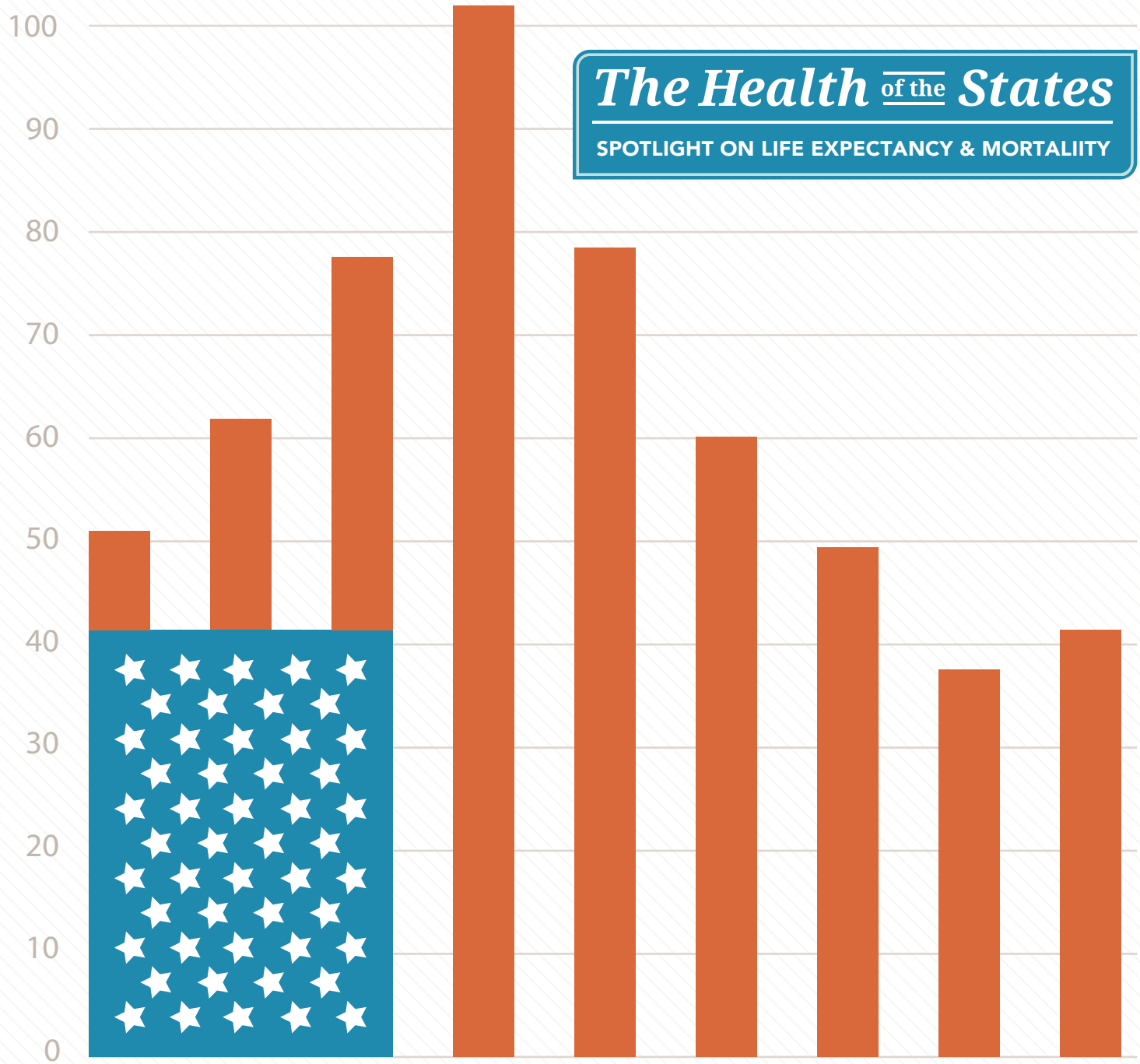

The Health of the States

SPOTLIGHT ON LIFE EXPECTANCY & MORTALIITY

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The Health of the States study, funded by the Robert Wood Johnson Foundation, was a systematic examination of health disparities in the U.S. across the 50 states and the District of Columbia. The study was conducted in 2014-2016 by the Virginia Commonwealth University Center on Society and Health and the Urban Institute. The goal was to take a "deep dive" into the available data on the health of the states and the factors that shape health. The project examined how 123 potential determinants of health, drawn from five broad domains, correlated with 39 different health outcomes that span mortality and illness/injury across the life course.

The results were issued in a series of reports: a summary report[1] released in October 2016, followed by a series of supplements. This report, the second of nine supplements, focuses on how mortality and life expectancy vary across the states. Please refer to the first supplement—*The Health of the States: Spotlight on methods*[2]—for details on the data sources and analytic methods used to produce these results.

THE HEALTH OF THE STATES

Supplement 2:

Spotlight on Life Expectancy and Mortality

Virginia Commonwealth University
Center on Society and Health
and the Urban Institute

January 2017

Spotlight on Life Expectancy and Mortality

Life expectancy at birth[a] varies substantially across the 50 states. As of 2010, life expectancy varied 6.3 years across the states, from 75.0 years in Mississippi to 81.3 years in Hawaii. Using data from 2007-2009, we also examined life expectancy at age 65 (a measure of survival for older adults) and years of potential life lost before age 75 (a measure of premature death). Additionally, we examined all-cause mortality rates from 2013, which ranged from 590.8 per 100,000 persons in Hawaii to almost double that rate in Mississippi (959.6 per 100,000 persons). Figure 1 presents the data for each state.

States in the "Top 10" (longest life expectancy at birth) were located primarily in the New England, Middle Atlantic, and Pacific regions (Figure 2). The same geographic pattern was observed for the other three measures: life expectancy at age 65 (Figure 3), all-cause mortality (Figure 4), and years of potential life lost (Figure 5). States that ranked in the Top 10 for all four measures included California, Connecticut, Hawaii, Minnesota, and New York. Hawaii had the highest life expectancy and lowest all-cause mortality rate in the nation; Minnesota had the best statistics for premature death (fewest years of life lost before age 75) in the United States.

As with most data in this project, the reader should bear in mind that—for reasons discussed in our summary report[1]—the results are not broken out by race and ethnicity, which can vary significantly.[3] For example, other studies have reported that the highest life expectancy for whites is not in Hawaii but in Minnesota; the highest life expectancy for African Americans and Latinos is in Nevada and Rhode Island, respectively.[4] Here, our results are based on state averages, obscuring important differences that occur within states and at the county and neighborhood levels. For example, although in our analysis the premature death rate for South Dakota as a whole was unremarkable, ranking in the middle of the range, an analysis by Basu et al. found that Shannon County,[b] located on South Dakota's Pine Ridge Indian Reservation, had more years of life lost before age 75 than any other county in the nation.[5] Native Americans had among the highest mortality rates in the country.[6]

a. Life expectancy at birth refers to the average number of years a newborn can be expected to live based on prevailing age-specific mortality rates.

b. In the study by Basu et al.,[5] Shannon County, South Dakota had the highest premature death rate for counties with a population greater than 10,000 persons. When counties with even smaller populations were included in the analysis, the county with the nation's highest premature mortality rate was Sioux County, South Dakota, which is located entirely within Standing Rock Indian Reservation.

