Table 12, Percent Urban Interstate Mileage in Poor Condition, 2020, Figure 7). In 2020, 911 of the 19,108 miles of urban Interstates were rated as poor, as compared to 947 poor-condition miles out of 19,069 miles in 2019, the last time this assessment was completed.

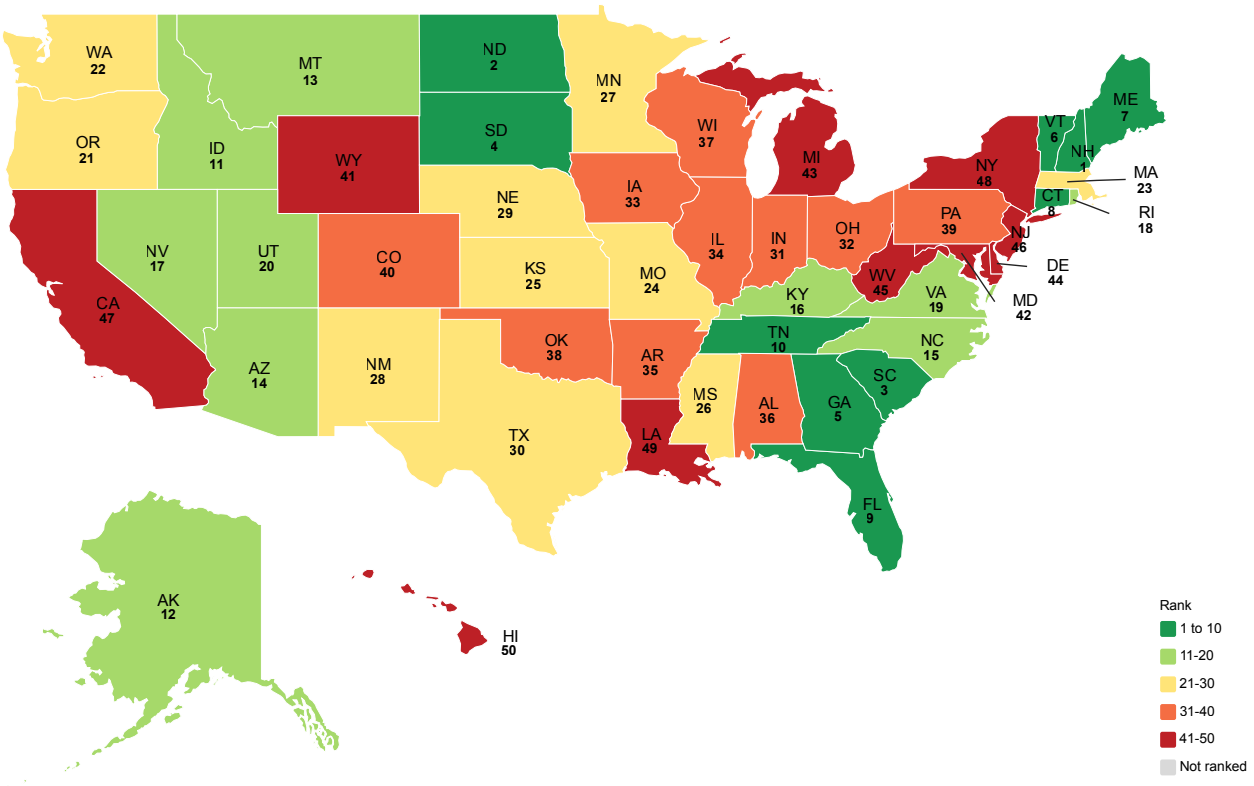
Between 2019 and 2020, the percentage of poor urban Interstate mileage increased in 25 states and decreased in 25 states. The percent of poor mileage changed less than one percentage point in 35 of the states. Minnesota and South Carolina led the states in reducing poor-condition mileage (by 2.65 and 2.49 points, respectively) while West Virginia and Hawaii led the states in increasing poor-condition mileage (by 4.31 and 2.24 points, respectively).

The condition of urban Interstate miles also varies widely by state. In 2020, every state reported at least some poor mileage. The bottom two states (Hawaii and Louisiana) reported more than 10% of their mileage to be in poor condition. These two states, collectively, have only about 2.45% of the urban Interstate mileage in the U.S. (469 of 19,108 miles) but have over 7% of the poor mileage (64 of 911 miles).

TABLE 12: PERCENT URBAN INTERSTATE MILEAGE IN POOR CONDITION, 2020

2020 Rank	State	Percent Urban Interstate Mileage in Poor Condition
1	New Hampshire	0.16
2	North Dakota	0.98
3	South Carolina	1.13
4	South Dakota	1.14
5	Georgia	1.36
6	Vermont	1.37
7	Maine	1.43
8	Connecticut	1.57
9	Florida	1.59
10	Tennessee	1.66
11	Idaho	1.66
12	Alaska	1.69
13	Montana	1.74
14	Arizona	2.13
15	North Carolina	2.27
16	Kentucky	2.32
17	Nevada	2.48
18	Rhode Island	2.49
19	Virginia	2.57
20	Utah	2.69
21	Oregon	2.88
22	Washington	2.92
23	Massachusetts	2.99
24	Missouri	3.03
25	Kansas	3.08
26	Mississippi	3.13
27	Minnesota	3.20
28	New Mexico	3.57
29	Nebraska	3.85
30	Texas	3.97
31	Indiana	4.24
32	Ohio	4.56
33	Iowa	4.72
34	Illinois	4.82
35	Arkansas	5.13
36	Alabama	5.16
37	Wisconsin	5.23
38	Oklahoma	5.42
39	Pennsylvania	6.13
40	Colorado	6.64
41	Wyoming	6.70
42	Maryland	6.94
43	Michigan	7.79
44	Delaware	8.67
45	West Virginia	8.99
46	New Jersey	9.32
47	California	9.38
48	New York	9.39
49	Louisiana	11.99
50	Hawaii	25.88
	Average	4.77

FIGURE 7: PERCENT OF URBAN INTERSTATES IN POOR CONDITION, 2020



RURAL OTHER PRINCIPAL ARTERIAL PAVEMENT CONDITION

Rural other principal arterials (ROPA) are two- to four-lane highways connecting different cities or regions. The condition of major rural arterials improved slightly from 2019 to 2020, by about 0.02 percentage points. Overall, about 1.13% of the ROPA system—1,016 miles out of 89,778—was reported to be in poor condition (Table 13, Percent Rural Other Principal Arterial Mileage in Poor Condition, 2019, Figure 8). This compares with about 1.15% (1,027 of 89,287 miles) in 2019, 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, highways near cities are often reclassified from rural to urban. If these highways were in good condition already, their reclassification has the effect of increasing the percentage of rural roads in poor condition.)

