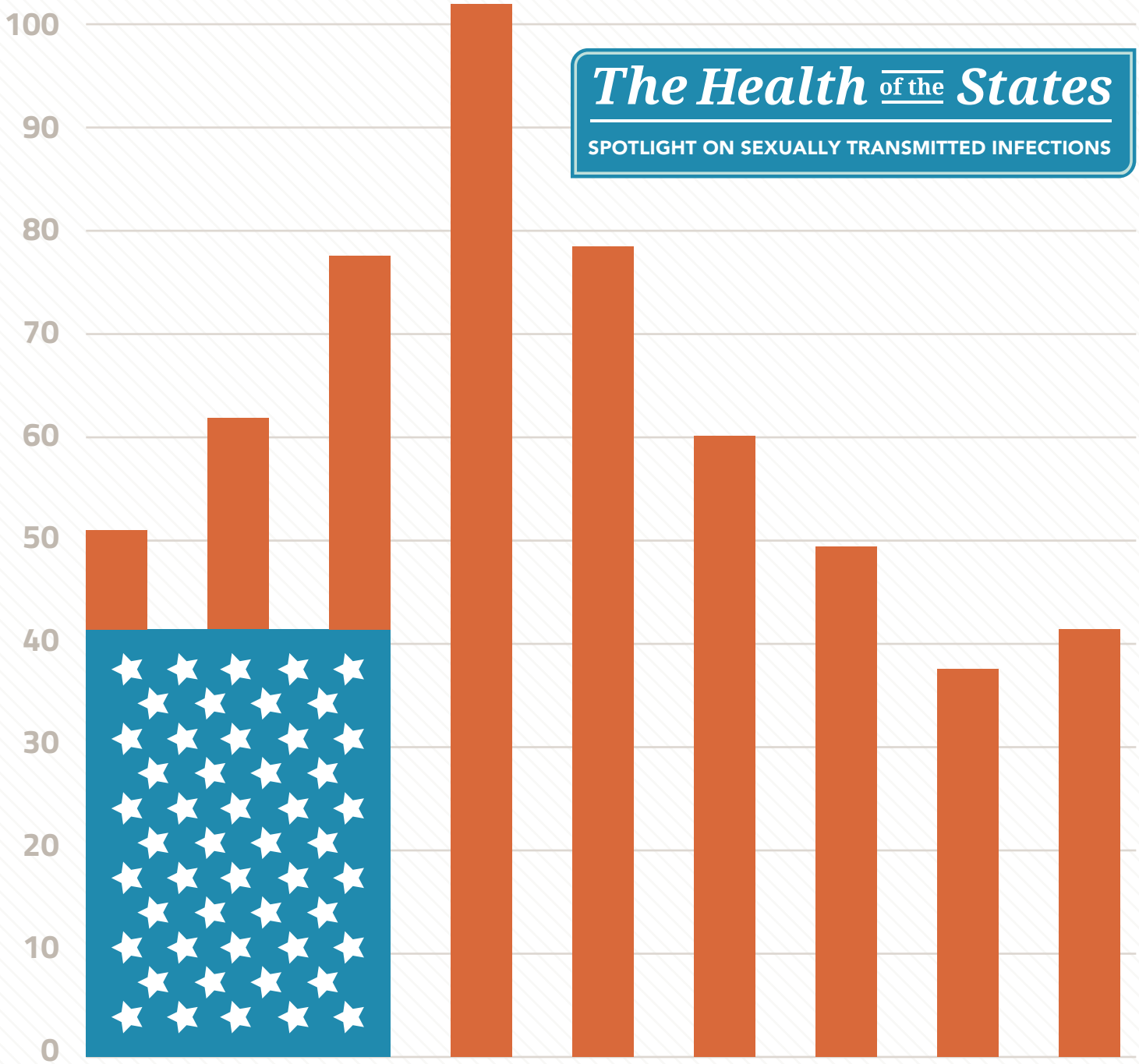


The Health of the States

SPOTLIGHT ON SEXUALLY TRANSMITTED INFECTIONS

Steven H. Woolf, MD, MPH*
Laudan Aron, MA**
Derek A. Chapman, PhD*
Lisa Dubay, PhD**
Emily Zimmerman, PhD*
Lauren C. Snellings, MPH, CHES*
Lindsey Hall, MPH*
Amber D. Haley, MPH*
Nikhil Holla, BA**
Kristin Ayers, MPH*
Christopher Lowenstein, BA**
Timothy A. Waidmann, PhD**