Life expectancy was generally shortest for infants born in the South, especially in Gulf Coast states and Appalachia (Figure 2), and the same region had the highest rates of all-cause mortality and premature death. Six Southern states—Alabama, Kentucky, Mississippi, South Carolina, Tennessee, and West Virginia—ranked in the Bottom 10 on all four measures. Mississippi, followed by Alabama and West Virginia, had the lowest life expectancy in the United States and the highest all-cause mortality and number of years of life lost before age 75. Three West South Central states (Arkansas, Louisiana, and Oklahoma) also ranked in the Bottom 10 on all four measures.

Certain states, such as North Dakota, ranked in the Top 10 only for life expectancy at age 65, suggesting a possible health advantage at older ages in these states or perhaps a migration pattern that selects for healthy retirees. For example, a majority of Florida's residents were born outside the South.[7] A health advantage for seniors may exist in Hawaii, where life expectancy at age 65 and all-cause mortality were far better than in other Top 10 states. Some states may have an advantage in preventing deaths among younger people (Minnesota, for example, had especially low rates of premature death) or in preventing deaths among older residents. These patterns may also relate to selection effects, such as places

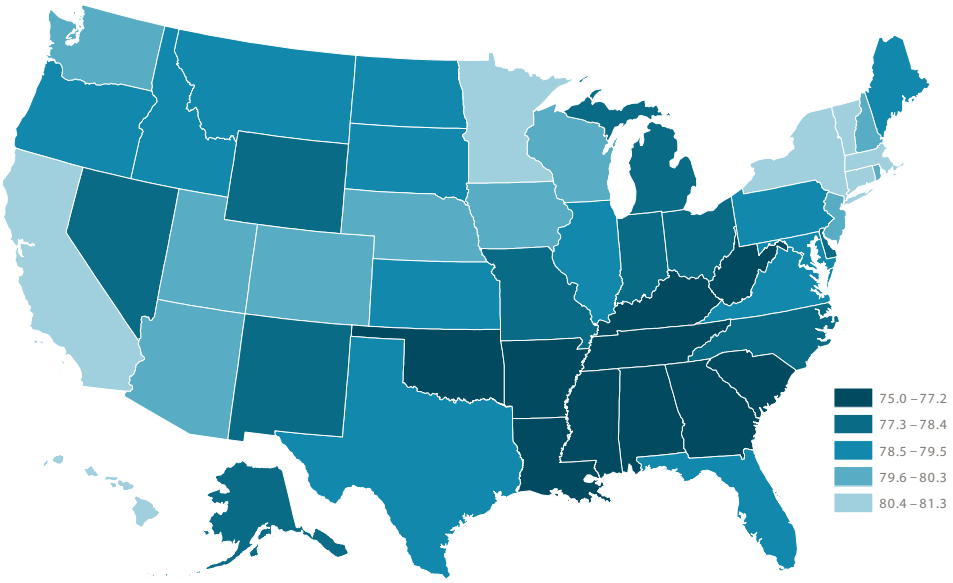
FIGURE 1.

LIFE EXPECTANCY AND MORTALITY OUTCOMES, BY STATE

Life expectancy at birth (years)		Life expectancy at age 65 (years)		All-cause mortality (per 100,000)		Total years of life lost before age 75 (per 100,000)	
HI	81.3	HI	21.3	HI	590.8	MN	5047.4
MN	81.1	FL	20.4	CA	630.1	MA	5241.6
CA	80.8	CA	20.3	CT	646.3	NH	5294.7
CT	80.8	AZ	20.2	NY	649.3	CT	5308.6
MA	80.5	CT	20.2	MN	651.0	VT	5430.0
NY	80.5	MN	20.1	CO	655.4	CA	5437.6
VT	80.5	NY	20.0	FL	663.4	NY	5554.1
NH	80.3	ND	19.9	MA	663.5	WA	5563.1
NJ	80.3	CO	19.8	AZ	674.2	NJ	5592.5
UT	80.2	SD	19.8	NJ	676.4	HI	5795.8
CO	80.0	UT	19.8	NH	679.1	NE	5802.1
WI	80.0	MA	19.7	SD	679.3	WI	5852.4
RI	79.9	NJ	19.6	WA	679.3	UT	5866.1
WA	79.9	NM	19.6	RI	709.6	IA	5885.5
NE	79.8	WI	19.5	ND	709.7	CO	5898.1
IA	79.7	IA	19.4	MD	710.4	RI	5901.2
AZ	79.6	ID	19.4	UT	710.4	OR	5998.3
ID	79.5	NH	19.4	VT	710.6	ID	6122.5
ND	79.5	RI	19.4	NE	714.7	ME	6125.8
OR	79.5	VT	19.4	OR	717.5	VA	6270.2
SD	79.5	WA	19.4	WI	720.1	ND	6324.1
FL	79.4	NE	19.3	IA	723.7	IL	6444.9
ME	79.2	OR	19.3	IL	724.0	MD	6631.0
IL	79.0	DE	19.2	AK	724.4	SD	6657.6
VA	79.0	MD	19.2	VA	724.8	AZ	6754.9
MD	78.8	MT	19.2	DE	726.8	TX	6755.9
KS	78.7	AK	19.1	ID	730.6	KS	6825.4
MT	78.5	IL	19.1	WY	731.7	PA	6939.7
PA	78.5	DC	19.0	NM	731.8	FL	7088.7
TX	78.5	KS	19.0	TX	751.6	NV	7193.9
DE	78.4	ME	19.0	DC	752.0	MI	7242.3
NM	78.4	WY	19.0	ME	754.2	NC	7310.4
AK	78.3	PA	18.9	KS	757.7	MT	7327.0
WY	78.3	TX	18.9	MT	761.3	DE	7367.3
MI	78.2	VA	18.9	PA	761.3	WY	7391.4
NV	78.1	MI	18.8	NV	769.8	AK	7406.0
NC	77.8	NV	18.7	NC	777.6	OH	7449.3
OH	77.8	NC	18.6	MI	782.3	GA	7505.0
IN	77.6	IN	18.5	GA	806.2	IN	7533.4
MO	77.5	MO	18.5	MO	807.7	MO	7757.2
GA	77.2	OH	18.5	OH	811.2	NM	7924.5
SC	77.0	SC	18.5	IN	832.2	SC	8328.0
DC	76.5	GA	18.2	SC	837.8	TN	8737.9
TN	76.3	AR	18.1	TN	881.1	KY	8831.6
AR	76.0	TN	18.0	AR	893.8	DC	8853.3
KY	76.0	LA	17.9	LA	897.7	AR	9130.3
OK	75.9	OK	17.7	KY	899.9	OK	9162.3
LA	75.7	AL	17.6	OK	910.7	LA	9257.8
AL	75.4	KY	17.6	WV	923.8	AL	9504.7
WV	75.4	MS	17.5	AL	925.2	WV	9513.2
MS	75.0	WV	17.5	MS	959.6	MS	10145.4

