



# MANPOWER ASSESSMENT REPORT

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## The Role of Two-Year Colleges in Preparing Students for Careers in Science and Technology

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### SUMMARY

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Over 56,000 associate's degrees were awarded in science, math, engineering, and technology (SMET) fields in 1993.\*

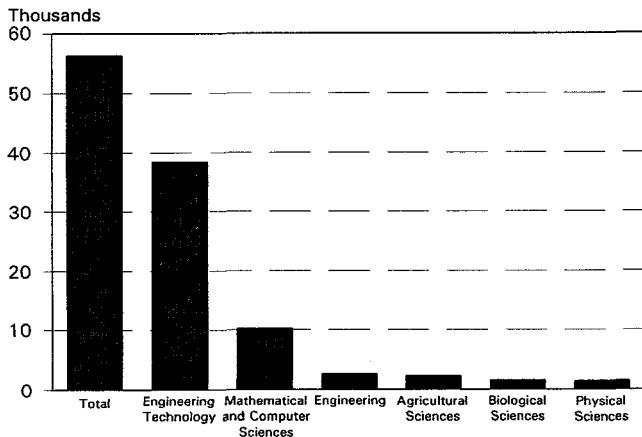
- More than 80% of these associate's degrees were awarded in engineering technologies or mathematical/computer sciences.
- Women earned 21% of the associate's degrees, a smaller share than their share of SMET bachelor's degrees.
- African Americans and Hispanic Americans each earned 8%, and Native Americans earned nearly 1%, a larger share than their share of SMET bachelor's degrees.

#### Two-year colleges prepare students for employment as technicians.

Among persons employed as technicians within six years of high school graduation:

- 18% of the total had associate's degrees, and 46% had some kind of training or courses provided by a two-year college.
- 13% of the women had associate's degrees, and 34% had some kind of training or courses provided by a two-year college.
- 22% of the underrepresented population had associate's degrees, and 41% had some kind of training or courses provided by a two-year college.

**Figure 1. Two-Year Associate's Degrees in Science, Math, Engineering, and Technology Fields, 1993**



Two-year colleges provide education leading to bachelor's or master's degrees in science and engineering.

#### All Graduates:

- 11% of persons receiving bachelor's or master's degrees in SMET fields had previously received associate's degrees.
- 36% of persons receiving bachelor's or master's degrees in SMET fields had previously taken courses at a two-year college.

#### Women:

- 11% of women receiving bachelor's or master's degrees in SMET fields had previously received associate's degrees.
- 37% of women receiving bachelor's or masters's degrees in SMET fields had previously taken courses at a two-year college.

#### African Americans:

- 12% of African Americans receiving bachelor's or master's degrees in SMET fields had previously received associate's degrees.
- 33% of African Americans receiving bachelor's or master's degrees in SMET fields had previously taken courses at a two-year college.

#### Hispanic Americans:

- 15% of Hispanic Americans receiving bachelor's or master's degrees in SMET fields had previously received associate's degrees.
- 42% of Hispanic Americans receiving bachelor's or master's degrees in SMET fields had previously taken courses at a two-year college.

#### Native Americans:

- 12% of Native Americans receiving bachelor's or master's degrees in SMET fields had previously received associate's degrees.
- 30% of Native Americans receiving bachelor's or master's degrees in SMET fields had previously taken courses at a two-year college.

\* Science, math, engineering, and technology (SMET) fields include physical sciences, life sciences, environmental sciences, math and computer sciences, engineering, and engineering technology, but exclude psychology, social sciences, and medical technology.

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Two-year colleges have a variety of goals when educating students. Some programs prepare students for bachelor's degrees. Other programs provide preparation in two years or less for employment in science, math, engineering, or technology occupations. In addition, two-year colleges provide courses, often in a certificate program, for job-specific training or retraining. Data on the success of two-year colleges must recognize these different paths. Accordingly, the data presented in this report examine not only two-year degree awards, but also technicians' use of two-year colleges to prepare for their work, regardless of whether they completed two-year associate's degrees. Data are also presented on the backgrounds of persons receiving bachelor's and master's degrees, including persons who did not complete two-year degrees, but who had completed some coursework at two-year colleges.

### Degree Awards

In 1993, there were 56,343 two-year associate's degrees awarded in science, math, engineering, and technology (SMET) fields. (Figure 1.) Relatively few of these awards were in traditional science and engineering fields; most were awarded in engineering technology or mathematical/computer sciences.