*Center on Society and Health, Virginia Commonwealth University, Richmond, Virginia
**Urban Institute, Washington, DC

Center on Society and Health

VCU

URBAN INSTITUTE

Supplement 5, July 2017

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, which was followed by a series of supplements. This report, the fifth of nine supplements, focuses on how rates of sexually transmitted infections 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 5:

Spotlight On Sexually Transmitted Infections

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

July 2017

Spotlight on Sexually Transmitted Infections

We reviewed state-level data on the prevalence of three sexually transmitted infections—chlamydia, gonorrhea, and human immunodeficiency virus (HIV) infection—in the United States. Figure 1 presents the data for each state. Studies of the prevalence of sexually transmitted infections should always be interpreted with caution. The reported prevalence of such infections is influenced not only by the true incidence of infections but also by the quality of public reporting (when diagnosing sexually transmitted infections, clinicians ideally should report cases to data collection agencies). Patients may not seek clinical attention, clinicians or laboratories may not report diseases, and public health departments may not keep surveillance data current. As a result, states that report low rates of sexually transmitted infections may truly have low rates, or they may have higher rates but breakdowns in their disease-reporting systems.

Chlamydia and Gonorrhea

According to 2012 data from the Centers for Disease Control and Prevention (CDC), the incidence of reported new cases of sexually transmitted infections varied significantly across the states: 4.6-fold for chlamydia, from 232.6 to 1,076.7 cases per 100,000, and 50-fold for gonorrhea, from 7.6 to 379.9 cases per 100,000. Four of the Top 10 states for low chlamydia rates were in New England (Figure 2), whereas the Top 10 states for low gonorrhea rates were primarily in New England and the Mountain region (Figure 3).

Four New England states—New Hampshire, Maine, Massachusetts, and Vermont—ranked in the Top 10 (best outcomes) for both infections, as did Oregon and neighboring Idaho. New Hampshire had the lowest rates of chlamydia, whereas Wyoming had the lowest rates of gonorrhea. West Virginia, a state that ranked in the Bottom 10 for 25 health outcomes examined in this report, ranked in the Top 10 for both chlamydia and gonorrhea. Nearby Kentucky, which also ranked in the Bottom 20 for 25 health outcomes, also had low chlamydia rates, ranking in the second quintile.

The District of Columbia and four Southern states— Alabama, Georgia, Mississippi, and South Carolina —ranked in the Bottom 10 (worst outcomes) for both infections, as did Louisiana and

Arkansas in the West South Central region. Mississippi had distinctly higher chlamydia incidence rates than did other Southern states. Like many urban centers, the incidence rates in the District of Columbia greatly exceeded state averages for both infections (Figure 1). Alaska, which ranked 11th-best in the United States (just outside the Top 10) for HIV, ranked in the Bottom 10 for chlamydia; Mississippi, too, had an incidence rate of chlamydia distinctly higher than those of its peers (Figure 1).

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. For example, in 2014 the prevalence of gonorrhea among African Americans was 11 times that of whites.[3] Our results are based on state averages, obscuring important differences that occur within states and at the county and neighborhood levels. Sexually transmitted infections can vary significantly across census tracts with different demographic and socioeconomic characteristics.[3]

What correlates the most with chlamydia and gonorrhea incidence rates?