FIGURE 2

LIFE EXPECTANCY AT BIRTH (YEARS) BY STATE (2010)

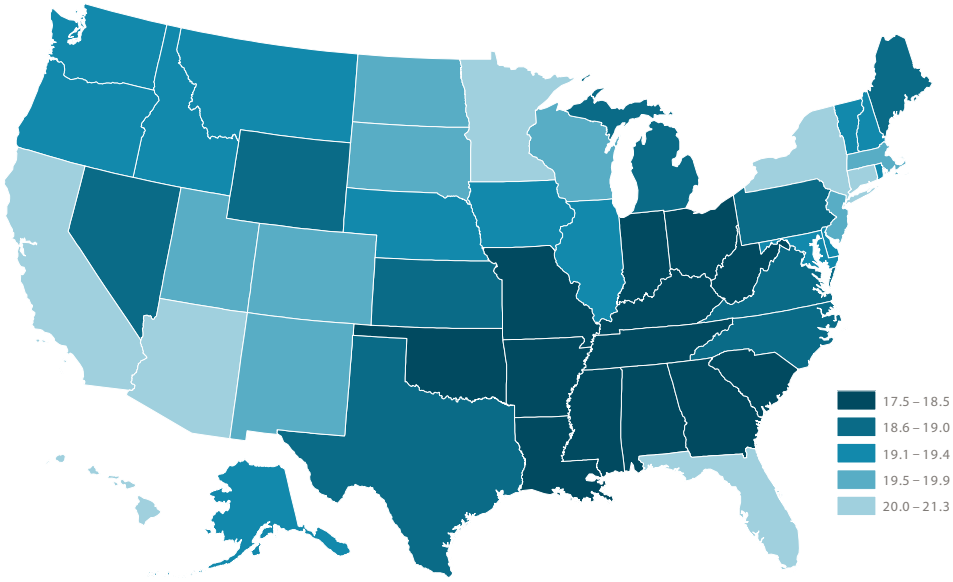


STATE *(Rank)*	CENSUS REGIONS: Pacific	Mountain	W. So. Central	W. No. Central	E. No. Central	New England	Middle Atlantic	South
TOP 10: LONGEST LIFE EXPECTANCY								
Hawaii *(1)*	■							
Minnesota *(2)*				■				
California *(3)*	■							
Connecticut *(3)*						■		
Vermont *(5)*						■		
Massachusetts *(5)*						■		
New York *(5)*							■	
New Hampshire *(8)*						■		
New Jersey *(8)*							■	
Utah *(10)*		■						
BOTTOM 10: SHORTEST LIFE EXPECTANCY								
Mississippi (51)								■
Alabama *(49)*								■
West Virginia *(49)*								■
Louisiana *(48)*			■					
Oklahoma *(47)*			■					
Kentucky *(45)*								■
Arkansas *(45)*			■					
Tennessee *(44)*								■
Washington, D.C. *(43)*								■
South Carolina *(42)*								■

See Supplement 1: The Health of the States: Spotlight on Methods *for our protocol for handling tied rankings*

FIGURE 3

LIFE EXPECTANCY AT AGE 65 (YEARS) BY STATE (2007–2009)

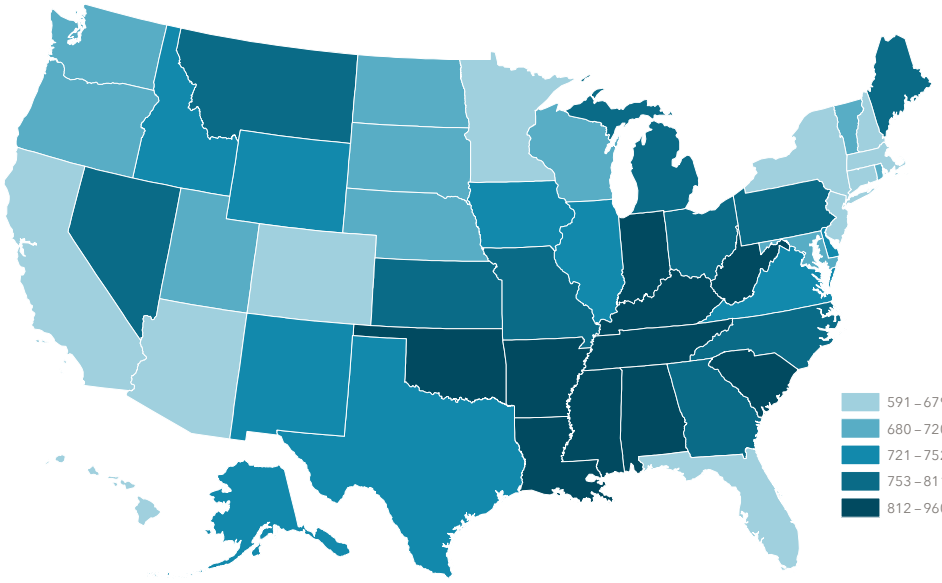


STATE *(Rank)*	CENSUS REGIONS: Pacific	Mountain	W. So. Central	W. No. Central	E. No. Central	New England	Middle Atlantic	South
TOP 10: LONGEST LIFE EXPECTANCY AT AGE 65								
Hawaii *(1)*	■							
Florida *(2)*								■
California *(3)*	■							
Arizona *(4)*		■						
Connecticut *(4)*						■		
Minnesota *(6)*				■				
New York *(7)*							■	
North Dakota *(8)*				■				
South Dakota *(9)*				■				
Colorado *(9)*		■						
Utah *(9)*		■						
BOTTOM 10: LONGEST LIFE EXPECTANCY AT 65								
Mississippi *(50)*								■
West Virginia *(50)*								■
Alabama *(48)*								■
Kentucky *(48)*								■
Oklahoma *(47)*			■					
Louisiana *(46)*			■					
Tennessee *(45)*								■
Arkansas *(44)*			■					
Georgia *(43)*								■

Top 10 for this outcome includes 11 states, Bottom 10 includes 9 states. See Supplement 1: The Health of the States: Spotlight on Methods *for our protocol for handling tied rankings.*

