CREATING A CULTURE OF HEALTH IN APPALACHIA

Disparities and Bright Spots

HEALTH DISPARITIES IN APPALACHIA

The first report in a series exploring health issues in Appalachia

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Appalachian Regional Commission

The Appalachian Regional Commission (ARC) provided funding, leadership, and project management for the project. Established in 1965, ARC is a regional economic development agency that represents a partnership of federal, state, and local government. ARC's mission is to innovate, partner, and invest to build community capacity and strengthen economic growth in Appalachia to help the Region achieve socioeconomic parity with the nation.

Foundation for a Healthy Kentucky

The non-profit Foundation for a Healthy Kentucky was the grantee and fiscal agent for the project. Since 2001, the Foundation for a Healthy Kentucky has been working to improve the health of Kentuckians through policy changes and community investments. Its mission is to address the unmet health care needs of Kentucky residents by developing and influencing health policy, improving access to care, reducing health risks and disparities, and promoting health equality.

Principal Investigators

To implement the research, the Appalachian Regional Commission and the Foundation for a Healthy Kentucky named two Principal Investigators for the study: Julie L. Marshall, PhD, Economist, Division of Planning and Research for the Appalachian Regional Commission, and Gabriela Alcalde, DrPH, Vice President, Policy and Program for the Foundation for a Healthy Kentucky.

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GLOSSARY OF TERMS

Area Health Resources Files	The Area Health Resources Files (AHRF) are a family of health data resource products that draw from an extensive county-level database assembled annually from more than 50 sources. The Health Resources and Services Administration division of the United States Department of Health and Human Services manage the data. AHRF contains data on the healthcare workforce.
Age Adjusting	Age adjusting is a technique that allows direct comparison of places that have different age distributions among their populations. See the Methodology section for more details.
Appalachian Region	The Appalachian Region is defined in the federal legislation from which the Appalachian Regional Commission derives its authority. The Region covers 205,000 square miles, and 420 counties in 13 states. It stretches more than 1,000 miles from Mississippi to New York, and is home to more than 25 million people.
Appalachian Regional Commission	The Appalachian Regional Commission (ARC) is a regional economic development agency that represents a partnership of federal, state, and local governments. Established by an act of Congress in 1965, ARC makes investments that address the goals identified in the Commission's strategic plan, which include economic development, infrastructure improvement, and health improvement.
ARC Economic Index	ARC uses an index-based classification system to compare each county in the nation with national averages on three economic indicators: three-year average unemployment rates, per capita market income, and poverty rates. Based on that comparison, each Appalachian county is classified within one of five economic status designations—distressed, at-risk, transitional, competitive, or attainment.
American Community Survey (ACS)	The ACS is an ongoing survey conducted by the U.S. Census Bureau. This survey samples the population on a number of topics including population, age, education, home ownership, income, labor force, migration, and veteran status.
Behavioral Risk Factor Surveillance System	The Behavioral Risk Factor Surveillance System (BRFSS) is the nation's premier system of health-related telephone surveys that collects state-level data about United States residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services. Many of the measures used in this report were derived from BRFSS data, via County Health Rankings.
Centers for Disease Control and Prevention	The Centers for Disease Control and Prevention (CDC) is the leading national public health protection agency in the United States. The CDC administers a number of data collection programs vital for health researchers, including the WONDER data system, which contains detailed mortality information, and the Behavioral Risk Factor Surveillance System.

County Health Rankings	The *County Health Rankings & Roadmaps* program is a collaboration between the Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute. The goals of the program are to build awareness of the multiple factors that influence health; provide a reliable, sustainable source of local data to communities to help them identify opportunities to improve their health; engage and activate local leaders from many sectors creating sustainable community change; and connect and empower community leaders working to improve health.
Economic Distress	Distressed counties are the most economically depressed counties and rank in the worst 10 percent of the nation's counties. In fiscal year 2017, 84 Appalachian counties qualify for distressed county status on the basis of low per capita income and high rates of poverty and unemployment.
Median	The median is the value of the midpoint in a data set; it divides a data set into two equal parts. In a data set of 41 values, 20 values are above the median, and 20 values are below the median.
Morbidity	Morbidity measures the frequency of any particular disease or illness within a population.
Mortality	In this report, mortality is used interchangeably with rate of death. Mortality indicators represent both disease-specific death rates, such as cancer mortality, and measures of all reasons for death, such as Years of Potential Life Lost.
Population-Weighted Average	Rather than simply averaging values across counties, weighted averages account for the different sizes of the population in each county and weights the average accordingly. As a result, a population-weighted average will be influenced more by counties with large populations than those with small populations. The population-weighted average should be interpreted as the average for the *people* living in the area and not the average for *counties* in that area. See the Methodology section for more details.
Quintile	Quintiles are groups of data points that have been divided into five equal parts from the dataset. The first quintile represents data points in the 20^{th} percentile and below. The second quintile represents data points between the 20^{th} and 40^{th} percentiles, etc.
Subregion	ARC divides Appalachia into five subregions: Northern, North Central, Central, South Central, and Southern. These subregions may be referred to as Northern Appalachia, North Central Appalachia, etc. Counties within each subregion share similar characteristics, such as topography, demographics, and economics.

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Executive Summary

Creating a Culture of Health in Appalachia: Disparities and Bright Spots is an innovative research initiative sponsored by the Robert Wood Johnson Foundation (RWJF) and the Appalachian Regional Commission (ARC) and administered by the Foundation for a Healthy Kentucky. This multi-part health research project will, in successive reports: measure population health and document disparities in health outcomes in the Appalachian Region compared to the United States as a whole, as well as disparities within the Appalachian Region; identify "Bright Spots," or communities that exhibit better-than-expected health outcomes given their resources; and explore a sample of the Bright Spot communities through in-depth, field-based case studies. Taken together, these reports will provide a basis for understanding and addressing health issues in the Appalachian Region. This research initiative aims to identify factors that support a Culture of Health in Appalachian communities and explore replicable activities, programs, or policies that encourage better-than-expected health outcomes that could translate into actions that other communities can replicate.

This first report, *Health Disparities in Appalachia*, measures population health in Appalachia and documents disparities between the Region and the nation as a whole, as well as disparities within the Appalachian Region.

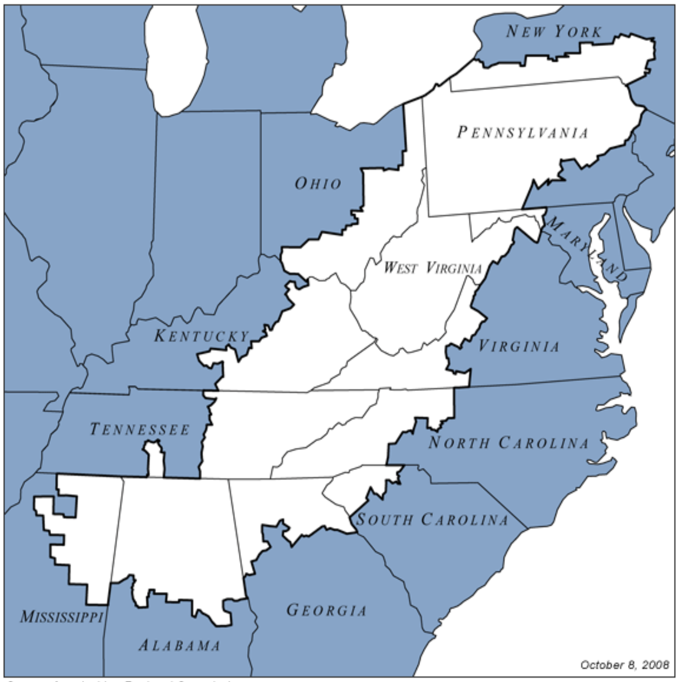
ABOUT THE APPALACHIAN REGION

The current boundary of the Appalachian Region includes all of West Virginia and parts of 12 other states: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia (see Figure 1). The Region covers 205,000 square miles and 420 counties, and is home to more than 25 million people. Forty-two percent of the Region's population is rural, compared with 20 percent of the nation's.

The Appalachian Region's economy, which was once highly dependent on extractive industries, has become more diversified in recent times and now includes larger shares of manufacturing and professional services, among other industries. Appalachia has made significant progress over the past five decades: its poverty rate, which was 31 percent in 1960, had fallen to 17.2 percent over the 2010–2014 period. The number of high-poverty counties in the Region (those with poverty rates more than 1.5 times the U.S. average) declined from 295 in 1960 to 91 over the 2010–2014 period.

Despite the progress made in the Region, many challenges remain, with Appalachian incomes, poverty rates, unemployment rates, and postsecondary education levels still lagging behind performance at the national level. In addition to these socioeconomic deficits, for many of the health drivers and outcomes discussed in this report, the Region performs poorly when compared to the nation as a whole. Progress in the socioeconomic and health spheres are often interrelated, if not interdependent, and much work remains.

Figure 1: Map of the Appalachian Region



Source: Appalachian Regional Commission

MEASURING HEALTH DISPARITIES IN THE APPALACHIAN REGION

A range of indicators are used in this report to measure population health in Appalachia and document health disparities between the Region and the nation as a whole. This report includes 41 measures of population health, organized into 9 domains: Mortality, Morbidity, Behavioral Health, Child Health, Community Characteristics, Lifestyle, Health Care Systems, Quality of Care, and Social Determinants. The domains reflect:

- Current health status: Mortality, Morbidity, and Behavioral Health;
- Generational health and health care: Child Health, Health Care Systems, and Quality of Care; and
- Risk factors and determinants of health: Lifestyle, Community Characteristics, and Social Determinants.

The indicators provide an overview of population health and include both health outcomes—such as specific measures of mortality and morbidity—and factors that drive or influence health outcomes—such as smoking prevalence, physical inactivity, and the supply of healthcare providers.

The data in this report are broken down by national quintiles, which are groups of data points that have been divided into five equal parts consisting of approximately the same number of counties in each. The quintiles are calculated from national datasets and are thus based on the national distributions for each measure. The first quintile represents data points in the 20th percentile and below, the second quintile represents data points between the 20th and 40th percentiles, and so on. If the Appalachian Region's distribution matched the national distribution, each quintile would contain 84 counties (20 percent of the total counties in Appalachia). Organizing the data into quintiles provides insight into how county-level outcomes are distributed throughout the Region, and can also help answer the question as to whether outcomes in the Appalachian Region are proportional to the outcomes in the nation as a whole.

KEY FINDINGS

Of the 41 indicators examined in this report, the Region performs better than the nation overall on 8: HIV prevalence, travel time to work, excessive drinking, student-teacher ratio, chlamydia prevalence, percentage of the population under age 65 that is uninsured, diabetes monitoring among Medicare patients, and the social association rate.

For the remaining 33 indicators in this report, the performance in the Appalachian Region is worse than the performance in the United States as a whole. This report includes 7 of the 10 leading causes of death in the United States: heart disease, cancer, chronic obstructive pulmonary disease (COPD), injury, stroke, diabetes, and suicide—and the Appalachian Region has higher mortality rates than the nation for each. Mortality due to poisoning—which includes drug overdoses—is markedly higher in the Region than the nation as a whole.

The Appalachian Region's number of physically unhealthy days, mentally unhealthy days, and prevalence of depression are all higher than the national averages for these measures. Obesity, smoking, and physical inactivity—risk factors for a number of health outcomes—are all higher in Appalachia than in the nation overall. The Region also has lower supplies of healthcare professionals when compared to the United States as a whole, including primary care physicians, mental health providers, specialty physicians, and dentists. Lower household incomes and higher poverty rates—both social determinants of health—reflect worse living conditions in the Region than in the nation as a whole.

This report also examines the *changes* over the last 20 years in eight measures: heart disease mortality, cancer mortality, stroke mortality, infant mortality, the supply of primary care physicians, poverty rates, education levels, and years of potential life lost. Over the past two decades, the Appalachian Region has experienced improvements in seven of the eight measures. However, the progress made by the Region often comes up short when compared to the progress made by the United States overall, and indicates a widening gap in overall health between Appalachia and the nation as a whole.

Mortality

The measures in the Mortality domain examine cause-specific deaths within a population and also include a broad measure of premature mortality. There are seven measures of mortality included in this domain:

- Heart disease
- Cancer
- COPD
- Injury
- Stroke
- Diabetes
- Years of Potential Life Lost (YPLL)

Each measure of mortality in this domain is higher (worse) in the Appalachian Region than in the nation as a whole.

Every mortality indicator is higher in the Region than in the nation overall: heart disease is 17 percent higher; cancer is 10 percent higher; COPD is 27 percent higher; injury is 33 percent higher; stroke is 14 percent higher; and diabetes is 11 percent higher.

Considering death broadly, YPLL, a measure of premature mortality, is 25 percent higher in the Region than in the nation as a whole.

The Appalachian Region's rural counties have higher mortality rates than the Region's large metro counties for each of the indicators, signifying a stark rural-urban divide in the Region: heart disease is 27 percent higher; cancer is 15 percent higher; COPD is 55 percent higher; injury is 47 percent higher; stroke is 8 percent higher; and diabetes is 36 percent higher.

YPLL is 40 percent higher in rural Appalachian counties than in the Region's large metro counties.

The distributions of the Mortality indicators among national quintiles for Appalachian counties are shown in Table 1. Of the 420 counties in the Appalachian Region, 163 counties (39 percent) have COPD mortality rates in the worst-performing national quintile, while only 27 counties in the Region (6 percent) are in the best-performing national quintile. There are 158 counties (38 percent) in the worst-performing national quintiles for both heart disease and cancer mortality. Only 13 counties (3 percent) are in the best-performing quintile for YPLL. These distributions show that mortality rates are disproportionately higher throughout the Appalachian Region when compared to the nation as a whole.

Table 1: Distributions of Mortality Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Heart disease deaths	15	*4%*	56	*13%*	76	*18%*	115	*27%*	158	*38%*
Cancer deaths	29	*7%*	49	*12%*	83	*20%*	101	*24%*	158	*38%*
COPD deaths	27	*6%*	54	*13%*	83	*20%*	93	*22%*	163	*39%*
Injury deaths	28	*7%*	59	*14%*	80	*19%*	106	*25%*	147	*35%*
Stroke deaths	40	*10%*	69	*16%*	90	*21%*	111	*26%*	110	*26%*
Diabetes deaths	60	*14%*	70	*17%*	91	*22%*	100	*24%*	99	*24%*
YPLL	13	*3%*	63	*15%*	81	*19%*	105	*25%*	156	*37%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Morbidity

The indicators in the Morbidity domain explore the prevalence of disease and other health conditions. There are five indicators of morbidity in this report:

- Physically unhealthy days
- Mentally unhealthy days
- HIV prevalence
- Diabetes prevalence
- Obesity prevalence

With the exception of HIV rates, the outcomes in Appalachia for each of these measures is higher (worse) than in the nation as a whole.

Appalachian residents report 14 percent more physically unhealthy days and mentally unhealthy days than the nation as a whole. The diabetes prevalence rate in the Region (11.9 percent) is slightly higher than the nation overall (9.8 percent). Likewise, the prevalence of adult obesity is higher in Appalachia (31.0 percent) than in the United States as a whole (27.4 percent).

Residents of rural Appalachian counties have higher numbers of physically unhealthy days, higher numbers of mentally unhealthy days, higher diabetes prevalence, and a higher prevalence of obesity than residents of the Region's large metro counties. Residents living in rural counties in the Region report 24 percent more physically unhealthy days than those living in large metro counties and 10 percent more mentally unhealthy days. Residents of rural Appalachian counties are also more likely to be obese than those living in large metro counties (33.1 percent compared to 29.5 percent).

The distributions of the Morbidity indicators among national quintiles for Appalachian counties are shown in Table 2. Considering mentally unhealthy days, 210 counties (50 percent) are in the worst-performing national quintile for this measure, while only 2 counties in the Region (less than 1 percent) are in the best-performing national quintile. Of the 420 counties in the Region, 180 are in the worst-performing national quintile for diabetes prevalence (43 percent), while only 12 counties (3 percent) are in the top-performing quintile. These results show that many health conditions are disproportionately worse throughout much of Appalachia when compared to the nation as a whole.

Table 2: Distributions of Morbidity Indicators among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Physically unhealthy days	5	*1%*	39	*9%*	93	*22%*	106	*25%*	177	*42%*
Mentally unhealthy days	2	*0%*	19	*5%*	96	*23%*	93	*22%*	210	*50%*
HIV prevalence	89	*21%*	109	*26%*	104	*25%*	61	*15%*	20	*5%*
Diabetes prevalence	12	*3%*	32	*8%*	68	*16%*	128	*30%*	180	*43%*
Obesity prevalence	45	*11%*	69	*16%*	74	*18%*	106	*25%*	126	*30%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Behavioral Health

The measures in the Behavioral Health domain examine issues related to both mental health and substance abuse. There are five measures in this domain:

- Depression prevalence among Medicare beneficiaries
- Suicide
- Excessive drinking
- Poisoning mortality
- Opioid prescriptions among Medicare beneficiaries

While excessive drinking in the Appalachian Region is lower (better) than in the nation as a whole, the Region performs worse than the nation on each of the other measures in this domain.

The poisoning mortality rate in Appalachia—which includes drug overdoses—is 37 percent higher than the national rate, and the suicide rate in the Region is 17 percent higher than the national rate. The prevalence of depression among Medicare beneficiaries is higher in the Region (16.7 percent) than in the nation as a whole (15.4 percent).

Residents of the Appalachian Region's rural counties are 21 percent more likely to commit suicide than those living in the Region's large metro counties, and the poisoning mortality rate is 40 percent higher in the Region's rural counties than in its large metro counties. Depression prevalence among Medicare beneficiaries is also slightly higher in the Region's rural counties (16.9 percent) than in its large metro counties (15.6 percent).

The distributions of the Behavioral Health indicators among national quintiles for Appalachian counties are shown in Table 3. For poisoning mortality, 195 of the 420 counties in the Appalachian Region (46 percent) are in the worst-performing national quintile, while only 24 counties (6 percent) are in the best-performing national quintile. For depression prevalence among Medicare beneficiaries, 161 counties (38 percent) are in the worst-performing national quintile, and only 22 counties (5 percent) are in the best-performing national quintile.

Table 3: Distributions of Behavioral Health Indicators among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Depression prevalence	22	*5%*	54	*13%*	69	*16%*	114	*27%*	161	*38%*
Suicide incidence	46	*11%*	69	*16%*	108	*26%*	127	*30%*	70	*17%*
Excessive drinking	202	*48%*	92	*22%*	82	*20%*	41	*10%*	3	*1%*
Poisoning mortality	24	*6%*	31	*7%*	56	*13%*	114	*27%*	195	*46%*
Opioid prescriptions	51	*12%*	77	*18%*	91	*22%*	100	*24%*	101	*24%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Child Health

Circumstances surrounding birth are explored in the Child Health domain. There are three measures in this domain:

- Infant mortality
- Low birth weight
- Teen births

The Region performs worse than the nation on each of these measures.

The infant mortality rate is 16 percent higher in the Appalachian Region than in the nation as a whole, and the percentage of low birth weight babies is higher in the Region (8.7 percent) than in the nation (8.1 percent).

The infant mortality rate in the Appalachian Region's rural counties is 19 percent higher than the rate in the Region's large metro counties and the teen birth rate in the Region's rural counties is 72 percent higher than the rate in Appalachia's large metro counties.
The distributions of the Child Health indicators among national quintiles for Appalachian counties are shown in Table 4. Of the 420 counties in the Appalachian Region, 127 (30 percent) are in the worst-performing national quintile for the incidence of low birth weight babies, while only 12 counties (3 percent) are in the best-performing quintile. The distribution of the infant mortality rate shows that only 24 Appalachian counties (6 percent) rank in the top-performing national quintile.

Table 4: Distributions of Child Health Indicators among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Infant mortality	24	*6%*	73	*17%*	112	*27%*	124	*30%*	87	*21%*
Low birth weight	12	*3%*	58	*14%*	90	*21%*	132	*31%*	127	*30%*
Teen births	44	*10%*	66	*16%*	95	*23%*	131	*31%*	83	*20%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Community Characteristics

The measures included in the Community Characteristics domain examine aspects of the external environment largely outside of residents' control. Three measures are included in this domain:

- Travel time to work
- Grocery store availability
- Student-teacher ratio

Appalachia performs better than the nation as a whole on two of these measures: travel time to work and the student-teacher ratio.

The average travel time to work in the Region is 25 minutes, which is just slightly lower than the national average of 26 minutes. The student-teacher ratio in Appalachia is 14.3, which is a lower (better) ratio than the national average of 16.5. With grocery store availability, however, the Region performs worse than the United States as a whole, with 14 percent fewer grocery stores per 1,000 population.

Unlike many other indicators in this report, rural areas throughout Appalachia perform better than large metro areas in the Region for each of the three variables in this domain.

The distributions of the Community Characteristics indicators among national quintiles for Appalachian counties are shown in Table 5. Despite the Region's slightly lower average travel time to work, 142 counties (34 percent) still rank in the worst-performing national quintile, and only 5 counties (1 percent) rank in the best-performing quintile.

Table 5: Distributions of Community Characteristics Indicators among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Travel time to work	5	*1%*	62	*15%*	101	*24%*	110	*26%*	142	*34%*
Grocery store availability	39	*9%*	99	*24%*	116	*28%*	96	*23%*	70	*17%*
Student-teacher ratio	37	*9%*	85	*20%*	116	*28%*	115	*27%*	52	*12%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Lifestyle

Individual choices and habits that play an important role in the health of a population are explored in the Lifestyle domain. There are three measures in this domain:

- Physical inactivity
- Smoking prevalence
- Chlamydia prevalence

Appalachia performs worse than the nation as a whole on two of these indicators: physical inactivity and smoking.

In the Appalachian Region, 28.4 percent of people report being physically inactive, a figure higher than the 23.1 percent reported for the United States as a whole. Nearly 20 percent of all adults in the Appalachian Region report being cigarette smokers, a figure higher than the 16.3 percent found at the national level.

In the Appalachian Region's rural counties, 31.8 percent of residents report being physically inactive, a figure much higher than the 25.2 percent in the Region's large metro areas. Residents in the Region's rural counties also report a higher smoking prevalence, with 22.5 percent of adults being cigarette smokers, compared to just 17.3 percent of those living in the Region's large metro areas.

The distributions of the Lifestyle indicators among national quintiles for Appalachian counties are shown in Table 6. Of the 420 counties in the Region, 179 (43 percent) rank in the worst-performing national quintile for physical inactivity. There are 189 counties in the Region (45 percent) that rank in the worst-performing national quintile for cigarette smoking, while only 17 counties (4 percent) rank in the best-performing national quintile.

Table 6: Distributions of Lifestyle Indicators among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Physical inactivity	18	*4%*	60	*14%*	79	*19%*	84	*20%*	179	*43%*
Smoking prevalence	17	*4%*	27	*6%*	67	*16%*	120	*29%*	189	*45%*
Chlamydia incidence	132	*31%*	111	*26%*	84	*20%*	50	*12%*	36	*9%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Health Care Systems

The Health Care Systems domain includes measures related to the availability of, and access to, healthcare. There are seven measures in this domain:

- Primary care physicians
- Mental health professionals
- Specialty physicians
- Dentists
- Percentage of the population under age 65 that is uninsured
- Heart disease hospitalizations among Medicare beneficiaries
- COPD hospitalizations among Medicare beneficiaries

The Appalachian Region performs worse than the United States as a whole on six of the seven measures. Only the percentage of the population under age 65 that is uninsured is slightly lower (better) in the Region than in the nation as a whole, although the data here largely predate the implementation of the Affordable Care Act.

The supply of primary care physicians is 12 percent lower in the Appalachian Region than in the nation as a whole. The deficit between Appalachia and the United States overall is even larger for the supply of mental health providers (35 percent lower), specialty physicians (28 percent lower), and dentists (26 percent lower). Hospitalization rates among Medicare beneficiaries are much higher in the Region for both COPD (23 percent higher in the Appalachia than in the United States) and heart disease (17 percent higher).

The supply of primary care physicians in rural counties in Appalachia is 20 percent lower than the supply in the Region's large metro counties. The supply of both specialists (57 percent lower) and dentists (36 percent lower) are also lower in the Region's rural counties when compared to large metro counties. COPD hospitalization rates (39 percent higher) and heart disease hospitalization rates (13 percent) are also higher in Appalachia's rural counties. The uninsured rate for the population under age 65 is 18.2 percent in rural Appalachian counties compared to 14.7 percent in the Region's large metro counties.

The distributions of the Health Care Systems indicators among national quintiles for Appalachian counties are shown in Table 7. Of the 420 counties in the Region, 203 counties (48 percent) rank in the worst national quintile for COPD hospitalizations, while only 12 counties (3 percent) are in the best-performing national quintile. Likewise, 179 counties (43 percent) rank in the worst national quintile for heart disease hospitalizations while only 7 counties (2 percent) rank in the best-performing national quintile.

Table 7: Distributions of Health Care Systems Indicators among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Primary care physicians	56	*13%*	84	*20%*	106	*25%*	95	*23%*	79	*19%*
Mental health providers	42	*10%*	81	*19%*	105	*25%*	116	*28%*	76	*18%*
Specialist physicians	67	*16%*	103	*25%*	94	*22%*	100	*24%*	56	*13%*
Dentists	35	*8%*	80	*19%*	99	*24%*	115	*27%*	91	*22%*
Uninsured population	53	*13%*	91	*22%*	117	*28%*	111	*26%*	48	*11%*
Heart disease hospitalizations	7	*2%*	43	*10%*	74	*18%*	117	*28%*	179	*43%*
COPD hospitalizations	12	*3%*	29	*7%*	75	*18%*	101	*24%*	203	*48%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Quality of Care

The types of care that are available to residents in a community are examined in the Quality of Care domain. There are three measures in this domain:

- Percentage of medical doctors that use electronic prescribing technology
- Percentage of Medicare beneficiaries ages 67 to 69 who have recently received a mammogram
- Diabetes monitoring among Medicare beneficiaries

For each of these three measures, the values reported in Appalachia are similar to those reported in the United States as a whole.

Medical doctors are somewhat less likely to use electronic prescribing in the Appalachian Region (63.8 percent of doctors) compared to the nation overall (65.8 percent). Mammogram screening percentages are comparable for the Region (61.4 percent) and the United States as a whole (62.1 percent), as are diabetes monitoring percentages, with Appalachia (85.9 percent) and the nation overall (84.7 percent) reporting similar figures.

Medical doctors in rural areas throughout the Region are less likely to use electronic prescribing (60.6 percent of doctors) than those in large metro areas (64.7 percent). Medicare-covered women ages 67 to 69 are less likely to have had a recent mammogram in rural areas (57.3 percent) than those in large metro areas (58.9 percent).

The distributions of the Quality of Care indicators among national quintiles for Appalachian counties are shown in Table 8. The indicators in this domain are relatively evenly distributed compared to many other indicators in this report.

Table 8: Distributions of Quality of Care Indicators among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Electronic prescriptions	58	*14%*	74	*18%*	94	*22%*	107	*25%*	82	*20%*
Mammogram screenings	56	*13%*	69	*16%*	91	*22%*	99	*24%*	104	*25%*
Diabetes monitoring	74	*18%*	103	*25%*	120	*29%*	85	*20%*	38	*9%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Social Determinants

The measures in the Social Determinants domain examine the conditions in which people live and work. There are five measures in this domain:

- Median household income
- Household poverty rate
- Percentage of the population receiving disability benefits
- Percentage of the population with some level of college education
- Social association rate

The Appalachian Region performs worse than the United States as a whole on four of the five measures—the social association rate is the only indicator with better performance in the Region.

Median household income in the Appalachian Region is 19 percent lower than the national median, and adults ages 25 to 44 are less likely to have some type of post-secondary education in the Region (57.1 percent) than in the United States overall (63.3 percent). The household poverty rate in Appalachia is higher than the national rate (17.2 percent compared to 15.6 percent), and more people receive disability benefits in the Region (7.3 percent) than in the nation as a whole (5.1 percent).

Rural counties throughout Appalachia perform markedly worse on the four measures in which the Region as a whole already lags behind national performance. Median household income in rural Appalachia is 34 percent lower than the median income in large metro counties throughout the Region. Education levels (49.0 percent in rural Appalachian counties; 65.1 percent in large metro counties), household poverty rates (23.0 percent in Appalachia's rural counties; 13.6 percent in the Region's large metro counties), and the receipt of disability benefits (11.2 percent in rural Appalachian counties; 5.5 percent in Appalachia's large metro counties) all show a stark rural-urban divide.

The distributions of the Social Determinants indicators among national quintiles for Appalachian counties are shown in Table 9. There are 203 Appalachian counties (48 percent) that rank in the worst-performing national quintile on receipt of disability benefits, while only 9 counties (2 percent) rank in the best-performing quintile. For median household income, 159 counties (38 percent) rank in the worst-performing national quintile, while only 19 counties (5 percent) rank in the best-performing quintile. These results show that outcomes for many social determinants are disproportionately worse throughout much of the Appalachian Region when compared to the nation as a whole.

Table 9: Distributions of Social Determinants Indicators among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Median household income	19	*5%*	33	*8%*	91	*22%*	118	*28%*	159	*38%*
Household poverty	17	*4%*	52	*12%*	95	*23%*	134	*32%*	122	*29%*
Disability	9	*2%*	19	*5%*	59	*14%*	130	*31%*	203	*48%*
Education: some college	20	*5%*	39	*9%*	83	*20%*	128	*30%*	150	*36%*
Social associations	45	*11%*	89	*21%*	102	*24%*	98	*23%*	86	*20%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

TRENDS

The trends section examines the changes in eight indicators over a period of approximately two decades. The changes in the Appalachian Region are compared to the United States as a whole for these measures examining premature death, causes of death, child and maternal health, healthcare access, and socioeconomic status.

For seven of the eight indicators considered in this section, the Appalachian Region—along with the nation as a whole—experienced improvements over the past two decades. However, the improvements made by the nation overall generally outpaced those made by the Region, indicating increasing disparities between Appalachia and the United States as a whole.

Table 10 shows the percentage changes over the past two decades in Appalachia and the United States for six of the eight variables included in this section. The Appalachian Region experienced a decrease (improvement) in all measures of mortality, but lagged the improvement experienced by the nation as a whole. Appalachia outperformed the rate of change for the nation overall in just one measure: the supply of primary care physicians.

Table 10: Percentage change in selected measures, the United States and Appalachia

Indicator	United States	Appalachia
Change between 1989–1995 and 2008–2014:		
YPLL	-24%	-8%
Stroke mortality	-40%	-35%
Cancer mortality	-21%	-14%
Heart disease mortality	-43%	-39%
Infant mortality	-28%	-19%
Change between 1990 and 2013:		
Primary care physicians	27%	31%

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Two indicators are not included in the table above: household poverty rates and the percentage of the population with a high school degree. Both Appalachia and the nation as a whole experienced an increase (worsening) in the household poverty rate between 1995 and 2014, with the Region's rate increasing from 14.2 percent to 17.2 percent, while the national rate increased at a slightly slower pace, going from 13.6 percent to 15.6 percent. Between 1990 and 2009–2013, Appalachia made great strides in the percentage of its population with a high school degree, improving from 68.4 percent to 84.6 percent. The nation as a whole also saw an increase in this measure, going from 75.7 percent in 1990 to 85.9 percent in 2009–2013.

NEXT STEPS

This report—measuring population health and documenting health disparities in the Appalachian Region—is the first in a series exploring health issues in Appalachia.

The information documented in this report provides context for the subsequent reports in this series that will explore Bright Spots, or Appalachian communities with better-than-expected health outcomes given their resources. Resources here are interpreted broadly, and include the health system, the environment, and socioeconomic factors, among others. Much of the data presented in this report will be used to establish a statistical framework for identifying Bright Spots, including factors that reflect a Culture of Health. Once Appalachian counties performing better than expected have been statistically identified, a sample of these communities will be explored through in-depth, field-based case studies. Working with these communities, the case studies will identify replicable activities, programs, or policies that encourage better-than-expected health outcomes that could translate into actions that other communities can replicate.

Introduction

ABOUT THE PROJECT

Culture of Health

Creating a Culture of Health in Appalachia: Disparities and Bright Spots is an innovative research initiative sponsored by the Robert Wood Johnson Foundation (RWJF) and the Appalachian Regional Commission (ARC) and administered by the Foundation for a Healthy Kentucky. This multi-part health research project will, in successive reports: measure population health and document health disparities in the Appalachian Region; establish a framework for identifying Appalachian "Bright Spots," or communities with better-than-expected health outcomes, including factors that reflect a Culture of Health; and, through in-depth case studies, explore replicable activities, programs, or policies that encourage better-than-expected health outcomes that translates into actions that other communities could replicate.

The Robert Wood Johnson Foundation's vision for a national Culture of Health—enabling all in our diverse society to lead healthier lives—is based on ten underlying principles:

1. Good health flourishes across geographic, demographic, and social sectors.
2. Attaining the best health possible is valued by our entire society.
3. Individuals and families have the means and the opportunity to make choices.
4. Business, government, individuals, and organizations work together to build healthy communities.
5. No one is excluded.
6. Everyone has access to affordable, quality health care.
7. Health care is efficient and equitable.
8. The economy is less burdened by excessive and unwarranted health care spending.
9. Keeping everyone as healthy as possible guides public and private decision-making.
10. Americans understand that we are all in this together.

According to the Robert Wood Johnson Foundation, building a Culture of Health means creating a society that gives every person an equal opportunity to live the healthiest life they can—whatever their ethnic, geographic, racial, socioeconomic, or physical circumstances happen to be. A Culture of Health recognizes that health and well-being are greatly influenced by where we live, how we work, the safety of our surroundings, and the strength and connectivity of our families and communities—and not just by what happens in the doctor's office.

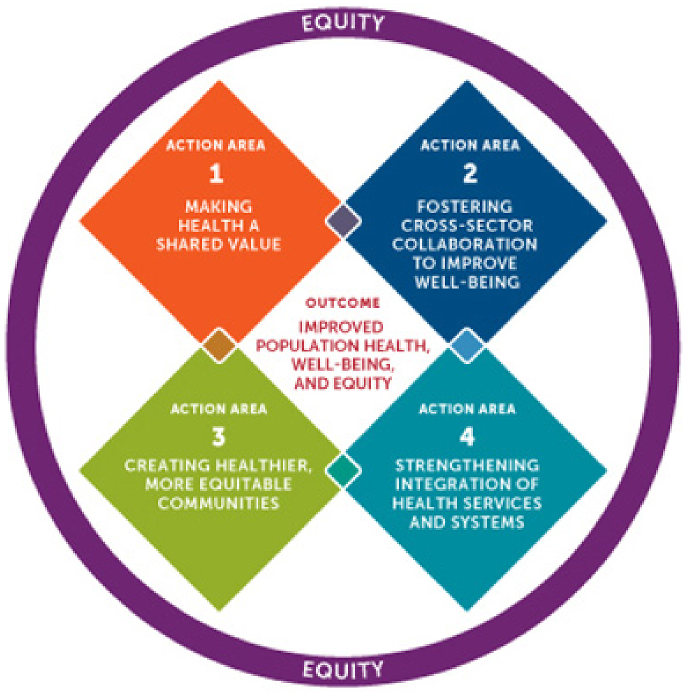
Overview of Health Measures

The 41 measures featured in this report provide a comprehensive picture of health in the Appalachian Region, focusing on how the Region compares to the United States as a whole and how parts of the Region compare to one another. This report uses a diverse group of measures that consider: disease outcomes, the health of children and adults, the health care delivery system, the quality of care, and social determinants—providing a broad understanding of population health in Appalachia.

The ten principles and the four Action Areas associated with RWJF's Culture of Health served as a starting point for identifying appropriate measures that reflect health outcomes and factors that drive or influence overall health in the Appalachian Region. Many of the measures in this report were chosen to reflect the RWJF Culture of Health Action Areas framework shown in Figure 2 (Plough, 2015).

All measures are presented in a national context to align with ARC's vision for bringing the Appalachian Region to parity with the nation. By establishing baselines of national and Appalachian performance for a number of health-related measures, this report provides a reference point to not only understand population health in the Appalachian Region, but also to support the development of a statistical framework for identifying Bright Spots.

Figure 2: Robert Wood Johnson Foundation Culture of Health Action Areas



Robert Wood Johnson Foundation

The measures of health in this report are organized into domains by common characteristics—capturing a cross section of factors that contribute to population health. Grouping the measures into domains allows the reader to identify and explore themes among related measures more easily. There are nine domains: Mortality, Morbidity, Behavioral Health, Child Health, Community Characteristics, Lifestyle, Health Care Systems, Quality of Care, and Social Determinants.

The measures in the Mortality domain examine cause-specific deaths within a population and also include a broad measure of premature mortality. The indicators in the Morbidity domain explore physical health through the prevalence of disease and other health conditions, while mental health is examined through the measures in the Behavioral Health domain related to both mental health and substance abuse. Circumstances surrounding birth are explored in the Child Health domain. Individual choices and habits play an important role in the health of a population—these are examined by the measures in the Lifestyle domain. The Culture of Health framework recognizes that the environment in which an individual lives and works is important to health—the measures included in the Community Characteristics domain examine aspects of the external environment that are largely outside of residents' control, while the conditions in which people live and work are explored in the Social Determinants domain. The comprehensiveness of available care is represented by the Health Care Systems domain which includes measures related to the availability of, and access to, healthcare, and by the Quality of Care domain, which measures the types of care that are available to a community.

Within each domain, measures either describe a health outcome or are factors that drive health outcomes (see Table 11). This distinction is important for structuring the framework in the subsequent Bright Spots analysis.

Outcomes are conditions or events that reflect health status. Examples of outcomes in this report include mortality rates, incidence of disease, and percentages of a population experiencing depression or substance abuse.

Drivers, often referred to as *health determinants*, are measures that impact health status and can be socioeconomic, behavioral, environmental, or associated with the quality of the health care system. For example, income and educational attainment have long been linked to overall health status. Some drivers, such as the supply of mental health providers, may impact outcomes in a specific domain, such as Behavioral Health.

Measures included in this report had to meet four criteria:

- Available to the public (including those for which permission must be obtained);
- Calculated at the county level and available for nearly all counties in the U.S.;[1]
- Relevant to the overall concept of population health; and
- Fit within one of the domains.

Despite their importance in understanding population health, a number of measures could not be included in this report due to lack of availability. Although oral health has a well-documented effect on both the physical and mental health of individuals, there is no readily obtainable data source for all counties in the United States. Likewise, Hepatitis C prevalence was excluded for lack of uniform availability at the county level.

Compiled data for the 41 indicators included in this report are available in the accompanying file, Appalachian_Health_Disparities_Data.xlsx.

[1] Some intra-county smoothing is required in counties with small sample sizes for certain measures. See Appendix B for details.

Table 11: Health Measures, by Domain

Domain	Measure	Outcome / Driver
Mortality	Heart Disease Deaths	Outcome
	Cancer Deaths	Outcome
	COPD Deaths	Outcome
	Injury Deaths	Outcome
	Stroke Deaths	Outcome
	Diabetes Deaths	Outcome
	Years of Potential Life Lost	Outcome
Morbidity	Physically Unhealthy Days	Outcome
	Mentally Unhealthy Days	Outcome
	HIV Prevalence	Outcome
	Diabetes Prevalence	Outcome
	Adult Obesity Prevalence	Outcome
Behavioral Health	Depression Prevalence	Outcome
	Suicide	Outcome
	Excessive Drinking	Outcome
	Poisoning Deaths	Outcome
	Opioid Prescriptions	Outcome
Child Health	Infant Mortality	Outcome
	Low Birth Weight	Outcome
	Teen Birth Rate	Driver
Community Characteristics	Travel Time to Work	Driver
	Grocery Store Availability	Driver
	Student–Teacher Ratio	Driver
Lifestyle	Physical Inactivity	Driver
	Smoking	Driver
	Chlamydia Incidence	Driver
Health Care Systems	Primary Care Physicians	Driver
	Mental Health Providers	Driver
	Specialty Physicians	Driver
	Dentists	Driver
	Uninsured Population	Driver
	Heart Disease Hospitalizations	Outcome
	COPD Hospitalizations	Outcome
Quality of Care	Electronic Prescribing	Driver
	Mammogram Screenings	Driver
	Diabetes Monitoring	Driver
Social Determinants	Median Household Income	Driver
	Poverty	Driver
	Disability	Driver
	Education	Driver
	Social Associations	Driver

As noted before, some of the indicators also directly reflect one of the four Culture of Health Action Areas (shown in Table 12).

Table 12: Health Measures, by RWJF Culture of Health Action Area

RWJF Culture of Health Action Area	Measure of Health
1. Making Health a Shared Value	Infant Mortality, Teen Births, Physical Inactivity, Chlamydia Rate
2. Fostering Cross-Sector Collaboration to Improve Well-Being	Electronic Prescriptions, Mammogram Screenings, Poverty, Social Associations
3. Creating Healthier More Equitable Communities	Depression, Opioid Prescriptions, Student-Teacher Ratio, Primary Care Physicians
4. Strengthening Integration of Health Services and Systems	Heart Disease Hospitalizations, Uninsured Population, COPD Hospitalizations

Previous Research on Health Disparities in Appalachia

The term *health disparity* refers to a difference in a health outcome across subgroups of a population; the literature contains many variations of this general idea (Elimination of Health Disparities, 2014). The Centers for Disease Control and Prevention (CDC) defines health disparities as gaps in health determinants or outcomes between different segments of a population (Centers for Disease Control and Prevention, What are Health Disparities?, 2013). The U.S. Department of Health and Human Services defines health disparities as "differences in health outcomes that are closely linked with social, economic, and environmental disadvantage" (United States Department of Health and Human Services, 2012). Healthy People 2020 defines health disparities similarly (Healthy People 2020, 2017).

The October 2006 issue of CDC's journal, *Preventing Chronic Disease,* featured a series of articles exploring challenges related to cancer prevention and treatment in the Appalachian Region. (Centers for Disease Control and Prevention, Preventing Chronic Disease: Appalachian Health, 2006). One article discussed the challenges of evaluating health disparities in the Appalachian Region (Behringer & Friedell, 2006). The article noted that, prior to 2006, outcome data for small areas within the Region were difficult to obtain. However, after electronic reporting systems improved data capabilities, examination of these data showed that outcomes in Appalachia were much poorer than outcomes in the rest of the nation. The report cites higher rates of cervical cancer, heart disease, and premature death in the Region.

A 2010 study completed by researchers at the University of Virginia concluded that persons living in communities in Appalachian Virginia were not receiving adequate healthcare relative to non-Appalachian Virginia counties, regardless of health insurance status (McGarvey, Leon-Verdin, Killos, Guterbock, & Cohn, 2011).

The Appalachian Regional Commission has commissioned several studies on health and health disparities in Appalachia.

A seminal report published in 2004 established a baseline regarding health disparities in the Region and compared Appalachia to the non-Appalachian United States (Halverson, Ma, & Harner, 2004). The authors concluded that the Region as a whole suffered considerable excess mortality from leading causes of death when compared to the rest of the nation. Halverson et al. also found a high degree of variability within the Region in various measures of mortality and rates of hospitalization. The report found that the most adverse outcomes were correlated with socioeconomic characteristics, behavioral risk profiles, and available medical resources, all of which vary greatly across geographies. However, the report established no statistical relationship between any of the explanatory factors and outcomes; many of the disparities were thus deemed variable and localized in nature.

Mental health and substance abuse, as well as access to treatment in the Appalachian Region were analyzed in a 2008 report (National Opinion Research Center (NORC) at the University of Chicago, and East Tennessee State University, 2008). This report found that disparities do exist in the Region for specific substance abuse issues and mental health conditions.

A 2012 report measured disparities in healthcare cost and access concluded that Appalachian counties lag behind non-Appalachian counties in both of these areas. This research also suggested a cultural, uniquely Appalachian factor with regard to health status—one that transcends economic status (Lane, Lutz, & Baker, 2012).

THE APPALACHIAN REGION

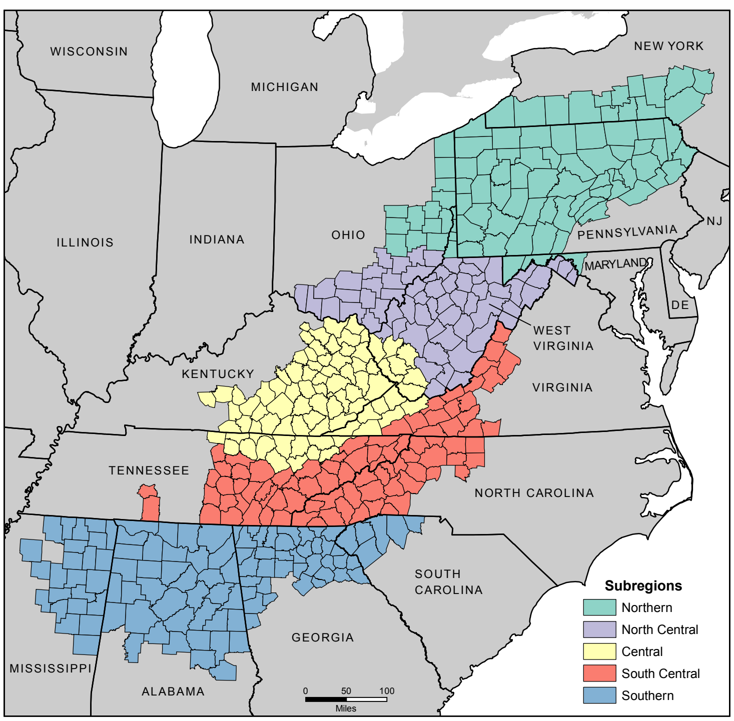
This report explores health disparities by geography and economic status across the Appalachian Region. Specifically, the report focuses on the difference between the Region and the United States as a whole; differences across Appalachian subregions; differences between the Appalachian and non-Appalachian portions of the states in the Region; differences based on rurality; and differences based on economic status. Exploring the data in different ways—such as using these various geographies—grants an additional lens to examine health in the Region.

Geographic Subregions

The current boundary of the Appalachian Region includes all of West Virginia and parts of 12 other states: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia. The Region is home to more than 25 million people and covers 420 counties and almost 205,000 square miles.

The Appalachian subregions are nearly contiguous regions of relatively similar characteristics (topography, demographics, and economics) within Appalachia (see Figure 3). Originally consisting of three subregions, ARC revised the classification system in 2009 and now divides the Region into five subregions. These smaller areas, the boundaries of which are based on recent economic and transportation data, allow for greater analytical detail.

Figure 3: Appalachian Subregions



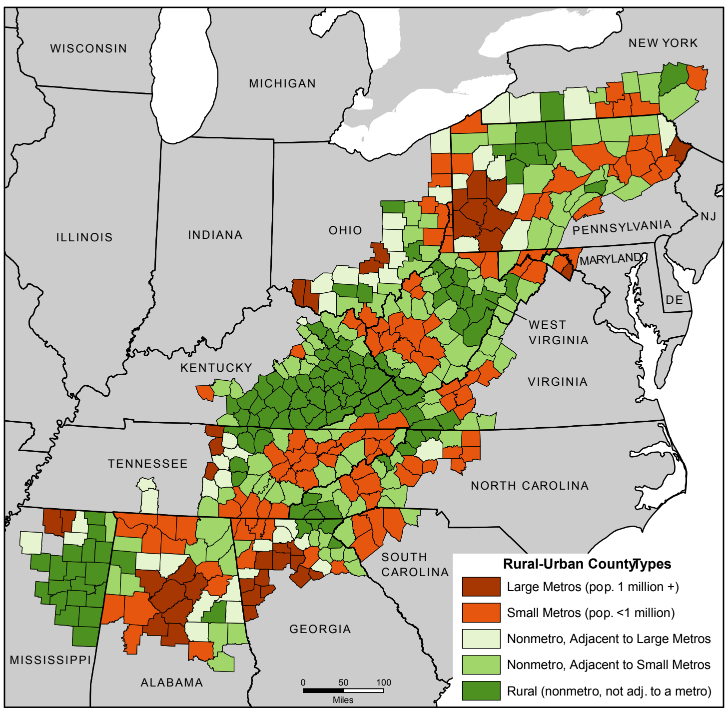
Source: Appalachian Regional Commission, Created November 2009

Rurality in Appalachia

ARC, in coordination with staff at USDA's Economic Research Service (ERS) developed a simplified version of the 2013 Urban Influence Codes (UIC) to distinguish metropolitan counties by population size of their metro area, and nonmetropolitan counties by the size of their largest city or town, as well as proximity to metro areas. ARC simplified the original 12-part county classification into five levels: large metropolitan area, small metropolitan area, non-metropolitan area adjacent to a large metropolitan area, non-metropolitan area adjacent to a small metropolitan area, and rural area. Figure 4 displays Appalachian counties by level of rurality.

Appalachia has 37 large metro counties, 115 small metro, 44 non-metro adjacent to large metro, 117 non-metro adjacent to small metro counties, and 107 rural counties.

Figure 4: Rurality by County in Appalachia



Source: USDA, Economic Research Service, 2013 Urban Influence Codes. Condensed by ARC. Figure created by ARC, October 2016.

County Economic Status in Appalachia

ARC also classifies counties based on economic status. The following information is based on ARC's report, "County Economic Status in Appalachia, FY 2017." Figure 5 shows Appalachian counties by economic status for fiscal year 2017.

The Appalachian Regional Commission uses an index-based county economic classification system to identify and monitor the economic status of Appalachian counties. The system involves the creation of a national index of county economic status through a comparison of each county's averages for three economic indicators—three-year average unemployment rate, per capita market income, and poverty rate—with national averages. The resulting values are summed and averaged to create a composite index value for each county. Each county in the nation receives a rank based on its composite index value, with higher values indicating higher levels of distress.

Each Appalachian county is classified into one of five economic status designations, based on its position in the national ranking.

Distressed
Distressed counties are the most economically depressed counties. They rank in the worst 10 percent of the nation's counties.

At-Risk
At-Risk counties are those at risk of becoming economically distressed. They rank between the worst 10 percent and 25 percent of the nation's counties.

Transitional
Transitional counties are those transitioning between strong and weak economies. They make up the largest economic status designation. Transitional counties rank between the worst 25 percent and the best 25 percent of the nation's counties.