There is considerable variation among states in the number and rate at which associate's degrees are awarded in SMET fields. (Table 1.) Thirty-five states produce 95 percent of the associate's degrees. The states that rank highest in absolute numbers are large states: New York, California, Ohio, Pennsylvania, and Alabama. The states with the highest proportion of the population completing SMET associate's degrees are mostly small states, but also include Alabama, Indiana, and Ohio. (Figure 2.)

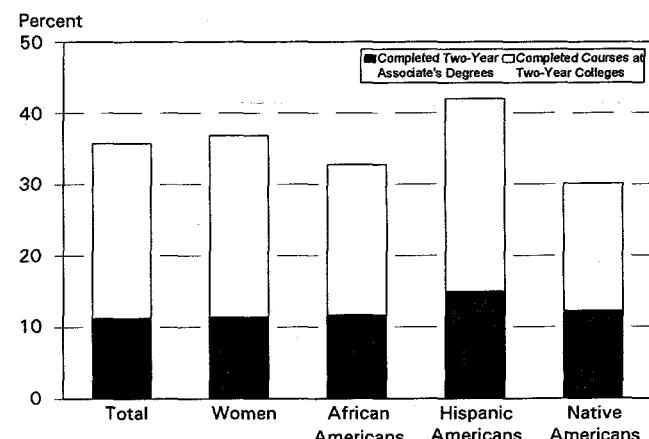
**Figure 2. States Ranked Highest and Lowest in the Ratio of Two-Year SMET Associate's Degrees Awarded to Age 21- to 27-Year-Olds in 1993**

<u>Highest</u>	<u>Lowest</u>
Alabama*	Georgia
Rhode Island	Louisiana
Wyoming	Nevada
North Dakota	South Dakota
Indiana	Arkansas
New Hampshire	Hawaii
Vermont	New Jersey
Delaware	Maryland
Ohio	Missouri
Idaho	Illinois

\* Alabama's high ranking is due in part to a large Air Force college that makes awards to students from other states.

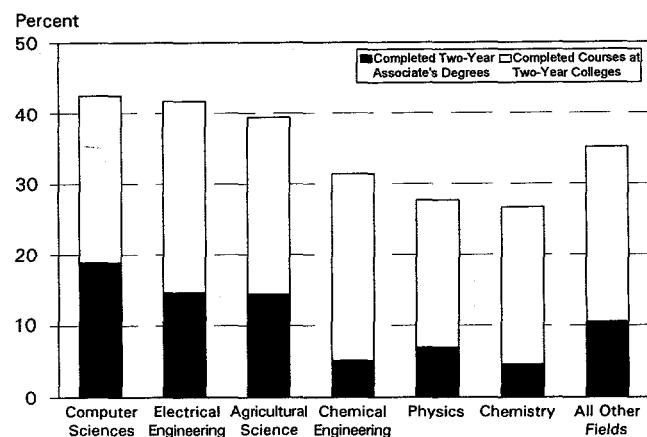
Only 11 percent of recent bachelor's and master's degree recipients in science, math, engineering, and technology had completed two-year associate's degrees previously. However, 36 percent of these graduates report they had completed one or more courses at two-year colleges. (Figure 3.)

**Figure 3. Bachelor's and Master's Degree Recipients in Science, Math, Engineering, and Technology Who Studied at Two-Year Colleges, 1990-1992**



Persons receiving bachelor's or master's degrees in computer sciences, agricultural sciences, or electrical engineering were most likely to have attended a two-year college or to have completed an associate's degree. Those receiving bachelor's or master's degrees in chemical engineering, chemistry, or physics were least likely to have used two-year colleges to further their educational goals. (Figure 4.)

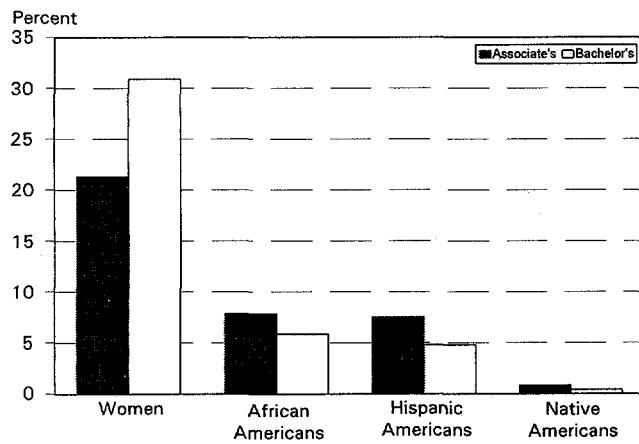
**Figure 4. Bachelor's and Master's Degree Recipients in Science, Math, Engineering, and Technology Who Studied at a Two-Year Colleges, by Degree Field, 1990-1992**