Incidence rates for chlamydia and gonorrhea (and presumably other sexually

FIGURE 1
SEXUALLY TRANSMITTED INFECTIONS, BY STATE

Chlamydia		Gonorrhea		HIV	
NH	232.6	WY	7.6	WY	1.5
ME	256.8	ID	10.5	ND	1.9
WV	258.2	MT	10.7	MT	2.5
UT	266.7	NH	11.1	VT	2.7
VT	275.4	VT	15.8	ID	2.9
ID	285.1	UT	16.8	SD	3.7
NJ	307.6	ME	34.3	ME	4.1
MN	335.7	OR	37.5	NH	4.3
OR	345.0	MA	39.5	IA	4.6
MA	354.3	WV	44.8	WI	4.7
WA	356.6	WA	46.9	AK	4.8
NE	363.7	ND	47.9	WV	5.2
CT	363.9	RI	48.3	UT	5.3
WY	364.7	CO	54.4	NE	5.6
IA	370.1	MN	57.3	KS	6.6
MT	380.7	HI	58.5	NM	7.1
KS	385.8	CT	59.4	HI	7.2
KY	394.3	IA	65.3	MN	7.2
FL	401.9	NE	77.0	OR	8.0
NV	403.7	KS	77.2	RI	8.6
RI	410.6	NV	82.1	WA	8.9
WI	414.3	WI	82.1	CO	9.0
ND	415.6	VA	84.1	IN	9.5
CO	417.0	NJ	84.4	MI	9.8
VA	427.1	SD	84.8	CT	9.9
PA	430.9	CA	88.3	OK	10.2
CA	440.8	AZ	88.6	KY	10.3
OK	441.5	NM	90.3	MO	10.7
MD	450.9	MD	96.6	OH	10.9
IN	451.3	KY	97.8	AZ	11.9
HI	455.4	DE	98.0	AR	12.3
OH	460.3	AK	99.3	PA	13.4
MO	462.2	FL	100.7	VA	14.3
AZ	464.6	IN	112.2	NV	16.2
SD	470.9	NY	115.3	AL	16.6
MI	481.3	OK	116.4	MA	16.6
DE	483.9	PA	120.6	TN	16.6
TX	487.5	TX	124.6	NC	16.8
TN	503.8	MI	127.3	CA	17.5
NY	513.8	MO	131.0	DE	18.1
NC	518.8	TN	140.9	SC	18.5
IL	525.8	IL	141.0	IL	18.7
GA	528.4	OH	142.9	MS	18.9
AR	563.3	AR	146.0	TX	22.4
NM	570.5	NC	146.8	NY	23.3
SC	574.7	GA	154.5	NJ	24.9
LA	594.4	SC	161.7	FL	28.1
AL	635.0	AL	192.2	LA	28.2
AK	746.7	LA	192.8	GA	37.0
MS	772.3	MS	230.3	MD	41.6
DC	1076.7	DC	379.9	DC	138.0

FIGURE 2

CHLAMYDIA INCIDENCE RATES (PER 100,000), BY STATE (2012)