FIGURE 4

ALL-CAUSE MORTALITY (PER 100,000) BY STATE (2013)

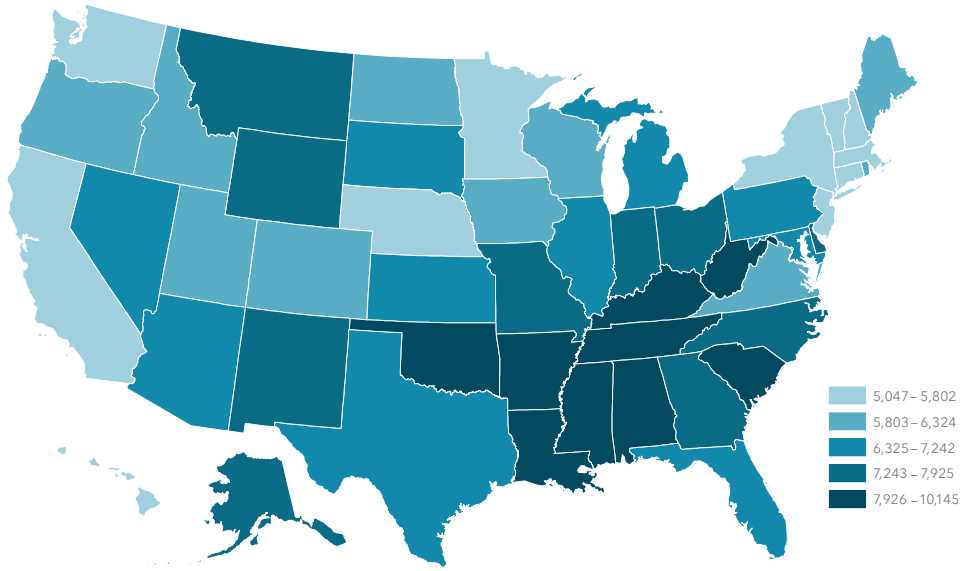


STATE *(Rank)*	Pacific	Mountain	W. So. Central	W. No. Central	E. No. Central	New England	Middle Atlantic	South
CENSUS REGIONS								
TOP 10: LOWEST ALL-CAUSE MORTALITY								
Hawaii *(1)*	■							
California *(2)*	■							
Connecticut *(3)*								
New York *(4)*							■	
Minnesota *(5)*								
Colorado *(6)*		■						
Florida *(7)*								■
Massachusetts *(8)*						■		
Arizona *(9)*		■						
New Jersey *(10)*							■	
BOTTOM 10: HIGHEST ALL-CAUSE MORTALITY								
Mississippi (51)								■
Alabama *(50)*								■
West Virginia *(49)*								■
Oklahoma *(48)*			■					
Kentucky *(47)*								■
Louisiana *(46)*			■					
Arkansas *(45)*			■					
Tennessee *(44)*								■
South Carolina *(43)*								■
Indiana *(42)*					■			

See Supplement 1: The Health of the States: Spotlight on Methods *for our protocol for handling tied rankings.*

FIGURE 5

TOTAL YEARS OF LIFE LOST BEFORE AGE 75 (PER 100,000) BY STATE (2007–2009)



STATE *(Rank)*	Pacific	Mountain	W. So. Central	W. No. Central	E. No. Central	New England	Middle Atlantic	South
CENSUS REGIONS								
TOP 10: FEWEST YEARS OF LIFE LOST								
Minnesota *(1)*				■				
Massachusetts *(2)*						■		
New Hampshire *(3)*						■		
Connecticut *(4)*						■		
Vermont *(5)*						■		
California *(6)*	■							
New York *(7)*							■	
Washington *(8)*	■							
New Jersey *(9)*							■	
Hawaii *(10)*	■							
BOTTOM 10: MOST YEARS OF LIFE LOST								
Mississippi (51)								
West Virginia *(50)*								■
Alabama *(49)*								■
Louisiana *(48)*			■					
Oklahoma *(47)*			■					
Arkansas *(46)*			■					
Washington, D.C. *(45)*								■
Kentucky *(44)*								
Tennessee *(43)*								■
South Carolina *(42)*								■

See Supplement 1: The Health of the States: Spotlight on Methods *for our protocol for handling tied rankings.*

FIGURE 6

WHAT CORRELATES WITH LIFE EXPECTANCY?

THE CORRELATION COEFFICIENTS (r_s)*

HEALTH BEHAVIORS			
Current smokers	-0.85	Any breastfeeding	0.64
Physical inactivity *(adult)*	-0.72	Fruit intake *(youth)*	0.62
Sexual activity before age 18	-0.70	Bicycle helmet use *(youth)*	0.62
Soda intake *(youth)*	-0.66	Birth control *(youth)*	0.53
Carrying weapons *(youth)*	-0.51		
PHYSICAL AND SOCIAL ENVIRONMENT			
Smokers in household (child present)	-0.73	Neighborhood resources for children	0.71
Childhood trauma	-0.70	Residents in walkable neighborhoods	0.66
Commuting by motor vehicle	-0.68	Proximity to parks	0.59
Children exposed to violence	-0.54		
Dating violence *(youth)*	-0.51		
SOCIAL AND ECONOMIC FACTORS			
Poverty *(adults)*	-0.70	Educated household head	0.75
Severe housing disrepair	-0.69	Bachelor's degree/higher	0.71
Residents in concentrated (>20%) poverty	-0.64	Median household income	0.70
Adults in prison	-0.60	Proficient in math *(grade 8)*	0.61
Single-parent households	0.54	Employment	0.57
Food insecurity *(households)*	-0.53		
HEALTH SYSTEM			
Primary care shortage	-0.63	Annual dental visit *(adult)*	0.70
Could not afford doctor	-0.63	Private insurance	0.54
Avoidable hospitalization	-0.62		

*Correlation coefficients range from zero to 1.0 and measure how strongly one variable correlates with another. Factors on the left (negative coefficients) are inversely related (e.g., one goes up when the other goes down). High correlations were also noted for other measures of **Health Behaviors:** Exclusive breastfeeding (r_s = 0.59), Physical activity (children) (0.50); **Physical and Social Environment:** Indoor smoking (child present) (-0.69), Smoke-free homes (0.65), Neighborhoods that are walkable (0.64), Commuting by walking/cycling (0.59), Indoor smoking (nonsmokers present) (-0.54); and **Social and Economic Factors:** Poverty (children) (-0.70), Proficient in math (grade 4) (0.59), Proficient in reading (grade 8) (0.57), Proficient in reading (grade 4) (0.53), and Poor living in concentrated (>20%) poverty (-0.52). See *Supplement 1: The Health of the States: Spotlight on methods* for definitions of terms, data sources, and methods for calculating the correlation coefficients.

that attract working-age professionals or retirees. The District of Columbia, for example, ranked in the Bottom 10 for life expectancy and premature death but not for life expectancy at age 65 or all-cause mortality. No Mountain state ranked well on premature deaths, suggesting a disadvantage for conditions that threaten youth. (See *Supplement 6: The Health of the States: Spotlight on injury fatalities*, regarding injury death rates in the Mountain states).