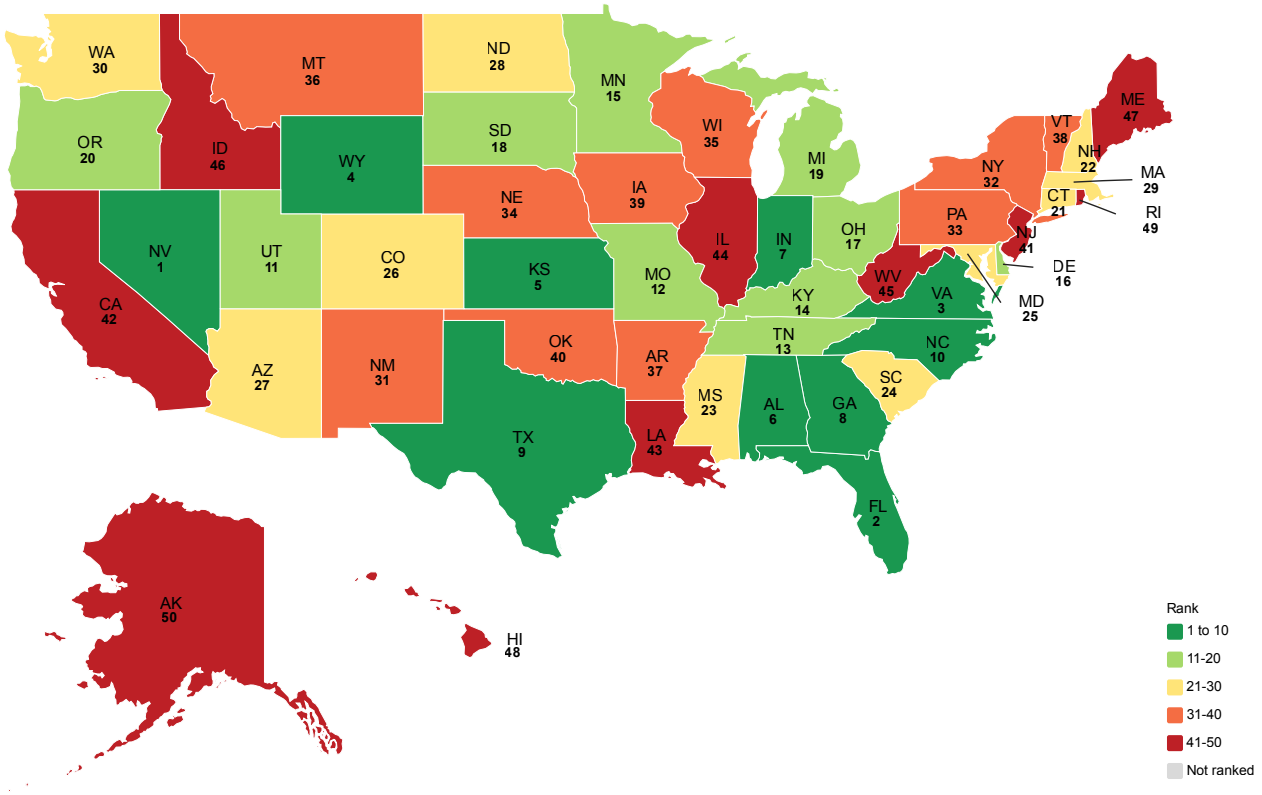
Between 2019 and 2020, the percentage of ROPA decreased in 29 states, increased in 19 states, and generally remained the same in two states. The percent of poor mileage changed less than one percentage point in 42 of the states. Rhode Island and New Jersey led the states in reducing poor condition (by 7.09 and 3.99 points respectively) while Idaho led the states in increasing poor condition mileage (by 2.86 points).

TABLE 13: PERCENT RURAL OTHER PRINCIPAL ARTERIAL MILEAGE IN POOR CONDITION, 2020

2020 Rank	State	Percent Rural Other Principal Arterial Mileage in Poor Condition
1	Nevada	0.11
2	Florida	0.17
3	Virginia	0.28
4	Wyoming	0.31
5	Kansas	0.32
6	Alabama	0.35
7	Indiana	0.37
8	Georgia	0.38
9	Texas	0.40
10	North Carolina	0.41
11	Utah	0.43
12	Missouri	0.47
13	Tennessee	0.47
14	Kentucky	0.52
15	Minnesota	0.56
16	Delaware	0.61
17	Ohio	0.62
18	South Dakota	0.69
19	Michigan	0.71
20	Oregon	0.72
21	Connecticut	0.79
22	New Hampshire	0.88
23	Mississippi	0.91
24	South Carolina	1.00
25	Maryland	1.01
26	Colorado	1.05
27	Arizona	1.10
28	North Dakota	1.11
29	Massachusetts	1.15
30	Washington	1.19
31	New Mexico	1.26
32	New York	1.27
33	Pennsylvania	1.35
34	Nebraska	1.42
35	Wisconsin	1.53
36	Montana	1.56
37	Arkansas	1.79
38	Vermont	1.80
39	Iowa	1.84
40	Oklahoma	2.05
41	New Jersey	2.26
42	California	2.32
43	Louisiana	2.33
44	Illinois	2.45
45	West Virginia	2.93
46	Idaho	3.21
47	Maine	3.85
48	Hawaii	4.16
49	Rhode Island	4.25
50	Alaska	13.78
	Average	1.13

The condition of ROPA miles varies widely by state. In 2020, all states reported at least some poor ROPA mileage. Twenty-four states reported 1% or less of their ROPA mileage was in poor condition. On the other hand, one state (Alaska) reported more than 10% of its ROPA mileage was in poor condition. Alaska has only 0.53% of the U.S. ROPA mileage, but 6.5% of the U.S. mileage that is in poor condition.

FIGURE 8: PERCENT OF RURAL OTHER PRINCIPAL ARTERIAL MILEAGE IN POOR CONDITION, 2020



URBAN OTHER PRINCIPAL ARTERIAL PAVEMENT CONDITION

Urban other principal arterials (UOPA) are four- to eight-lane highways connecting different parts of an urban region. Overall, about 14.19% of the UOPA system—9,105 miles out of 64,183—was reported to be in poor condition (Table 13, Percent Urban Other Principal Arterial Mileage in Poor Condition, 2020, Figure 9). This is a 0.33-point decrease from 2019 when 14.52% or 8,660 miles out of 64,054 miles were in poor condition. Overall, urban arterials are in much worse condition than rural arterials, rural Interstates, or urban Interstates with the percentage in poor condition at 1.13%, 2.09%, and 4.77% respectively.