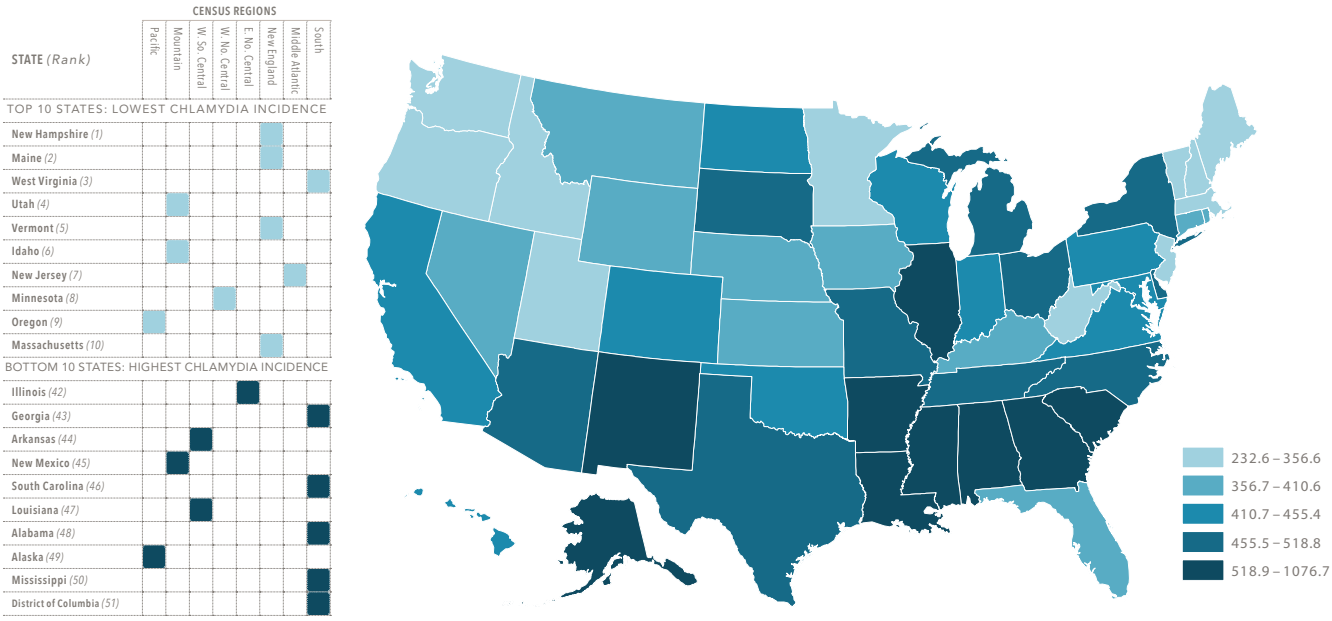
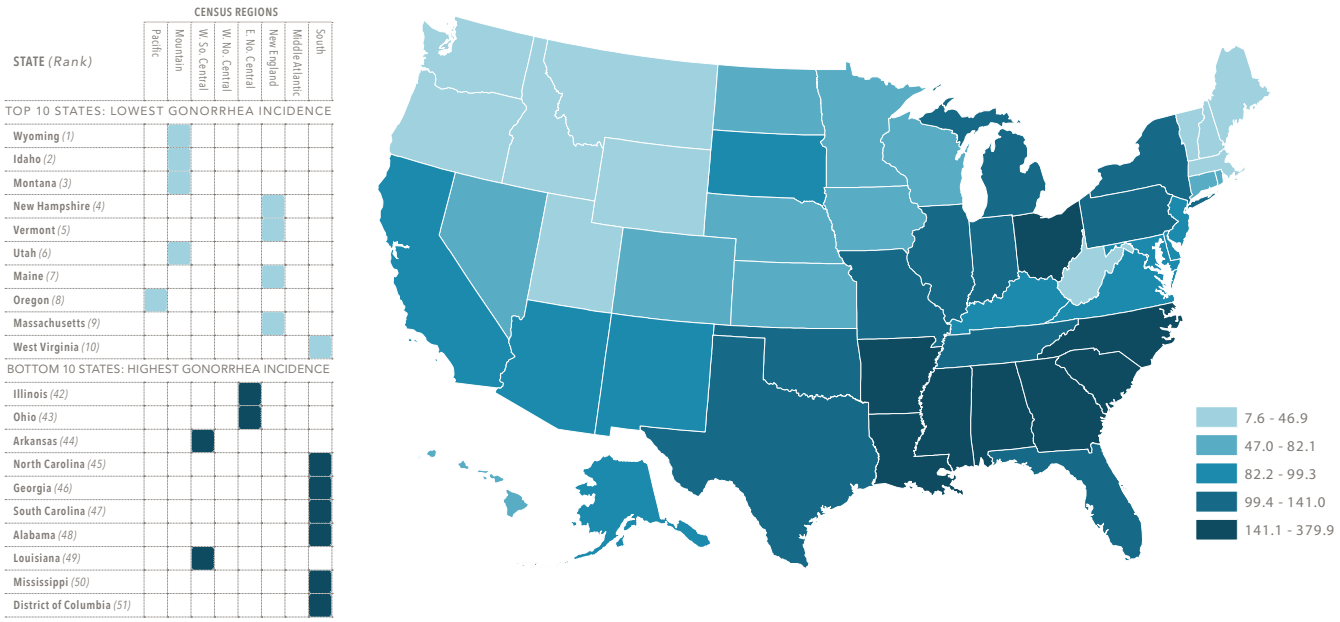


FIGURE 3

GONORRHEA INCIDENCE RATES (PER 100,000), BY STATE (2012)



transmitted infections) correlated highly with state data on unsafe sexual practices (such as not using birth control). They also correlated with other unhealthy behaviors, such as physical inactivity. 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 associated with one disease may also rank highly on behaviors linked to other diseases or injuries. For example, in Bottom 10 states (those with high gonorrhea rates), 11.7 percent of women reported exclusive breastfeeding, compared with 22.2 percent in Top 10 states.

The incidence of chlamydia and gonorrhea correlated even more strongly with a states' socioeconomic status. States with high rates of chlamydia and gonorrhea were more likely to have high rates of poverty, single-parent households, and poor education (Figures 4-5). For example, the child poverty rate was 16.7 percent in Top 10 states (best outcomes) for chlamydia infection and 25.5 percent in Bottom 10 states.

Infection rates correlated highly with racial segregation: in Bottom 10 states (with high infection rates), the percentage of the population living in segregated census tracts (less than 35 percent non-Hispanic white) was 23.6 percent and 20.5 percent for chlamydia and gonorrhea, respectively; the corresponding percentages in Top 10 states were 3.7 percent and 1.5, respectively—a 6.4-fold difference for chlamydia and a 13.7-fold difference for gonorrhea. The convergence of racial segregation and neighborhood poverty differed dramatically in the Bottom 10 and Top 10 states: whereas the proportion of census tracts *with* concentrated poverty (more than 20 percent of the population living in poverty) varied two-fold for chlamydia and gonorrhea, the proportion of the population living in racially segregated census tracts with concentrated poverty varied 7.5-fold for chlamydia and 11.5-fold for gonorrhea.