A WORD ABOUT METHODS

We examined how strongly health outcomes correlated with state statistics in five domains that shape health: health behaviors, the physical and social environment, social and economic factors, health care, and public policies and spending. The results, presented in Figures 6-9, are based on Spearman rank-order correlation coefficients (r_s), which measure the degree to which the state ranking for the indicator (e.g., poverty) matches the state ranking for the health outcome (e.g., life expectancy). Zero represents no association between the two rankings, and 1.0 represents an exact match. A positive correlation means that a high rank on the indicator is linked to a high rank on the health outcome, or vice versa; a negative correlation means that a high rank on the indicator is linked to a low rank on the health outcome, or vice versa. See *Supplement 1: The Health of the States: Spotlight on methods* for more details on data sources and methods and the rationale for omitting certain results from this report.

WHAT CORRELATES THE MOST WITH LIFE EXPECTANCY, ALL-CAUSE MORTALITY, AND PREMATURE DEATH?

Health behaviors: Consistent with prior research findings,[8] we found that states with lower life expectancy or with high all-cause and premature mortality had a notably higher prevalence of unhealthy behaviors, especially smoking and physical inactivity (Figure 6). These associations are expected, as smoking and the behaviors responsible for obesity—poor diet and physical activity—are major causes of the chronic diseases that are the leading causes of death in the United States.[9] Smoking rates in the Top 10 states (longest life expectancy) averaged 14.0 percent, compared with 22.2 percent in Bottom 10 states; smoking rates for heads of households with children averaged 20.2 and 32.3 percent, in the Top 10 and Bottom 10 states, respectively.

States with lower life expectancy also had higher rates of other unhealthy behaviors beginning in childhood (Figure 6). These associations do not necessarily reflect causal relationships but rather a pattern of *co-occurrence*, where conditions "go together" at the state level. States where people often engage in a behavior that causes one disease may also rank highly on behaviors that cause other diseases or injuries. For example, in states with lower life expectancy and a greater likelihood of unhealthy behaviors among

FIGURE 7

WHAT CORRELATES WITH LIFE EXPECTANCY AT AGE 65?

THE CORRELATION COEFFICIENTS (r_s)*

HEALTH BEHAVIORS			
Current smokers	-0.83	Any breastfeeding	0.63
Physical inactivity *(adult)*	-0.72	Fruit intake *(youth)*	0.61
Sexual activity before age 18	-0.61		
PHYSICAL AND SOCIAL ENVIRONMENT			
Indoor smoking *(child present)*	-0.74	Neighborhood resources for children	0.66
Commuting by motor vehicle	-0.68	Proximity to parks	0.63
Childhood trauma	-0.60	Residents in walkable neighborhoods	0.59
Air pollution	-0.50		
SOCIAL AND ECONOMIC FACTORS			
Severe housing disrepair *(SEF25)*	-0.66	Bachelor's degree/higher	0.61
Severe housing disrepair	-0.66	Median household income	0.61
Residents in concentrated *(>20%)* poverty	-0.52	Higher educated household head	0.60
HEALTH SYSTEM			
Avoidable hospitalization	-0.68	Annual dental visit *(adult)*	0.59
Primary care shortage	-0.57		
Could not afford doctor	-0.57		

*Correlation coefficients range from zero to 1.0 and measure how strongly one variable correlates with another. Factors on the left (negative coefficients) are inversely related (e.g., one goes up when the other goes down). High correlations were also noted for other measures of **Health Behaviors:** Soda intake (youth) (r_s= -0.60), Bicycle helmet use (youth) (0.59), Exclusive breastfeeding (0.55), Ever smokers (-0.51); **Physical and Social Environment:** Smokers in household (child present) (-0.72), Smoke-free homes (0.68), Commuting by walking/cycling (0.60), Neighborhoods that are walkable (0.57), Indoor smoking (nonsmokers present) (-0.56) and **Social and Economic Factors:** Poverty (children) (-0.56). See *Supplement 1: The Health of the States: Spotlight on methods* for definitions of terms, data sources, and methods for calculating the correlation coefficients.

FIGURE 8

WHAT CORRELATES WITH ALL-CAUSE MORTALITY?

THE CORRELATION COEFFICIENTS (r_s)*

HEALTH BEHAVIORS			
Current smokers	0.87	Any breastfeeding	0.64
Physical inactivity *(adult)*	0.71		
Sexual activity before age 18	0.63		
Soda intake *(youth)*	0.60		
PHYSICAL AND SOCIAL ENVIRONMENT			
Smokers in household *(child present)*	0.77	Neighborhood resources for children	-0.71
Commuting by motor vehicle	0.74	Residents in walkable neighborhoods	-0.67
Childhood trauma	0.72	Proximity to parks	-0.65
SOCIAL AND ECONOMIC FACTORS			
Severe housing disrepair	0.74	Median household income	-0.75
Poverty *(adults)*	0.69	Bachelor's degree/higher	-0.73
Residents in concentrated (>20%) poverty	0.59	Higher educated household head	-0.66
Food insecurity *(households)*	0.54	Employment	-0.54
HEALTH SYSTEM			
Primary care shortage	0.64	Annual dental visit *(adult)*	-0.66
Avoidable hospitalization	0.63	Private insurance	-0.50
Could not afford doctor	0.59		

*Correlation coefficients range from zero to 1.0 and measure how strongly one variable correlates with another. Factors on the left (negative coefficients) are inversely related (e.g., one goes up when the other goes down). High correlations were also noted for other measures of **Health Behaviors:** Fruit intake (youth) (r_s= -0.59), Bicycle helmet use (youth) (-0.58), Ever smokers (0.53), Exclusive breastfeeding (-0.52); **Physical and Social Environment:** Indoor smoking (child present) (0.73), Smoke-free homes (-0.69), Neighborhoods that are walkable (-0.64), Indoor smoking (nonsmokers present) (0.57), Commuting by walking/cycling (-0.57), Commuting by public transit (-0.57); and **Social and Economic Factors:** Poverty (children) (0.64). See *Supplement 1: The Health of the States: Spotlight on methods* for definitions of terms, data sources, and methods for calculating the correlation coefficients.

adults, we found that children had poorer diets, began sexual activity at an earlier age, and were more likely to not use birth control. Whereas one fifth (21.0 percent) of women in Top 10 states reported exclusive breastfeeding, only 11.2 percent did so in Bottom 10 states. In Bottom 10 states (low life expectancy), 31.7 percent of children drank soda at least once a day, almost double that of children in Top 10 states (15.1 percent). Conversely, only 5.6 percent of children in Bottom 10 states wore bicycle helmets, one quarter the rate for children in Top 10 states (23.7 percent). The current behavior of children cannot explain the life expectancy of adults who are currently age 65 years but may reflect more (or less) healthy lifestyles generally in the state.