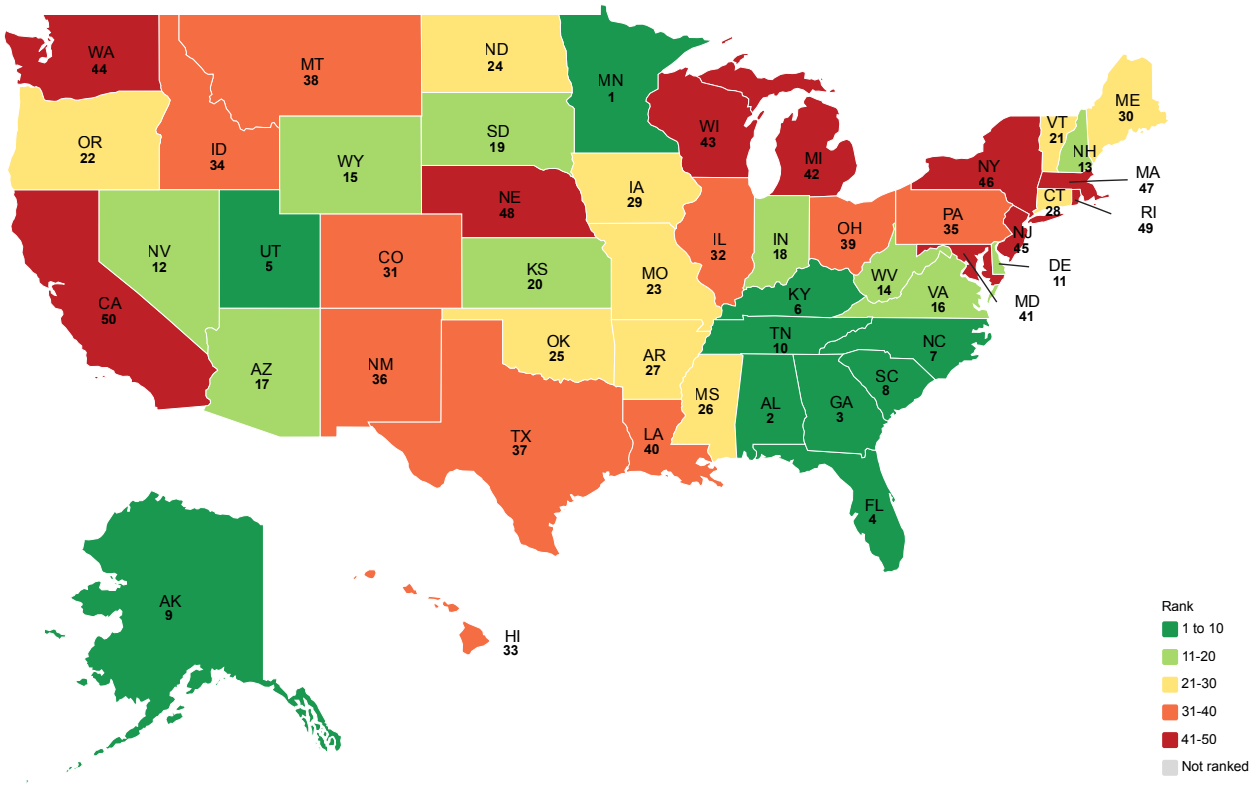
The percent UOPA mileage in poor condition varies drastically by state, from Minnesota with 1.85% to California at 39.80%. Ten states reported less than 5% of UOPA miles in poor condition. On the other hand, five states (California, Rhode Island, Nebraska, Massachusetts, and New York) reported more than 20% of their UOPA mileage to be in poor condition. These five states have 18.36% of the U.S. ROPA mileage, but 41.99% of the mileage that is in poor condition.

TABLE 14: PERCENT URBAN OTHER PRINCIPAL ARTERIAL MILEAGE IN POOR CONDITION, 2020

2020 Rank	State	Percent Urban Other Principal Arterial Mileage in Poor Condition
1	Minnesota	1.85
2	Alabama	1.94
3	Georgia	1.97
4	Florida	2.09
5	Utah	3.15
6	Kentucky	3.56
7	North Carolina	4.16
8	South Carolina	4.20
9	Alaska	4.48
10	Tennessee	4.97
11	Delaware	5.03
12	Nevada	5.04
13	New Hampshire	5.65
14	West Virginia	5.74
15	Wyoming	5.94
16	Virginia	6.10
17	Arizona	6.27
18	Indiana	6.66
19	South Dakota	6.88
20	Kansas	6.94
21	Vermont	7.11
22	Oregon	7.75
23	Missouri	8.11
24	North Dakota	8.65
25	Oklahoma	9.65
26	Mississippi	9.82
27	Arkansas	9.90
28	Connecticut	10.02
29	Iowa	10.53
30	Maine	10.98
31	Colorado	11.36
32	Illinois	11.48
33	Hawaii	12.06
34	Idaho	13.23
35	Pennsylvania	13.26
36	New Mexico	14.18
37	Texas	14.50
38	Montana	14.89
39	Ohio	15.37
40	Louisiana	15.89
41	Maryland	16.81
42	Michigan	16.95
43	Wisconsin	17.30
44	Washington	17.50
45	New Jersey	18.69
46	New York	23.81
47	Massachusetts	23.97
48	Nebraska	28.70
49	Rhode Island	30.00
50	California	39.80
	Weighted Average	14.19

Between 2019 and 2020, most states saw minor changes in UOPA pavement condition. Thirty-six states saw changes in poor condition mileage of one percentage point or less, with 14 states seeing decreases and 22 states seeing increases. On the other hand, nine states had more than 2% of their mileage in poor condition. The percentage of the UOPA system in poor condition in California, Idaho, and Arkansas increased (by 9.17, 6.93, and 3.40 points, respectively), while the poor mileage in Hawaii, New Jersey, and West Virginia decreased (by 6.24, 4.44, and 3.11 points, respectively).

FIGURE 9: PERCENT OF URBAN OTHER PRINCIPAL ARTERIAL MILEAGE IN POOR CONDITION, 2020



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 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.

This year, the *Annual Highway Report* uses data from Texas A&M Transportation Institute's 2021 Urban Mobility Report (UMR). This report uses 2020 congestion data. The metric selected was the "annual hours of delay per auto commuter." UMR defines annual delay per auto commuter as "a measure of the extra travel time endured throughout the year by auto commuters who make trips during the peak period." (The UMR data, which are computed only for urban areas, are aggregated by state. See the Appendix for details.)