States with high chlamydia rates were also more likely to be states with high rates of violence and unsafe environments for children. Parents were more likely to consider their children unsafe at school or in the neighborhood. Compared with teens in Top 10 states for chlamydia, those in the Bottom 10 states were 1.5 times more likely to report being threatened or injured with a weapon at school; those in the Bottom 10 states for gonorrhea were 1.5 times more likely to have been in a fight that resulted in injury. The violent crime rate in Bottom 10 states for chlamydia averaged 535.0 per 100,000, compared with 229.5 per 100,000 in Top 10 states. Adults were more than twice as likely to be incarcerated. The association between violence/safety and poor

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 4, 5, and 7, 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., infant mortality). 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*[2] for more details on data sources and methods and the rationale for omitting certain results from this report.

FIGURE 4

WHAT CORRELATES WITH CHLAMYDIA?

THE CORRELATION COEFFICIENTS (r_s)*

HEALTH BEHAVIORS			
Physical inactivity *(children)*	**0.59**	**Birth control** *(youth)*	**-0.53**
Fights with injury *(youth)*	**0.51**	**Breakfast** *(youth)*	**-0.53**
PHYSICAL AND SOCIAL ENVIRONMENT			
Violent crime rate	**0.70**	**Safe schools** *(parent report)*	**-0.61**
Weapon injury in school	**0.56**	**Safe neighborhoods** *(parent report)*	**-0.56**
SOCIAL AND ECONOMIC FACTORS			
People living amid racial segregation + concentrated *(>20%)* **poverty**	**0.76**	**Proficient in reading** *(grade 8)*	**-0.70**
Single-parent households	**0.75**	**Married**	**-0.55**
Racial segregation	**0.70**	**Higher educated household head**	**-0.51**
Adults in prison	**0.62**		
Poverty *(children)*	**0.60**		

*Correlation coefficients range from zero to 1.0 and measure how strongly one variable correlates with another. Factors on the right (negative coefficients) are inversely related (e.g., one goes up when the other goes down).

High correlations were noted for other measures of **Social and Economic Factors**: People living amid racial segregation + very concentrated (>40%) poverty (r_s= 0.71), Poor people living amid racial segregation + concentrated (>20%) poverty (0.68), Poor people living amid racial segregation + very concentrated (>40%) poverty (0.65), Poor living amid racial segregation (0.64), Residents in very concentrated (>40%) poverty (0.63), Proficient in math (grade 4) (-0.63), Poor living in concentrated (>20%) poverty (0.62), Proficient in math (grade 8) (-0.59), Poverty (supplemental def.) (0.59), Proficient in reading (grade 4) (-0.58), Residents in concentrated (>20%) poverty (0.57), Poor living in very concentrated (>40%) poverty (0.54), and Poverty (adults) (0.50).

FIGURE 5

WHAT CORRELATES WITH GONORRHEA?