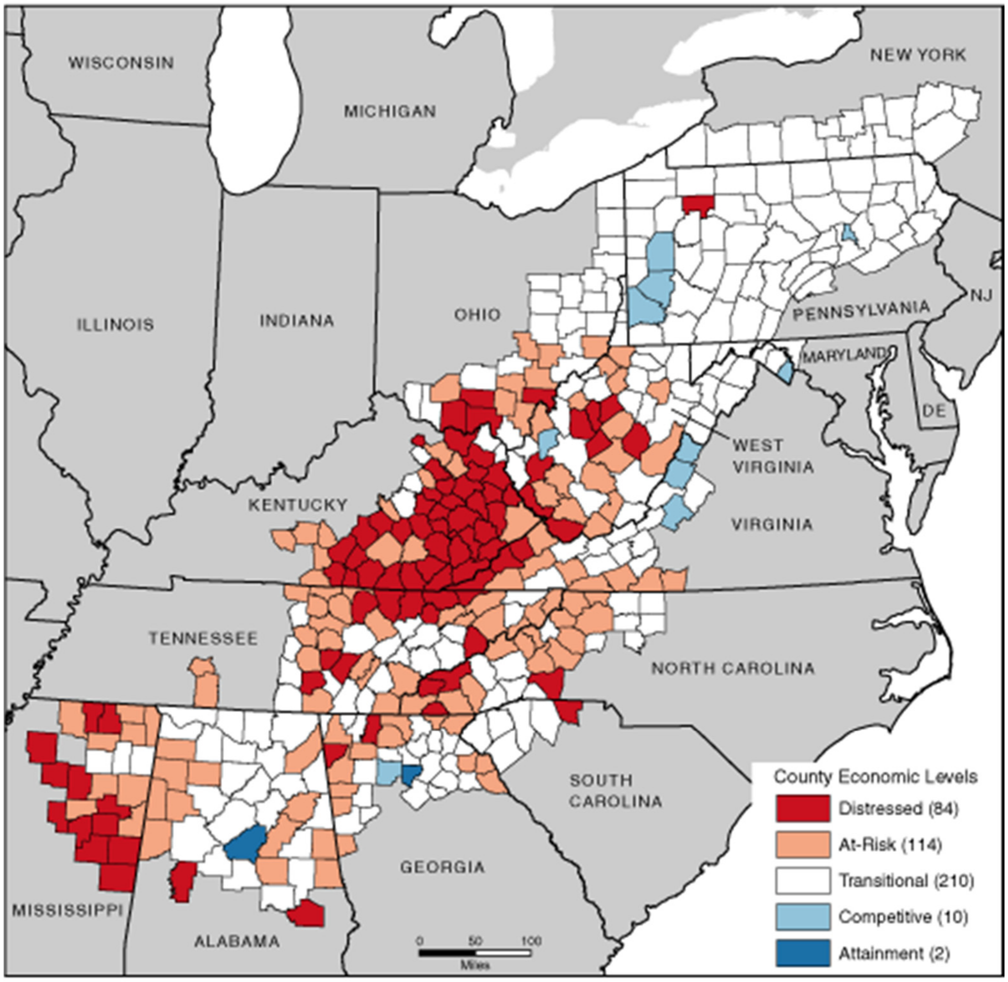
Competitive
Competitive counties are those that are able to compete in the national economy but are not in the highest 10 percent of the nation's counties. Counties ranking between the best 10 percent and 25 percent of the nation's counties are classified competitive.

Attainment
Attainment counties are the economically strongest counties. Counties ranking in the best 10 percent of the nation's counties are classified attainment.

A sixth category—Non-Distressed— is used throughout this report to separate counties in the Distressed category from the other categories:

Non-Distressed
This category includes all counties in the four classifications outside of the Distressed designation: At-Risk, Transitional, Competitive, and Attainment.

Figure 5: County Economic Status in Appalachia, FY 2017



Created by the Appalachian Regional Commission, March 2016
Data Sources:
Unemployment data: U.S. Bureau of Labor Statistics, LAUS, 2012–2014
Income data: U.S. Bureau of Economic Analysis, REIS, 2014
Poverty data: U.S. Census Bureau, American Community Survey, 2010–2014

Effective October 1, 2016
through September 30, 2017

VISUALIZATION OF THE HEALTH MEASURES: QUINTILES, THEMATIC MAPS, AND BOX PLOTS

For the 41 indicators, this report uses the values for the national quintiles for each measure and classifies each Appalachian county into one of these five groups. In addition to maps displaying the county-level values for the Appalachian Region and the United States, each indicator has accompanying charts and graphs displaying data for: the Region compared both to the U.S. as a whole and to the non-Appalachian portion of the country; the Appalachian subregions; Appalachian levels of rurality; and Appalachian economic status levels. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Although national quintiles provide a first look at how Appalachia is doing when compared to *the nation as a whole*, providing data for *the rest of the nation* as well as by subregion, level of rurality, and economic status grants an additional comparative viewpoint to examine health throughout the Region.

Quintiles

The data in this report are broken down by national quintiles, which are groups of data points that have been divided into five equal parts consisting of approximately the same number of counties in each. The quintiles are calculated from national datasets and are thus based on the national distributions for each measure. The first quintile represents data points in the 20th percentile and below, the second quintile represents data points between the 20th and 40th percentiles, and so on. If the Appalachian Region's distribution matched the national distribution, each Appalachian quintile would contain 84 counties (20 percent of the total counties in Appalachia). Organizing the data into quintiles provides insight into how county-level outcomes are distributed throughout the Region, and can also help answer the question as to whether outcomes in the Appalachian Region are proportional to the outcomes in the nation as a whole.

Table 13 shows the distribution of cancer mortality rates for Appalachian counties among national quintiles. Of the 420 counties in the Appalachian Region, 158 counties (38 percent) have cancer mortality rates in the worst-performing national quintile, while only 29 counties in the Region (7 percent) are in the best-performing national quintile. If the Appalachian distribution matched the nation's, there would be 84 counties (20 percent) in each quintile. This distribution shows that cancer mortality rates are disproportionately higher (worse) throughout the Appalachian Region when compared to the nation as a whole.

Table 13: Distribution of Cancer Mortality Rates per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Cancer deaths	29	*7%*	49	*12%*	83	*20%*	101	*24%*	158	*38%*

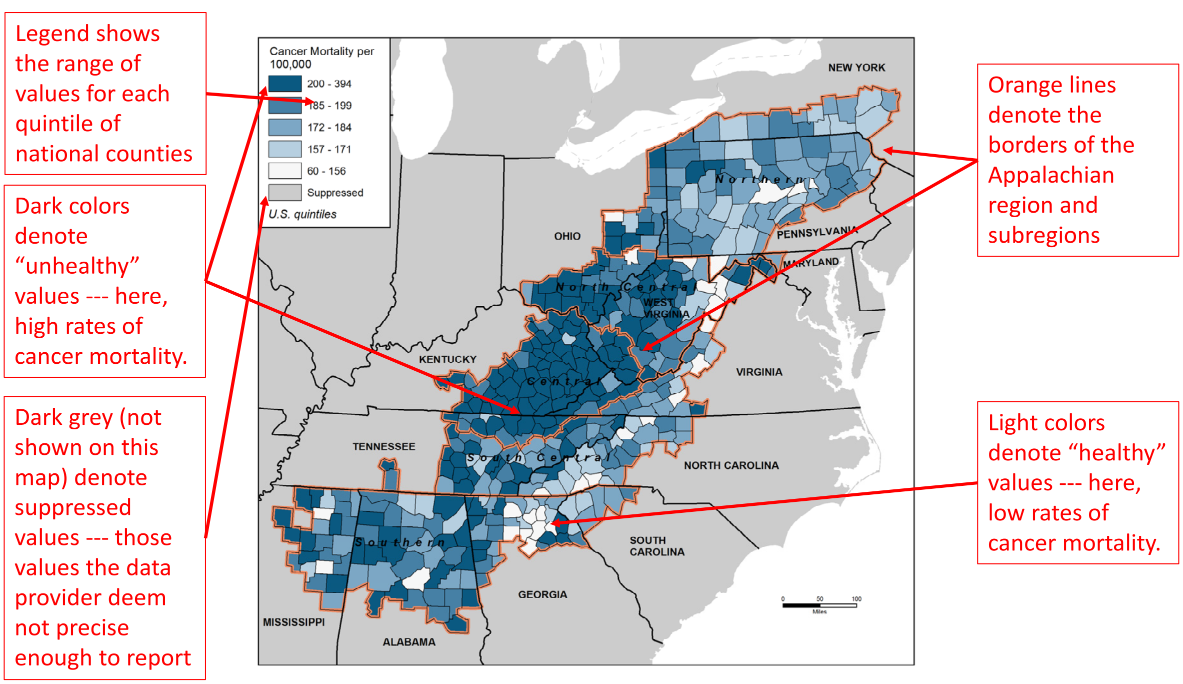
Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

Thematic Maps

This report contains two maps for each indicator—one for the Appalachian Region and another for the entire United States, with the Region highlighted in orange. Each map color codes all counties into five national quintiles, each containing 20 percent of the nation's counties. Throughout the report, darker colors represent less desirable results (i.e., results associated with worse health). For example, in the maps showing cancer mortality, the darkest blue counties have the highest cancer mortality rates and rank in the worst-performing national quintile while the lightest counties have the lowest cancer mortality rates and rank in the best-performing national quintile. It is important to note that the five groupings in the Appalachian maps are based on these national quintiles. That is, there are an equal number of counties with each color in the national map.[2] Because the regional map is also based on national quintiles, unless the Appalachian distribution matches the national distribution, the Region will almost always have more of some colors than of others.

Figure 6 presents a map of cancer mortality rates per 100,000 population in the Appalachian Region. The upper left of the figure shows the legend containing the national quintile ranges. The worst-performing quintile is the darkest shade of blue, and has values ranging from 200 to 394 deaths per 100,000 population. A review of the Appalachian map shows that counties in the Central and North Central subregions (Appalachian Kentucky, Appalachian Ohio, and southeastern West Virginia) have a large number of dark-colored counties, indicating that a high number of counties in this subregion have cancer mortality rates among the worst-performing quintile in the country (highest 20 percent). In contrast, many counties in northern Georgia have the lightest color, indicating a number of counties in the best-performing national quintile (the lowest 20 percent of values nationally).

Figure 6: Explanation of Thematic Maps

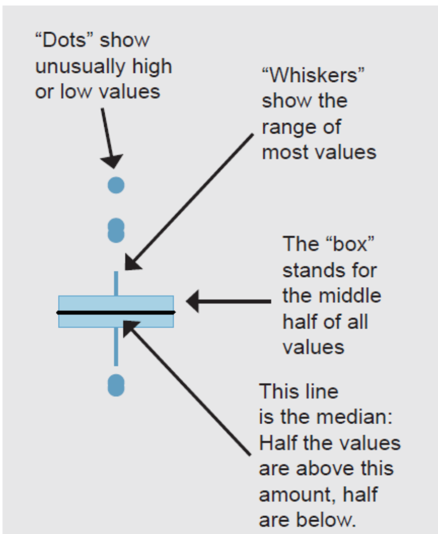


[2] Technically, the number may vary by one between groups. For example, there are 3113 counties analyzed, which does not divide equally into groups of five, meaning for indicators with complete data, three groups will have 623 and two will have 622.

Box Plots

A box plot is a type of graph that shows the distribution of data. Comparing box plots among different groups shows how the median of each group compares to the other groups, how much variation exists within each group, and how the variation compares between the groups. In this report, box plots for each measure compare the national average to the medians for: the Appalachian Region and the non-Appalachian U.S.; each Appalachian subregion; and distressed and non-distressed Appalachian counties. The diagram below illustrates the elements of "boxes" and "whiskers."

Figure 7: How to Read a Box Plot



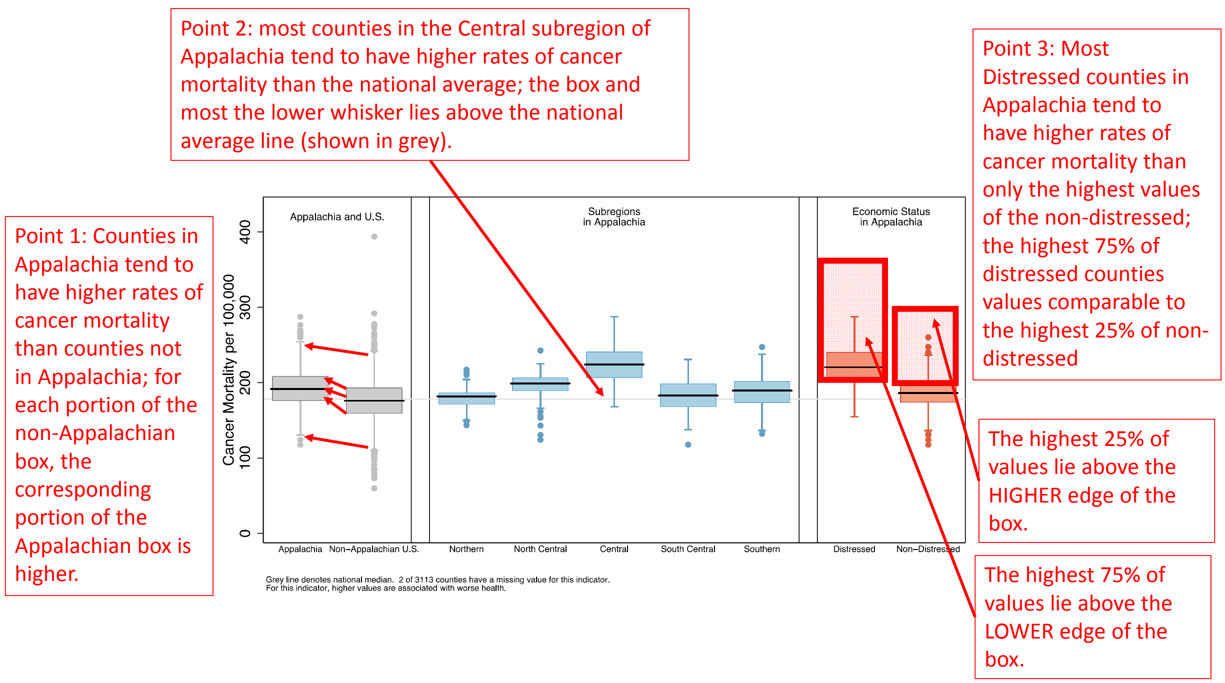
The edges of the whiskers and the black line represent specific statistics calculated from the data. For example, the black line denotes the median (half of values are greater than this value, half are less than this value). The lower and upper edges of the box represent the 25th and 75th percentiles, respectively. The 25th percentile is the value for which 25 percent of county values are less, and the remainder (75 percent) are greater. The 75th percentile is defined similarly. The caps of the whiskers are defined as "adjacent values" (Tukey, 1977). The upper adjacent value ("top whisker") is the largest observed value that is less than or equal to the 75th percentile plus 3/2 of the difference between the 75th and 25th percentile. The lower adjacent value is defined similarly. Outside values —the dots described as "unusually high or low values"—are those values that lie outside the adjacent values.

The Cancer Mortality example in Figure 8 is annotated with three takeaways that one can learn from the box plot. The horizontal grey line is the national average and the horizontal black line in the middle of each box is the median for the group. The first two plots compare cancer mortality rates in both the Appalachian Region and the non-Appalachian U.S. to the national average. The first takeaway is that cancer mortality among counties in the Appalachian Region is generally higher than counties in the non-Appalachian U.S. (Point 1). This is seen by comparing the corresponding portion of the box plot between the two grey boxes. The box on the left represents counties in Appalachia; the box on the right denotes counties not in Appalachia. For each portion of the non-Appalachian box, the corresponding portion of the Appalachia box is "higher."

The blue boxes denote the distribution of Appalachian counties by geographic subregion. Here, we see that most of the counties in the Central subregion (middle box) exceed the national average (Point 2). This is evident by reviewing the box—the entire box and most of the lower "whisker" lies above the line. This means that at least 75 percent (the lower edge of the box) of counties in the Central subregion exceed the national average, and most of the remainder do as well (only a little of the whisker extends below the national average).

The orange boxes on the far right of the plot show the distribution of values for Appalachian counties that are economically distressed versus those that are not distressed. Here, we see that the 75 percent highest values of the economically distressed have values comparable to the highest 25 percent of the non-distressed (Point 3). That is, the lower edge of the box of Distressed is roughly equal to the value of the upper edge of Non-distressed. The difference between these two distributions is larger than the difference between the Appalachian and non-Appalachian values (grey boxes at far left, where the "upward shift" is small relative to the "upward shift" seen in the orange boxes.)

Figure 8: Box Plot of Cancer Mortality Rates by Geography and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015.

Domains

Mortality

Morbidity

Behavioral Health

Child Health

Community Characteristics

Lifestyle

Health Care Systems

Quality of Care

Social Determinants

Mortality

Heart Disease Deaths

KEY FINDINGS | Heart Disease Mortality Rates

- The Appalachian Region's heart disease mortality rate is 17 percent higher than the national rate.
- The regional average masks very high rates within parts of Appalachia. For example, in Central Appalachia, the heart disease mortality rate is 42 percent higher than the national rate, and 80 of the subregion's 82 counties have heart disease mortality rates higher than the national rate.
- The heart disease mortality rate for the Appalachian Region's rural counties is 27 percent higher than the rate for the Region's large metro counties.
- The heart disease mortality rate for the Appalachian Region's distressed counties is 29 percent higher than the rate for the Region's non-distressed counties.

Background

The heart disease mortality rate is the number of deaths from all forms of heart disease per 100,000 population, per year. The data for this measure come from the Compressed Mortality File provided by the National Center for Health Statistics. The data have been age-adjusted and cover the 2008–2014 period. Coronary artery disease—the most common form of heart disease in the United States—is the main cause of heart attacks. There are many forms of heart disease, including rheumatic fever, hypertensive heart and renal disease, acute myocardial infarction, ischemic heart disease, angina pectoris, old myocardial infarction, and endocardium. Heart disease is the leading cause of death for adults in the United States, accounting for 25 percent of all deaths (Centers for Disease Control and Prevention, Heart Disease Facts, 2016).

Risk factors for heart disease include a number of behaviors or conditions profiled elsewhere in this report, including smoking, obesity, diabetes, excessive alcohol use, and physical inactivity. Other conditions such as hypertension and stress also increase risk (Centers for Disease Control and Prevention, Heart Disease Facts, 2016). Treatments and management of heart disease include medications such as statins and beta-blockers, as well as lifestyle adjustments such as smoking cessation, improved diet, and increased physical activity.

Although it is the leading cause of death in the United States, heart disease mortality declined by 40 percent nationwide between 1999 and 2009 (Kulshreshtha, Abhinav, Dabhadkar, Veledar, & Vaccarino, 2014). However, this long-term national decrease masks only minor improvements in rural areas and among the African-American population.

Overview: Heart Disease Mortality in the Appalachian Region

The heart disease mortality rate in the Appalachian Region is 204 per 100,000 population, which is 17 percent higher than the national rate of 175 per 100,000 population. All five subregions in Appalachia have heart disease mortality rates higher than the national rate. The Central Appalachian rate of 249 per 100,000 population is nearly 1.5 times higher than the national rate, and all but 2 of the 82 counties in Central Appalachia have heart disease mortality rates higher than the national rate. South Central Appalachia has the lowest rate among subregions, but its rate is still 10 percent higher than the national rate.

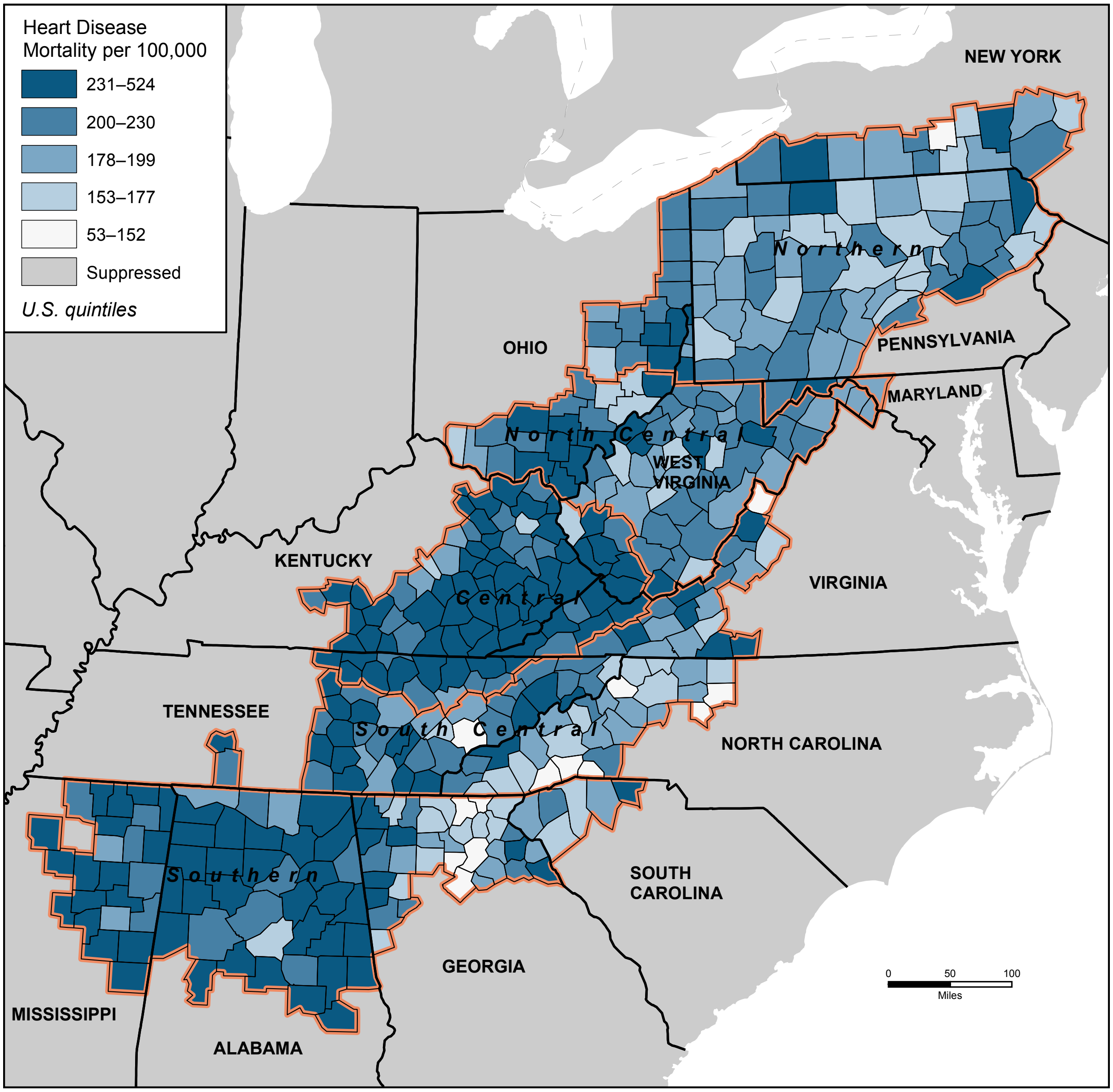
Rural areas in Appalachia experience higher heart disease mortality rates than more urbanized areas in the Region. The heart disease mortality rate for rural Appalachian counties is 234 per 100,000 population, which is 27 percent higher than the rate of 184 per 100,000 for the Region's large metro counties, and 34 percent higher than the national rate. Economic status also plays a role, as economically distressed communities have a heart disease mortality rate of 258 per 100,000 population, which is 29 percent higher than the Region's non-distressed county rate of 200 per 100,000, and 47 percent higher than the nation as a whole.

The Appalachian portions of Kentucky, Maryland, Ohio, Pennsylvania, and Virginia have notably higher rates than the non-Appalachian portions of those states. With the exceptions of Appalachian Georgia and Appalachian North Carolina, the Appalachian portions of all states are at or above the national heart disease mortality rate.

Figure 9 shows heart disease mortality rates for Appalachian counties, grouped by national quintiles. Darker colors indicate higher heart disease mortality rates while lighter colors indicate lower mortality rates. Although there are many areas of the Region with heart disease mortality rates in the worst-performing national quintile, a number of areas—including some in Appalachian Georgia and Appalachian North Carolina—have counties in the best-performing quintile.

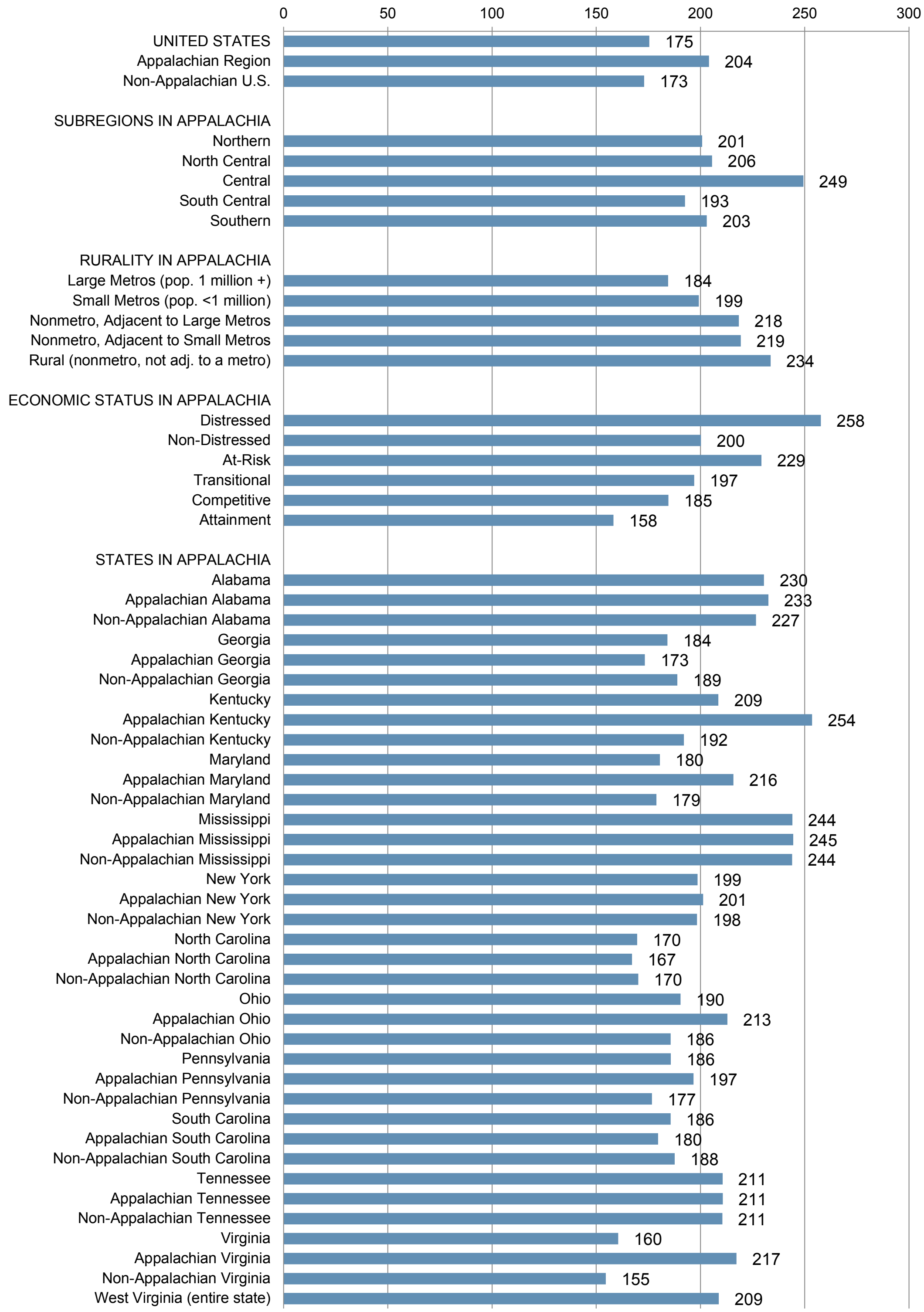
Figure 10 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 9: Map of Heart Disease Mortality Rates per 100,000 Population in the Appalachian Region, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Figure 10: Chart of Heart Disease Mortality Rates per 100,000 Population, 2008–2014

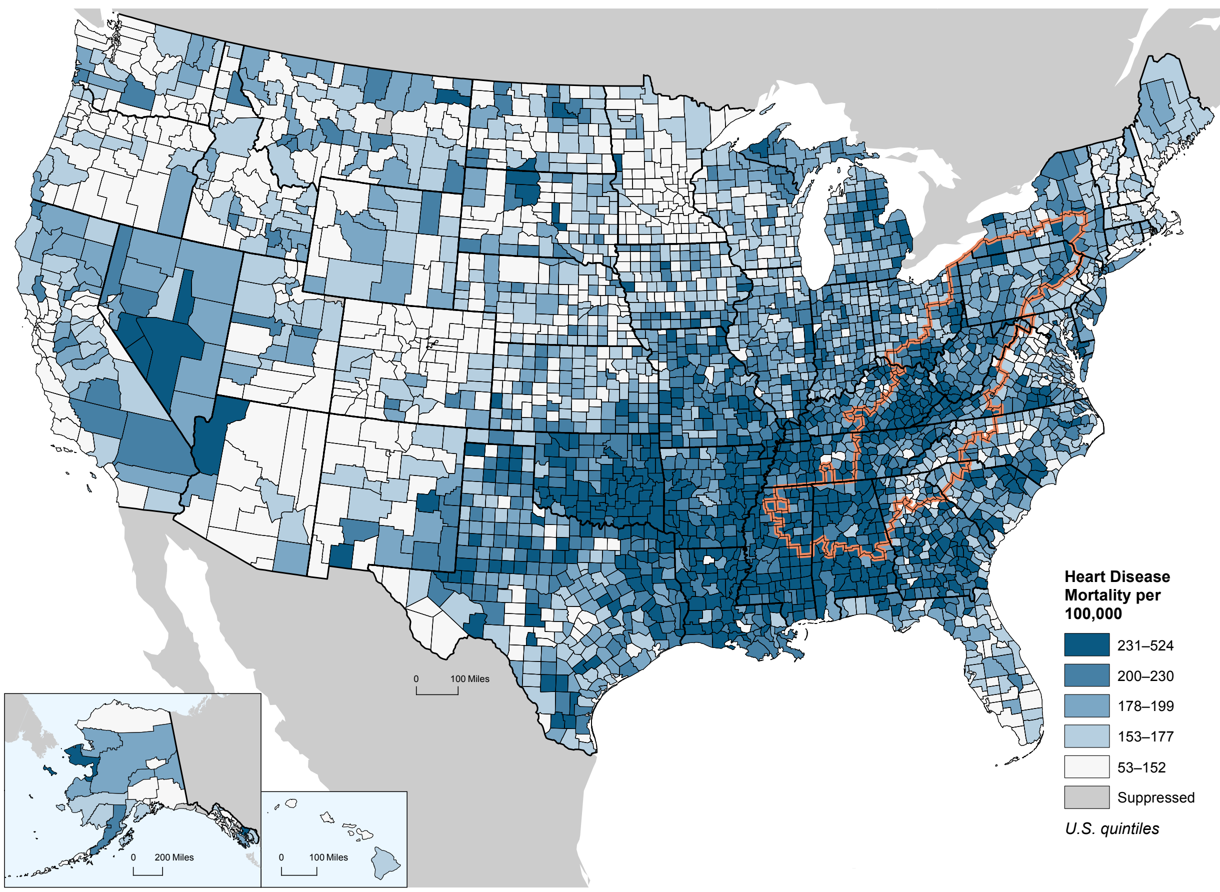


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Overview: Heart Disease Mortality in the United States

Figure 11 displays the variation in heart disease mortality rates across the United States. The elevated heart disease mortality rates of the Appalachian Region are comparable to the high rates found throughout the Deep South. A large cluster of elevated heart disease mortality rates occurs in Arkansas, Missouri, and western Tennessee, and this continues south and west into Louisiana and the Red River Valley of Oklahoma and Texas. Northern Michigan and Wisconsin have higher rates, as does South Dakota, but other areas of the Upper Midwest, such as southern Minnesota, tend to have lower rates. Arizona, Colorado, and New Mexico show lower mortality from heart disease, but other Western states, including Montana and Wyoming, are mixed. The lowest heart disease mortality rates tend to occur in the Southwest, Upper Midwest, and parts of the Pacific Northwest.

Figure 11: Map of Heart Disease Mortality Rates per 100,000 Population in the United States, 2008–2014

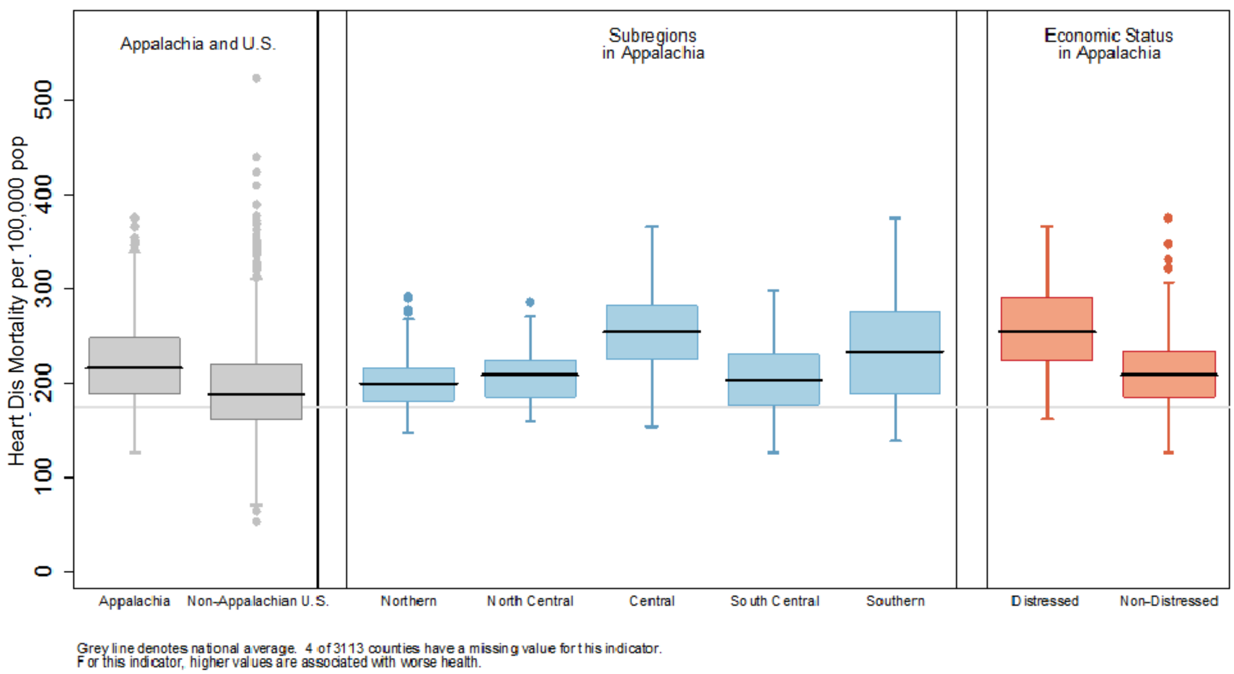


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Distribution of Heart Disease Mortality Rates

Figure 12 shows the distribution of heart disease mortality rates by geography and economic status. The horizontal grey line is the national average and the horizontal black line in the middle of each box is the median for the group. The shaded boxes show the middle half of all values; dots represent unusually high or low values. Of all 3,113 counties in the nation, four have a missing value for this indicator. For this measure, higher values are associated with worse health.

Figure 12: Box Plot of Heart Disease Mortality Rates per 100,000 Population by Geography and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The distribution of heart disease mortality rates among national quintiles for Appalachian counties is shown in Table 14. Of the 420 counties in the Region, 158 (38 percent) rank in the worst-performing national quintile, while only 15 (4 percent) rank in the best-performing national quintile.

Table 14: Distribution of Heart Disease Mortality Rates per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Heart disease deaths	15	*4%*	56	*13%*	76	*18%*	115	*27%*	158	*38%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Cancer Mortality Rates

- The Appalachian Region's cancer mortality rate is 10 percent higher than the national rate.
- In 85 percent of Appalachian counties, cancer mortality rates are higher than the national average. In Central Appalachia, 81 of the subregion's 82 counties have cancer mortality rates higher than the national rate.
- The cancer mortality rate for the Appalachian Region's rural counties is 15 percent higher than for the Region's large metro counties.
- The cancer mortality rate for the Region's distressed counties is 20 percent higher than the rate for the Region's non-distressed counties.

Background

The cancer mortality rate is the number of deaths with malignant neoplasm (cancer) as the underlying cause per 100,000 population, per year. The data for this measure come from the Compressed Mortality File provided by the National Center for Health Statistics. The data have been age-adjusted and cover the 2008–2014 period. Cancer is the second-leading cause of death in the United States and it is predicted to be the top cause by 2020 (Weir, 2016).

Although not all cancers can be prevented, the risk of getting cancer can be reduced by making healthy lifestyle choices, including: avoiding smoking and exposure to secondhand smoke, protecting skin from ultraviolet rays, limiting alcohol consumption, and maintaining a healthy bodyweight (Centers for Disease Control and Prevention, Cancer Prevention, Healthy Choices, 2016). Additionally, CDC recommends screenings for breast, cervical, colorectal, and lung cancers, since early detection allows for earlier treatment and better chances of survival (Centers for Disease Control and Prevention, How to Prevent Cancer or Find it Early, 2016).

Despite the decline in cancer mortality rates in the United States over the past 25 years, nearly two-fifths of men and women in the country will receive some form of cancer diagnosis in their lifetimes (National Cancer Institute, 2016). The declines in cancer mortality have occurred alongside decreases in smoking rates and increases in early detection and treatment (Siegel, Miller, & Jemal, 2017) The cancer mortality rate is likely to be higher in areas where detection occurs at later stages, where people have more exposure to risk factors—whether behavioral or environmental—and where people have limited access to screening and treatment. Early detection and treatment are keys to survival.

Overview: Cancer Mortality in the Appalachian Region

The national cancer mortality rate is 168 per 100,000 population and has been declining since 1991, when the rate was 215 per 100,000 population. The Appalachian Region has a cancer mortality rate of 184 per 100,000 population, which is 10 percent higher than the national rate. Central Appalachia has the highest rate at 222 per 100,000, which is 32 percent higher than the national rate. However, even Southern Appalachia, which has the lowest rate at 177 per 100,000, is still five percent higher than the nation as a whole.

There is a noticeable urban-rural trend in cancer mortality in the Region. The cancer mortality rate in rural Appalachian counties is 202 per 100,000 population, approximately 15 percent higher than the large metro county rate of 175 per 100,000, and 20 percent higher than the national rate. There is also a marked difference between distressed and non-distressed counties: the cancer mortality rate in distressed counties in the Appalachian Region is 218 per 100,000 population, which is 20 percent higher than the non-distressed county mortality rate of 182 per 100,000, and 30 percent higher than the national rate.

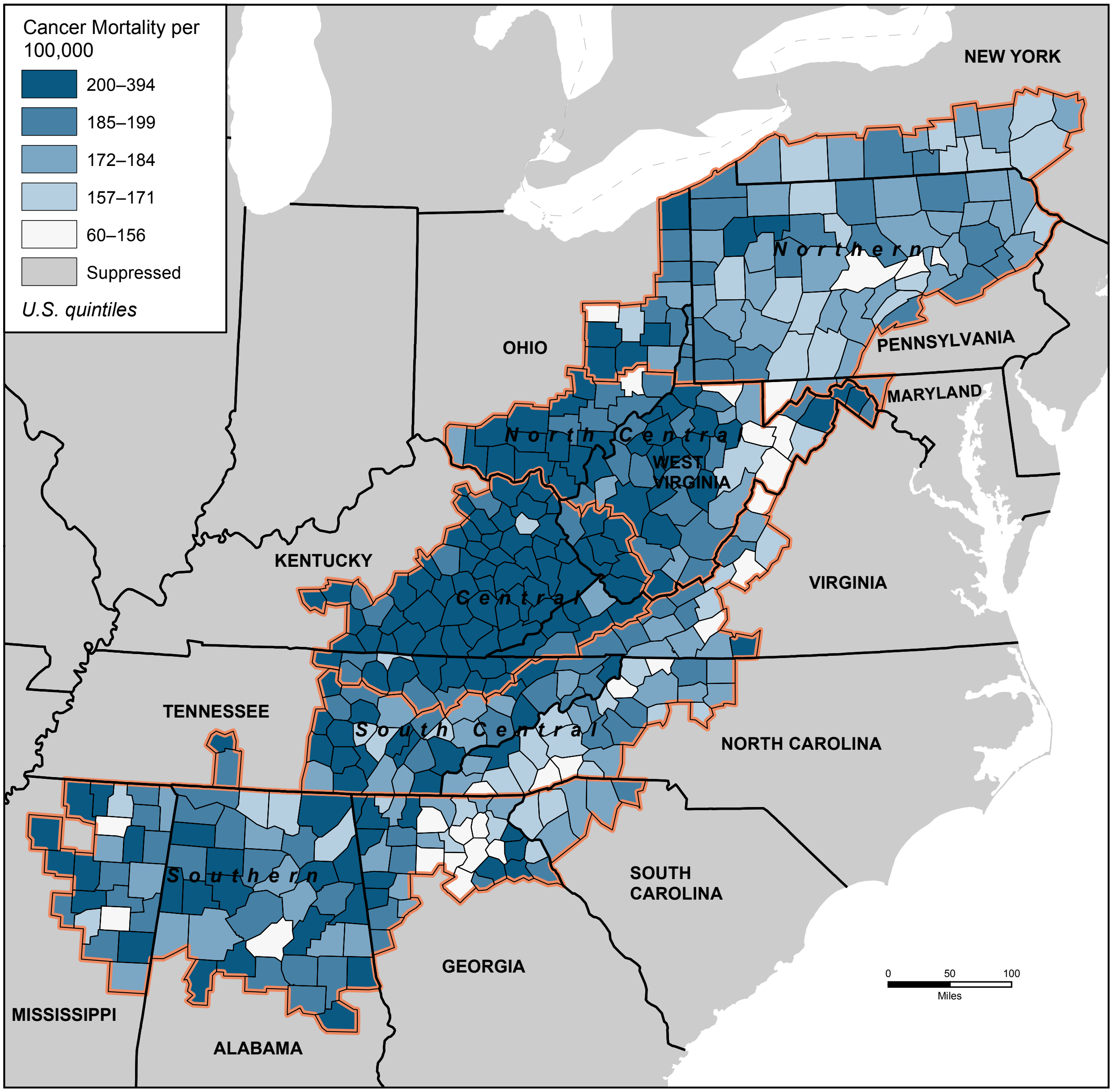
Kentucky, Mississippi, Tennessee, and West Virginia have the highest state-level cancer mortality rates in the Region. The rates in the Appalachian portions of those states all exceed 190 per 100,000, and are well above the national average of 168 per 100,000. Appalachian Kentucky's rate of 227 per 100,000 exceeds the national average by 35 percent. The cancer mortality rates in nearly 20 percent of counties in the Region are currently higher than 215 per 100,000 population, the national rate back in 1991.

Although state-level cancer mortality rates in Maryland, New York, and Virginia are all close to the national rate, the Appalachian counties in each of those states have higher rates than the non-Appalachian counties. Among the Appalachian portions of states in the Region, only Georgia, with a cancer mortality rate of 166 per 100,000 population, is lower than the national rate.

Figure 13 shows the cancer mortality rates for Appalachian counties, grouped by national quintiles. Darker colors indicate higher mortality rates while lighter colors indicate lower mortality rates. Higher cancer mortality rates are heavily concentrated in the Central and North Central subregions, although there are several pockets of counties ranking in the best-performing national quintile throughout the Region.

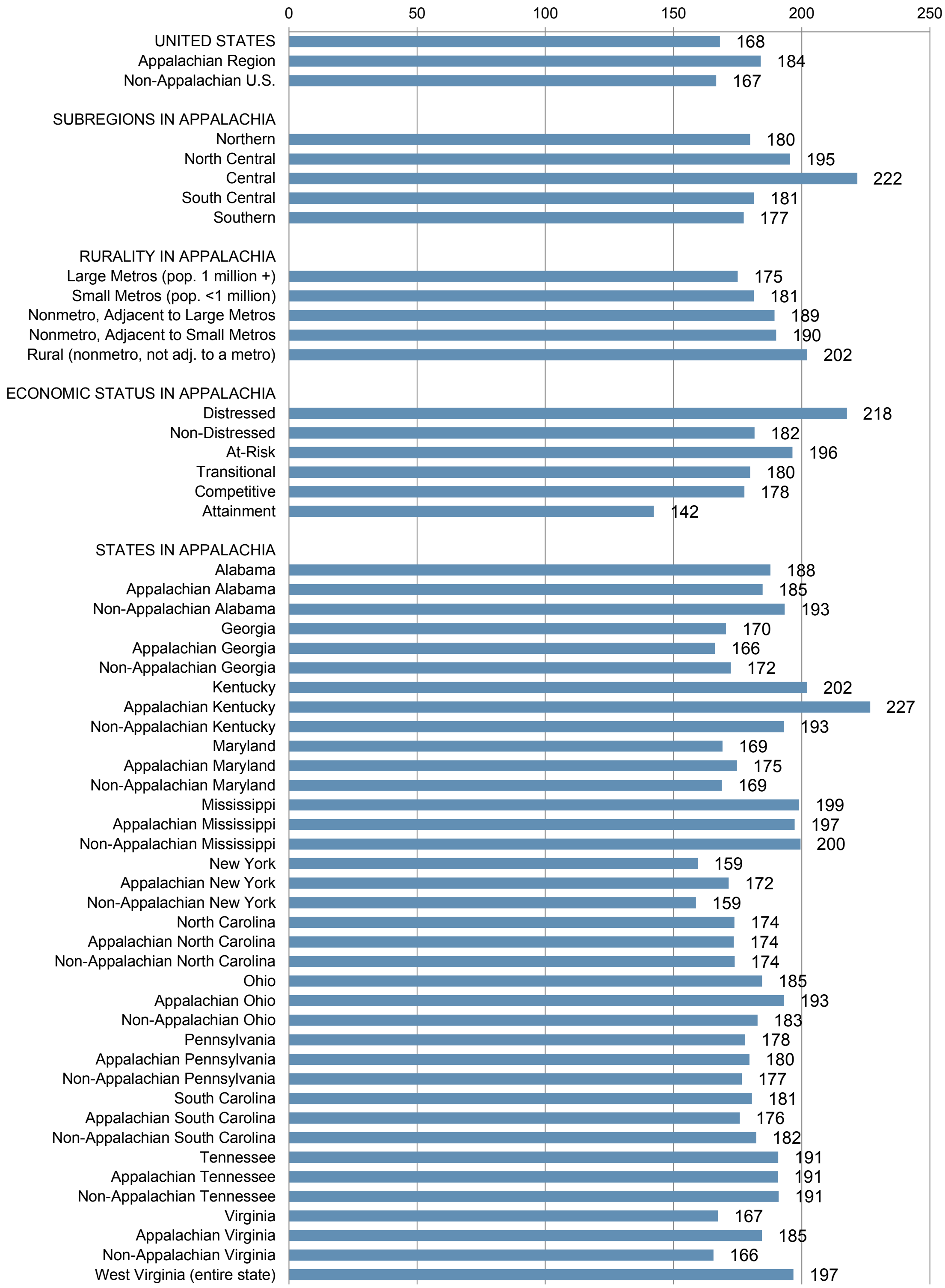
Figure 14 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 13: Map of Cancer Mortality Rates per 100,000 Population in the Appalachian Region, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Figure 14: Chart of Cancer Mortality Rates per 100,000 Population, 2008–2014

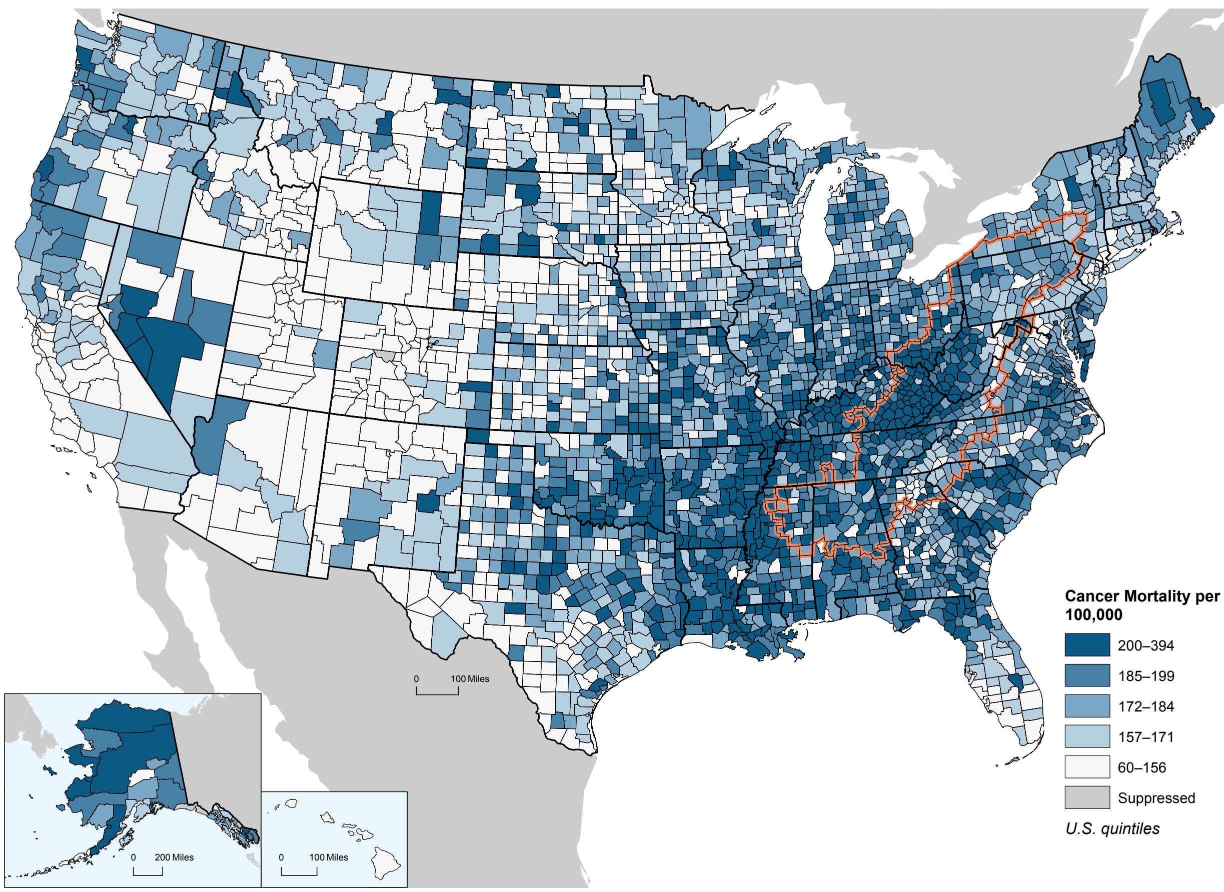


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Overview: Cancer Mortality in the United States

Figure 15 shows the variation in cancer mortality rates throughout the United States. The pattern of high cancer mortality rates extends west from Central Appalachia through western Tennessee and Kentucky, throughout the Southeast and Mississippi Delta Region (i.e., Arkansas, Mississippi, and Louisiana), and into Oklahoma and Texas. The Upper Midwest, most of the Mountain West, and much of the Southwest generally have lower rates of cancer mortality. Coastal and central California also generally exhibit low rates of cancer mortality, while the northern Pacific coast tends to have slightly higher rates. Counties in southern Florida tend to have slightly lower rates.