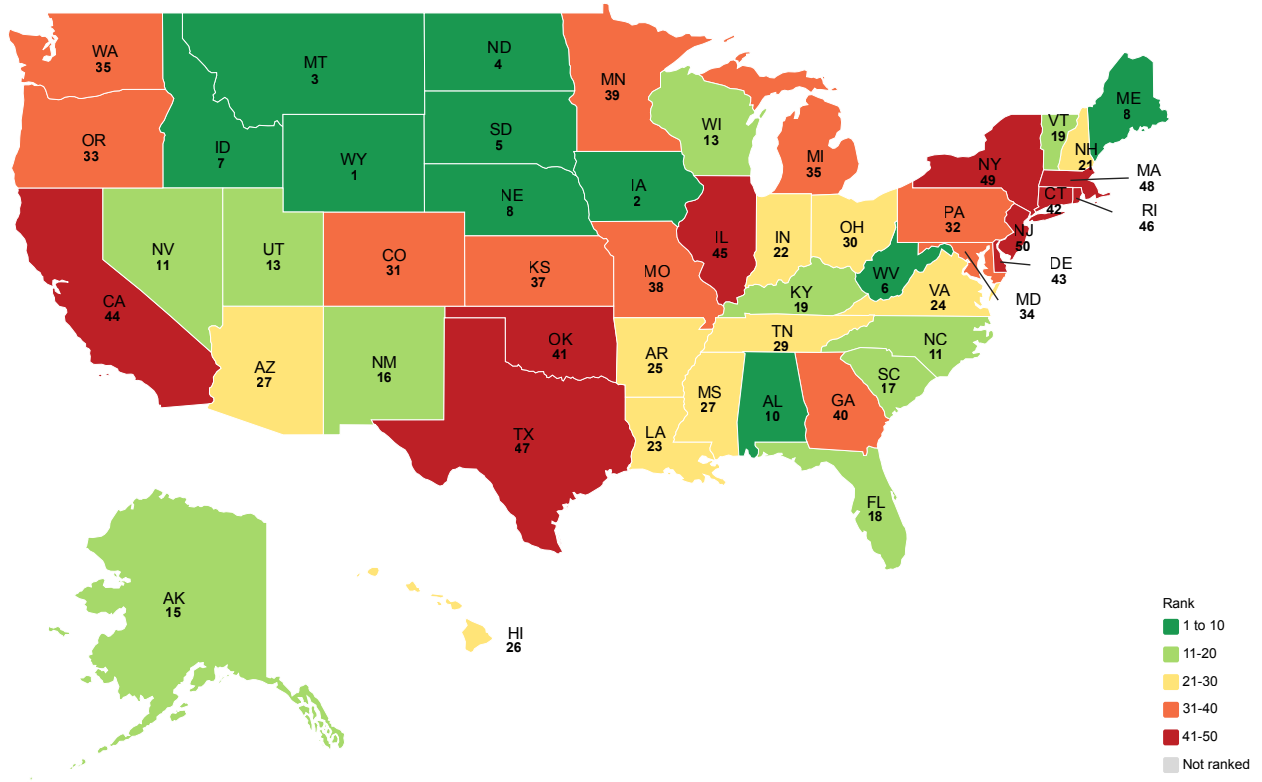
TABLE 15: ANNUAL PEAK HOURS SPENT IN CONGESTION PER AUTO COMMUTER, 2020

2020 Rank	State	Peak Hours Spent in Congestion per Auto Commuter
1	Wyoming	6.5
2	Iowa	7.5
3	Montana	8
4	North Dakota	8.6
5	South Dakota	9.8
6	West Virginia	10
7	Idaho	11.3
8	Maine	14.7
9	Nebraska	14.7
10	Alabama	16.2
11	North Carolina	16.4
12	Nevada	16.4
13	Utah	17
14	Wisconsin	17
15	Alaska	17.1
16	New Mexico	17.6
17	South Carolina	18.5
18	Florida	18.8
19	Kentucky	19
20	Vermont	19
21	New Hampshire	19.1
22	Indiana	19.4
23	Louisiana	19.5
24	Virginia	19.9
25	Arkansas	20.4
26	Hawaii	20.7
27	Arizona	22.2
28	Mississippi	22.2
29	Tennessee	22.5
30	Ohio	22.6
31	Colorado	22.8
32	Pennsylvania	22.9
33	Oregon	23
34	Maryland	23.5
35	Michigan	24.3
36	Washington	24.3
37	Kansas	24.7
38	Missouri	28.1
39	Minnesota	28.5
40	Georgia	28.9
41	Oklahoma	29.6
42	Connecticut	30.2
43	Delaware	30.8
44	California	31.3
45	Illinois	32
46	Rhode Island	32.7
47	Texas	34.9
48	Massachusetts	40.4
49	New York	43.2
50	New Jersey	48
	Average	27.04

In 2020, the average annual hours of delay per auto commuter in urbanized areas was 27.04 hours (see Table 15, Annual Hours of Delay per Auto Commuter, Figure 10). Annual hours of delay range from 6.5 in Wyoming to 48 in New Jersey. The congestion problem is primarily concentrated in the major cities of just a few states.

In 2020, commuters in six states spent fewer than 10 hours of delay sitting in peak-hour congestion. Commuters in 41 other states spent less than 40 hours of delay sitting in peak-hour congestion. Commuters in the bottom three states (New Jersey, New York, and Massachusetts) spent more than 40 hours of delay per year in traffic congestion.

FIGURE 10: PEAK HOURS SPENT IN AUTO CONGESTION PER COMMUTER, 2020



STRUCTURALLY DEFICIENT BRIDGES

Federal law mandates the uniform inspection of all bridges for structural adequacy at least every two years; bridges rated "deficient" are eligible for federal repair dollars. Table 16 and Figure 11 of this analysis use the *National Bridge Inventory* (NBI) as the source of the bridge data, which is provided in summary form 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. So, a "December 2020" summary from the NBI would represent, on average, bridge condition as of December 2019.