## Women

Although women attend and complete college with slightly greater frequency than men, a greater proportion of men choose science, math, engineering, or technology-related majors at both two- and four-year colleges. Figure 5 shows that in 1993 women earned only about 21 percent of SMET associate's degrees and 31 percent of SMET bachelor's degrees. At the two-year college level, where occupational programs make up a high proportion of all two-year degrees, males often choose engineering technology programs, whereas females often enroll in fields such as medical technology or health practitioner fields, which are by definition not SMET fields.

**Figure 5. Science, Math, Engineering, and Technology Associate's and Bachelor's Degrees Awarded to Women and Underrepresented Population, 1993**



Women who earned bachelor's or master's degrees in SMET fields report that they earned two-year associate's degrees or completed courses at two-year colleges about as frequently as men; about 37 percent studied at two-year colleges. (Figure 3.)

The rate at which women earned two-year associate's degrees in SMET fields varies considerably by state. In Georgia, Hawaii, and Illinois, women earn two-year degrees in SMET fields at less than one-third the national average for women. In Wyoming and Alabama, women earn these degrees at more than three times the national rate. (Table 2.)

## African Americans

African Americans attend and complete college at lower rates than all others. However, at two-year colleges, they earned about 8 percent of SMET associate's degrees in 1993

(compared with only 6 percent of SMET bachelor's degrees). (Figure 5.)

The African Americans who earn bachelor's or master's degrees in SMET fields report that they studied at two-year colleges almost as frequently as others who earned such bachelor's and master's degrees. (Figure 3.)

The proportion of African Americans earning two-year associate's degrees in SMET fields varies considerably by state. New York stands out as a state with a large African-American population where the proportion earning two-year associate's degrees in SMET fields is relatively high. In contrast, Louisiana and North Carolina have large African-American populations, but relatively low numbers of degree awards to African Americans. (Table 2.)

## Hispanic Americans

Hispanic Americans, like other underrepresented population groups, attend and complete college at relatively low rates. However, Hispanic Americans do make relatively more use of two-year colleges; Hispanic Americans earned about 8 percent of all two-year associate's degrees in SMET fields, compared with only 5 percent of SMET bachelor's degrees. (Figure 5.)

The Hispanic Americans who earn bachelor's or master's degrees in SMET fields report that they studied at two-year colleges more often than other groups. (Figure 3.)

The proportion of young Hispanic Americans earning two-year associate's degrees in SMET fields varies considerably by state. California has by far the largest population of college-age Hispanic Americans, and it awards more two-year SMET degrees than any other state, but the ratio of such awards to the total population is well below the national average. The highest rates are in Oklahoma and Indiana, states with relatively few Hispanic Americans. Among states with large Hispanic populations, New Jersey has the lowest rate of awards to Hispanic Americans, and Arizona has the highest rate. (Table 2.)

## Native Americans

Native Americans attend and complete college at lower rates than the national average. However, at two-year colleges, they earned about 0.8 percent of SMET associate's degrees in 1993, compared with only 0.4 percent of SMET bachelor's degrees. (Figure 5.)

The Native Americans who earn bachelor's or master's degrees in SMET fields report that they studied at two-year

colleges less frequently than others who earned such bachelor's and master's degrees. (Figure 3.)

The proportion of Native Americans who earn two-year associate's degrees in SMET fields varies considerably by state. Oklahoma awards more two-year associate's degrees in SMET fields to Native Americans than any other state, and Oklahoma has a large Native American population. However, the rate at which this population earns such degrees is only slightly above the national rate for Native Americans. States with more modest but still substantial populations of Native Americans include several where the rate of two-year SMET degree completion is higher than Oklahoma. These include Florida, Kansas, Michigan, and Montana. In contrast, Arizona and New Mexico have large Native American populations and a relatively low rate of two-year SMET degree awards to Native Americans. (Table 2.)