The physical environment: Although health behaviors are important, our ability to maintain a healthy lifestyle depends on whether we live in environments that are safe and conducive to good health.[10] We found that life expectancy, all-cause mortality, and premature death correlated highly with the physical features of the environments in which people live, including the home environment (e.g., indoor smoking) and features of the neighborhood (Figures 6-9). We observed a correlation between air pollution (airborne concentrations of fine particulate matter) and life expectancy at age 65: it was slightly higher in Bottom 10 states (12.5 µg/m^3) than Top 10 states (11.0 µg/m^3). Research has shown that exposure to

fine particulate matter is associated with higher mortality and risks for cardiovascular disease.[11–13]

Compared to classic environmental threats like air pollution, we observed a much stronger correlation with features of the built environment, such as neighborhood walkability, access to parks, and public transportation (Figures 6-9). Researchers have shown that these features are associated with greater physical activity and lower rates of chronic diseases and premature mortality.[14–19] Our data also suggest associations with commuting habits. For example, in Top 10 states for all-cause mortality, 7.3 percent of people commuted by public transportation, 10 times the rate in Bottom 10 states (0.7 percent). Likewise, commuting by walking/cycling was twice as common in Top 10 states than in Bottom 10 states. Figure 10 contrasts features of the built environment in the Top 10 and Bottom 10 states for life expectancy. Comparing Top 10 and Bottom 10 states, the percentage of neighborhoods that were walkable varied more than two-fold for life expectancy (18.2 percent versus 8.6 percent) but varied four-fold (13.6 percent versus 3.4 percent) for life expectancy at age 65 and more than five-fold (17.6 percent versus 3.4 percent) for all-cause mortality.

Social environment: The social environment also correlated highly with life expectancy, especially with regard to the risk of violent deaths, which

FIGURE 9

WHAT CORRELATES WITH YEARS OF LIFE LOST BEFORE AGE 75?

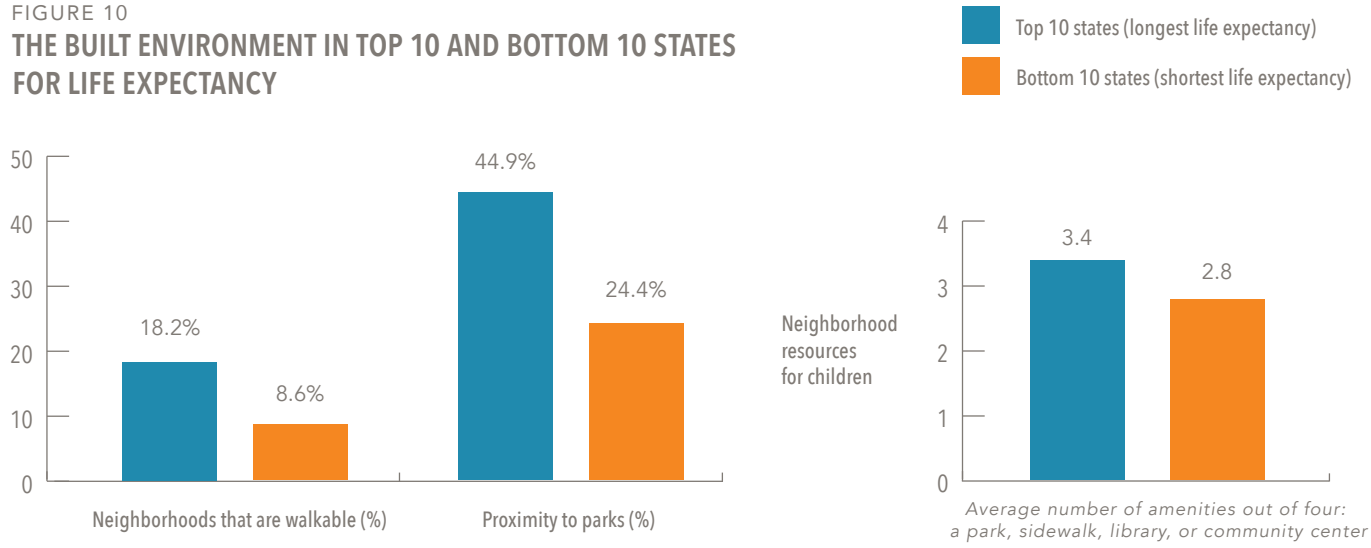
THE CORRELATION COEFFICIENTS (r_s)*

HEALTH BEHAVIORS			
Current smokers	0.82	Any breastfeeding	-0.62
Sexual activity before age 18	0.69	Birth control *(youth)*	-0.54
Physical inactivity *(adult)*	0.68		
Soda intake *(youth)*	0.64		
Carrying weapons *(youth)*	0.56		
PHYSICAL AND SOCIAL ENVIRONMENT			
Smokers in household (child present)	0.72	Neighborhood resources for children	-0.70
Childhood trauma	0.71	Residents in walkable neighborhoods	-0.65
Commuting by motor vehicle	0.65	Proximity to parks	-0.54
Children exposed to violence	0.60	Safe schools *(parent report)*	-0.51
SOCIAL AND ECONOMIC FACTORS			
Poverty *(children)*	0.73	Higher educated household head	-0.79
Severe housing disrepair	0.70	Bachelor's degree/higher	-0.72
Residents in concentrated (>20%) poverty	0.67	Median household income	-0.71
Adults in prison	0.65	Proficient in math *(grade 8)*	-0.67
Single-parent households	0.58	Employment	-0.58
Food insecurity *(households)*	0.54		
HEALTH SYSTEM			
Primary care shortage	0.63	Annual dental visit *(adult)*	-0.73
Could not afford doctor	0.61	Private insurance	-0.58
Avoidable hospitalization	0.57	Colon cancer screening	-0.54

*Correlation coefficients range from zero to 1.0 and measure how strongly one variable correlates with another. Factors on the left (negative coefficients) are inversely related (e.g., one goes up when the other goes down). High correlations were also noted for other measures of **Health Behaviors:** Fruit intake (youth) (r_s = -0.57), Exclusive breastfeeding (-0.57), Bicycle helmet use (youth) (-0.56); **Physical and Social Environment:** Indoor smoking (child present) (0.64), Neighborhoods that are walkable (-0.63), Smoke-free homes (-0.62), Commuting by walking/cycling (-0.54), Indoor smoking (nonsmokers present) (0.52); and **Social and Economic Factors:** Poverty (adults) (0.72), Proficient in reading (grade 8) (-0.65), Proficient in math (grade 4) (-0.63), Proficient in reading (grade 4) (-0.60), Poor living in concentrated (>20%) poverty (0.56). See *Supplement 1: The Health of the States: Spotlight on methods* for definitions of terms, data sources, and methods for calculating the correlation coefficients.