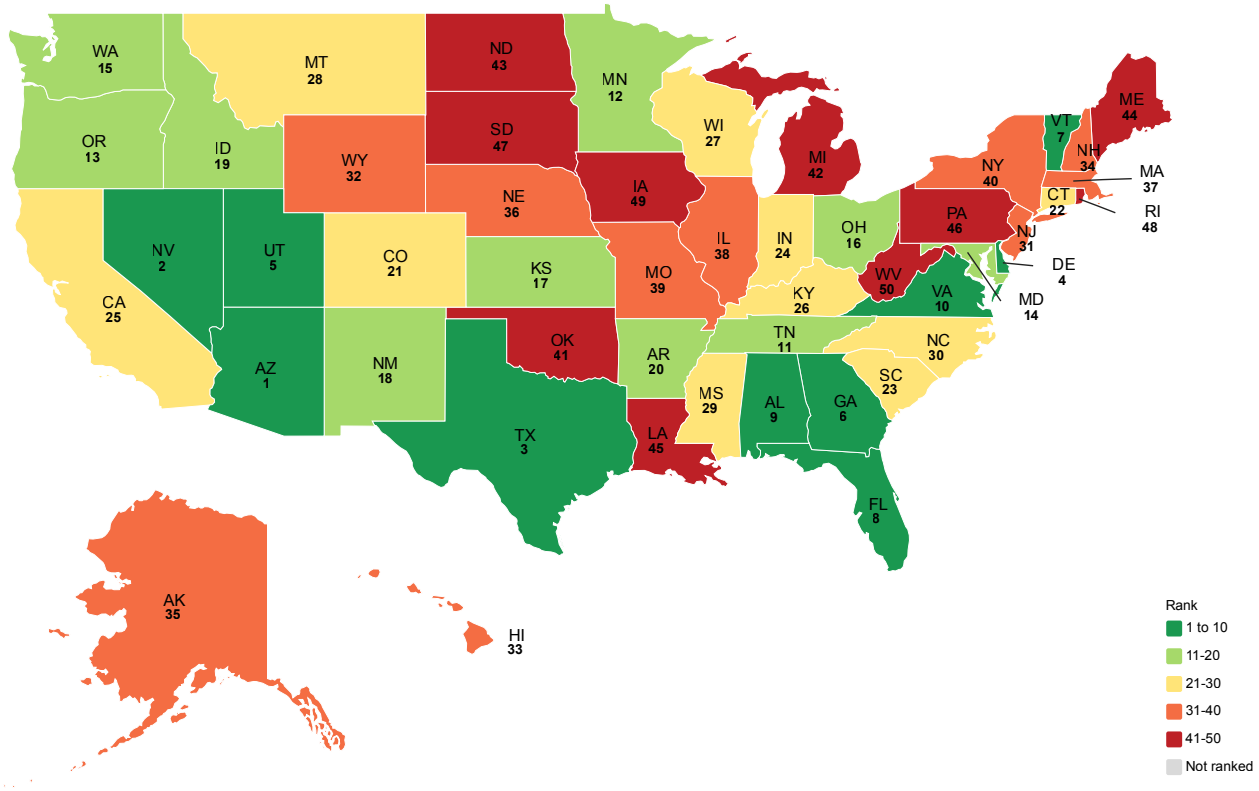
The condition of the nation's highway bridges in 2021 improved slightly from 2020, the last time this assessment was completed. Of the 617,008 highway bridges reported, 43,289 (7.02%) were rated structurally deficient for 2021 (Table 16, Percent of Structurally Deficient Bridges, 2021, Figure 11). This represents a 0.44% improvement over 2020 when 45,861 of 614,490 (7.46%) were rated as structurally deficient.

Arizona, Nevada, Texas, and Delaware reported less than 2% of their bridges as structurally deficient (1.38%, 1.40%, 1.43%, and 1.94% respectively). West Virginia reported more than 20% of its bridges as structurally deficient (at 20.37%). The majority of states (39) reported at least some improvement in the percentage of structurally deficient bridges between 2020 and 2021, with Rhode Island and South Carolina seeing the most improvement (4.88 and 3.13 percentage points, respectively). Of the 11 states that reported a higher percentage of deficient bridges, none saw an increase of more than one percentage point.

TABLE 16: PERCENT STRUCTURALLY DEFICIENT BRIDGES, 2021

2021 Rank	State	Percent Structurally Deficient Bridges
1	Arizona	1.38
2	Nevada	1.40
3	Texas	1.43
4	Delaware	1.94
5	Utah	2.06
6	Georgia	2.13
7	Vermont	2.40
8	Florida	3.62
9	Alabama	3.63
10	Virginia	3.79
11	Tennessee	4.14
12	Minnesota	4.58
13	Oregon	4.64
14	Maryland	4.65
15	Washington	4.80
16	Ohio	4.91
17	Kansas	5.12
18	New Mexico	5.17
19	Idaho	5.22
20	Arkansas	5.25
21	Colorado	5.29
22	Connecticut	5.30
23	South Carolina	5.31
24	Indiana	5.60
25	California	5.80
26	Kentucky	6.87
27	Wisconsin	6.90
28	Montana	6.93
29	Mississippi	6.99
30	North Carolina	7.02
31	New Jersey	7.09
32	Wyoming	7.39
33	Hawaii	7.49
34	New Hampshire	7.68
35	Alaska	8.21
36	Nebraska	8.34
37	Massachusetts	8.69
38	Illinois	8.96
39	Missouri	9.02
40	New York	9.52
41	Oklahoma	9.89
42	Michigan	10.99
43	North Dakota	11.23
44	Maine	12.64
45	Louisiana	12.76
46	Pennsylvania	13.80
47	South Dakota	17.30
48	Rhode Island	17.46
49	Iowa	18.87
50	West Virginia	20.37
	Average	7.02

FIGURE 11: PERCENT STRUCTURALLY DEFICIENT BRIDGES, 2021



RURAL FATALITY RATE

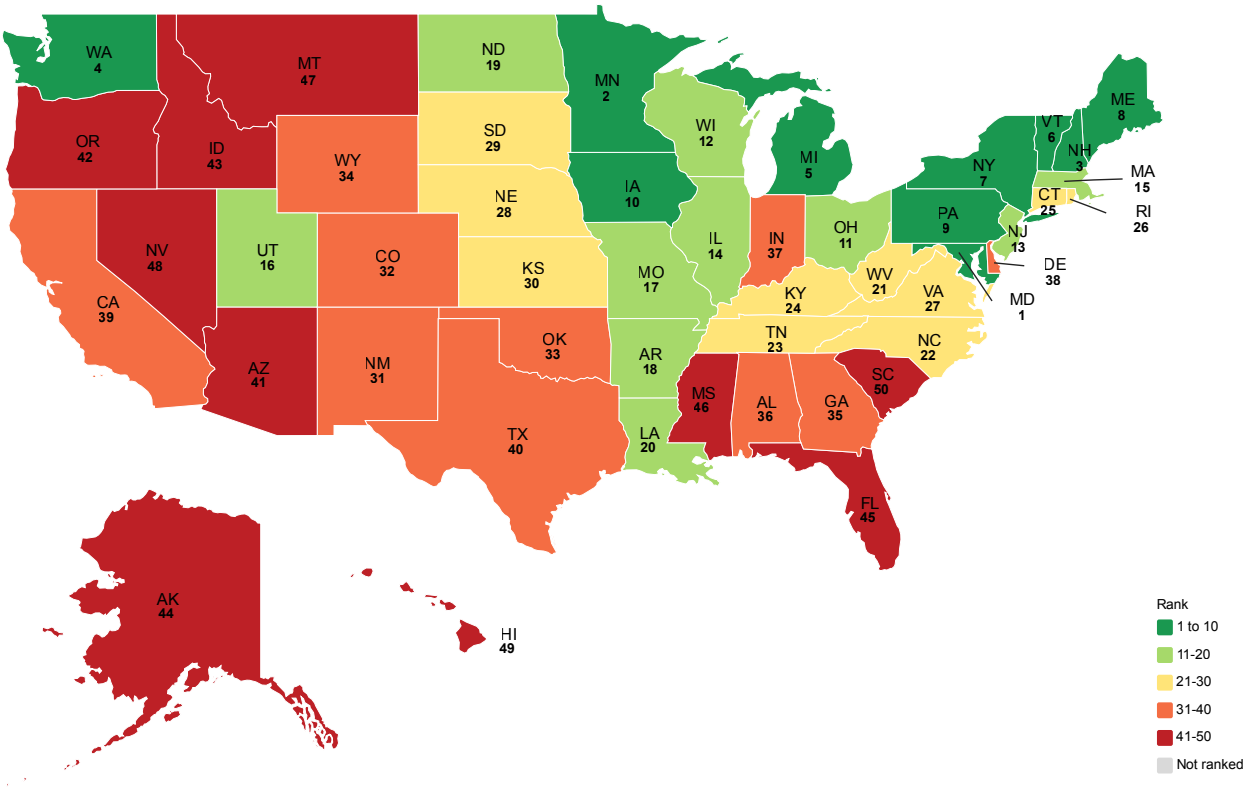
The rural fatality rate measures fatalities on all rural arterials in the state. The nation's rural highway fatality rate increased from 1.26 in 2019 to 1.30 in 2020 (Table 17, Rural Fatality Rate per 100 Million Vehicle-Miles, 2020, Figure 12). In 2020, 5,822 rural fatalities were reported, fewer than the 6,273 rural fatalities reported in 2019, as rural VMT (vehicle-miles of travel) decreased to 0.45 trillion from 0.50 trillion in 2019, partly as a result of COVID-19.