Figure 15: Map of Cancer Mortality Rates per 100,000 Population in the United States, 2008–2014

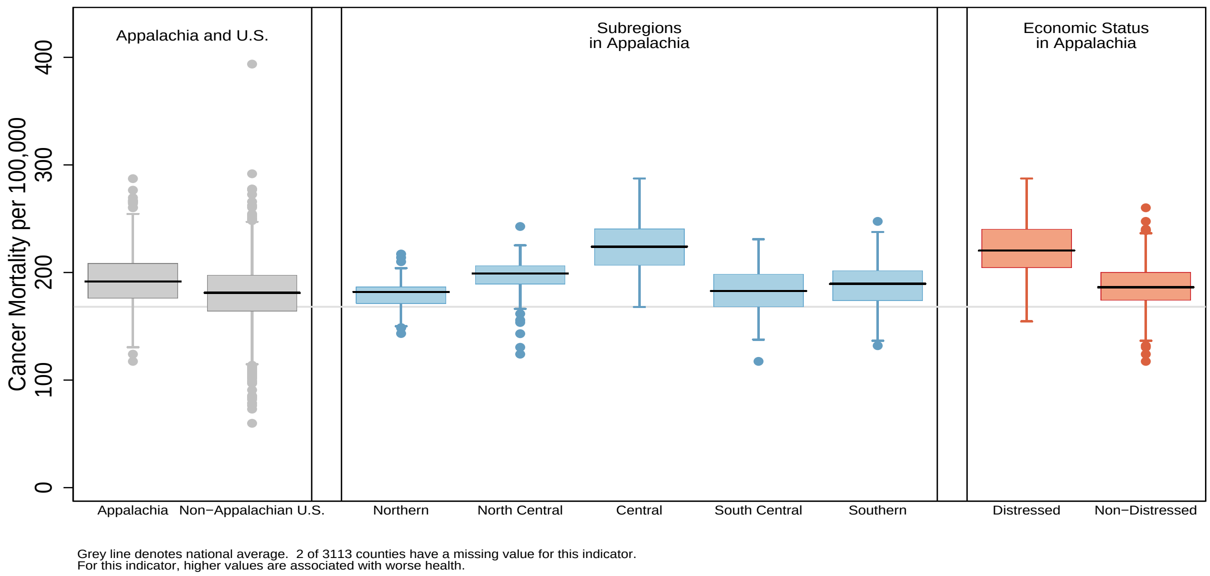


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Distribution of Cancer Mortality Rates

Figure 16 shows the distribution of cancer mortality rates by geography and economic status. The horizontal grey line is the national average and the horizontal black line in the middle of each box is the median for the group. The shaded boxes show the middle half of all values; dots represent unusually high or low values. Of all 3,113 counties in the nation, two have a missing value for this measure. For this indicator, higher values are associated with worse health.

Figure 16: Box Plot of Cancer Mortality Rates per 100,000 Population by Geography and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The distribution of cancer mortality rates among national quintiles for Appalachian counties is shown in Table 15. Of the 420 counties in the Region, 158 (38 percent) rank in the worst-performing national quintile, while 29 (7 percent) rank in the best-performing national quintile.

Table 15: Distribution of Cancer Mortality Rates per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Cancer deaths	29	*7%*	49	*12%*	83	*20%*	101	*24%*	158	*38%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Chronic Obstructive Pulmonary Disease Mortality Rates

- The Appalachian Region's Chronic Obstructive Pulmonary Disease (COPD) mortality rate is 27 percent higher than the national rate.
- All five subregions in Appalachia have COPD mortality rates higher than the national rate. Northern Appalachia is the best-performing subregion, although the rate there is still eight percent higher than the national average.
- The COPD mortality rate for the Appalachian Region's rural counties is 55 percent higher than the rate for the Region's large metro counties.
- The COPD mortality rate for the Appalachian Region's economically distressed counties is 43 percent higher than the rate for the Region's non-distressed counties.

Background

The Chronic Obstructive Pulmonary Disease (COPD) mortality rate is the number of deaths with COPD as the primary cause, per 100,000 population, per year. The data for this measure come from the Compressed Mortality File provided by the National Center for Health Statistics. The data have been age-adjusted and cover the 2008–2014 period. COPD is a broad term for conditions that cause breathing problems and affect the respiratory system, and includes conditions such as chronic bronchitis and emphysema. COPD is the third-leading cause of death in the United States (Centers for Disease Control and Prevention, Chronic Obstructive Pulmonary Disease (COPD), 2016).

Smoking—discussed in the Lifestyle domain of this report— is the most significant risk factor for COPD, and areas with higher rates of smoking tend to have higher mortality rates from COPD (Centers for Disease Control and Prevention, Chronic Obstructive Pulmonary Disease (COPD), 2016). Other risk factors for COPD include environmental conditions (e.g., air quality), genetic factors, and respiratory infections (Centers for Disease Control and Prevention, Chronic Obstructive Pulmonary Disease (COPD), 2016). A number of recent studies have explored the relationship between respiratory diseases and coal mine dust. A 2011 study showed that cumulative lifetime exposure to coal mine dust increased the risk of death from COPD (Santo Tomas, 2011). Likewise, another study found that coal mine dust caused a number of lung and respiratory diseases, including COPD (Laney & Weissman, 2014), while a 2009 study found that the cumulative exposure to coal mine dust was a significant predictor of emphysema, even after for controlling for other factors such as age, race, and cigarette smoking (Kuempel, Wheeler, Smith, Vallyathan, & Green, 2009).

There are a number of complications related to COPD, including: difficulty performing physical activities; inability to work; the need for specialized equipment such as oxygen tanks; a high number of emergency room visits and hospital stays; and other chronic diseases such as arthritis, congestive heart failure, diabetes, coronary heart disease, stroke, asthma, and even depression. Seasonal flu can lead to serious complications among persons with COPD, although immunizations can be highly effective in preventing acute respiratory illness (Criner, Bourbeau, & Diekemper, 2015).

According to CDC, effective treatment for COPD can alleviate symptoms, decrease both the frequency and severity of complications, and increase exercise tolerance. Smoking cessation is the most critical aspect of treatment for those who smoke. Removal of the irritant, whether it be tobacco smoke or another air pollutant, is also important. Other treatments include pulmonary rehabilitation, medication, and administration of supplemental oxygen (Centers for Disease Control and Prevention, Chronic Obstructive Pulmonary Disease (COPD), 2016). One factor inhibiting effective management of the condition is that many people, including more than half of those with low respiratory function, are not aware that they have COPD (Centers for Disease Control and Prevention, Chronic Obstructive Pulmonary Disease (COPD), 2016). Consequently, the U.S. Preventive Services Task Force recommends screening for COPD even among adults who show no signs of the disease (U.S. Preventive Services Task Force, 2016). Identification of the condition typically depends on the individual experiencing symptoms seeking a medical diagnosis.

Overview: COPD Mortality in the Appalachian Region

The Appalachian Region's COPD mortality rate is 53.5 per 100,000 population, which is 27 percent higher than the national rate of 42.0 per 100,000. All five subregions have higher COPD mortality rates than the nation as a whole. The Central Appalachian rate of 78.1 per 100,000 is 86 percent higher than the national rate. The Northern subregion, with a rate of 45.5 per 100,000, is the best-performing among the Appalachian subregions, although the rate there is still 8 percent higher than the national rate.

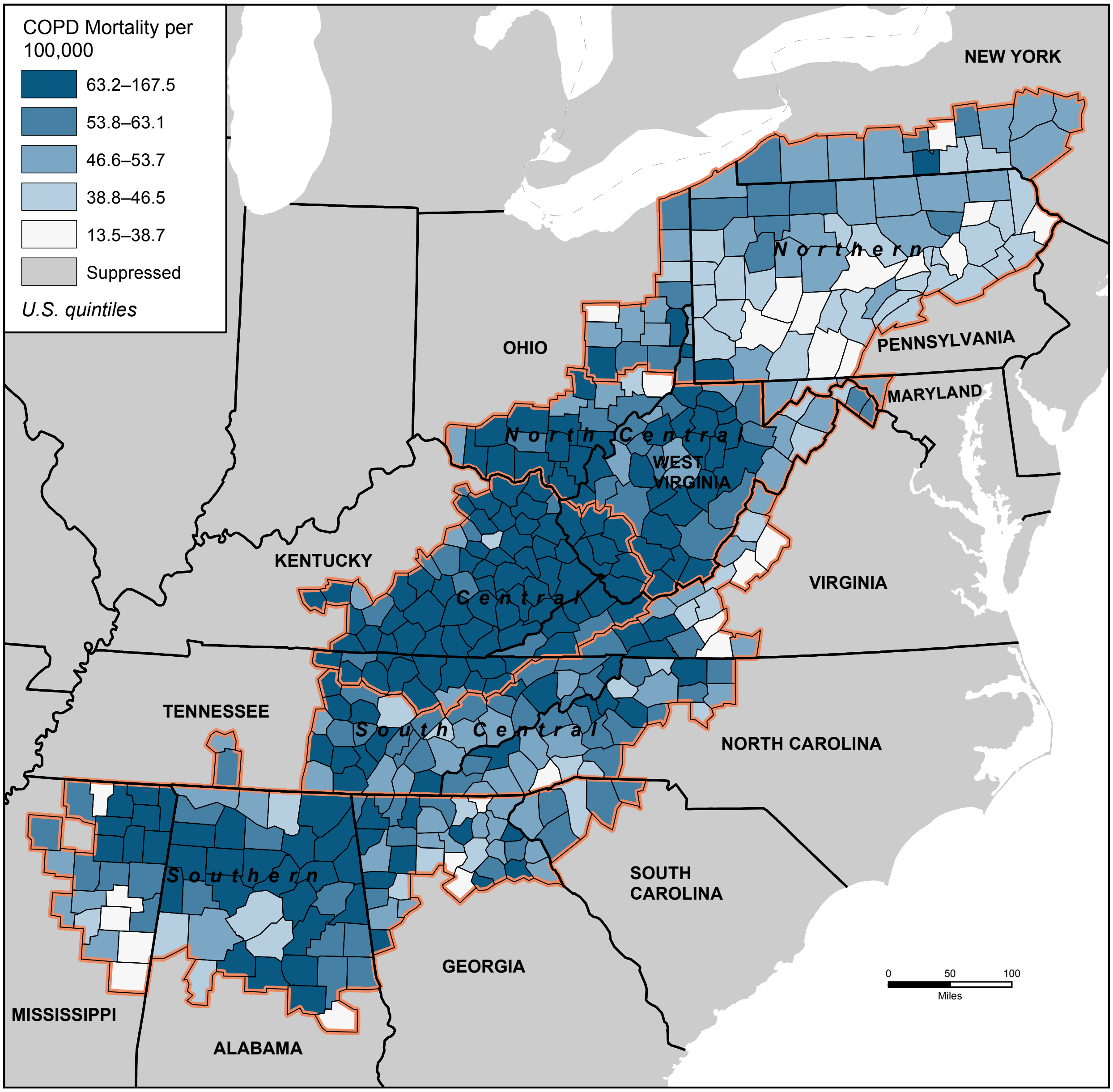
Areas throughout Appalachia that are more rural experience higher COPD mortality rates than more urbanized areas. The COPD mortality rate for the Appalachian Region's rural counties is 68.9 per 100,000 population, which is 55 percent higher than the large metro county rate of 44.5 per 100,000. Economic status also plays a role; economically distressed counties have a COPD mortality rate of 74.6 per 100,000 population, which is 43 percent higher than the rate for non-distressed counties and 78 percent higher than the national rate.

COPD mortality rates are higher in the Appalachian portions of each state than in the non-Appalachian portions. The non-Appalachian portions of Maryland, New York, Pennsylvania, and Virginia have rates better than the national rate. In Appalachian Kentucky, the COPD mortality rate is almost double the national rate and in West Virginia, the rate is 1.5 times the national rate. Only Appalachian Pennsylvania, with a COPD mortality rate of 42.9 per 100,000 population, comes close to the national rate.

Figure 17 shows the COPD mortality rates for Appalachian counties, grouped by national quintiles. Darker colors indicate higher mortality rates, while lighter colors indicate lower mortality rates. Every county in Central Appalachia has a COPD mortality rate higher than the national average, with most counties in this subregion ranking in the worst-performing quintile. Appalachian Pennsylvania and Appalachian Mississippi are notable for the proportion of counties in the best-performing national quintile.

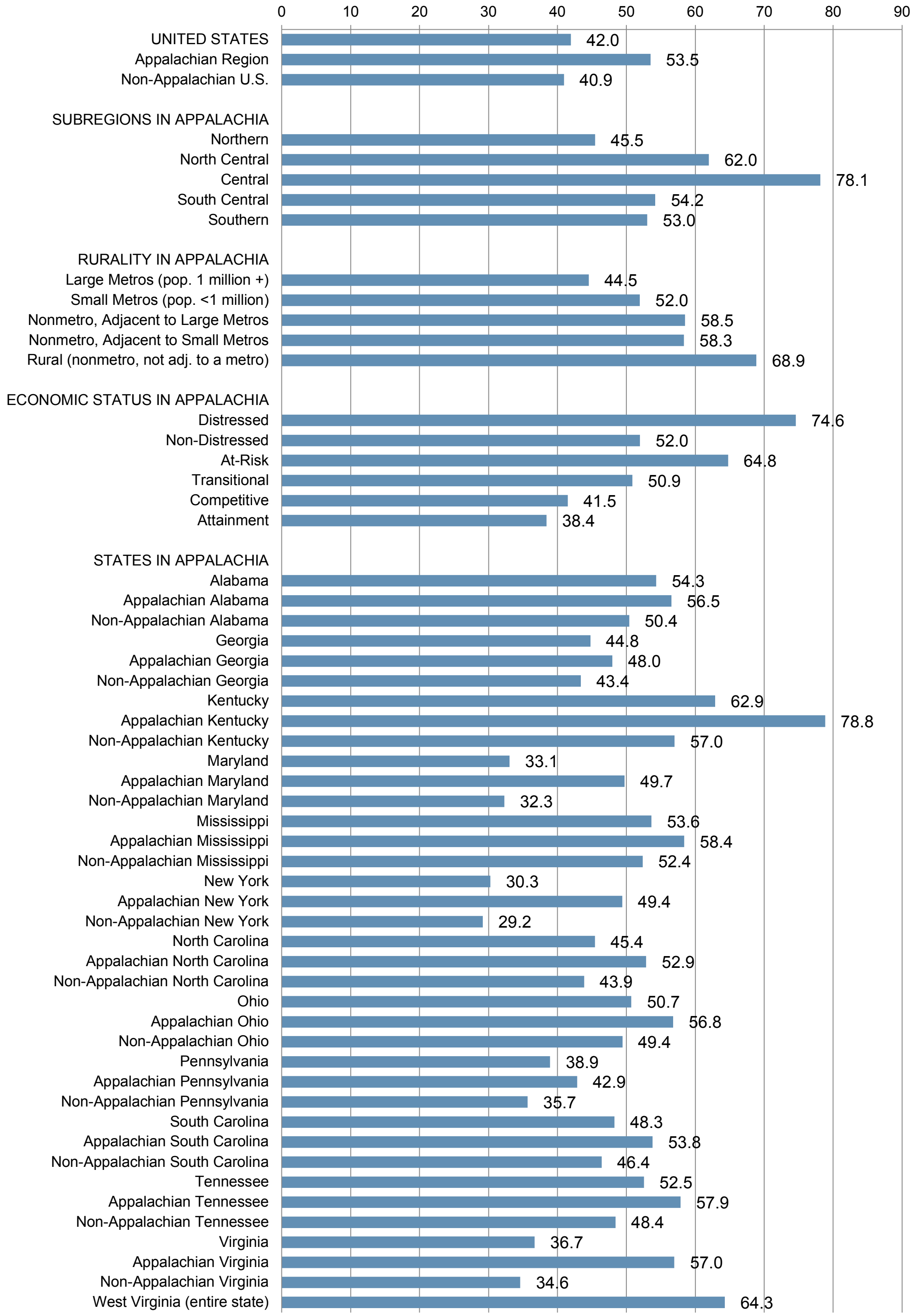
Figure 18 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 17: Map of COPD Mortality Rates per 100,000 Population in the Appalachian Region, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Figure 18: Chart of COPD Mortality Rates per 100,000 Population, 2008–2014

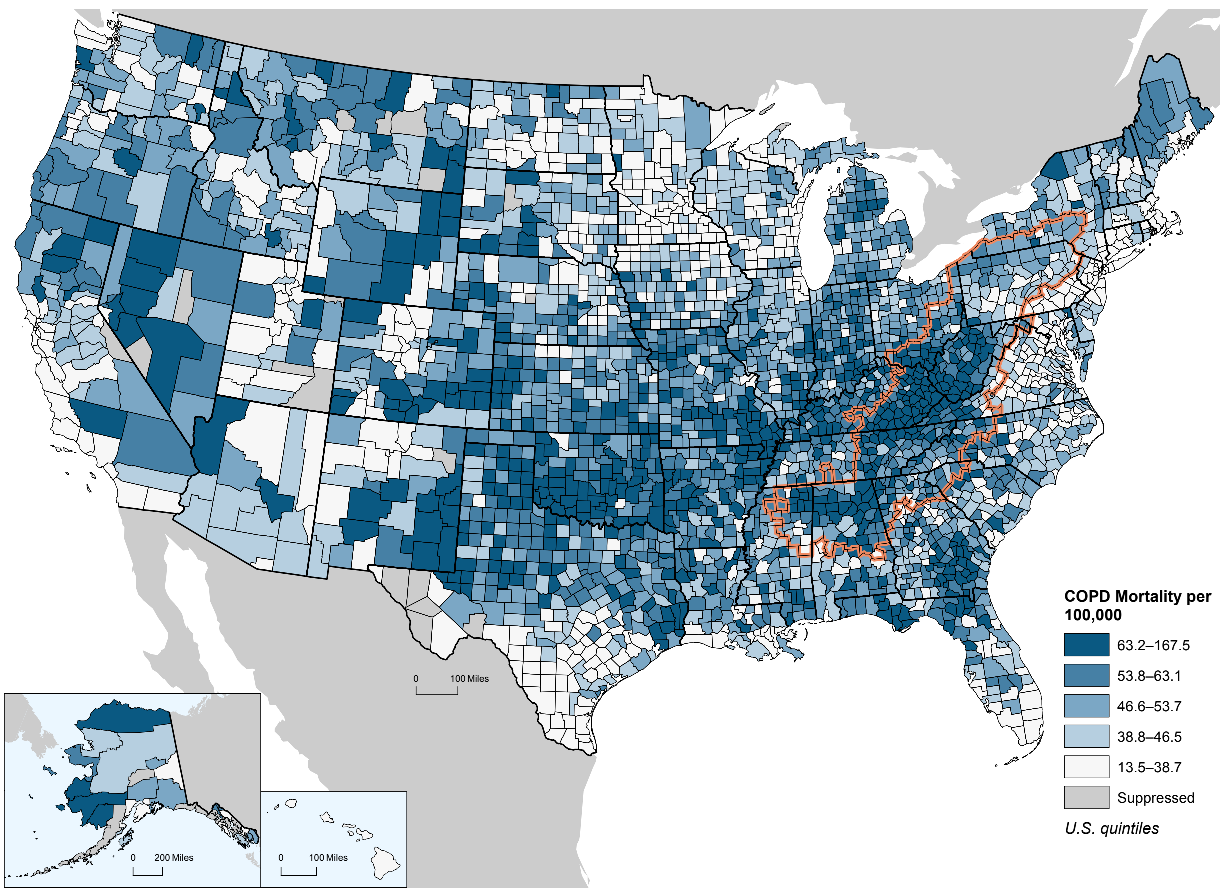


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Overview: COPD Mortality in the United States

Figure 19 shows the variation in COPD mortality rates across the United States and underscores the high rates in the Appalachian Region compared to the rest of the nation. The high rates in West Virginia stand in marked contrast to the low rates found to the north and east in New York, Pennsylvania, and Virginia. Concentrations of high COPD mortality rates occur across the southern part of the country, from Georgia to New Mexico. Higher rates of COPD mortality found in Appalachia continue west into Arkansas, Oklahoma, and northern Texas. Outside of Northern Michigan, the Upper Midwest tends to have low rates of COPD mortality. Coastal California has lower rates, but higher rates extend from northern California throughout much of the Pacific Northwest. Counties near the northeastern coast, stretching from Boston to southern Virginia, tend to have low rates of COPD mortality.

Figure 19: Map of COPD Mortality Rates per 100,000 Population in the United States, 2008–2014

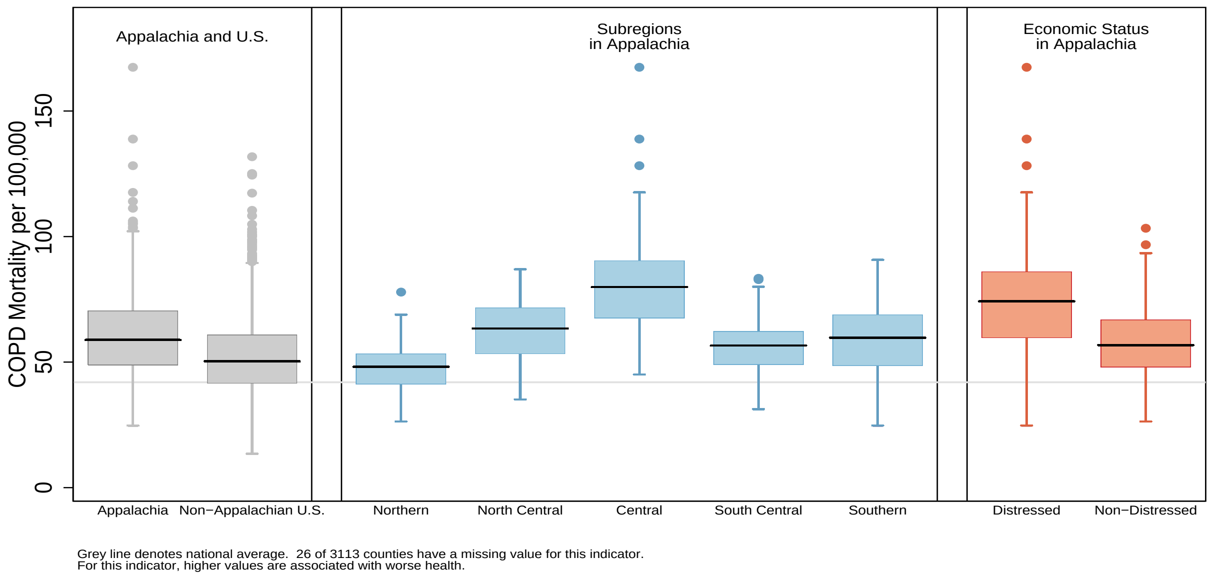


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Distribution of COPD Mortality Rates

Figure 20 shows the distribution of COPD mortality rates by geography and economic status. The horizontal grey line is the national average and the horizontal black line in the middle of each box is the median for the group. The shaded boxes show the middle half of all values; dots represent unusually high or low values. Of all 3,113 counties in the nation, 26 have a missing value for this indicator. For this measure, higher values indicate worse health.

Figure 20: Box Plot of COPD Mortality Rates per 100,000 Population by Geography and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The distribution of COPD mortality rates among national quintiles for Appalachian counties is shown in Table 16. Of the 420 counties in the Region, 163 (39 percent) rank in the worst-performing national quintile, while 27 (6 percent) rank in the best-performing national quintile.

Table 16: Distribution of COPD Mortality Rates per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
COPD deaths	27	*6%*	54	*13%*	83	*20%*	93	*22%*	163	*39%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Injury Mortality Rates

- The Appalachian Region's injury mortality rate is 33 percent higher the national rate.
- Although all five Appalachian subregions have injury mortality rates higher than the national average, the figure in Central Appalachia is especially high—more than double the national rate. All 82 counties in Central Appalachia have injury mortality rates higher than the nation as a whole. In South Central Appalachia, 84 of the subregion's 85 counties have injury mortality rates higher than the national rate.
- The injury mortality rate for the Appalachian Region's rural counties is 47 percent higher than the rate for the Region's large metro counties.
- The injury mortality rate for the Appalachian Region's distressed counties is 55 percent higher than the rate for the Region's non-distressed counties.

Background

The injury mortality rate is the number of deaths for which injury is the primary cause, per 100,000 population, per year. The data for this measure come from the Compressed Mortality File provided by the National Center for Health Statistics. The data have been age-adjusted and cover the 2008–2014 period. Unintentional injury was the fourth-leading cause of death in the United States in 2014 (Centers for Disease Control and Prevention, Diabetes FastStats, 2016).

Mortality from injury is a broad indicator that includes deaths resulting from unintentional injuries and accidents, such as motor vehicle accidents (MVAs), falls, and poisoning, the latter of which includes drug overdoses. Drug overdoses—discussed in the Behavioral Health domain of this report—have become the largest component of injury deaths over the past few years (United States Drug Enforcement Administration, 2015).

The most common causes of injury mortality vary throughout the life cycle. For example, suffocation and drowning are the primary causes of injury death in children ages four and younger; motor vehicle accidents are the most common cause for people between the ages of 5 and 24; poisoning dominates the 25 to 64 age group; and falls are the most common cause for people age 65 and over (Centers for Disease Control and Prevention, Diabetes FastStats, 2016). Previous studies have identified common risk factors for injury mortality, such as socioeconomic status (Cubbin, LeClere, & Smith, 2000) and the lack of a local trauma center (Rutledge, et al., 1992). Studies have also isolated specific factors associated with individual accident types. For example, there is a correlation between social isolation and falls resulting in fatal injuries (Nicholson Jr., 2005). Multiple evidence-based prevention strategies exist for falls and other injuries, and the National Council on Aging recommends programs designed to increase balance and strength (National Council on Aging, 2016).

Both individual and community factors impact the injury mortality rate, including the socioeconomic status at both of these levels (Cubbin, LeClere, & Smith, 2000). Injury mortality rates are higher in communities with fewer trauma services (Rutledge, et al., 1992). Because motor vehicle accidents are a common cause of injury deaths, transportation infrastructure, including the safety of roadways, has a large impact on this rate (Bureau of Transportation Statistics, 2000). Certain individual behaviors may also increase the risk of mortality due to injury; for example, alcohol and drug users have a higher risk of mortality due to motor vehicle accidents (Callaghan, Gatley, Veldhuizen, Lev-Ran, & Mann, 2013).

Overview: Injury Mortality in the Appalachian Region

The injury mortality rate in the Appalachian Region is 52.4 per 100,000 population, which is 33 percent higher than the national rate of 39.5 per 100,000 population. All five subregions in Appalachia have higher injury mortality rates than the national rate. The rate in Northern Appalachia is the lowest of all subregions, but is still 16 percent higher than the rate for the nation as a whole. At 81.4 injury deaths per 100,000, the rate in Central Appalachia is more than twice the rate for the nation as a whole.

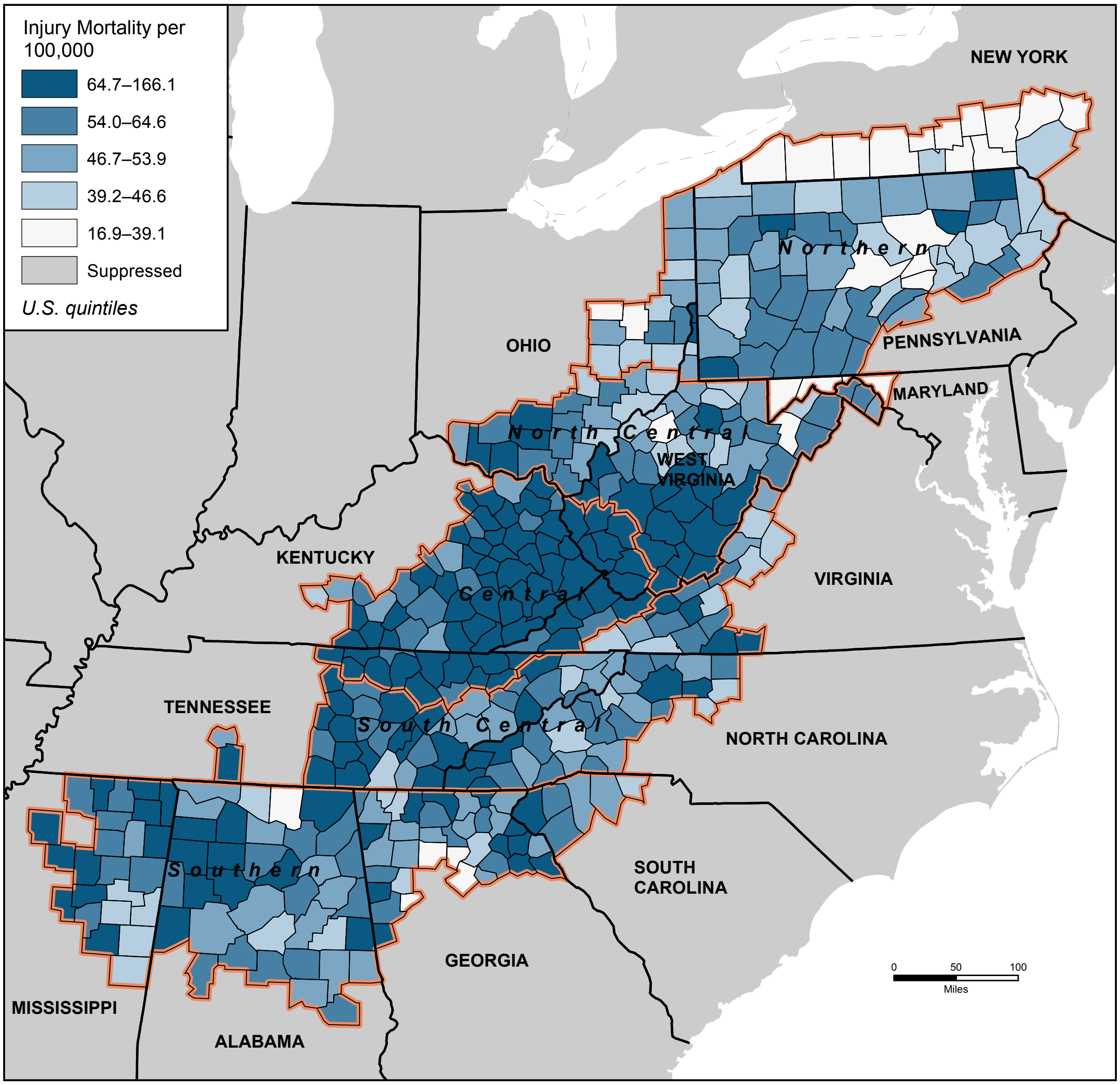
Areas in Appalachia that are more rural have higher injury mortality rates than more urbanized areas. The injury mortality rate for rural counties in the Appalachian Region is 67.4 per 100,000 population, which is 47 percent higher than the rate of 45.7 per 100,000 found in large metro counties in the Region. Economic status also plays a role: distressed counties in the Appalachian Region have an injury mortality rate of 78.1 per 100,000, which is 55 percent higher than the rate of 50.5 per 100,000 in the Region's non-distressed counties, and nearly double the national rate.

Several Appalachian states have injury mortality rates that are substantially higher than the nation as a whole: the rate in Appalachian Kentucky is more than double the national rate, while the rate in West Virginia is 70 percent higher than the national rate. The Appalachian portions of Mississippi, Tennessee, and Virginia all have rates that are around 50 percent higher than the national rate. Only Appalachian Maryland and Appalachian New York have injury mortality rates lower than the nation as a whole.

Figure 21 shows the rates of injury mortality for Appalachian counties, grouped by national quintiles. Darker colors indicate higher injury mortality rates. Appalachian New York stands out because all of its counties are in the best-performing national quintiles for injury mortality. By contrast, large portions of North Central, Central, and South Central Appalachia are in the worst-performing national quintiles for injury mortality. The Appalachian portions of every state except Maryland and New York have counties in the worst-performing national quintile.

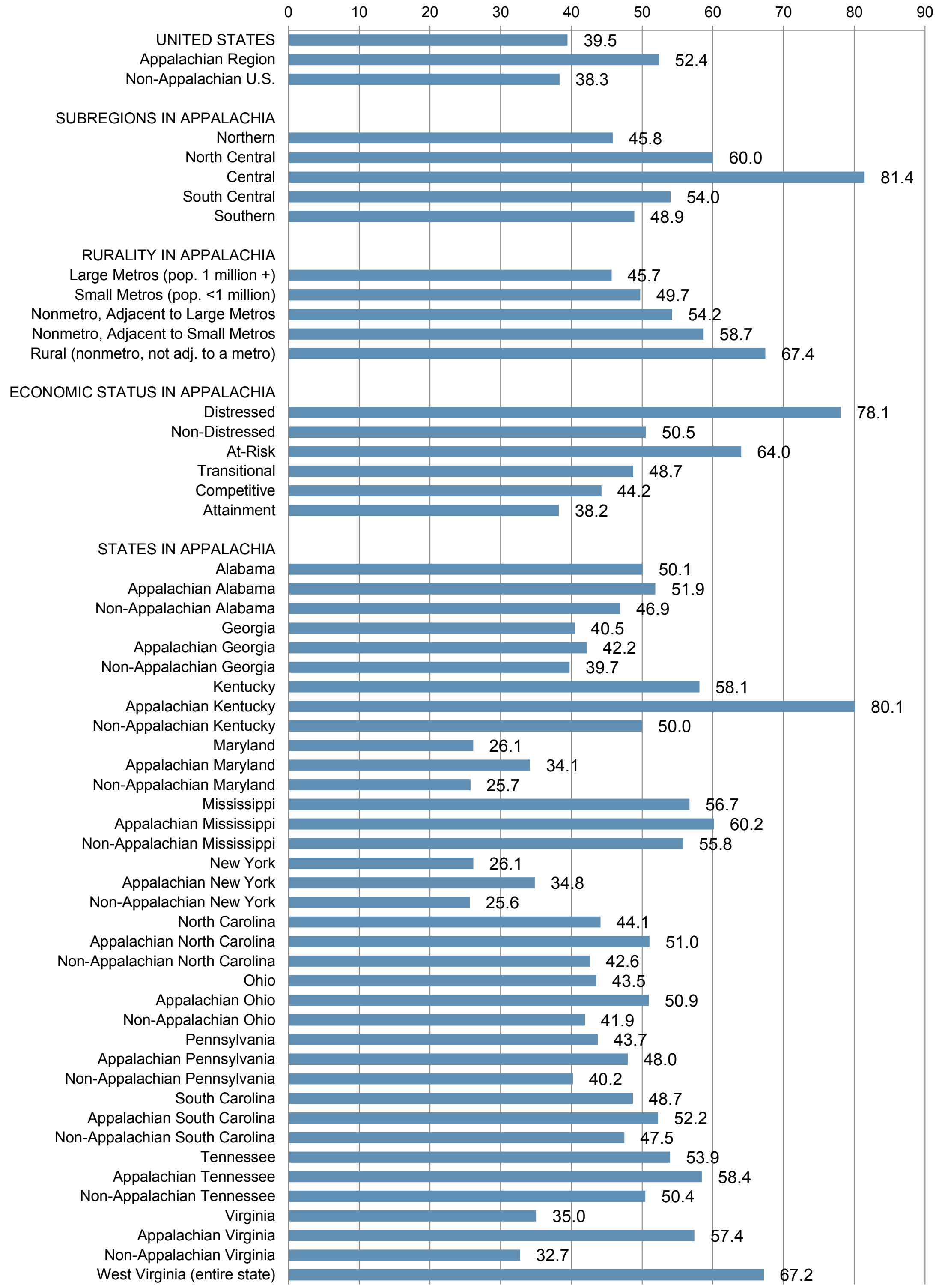
Figure 22 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 21: Map of Injury Mortality Rates per 100,000 Population in the Appalachian Region, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Figure 22: Chart of Injury Mortality Rates per 100,000 Population, 2008–2014

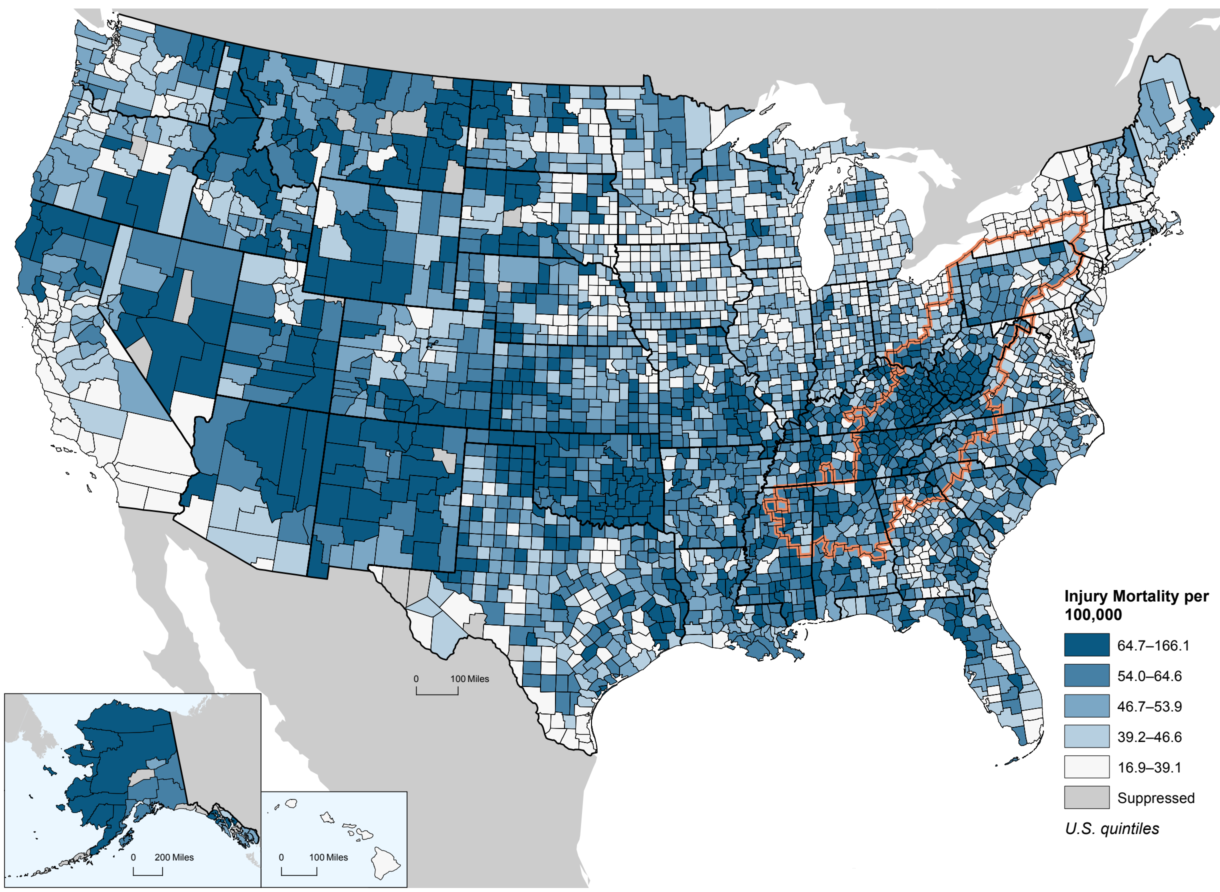


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Overview: Injury Mortality in the United States

Figure 23 shows the variation in injury mortality rates across the United States. The pattern of injury mortality deviates from the pattern seen for mortality due to chronic diseases such as cancer, COPD, and stroke. Unlike those conditions, the Mountain West has high rates of injury mortality. In addition, much of Oklahoma, New Mexico, and Arizona display notably high rates. The lone pockets of low injury mortality rates in the West are found in a few counties in the Pacific Northwest, as well as throughout central and southern California. In the East, Central Appalachia stands out for its high rates, whereas those areas to the north—the Upper Midwest, Midwest, and Northeast—generally report low levels of injury mortality.

Figure 23: Map of Injury Mortality Rates per 100,000 Population in the United States, 2008–2014

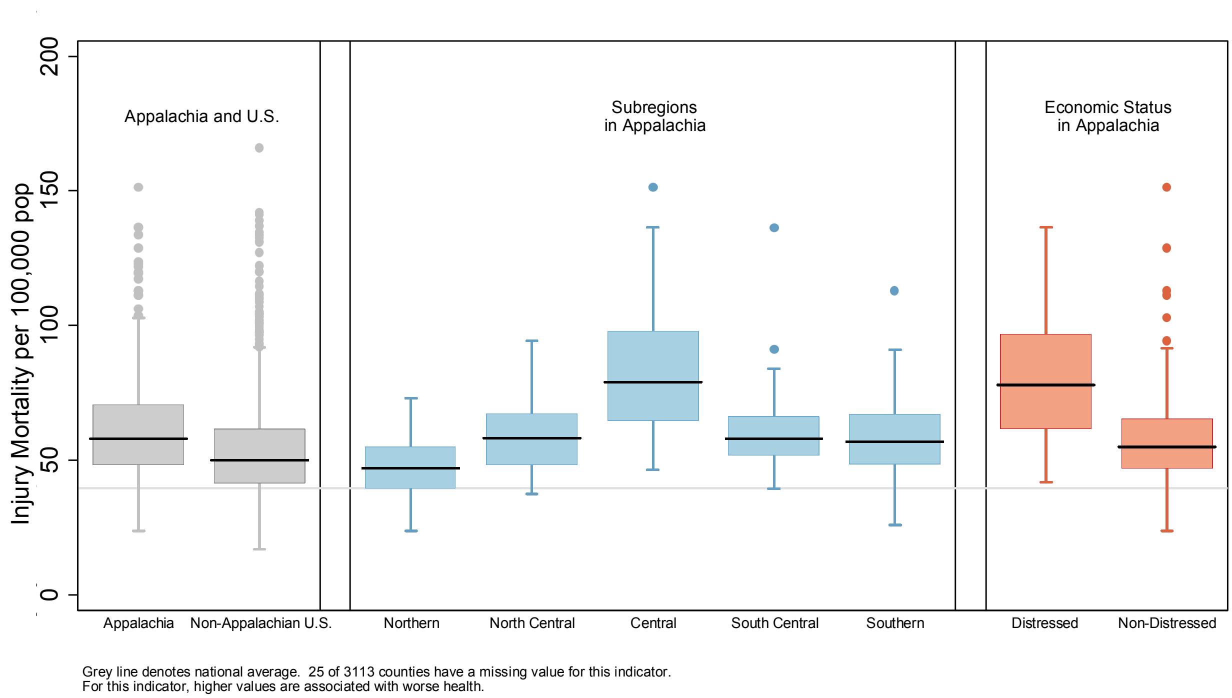


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Distribution of Injury Mortality Rates

Figure 24 shows the distribution of injury mortality rates by geography and economic status. The horizontal grey line is the national average and the horizontal black line in the middle of each box is the median for the group. The shaded boxes show the middle half of all values; dots represent unusually high or low values. Of all 3,113 counties in the nation, 25 have a missing value for this indicator. For this measure, higher values are associated with worse health.

Figure 24: Box Plot of Injury Mortality Rates per 100,000 Population by Geography and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The distribution of injury mortality rates among national quintiles for Appalachian counties is shown in Table 17. Of the 420 counties in the Region, 147 (35 percent) rank in the worst-performing national quintile, while 28 (7 percent) rank in the best-performing national quintile.

Table 17: Distribution of Injury Mortality Rates per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Injury deaths	28	*7%*	59	*14%*	80	*19%*	106	*25%*	147	*35%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Stroke Deaths

KEY FINDINGS | Stroke Mortality Rates

- The Appalachian Region's stroke mortality rate is 14 percent higher than the national rate.
- Four of the five Appalachian subregions have stroke mortality rates markedly higher than the rate for the nation as a whole. Only Northern Appalachia has a rate on par with the nation.
- The stroke mortality rate for the Appalachian Region's rural counties is eight percent higher than the rate for the Region's large metro counties.
- The stroke mortality rate for the Appalachian Region's distressed counties is 14 percent higher than the rate for the Region's non-distressed counties.

Background

The stroke mortality rate is the number of deaths in which stroke is reported as the primary cause of death per 100,000 population, per year. The data for this measure come from the Compressed Mortality File provided by the National Center for Health Statistics. The data have been age-adjusted and cover the 2008–2014 period. Stroke, or cerebrovascular disease, occurs when blood flow to an area of the brain is cut off, depriving brain cells of oxygen and resulting in cell death. Strokes can occur as the result of clots, leaks, or breaks in arteries in the brain, as well as those that lead to the brain. Stroke is the fifth-leading cause of death in the United States (Centers for Disease Control and Prevention, Stroke, 2017).

Risk factors for stroke fall into three broad categories: underlying health conditions, lifestyle choices, and genetics and family history. Underlying health conditions that may increase the risk of suffering a stroke include a previous stroke or mini-stroke, high blood pressure, high cholesterol, heart disease, diabetes, and sickle cell disease. An unhealthy diet, physical inactivity, obesity, excessive alcohol intake, and tobacco use are all lifestyle factors that increase the risk of stroke. Incidence and mortality from stroke are often the result of a number of preventable risk factors; however, certain immutable risk factors resist intervention, such as heredity, age, gender, and ethnicity (Centers for Disease Control and Prevention, Conditions that Increase the Risk for Stroke, 2017).

The first hour after suffering a stroke is critical for reducing stroke mortality and disability (Sauer, et al., 2010). Administration of tissue plasminogen activator (tPA) within 3 hours of the first symptoms of a stroke improves the chances of recovering from a stroke. Patients who receive tPA are more likely to recover fully, have less disability than patients who do not receive the drug, and are also less likely to need long-term nursing care (Centers for Disease Control and Prevention, Stroke Treatment, 2017). Surgery, other medicines, or additional procedures may be required to treat a stroke (Centers for Disease Control and Prevention, Stroke Treatment, 2017). With ongoing prevention efforts and advances in treatment, stroke rates have declined over the past few decades (Cardiovascular Health Branch, Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion, CDC, 1999).

Overview: Stroke Mortality in the Appalachian Region

The Appalachian Region's stroke mortality rate is 43.8 per 100,000 population, which is 14 percent higher than the national rate of 38.4 per 100,000. Mortality rates in all five of the subregions in Appalachia are above the national rate—only Northern Appalachia has a rate comparable to the nation as a whole. The southern portion of Appalachia lies in the *Stroke Belt*, an area in the southeastern United States long characterized by high incidence of stroke (Howard, et al., 2004). In Southern Appalachia, 92 of 104 counties, or 88 percent, have stroke mortality rates that exceed the national rate. The counties of northern Georgia— with rates below the nation as a whole—are outliers in Southern Appalachia. Central Appalachian counties are also likely to have high rates; 68 of 82 counties, or 83 percent, are above the national rate. Northern Appalachian counties, particularly in Pennsylvania and New York, are more likely to have low stroke mortality rates and rank in the best-performing national quintile.

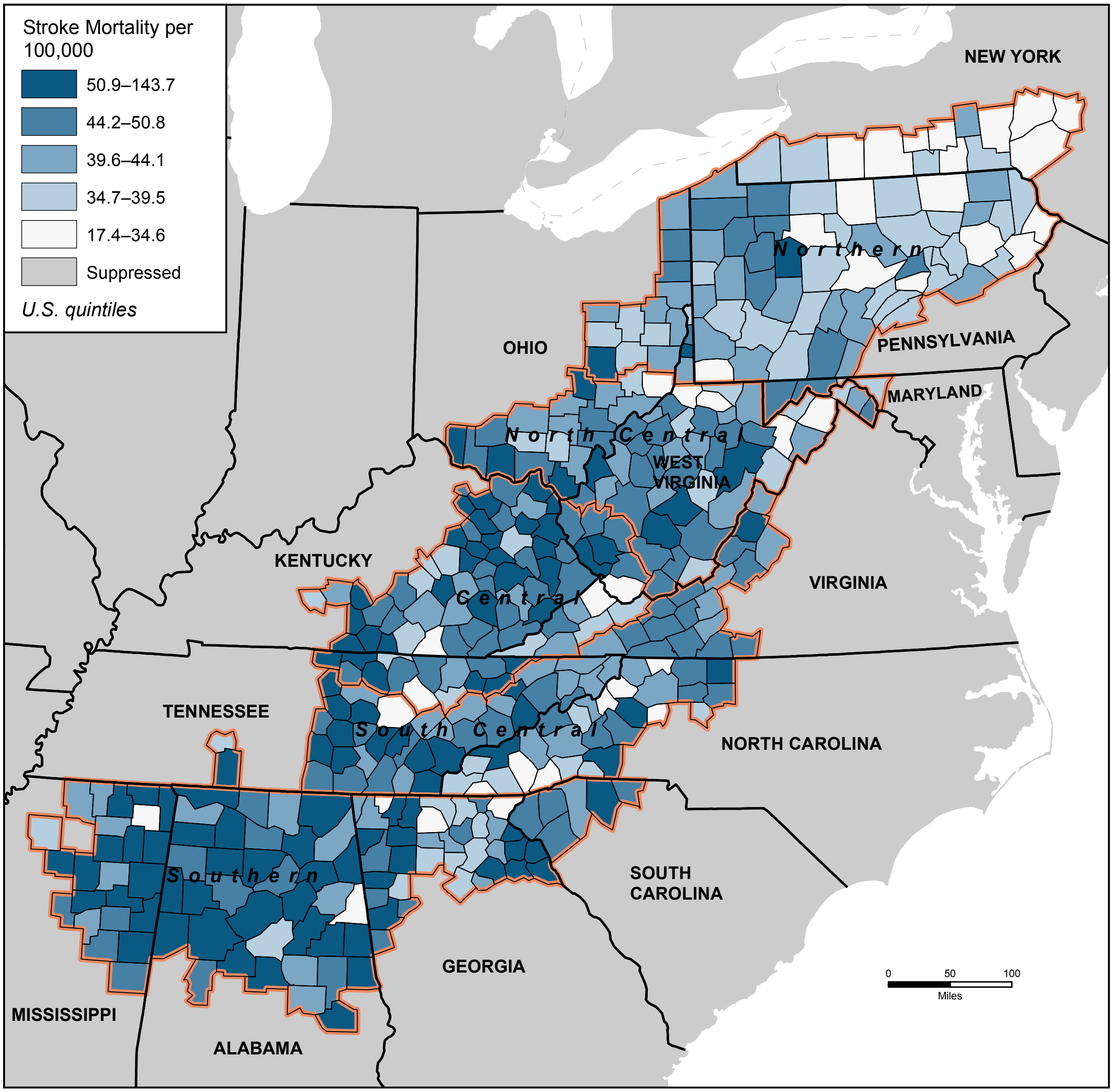
There is relatively little difference in stroke mortality rates between rural and urban areas; the rate in the Appalachian Region's rural counties is only eight percent higher than in the Region's urban counties. The Region's economically distressed counties have a stroke mortality rate of 49.5 per 100,000 population, which is 14 percent higher than the Region's non-distressed county rate of 43.4 per 100,000, and 29 percent higher than the national rate.

Appalachian Mississippi (53.0 stroke deaths per 100,000 population) and Appalachian Alabama (51.0 per 100,000) have the highest rates of stroke mortality, at 38 percent and 33 percent above the national rate, respectively. With the exception of Appalachian New York, there is little difference between the Appalachian and non-Appalachian portions of each state for this measure. Although the average stroke rate for Appalachian New York is 33 percent higher than the state as a whole, it remains lower than the national rate.

Figure 25 shows the rates of stroke mortality for Appalachian counties, grouped by national quintile. The disease pattern appears more concentrated in the southern and central parts of the Region, with large proportions of counties in the worst-performing national quintile located in Southern, Central and North Central Appalachia. Many counties in western Pennsylvania and southeastern Ohio also have high stroke mortality rates.