FIGURE 10

THE BUILT ENVIRONMENT IN TOP 10 AND BOTTOM 10 STATES FOR LIFE EXPECTANCY



See *Supplement 1: The Health of the States: Spotlight on methods* for definitions of terms and data sources.

disproportionately claim the lives of young people. Social factors correlated strongly with the years of life lost before age 75 (Figure 9). In Bottom 10 states for premature death (most years of life lost before age 75), the violent crime rate was 491.5 per 100,000, compared with 279.1 per 100,000 in the Top 10 states. In Bottom 10 states (for premature death), youth in 9th-12th grade carried weapons (e.g., gun, knife, club) an average of 21.0 days in the past month, compared with 11.5 days in Top 10 states. In Bottom 10 states for both premature death and life expectancy, the adult incarceration rate was twice as high as in Top 10 states. These factors were not highly correlated with life expectancy at age 65, perhaps reflecting their disproportionate impact on youth.

Consistent with the growing literature that adult diseases are associated with early-life exposure to trauma through adverse childhood events (ACEs),[20–22] we found that exposure to two or more ACEs correlated highly with life expectancy, life expectancy at age 65, all-cause mortality, and premature death. Such exposure occurred in 27.8 percent of children in Bottom 10 states (shortest life expectancy), compared with 19.6 percent of children in Top 10 states (longest life expectancy).[c]

Social and economic factors: Social and economic circumstances matter greatly to the previous two domains (health behaviors and the environment) because they determine how easily people can live a healthy lifestyle and whether they can afford to live in places with healthy physical and social environments.[10] We found that both life expectancy and health behaviors correlated strongly with socioeconomic status, a relationship well documented in the literature.[23,24] States with shorter life expectancy had higher

c. Such associations are complex, because early life experiences correlate with other factors that also cause diseases. For example, states with higher ACE exposure also tend to have lower socioeconomic status. In addition, childhood trauma and ACEs can precipitate behaviors that affect health by other means, such as the use of tobacco, alcohol, or drugs. Finally, the socioeconomic status of the neighborhood can act as a confounding variable.

FIGURE 11

POVERTY RATES IN TOP 10 AND BOTTOM 10 STATES FOR LIFE EXPECTANCY

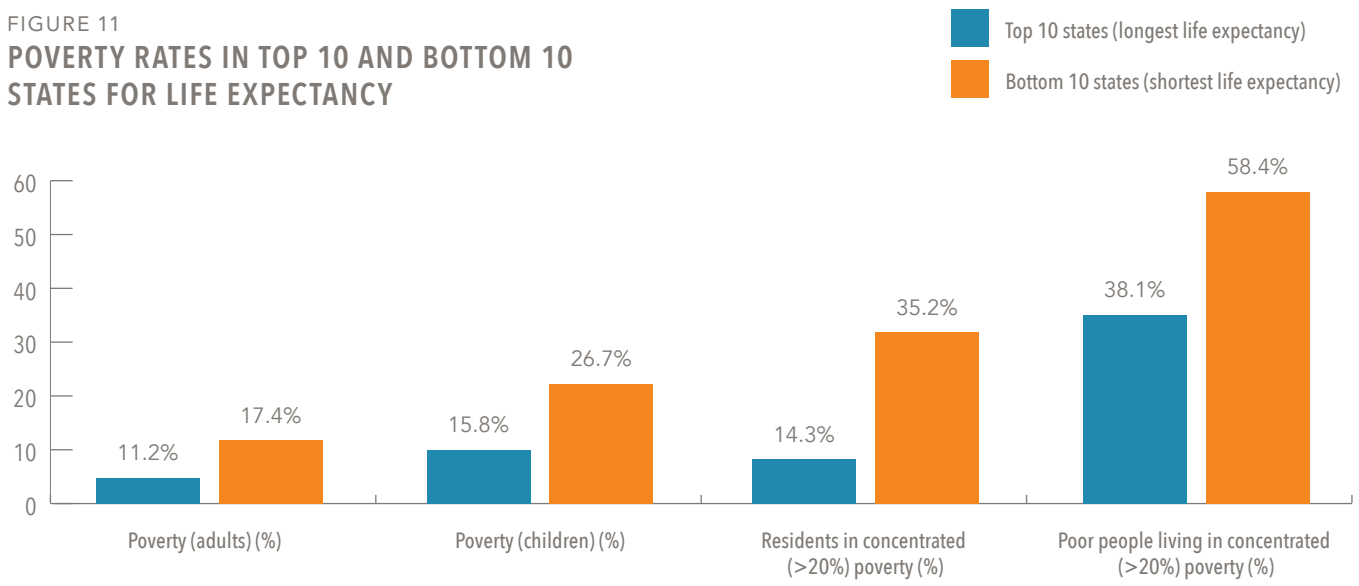
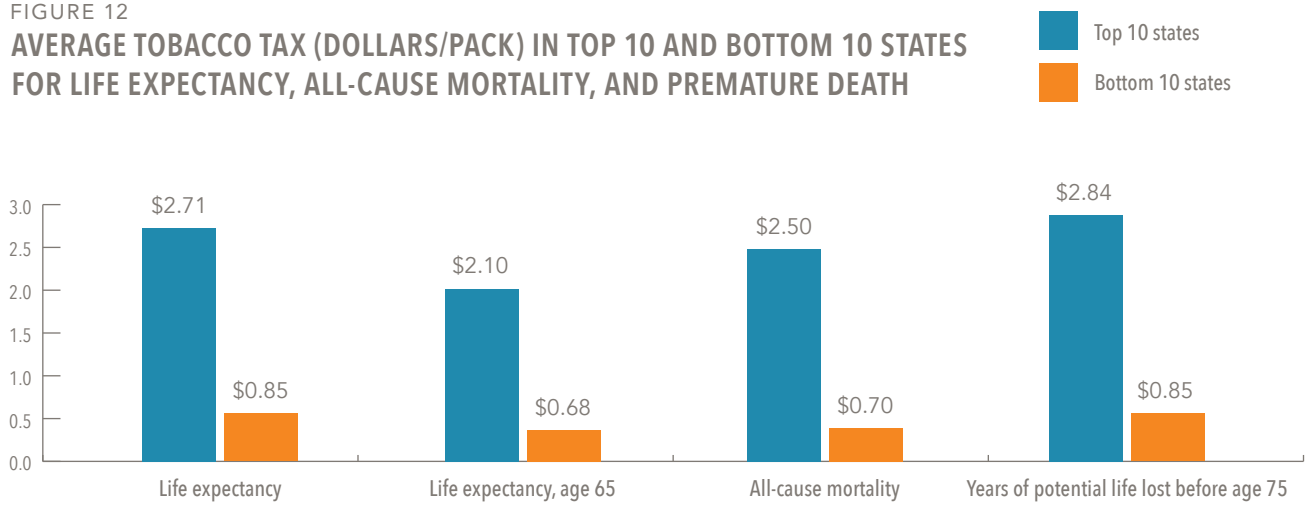