For 2020, Maryland reported the lowest rural fatality rate, 0.57, while South Carolina reported the highest, 2.92. Twenty states reported a decrease in their rural fatality rate compared to 2019, led by Hawaii, Arkansas, and Kansas (which improved 1.97, 1.03, and 0.70 points respectively). Three states had rates that remained the same. Twenty-seven states saw their fatality rate increase, led by Rhode Island, Connecticut, and South Carolina (which worsened at 1.02, 0.79, and 0.73 points, respectively).

TABLE 17: FATALITY RATE PER 100 MILLION RURAL VEHICLE-MILES, 2020

2020 Rank	State	Fatality Rate Per 100 Million Rural Vehicle-Miles
1	Maryland	0.57
2	Minnesota	0.69
3	New Hampshire	0.77
4	Washington	0.81
5	Michigan	0.82
6	Vermont	0.82
7	New York	0.83
8	Maine	0.83
9	Pennsylvania	0.83
10	Iowa	0.84
11	Ohio	0.85
12	Wisconsin	0.89
13	New Jersey	0.90
14	Illinois	0.92
15	Massachusetts	0.95
16	Utah	0.98
17	Missouri	1.02
18	Arkansas	1.03
19	North Dakota	1.04
20	Louisiana	1.11
21	West Virginia	1.14
22	North Carolina	1.16
23	Tennessee	1.17
24	Kentucky	1.19
25	Connecticut	1.19
26	Rhode Island	1.19
27	Virginia	1.20
28	Nebraska	1.23
29	South Dakota	1.25
30	Kansas	1.27
31	New Mexico	1.29
32	Colorado	1.29
33	Oklahoma	1.33
34	Wyoming	1.35
35	Georgia	1.37
36	Alabama	1.45
37	Indiana	1.45
38	Delaware	1.49
39	California	1.52
40	Texas	1.54
41	Arizona	1.62
42	Oregon	1.63
43	Idaho	1.64
44	Alaska	1.71
45	Florida	1.79
46	Mississippi	1.81
47	Montana	1.84
48	Nevada	2.19
49	Hawaii	2.89
50	South Carolina	2.92
	Average	1.30

FIGURE 12: FATALITY RATE PER 100 MILLION RURAL VEHICLE-MILES, 2020



URBAN FATALITY RATE

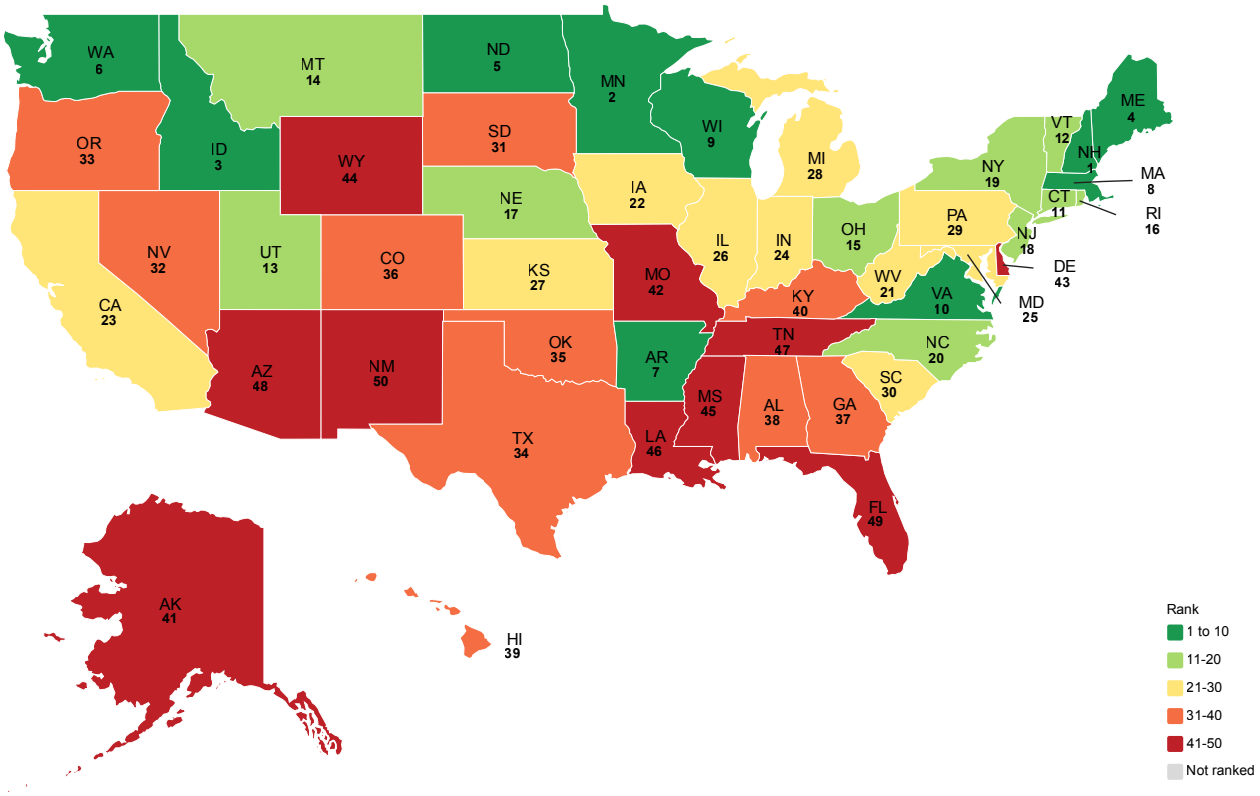
The urban fatality rate measures fatalities on all urban arterials in the state. The nation's urban highway fatality rate worsened from 0.82 in 2019 to 1.04 in 2020 (Table 18, Urban Fatality Rate per 100 Million Vehicle-Miles, 2020, Figure 13). The urban fatality rate has increased over the last several years after a decades-long downward trend. While there is no one cause, distracted driving may be a significant contributor. In 2020, 11,889 urban fatalities were reported, more than the 10,737 urban fatalities reported in 2019, as urban VMT (vehicle-miles of travel) decreased to 1.14 trillion from 1.31 trillion in 2019, partly as a result of COVID-19.