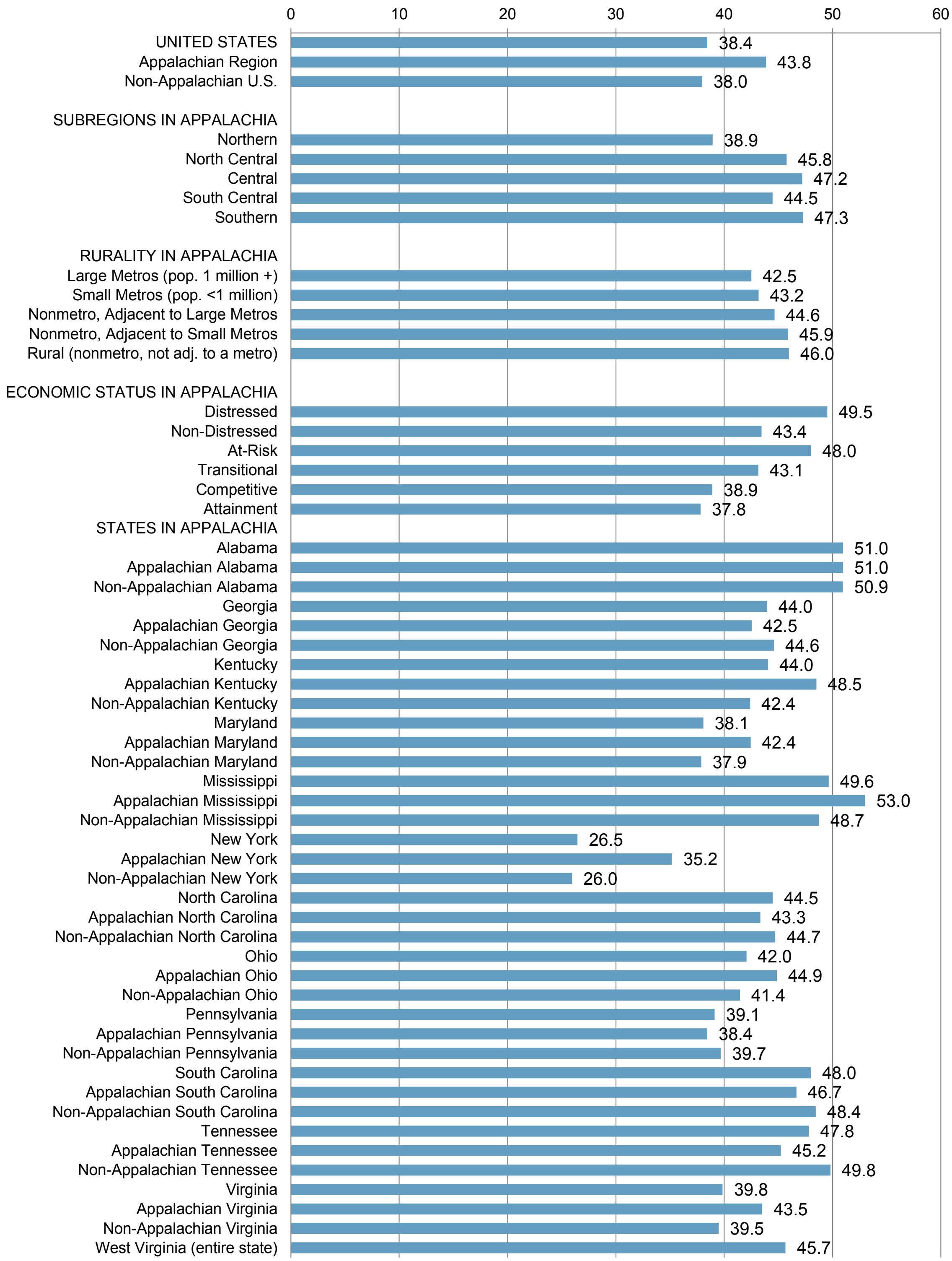
Figure 26 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 25: Map of Stroke Mortality Rates per 100,000 Population in the Appalachian Region, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Figure 26: Chart of Stroke Mortality Rates per 100,000 Population, 2008–2014



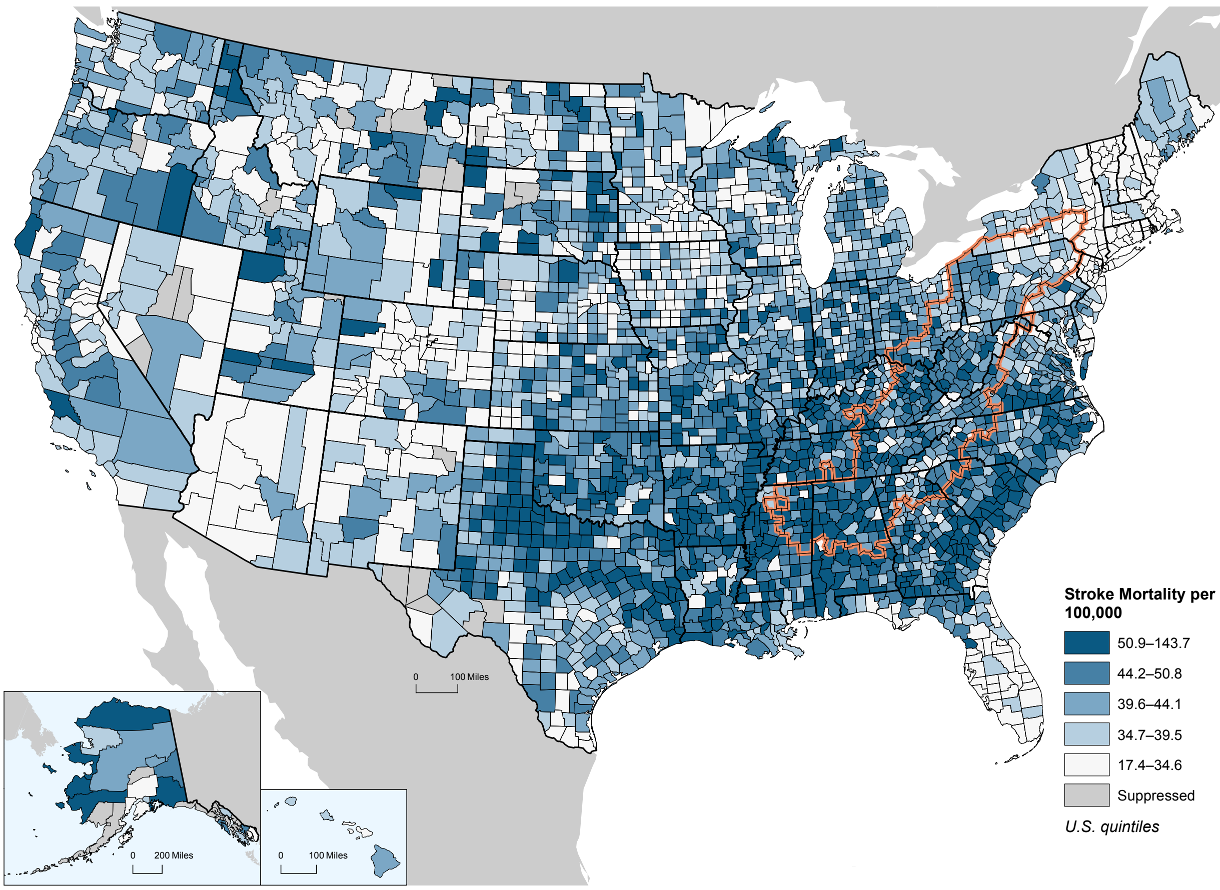
Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Overview: Stroke Mortality in the United States

Figure 27 shows the variation in stroke mortality across the United States. The map shows a concentration of higher stroke mortality in the eastern half of the country, with high rates extending from the Tidewater region of Virginia through southern Georgia and into Louisiana and Arkansas, the area known as the *Stroke Belt*.

The pattern throughout the Appalachian Region is similar to that found in the Stroke Belt. Although it has been suggested that the larger population of African-Americans is a contributing factor to the prevalence of cerebrovascular disease in the Stroke Belt, given the demographic makeup of the Appalachian Region, this ethnic characteristic does not explain the higher rates also found in Central and South Central Appalachia (Go, 2013). Counties throughout New England and the Southwest generally have rates lower than the national rate.

Figure 27: Map of Stroke Mortality Rates per 100,000 Population in the United States, 2008–2014

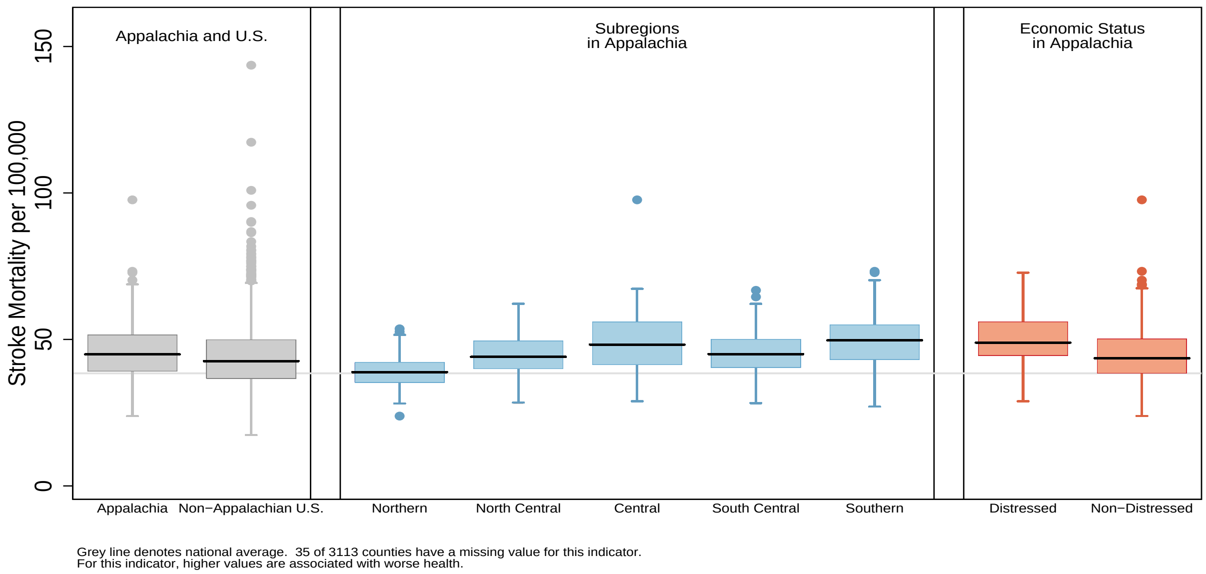


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Distribution of Stroke Mortality Rates

Figure 28 shows the distribution of stroke mortality rates by geography and economic status. The horizontal grey line is the national average and the horizontal black line in the middle of each box is the median for the group. The shaded boxes show the middle half of all values; dots represent unusually high or low values. Of all 3,113 counties in the nation, 35 have a missing value for this indicator. For this measure, higher values are associated with worse health.

Figure 28: Box Plot of Stroke Mortality Rates per 100,000 Population by Geography and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The distribution of stroke mortality rates among national quintiles for Appalachian counties is shown in Table 18. Of the 420 counties in the Region, 110 (26 percent) rank in the worst-performing national quintile, while 40 (10 percent) rank in the best-performing national quintile.

Table 18: Distribution of Stroke Mortality Rates per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Stroke deaths	40	*10%*	69	*16%*	90	*21%*	111	*26%*	110	*26%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Diabetes Deaths

KEY FINDINGS | Diabetes Mortality Rates

- The Appalachian Region's diabetes mortality rate is 11 percent higher than the national rate.
- In North Central and Central Appalachia, diabetes mortality rates are 41 percent higher than the rate for the nation as a whole.
- There is an urban-rural divide in diabetes mortality rates throughout the Region, with rural areas reporting a rate 36 percent higher than the rate found in large metro areas.
- Economically distressed Appalachian counties report a diabetes mortality rate 33 percent higher than those counties classified as non-distressed.

Background

The diabetes mortality rate is the number of deaths for which chronic diabetes (Type 1 or Type 2) is the primary cause of death per 100,000 population, per year. The data for this measure come from the Compressed Mortality File provided by the National Center for Health Statistics. The data have been age-adjusted and cover the 2008–2014 period. Diabetes was the seventh-leading cause of death in the United States in 2014 (Centers for Disease Control and Prevention, Diabetes FastStats, 2016).

There are three common types of diabetes: Type 1, Type 2, and gestational. In Type 1 diabetes, the body produces little or no insulin and those with the disease typically have to inject insulin daily. Type 1 is most often diagnosed in children and young adults. People with Type 2 diabetes either do not produce insulin or their bodies do not efficiently use the insulin the body does produce. Type 2 diabetes can be diagnosed at any age, although it is more common among older people. Type 2 diabetes is considered a preventable disease, unlike the Type 1 variant (Centers for Disease Control and Prevention, What is Diabetes?, 2016). Gestational diabetes occurs in pregnant women and increases the likelihood of developing Type 2 diabetes after pregnancy (National Institute of Diabetes and Digestive and Kidney Diseases, 2016).

Diabetics have a higher risk of premature death than those living without diabetes (Centers for Disease Control and Prevention, What is Diabetes?, 2016). According to CDC, the risk factors for Type 2 diabetes include: older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, race, and ethnicity (Centers for Disease Control and Prevention, Basics About Diabetes, 2015).

Diabetes mortality can be a complicated measure to interpret because the rate does not include persons who had diabetes at the time of death but are classified as having died from a separate primary cause. Despite the prevalence of diabetes, studies have found that only 35–45 percent of people with diabetes had a death certificate that noted diabetes; and only 10–15 percent of death certificates listed diabetes as the underlying cause of death (American Diabetes Association, Statistics About Diabetes, 2016). The relationship between mortality and diabetes—which is not always entirely clear—is different than the relationship between mortality and many other diseases, such as cancer, where the relationship is direct and easier to measure. As such, an important caveat to consider for this indicator is that some researchers believe diabetes mortality rates are underreported because physicians often cite the primary cause of death as one of the disease's complications, such as heart attack, stroke, or kidney failure (McEwen, Kim, & Haan, 2006).

Overview: Diabetes Mortality in the Appalachian Region

The mortality rate from diabetes in the Appalachian Region is 23.8 per 100,000 population, which is slightly higher than the national rate of 21.5 per 100,000. The 11 percent difference between the Region and the nation as a whole is relatively small when compared to differences in mortality rates for many other diseases. North Central and Central Appalachia both have the highest diabetes mortality rates among the subregions, and at 30.3 and 30.4 per 100,000 population, respectively, their rates are 41 percent higher than the national rate. Only Southern Appalachia's diabetes mortality rate of 20.6 per 100,000 population is lower than the national rate.

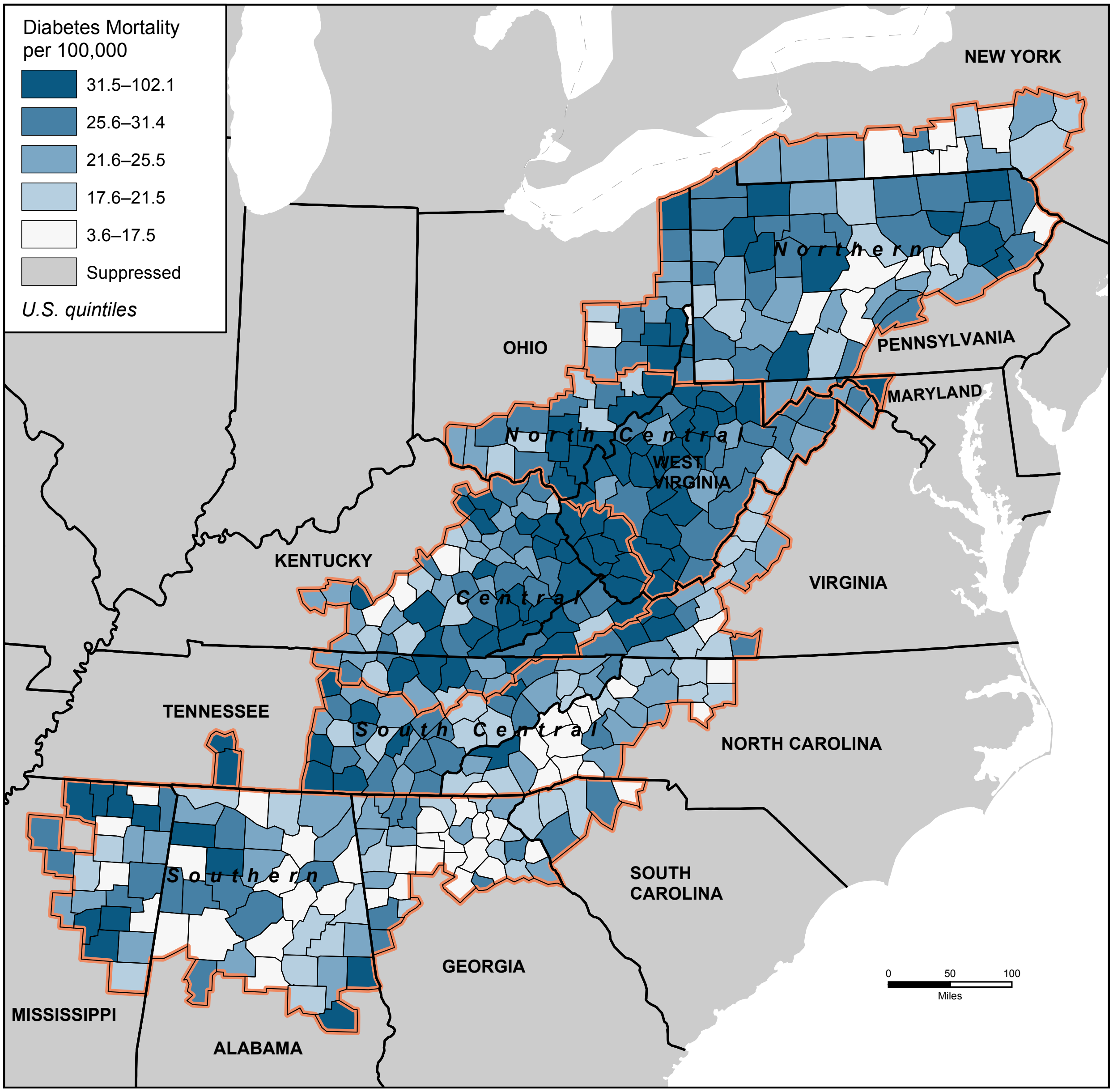
The data show an urban-rural disparity; rural counties in Appalachia have a diabetes mortality rate of 27.7 per 100,000 population, which is 36 percent higher than the Region's large metro county rate of 20.3 per 100,000. The diabetes mortality rate in the Appalachian Region's distressed counties is 30.9 per 100,000 population, which is 33 percent higher than the Region's non-distressed county rate of 23.3 per 100,000, and 44 percent higher than the national rate.

The diabetes mortality rate of 32.8 per 100,000 population in West Virginia is the highest rate in the Appalachian Region and is 53 percent higher than the national figure. Appalachian Maryland has the next highest rate in the Region at 28.8 per 100,000, and the Appalachian portions of Kentucky, Mississippi, and Ohio all report diabetes mortality rates of around 28 per 100,000. The non-Appalachian portions of Alabama, Georgia, Mississippi, North Carolina, and South Carolina all have rates higher than the Appalachian portions of those states.

Figure 29 shows the diabetes mortality rates for Appalachian counties, grouped by national quintile. The map shows several concentrations of high rates throughout Central and North Central Appalachia, although counties in the worst-performing national quintile are found in each subregion. Diabetes mortality rates in many parts of Southern Appalachia are actually lower than the national average, particularly in the Appalachian portions of Alabama and Georgia. In the Northern subregion, multiple counties in the best-performing national quintile are found in the Appalachian portions of New York and Pennsylvania.

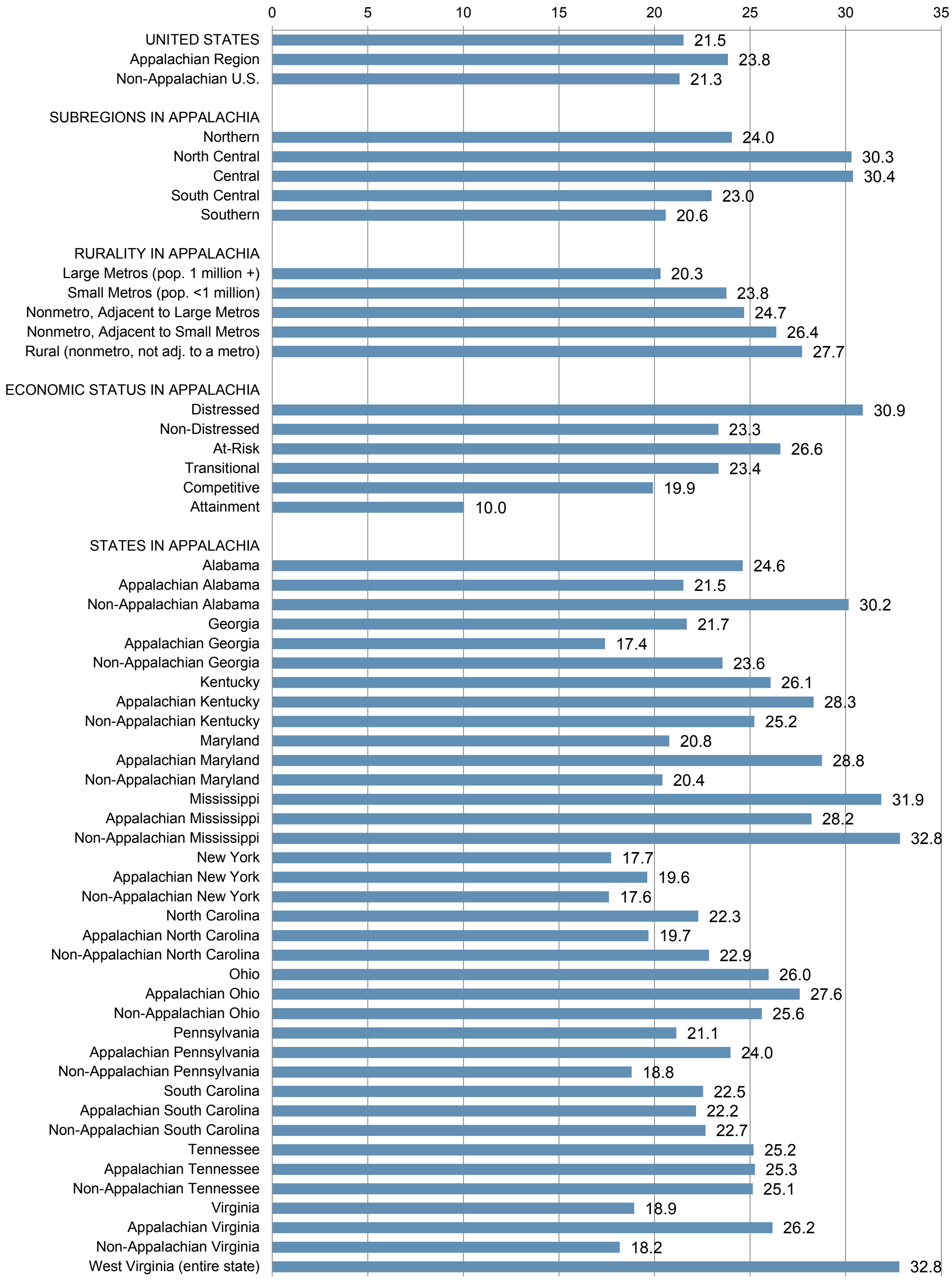
Figure 30 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 29: Map of Diabetes Mortality Rates per 100,000 Population in the Appalachian Region, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Figure 30: Chart of Diabetes Mortality Rates per 100,000 Population, 2008–2014

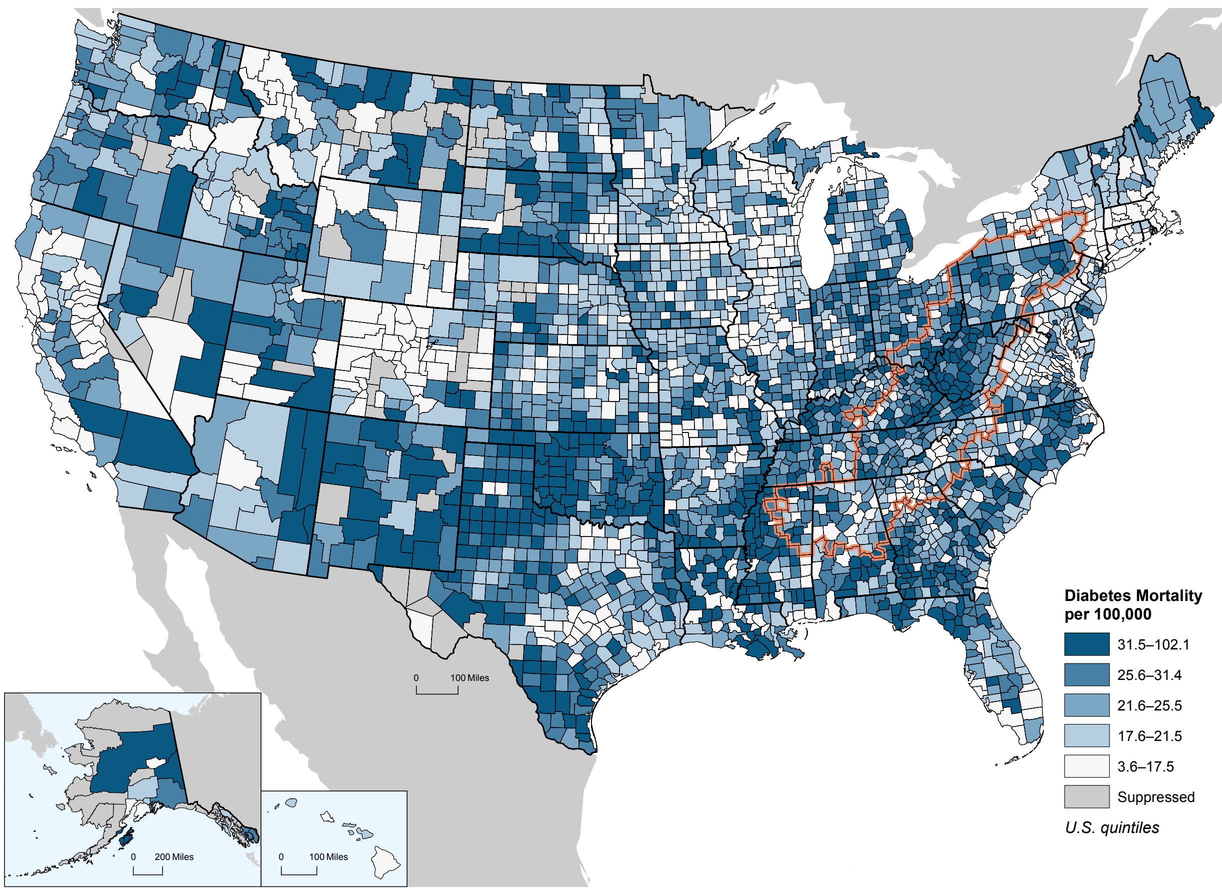


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Overview: Diabetes Mortality in the United States

Figure 31 shows the variation in diabetes mortality rates across the United States. Rates in Central and North Central Appalachia are higher than much of the country east of the Mississippi River, with the exception of the Atlantic Coastal Plain and the area surrounding the Florida peninsula. The Mississippi Delta region also displays high rates, and these elevated levels stretch into Oklahoma, western Texas, and much of New Mexico. Although many counties throughout the Midwest and Upper Midwest display low diabetes mortality rates, there are also pockets of poor performance, perhaps most notably so in the Dakotas. Some areas throughout the Rocky Mountain region display low levels of diabetes mortality rates, including much of Colorado.

Figure 31: Map of Diabetes Mortality Rates per 100,000 Population in the United States, 2008–2014

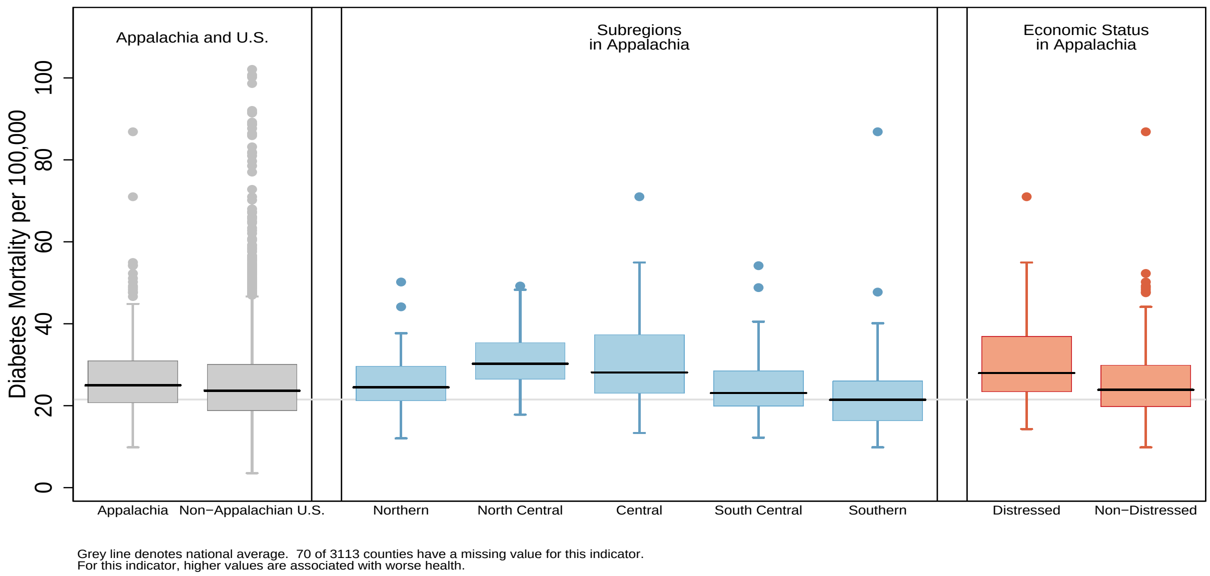


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Distribution of Diabetes Mortality Rates

Figure 32 shows the distribution of diabetes mortality rates by geography and economic status. The horizontal grey line is the national average and the horizontal black line in the middle of each box is the median for the group. The shaded boxes show the middle half of all values; dots represent unusually high or low values. Of all 3,113 counties in the nation, 70 have a missing value for this indicator. For this measure, higher values indicate worse health.

Figure 32: Box Plot of Diabetes Mortality Rates per 100,000 Population by Geography and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The distribution of diabetes mortality rates among national quintiles for Appalachian counties is shown in Table 19. Of the 420 counties in the Region, 99 (24 percent) rank in the worst-performing national quintile.

Table 19: Distribution of Diabetes Mortality Rates per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Diabetes deaths	60	*14%*	70	*17%*	91	*22%*	100	*24%*	99	*24%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Years of Potential Life Lost

- The rate for Years of Potential Life Lost—a broad measure of premature mortality from all causes—is 25 percent higher in the Appalachian Region than in the nation as a whole.
- Although all five subregions have YPLL rates higher than the national figure, performance in this indicator is particularly poor in Central Appalachia, where the rate is 69 percent higher than the national mark.
- The YPLL rate for the Appalachian Region's rural counties is 40 percent higher than the rate for the Region's large metro counties.
- The YPLL rate for the Appalachian Region's distressed counties is 42 percent higher than the rate for the Region's non-distressed counties.

Background

Years of Potential Life Lost (YPLL) is a measure of premature mortality; higher values of YPLL indicate worse health in a community. This measure comes from County Healthy Rankings. The data have been age-adjusted and cover the 2011–2013 period.

YPLL sums the total years of individuals' lives that were lost due to deaths prior to age 75. The numerator aggregates the difference between a target age—in this case, age 75—and the age at death for every individual in a given population. These figures are then calculated into rates per 100,000 population so that populations of different sizes are comparable. For this report, the county defines the population group. Unlike age-adjusted mortality rates, YPLL gives increased weight to deaths in younger age groups. Thus, mortality due to conditions that tend to affect younger populations—such as motor vehicle accidents—will contribute more to the YPLL value than conditions such as Alzheimer's, which primarily affects older populations.

YPLL captures the cumulative number of years a population loses when people die before the age of 75. A person who dies at age 55, for example, generates an individual YPLL of 20. One person who dies at age 1 would have the same effect on the measure as 74 people who die at age 74. This measure is considered valuable for developing a Culture of Health, as deaths in younger populations are typically preventable and thus, more responsive to interventions (Dranger & Remington, 2004). The U.S. Department of Health report *Healthy People 2020* uses age 75 as the target for average individual longevity in the United States (Office of Disease Prevention and Health Promotion, 2016).

Overview: Years of Potential Life Lost in the Appalachian Region

The YPLL rate for the Appalachian Region is 8,291 per 100,000 population, which is 25 percent higher than the national rate of 6,658 per 100,000. All five subregions have rates higher than the national figure, and even the best-performing subregion, Northern Appalachia (7,285 per 100,000), has a rate nine percent higher than the national mark. Central Appalachia, with 11,226 years of potential life lost per 100,000 population, reports a rate 69 percent higher than the national figure.

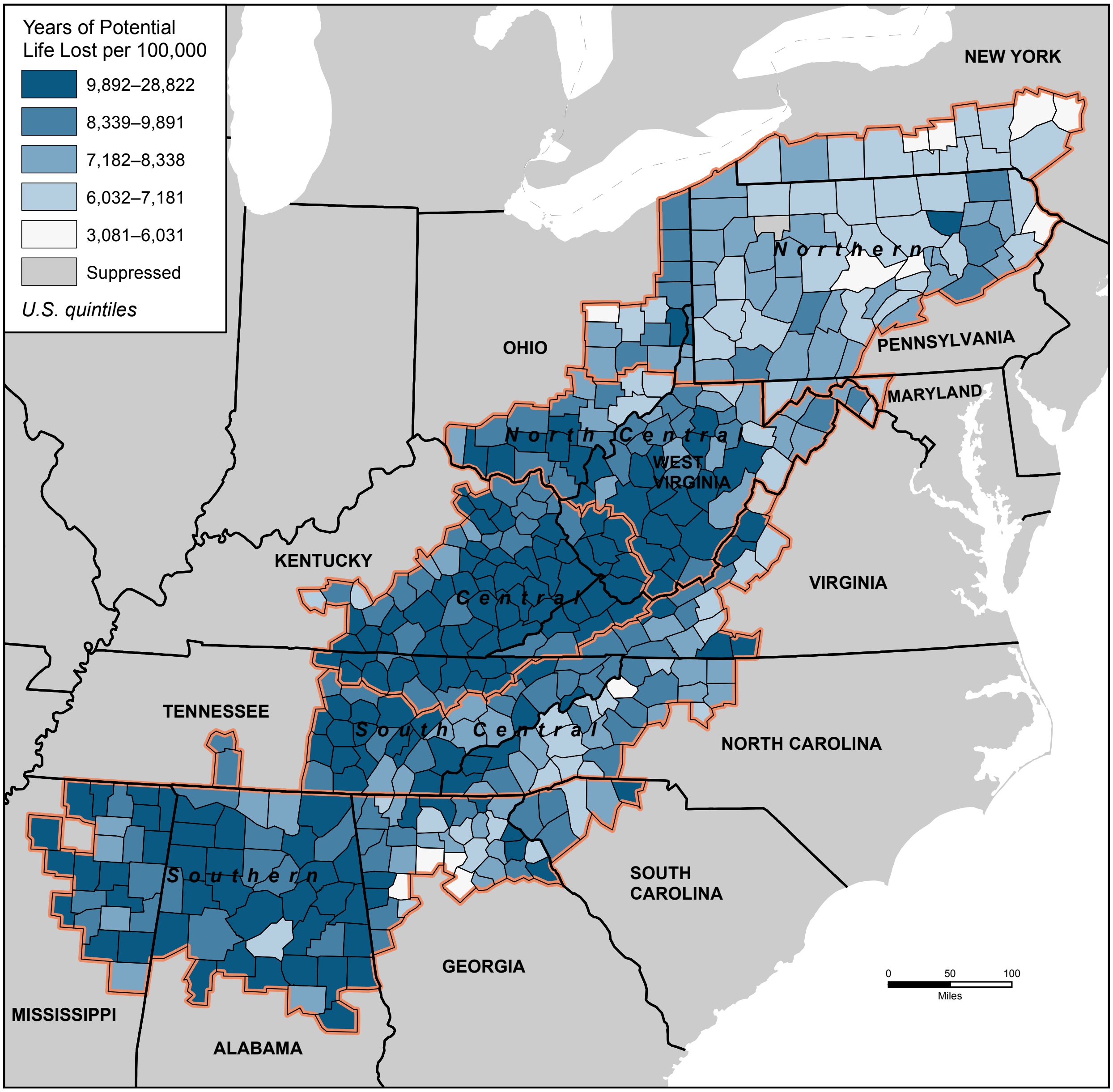
There is an urban-rural divide for YPLL in Appalachia. Rural Appalachian counties have YPLL rates approximately 40 percent higher than large metro counties in Appalachia (10,100 per 100,000 population compared to 7,221). However, even the large metro Appalachian counties have YPLL rates eight percent higher than the national mark. The economic status of a county also plays a role in YPLL rates across the Region, as economically distressed counties (11,471 per 100,000 population) experience a rate 42 percent higher than that in non-distressed counties (8,065). The rate in economically distressed counties is 72 percent higher than the national mark.

Appalachian Kentucky (10,880 per 100,000 population) has the highest YPLL rate in the Region, a mark 34 percent higher than the rate in non-Appalachian Kentucky (8,095). The next highest rate among Appalachian portions of states throughout the Region is 9,876 per 100,000 in Appalachian Mississippi. However, this rate is actually slightly lower than the rate found in non-Appalachian Mississippi (10,198 per 100,000). West Virginia then reports the next highest rate at 9,782 per 100,000 population. In terms of intrastate disparities, there is a large divide found in Virginia: Appalachian Virginia (9,164 per 100,000) reports a rate 54 percent higher than non-Appalachian Virginia (5,953). Only Appalachian New York (6,508 per 100,000) and Appalachian Georgia (6,602) report figures lower than the national rate.

Figure 33 shows YPLL rates for Appalachian counties, grouped by national quintiles. Darker colors indicate higher YPLL rates. Outside of Northern Appalachia and parts of South Central Appalachia, high YPLL rates are found throughout much of the Region. Rates are particularly high and noticeable in the Appalachian portions of Alabama and Kentucky, and in West Virginia.

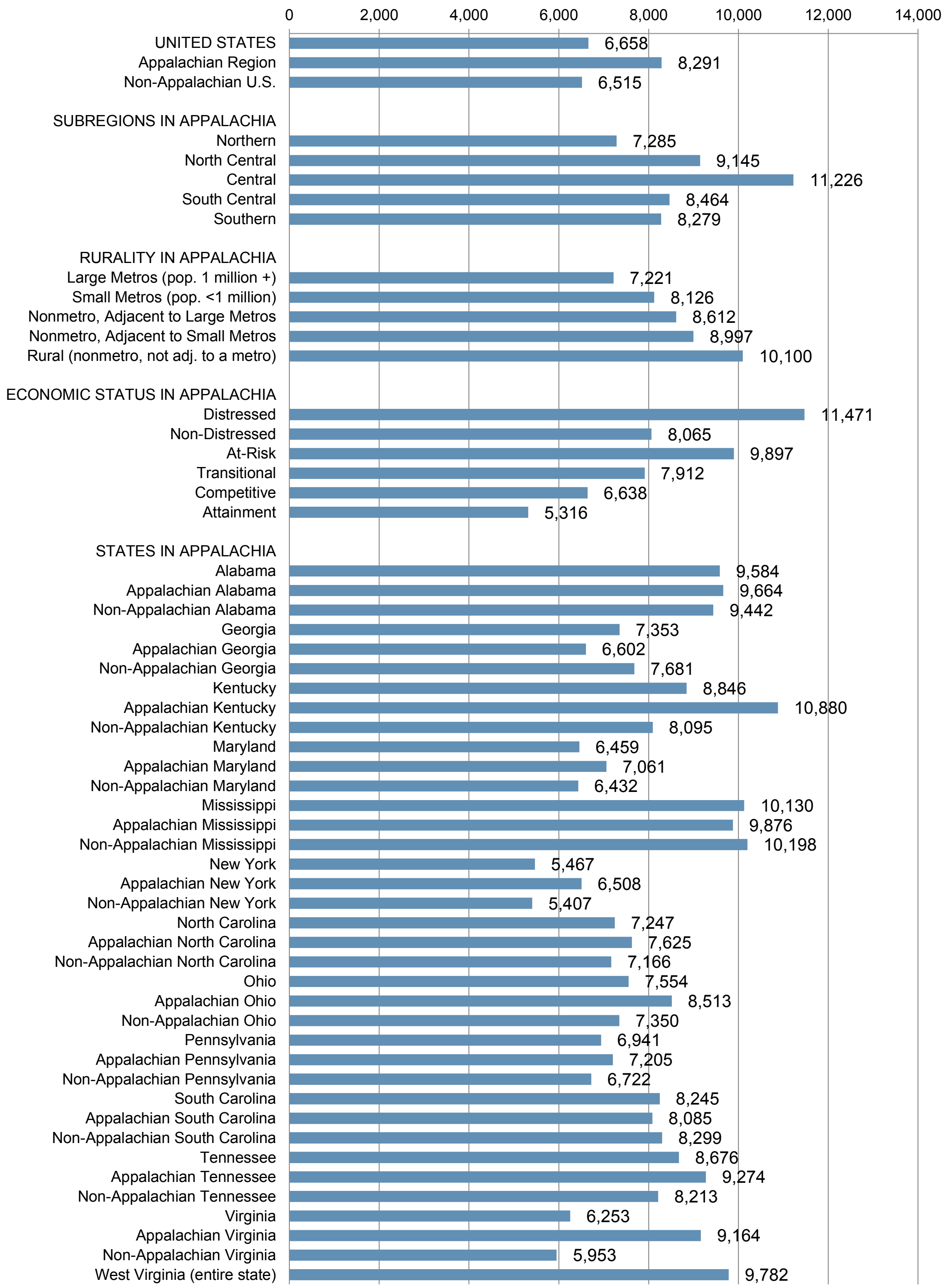
Figure 34 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 33: Map of Years of Potential Life Lost per 100,000 Population in the Appalachian Region, 2011–2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 34: Chart of Years of Potential Life Lost per 100,000 Population, 2011–2013

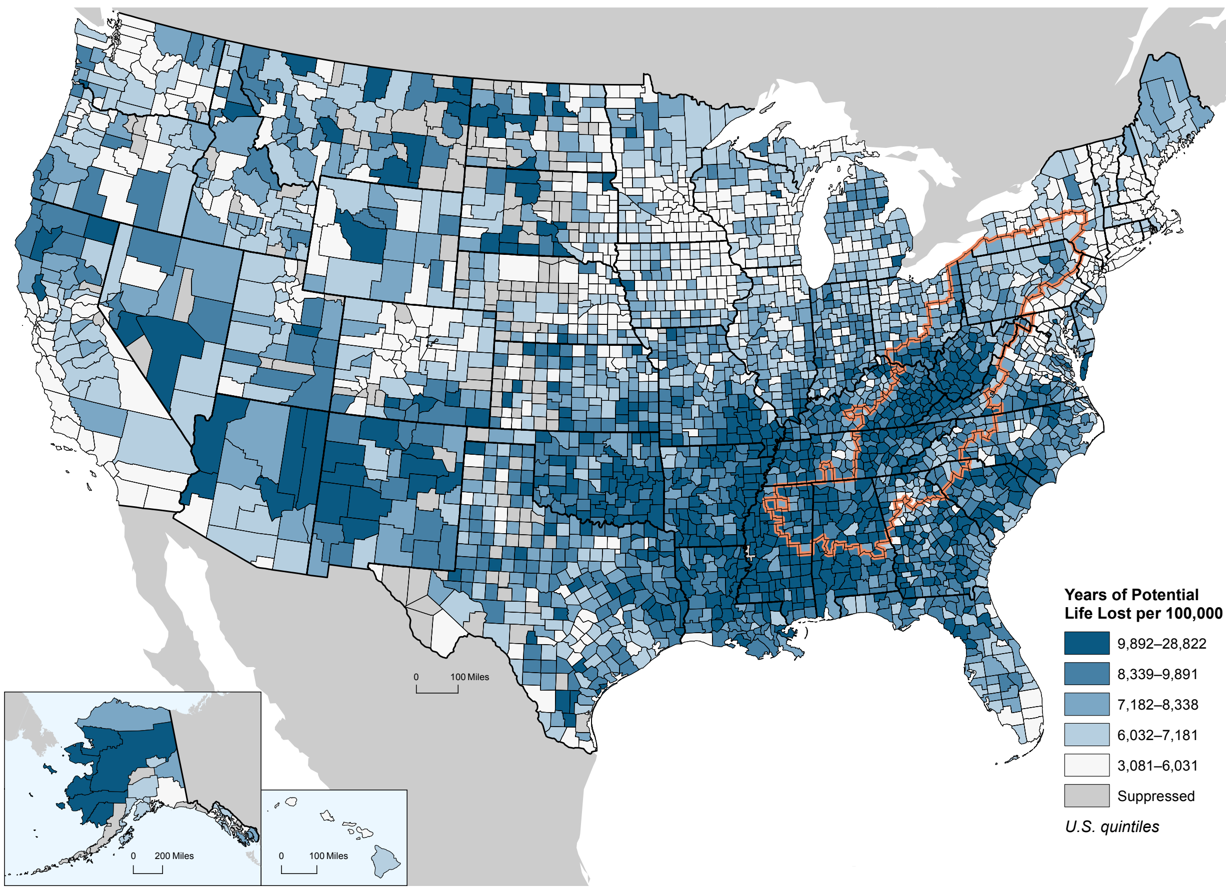


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Years of Potential Life Lost in the United States

Figure 35 shows the variation in YPLL rates across the United States. Outside of the Northern Appalachian subregion, much of the Region consists of counties ranking in the worst-performing national quintile. This pattern of poor performance throughout Appalachia stretches into the Southeast and Mississippi Delta regions. Parts of Arizona and New Mexico also report high YPLL rates, as do several counties in the Dakotas and northern Rocky Mountain states. Rates are lowest in the Upper Midwest and Northeast, as well as in many counties near the Pacific Coast.

Figure 35: Map of Years of Potential Life Lost per 100,000 Population in the United States, 2011–2013

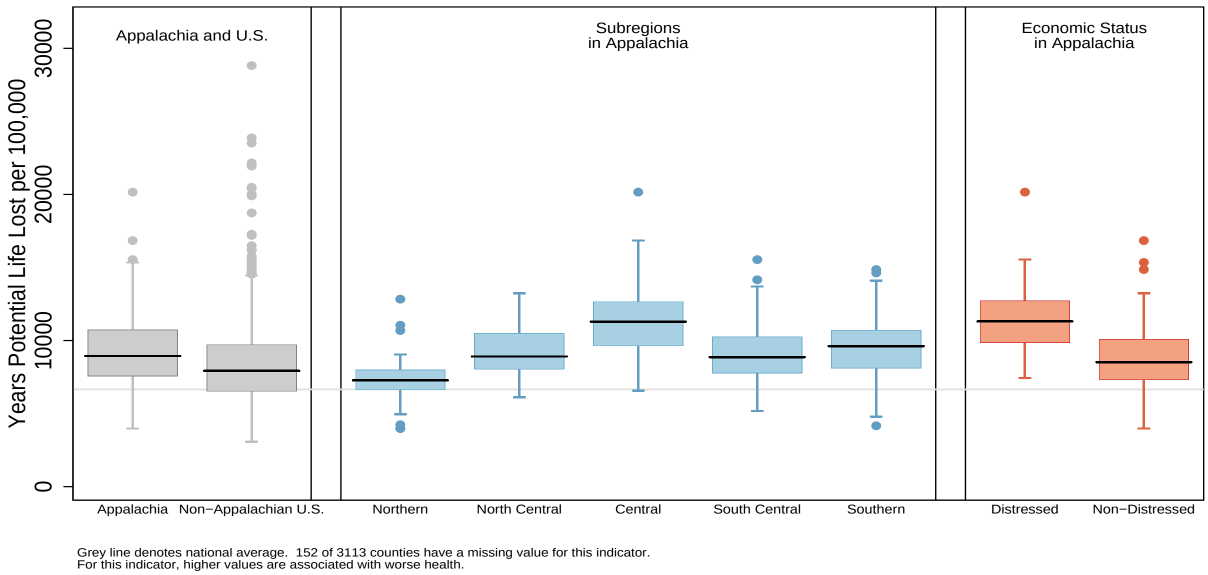


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Years of Potential Life Lost

Figure 36 shows the distribution of YPLL rates by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 152 have a missing value for this indicator. Higher values for this measure indicate worse health.

Figure 36: Box Plot of Years of Potential Life Lost per 100,000 Population by Geography and Economic Status, 2011–2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of YPLL rates among national quintiles for Appalachian counties is shown in Table 20. Of the 420 counties in the Region, 156 (37 percent) rank in the worst-performing national quintile, while 13 (3 percent) rank in the best-performing national quintile.

Table 20: Distribution of Years of Potential Life Lost per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
YPLL	13	*3%*	63	*15%*	81	*19%*	105	*25%*	156	*37%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Further Reading

Heart Disease Deaths

Centers for Disease Control and Prevention. Heart Disease Facts. http://www.cdc.gov/heartdisease/facts.htm

Cancer Deaths

Cancer Statistics. National Cancer Institute. http://www.cancer.gov/about-cancer/understanding/statistics

Healthy People 2020, Office of Disease Prevention and health Promotion. https://www.healthypeople.gov/2020/topics-objectives/topic/cancer

COPD Deaths

Centers for Disease Control and Prevention. Chronic Obstructive Pulmonary Disease (COPD) Accessed 1 July 2016. http://www.cdc.gov/copd/index.html

Office of Disease Prevention and Health Promotion. Respiratory Diseases. https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases

Injury Deaths

County Health Rankings at http://www.countyhealthrankings.org/measure/injury-deaths

Alamgir H, Muazzam S, Nasrullah M. Unintentional falls mortality among elderly in the United States: time for action. Injury. 2012 Dec; 43(12):2065-71. doi: 10.1016/j.injury.2011.12.001. Epub 2012 Jan 20.

Callaghan RC, Gatley JM, Veldhuizen S, Lev-Ran S, Mann R, Asbridge M. Alcohol- or drug-use disorders and motor vehicle accident mortality: a retrospective cohort study. Accident; Analysis and Prevention. 2013 April; 53:149-55. doi: 10.1016/j.aap.2013.01.008. Epub 2013 Feb 1.

Cubbin C, LeClere FB, Smith GS. Socioeconomic status and injury mortality: individual and neighborhood determinants. Journal of Epidemiology and Community Health. 2000 July; 54(7): 517-24.

National Council on Aging. Falls Prevention Programs. Accessed 1 July 2016. https://www.ncoa.org/healthy-aging/falls-prevention/falls-prevention-programs-for-older-adults

Rutledge R, Messick J, Baker CC, Rhyne S, Butts J, Meyer A, Ricketts T. Multivariate population-based analysis of the association of county trauma centers with per capita county trauma death rates. J Trauma. 1992 Jul; 33(1):29-37; discussion 37-8.

Stroke Deaths

Mozaffarian et al. Executive Summary: Heart Disease and Stroke Statistics—2016 Update: A Report From the American Heart Association. Circulation, January 26, 2016. http://circ.ahajournals.org/content/133/4/447.long

Stroke Facts, Centers for Disease Control and Prevention: http://www.cdc.gov/stroke/facts.htm

Healthy People 2020, HDS-3 (Reduce Stroke Deaths): https://www.healthypeople.gov/2020/topics-objectives/topic/heart-disease-and-stroke/objectives

Diabetes Deaths

American Diabetes Association. Statistics About Diabetes. http://www.diabetes.org/diabetes-basics/statistics/

Centers for Disease Control and Prevention. Diabetes. http://www.cdc.gov/nchs/fastats/diabetes.htm

Years of Potential Life Lost

Dranger E and Remington P. YPLL: A Summary Measure of Premature Mortality used in Measuring the Health of Communities. University of Wisconsin Public Health and Health Policy Institute. https://uwphi.pophealth.wisc.edu/publications/issue-briefs/issueBriefv05n07.pdf

Morbidity

KEY FINDINGS | Physically Unhealthy Days

- The average adult in the Appalachian Region reports feeling physically unhealthy 14 percent more often than the average American.
- With 5.1 physically unhealthy days per person per month, residents in Central Appalachia report feeling physically unhealthy 42 percent more often than the average American. This figure is the highest among the five Appalachian subregions.
- Residents living in the Appalachian Region's rural counties are 24 percent more likely to report feeling physically unhealthy than those living in the Region's large metro areas.
- Residents living in the Appalachian Region's distressed counties are 25 percent more likely to report feeling physically unhealthy than those living in the Region's non-distressed counties.