FIGURE 12

AVERAGE TOBACCO TAX (DOLLARS/PACK) IN TOP 10 AND BOTTOM 10 STATES FOR LIFE EXPECTANCY, ALL-CAUSE MORTALITY, AND PREMATURE DEATH



For definitions of terms and data sources of both figures 11 and 12 see *Supplement 1: The Health of the States: Spotlight on methods.*

rates of poverty, single-parent households, and food insecurity. Figure 11 presents the average poverty rates in Top 10 and Bottom 10 states. Residents in states with higher life expectancy had higher educational attainment, employment, and median household incomes (all of which are positively associated with one another). Income also correlated highly (and negatively) with the risk of premature death: it was $44,741 in the Bottom 10 states for premature death (more years of life lost before age 75),

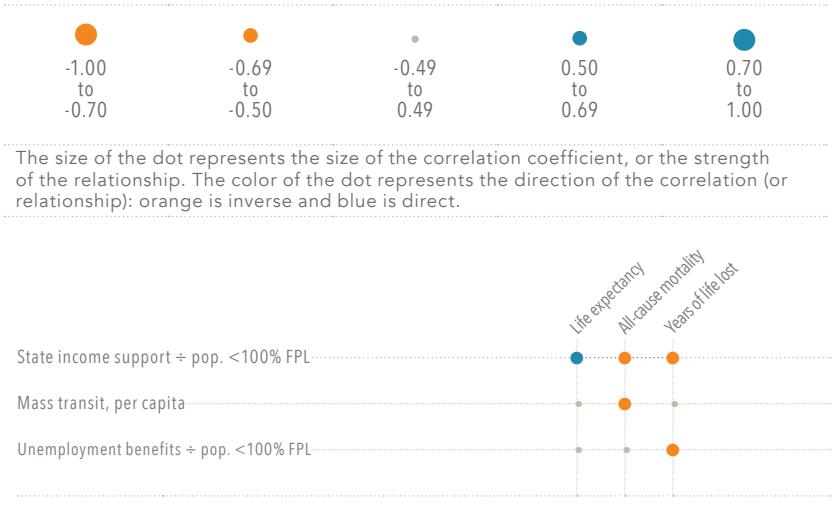
compared to $63,168 in Top 10 states (fewer premature deaths).

In another pattern of co-occurrence, children in states with higher life expectancy had higher math and reading scores. For example, in Top 10 states for life expectancy, 41.0 percent of 8th grade students received proficient scores in math, compared with 24.7 percent in Bottom 10 states. In Top 10 states for premature death (fewest years of life lost before age 75), almost half (45.8 percent) of household heads were high school graduates, compared with only one third (32.6 percent) in Bottom 10 states (most premature deaths). All-cause mortality was also strongly correlated with education: in Top 10 states (those with the lowest rates), 24.2 percent of adults had a Bachelor's degree or higher education, compared with 15.9 percent in Bottom 10 states.

Health systems: Life expectancy, life expectancy at age 65, all-cause mortality, and premature death also correlated with access to health care. The strongest correlate with life expectancy was dental visits, a marker for greater access to care more generally. Life expectancy also correlated with shortages in primary care physicians and higher rates of avoidable hospitalizations—a marker for inadequate primary care. In the Top 10 states for shortest life expectancy, 53.9 percent of hospitalizations were avoidable, compared with 82.4 percent in Bottom 10 states. We also observed correlations with private (commercial) insurance coverage and the

FIGURE 13

CORRELATIONS WITH STATE SPENDING



FPL = Federal poverty level. <100% FPL and <200% FPL refers to spending divided by the population living with incomes below 100 percent and 200 percent of the FPL, respectively. High inverse correlations with years of life lost were also noted for spending on State income support ÷ pop. <200% FPL (r_s= -0.53), and State/Federal income support ÷ pop. <100% FPL (r_s= -0.50). See *Supplement 1: The Health of the States: Spotlight on methods* for definitions of terms, data sources, and methods for calculating the correlation coefficients.

ability to afford medical care. Whereas 10.9 percent of persons in Top 10 states (longest life expectancy) could not afford their doctor, 16.9 percent could not do so in Bottom 10 states.

Life expectancy, life expectancy at age 65, all-cause mortality, and premature death also correlated with state policies, notably the tobacco tax[d]—an important policy affecting smoking rates and tobacco-related diseases (Figure 12). States with higher life expectancy and lower all-cause mortality and premature death also spent more on income support relative to the size of the low-income population (Figure 13). The Top 10 states for premature death (fewer years of life lost before age 75), for example, spent an average of $2,560 on income support per person in or near poverty (less than 200 percent of the poverty level), whereas Bottom 10 states spent only $1,153 per person.[e]

d. The correlation with tobacco taxes was consistent: r_s= 0.63 for newborn life expectancy, 0.59 for life expectancy at age 65, -0.62 for all-cause mortality, and -0.59 for years of life lost before age 75.

e. Years of life lost did not correlate with state education spending per capita but did correlate (r_s = -0.51) when spending was calculated per poor person.

Conclusion

Premature death is a life course story: it is about deaths that occur at birth and among children, adolescents, and young adults who die before their time, as well as those of middle age whose lives are cut short by accidents and diseases such as cancer, diabetes, substance abuse, or mental illness. A detailed understanding of the health of the states requires more than an examination of life expectancy or the deaths (or lost years) experienced by an entire state's population. Health is defined by many measures other than mortality and morbidity, including quality of life and functional status. Prior efforts to rank states have focused on a defined subset of potential factors, limited not only by a desire for parsimony but also by limitations in available data. Indicators of known importance are not always available or easy to measure for large populations. Some U.S. health statistics are available only for certain communities and states but may not be available for all 50 states.

The supplements that follow this report (Supplements 3-9) turn to each stage of the life course to examine how states compare in terms of the conditions that assume importance from cradle to grave. These include birth outcomes (Supplement 3), child and adolescent health (Supplement 4), sexually transmitted infections (Supplement 5), injury fatalities (Supplement 6), adult health status (Supplement 7), overweight/obesity, diabetes, and cardiovascular conditions (Supplement 8), and cancer, lower respiratory disease, influenza and pneumonia, and Alzheimer's disease (Supplement 9).

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