For 2020, New Hampshire reported the lowest urban fatality rate, 0.37, while New Mexico reported the highest, 2.15. Three states reported a decrease in their urban fatality rates compared to 2019, led by Arkansas and Idaho (which improved 0.49 and 0.26 points respectively). Forty-seven states saw their fatality rate increase, led by Wyoming and Arkansas (which increased by 0.71 and 0.67 points respectively).

TABLE 18: FATALITY RATE PER 100 MILLION URBAN VEHICLE-MILES, 2020

2020 Rank	State	Fatality Rate Per 100 Million Urban Vehicle-Miles
1	New Hampshire	0.37
2	Minnesota	0.40
3	Idaho	0.51
4	Maine	0.52
5	North Dakota	0.53
6	Washington	0.58
7	Arkansas	0.58
8	Massachusetts	0.58
9	Wisconsin	0.67
10	Virginia	0.69
11	Connecticut	0.74
12	Vermont	0.75
13	Utah	0.78
14	Montana	0.79
15	Ohio	0.83
16	Rhode Island	0.83
17	Nebraska	0.84
18	New Jersey	0.88
19	New York	0.91
20	North Carolina	0.93
21	West Virginia	0.95
22	Iowa	0.95
23	California	0.96
24	Indiana	0.96
25	Maryland	0.98
26	Illinois	1.02
27	Kansas	1.03
28	Michigan	1.03
29	Pennsylvania	1.06
30	South Carolina	1.07
31	South Dakota	1.08
32	Nevada	1.08
33	Oregon	1.10
34	Texas	1.10
35	Oklahoma	1.13
36	Colorado	1.18
37	Georgia	1.20
38	Alabama	1.21
39	Hawaii	1.24
40	Kentucky	1.26
41	Alaska	1.27
42	Missouri	1.30
43	Delaware	1.33
44	Wyoming	1.37
45	Mississippi	1.43
46	Louisiana	1.43
47	Tennessee	1.45
48	Arizona	1.49
49	Florida	1.55
50	New Mexico	2.15
	Average	1.04

FIGURE 13: FATALITY RATE PER 100 MILLION URBAN VEHICLE-MILES, 2020



OTHER FATALITY RATE

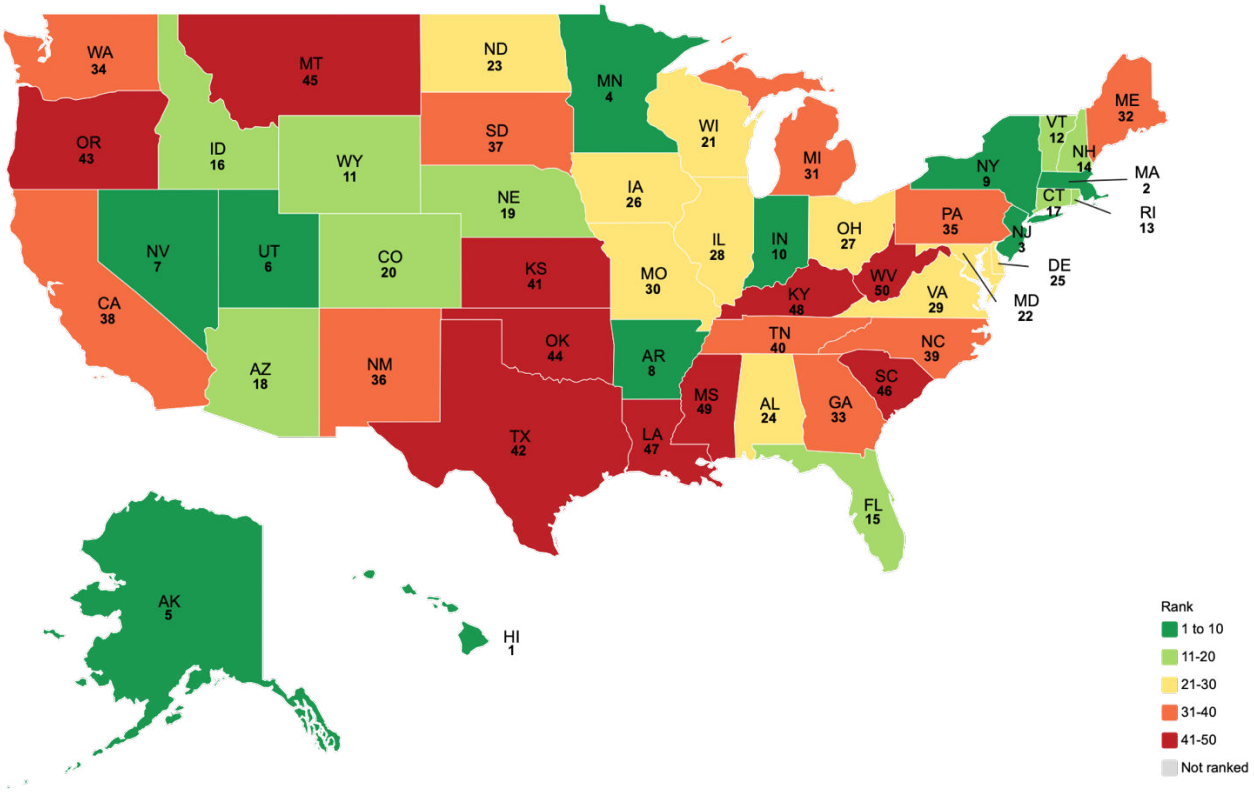
The other fatality rate measures fatalities on rural and urban minor arterials, collectors, and local roadways in the state as fatalities per 100 million vehicle-miles. The nation's average other fatality rate for 2020 is 1.54, (Table 19, Other Fatality Rate per 100 Million Vehicle-Miles, 2020, Figure 14). In 2020, 20,193 fatalities were reported, more than the 18,855 fatalities reported in 2019 when VMT (vehicle-miles of travel) decreased due to COVID-19.