Background

Physically unhealthy days are the number of days per month the average adult age 18 years and older reports feeling physically unhealthy or of poor physical health. The data for this measure come from County Health Rankings and are based on CDC's Behavioral Risk Factor Surveillance System (BRFSS) survey data collected in 2014. The data for this measure have been age-adjusted.

This measure is intended, in part, to examine overall quality of life; that is, how do people *feel* on a typical day? It is also intended to capture the aspects of poor health that may not be picked up by other morbidity measures focusing on specific diseases and illnesses. Data for physically unhealthy days are collected as part of the BRFSS survey in which respondents are asked, "Now, thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?"

Understanding the number of days people *feel* sick or unhealthy is an important component when examining a community's health status (Froshaug, Dickinson, Fernald, & Green, Personal Health Behaviors are Associated with Physical and Mental Unhealthy Days: A Prescription for Health (P4H) Practice-based Research Networks Study, 2009). As such, the measure has been applied in both public health and clinical research contexts (Moriarty, Zack, & Kobau, 2003). In addition to the physical health effects, physically unhealthy days can inhibit a person's ability to obtain gainful employment and, in some instances, can also affect a person's mental health status. Some researchers believe that physically unhealthy days are a precursor of future health issues and demands for medical care (Dominick, Ahern, Gold, & Heller, 2002). Based on a county-level analysis, more physically unhealthy days were found to be correlated with higher unemployment and poverty rates, as well as lower rates of high school completion (Jia, Muennig, Lubetkin, & Gold, 2004). These socioeconomic patterns are evident throughout studies examining physically unhealthy days.

Overview: Physically Unhealthy Days in the Appalachian Region

Overall, at 4.1 days per person per month, Appalachian residents report approximately 0.5 more physically unhealthy days per month than the national average of 3.6, or around 6 more days per person per year. Northern Appalachia is the best-performing subregion at 3.7 days per month, a figure still higher than the national average. Rates are markedly higher in Central Appalachia, with residents in the subregion reporting 1.5 more physically unhealthy days per month than the average American. The average of 5.1 days per person per month in this subregion is 42 percent higher than the national average. North Central (4.5 days per person per month), South Central (4.3 days), and Southern Appalachia (4.1 days) are all relatively similar: not quite as extreme as Central Appalachia but still performing worse than the nation as a whole.

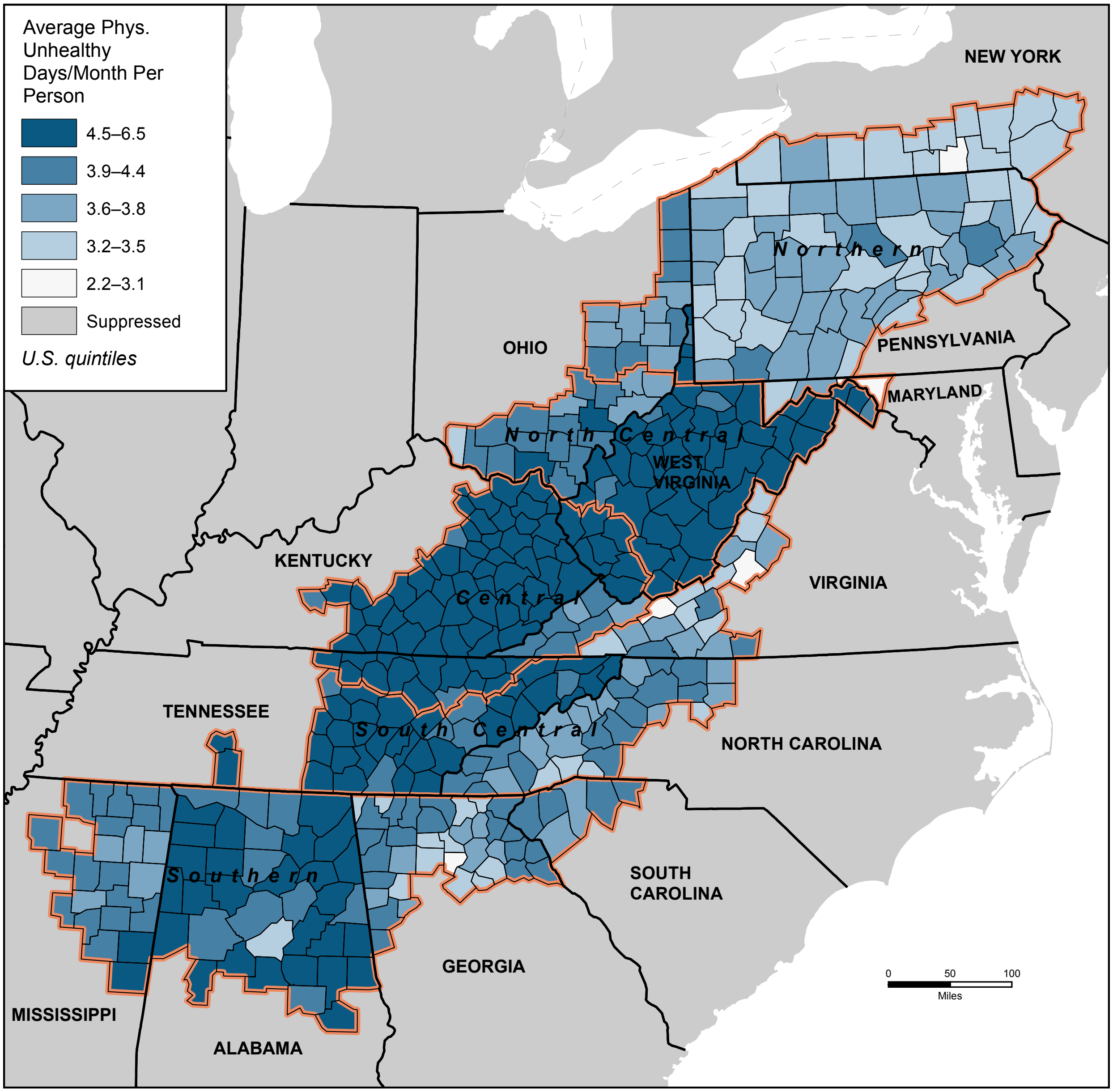
There is an urban-rural divide within the Region, with residents in rural counties reporting an average of 4.6 days per person per month (or 55 days per year), a figure 24 percent higher than the 3.7 days per person per month (or 44 days per year) reported in the Region's large metro counties. There is a stark difference in the frequency of physically unhealthy days based on a county's economic status. Residents in Appalachian counties classified as distressed report an average of 5.0 days per person per month (or 60 days per person per year), a mark 25 percent higher than the average in the Region's non-distressed counties of 4.0 days per person per month (or 48 days per person per year). The average for the Region's non-distressed counties is still 11 percent higher than the national average.

The Appalachian portions of Alabama, Kentucky, and Tennessee, as well as all of West Virginia, report the highest numbers of physically unhealthy days in the Region. The average for each of these areas is around 5 days per month (or 60 days per year), well above the national average of 43 days per year. As expected given the subregional patterns, the Appalachian portions of Maryland, New York, and Pennsylvania all experience levels either at or below the national average.

Figure 37 displays the variation in the average number of physically unhealthy days reported per person per month across the Appalachian Region. Darker colors indicate a greater frequency of physically unhealthy days. Many counties throughout the North Central, Central, and South Central Appalachian subregions, as well as Appalachian Alabama, rank in the worst-performing national quintile for this measure.

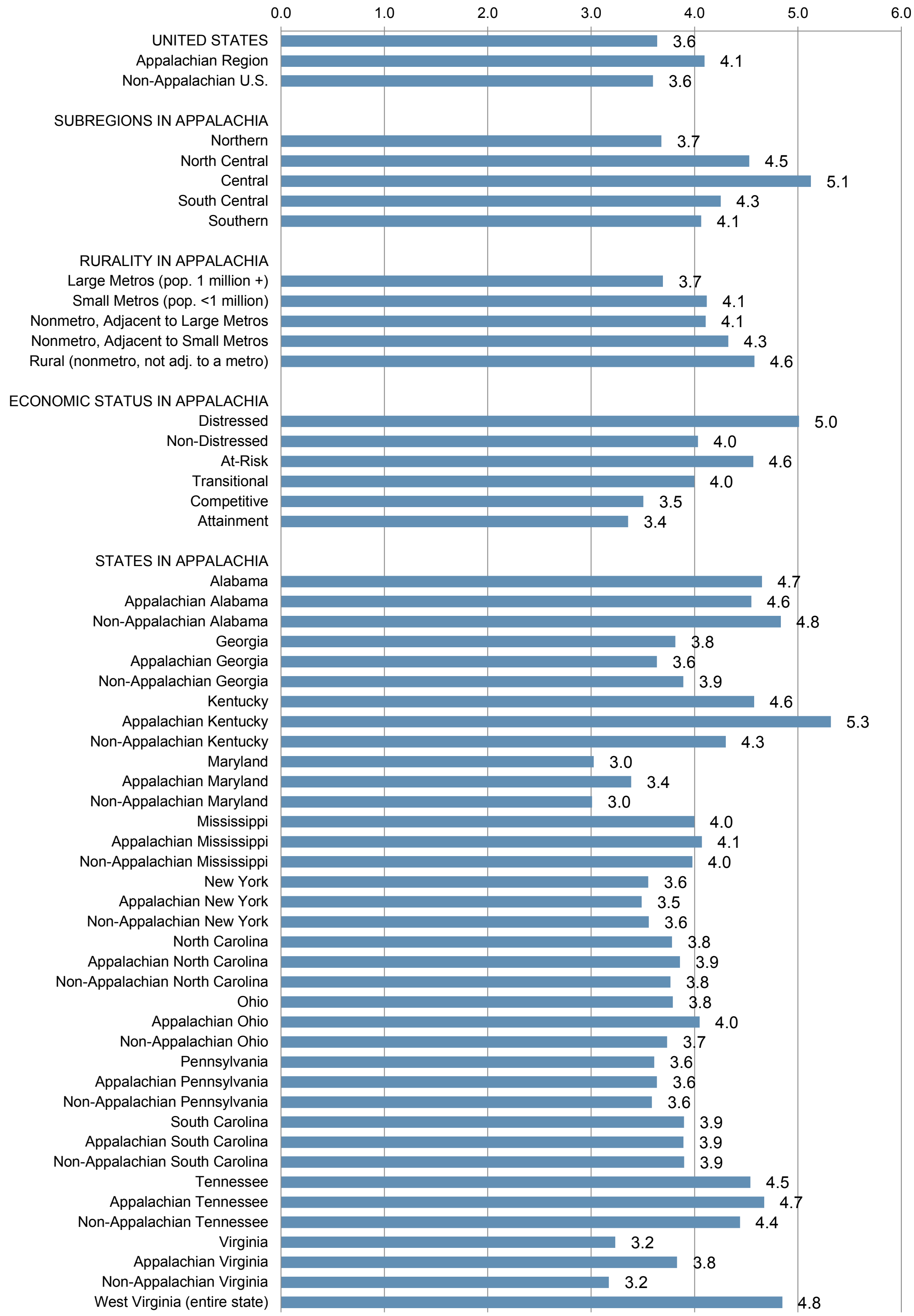
Figure 38 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 37: Map of Physically Unhealthy Days per Person per Month in the Appalachian Region, 2014



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 38: Chart of Physically Unhealthy Days per Person per Month, 2014

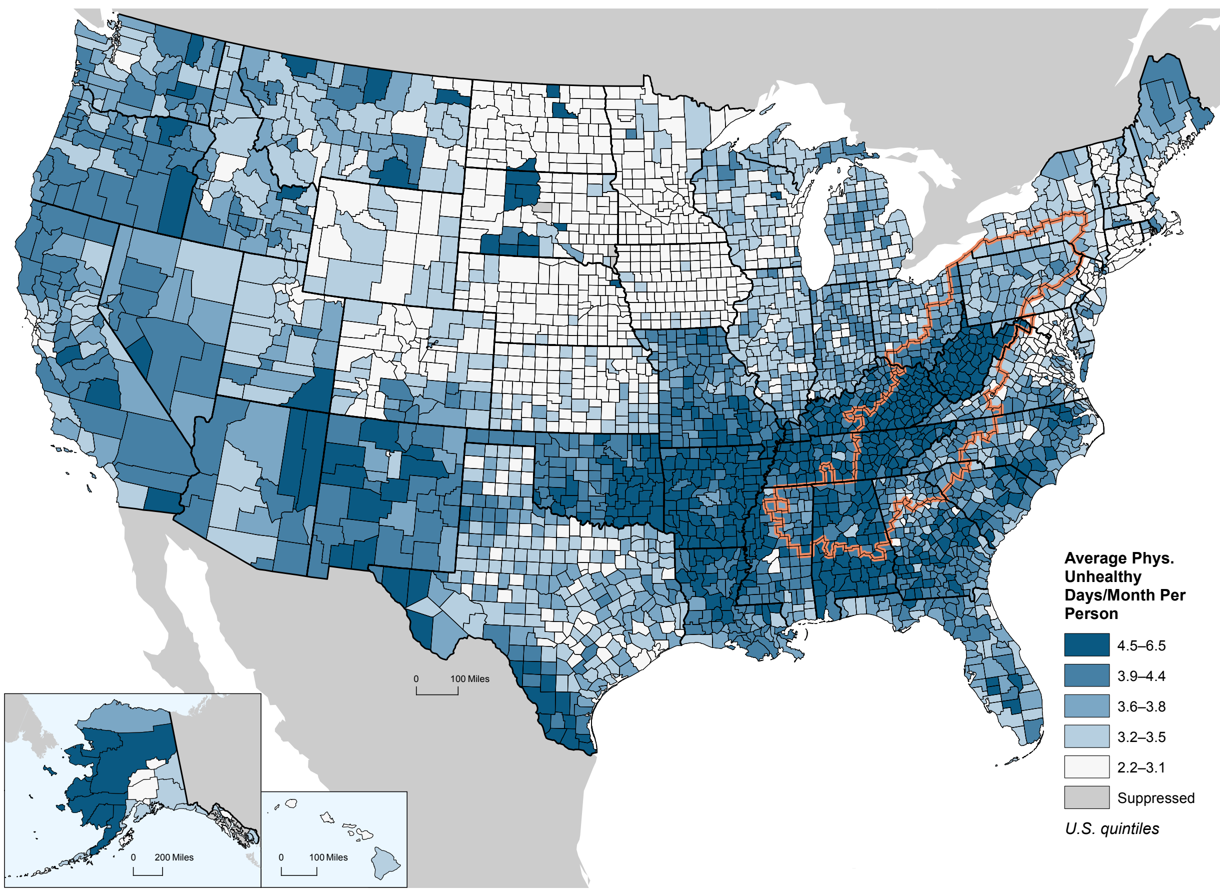


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Physically Unhealthy Days in the United States

Figure 39 shows the variation in the frequency of physically unhealthy days across the United States. The pattern of high values in Central Appalachia extends into much of the southern part of the country, including the coastal Southeast. The Mississippi Delta region has noticeably high levels that stretch into Missouri to the north and Oklahoma to the west. There are also pockets of poor performance throughout the West, although few counties rank in the worst-performing national quintile. Meanwhile, many counties throughout the Northeast and upper Midwest rank in the best-performing national quintile. There also appears to be a positive trend around large metropolitan areas throughout the country.

Figure 39: Map of Physically Unhealthy Days per Person per Month in the United States, 2014

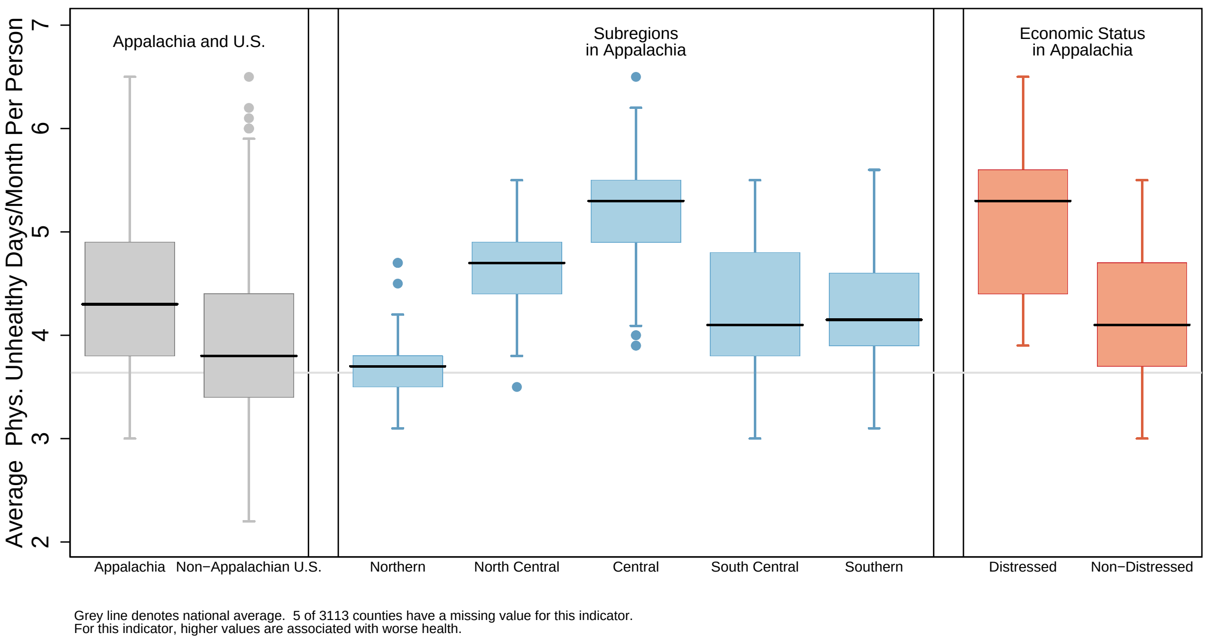


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Physically Unhealthy Days

Figure 40 shows the distribution of physically unhealthy days by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, five have a missing value for this indicator. For this measure, higher values are associated with worse health.

Figure 40: Box Plot of Physically Unhealthy Days per Person per Month by Geography and Economic Status, 2014



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of physically unhealthy days among national quintiles for Appalachian counties is shown in Table 21. Of the 420 counties in the Region, 177 (42 percent) rank in the worst-performing national quintile, while only 5 (1 percent) rank in the best-performing national quintile.

Table 21: Distribution of Physically Unhealthy Days per Person per Month among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Physically unhealthy days	5	*1%*	39	*9%*	93	*22%*	106	*25%*	177	*42%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Mentally Unhealthy Days

KEY FINDINGS | Mentally Unhealthy Days

- The average resident in Appalachia reports feeling mentally unhealthy 14 percent more often than the average American.
- With 4.5 mentally unhealthy days per person per month, residents in both North Central and Central Appalachia report feeling mentally unhealthy 25 percent more often than the average American.
- Residents living in the Appalachian Region's rural counties are 10 percent more likely to report feeling mentally unhealthy than those living in the Region's large metro areas.
- Residents living in the Appalachian Region's distressed counties are 10 percent more likely to report feeling mentally unhealthy than those living in the Region's non-distressed counties.

Background

Mentally unhealthy days are the number of days per month the average adult age 18 and older reports feeling mentally unhealthy or of poor mental health. The data for this measure come from County Health Rankings and are based on CDC's Behavioral Risk Factor Surveillance System (BRFSS) survey data collected in 2014. The data for this measure have been age-adjusted.

This measure is intended, in part, to examine overall quality of life; that is, how do people *feel* on a typical day? It is also intended to capture the aspects of poor health and quality of life that may not be picked up by other morbidity or well-being measures. Data for mentally unhealthy days are collected as part of the BRFSS survey in which respondents are asked, "Now, thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"

Counties with greater numbers of mentally unhealthy days have higher unemployment, poverty, disability, and mortality rates, as well as lower high school completion rates (Jia, Muennig, Lubetkin, & Gold, 2004). Higher levels of education and income are also correlated with lower numbers of mentally unhealthy days (United Health Foundation, 2016).

Not every poor mental health day reflects a condition requiring treatment. Transitory conditions such as grief, for example, or temporary anxiety or stress, are also captured as part of this measure. Still, poor mental health days may have an effect on a person's ability to work or care for a dependent child or family member. Mental health issues may also lead to physical health issues (Canadian Mental Health Association, 2017).

Overview: Mentally Unhealthy Days in the Appalachian Region

At 4.1 days per person per month, Appalachian residents report approximately 0.5 more mentally unhealthy days than the national average of 3.6, or around 6 more days per person per year. Northern Appalachia is the best-performing subregion at 3.9 days per person per month, a figure still higher than the national average. Levels are markedly higher in both North Central and Central Appalachia, with their residents reporting 0.9 more mentally unhealthy days per month than the average American. The average of 4.5 days per person per month in these subregions is 25 percent higher than the national average. South Central Appalachia (4.2 days per person per month, 17 percent higher than the national average) and Southern Appalachia (4.1 days, 14 percent higher) also perform worse than the nation as a whole.

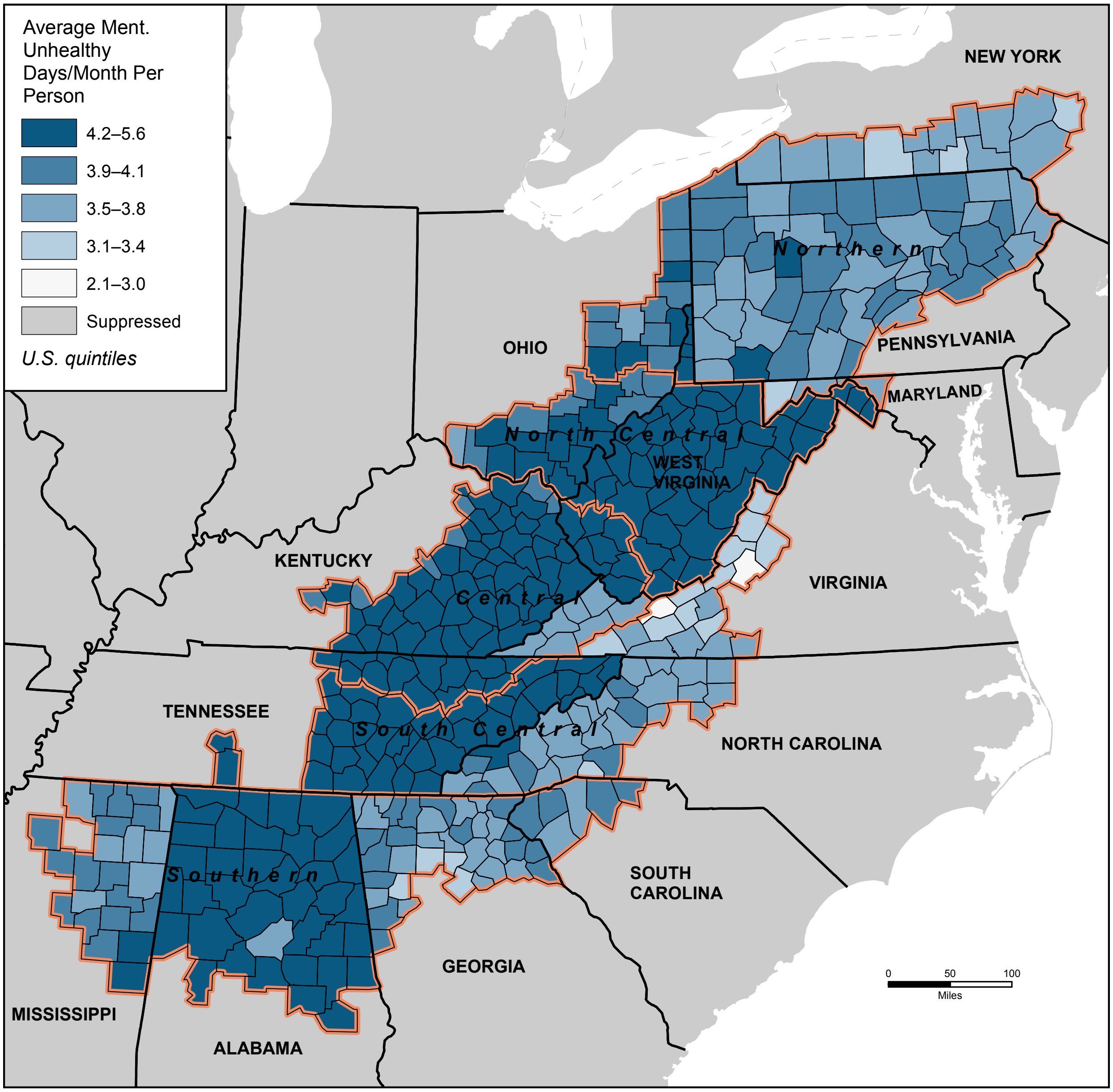
There is some degree of an urban-rural divide within the Region, with residents in rural counties in the Appalachian Region reporting an average of 4.3 mentally unhealthy days per person per month (or 52 days per person per year), a figure 10 percent higher than the 3.9 days reported in the Region's large metro counties (or 47 days per person per year). There is also a divide in the frequency of mentally unhealthy days based on a county's economic status. Residents in Appalachian counties classified as distressed report an average of 4.5 days per person per month (or 54 days per person per year), which is 10 percent higher than those in non-distressed counties (4.1 days per person per month, 49 days per person per year). The average among non-distressed counties is still 14 percent higher than the national average.

Residents in the Appalachian portions of Alabama, Kentucky, and Tennessee, as well as all of West Virginia, report the highest numbers of mentally unhealthy days in the Region. The averages in the Appalachian portions of these four states are all 4.5 per person per day or higher, which is 25 percent higher than the national average. Although pockets of the Region experience levels of strong performance, Appalachian Virginia, with 3.6 mentally unhealthy days per person per month, is the only Appalachian portion of any state on par with the nation as a whole.

Figure 41 shows the variation of mentally unhealthy days across the Appalachian Region. Darker colors indicate higher rates of mentally unhealthy days. The majority of counties in North Central and Central Appalachia rank in the worst-performing national quintile. Large portions of both South Central and Southern Appalachia also perform poorly on this measure, while most of Northern Appalachia appears to be close to the national average.

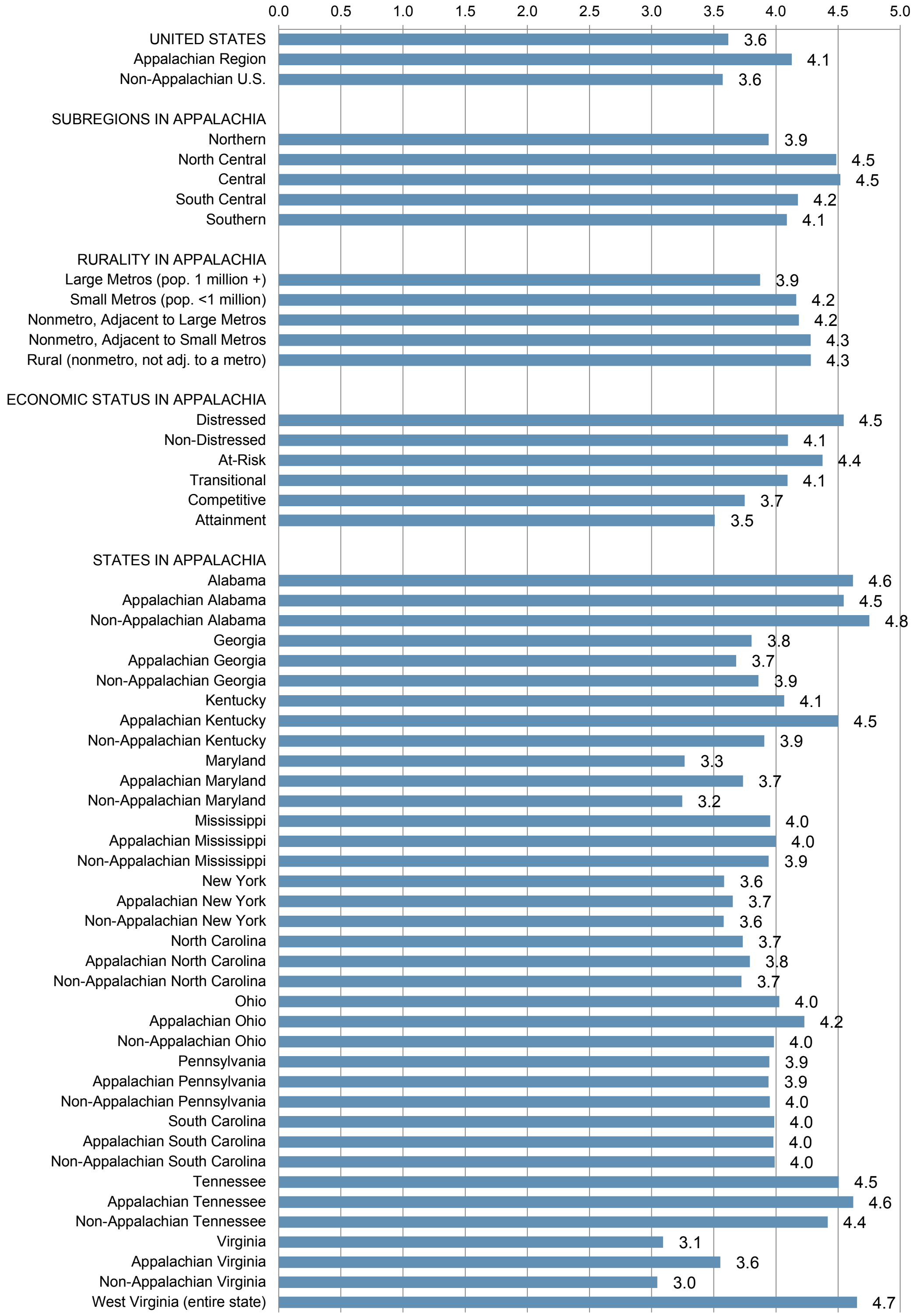
Figure 42 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 41: Map of Mentally Unhealthy Days per Person per Month in the Appalachian Region, 2014



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 42: Chart of Mentally Unhealthy Days per Person per Month, 2014

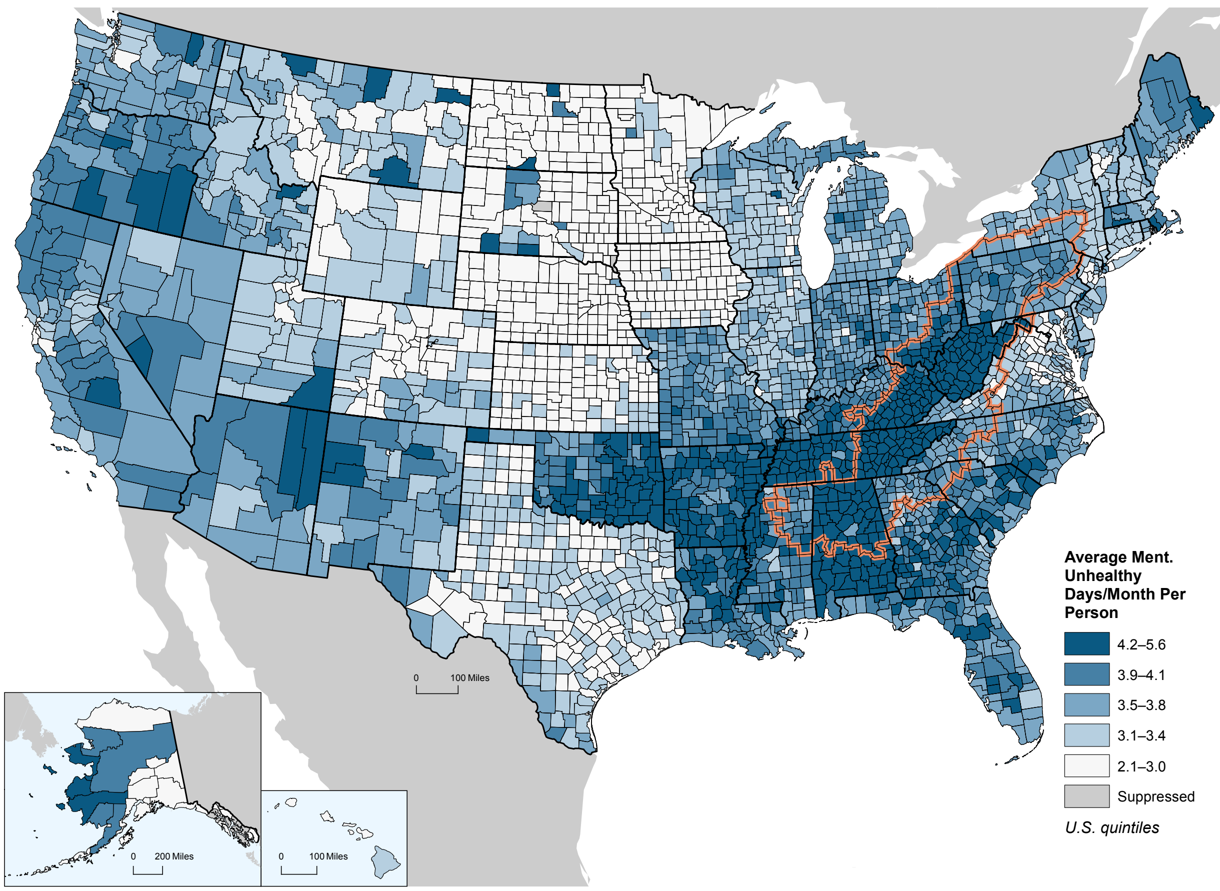


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Mentally Unhealthy Days in the United States

Figure 43 shows the variation in the frequency of mentally unhealthy days across the United States. The pattern of high values throughout Appalachia extends into much of the southern part of the country, including pockets in the coastal Southeast. High values are also found in the Mississippi Delta region, including north into Missouri and west into Oklahoma. Counties throughout the middle of the country, stretching from the Dakotas and Minnesota in the north to Texas in south, have the lowest levels in the country. Counties throughout the West generally perform on par with the national average, with pockets of both good and bad performance.

Figure 43: Map of Mentally Unhealthy Days per Person per Month in the United States, 2014

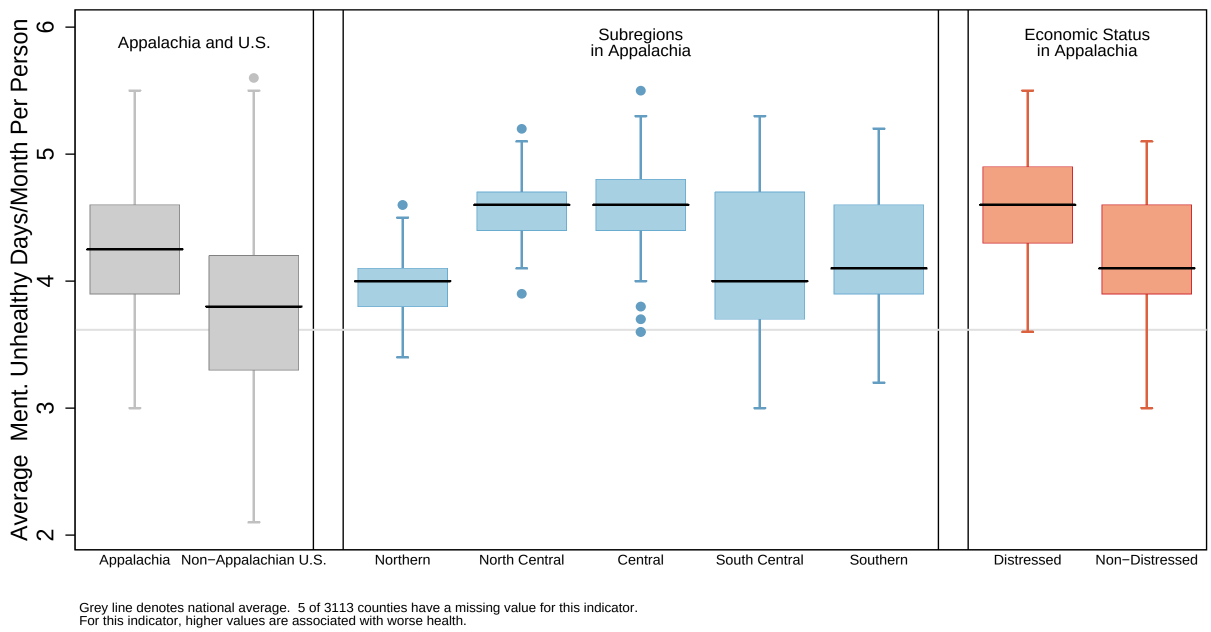


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Mentally Unhealthy Days

Figure 44 shows the distribution of mentally unhealthy days by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, five have a missing value for this indicator and are not included. For this measure, higher values are associated with worse health.

Figure 44: Box Plot of Mentally Unhealthy Days per Person per Month by Geography and Economic Status, 2014



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of mentally unhealthy days among national quintiles for Appalachian counties is shown in Table 22 . Of the 420 counties in the Region, 210 (50 percent) rank in the worst-performing national quintile, while only 2 counties (nearly zero percent) rank in the top-performing national quintile.

Table 22: Distribution of Mentally Unhealthy Days per Person per Month among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Mentally unhealthy days	2	*0%*	19	*5%*	96	*23%*	93	*22%*	210	*50%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

HIV Prevalence

KEY FINDINGS | HIV Prevalence

- The prevalence of HIV is 57 percent lower in the Appalachian Region than in the nation as a whole.
- Among the five subregions, Southern Appalachia has the highest HIV prevalence, a figure that is still 41 percent lower than the national average.
- There is an urban-rural divide in HIV rates in the Appalachian Region. Residents living in the Appalachian Region's large metro areas are more than twice as likely to have HIV as those living in the Region's rural areas.
- The Appalachian Region's non-distressed counties report HIV rates 57 percent higher than the rates reported by the Region's distressed counties.

Background

The HIV prevalence rate measures the number of people living with HIV per 100,000 population. This measure is based on 2013 data from the Centers for Disease Control and Prevention. HIV is a virus that attacks the immune system, making it difficult for the body to fight off infections and disease. More than 1.2 million people in the United States are living with HIV, and among those infected, one in eight are unaware of their condition (Centers for Disease Control and Prevention, HIV, 2016).

In the United States, HIV is spread primarily through unprotected sex or sharing of intravenous drug use material with infected persons (Centers for Disease Control and Prevention, HIV Transmission, 2016). According to CDC, there are a number of ways to prevent HIV infection, including: abstinence, limiting the number of sexual partners, using condoms, and not sharing needles. Additionally, there are medications that reduce the risk of infection (Centers for Disease Control and Prevention, HIV Prevention, 2016). While HIV cannot be cured, it can be managed. There are a number of complications related to HIV infection, including: AIDS, certain cancers, tuberculosis, and hepatitis B and C (Centers for Disease Control and Prevention, TB and HIV Coinfection, 2016); (Centers for Disease Control and Prevention, HIV and Viral Hepatitis, 2014). Because HIV and hepatitis B and C are transmitted through common modes, people with HIV are at increased risk of hepatitis coinfection. CDC notes that approximately 80 percent of people with HIV who inject drugs also have hepatitis C. HIV coinfection more than triples the risk for liver disease, liver failure, and liver-related death from hepatitis C (Centers for Disease Control and Prevention, HIV and Viral Hepatitis, 2014).

Since 2005, new diagnoses of HIV have decreased among some groups, including heterosexuals, intravenous drug users, and women; however, African-Americans and Latinos have seen an increase over the same period (Centers for Disease Control and Prevention, HIV by Group, 2017). The majority of new diagnoses occur among homosexual men (Centers for Disease Control and Prevention, HIV by Group, 2017).

Past studies have found HIV rates to be higher in urban areas, particularly those located in the South (Vyavaharkar, Glover, Leonhirth, & Probst, 2013). Prevention and treatment of HIV requires a complex and interconnected web of programs and resources. For instance, a past study determined that an HIV vaccine might be acceptable to high-risk drug users in Appalachia, but successful implementation would first require the creation of a multitude of specific programmatic details to address social norms and other barriers in the Region (Young, DiClemente, Halgin, Sterk, & Havens, 2014).

One particularly important component of HIV prevention efforts include improving the rates of early diagnosis and then treating those diagnosed to achieve viral suppression. Increasing education, testing, and awareness of HIV, as is the case for so many health issues, are key factors.

Overview: HIV Prevalence in the Appalachian Region

At 153 cases of HIV per 100,000 population, HIV prevalence in the Appalachian Region is 57 percent lower than the national rate of 355 cases per 100,000. Southern Appalachia has the highest rate among the subregions at 211 cases per 100,000 population, which is still 41 percent lower than the national rate. Central Appalachia is the best-performing subregion in Appalachia, with an HIV rate of just 63 cases per 100,000 population. Northern Appalachia (131 cases per 100,000 population), North Central Appalachia (99 cases), and South Central Appalachia (157 cases) are all well below the national figure.

As one moves from large metro areas to rural areas throughout Appalachia, HIV prevalence declines. In large metro areas in the Region, the number of reported cases per 100,000 population is 207, more than double the 90 cases reported in the Region's rural areas. The Appalachian Region's distressed counties (100 cases per 100,000 population) report lower HIV prevalence than non-distressed counties (157 cases).

Among the Appalachian portions of each state in the Region, Maryland's three counties report the highest HIV rates at 295 cases per 100,000, although this number is still below the national rate. As expected given the subregional trends, the Appalachian portions of Alabama (254 cases per 100,000 population), South Carolina (228 cases), Mississippi (188 cases), and Georgia (165 cases) report the highest rates in the Region, but these figures are all still well below the national rate. Appalachian North Carolina (188 cases per 100,000 population) and Appalachian New York (162 cases) are also found in this range.

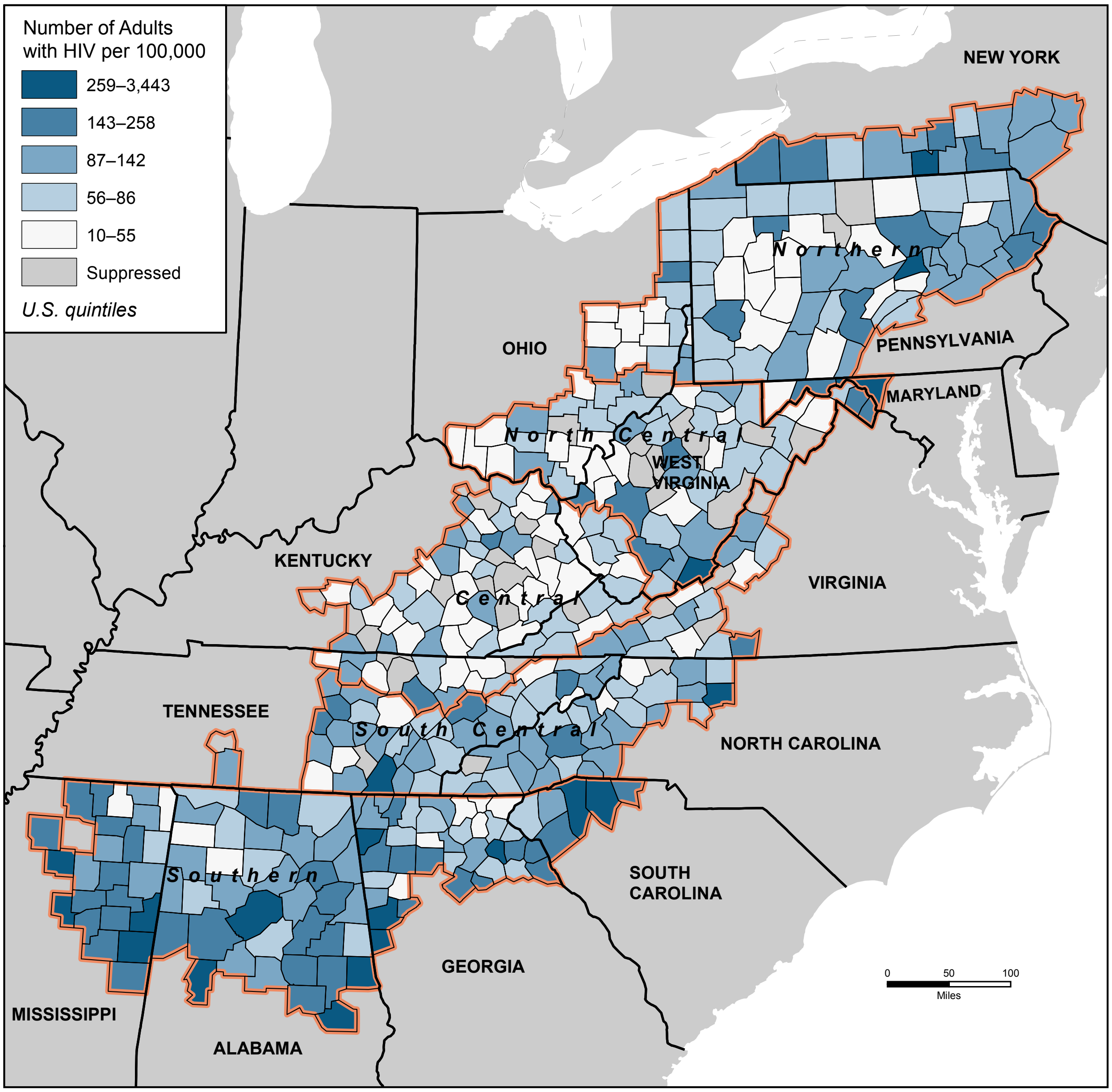
The rates reported by states as a whole demonstrate the urban-rural divide in HIV prevalence. New York (772 cases per 100,000 population) and Maryland (638 cases) have the highest rates among the thirteen states when considering both Appalachian and non-Appalachian portions. These high rates can most likely be explained by the large percentages of the two states' populations residing in New York City and the Baltimore-Washington metropolitan areas, respectively. Georgia (495 cases per 100,000 population) reports the third highest figure among states as a whole, a finding consistent with previously discussed trends regarding both urban-rural differences (Atlanta is the largest metropolitan area in the state) and a generally higher prevalence in the South.

Figure 45 shows the variation in HIV prevalence across the Appalachian Region. Darker blue indicates higher HIV rates among a county's residents. Southern Appalachia has the highest rate among the subregions, and each of the four states—Alabama, Georgia, Mississippi, and South Carolina—have multiple counties in the worst-performing national quintile.

Figure 46 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout

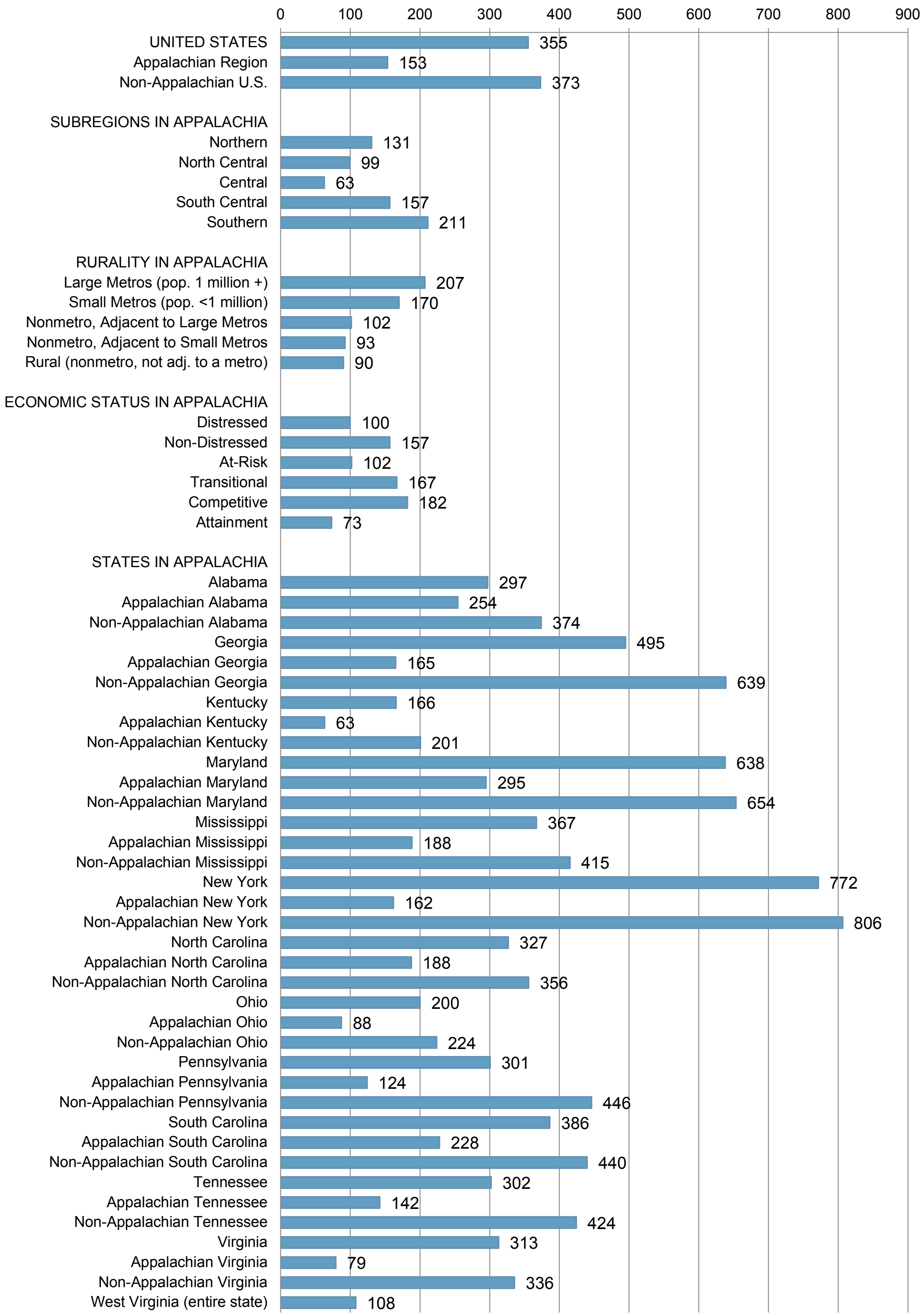
Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 45: Map of HIV Prevalence per 100,000 Population in the Appalachian Region, 2013



Data source: CDC National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Centers for Disease Control and Prevention http://gis.cdc.gov/grasp/nchhstpatlas/main.html?value=AQT.