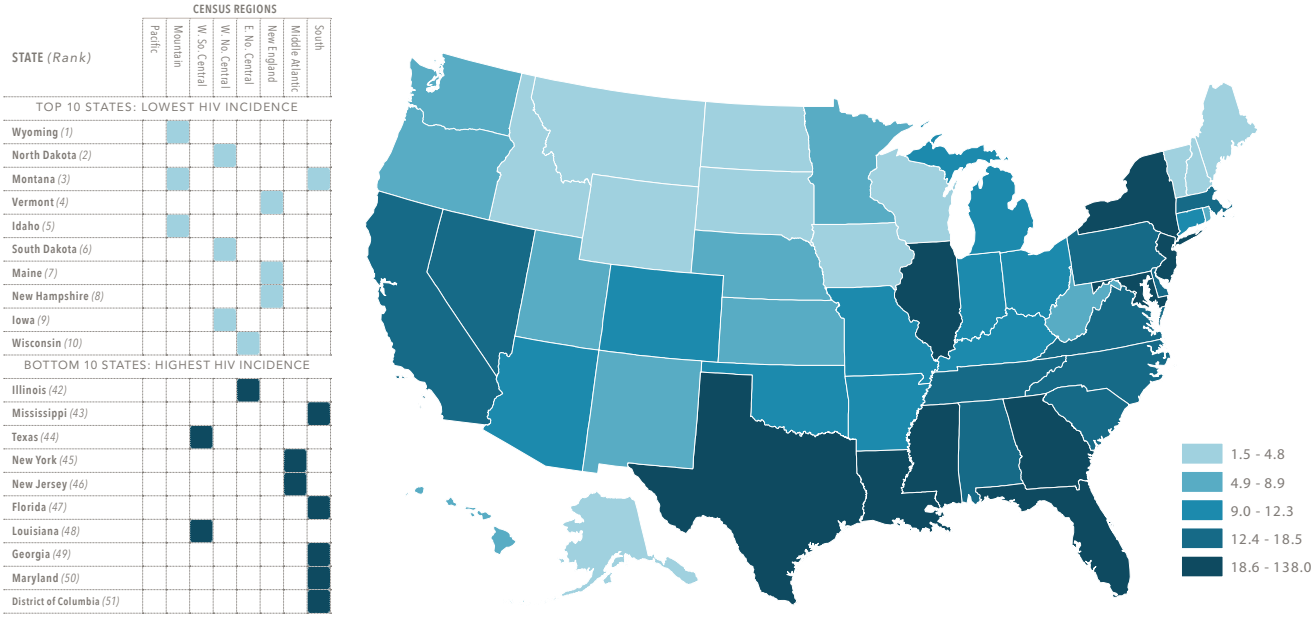
THE CORRELATION COEFFICIENTS (r_s)*

HEALTH BEHAVIORS			
Physical inactivity *(children)*	**0.66**	**Exclusive breastfeeding**	**-0.68**
Fights with injury *(youth)*	**0.57**	**Bicycle helmet use** *(youth)*	**-0.65**
		Birth control *(youth)*	**-0.56**
PHYSICAL AND SOCIAL ENVIRONMENT			
Violent crime rate	**0.68**	**Safe schools** *(parent report)*	**-0.65**
Indoor smoking (child present)	**0.53**	**Commuting by walking/cycling**	**-0.60**
		Safe neighborhoods *(parent report)*	**-0.59**
		Reading to children	**-0.54**
SOCIAL AND ECONOMIC FACTORS			
Single-parent households	**0.80**	**Proficient in reading** *(grade 8)*	**-0.59**
People living amid racial segregation + very concentrated *(>40%)* **poverty**	**0.77**	**Married**	**-0.56**
Poverty (children)	**0.68**	**Employment**	**-0.52**
Racial segregation	**0.64**	**Higher educated household head**	**-0.51**
Adults in prison	**0.61**		
Income inequality	**0.58**		
HEALTH SYSTEM			
Avoidable hospitalization	**0.57**		
Rehospitalization	**0.52**		

*Correlation coefficients range from zero to 1.0 and measure how strongly one variable correlates with another. Factors on the right (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**: Physical inactivity (adult) (r_s= 0.66), Any breastfeeding (-0.63), and Breakfast (youth) (-0.51); **Social and Economic Factors**: Residents in very concentrated (>40%) poverty (0.74), People living amid racial segregation + concentrated (>20%) poverty (0.72), Poor living in concentrated (>20%) poverty (0.70), Poor people living amid racial segregation + very concentrated (>40%) poverty (0.70), Poor living in very concentrated (>40%) poverty (0.67), Residents in concentrated (>20%) poverty (0.64), Poor people living amid racial segregation + concentrated (>20%) poverty (0.62), Poverty (supplemental def.) (0.60), Poverty (adults) (0.59), Proficient in math (grade 4) (-0.58), Poor living amid racial segregation (0.57), Proficient in math (grade 8) (-0.57), and Children with employed parents (-0.50); and **Health Systems**: Rehospitalization (heart failure) (0.53).

FIGURE 6
HIV INCIDENCE RATES (PER 100,000), BY STATE (2012)



socioeconomic status could explain this, but violence may also be a proxy for other unstable social or economic conditions that have direct causal ties to aggressive or unsafe sexual behavior. Our measures of health system characteristics correlated with incidence rates of gonorrhea, but not chlamydia.