## Technician Employment

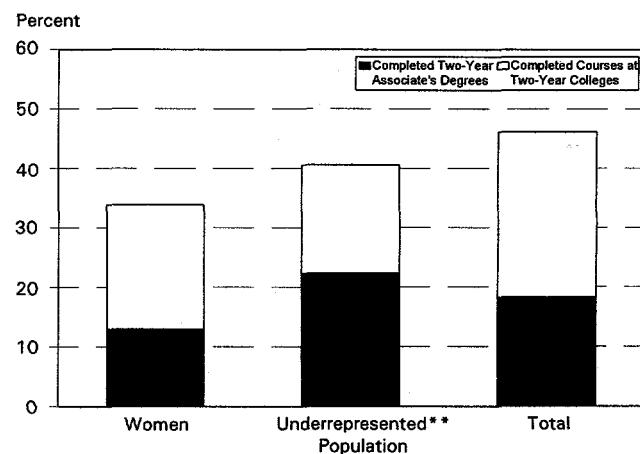
Figure 6 shows data on persons who were employed as technicians within six years of high school graduation. Figure 6 shows that members of the underrepresented population (African Americans, Hispanic Americans, and Native Americans combined) who obtain technician employment without earning a bachelor's degree make use of two-year colleges nearly 41 percent of the time—less frequently than other technicians. However, members of the underrepresented population employed as technicians more often report that they have two-year degrees, while Caucasians and Asian Americans make relatively greater use of other opportunities afforded by two-year colleges such as training courses or coursework not resulting in a degree.

## Technical Notes

1. The National Science Foundation's "CASPAR Database System" is the source of all data on associate's and bachelor's degree awards. These data describe awards made in 1993.
2. Data on the two-year college backgrounds of bachelor's and master's degree recipients are from special tabulations made from the "National Survey of Recent College Graduates." Conducted for the National Science Foundation in 1993, this survey obtained responses from persons receiving science and engineering bachelor's and master's degrees in 1990, 1991, and 1992.
3. Estimates of the 1993 state-by-state population of 21- to 27-year-olds were obtained from the "1990 Census of Population." The estimates shown in this report are identical to the decennial census estimates of the population of 18- to 24-year-olds in 1990.
4. Estimates of the proportion of technicians who took courses at two-year colleges or completed associate's degrees are from special tabulations of the U.S. Department of Education's Survey, "High School and Beyond," a longitudinal survey of the high school class

Only 13 percent of women technicians who were interviewed six years after their high school graduation reported that they had earned associate's degrees. However, 34 percent of women technicians indicated they had received training of some kind from two-year colleges; most often this involved completion of courses for credit but sometimes it involved only noncredit training. (Figure 6.)

**Figure 6. Technicians\* Who Studied at Two-Year Colleges, 1986**



\* Includes those reporting they were employed as technicians six years after high school graduation. Excludes persons with a bachelor's or higher degree.

\*\* In this figure, African American, Hispanic American, and Native American technicians are combined because limited sample size does not permit separate estimates for each group.

of 1980. These tabulations were restricted to persons who had obtained employment as technicians within six years of high school graduation and excluded technicians who had completed a bachelor's or higher degree.

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**Table 1. Science, Mathematics, Engineering, and Technology Associate's Degrees Awarded by State, 1993**

State	All SMET Awards		SMET Awards per 1000 21- to 27-Year-Olds	
	Number	Rank	Number	Rank
<b>Total</b>	<b>56,343</b>		<b>2.11</b>	
Alabama	3,347	5	7.55	1
Alaska	85	49	1.52	36
Arizona	909	18	2.31	18
Arkansas	202	44	0.85	47
California	5,153	2	1.51	37
Colorado	700	22	2.09	22
Connecticut	537	30	1.55	34
Delaware	245	42	3.21	8
District of Columbia	141	46	1.71	31
Florida	1,664	9	1.37	39
Georgia	379	35	0.51	51
Hawaii	108	47	0.89	46
Idaho	307	36	3.12	10
Illinois	1,565	10	1.29	42
Indiana	2,175	8	3.60	5
Iowa	761	21	2.68	15
Kansas	569	27	2.24	19
Kentucky	773	20	1.93	23
Louisiana	285	37	0.61	50
Maine	262	39	2.12	21
Maryland	558	28	1.10	44
Massachusetts	985	14	1.39	38
Michigan	3,041	7	3.03	12
Minnesota	595	26	1.34	40
Mississippi	546	29	1.86	26
Missouri	602	25	1.16	43
Montana	91	48	1.30	41
Nebraska	279	38	1.79	27
Nevada	76	50	0.64	49
New Hampshire	421	32	3.58	6
New Jersey	805	19	1.03	45
New Mexico	260	40	1.71	30
New York	5,156	1	2.64	16
North Carolina	1,245	12	1.59	32
North Dakota	253	41	3.73	4
Ohio	3,556	3	3.13	9
Oklahoma	979	15	3.05	11
Oregon	632	24	2.36	17
Pennsylvania	3,395	4	2.77	14
Rhode Island	522	31	4.34	2
South Carolina	644	23	1.58	33
South Dakota	46	51	0.68	48
Tennessee	914	17	1.73	28
Texas	3,267	6	1.73	29
Utah	384	34	1.92	24
Vermont	217	43	3.44	7
Virginia	1,114	13	1.55	35
Washington	917	16	1.88	25
West Virginia	397	33	2.21	20
Wisconsin	1,511	11	2.95	13
Wyoming	160	45	3.87	3