Figure 46: Chart of HIV Prevalence per 100,000 Population, 2013

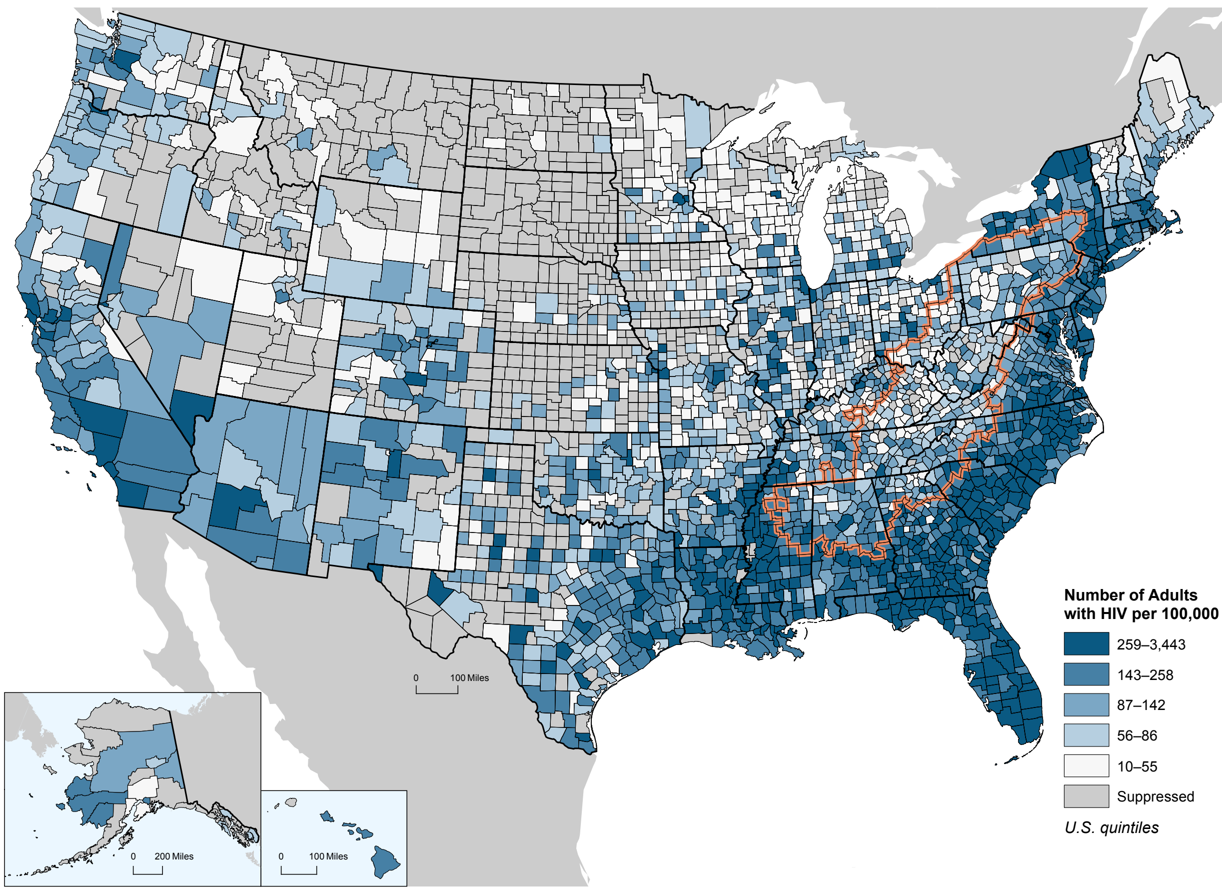


Data source: CDC National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Centers for Disease Control and Prevention http://gis.cdc.gov/grasp/nchhstpatlas/main.html?value=AQT.

Overview: HIV Prevalence in the United States

Figure 47 shows the variation in HIV prevalence across the United States. The map shows a clear concentration of high HIV rates along the East Coast, from New England to Florida and then into inland areas of the South, including the Mississippi Delta region. Throughout the East, as well as across the rest of the country, rates are noticeably higher in and around large metropolitan areas. Many counties throughout the West and Upper Midwest have suppressed values, and thus a complete picture of national HIV prevalence is unavailable.

Figure 47: Map of HIV Prevalence per 100,000 Population in the United States, 2013

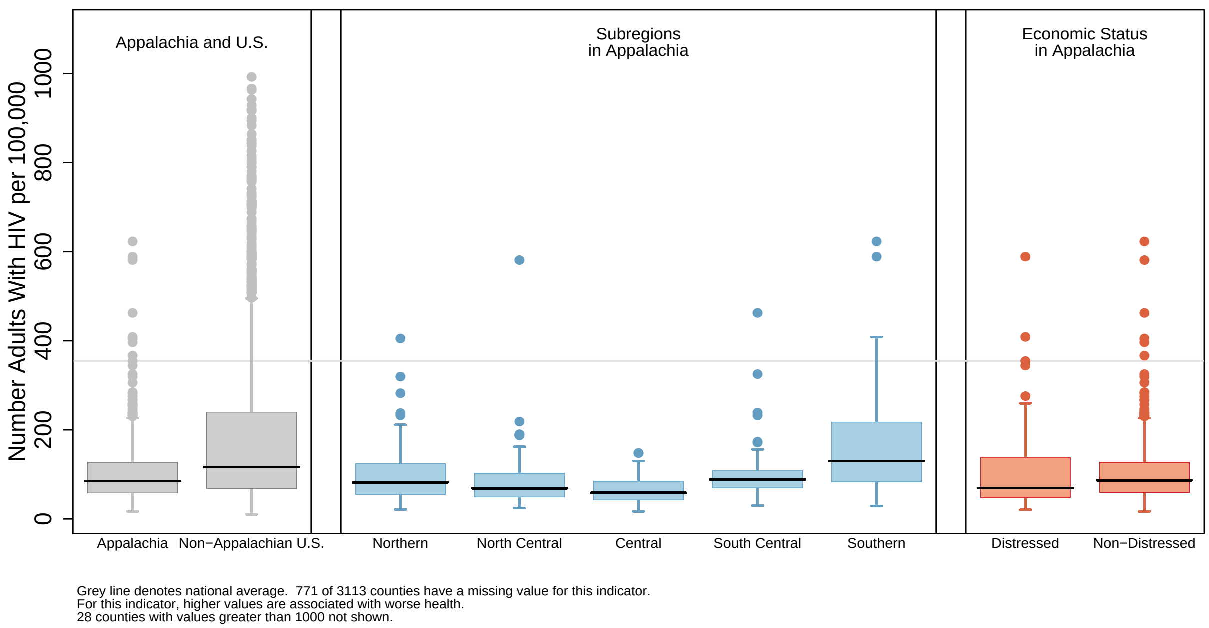


Data source: CDC National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Centers for Disease Control and Prevention [http://gis.cdc.gov/grasp/nchhstpatlas/main.html?value=AQT.](http://gis.cdc.gov/grasp/nchhstpatlas/main.html?value=AQT)

Distribution of HIV Prevalence

Figure 48 shows the distribution of HIV prevalence rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of the 3,113 counties in the nation, 771 have a missing value for this indicator, and 28 counties with values greater than 1,000 are not included in this box plot. For this measure, higher values are associated with worse health.

Figure 48: Box Plot of HIV Prevalence per 100,000 Population by Geography and Economic Status, 2013



Data source: CDC National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Centers for Disease Control and Prevention http://gis.cdc.gov/grasp/nchhstpatlas/main.html?value=AQT.

The distribution of HIV prevalence among national quintiles for Appalachian counties is shown in Table 23. Of the 420 counties in the Region, 20 (5 percent) rank in the worst-performing national quintile, while 89 (21 percent) are in the best-performing national quintile.

Table 23: Distribution of HIV Prevalence per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
HIV prevalence	89	*21%*	109	*26%*	104	*25%*	61	*15%*	20	*5%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Diabetes Prevalence

- The prevalence of diabetes in the Appalachian Region is 11.9 percent, a mark higher than the 9.8 percent experienced by the nation as a whole.
- All five subregions in Appalachia report a higher prevalence of diabetes than the national average, with Central Appalachia (13.5 percent) and North Central Appalachia (12.8 percent) reporting the highest percentages.
- There is an urban-rural divide in diabetes prevalence—13.0 percent of the residents in the Appalachian Region's rural counties have been diagnosed with the disease, compared to 10.5 percent of those living in the Region's metro areas.
- There is also a divide in diabetes prevalence based on economic status. The Appalachian Region's distressed counties report a mark of 13.7 percent, whereas the Region's non-distressed counties report 11.7 percent.

Background

Diabetes prevalence is the percentage of adults age 20 and older who have been diagnosed with Type 1 or Type 2 diabetes. The measure is based on 2012 information from the Centers for Disease Control and Prevention that combines multiple datasets and direct survey responses to estimate the local prevalence rate (Centers for Disease Control and Prevention, Diabetes(b) 2016).

Type 2 diabetes is much more common among adults than Type 1 diabetes— approximately 30 million adults have been diagnosed with Type 2 diabetes in the United States (Centers for Disease Control and Prevention, Diabetes, 2014). Type 2 diabetes is considered a preventable disease, unlike the Type 1 variant (Centers for Disease Control and Prevention, Diabetes(a) 2016). According to CDC, the risk factors for Type 2 diabetes include: older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, race, and ethnicity (Centers for Disease Control and Prevention, Diabetes 2015). Among the many complications of diabetes, the disease can result in blindness, kidney failure, neuropathy, and lower-extremity amputation (Centers for Disease Control and Prevention, Diabetes, 2014). Diabetics have a higher risk of premature death than those living without diabetes (Centers for Disease Control and Prevention, Diabetes, 2014). Diabetes is known to increase the risk of depression and result in a lower quality of life among diagnosed adults (Centers for Disease Control and Prevention, Diabetes, 2014).

According to the National Center for Health Statistics, three percent of adults in the United States over the age of twenty have undiagnosed diabetes (Centers for Disease Control and Prevention, Diabetes 2016). Diabetes prevalence has increased in conjunction with the recent rise in obesity rates (Eckel, et al., 2011). Diabetes prevalence among rural residents is much higher than for those living in urban areas (Krishna, Gillespie, & McBride, 2010). In general, older individuals are at an increased risk for developing diabetes, as are minorities and low-income individuals (Centers for Disease Control and Prevention, Diabetes, 2014).

Overview: Diabetes Prevalence in the Appalachian Region

With 11.9 percent of Appalachian residents age 20 and older diagnosed with diabetes, the disease is more common in the Appalachian Region than in the nation as a whole (9.8 percent). All five subregions in Appalachia report higher diabetes prevalence than the national figure, with Central (13.5 percent) and North Central (12.8 percent) Appalachia reporting the highest percentages.

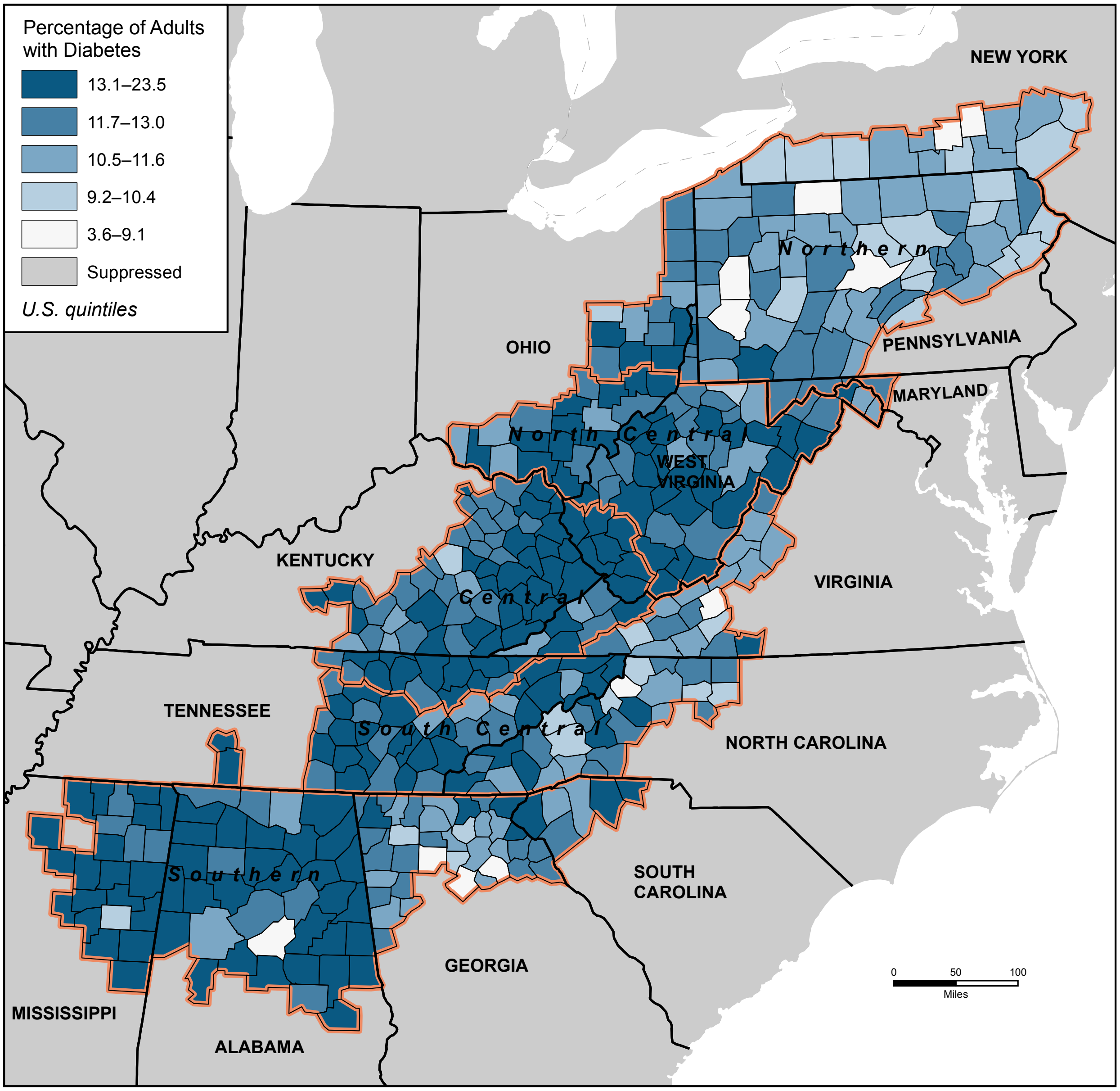
There is an urban-rural divide in diabetes prevalence. In the Appalachian Region's rural counties, 13.0 percent of the residents have been diagnosed with the disease, compared to 10.5 percent of those living in the Region's metro areas. There is also a divide in diabetes prevalence based on economic status. Distressed counties in Appalachia report an average of 13.7 percent, a mark higher than the 11.7 percent reported in the Region's non-distressed counties.

When considering the Appalachian portions of states throughout the Region, the percentages mirror the subregional trends and tend to be highest in the central and southern areas. Appalachian Mississippi reports the highest prevalence at 13.8 percent, with the Appalachian portions of Kentucky (13.3 percent), Tennessee (13.0 percent), and Alabama (12.9 percent) also reporting high percentages. West Virginia (13.1 percent) also reports a high percentage of its residents living with diabetes.

Figure 49 shows the variation in diabetes prevalence across the Appalachian Region. Darker blue indicates a higher incidence of diabetes among a county's residents. High levels of diabetes prevalence are found throughout much of the Region, with many counties ranking in the two worst-performing national quintiles.

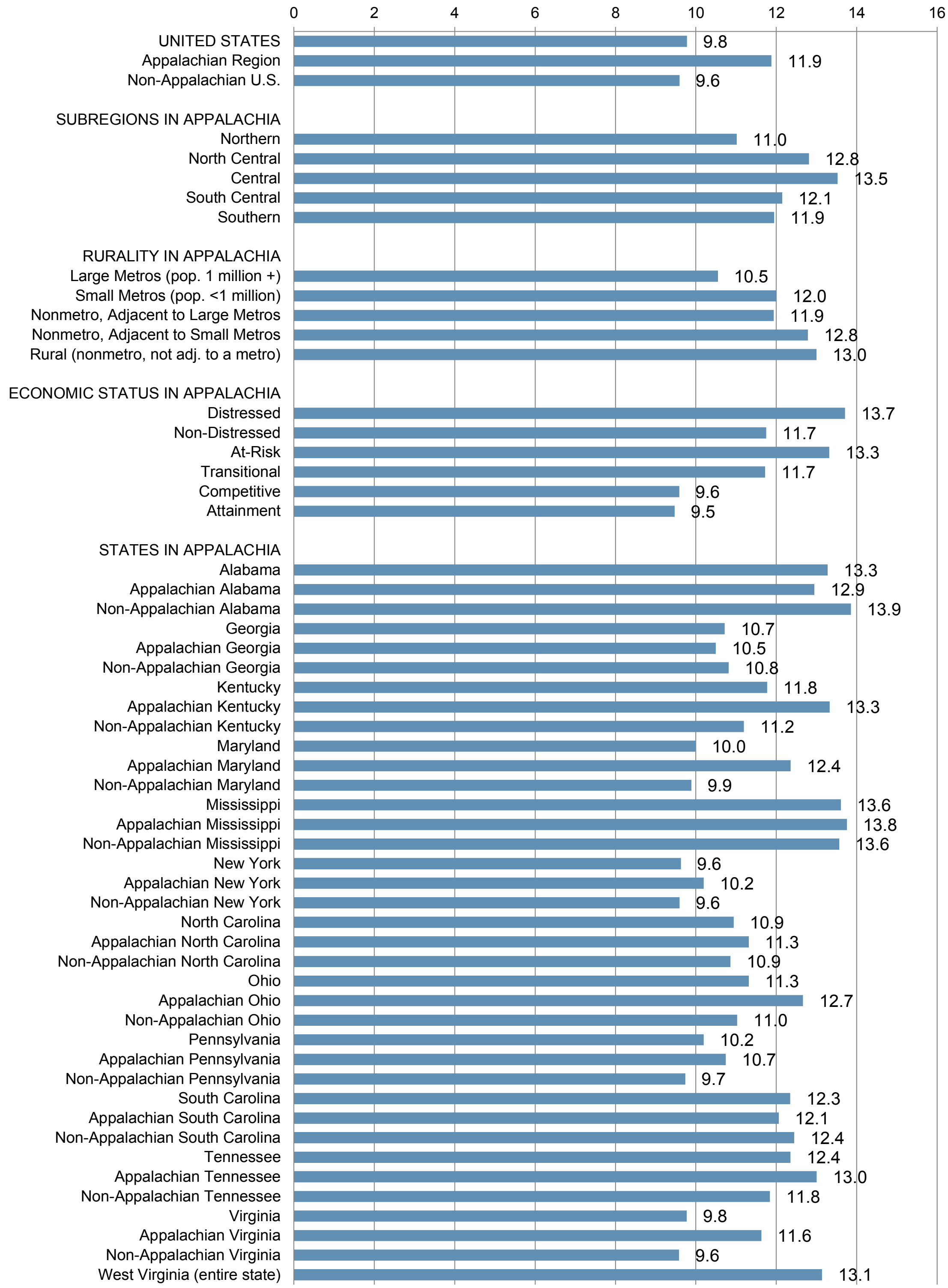
Figure 50 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 49: Map of Percentage of Adults with Diabetes in the Appalachian Region, 2012



Data source: National Center for Chronic Disease Prevention and Health Promotion; Division of Diabetes Translation County Data Indicators. Centers for Disease Control and Prevention. http://www.cdc.gov/diabetes/data/countydata/countydataindicators.html

Figure 50: Chart of Percentage of Adults with Diabetes, 2012

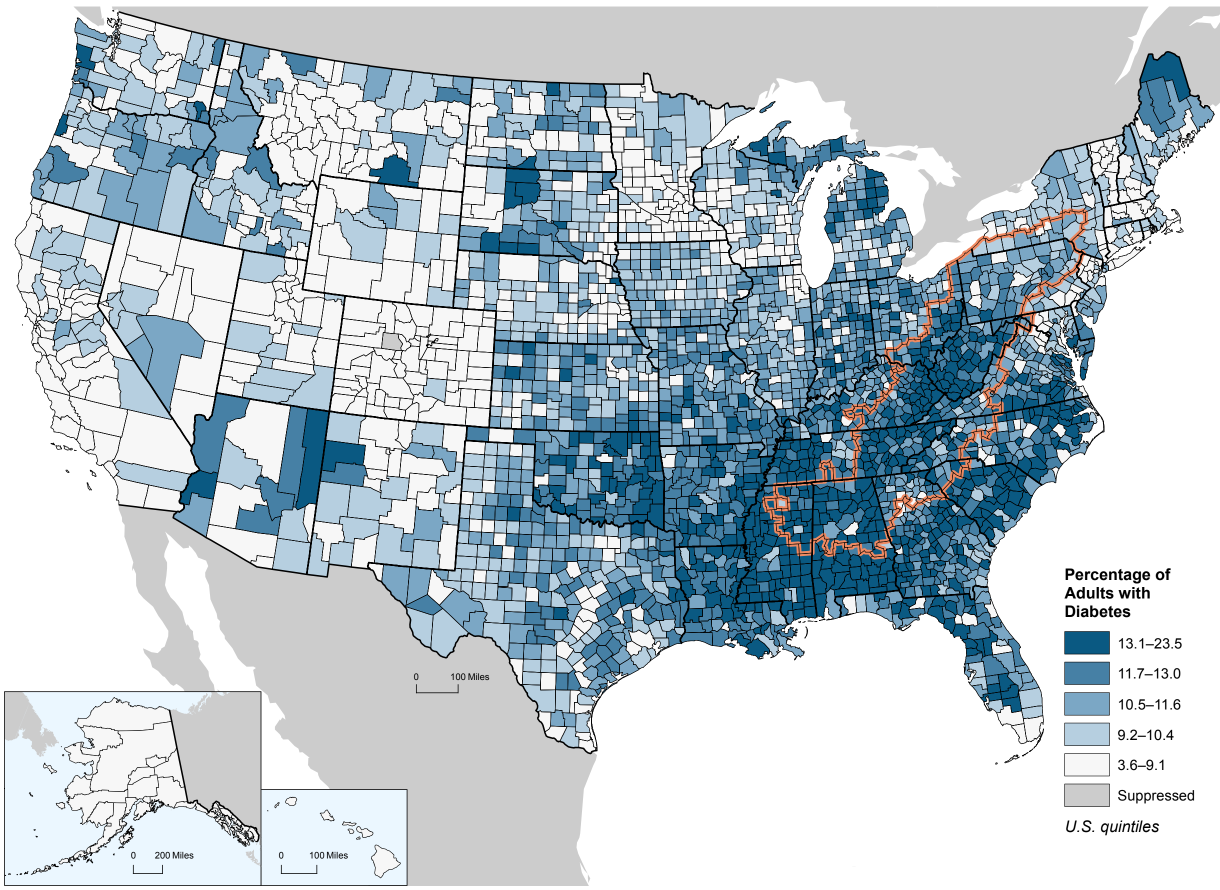


Data source: National Center for Chronic Disease Prevention and Health Promotion; Division of Diabetes Translation County Data Indicators. Centers for Disease Control and Prevention. http://www.cdc.gov/diabetes/data/countydata/countydataindicators.html

Overview: Diabetes Prevalence in the United States

Figure 51 shows the variation in diabetes prevalence across the United States. High percentages are not confined to Appalachia and stretch across the Region's borders into surrounding areas including the Midwest, Deep South, and coastal Southeast. Many of the counties located in the western part of the country report very low levels of diabetes. New England also has many counties ranking in the best-performing national quintile. Throughout the country, counties surrounding large metropolitan areas tend to rank in the two best-performing quintiles, with diabetes prevalence increasing as areas become more rural.

Figure 51: Map of Percentage of Adults with Diabetes in the United States, 2012

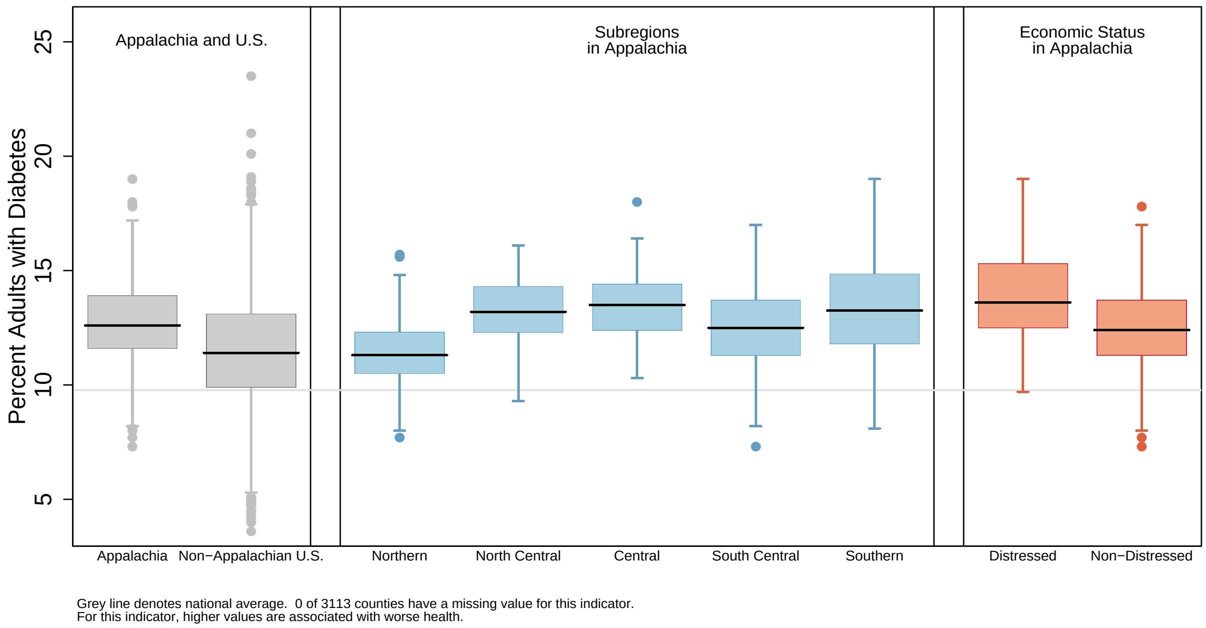


Data source: National Center for Chronic Disease Prevention and Health Promotion; Division of Diabetes Translation County Data Indicators. Centers for Disease Control and Prevention. http://www.cdc.gov/diabetes/data/countydata/countydataindicators.html

Distribution of Diabetes Prevalence

Figure 52 shows the distribution of diabetes prevalence by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, none have a missing value for this indicator. For this measure, higher values are associated with worse health.

Figure 52: Box Plot of Percentage of Adults with Diabetes by Geography and Economic Status, 2012



Data source: National Center for Chronic Disease Prevention and Health Promotion; Division of Diabetes Translation County Data Indicators. Centers for Disease Control and Prevention. http://www.cdc.gov/diabetes/data/countydata/countydataindicators.html

The distribution of diabetes prevalence among national quintiles for Appalachian counties is shown in Table 24. Of the 420 counties in the Region, 180 (43 percent) rank in the worst-performing national quintile, while 12 (3 percent) rank in the best-performing national quintile.

Table 24: Distribution of Percentage of Adults with Diabetes among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Diabetes prevalence	12	*3%*	32	*8%*	68	*16%*	128	*30%*	180	*43%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Adult Obesity

KEY FINDINGS | Adult Obesity Prevalence

- The prevalence of adult obesity is 31.0 percent throughout the Appalachian Region, a mark higher than the 27.4 percent experienced in the nation as a whole.
- All five subregions throughout Appalachia report adult obesity percentages higher than the national average, with Central Appalachia (34.7 percent) and North Central Appalachia (33.4 percent) reporting the highest percentages.
- There is an urban-rural divide in adult obesity prevalence, with 33.1 percent of residents in the Appalachian Region's rural counties classified as obese, compared to 29.5 percent in the Region's large metro areas.
- Residents in the Appalachian Region's distressed counties are particularly prone to high percentages of adult obesity, with 34.7 percent of these residents classified as obese. This compares to 30.7 percent in the Region's non-distressed counties.

Background

Adult obesity prevalence is the percentage of adults age 18 and over who report height and weight measurements resulting in a body mass index of 30 or higher. The data for this measure come from County Health Rankings and are based on 2012 data from both CDC's Behavioral Risk Factor Surveillance System (BRFSS), as well as the U.S. Census Bureau's Population Estimates Program.

The risk factors for obesity fall into three broad groups: individual behaviors, environmental factors, and genetics (Centers for Disease Control and Prevention, Obesity(a), 2016). Behaviors primarily include eating patterns, physical activity levels, and medication use. Environmental factors include the type of food that is accessible, marketing practices of the food industry, education and awareness, and whether the built environment supports physical activity. Although the relationship is not entirely clear, how people respond to both physical activity and certain foods suggests that genetics do play a role in developing obesity (Centers for Disease Control and Prevention, Obesity(a), 2016). Obesity increases the risk for a number of conditions, such as: high blood pressure, high cholesterol, Type 2 diabetes, coronary heart disease, stroke, osteoarthritis, sleep apnea and other breathing problems, some cancers, low quality of life, mental illness, and physical pain (Centers for Disease Control and Prevention, Obesity(a), 2016). Some of the risk factors and complications of obesity are discussed elsewhere in this report.

There are well-known racial and socioeconomic patterns in obesity rates across the United States. African-American and Hispanic adults tend to have the highest rates, and those with low levels of education are also at higher risk (Centers for Disease Control and Prevention, Obesity(b), 2016). The national obesity epidemic of the past two decades has shown signs of stabilization, as increased understanding and visibility of the issue have led individuals and communities across the country to develop and adopt multiple strategies aimed at reversing the trend (Felgal, Carroll, Kit, & Ogden, 2012).

Many community strategies focus on children, aiming to bend the curve with younger generations so that they develop healthy eating and living habits that will last a lifetime (Centers for Disease Control and Prevention, State and Local Programs, Nutrition: Strategies and Resources, 2016).

Overview: Adult Obesity Prevalence in the Appalachian Region

With 31.0 percent of Appalachian residents age 18 and over classified as obese, this health issue is more prevalent in the Region than in the nation as a whole, where the figure stands at 27.4 percent. All five subregions in Appalachia report adult obesity percentages higher than the national average, with Central Appalachia (34.7 percent) and North Central Appalachia (33.4 percent) reporting the highest percentages. Southern Appalachia also reports a high prevalence, with 31.1 percent of the subregion's residents classified as obese.

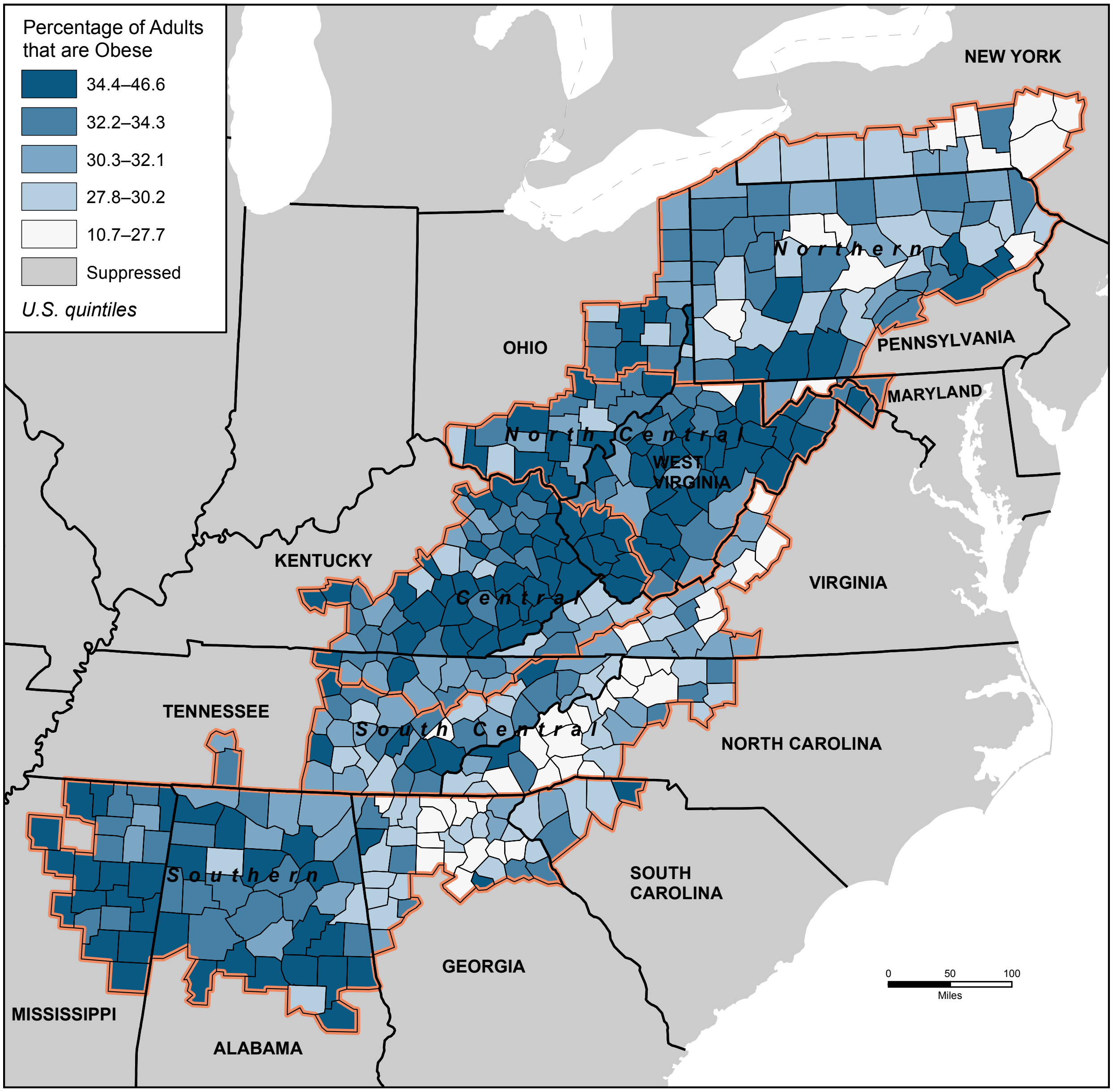
There is an urban-rural divide in adult obesity prevalence, with 33.1 percent of residents living in rural Appalachian counties classified as obese; this compares to 29.5 percent of those living in the Region's large metro areas. There is also a divide in obesity prevalence based on a county's economic status. Distressed counties throughout Appalachia report a prevalence of 34.7 percent, a figure well above the 30.7 percent of those living in the Region's non-distressed counties.

Appalachian Kentucky reports the highest prevalence of obesity in the Region at 35.2 percent, a mark much higher than non-Appalachian Kentucky (31.2 percent). Although both Appalachian Mississippi (34.8 percent) and Appalachian Alabama (33.3 percent) report adult obesity percentages among the highest in the Region, the non-Appalachian portions of these states actually experience higher percentages of adult obesity: non-Appalachian Mississippi reports 35.4 percent and non-Appalachian Alabama reports 34.1 percent. This trend exists in several other states throughout the Region: Appalachian portions of states have lower percentages of adult obesity than the non-Appalachian portions, although the differences are typically quite small. In addition to Mississippi and Alabama, the Appalachian portions of Georgia, North Carolina, South Carolina, and Tennessee also have a slightly lower prevalence of adult obesity than the states' non-Appalachian portions.

Figure 53 shows the variation in adult obesity prevalence across the Appalachian Region. Darker blue indicates a higher prevalence of obesity among a county's residents. The problem is pervasive throughout Appalachia, and especially so in the central and southern portions of the Region, although well-performing pockets of counties do exist along the eastern boundary of the Region.

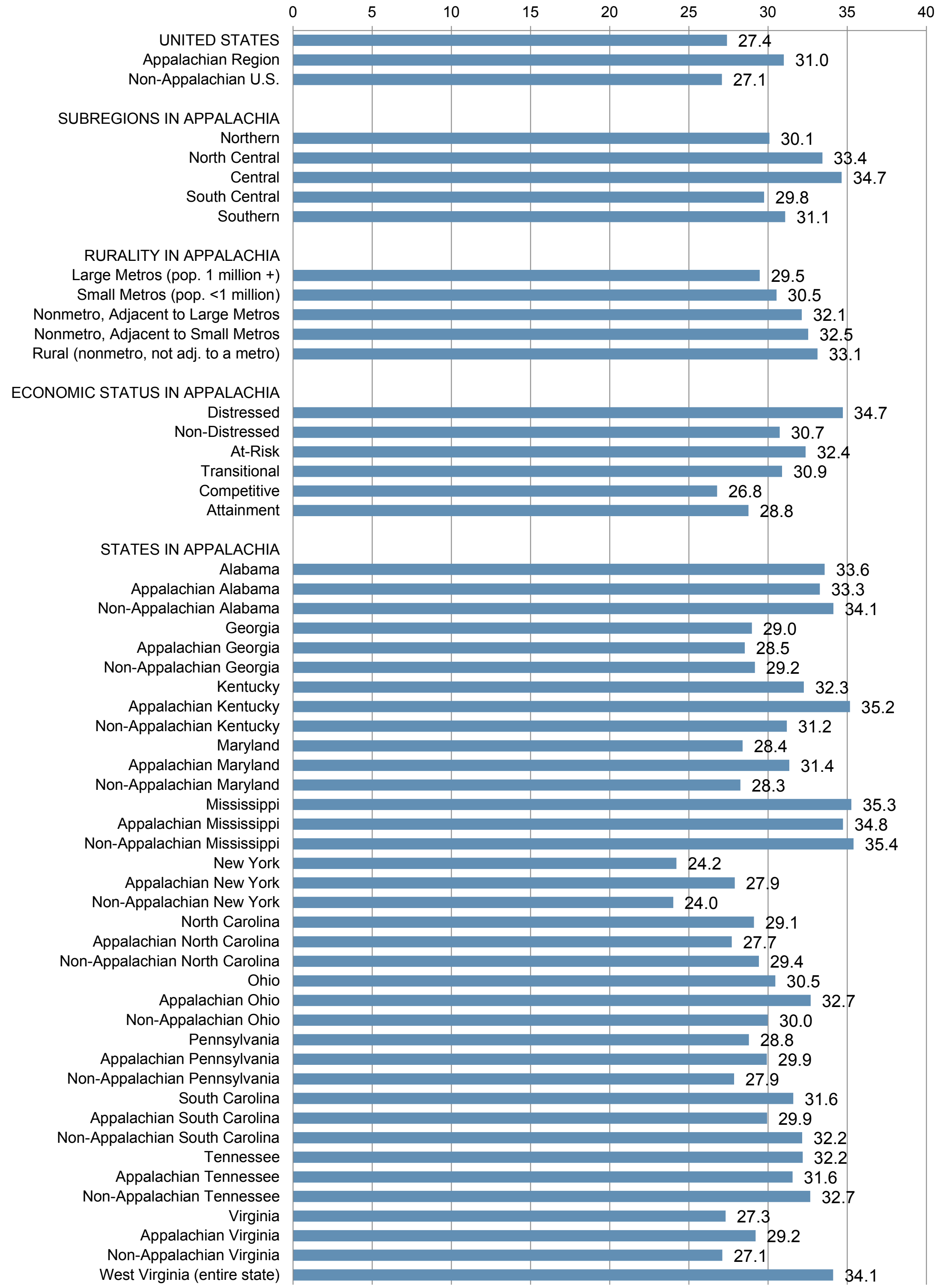
Figure 54 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 53: Map of Adult Obesity Prevalence in the Appalachian Region, 2012



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 54: Chart of Adult Obesity Prevalence, 2012

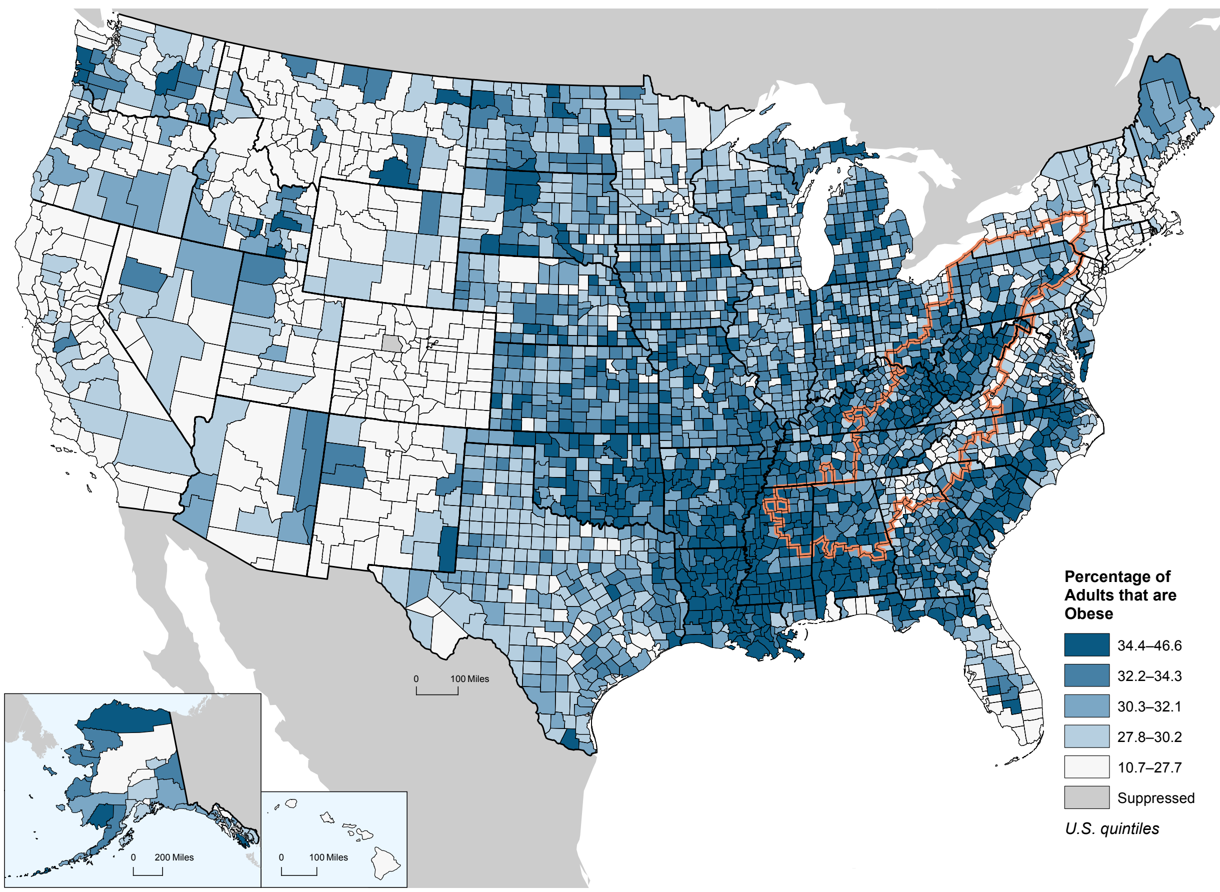


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Adult Obesity Prevalence in the United States

Figure 55 shows the variation in adult obesity prevalence across the United States. Although there are pockets of counties throughout Appalachia that rank in the worst-performing national quintiles, large concentrations of high obesity percentages are found throughout much of the eastern half of the country. The Mississippi Delta, coastal Southeast, and counties throughout the Midwest and Upper Midwest all experience very high obesity prevalence. Much of the western United States, as well as the Northeast, report low levels. Counties surrounding the country's large metropolitan areas tend be among the best-performing.

Figure 55: Map of Adult Obesity Prevalence in the United States, 2012

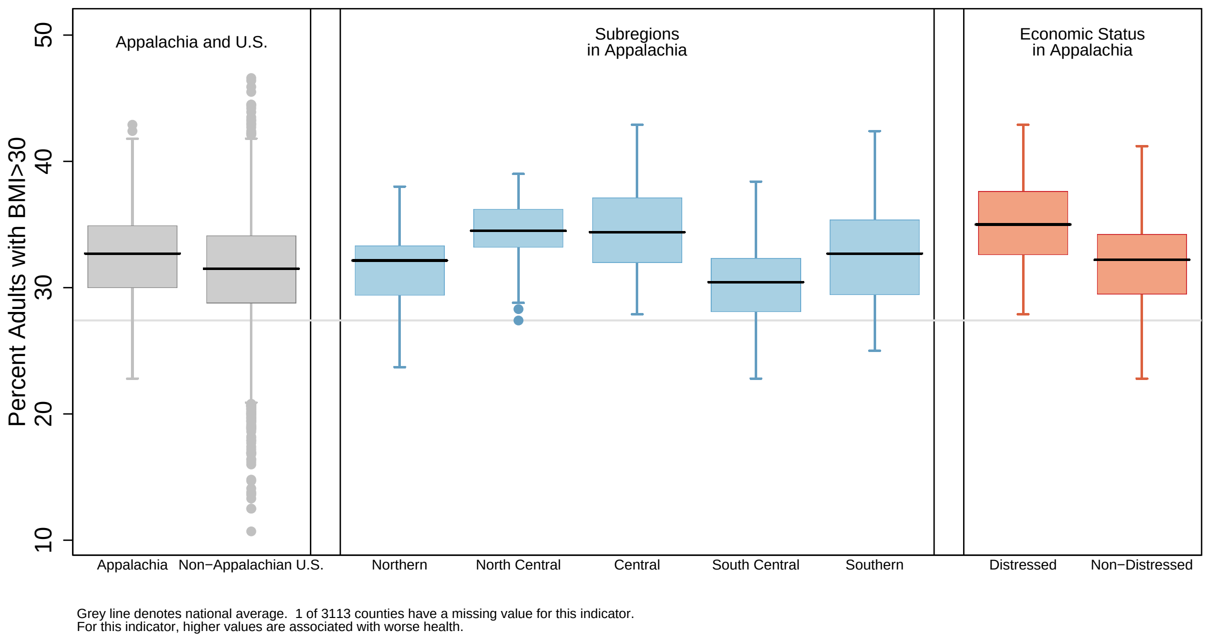


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Adult Obesity Prevalence

Figure 56 shows the distribution of adult obesity prevalence by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, one has a missing value for this indicator. For this measure, higher values are associated with worse health.

Figure 56: Box Plot of Adult Obesity Prevalence by Geography and Economic Status, 2012



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of adult obesity prevalence among national quintiles for Appalachian counties is shown in Table 25. Of the 420 counties in the Region, 126 (30 percent) rank in the worst-performing national quintile, while 45 (11 percent) rank in the best-performing national quintile.

Table 25: Distribution of Adult Obesity Prevalence among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Obesity prevalence	45	*11%*	69	*16%*	74	*18%*	106	*25%*	126	*30%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Further Reading

Physically Unhealthy Days

Poor physical health days. County Health Rankings. http://www.countyhealthrankings.org/measure/poor-physical-health-days

Mentally Unhealthy Days

The Substance Abuse and Mental Health Services Administration has a general resources page for mental health, including a mental health services locator. https://www.samhsa.gov/treatment/index.aspx

Froshaug, DB, Dickinson, L. M., Fernald, D. H., & Green, L. A. (2009). Personal Health Behaviors are Associated with Physical and Mental Unhealthy Days: A Prescription for Health (P4H) Practice-based Research Networks Study. The Journal of the American Board of Family Medicine, 22(4), 368-374.

County Health Rankings. Poor mental health days. http://www.countyhealthrankings.org/measure/poor-mental-health-days

HIV Prevalence

Centers for Disease Control and Prevention. HIV/AIDS. http://www.cdc.gov/hiv/

CDC includes comprehensive prevention plans and progress on their website: http://www.cdc.gov/hiv/policies/index.html

Diabetes Prevalence

Ali S., Stone M.A., Peters J.L., Davies M.J. & Khunti K. The Prevalence of Co-Morbid Depression in Adults with Type 2 Diabetes: A Systematic Review and Meta-Analysis. Diabetic Medicine, 2006; 23(11):1165-1173.

Division of Diabetes Translation, National Center for Chronic Disease Prevention and Health Promotion. (2015). “Diabetes Public Health Resource: Methods and Limitations.” Centers for Disease Control. Available: http://www.cdc.gov/diabetes/statistics/incidence/methods.htm

Menke A, Casagrande S, Geiss L., Cowie, CC. Prevalence of and Trends in Diabetes Among Adults in the United States, 1988-2012. JAMA, 2015; 314(10):1021-1029.

Obesity Prevalence

Centers for Disease Control and Prevention. Overweight and Obesity. Strategies to Prevent Obesity. Available at :https://www.cdc.gov/obesity/strategies/index.html

County Health Rankings. Adult obesity. http://www.countyhealthrankings.org/measure/adult-obesity

Ogden CL, Carroll MD, Fryar CD, Flegal KM. Prevalence of obesity among adults and youth: United States, 2011–2014. NCHS data brief, no 219. Hyattsville, MD: National Center for Health Statistics. 2015. Available at: https://www.cdc.gov/nchs/data/databriefs/db219.pdf

Finkelstein EA, Trogdon JG, Cohen JW, Dietz W. Annual Medical Spending Attributable to Obesity: Payer-and Service-Specific *Health Affairs* 2009; 28(5):w822-w831.

Behavioral Health

KEY FINDINGS | Depression Prevalence

- The prevalence of depression among fee-for-service Medicare beneficiaries in the Appalachian Region is 16.7 percent, compared to 15.4 percent for the United States as a whole.
- The prevalence of depression among fee-for-service Medicare beneficiaries is the highest in both North Central and Central Appalachia, at approximately 19 percent.
- There is a small difference in depression prevalence among fee-for-service Medicare beneficiaries in the Appalachian Region's rural counties (16.9 percent) and large metro counties (15.6 percent).
- There is a slight difference in depression prevalence among fee-for-service Medicare beneficiaries in the Appalachian Region's distressed counties (17.6 percent) and non-distressed counties (16.6 percent).

Background

The depression prevalence measure is the percentage of Medicare beneficiaries in the fee-for-service option who received treatment for depression in 2012 at least once. These data come from the CMS Chronic Conditions Warehouse, which is maintained by the Centers for Medicare & Medicaid Services. Technically the indicator measures "the percentage of fee-for-service Medicare beneficiaries who had at least one Medicare visit for which depression was listed as a diagnosis." Untreated depression could also be captured by this value—such as an initial office visit for symptoms diagnosed as depression without any subsequent follow-up—and there is evidence that a large portion of adults with depression do not seek treatment for it (Olfson, Blanco, & Marcus, 2016). Nevertheless, for ease of discussion, we refer to this as "prevalence" in this report. This indicator provides information on beneficiaries in Medicare's fee-for-service option only, and it does not include Medicare's managed care beneficiaries. Therefore, this measure captures only a subset of the Medicare population and represents approximately 12 percent of the total population in the nation (Kaiser Family Foundation, 2015); (Centers for Medicare & Medicaid Services, 2017).

Depression is a serious medical illness as well as an important public health issue. According to the National Institute of Mental Health, depression—also called major depressive disorder or clinical depression—is a common but serious mood disorder that causes severe symptoms that affect how one feels, thinks, and handles daily activities, such as eating, working, or sleeping (National Institute of Mental Health, 2016). Diagnosis of depression requires the symptoms to be present for at least two weeks. Depression not only causes suffering for depressed individuals but can also have negative impacts on their families and their communities. Depression is associated with significant healthcare needs, loss of work or problems in school, and premature mortality (Centers for Disease Control and Prevention, Depression, 2016).

Risk factors for depression include a personal or family history of depression, major life changes, trauma, stress, certain physical conditions, and medications (National Institute of Mental Health, 2016). Depression itself is also a risk factor for opioid abuse, suicide, and mortality from a number of other conditions (Centers for Disease Control and Prevention, Depression, 2016).

Because depression often occurs alongside other chronic conditions, managing the condition is complex. Treatment options typically include both medication and psychotherapy, with therapy a particular challenge in some parts of the Appalachian Region due to a shortage of mental health providers (see the section on Mental Health Providers in the Healthcare Systems domain of this report). The individual nature of depression means treatment may require a "trial and error" approach, making it more challenging to successfully treat than many other common conditions (National Institute of Mental Health, 2016).

The interpretation of this indicator may be approached from several viewpoints. While the indicator may simply capture the prevalence of depression among fee-for-service Medicare beneficiaries in an area, it must be considered with an important caveat: identification and diagnosis varies significantly across counties, states, and regions. As such, low values in this measure could be interpreted as representing less success in the identification, diagnosis, and treatment of depression, rather than a lower prevalence. For this study, high depression prevalence is simply interpreted as an indicator of poor health, although this caveat should be kept in mind.