HIV infection

According to CDC data for 2012, the incidence of reported new cases of HIV varied 92-fold across the states. As with gonorrhea, Wyoming had the lowest rate of HIV in the nation (1.5 per 100,000 persons) and the District of Columbia had the highest rate (138.0 per 100,000 persons). The Top 10 states (with low HIV rates) included a contiguous cluster of states stretching from Idaho to Iowa, as well as a cluster of three New England states: Maine, New Hampshire, and Vermont (Figure 6). Alaska ranked 11th for HIV, but was in the Bottom 10 for chlamydia.

Although the geographic footprint for states with a high HIV incidence was broad, the Bottom 10 states were primarily in the Middle Atlantic and Southern regions of the country (Figure 6). As with chlamydia and gonorrhea, HIV incidence in the District of Columbia greatly exceeded state averages. Maryland had the highest HIV rate for a state. Rates along the east coast (in Maryland, Florida, New York, New Jersey, Illinois, and Delaware) exceeded those of many Southern states. New Jersey, despite appearing among the

FIGURE 7

WHAT CORRELATES WITH HIV INFECTION?

THE CORRELATION COEFFICIENTS (r_s)*

HEALTH BEHAVIORS			
Fights with injury (youth)	0.50	Exclusive breastfeeding	-0.64
		Physical activity *(children)*	-0.63
		Birth control *(youth)*	-0.51
PHYSICAL AND SOCIAL ENVIRONMENT			
Violent crime rate	0.60	Safe neighborhoods *(parent report)*	-0.75
Dating violence *(youth)*	0.59	Safe schools *(parent report)*	-0.70
Weapon injury in school	0.54	Children in supportive neighborhoods	-0.66
Low social capital index	0.51	Reading to children	-0.52
SOCIAL AND ECONOMIC FACTORS			
Poverty *(supplemental def.)*	0.79	Married	-0.76
Racial segregation	0.77	Housing cost burden less than 50% of income	-0.62
People living amid racial segregation + concentrated (>20%) poverty	0.74	Children with employed parents	-0.59
Income inequality	0.74		
Single-parent households	0.60		
HEALTH SYSTEM			
Rehospitalization	0.72		

*Correlation coefficients range from zero to 1.0 and measure how strongly one variable correlates with another. Factors on the right (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**: Bicycle helmet use (youth) (r_s= -0.58); **Social and Economic Factors**: Poor living amid racial segregation (0.73), Poor people living amid racial segregation + concentrated (>20%) poverty (0.70); Poor people living amid racial segregation + very concentrated (>40%) poverty (0.66), People living amid racial segregation + very concentrated (>40%) poverty (0.66), Poor living in concentrated (>20%) poverty (0.57), and Poor living in very concentrated (>40%) poverty (0.51); and **Health Systems**: Rehospitalization (heart attack) (0.71), Rehospitalization (heart failure) (0.71), and Rehospitalization (pneumonia) (0.68).

Bottom 10 states for HIV infection, ranked in the Top 10 for 15 health outcomes examined in this report, including chlamydia. Even more surprisingly, Massachusetts, a state that ranked in the Top 10 for 21 health outcomes, a total matched only by Utah, ranked in the fourth (second to lowest) quintile for HIV infection.

What correlates the most with HIV infection?

As was true for chlamydia and gonorrhea, the prevalence of HIV infection among states correlated with their rates of contraceptive use and with other health behaviors (Figure 7) that are not on the causal pathway but help characterize behavioral patterns in the states. For example, rates of smoking during pregnancy and breastfeeding differed two-fold between Top 10 and Bottom 10 states. Although HIV is transmitted by users of injection drugs, we found no correlation with state data on illicit drug use.[a]

HIV rates correlated even more strongly with measures of socioeconomic status (e.g., poverty rates, income inequality) and household structure (e.g., single-parent households) (Figure 7). States with higher HIV rates spent less on higher education (rs= -0.47).

Racial segregation was a powerful predictor of HIV rates. The proportion

a. For reasons that require further research, we found an inverse correlation between HIV rates and state spending per capita on natural resources (r_s= -0.52) and highways/toll roads (r_s= -0.67).

of the population living in racially segregated neighborhoods in Bottom 10 states (high HIV rates) was 28.9 percent—almost 14 times that of Top 10 states (2.1 percent)—and the proportion living in racially segregated neighborhoods with concentrated poverty was 8.4 times higher. In Bottom 10 states (with high HIV rates), 34.6 percent of the poor lived in racially segregated neighborhoods with concentrated poverty (where more than 20 percent of people were also poor); the corresponding percentage in Top 10 states was only 5.8 percent.