Note: Alabama's high ranking is due in part to a large Air Force college that makes awards to students from other states.

**Table 2. Science, Mathematics, Engineering, and Technology  
Associate's Degrees Awarded to Women and Underrepresented Population by State, 1993**

State	Women				African Americans			
	All SMET Awards		SMET Awards per 1000 21- to 27-Year-Olds		All SMET Awards		SMET Awards per 1000 21- to 27-Year-Olds	
	Number	Rank	Number	Rank	Number	Rank	Number	Rank
<b>Total</b>	<b>11,997</b>		<b>0.91</b>		<b>4,081</b>		<b>1.10</b>	
Alabama	536	6	2.40	2	93	16	0.75	36
Alaska	36	45	1.44	8	8	37	2.29	6
Arizona	129	24	0.68	32	33	27	2.37	4
Arkansas	35	46	0.29	48	41	25	0.95	26
California	1,608	1	1.02	21	281	3	1.02	24
Colorado	132	23	0.81	28	38	26	2.23	7
Connecticut	74	33	0.44	43	29	28	0.78	35
Delaware	48	43	1.24	15	12	34	0.82	33
District of Columbia	66	37	1.50	6	80	19	1.73	12
Florida	335	10	0.56	37	225	4	1.08	21
Georgia	61	38	0.17	51	164	7	0.75	37
Hawaii	14	51	0.26	50	5	39	0.83	32
Idaho	73	35	1.52	5	1	44	1.80	11
Illinois	160	20	0.27	49	183	5	0.89	28
Indiana	403	8	1.34	12	105	12	2.07	8
Iowa	101	28	0.72	31	10	35	1.46	15
Kansas	168	19	1.37	10	24	30	1.29	18
Kentucky	218	13	1.10	18	57	21	1.71	13
Louisiana	70	36	0.30	47	71	20	0.45	46
Maine	57	42	0.93	23	0	49	0.00	49
Maryland	146	21	0.58	35	117	11	0.81	34
Massachusetts	187	16	0.52	38	43	24	1.02	23
Michigan	689	4	1.37	11	134	9	0.84	30
Minnesota	107	27	0.48	40	8	37	0.66	43
Mississippi	133	22	0.90	25	85	18	0.73	40
Missouri	108	26	0.42	45	56	22	0.86	29
Montana	32	47	0.93	22	1	44	2.36	5
Nebraska	59	40	0.76	30	10	35	1.41	16
Nevada	20	49	0.35	46	1	44	0.10	48
New Hampshire	101	28	1.71	3	1	44	0.83	31
New Jersey	172	17	0.45	42	95	15	0.72	41
New Mexico	92	30	1.22	16	2	40	0.53	45
New York	1,216	2	1.25	13	658	1	1.87	10
North Carolina	171	18	0.45	41	101	14	0.53	44
North Dakota	21	48	0.66	33	0	49	0.00	49
Ohio	652	5	1.14	17	170	6	1.29	17
Oklahoma	217	14	1.38	9	52	23	1.70	14
Oregon	82	32	0.62	34	2	40	0.36	47
Pennsylvania	479	7	0.78	29	125	10	0.97	25
Rhode Island	91	31	1.52	4	29	28	5.13	1
South Carolina	210	15	1.05	19	136	8	1.05	22
South Dakota	17	50	0.51	39	2	40	3.50	2
Tennessee	113	25	0.43	44	91	17	0.94	27
Texas	831	3	0.90	26	286	2	1.14	19
Utah	58	41	0.57	36	2	40	1.09	20
Vermont	39	44	1.25	14	0	49	0.00	49
Virginia	315	11	0.91	24	102	13	0.68	42
Washington	242	12	1.02	20	15	33	0.74	39
West Virginia	74	33	0.82	27	16	32	2.42	3
Wisconsin	370	9	1.45	7	23	31	0.75	38
Wyoming	61	38	3.04	1	1	44	1.93	9