Overview: Depression Prevalence in the Appalachian Region

In the Appalachian Region, the prevalence of depression in fee-for-service Medicare beneficiaries is 16.7 percent, compared with 15.4 percent of beneficiaries throughout the United States as a whole. The prevalence of beneficiaries with depression in both North Central (18.8 percent) and Central Appalachia (19.2 percent) are both higher than the national figure. Depression prevalence among Medicare fee-for-service beneficiaries in Southern Appalachia is 15.1 percent, which is slightly better than the national average.

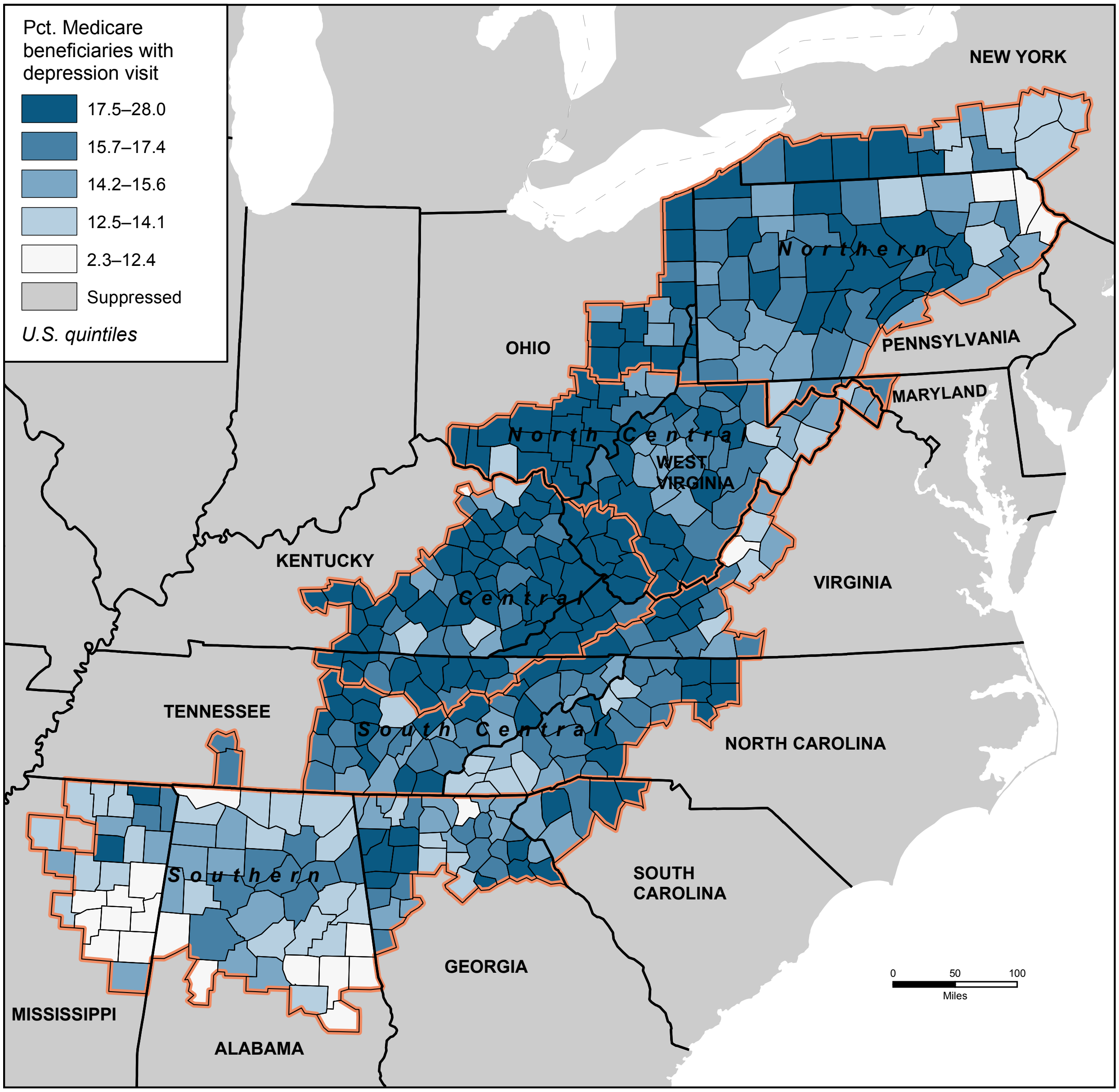
There is a slight difference in the prevalence of depression in Medicare beneficiaries between the Appalachian Region's rural counties (16.9 percent) and its large metro counties (15.6 percent). Likewise, there is little difference in depression prevalence in distressed and non-distressed counties in the Region: depression occurs in 17.6 percent of Medicare beneficiaries in economically distressed counties, compared to 16.6 percent of beneficiaries in non-distressed counties.

With the exceptions of Virginia and South Carolina, there is little intrastate disparity between the Appalachian and non-Appalachian portions of each state. Among the Appalachian portions of states, depression prevalence is highest in Appalachian Ohio, at 18.7 percent of Medicare beneficiaries. West Virginia and the Appalachian portions of Kentucky, Tennessee, and Virginia all report a depression prevalence of approximately 18 percent of their Medicare fee-for-service beneficiaries.

Figure 57 shows the percentage of Medicare fee-for-service beneficiaries in Appalachian counties with depression, grouped by national quintiles. Darker colors indicate higher percentages of depression, and therefore, worse health. Central Appalachia and North Central Appalachia have the highest percentages in the Region, and many of the counties in Central Appalachia are in the worst-performing national quintile. Southern Appalachia has the lowest prevalence of depression among Medicare fee-for-service beneficiaries.

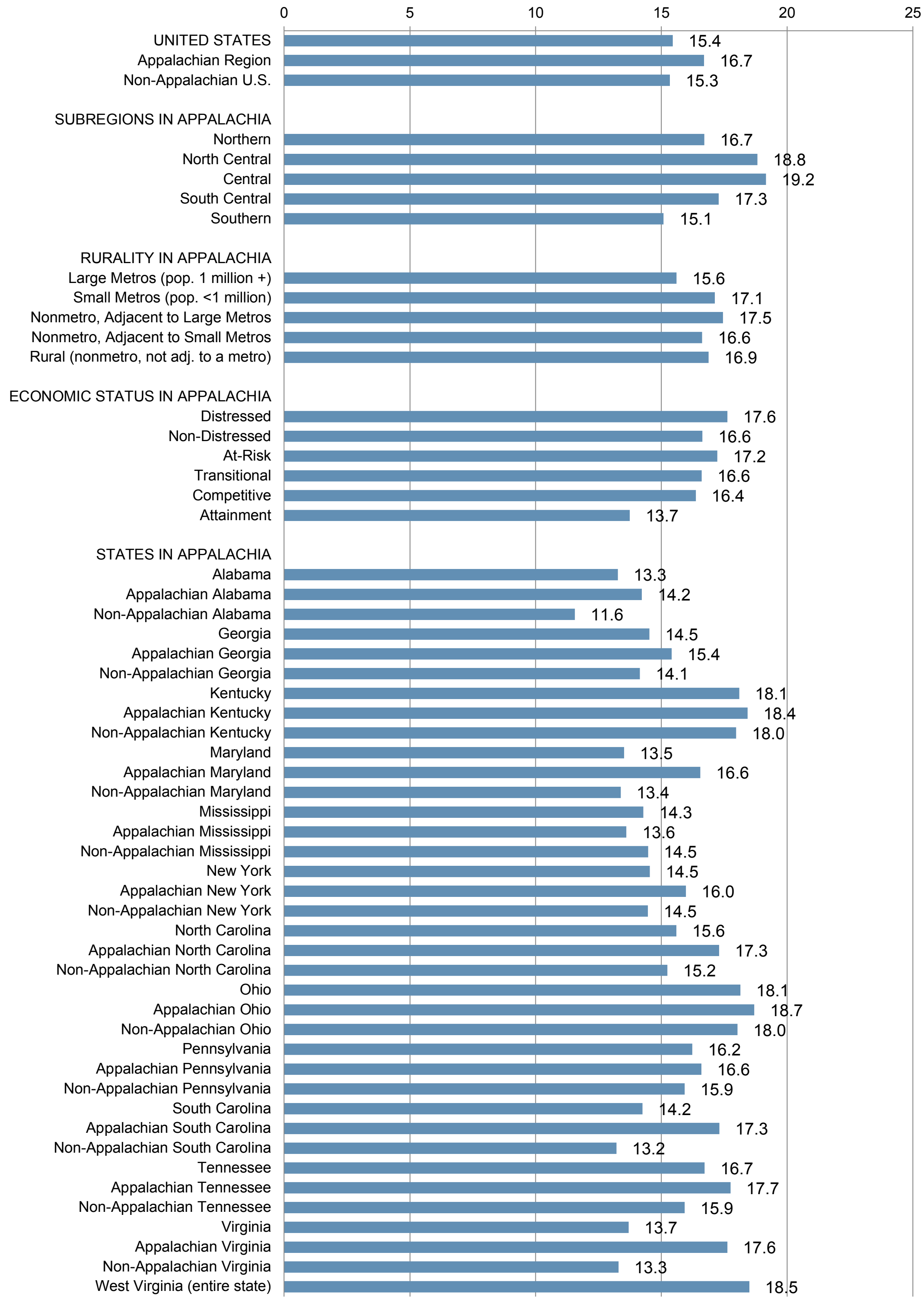
Figure 58 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 57: Map of Percentage of Medicare Beneficiaries that had a Depression-Related Office Visit in the Appalachian Region, 2012



Data source: CMS Chronic Conditions Warehouse. Centers for Medicare & Medicaid Services. https://www.ccwdata.org/web/guest/interactive-data/ams-dashboard.

Figure 58: Chart of Percentage of Medicare Beneficiaries that had a Depression-Related Office Visit, 2012

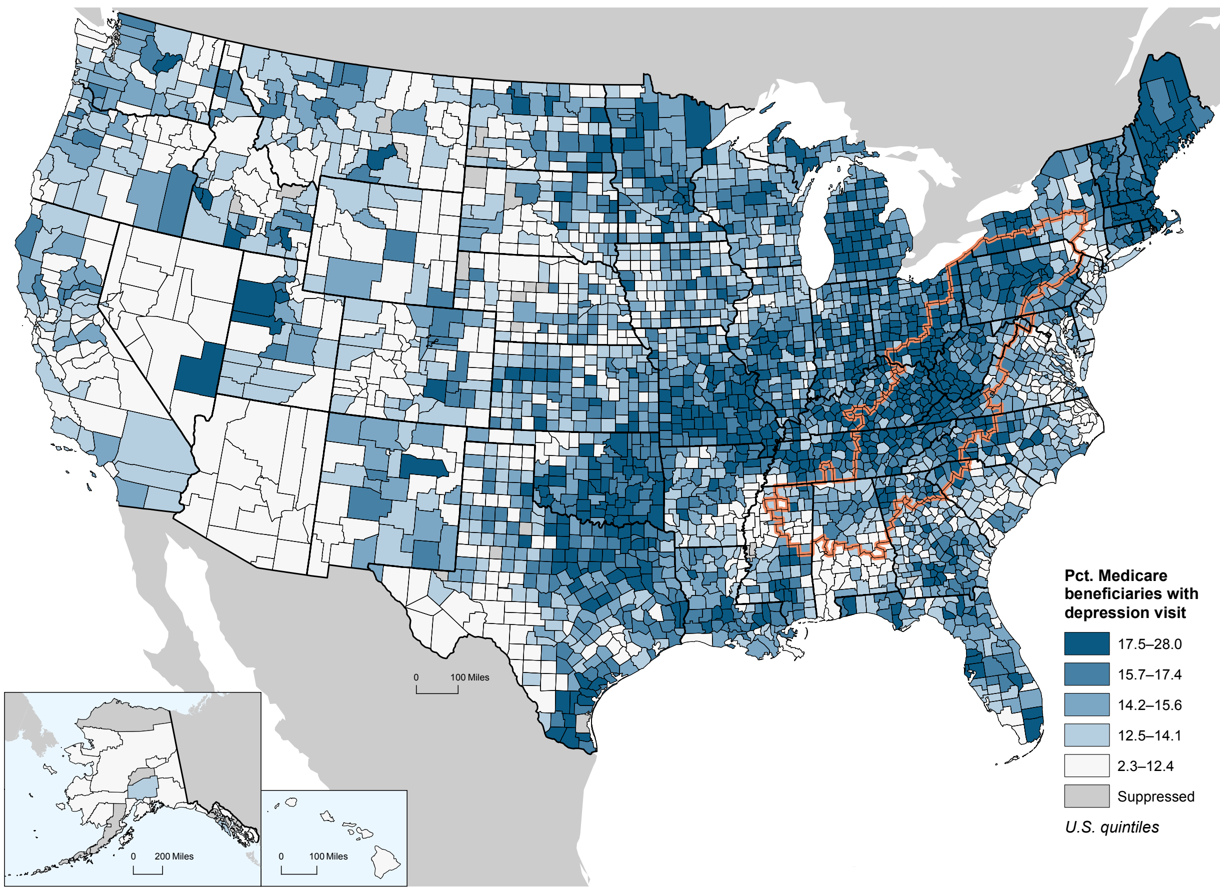


Data source: CMS Chronic Conditions Warehouse. Centers for Medicare & Medicaid Services. [https://www.ccwdata.org/web/guest/interactive-data/ams-dashboard.](https://www.ccwdata.org/web/guest/interactive-data/ams-dashboard)

Overview: Depression Prevalence in the United States

Figure 59 shows the variation in depression prevalence across the United States. Prevalence is highest in New England, Appalachia, and throughout much of the Midwest. Northern Texas and Oklahoma also have high levels, as do many counties in the Upper Midwest. Counties throughout the western half of the country are more likely to have low levels of depression prevalence. Each county in Arizona ranks in the best-performing national quintile.

Figure 59: Map of Medicare Beneficiaries that had a Depression-Related Office Visit in the United States, 2012

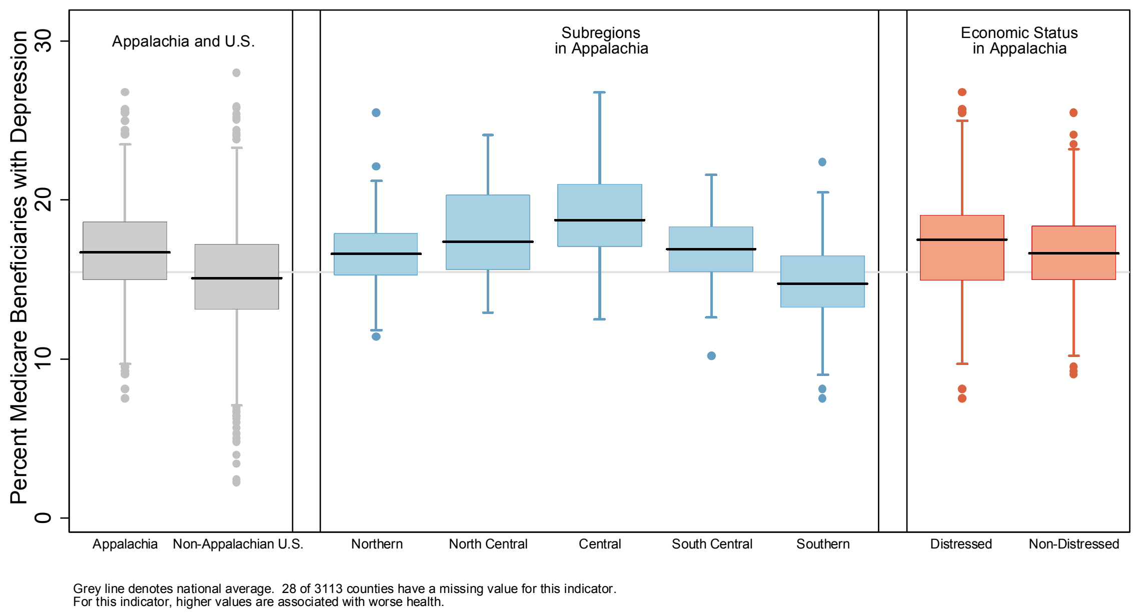


Data source: CMS Chronic Conditions Warehouse. Centers for Medicare & Medicaid Services. https://www.ccwdata.org/web/guest/interactive-data/ams-dashboard.

Distribution of Depression Prevalence

Figure 60 shows the distribution of depression prevalence in Medicare beneficiaries by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 28 have a missing value for this indicator.

Figure 60: Box Plot of Percentage of Medicare Beneficiaries that had a Depression-Related Office Visit by Geography and Economic Status, 2012



Data source: CMS Chronic Conditions Warehouse. Centers for Medicare & Medicaid Services. https://www.ccwdata.org/web/guest/interactive-data/ams-dashboard.

The distribution of the percentage of Medicare beneficiaries that had a depression-related office visit among national quintiles for Appalachian counties is shown in Table 26. Of the 420 counties in the Region, 161 (38 percent) rank in the worst-performing national quintile, while 22 (5 percent) rank in the best-performing national quintile.

Table 26: Distribution of Medicare Beneficiaries that had a Depression-Related Office Visit among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Depression prevalence	22	*5%*	54	*13%*	69	*16%*	114	*27%*	161	*38%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Suicide Rates

- The suicide rate in the Appalachian Region is 17 percent higher than the national rate.
- All five Appalachian subregions report suicide rates higher than the nation as a whole, with Central Appalachia reporting an incidence 31 percent higher than the national rate.
- Residents in the Appalachian Region's rural counties are 21 percent more likely to commit suicide than those living in the Region's large metro areas.
- Residents living in the Appalachian Region's distressed counties are 14 percent more likely to commit suicide than those living in the Region's non-distressed counties.

Background

The suicide rate is the number of suicides per 100,000 population, per year. The data for this measure come from the Compressed Mortality file provided by the National Center for Health Statistics. The data have been age-adjusted and cover the 2008–2014 period. Suicides were the tenth-leading cause of death in the United States in 2014 (National Center for Health Statistics, 2017).

There are a number of factors that contribute to suicide, such as: family history of suicide, previous suicide attempts, history of mental health disorders such as depression, history of alcohol and substance abuse, feelings of hopelessness, local epidemics of suicide, isolation, lack of access to mental health providers, and physical illness (Centers for Disease Control and Prevention,Violence Prevention, Suicide: Risk and Protective Factors, 2016). Individuals who are opioid-dependent are at increased risk of suicide, suggesting that as the opioid dependence epidemic is addressed, it will be important to monitor suicide risk among this population (Dragisic, Dickov, Dickov, & Mijatovic, 2015).

There are a number of measures that may help individuals experiencing suicidal thoughts and behavior, including: effective clinical care for mental, physical, and substance abuse disorders; access to a variety of clinical interventions and support; family and community support; support from ongoing medical and mental health care relationships; and skills in problem solving, conflict resolution, and nonviolent ways of handling disputes (Centers for Disease Control and Prevention,Violence Prevention, Suicide: Risk and Protective Factors, 2016).

Firearms accounted for more than 50 percent of male suicides, and recent work identified the suicide rate as a major component of the "deaths of despair," a leading driver of the increased death rate among middle-aged white males (Centers for Disease Control and Prevention, Suicide, 2017); (Case & Deaton, 2015). Suicide rates in the United States have increased since 1999 (Curtin, Warner, & Hedegaard, 2016). Rural areas have higher rates of suicide among youth, and the gap between rural and urban areas is growing (Fontanella, et al., 2015).

Overview: Suicide Rates in the Appalachian Region

The suicide rate in the Appalachian Region is 14.5 per 100,000 population, which is 17 percent higher than the national rate of 12.4 per 100,000. All five Appalachian subregions have higher suicide rates than the national rate. The North Central (15.5 per 100,000), Central (16.3), and South Central (16.0) subregions have the highest suicide rates in the Region.

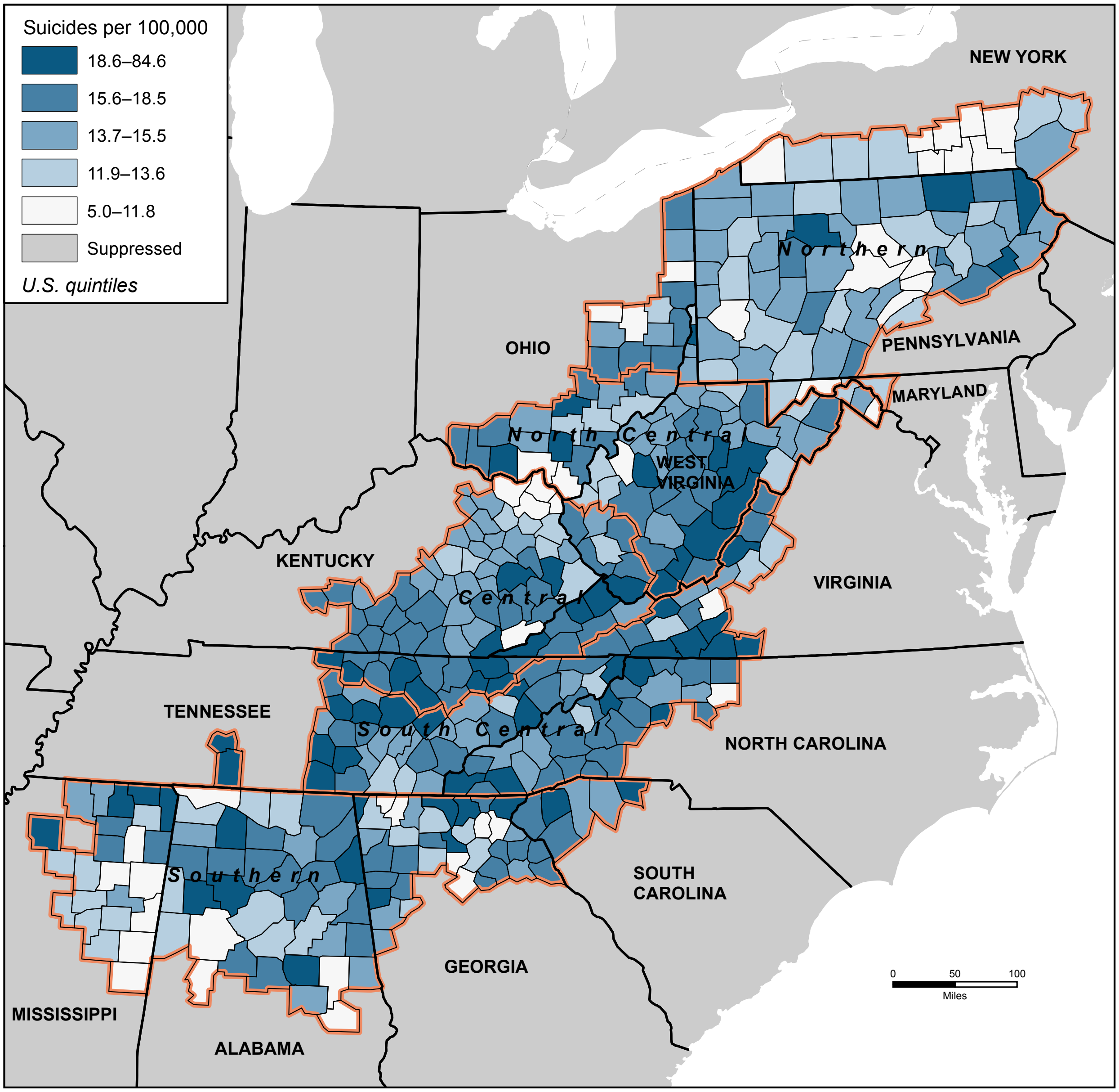
The suicide rate in the Appalachian Region's rural counties is 15.9 per 100,000 population, which is 21 percent higher than the rate of 13.1 per 100,000 population in the Region's large metro counties. Economically distressed counties throughout Appalachia have a suicide rate of 16.4 per 100,000 population, which is 14 percent higher than the non-distressed county rate of 14.4 per 100,000, and 32 percent higher than the national rate.

The states with the greatest disparities between their Appalachian and non-Appalachian portions are Maryland, New York, North Carolina, Ohio, and Virginia. In each of these states, the Appalachian portions report suicide rates more than 25 percent higher than the non-Appalachian portions. The suicide rate in Appalachian New York (11.7 per 100,000), for example, is 54 percent higher than that found in the non-Appalachian portion of the state (7.6). With the exception of Kentucky, all states have higher suicide rates in the Appalachian portions than in the non-Appalachian portions.

Figure 61 shows suicide rates for Appalachian counties, grouped by national quintiles. Darker colors indicate higher suicide rates. Although there are many areas of the Region with suicide rates in the worst-performing national quintile, a number of areas—including parts of Appalachian Kentucky, Appalachian Mississippi, and Appalachian North Carolina—have counties in the best-performing quintile.

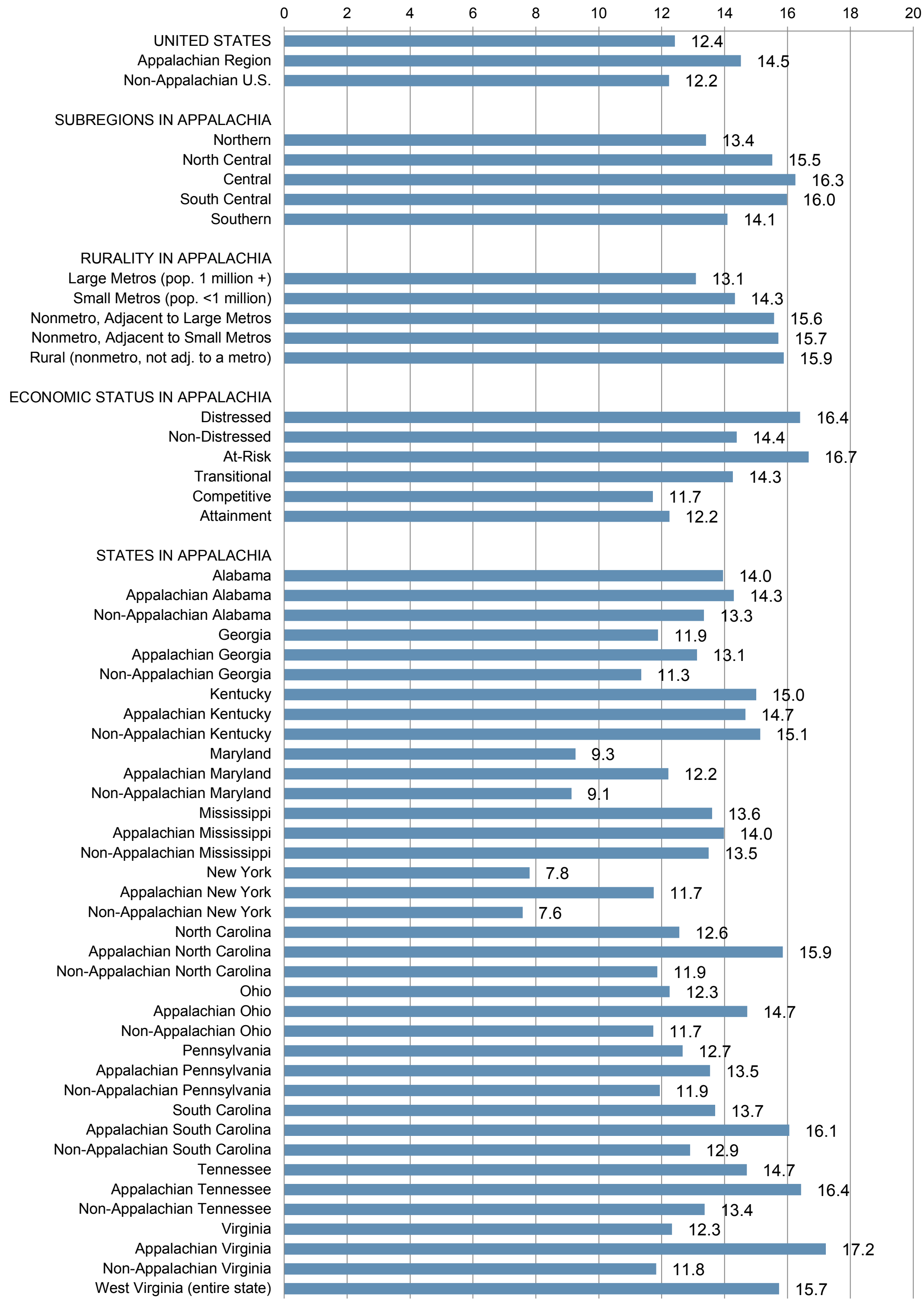
Figure 62 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 61: Map of Suicide Rates per 100,000 Population in the Appalachian Region, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD‑ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland 2015. http://www.cdc.gov/nchs/data_access/cmf.htm.

Figure 62: Chart of Suicide Rates per 100,000 Population, 2008–2014

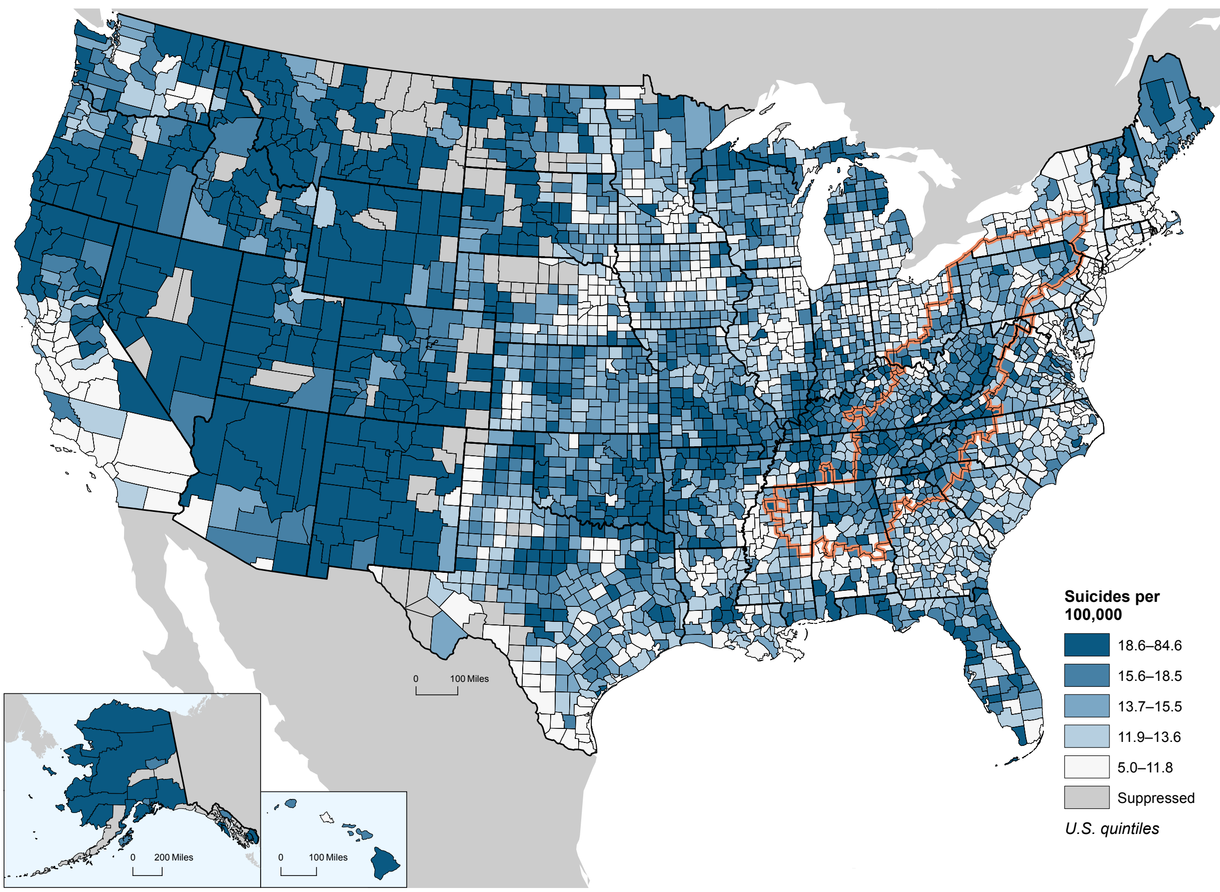


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD‐ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland 2015. http://www.cdc.gov/nchs/data_access/cmf.htm.

Overview: Suicide Rates in the United States

Figure 63 shows the variation in suicide rates across the United States. The Appalachian Region stands out relative to other regions in the eastern half of the country due to its high rates, although high suicide incidence stretches west into parts of the Midwest. The central part of the country, including Kansas, Oklahoma, and Missouri, report high suicide rates, as do several counties in the northern reaches of the Upper Midwest. Outside of southern California, many counties throughout the western United States report suicide rates ranking in the worst-performing national quintile. Although poor-performing counties are found in nearly every state, parts of the Northeast, Southeast, and Midwest have groups of counties with low suicide rates. A few pockets in the Mississippi Delta region perform strongly on this measure, as well.

Figure 63: Map of Suicide Rates per 100,000 Population in the United States, 2008–2014

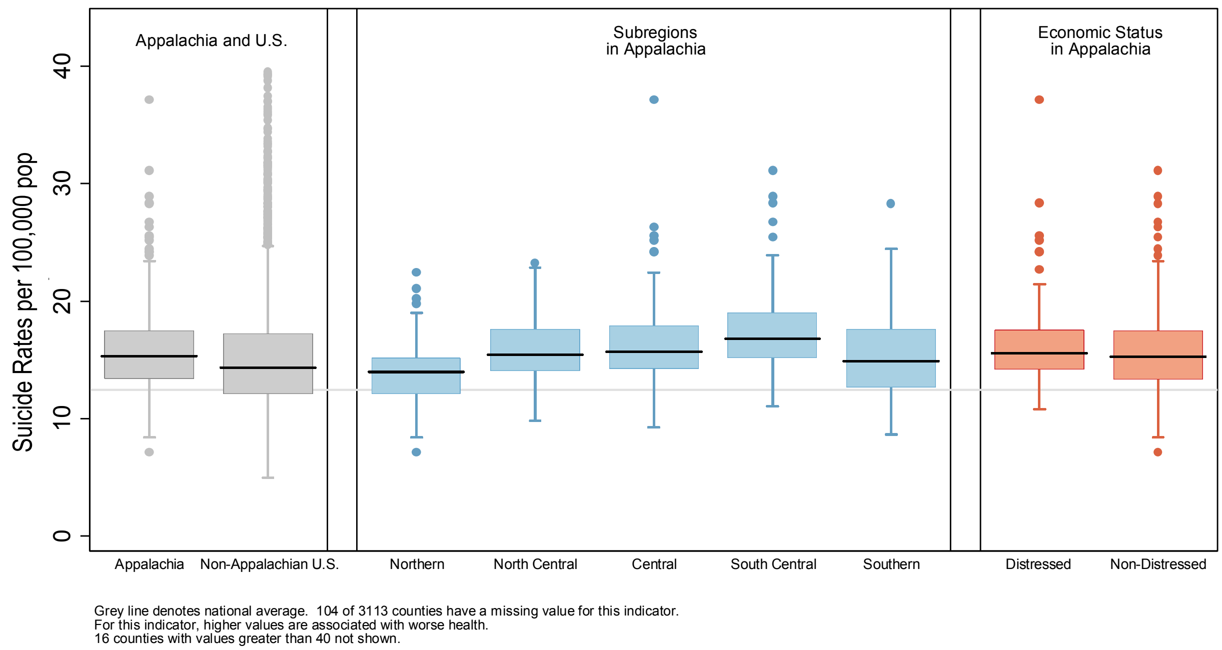


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD‐ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland 2015. http://www.cdc.gov/nchs/data_access/cmf.htm.

Distribution of Suicide Rates

Figure 64 shows the distribution of suicide rates by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 104 have a missing value for this indicator and 16 counties with values greater than 40 are not represented in the box plot.

Figure 64: Box Plot of Suicide Rates per 100,000 Population by Geography, and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD-ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland 2015. http://www.cdc.gov/nchs/data_access/cmf.htm.

The distribution of the percentage of suicide rates among national quintiles for Appalachian counties is shown in Table 27. Of the 420 counties in the Region, 70 (17 percent) rank in the worst-performing national quintile, while 46 (11 percent) rank in the best-performing national quintile.

Table 27: Distribution of Suicide Rates per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Suicide incidence	46	*11%*	69	*16%*	108	*26%*	127	*30%*	70	*17%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Excessive Drinking

- A lower percentage of adults in the Appalachian Region report excessive drinking (15.2 percent) than in the nation as a whole (17.7 percent).
- Four of the five Appalachian subregions have lower percentages of adults reporting excessive drinking than the nation as a whole. The lone subregion above the national mark is Northern Appalachia, and the difference is minor (17.8 percent in the subregion compared to 17.7 percent in the nation as a whole).
- Adults living in the Appalachian Region's rural counties report less excessive drinking (13.3 percent) than those living in the Region's large metro areas (17.3 percent).
- Adults living in the Appalachian Region's distressed counties report less excessive drinking (12.3 percent) than those living in the Region's non-distressed counties (15.4 percent).

Background

Excessive drinking is defined as the percentage of the population who report at least one binge drinking episode involving five or more drinks for men and four or more for women over the past 30 days, or heavy drinking involving more than two drinks per day for men and more than one per day for women, over the same time period. The data come from County Health Rankings and are based on 2014 data CDC collects through its Behavioral Risk Factor Surveillance System (BRFSS).

Alcohol use is a behavioral health issue that is also a risk factor for a number of negative health outcomes, including: physical injuries related to motor vehicle accidents, stroke, chronic diseases such as heart disease and cancer, and mental health conditions such as depression and suicide. There are a number of evidence-based interventions that may reduce excessive/binge drinking; examples include raising taxes on alcoholic beverages, restricting access to alcohol by limiting days and hours of retail sales, and screening and counseling for alcohol abuse (Centers for Disease Control and Prevention, Alcohol Use, 2016).

Residents of the Appalachian Region, and particularly those in Southern Appalachia, have historically reported lower rates of alcohol use than the nation as a whole (Centers for Disease Control and Prevention, Alcohol and Public Health, 2016). For example, in 2011, in 7 of the 13 Appalachian states—Alabama, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, West Virginia—the percentage of adults who reported consuming at least one drink in the previous 30 days ranked in the lowest quartile in the country (Kanny, Liu, Brewer, & Lu, 2013). Likewise, a study examining alcoholic beverage sales from 1977 to 2009 concluded that among all 50 states, Georgia, Kentucky, Tennessee, and West Virginia had some of the lowest alcohol consumption rates in the nation (LaVallee & Yi, 2011).

Overview: Excessive Drinking in the Appalachian Region

A lower percentage of adults in Appalachia report excessive drinking (15.2 percent) than the national average (17.7 percent). Four of the five Appalachian subregions have lower percentages of adults reporting excessive drinking than the national average. In Central Appalachia, 11.5 percent of adults report excessive drinking—the lowest in the Region—compared to 17.8 percent in Northern Appalachia.

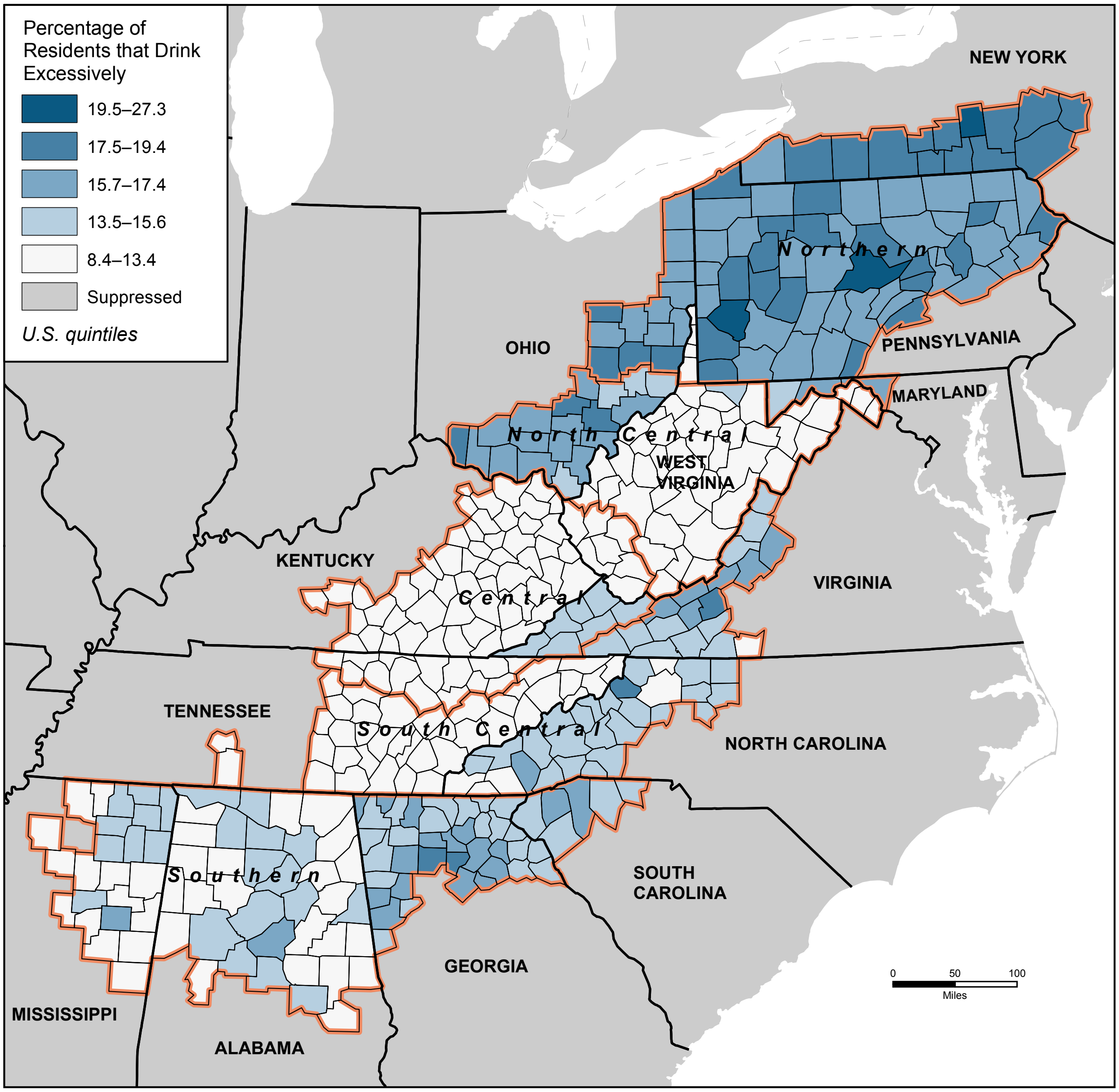
There is an urban-rural disparity in the Region, with 13.3 percent of adults in rural counties reporting excessive drinking, compared to 17.3 percent of adults in large metro counties. There is also a difference in excessive drinking percentages based on a county's economic status. Distressed counties in the Appalachian Region have lower percentages of adults who report drinking excessively (12.3 percent) than the Region's non-distressed counties (15.4 percent).

West Virginia (11.4 percent) and the Appalachian portions of Kentucky (11.1 percent) and Tennessee (11.7 percent) report the lowest percentages of excessive drinking—well below the national average of 17.7 percent. These three states also report the lowest excessive drinking percentages in the Region when considering both Appalachian and non-Appalachian portions of states. The Appalachian portions of New York (18.4 percent) and Pennsylvania (18.2 percent) report the highest percentages of excessive drinking in the Region, both of which are above the national average.

Figure 65 shows the variation in the percentage of adults who report excessive drinking in the Appalachian Region. In this figure, there are sharp state border effects—this can be seen in the difference between West Virginia and Appalachian Pennsylvania and Appalachian Ohio counties—and is largely due to a smoothing estimation technique used by CDC (see the Methodology section in Appendix B for more details on estimation procedures.) Northern Appalachia is the only subregion with a large number of counties ranking in the worst-performing national quintiles.

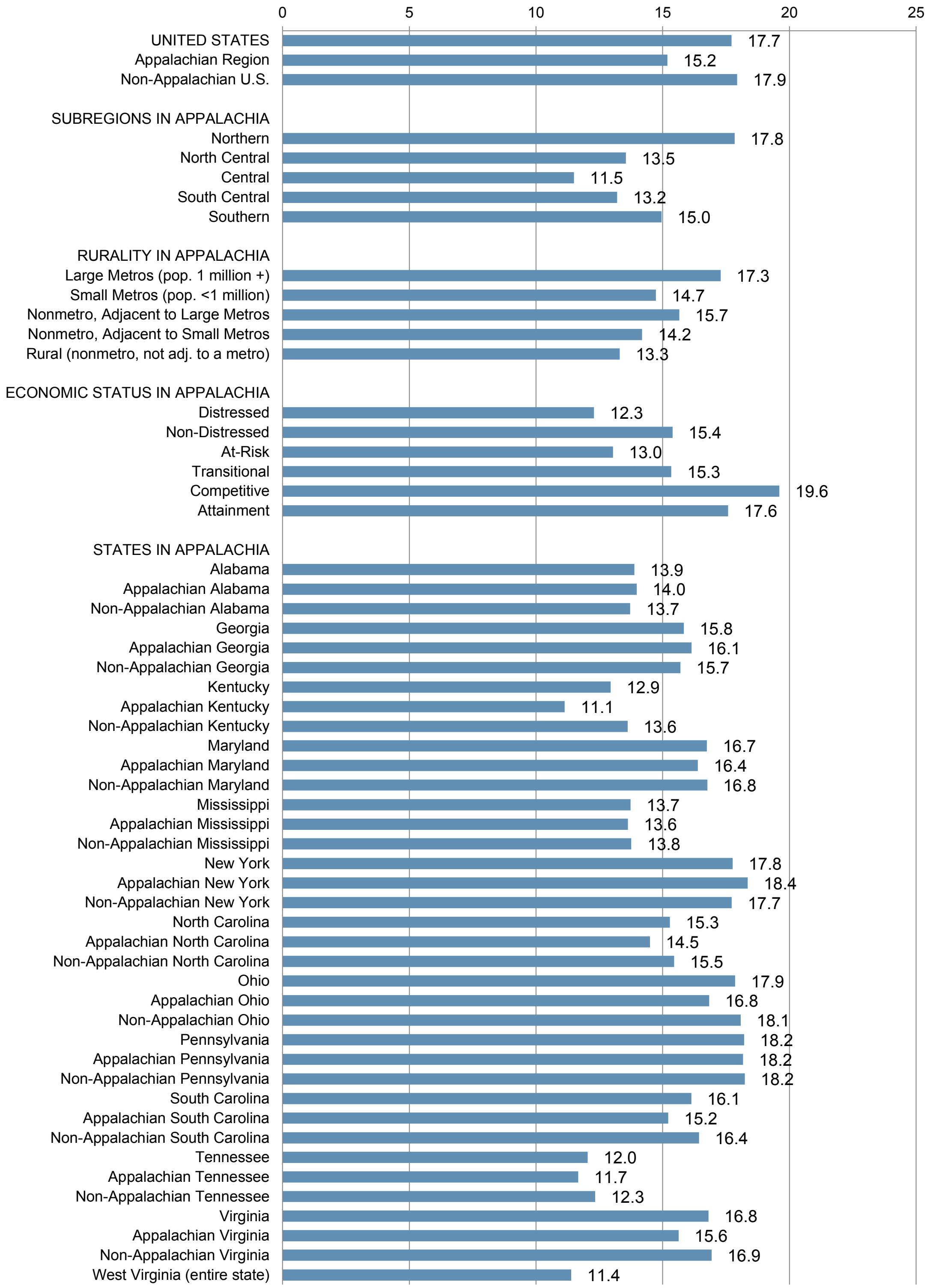
Figure 66 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 65: Map of Percentage of Residents that Report Excessive Drinking in the Appalachian Region, 2014



Data source: County Health Rankings & Roadmaps, 2016. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 66: Chart of Percentage of Residents that Report Excessive Drinking, 2014

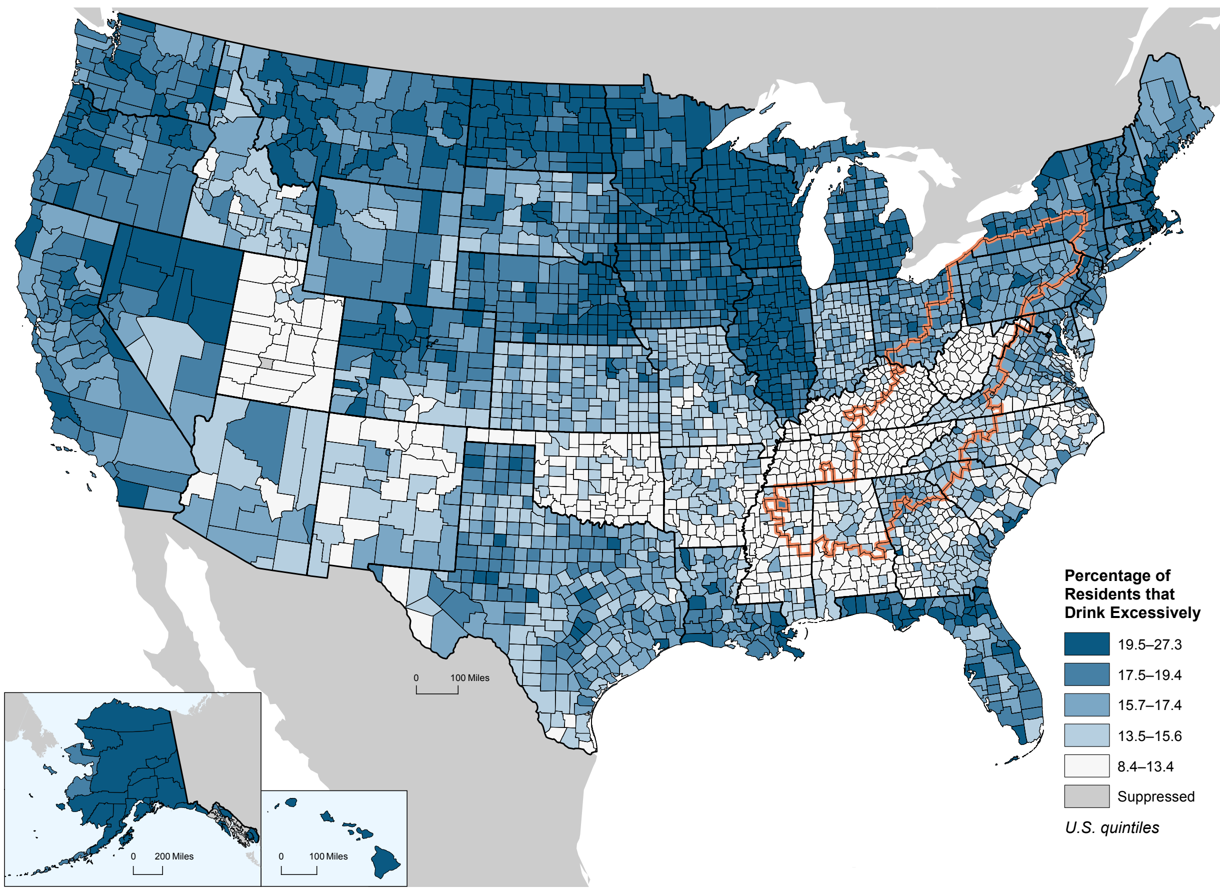


Data source: County Health Rankings & Roadmaps, 2016. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Excessive Drinking in the United States

Figure 67 shows the variation in the percentage of the adult population reporting excessive drinking across the United States. The low percentages in Appalachia stand out compared to the rest of the country, and these low levels stretch into much of the Southeast and Mississippi Delta regions. Both Oklahoma and Utah stand out for the large number of counties in each state that rank in the best-performing national quintile. The Upper Midwest is home to a large number of counties ranking in the worst-performing national quintile. Counties throughout the Pacific Coast and Northeast, as well as Florida, also report higher percentages of excessive drinking.