For 2020, Hawaii reported the lowest other fatality rate, 0.65, while West Virginia reported the highest, 2.28. The 2020 other fatality rate cannot be compared to previous years, as it is a new performance indicator.

TABLE 19: FATALITY RATE PER 100 MILLION OTHER VEHICLE-MILES, 2020

2020 Rank	State	Fatality Rate Per 100 Million Vehicle-Miles
1	Hawaii	0.65
2	Massachusetts	0.68
3	New Jersey	0.84
4	Minnesota	0.99
5	Alaska	0.99
6	Utah	1.03
7	Nevada	1.10
8	Arkansas	1.11
9	New York	1.17
10	Indiana	1.19
11	Wyoming	1.20
12	Vermont	1.20
13	Rhode Island	1.21
14	New Hampshire	1.21
15	Florida	1.28
16	Idaho	1.31
17	Connecticut	1.32
18	Arizona	1.34
19	Nebraska	1.35
20	Colorado	1.38
21	Wisconsin	1.39
22	Maryland	1.40
22	North Dakota	1.41
24	Alabama	1.43
25	Delaware	1.43
26	Iowa	1.44
27	Ohio	1.50
28	Illinois	1.52
29	Virginia	1.52
30	Missouri	1.52
31	Michigan	1.55
32	Maine	1.58
33	Georgia	1.61
34	Washington	1.62
34	Pennsylvania	1.62
36	New Mexico	1.63
37	South Dakota	1.76
38	California	1.77
39	North Carolina	1.85
40	Tennessee	1.88
41	Kansas	1.89
42	Texas	1.89
43	Oregon	1.94
44	Oklahoma	1.97
45	Montana	1.99
46	South Carolina	2.09
47	Louisiana	2.11
48	Kentucky	2.14
49	Mississippi	2.16
50	West Virginia	2.28
	Average	1.54

FIGURE 14: FATALITY RATE PER 100 MILLION OTHER VEHICLE–MILES, 2020



ABOUT THE AUTHORS

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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*.

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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 for congestion, we use data from INRIX Research, the Texas A&M Transportation Institute, and the *American Community Survey*. This assessment evaluates states based on expenditures, pavement quality, traffic congestion, and safety. In general, we use self-reported 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.

MEASURE 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 Highway Agency Mileage*:** For each state the report uses the total numbers of lane-miles for the state roadway system. Each state's responsibility for roads varies. In some, such as 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. We use the lane-miles to calculate and then to weight overall financial performance. The source of data for state lane-miles is Table HM-81, *Highway Statistics 2020* (https://www.fhwa.dot.gov/policyinformation/statistics/2020/).

DISBURSEMENTS FOR STATE-OWNED HIGHWAYS

There are multiple 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 put into four categories (Capital and Bridge Disbursements, Maintenance Disbursements, Administrative Disbursements, and Other 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 2020* (https://www. fhwa.dot. gov/policyinformation/statistics/2020/).

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 contract with private-sector companies to build and reconstruct the system, although in some cases states 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 vary widely from year to year.

Other Disbursements: These disbursements are not counted in the first three categories and include law enforcement, safety, bonds, and interest. This category can vary from year to year due to major bond sales which, because they are collected in one year and expended in another, 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, Rural Fatality Rate, Urban Fatality Rate, and Other 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 the 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 2020* (https://www.fhwa.dot.gov/policyinformation/statistics/2020/), 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 "annual hours of delay per auto commuter 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 of delay 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.

There are two data sources required to calculate the current metric: Texas A&M Transportation Institute's *Urban Mobility Report* (https://mobility.tamu.edu/umr/) and Table HM-74 from the FHWA *Highway Statistics* series (https://www.fhwa.dot.gov/policyinformation/statistics.cfm)

The 2021 Urban Mobility Report (UMR) provides 2020 congestion data for 494 urban areas in the U.S. Data items include annual hours of delay per auto commuter as well as the number of auto commuters for each area. The UMR calculates their data based on INRIX speed data. 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.

The calculation of the final metric is done through three steps. First, the total annual hours of delay for each state are calculated by multiplying the annual hours of delay per auto commuter by the number of auto commuters for each urban area, and then summing them up for each state, adjusted by the DVMT data. Second, the total number of commuters for each state, adjusted by the DVMT data, are added up from the urban areas. Finally, each state's annual hours of delay per commuter are computed by dividing the state's total annual hours of delay by its total number of commuters.

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 ago, the "average" inspection age is about one year. So, an October

2021 summary from the *Inventory* would represent, on average, bridge condition as of October 2020.

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 engineers. The 2021 *Better Roads Bridge Inventory* (http://www.equipmentworld.com/2020-better-roads-bridge-inventory-2-year-decline-in-deficient-u-s-bridges-snapped/) contains data collected through October 2021.

Rural 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 Rural Fatality Rate applies to all rural Interstates, other freeways and expressways, and other principal arterials. 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 2020* (https://www.fhwa.dot.gov/policyinformation/statistics/2020/). 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.

Urban Fatality Rate: The Urban Fatality Rate applies to all urban Interstates, other freeways and expressways, and other principal arterials. It is calculated in the same manner as the Rural Fatality Rate.

Other Fatality Rate: The Overall Fatality Rate applies to all rural and urban minor arterials, collectors, and local roads. It is calculated in the same manner as the Rural Fatality Rate.

OVERALL RATINGS

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

- 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 expected 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)

$E(M_{is})$ = Expected value of Measure "i" for state "s".

The expected values for the four spending categories are determined by LOESS regressions between the spending amounts per lane-mile and the percent of urban lane-miles to take into account the fact that more urbanized states are expected to spend more on roads (per lane-mile) than less urbanized ones. For each state, the percent of urban lane-miles is calculated by dividing the urban lane-miles by the total (urban plus rural) lane-miles of that state. We use local regressions instead of linear regressions to account for the non-linear relationships between the percent of urban lane-miles and the disbursement per lane-mile, especially for the "other disbursement" category. The local regressions are performed in R, a statistical programming language, using the default span of 0.75. For the other nine categories, the expected value is the national weighted average of the measure across the 50 states.

R_{is} = Performance Ratio for measure "i", state "s"
= $M_{is}/E(M_{is})$

- The 13 performance ratios are combined to calculate the average performance ratio:

$$\overline{R_s} = \frac{1}{n}\sum_{i=1}^{n} R_{is}$$

In lieu of 13, Delaware and Hawaii use 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.