**Table 2 (continued). Science, Mathematics, Engineering, and Technology Associate's Degrees Awarded to Women and Underrepresented Population by State, 1993**

State	Hispanic Americans					Native Americans				
	All SMET Awards		SMET Awards per 1000 21- to 27-Year-Olds			All SMET Awards		SMET Awards per 1000 21- to 27-Year-Olds		
	Number	Rank	Number	Rank	Number	Rank	Number	Rank	Number	Rank
<b>Total</b>	<b>3,937</b>		<b>1.24</b>		<b>407</b>		<b>1.71</b>			
Alabama	5	29	1.46	9	2	26	1.14	31		
Alaska	1	43	0.40	38	11	13	1.15	29		
Arizona	151	5	1.64	6	29	3	1.14	30		
Arkansas	1	43	0.33	43	0	43	0.00	43		
California	850	1	0.71	29	43	2	1.44	20		
Colorado	76	8	1.45	11	5	21	1.39	21		
Connecticut	22	17	0.71	28	1	34	1.21	27		
Delaware	3	33	1.23	18	1	34	4.29	4		
District of Columbia	9	24	1.46	10	0	43	0.00	43		
Florida	214	4	1.19	19	13	10	3.16	10		
Georgia	8	27	0.40	40	1	34	0.56	40		
Hawaii	2	39	0.19	46	1	34	1.37	22		
Idaho	3	33	0.40	37	5	21	2.85	12		
Illinois	99	6	0.72	26	1	34	0.34	42		
Indiana	40	10	2.98	2	4	24	2.66	13		
Iowa	1	43	0.21	45	2	26	2.05	16		
Kansas	33	14	2.42	3	14	9	4.41	3		
Kentucky	2	39	0.58	33	1	34	1.33	23		
Louisiana	12	22	1.01	23	2	26	0.88	36		
Maine	0	48	0.00	48	3	25	3.94	5		
Maryland	13	20	0.70	30	2	26	1.21	26		
Massachusetts	32	15	0.71	27	5	21	3.09	11		
Michigan	34	13	1.25	16	24	4	3.33	9		
Minnesota	4	30	0.55	34	8	15	1.30	24		
Mississippi	3	33	1.32	15	11	13	10.89	1		
Missouri	4	30	0.48	35	2	26	0.92	34		
Montana	0	48	0.00	48	19	5	3.49	8		
Nebraska	4	30	0.80	24	1	34	0.64	38		
Nevada	2	39	0.11	47	0	43	0.00	43		
New Hampshire	3	33	1.80	5	0	43	0.00	43		
New Jersey	40	10	0.40	39	1	34	0.54	41		
New Mexico	83	7	1.24	17	12	11	0.73	37		
New York	388	3	1.32	14	16	7	2.01	17		
North Carolina	6	28	0.39	41	15	8	1.44	19		
North Dakota	0	48	0.00	48	2	26	0.64	39		
Ohio	27	16	1.50	8	19	5	8.18	2		
Oklahoma	44	9	3.59	1	61	1	2.16	15		
Oregon	11	23	0.63	31	8	15	1.77	18		
Pennsylvania	37	12	1.12	20	0	43	0.00	43		
Rhode Island	17	18	2.35	4	2	26	3.85	6		
South Carolina	2	39	0.37	42	0	43	0.00	43		
South Dakota	1	43	1.38	12	6	19	1.00	33		
Tennessee	3	33	0.58	32	0	43	0.00	43		
Texas	615	2	1.05	21	8	15	1.03	32		
Utah	9	24	0.78	25	8	15	2.34	14		
Vermont	1	43	1.53	7	0	43	0.00	43		
Virginia	13	20	0.48	36	2	26	0.90	35		
Washington	9	24	0.28	44	12	11	1.22	25		
West Virginia	0	48	0.00	48	1	34	3.70	7		
Wisconsin	17	18	1.33	13	6	19	1.20	28		
Wyoming	3	33	1.05	22	0	43	0.00	43		