As with chlamydia and gonorrhea, HIV rates correlated highly with measures of neighborhood violence/safety, although the latter does not have a direct causal role. Teens in states with high HIV incidence were more likely to have been injured by a weapon at school. The violent crime rate in Bottom 10 states was 479.5 per 100,000, more than twice that of Top 10 states (216.6 per 100,000). In addition, HIV rankings correlated with measures of social capital and social support for children. Although most of the health characteristics we measured did not correlate with HIV rates, we found a very high correlation with hospital readmission rates, a proxy for inadequate primary care.

What The Data Affirm: The Takeaway

Personal behaviors, such as safe sexual practices (and not injecting drugs with contaminated needles), determine whether people acquire sexually transmitted and HIV infections, but socioeconomic conditions and safe and supportive neighborhoods are also associated with infection rates and the behaviors that cause them. States with high rates of sexually transmitted and HIV infections tend to be states where children, teens, and pregnant women have less healthy behaviors and children experience less social support.

The bottom line? Sexual health is linked with the economic and social wellbeing of communities.

References

1. Woolf SH, Aron L, Chapman DA, et al. *The Health of the States: How U.S. States Compare in Health Status and the Factors that Shape Health—Summary Report.* Richmond, VA: Center on Society and Health, Virginia Commonwealth University, 2016.

2. Woolf SH, Aron L, Chapman DA, et al. *The Health of the States: How U.S. States Compare in Health Status and the Factors that Shape Health—Spotlight on Methods.* Richmond, VA: Center on Society and Health, Virginia Commonwealth University, 2016.

3. Centers for Disease Control and Prevention. *Sexually Transmitted Disease Surveillance Report 2010.* Atlanta, GA: Department of Health and Human Services; 2011.

Acknowledgments

Although any errors or omissions are those of the authors only, we would like to thank our Expert Advisory Panel, which included Nancy Adler, Paula Braveman, Debbie Chang, Ana Diez Roux, Neal Halfon, David Kindig, Anna Schenck, and Jonathan Showstack. We also appreciate the advice we received from the staff of the Robert Wood Johnson Foundation, notably Matthew Trujillo, who served as our program officer, and his predecessor, Herminia Palacio.

We thank our colleagues at Virginia Commonwealth University for their roles in this study, including Sarah Blackburn and Cassandra Ellison for graphic design, layout, and dissemination of this report, Lauren Waaland-Kreutzer for data verification, and Jill Hellman, for administrative support. We also thank Allison Phillips for managing the first phases of this project and Steven Cohen for providing advice on demographic research methods.

We thank our colleagues at the Urban Institute, especially Julia Isaacs for guiding our analysis of spending data, but also William Adams, Nan Astone, Richard Auxier, Maeve Gearing, Linda Giannarelli, Chris Hayes, Olivia Healy, Carl Hedman, Carrie Heller, Ryan King, Carlos Martin, Will Monson, Rolf Pendall, Bryce Peterson, Kathryn Pettit, Molly Scott, and Janine Zweig.

We also thank Stephanie Zaza, Centers for Disease Control and Prevention, for assistance in accessing data from the Youth Risk Behavior Surveillance System (YRBSS) and Robert Johnson, Vanderbilt University, for biostatistical consulting. Other colleagues who gave us advice included Oscar Arevalo, Nicklaus Children's Hospital; Elizabeth Bradley, Yale University; Ichiro Kawachi, Harvard School of Public Health; Matthew Penn, Public Health Law Program, Centers for Disease Control and Prevention; Robert Phillips, Jr., American Board of Family Medicine; Christopher B. Swanson, Editorial Projects in Education; Daniel Taber, University of Texas Health Science Center at Houston, School of Public Health; Alan Ellis, Joseph Morrissey, and Kathleen Thomas, University of North Carolina Cecil G. Sheps Center for Health Services Research; and Angela Kimball, National Alliance on Mental Illness.

FUNDING

This project was funded by grant number 71508 from the Robert Wood Johnson Foundation.

This report is one of a series produced, in partnership with the Urban Institute, as part of the Health of the States project — an initiative funded by the Robert Wood Johnson Foundation (grant number 71508). For more information on the project, and to view other reports in the series, visit societyhealth.vcu.edu.

Virginia Commonwealth University

VCU Center on Society and Health

societyhealth@vcu.edu

830 East Main Street, Suite 5035

P.O. Box 980212

Richmond, Virginia 23298-0212

(804) 628-2462