Figure 67: Map of Percentage of Residents that Report Excessive Drinking in the United States, 2014

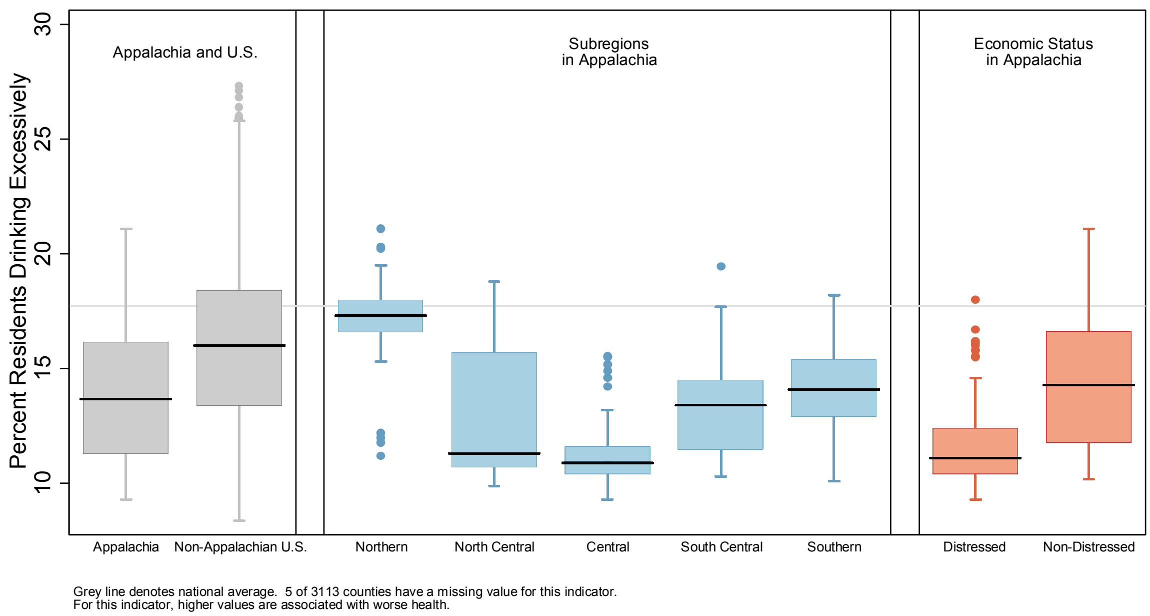


Data source: County Health Rankings & Roadmaps, 2016. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Excessive Drinking

Figure 68 shows the distribution of excessive drinking percentages by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, five have a missing value for this indicator.

Figure 68: Box Plot of Percentage of Residents that Report Excessive Drinking by Geography and Economic Status, 2014



Data source: County Health Rankings & Roadmaps, 2016. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of the percentage of residents that report excessive drinking among national quintiles for Appalachian counties is shown in Table 28. Of the 420 counties in the Region, just 3 (1 percent) rank in the worst-performing national quintile, while 202 (48 percent) rank in the best-performing national quintile.

Table 28: Distribution of Percentage of Residents that Report Excessive Drinking among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Excessive drinking	202	*48%*	92	*22%*	82	*20%*	41	*10%*	3	*1%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Poisoning Mortality Rates

- The poisoning mortality rate in the Appalachian Region is 37 percent higher than the national rate.
- All five Appalachian subregions have higher poisoning mortality rates than the national rate. The poisoning mortality rate in Central Appalachia is 146 percent higher than the nation as a whole.
- The poisoning mortality rate for the Appalachian Region's rural counties is 40 percent higher than the rate for the Region's large metro counties—and 76 percent higher than the national rate.
- The poisoning mortality rate for the Region's distressed counties is 63 percent higher than the rate for the Region's non-distressed counties—and more than double the national rate.

Background

Poisoning mortality is the number of deaths with poisoning as the primary cause per 100,000 population, per year. The data for this measure come from the Compressed Mortality File provided by the National Center for Health Statistics. The data have been age-adjusted and cover the 2008–2014 period. Death from poisoning includes deaths associated with medication abuse, both pharmaceutical and illicit. Although it is natural to think of a child ingesting a household cleaner as poisoning, these incidents are rare relative to unintentional deaths due to overdose of medications or other drugs.

Death from poisoning or overdose is more likely to impact males, the non-Hispanic white population, and the U.S. population ages 45–54 (Centers for Disease Control and Prevention, NCHS Data on Drug-poisoning Deaths, 2016). Among poisoning deaths nationally, 85 percent were due to deaths from narcotics, hallucinogens, unspecified drugs, medications, or some other type of biological substance, and less than one percent were from exposure to other unspecified chemicals (Fingerhut, 2010). Because self-poisoning is a common method of suicide and depression is frequently a factor in suicide, this measure is included as part of the Behavioral Health domain (Hawton, 2010).

In the Appalachian Region, 64 percent of deaths due to poisoning were from accidental poisoning by narcotics and psychodysleptics[3] or by "other and unspecified drugs, medicaments, or biological substances."[4] The struggle of many Appalachian communities in addressing drug dependence and other related issues—especially in southern West Virginia and eastern Kentucky—has been well-documented by the national media (Park & Bloch, 2016).

[3] (ICD-10 code X42)
[4] (ICD-10 code X44)

Overview: Poisoning Mortality in the Appalachian Region

The poisoning mortality rate in the Appalachian Region is 20.4 per 100,000 population, which is 37 percent higher than the national rate of 14.9 per 100,000 population. All five of the Appalachian subregions have rates above the national rate. With a poisoning mortality rate of 15.5 per 100,000 population, Southern Appalachia is the only subregion that approaches the national rate. The Central Appalachian poisoning mortality rate of 36.6 per 100,000 population is 146 percent higher than the national rate, and the rate in North Central Appalachia of 26.7 per 100,000 population is 79 percent higher than the nation as a whole.

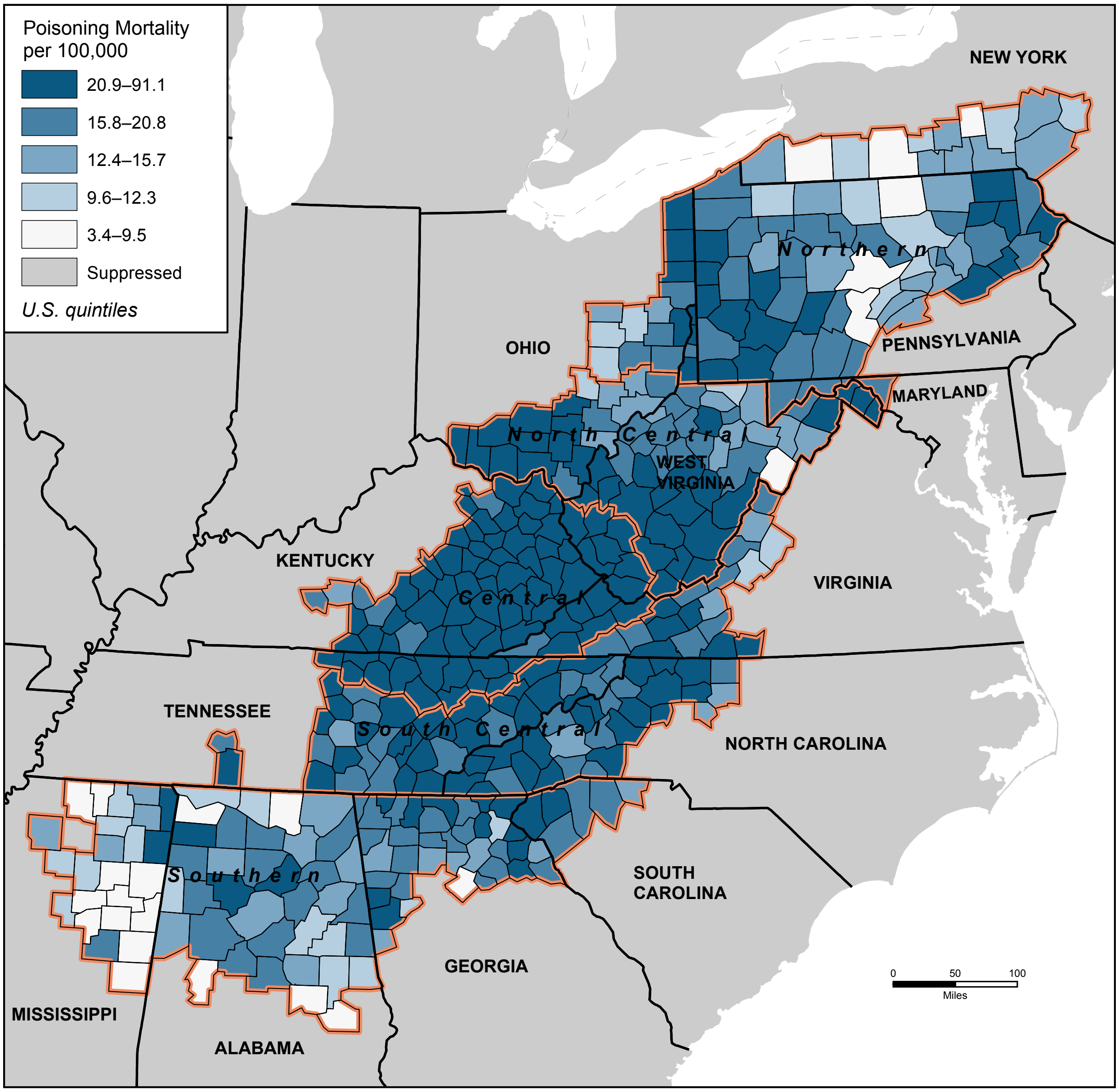
There is a stark difference in poisoning mortality between rural and metro areas in Appalachia. The poisoning mortality rate for rural counties in the Appalachian Region is 26.2 per 100,000 population—40 percent higher than the Region's large metro rate of 18.7 per 100,000—and 76 percent higher than the national rate. Likewise, distressed counties have a higher poisoning mortality rate than non-distressed counties. The poisoning mortality rate for distressed counties in the Appalachian Region is 31.9 per 100,000 population, which is 63 percent higher than the rate for the Region's non-distressed counties of 19.6 per 100,000—and more than double the national rate.

Appalachian Kentucky has a poisoning mortality rate of 35.9 per 100,000 population, the highest among the Appalachian portions of states in the Region and more than double the national rate. Likewise, the rate in West Virginia is also more than double the national rate at 31.3 per 100,000 population. The Appalachian portions of three states report rates lower than the national rate: Appalachian Georgia, Appalachian Mississippi, and Appalachian New York. There are a few states with significant disparities between their Appalachian portions and non-Appalachian portions: Appalachian Kentucky's poisoning mortality rate is 68 percent higher than the rate in the non-Appalachian portion of the state, and, likewise, Appalachian North Carolina's rate is 53 percent higher than the non-Appalachian portion. Other states show smaller differences between the Appalachian and non-Appalachian portions.

Figure 69 shows poisoning mortality rates for Appalachian counties, grouped by national quintiles. Darker colors indicate higher rates of poisoning mortality; for this measure, higher rates are associated with worse health. North Central, Central, and South Central Appalachia all show high concentrations of counties with poisoning mortality rates ranking in the worst-performing national quintile.

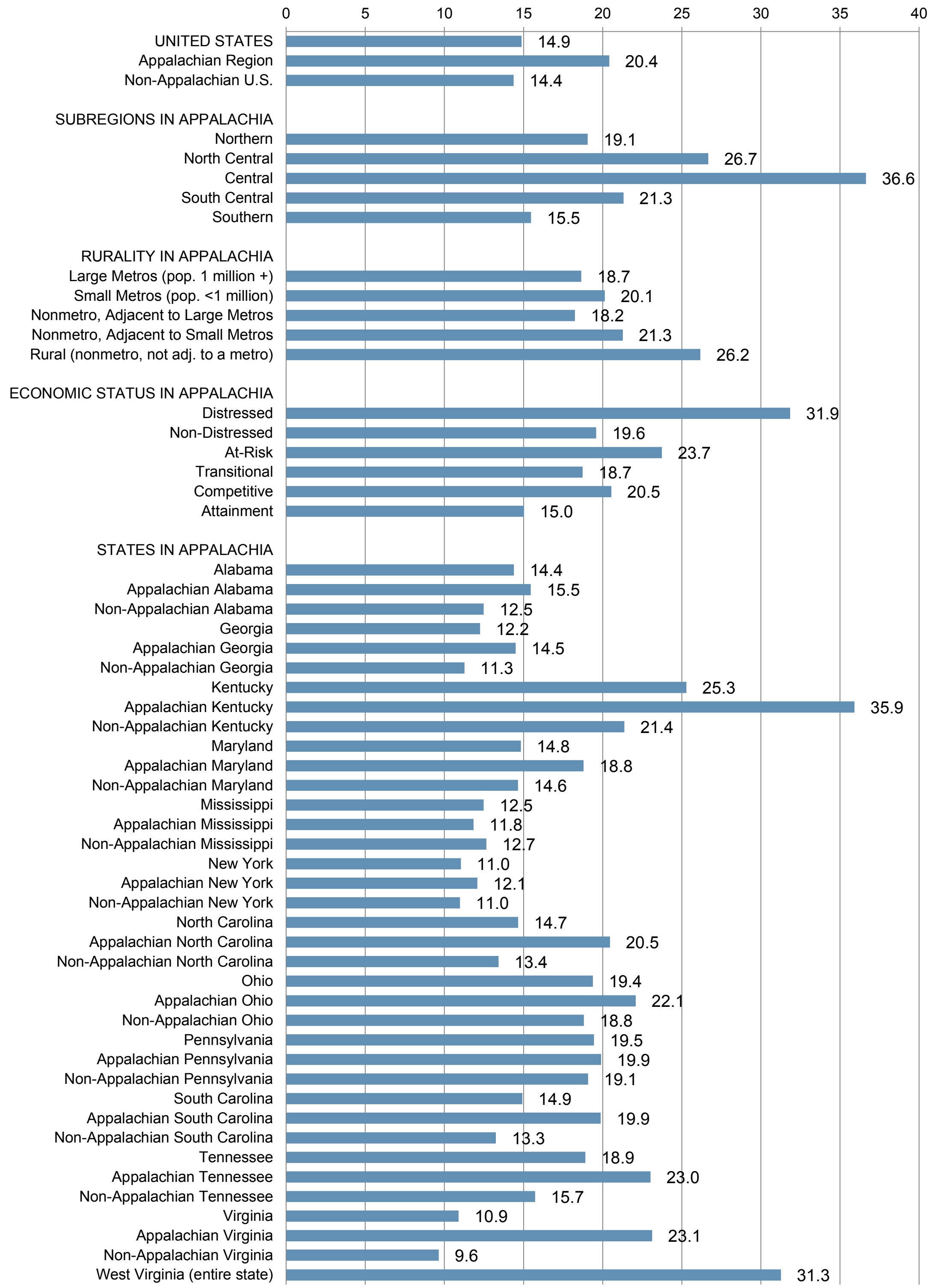
Figure 70 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 69: Map of Poisoning Mortality Rates per 100,000 Population in the Appalachian Region, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD-ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland 2015. http://www.cdc.gov/nchs/data_access/cmf.htm.

Figure 70: Chart of Poisoning Mortality Rates per 100,000 Population, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD‐ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland 2015. http://www.cdc.gov/nchs/data_access/cmf.htm.

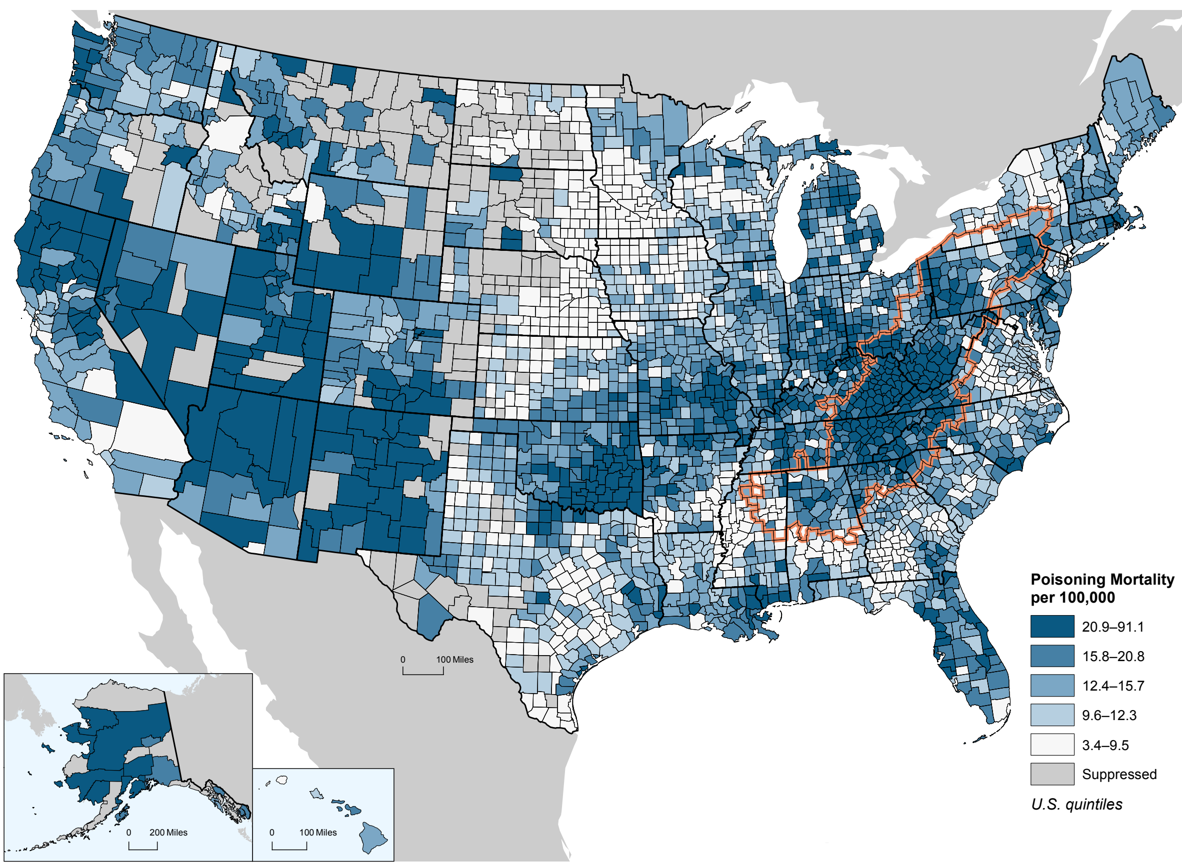
Overview: Poisoning Mortality in the United States

Figure 71 shows the variation in poisoning mortality across the United States. There is a concentration of higher poisoning mortality in the Appalachian Region, as well as in several Western states. There are also pockets of higher rates in upper New England, the Gulf Coast, and a strip extending from Oklahoma through Arkansas to Missouri. Higher rates also appear in the Florida peninsula, upper Michigan, and the New Jersey/Delaware area.

There is a band along the East Coast—running from the Tidewater area of Virginia down through Georgia, then through Alabama, Mississippi, and Louisiana—that generally has rates lower than the national average. The Upper Midwest has many counties ranking in the best-performing national quintile, and these low rates extend down through the Central Plains and into parts of Texas.

All states west of the Central Plains area have noticeably high poisoning mortality rates, with almost every county in New Mexico ranking in the worst-performing quintile. Alaska also reports much higher rates compared to the rest of the nation. The rates for a number of counties in the Upper Midwest is suppressed due to insufficient sample size.

Figure 71: Map of Poisoning Mortality Rates per 100,000 Population in the United States, 2008–2014

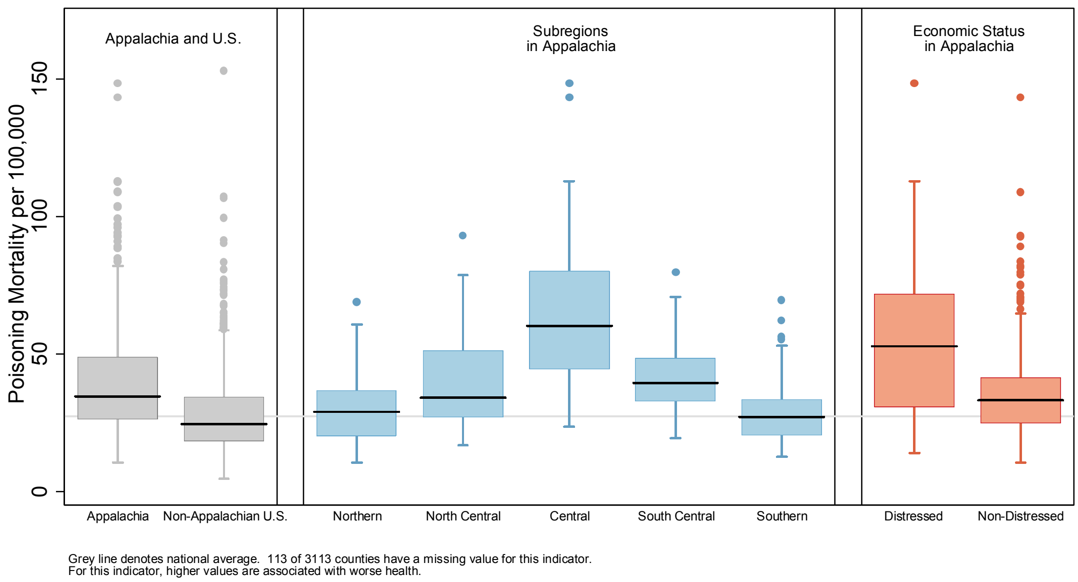


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD‐ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland 2015. http://www.cdc.gov/nchs/data_access/cmf.htm.

Distribution of Poisoning Mortality Rates

Figure 72 shows the distribution of poisoning mortality rates by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 113 have a missing value for this indicator.

Figure 72: Box Plot of Poisoning Mortality Rates per 100,000 Population by Geography and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD‐ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland 2015. http://www.cdc.gov/nchs/data_access/cmf.htm.

The distribution of poisoning mortality rates among national quintiles for Appalachian counties is shown in Table 29. Of the 420 counties in the Region, 195 (46 percent) rank in the worst-performing national quintile, while 24 (6 percent) rank in the best-performing national quintile.

Table 29: Distribution of Poisoning Mortality Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Poisoning mortality	24	*6%*	31	*7%*	56	*13%*	114	*27%*	195	*46%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Opioid Prescription Claims

- Six percent of all Medicare prescription claims in the Appalachian Region are for opioids, compared to 5.3 percent for the United States as a whole.
- In four of the five Appalachian subregions, the percentage of Medicare prescriptions for opioids is above the national average. Northern Appalachia, at 4.8 percent, is the only subregion with Medicare opioid prescriptions below the national mark.
- There is no significant urban-rural divide in opioid prescription levels, as Appalachia's rural counties have opioid prescription claims of 5.8 percent of total claims, compared with 5.7 percent for the Region's large metro counties.
- The Appalachian Region's distressed counties have Medicare opioid prescription claims of 6.1 percent of total claims, compared with 6.0 percent for the Region's non-distressed counties.

Background

The opioid prescriptions indicator is the percentage of all prescriptions filled by fee-for-service Medicare beneficiaries in 2013 that were for an opioid. These data come from the Chronic Conditions Warehouse maintained by the Centers for Medicare & Medicaid Services. This indicator only provides information on beneficiaries in Medicare's fee-for-service option, and does not include Medicare's managed care beneficiaries. This measure captures only a subset of the Medicare population and represents approximately 12 percent of the total population in the nation (Kaiser Family Foundation, 2015); (Centers for Medicare & Medicaid Services, 2017). However, this measure is one of the few available indicators that show county-level opioid use.

Prescribed opioids are natural analgesics, which include morphine and codeine, and semi-synthetic opioid analgesics such as oxycodone, hydrocodone, hydromorphone, and oxymorphone. Other opioids include synthetic opioids (methadone, tramadol, and fentanyl) and heroin. More than two million people suffer from opioid-related substance abuse disorders in the United States, and nearly 500,000 are addicted to heroin (Substance Abuse and Mental Health Services Administration, 2013).

There are a number of factors that place people at greater risk for opioid abuse and addiction, such as: obtaining overlapping prescriptions from multiple providers and pharmacies; taking high daily dosages of prescription pain relievers; mental illness; a history of alcohol or other substance abuse; residing in rural areas, and low income (Centers for Disease Control and Prevention, Prescription Opioids, 2016).

Deaths due to prescription opioid overdoses have increased over the past few years (Centers for Disease Control and Prevention, Opioid Overdose-Understanding the Epidemic, 2016). About 52 people die every day from opioid pain medications, although this is likely an underestimate, as the type of drug is not always listed on a death certificate (National Safety Council, 2016). Drug use, and opioids in particular, has been blamed for the declines in life expectancies among middle-aged white Americans (Case & Deaton, 2015). In March 2015, the Secretary of the U.S. Department of Health and Human Services made reversal of the opioid epidemic a national priority, selecting three targets: prescription practices, expanding access to medication-assisted treatment for persons using opioids, and expanding the use of naloxone, an opioid antidote (U.S. Department of Health and Human Services, The Opioid Epidemic: By the Numbers, 2016).

Although these data do not capture the entire population, they serve as a proxy for overuse of opioids. The increased access to opioids made possible by the Medicare Part D prescription drug benefit program has been linked to increased abuse in non-Medicare populations, suggesting a significant spillover effect (Powell, Pacula, & Taylor, 2015).

Overview: Opioid Prescriptions in the Appalachian Region

Six percent of all Medicare prescription claims in the Appalachian Region are for opioids, a figure slightly higher than that for the nation overall (5.3 percent). In four of the five Appalachian subregions, the percentage of Medicare opioid prescription claims is above the national average. Northern Appalachia, at 4.8 percent, is the only subregion with Medicare opioid prescriptions below the national mark. Southern Appalachia's Medicare opioid claims percentage of 6.8 percent is the highest in the Region.

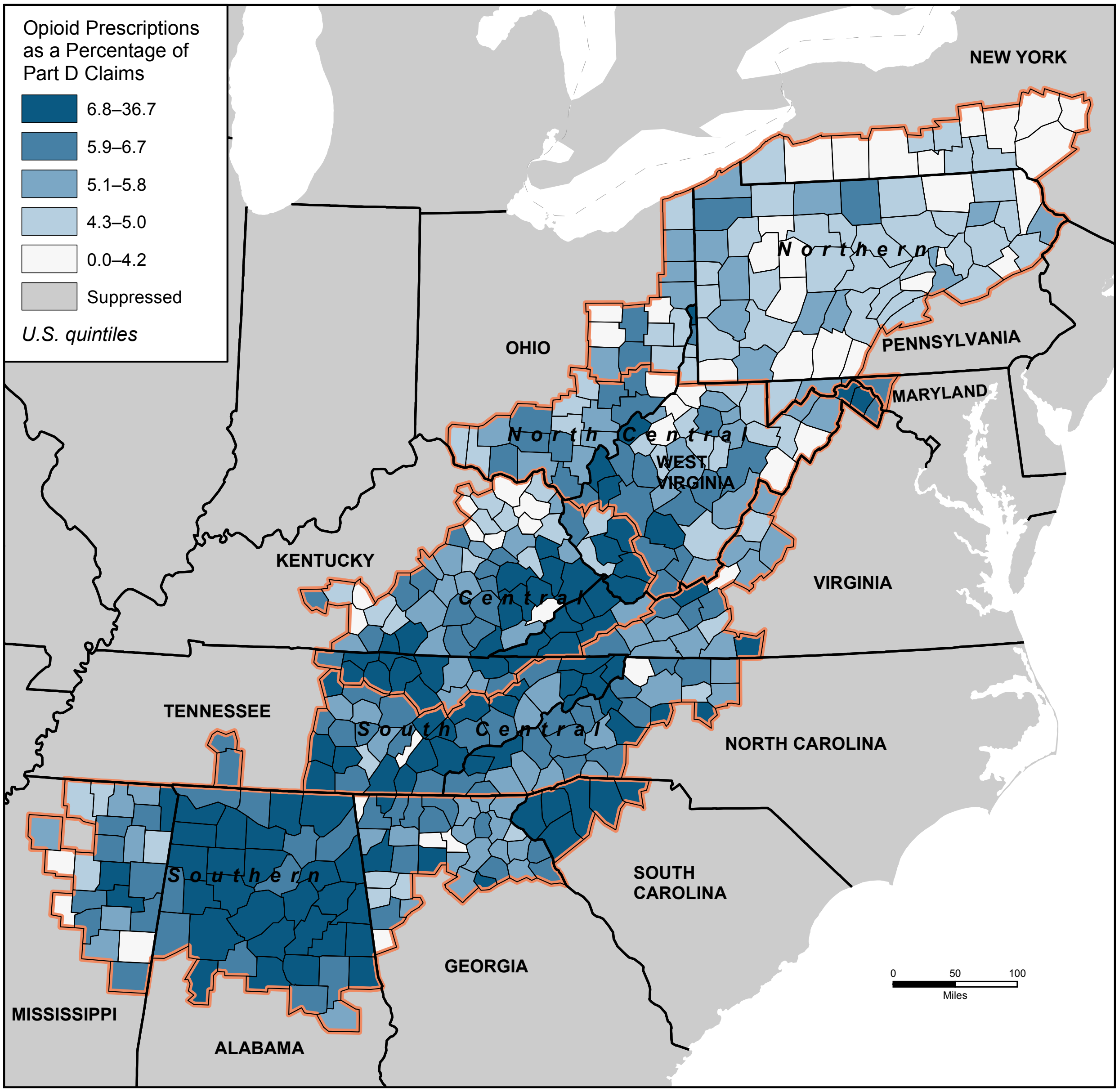
There is little difference in Medicare opioid prescription claims between rural and urban counties. Rural Appalachian counties have opioid prescription claims of 5.8 percent, compared with 5.7 percent for the Region's large metro counties. Likewise, there is little difference in the percentage of Medicare opioid prescription claims by economic status. The Appalachian Region's distressed counties have Medicare opioid prescription claims of 6.1 percent, compared with 6.0 percent for the Region's non-distressed counties.

Among the Appalachian states, there is significant variation in opioid prescriptions. Appalachian South Carolina and Appalachian Alabama have the highest percentages in the Region, at 7.8 percent and 7.5 percent, respectively, which are both far higher than the national average. Among the Appalachian portions of states throughout the Region, only Appalachian New York (4.0 percent) and Appalachian Pennsylvania (4.8 percent) have percentages lower than the national average.

Figure 73 shows the percentage of Medicare Part D prescription claims for opioids across the Appalachian Region. Darker blue indicates higher percentages of opioid prescription claims, with higher values for this measure indicating worse health. The map shows how percentages increase as one moves from north to south throughout the Region. Appalachian Alabama stands out for having the majority of its counties ranking in the worst-performing national quintile.

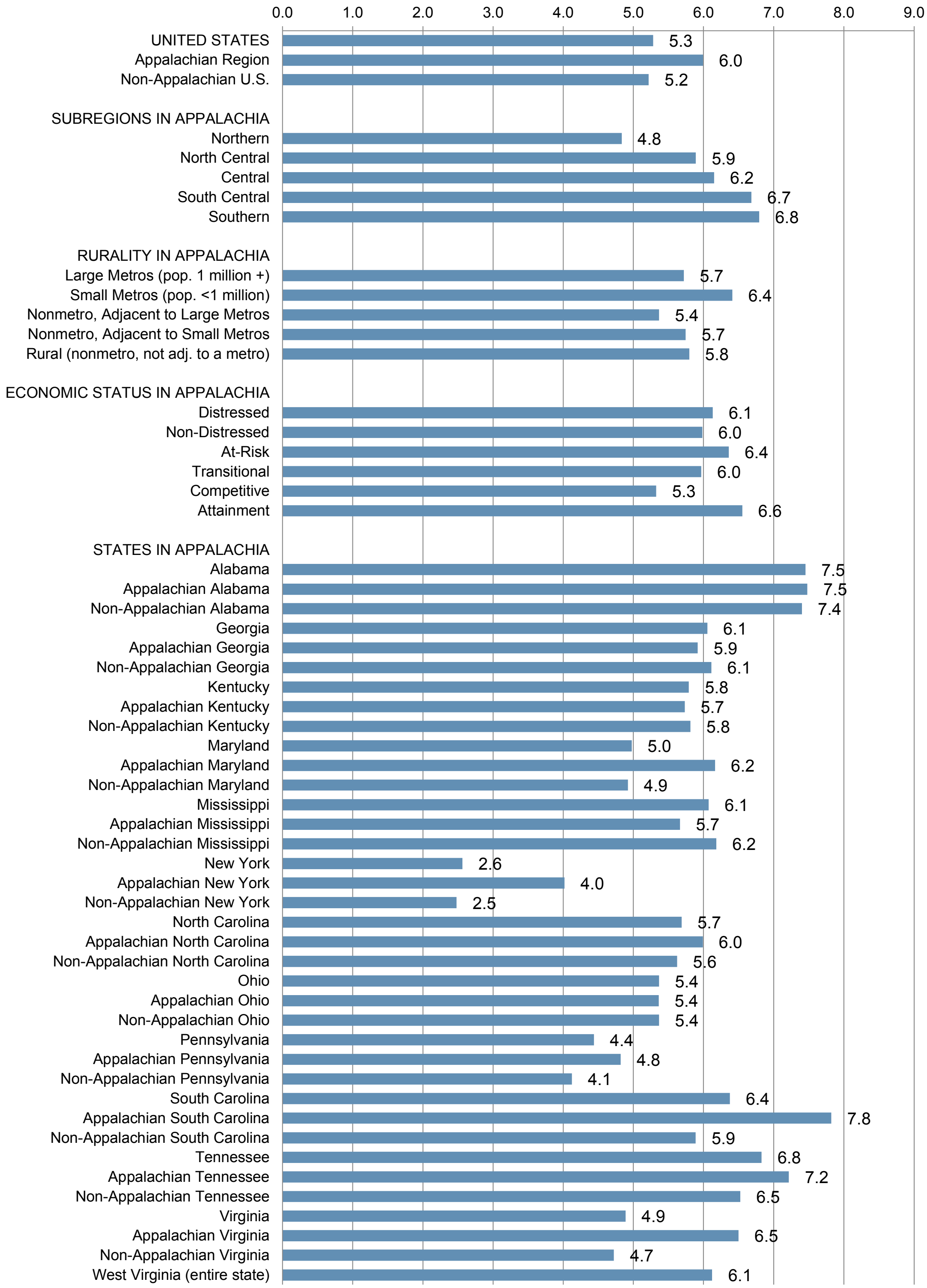
Figure 74 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 73: Map of Opioid Prescriptions as a Percentage of Medicare Part D Claims in the Appalachian Region, 2013



Data source: Medicare Part D Opioid Drug Mapping Tool, Centers for Medicare & Medicaid Services
https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/OpioidMap.html.

Figure 74: Chart of Opioid Prescriptions as a Percentage of Medicare Part D Claims, 2013

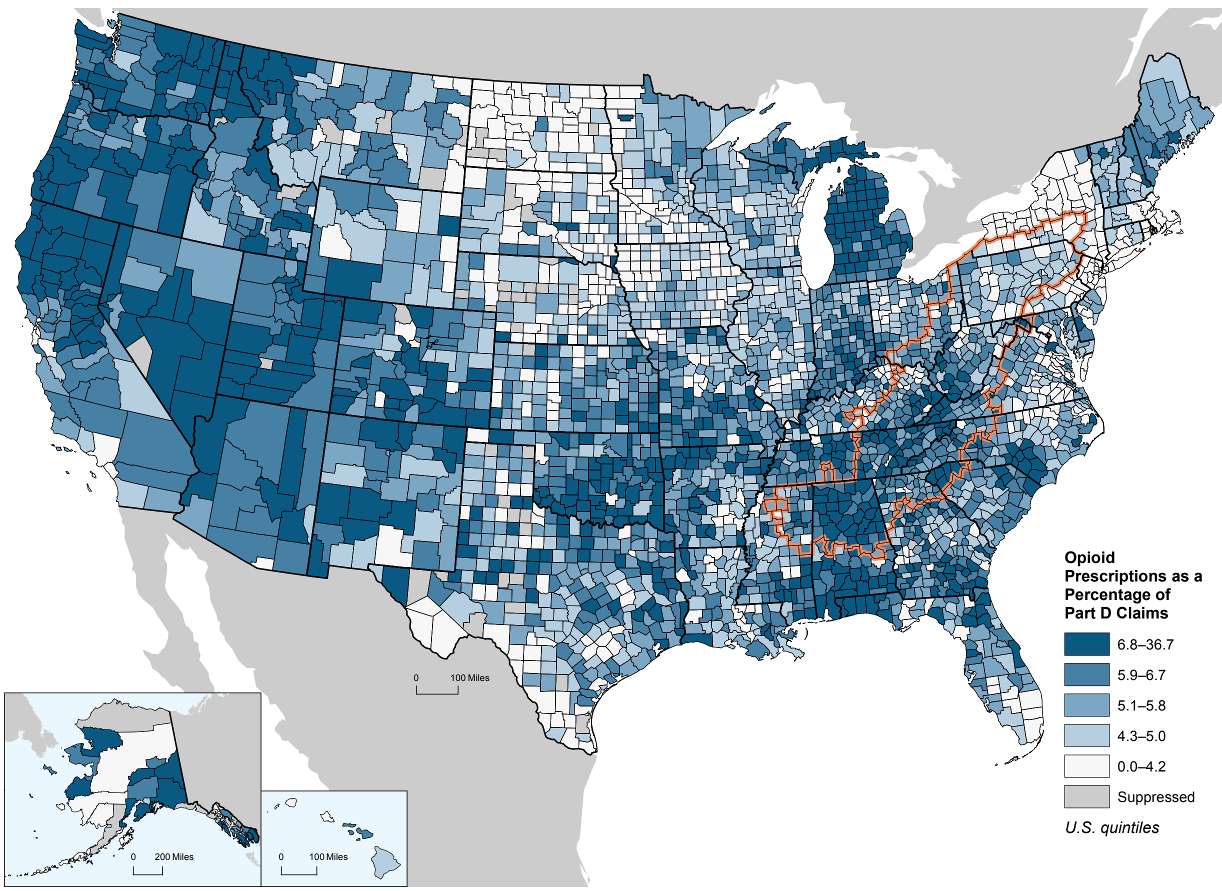


Data source: Medicare Part D Opioid Drug Mapping Tool, Centers for Medicare & Medicaid Services [https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/OpioidMap.html.](https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/OpioidMap.html)

Overview: Opioid Prescriptions in the United States

Figure 75 shows the variation in opioid prescription claims across the United States. Groupings of counties with high percentages occur throughout parts of the South, Midwest, and West. In the eastern half of the country, both Michigan and Alabama stand out for having nearly all of their counties ranking in the worst-performing national quintile. There is also a pocket of counties centered on Oklahoma—and stretching into surrounding states—ranking in the worst-performing national quintile. Much of the western half of the country has high opioid prescription percentages, particularly in northern California and other parts of the Pacific Northwest.

Figure 75: Map of Opioid Prescriptions as a Percentage of Medicare Part D Claims in the United States, 2013

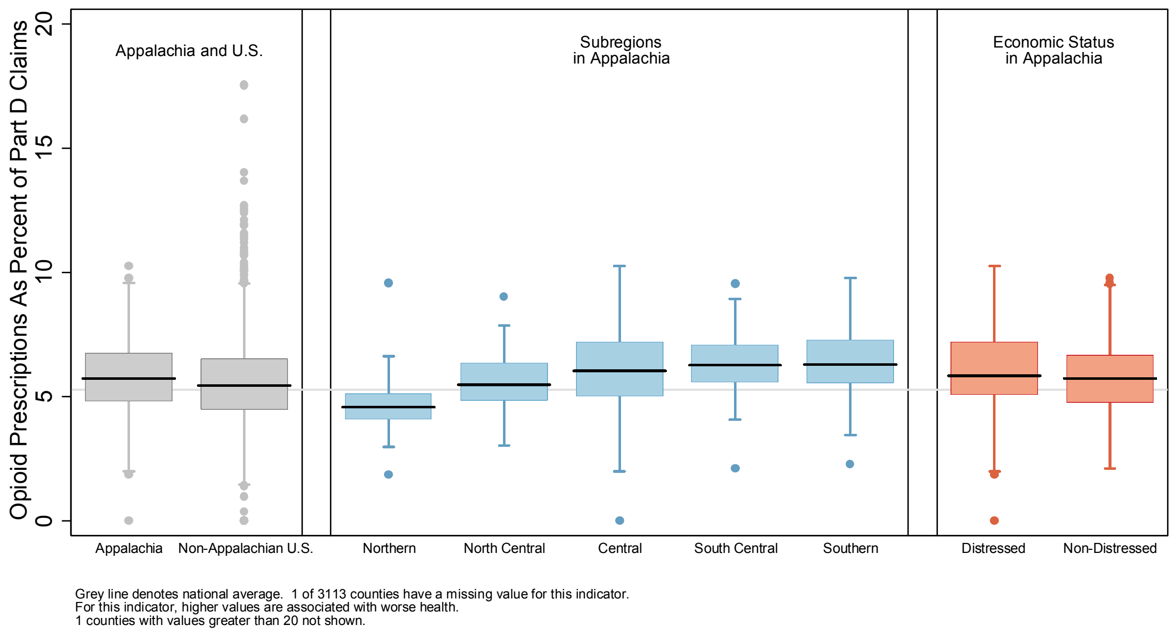


Data source: Medicare Part D Opioid Drug Mapping Tool, Centers for Medicare & Medicaid Services [https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/OpioidMap.html.](https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/OpioidMap.html)

Distribution of Opioid Prescriptions

Figure 76 shows the distribution of opioid prescription rates by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, one has a missing value for this indicator, and one county with a value greater than 20 is not represented in this box plot.

Figure 76: Box Plot of Opioid Prescriptions as a Percentage of Medicare Part D Claims by Geography and Economic Status, 2013



Data source: Medicare Part D Opioid Drug Mapping Tool, Centers for Medicare & Medicaid Services
https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/OpioidMap.html.

The distribution of opioid prescriptions as a percentage of Medicare Part D claims among national quintiles for Appalachian counties is shown in Table 30. Of the 420 counties in the Region, 101 (24 percent) rank in the worst-performing national quintile, while 51 (12 percent) rank in the best-performing national quintile.

Table 30: Distribution of Opioid Prescriptions as a Percentage of Medicare Part D Claims among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Opioid prescriptions	51	*12%*	77	*18%*	91	*22%*	100	*24%*	101	*24%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Further Reading

Depression Prevalence

"Depression is Not a Normal Part of Growing Older" https://www.cms.gov/Medicare/Prevention/PrevntionGenInfo/Health-Observance-Mesages-New-Items/2015-05-14-depression.html

Suicide

Centers for Disease Control and Prevention. Suicide Prevention. http://www.cdc.gov/violenceprevention/suicide/

Excessive Drinking

Alcohol Facts and Statistics. National Institute on Alcohol Abuse and Alcoholism. Retrieved 2016/08/31. Accessed at: https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-facts-and-statistics

Alcohol Use. Centers for Disease Control and Prevention National Center for Health Statistics. Retrieved 2016/08/31. Accessed at: http://www.cdc.gov/nchs/fastats/alcohol.htm.

Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., & Patra, J. (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. The Lancet, 373(9682), 2223-2233

Roland, S. (2002). The effects of obesity, smoking, and drinking on medical problems and costs. Health Affairs, 245-253

Poisoning Mortality

NCHS Data on Drug-poisoning Deaths. (2016). Retrieved from http://www.cdc.gov/nchs/data/factsheets/factsheet_drug_poisoning.htm

Opioid Prescriptions

Dunn KM. Opioid Prescriptions for Chronic Pain and Overdose. *Annals of Internal Medicine*. 2010:152(2); 85

Centers for Disease Control and Prevention. Opioid Overdose: Opioid Data Analysis. Available at: http://www.cdc.gov/drugoverdose/data/analysis.html

Centers for Disease Control and Prevention. Understanding the Epidemic. Available at: http://www.cdc.gov/drugoverdose/epidemic/index.html.

Child Health

KEY FINDINGS | Infant Mortality Rates

- The infant mortality rate is 16 percent higher in the Appalachian Region than in the nation as a whole.
- With identical infant mortality rates of 7.4 per 1,000 births, the North Central, Central, and Southern Appalachian subregions have rates 21 percent higher than the national rate.
- There is an urban-rural divide in infant mortality, with the Appalachian Region's rural counties reporting an infant mortality rate 19 percent higher than the rate found in the Region's large metro areas.
- Economic status is also an indicator of infant mortality. The rate in the Appalachian Region's distressed counties is 19 percent higher than the rate found in the Region's non-distressed counties.

Background

Infant mortality is the number of deaths of infants under age one per 1,000 live births, per year. Data for this indicator come from the Compressed Mortality File provided by the National Center for Health Statistics and cover the 2008–2014 period. Infant mortality is one of the most commonly used population health indicators for communities. Past studies have shown that factors leading to increased infant deaths are also correlated with negative outcomes for the entire population (Matteson, W., Burra, & Marshall, 1998).

There are a number of factors that contribute to infant mortality, including: preterm birth, low birthweight, birth defects, maternal pregnancy complications, sudden infant death syndrome (SIDS), and accidents (Centers for Disease Control and Prevention, Infant Mortality, 2016). Although some infant deaths may be attributed to birth defects and congenital abnormalities, many remain preventable. Prenatal care can help reduce prenatal injuries and preterm birth, both of which are large contributors to infant mortality rates. Likewise, many unhealthy maternal behaviors, such as smoking, drinking alcohol, and being physically inactive are also risk factors, and modifying these behaviors can reduce the risk of infant mortality (Centers for Disease Control and Prevention, Infant Mortality, 2016).

Overview: Infant Mortality in the Appalachian Region

With a rate of 7.1 infant deaths per 1,000 live births, the infant mortality rate is 16 percent higher in the Appalachian Region than the national rate of 6.1 per 1,000. All five subregions perform worse than the nation as a whole, with the three worst-performing subregions—North Central, Southern, and Central Appalachia—all reporting identical rates of 7.4 per 1,000.

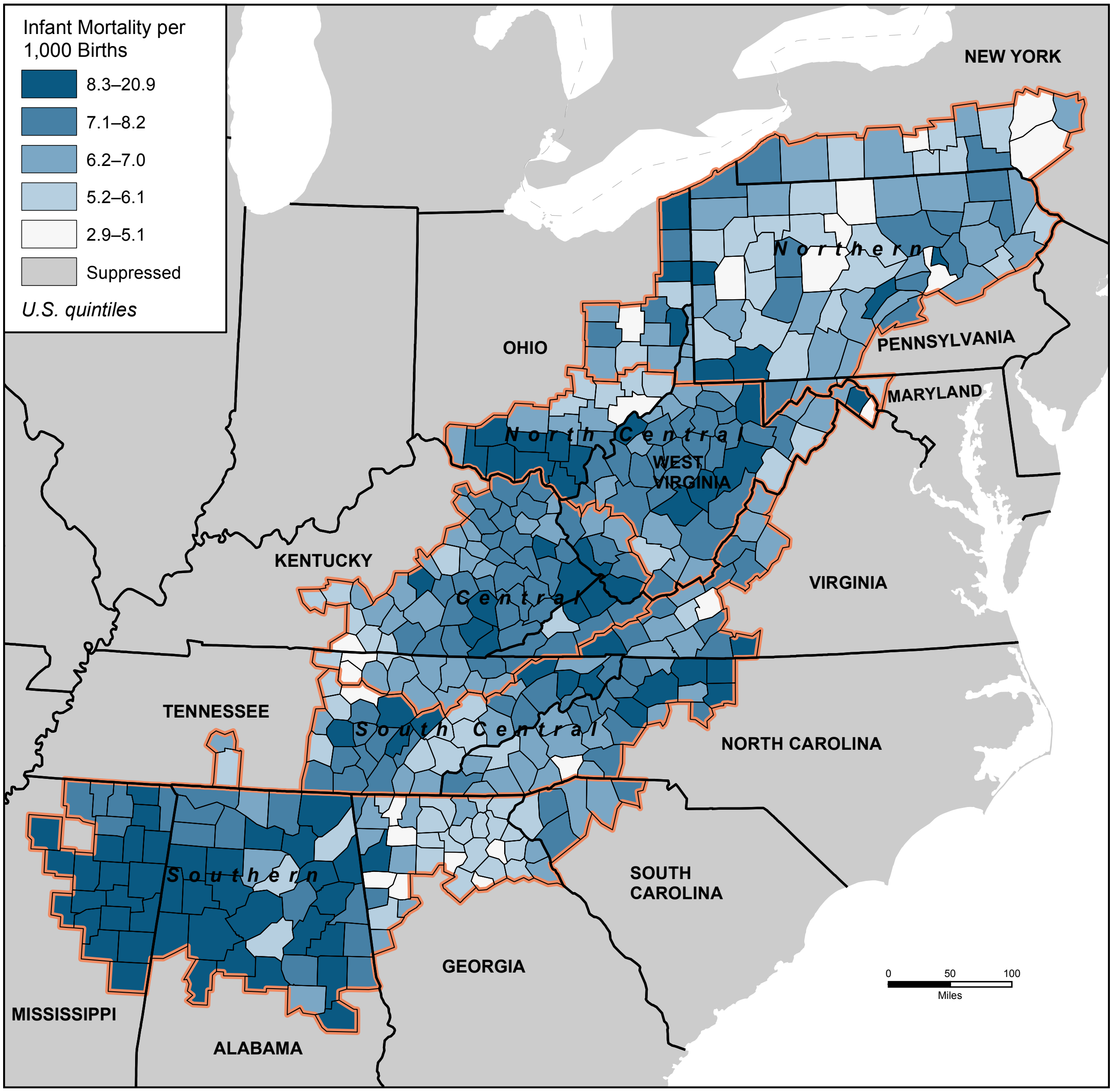
There is an urban-rural divide in infant mortality rates, with those living in rural areas throughout the Region experiencing a rate 19 percent higher than those in the Region's large metro areas (8.0 per 1,000 births compared to 6.7 per 1,000). The infant mortality rates for the remaining three urban-rural classifications are all closer to the large metro figure of 6.7 per 1,000 births than the 8.0 per 1,000 experienced in rural areas. There is also a divide based on a county's economic status: the infant mortality rate in distressed counties throughout Appalachia is 8.3 per 1,000 births, a rate 19 percent higher than the rate of 7.0 per 1,000 found in the Region's non-distressed counties.

The majority of counties in the western half of Southern Appalachia are in the worst-performing national quintile, and the Appalachian portions of Mississippi (9.4 per 1,000 births) and Alabama (8.9 per 1,000) report the highest rates among Appalachian portions of the Region's thirteen states. While infant mortality rates elsewhere aren't quite as high as in these two areas of the Southern subregion, other Appalachian portions of states report figures much higher than the national rate, including: Appalachian North Carolina (7.6 per 1,000 births), West Virginia (7.5), Appalachian Ohio (7.4), and Appalachian Kentucky (7.4).

Figure 77 shows the variation in infant mortality across the Appalachian Region. Darker blue indicates a higher infant mortality rate. There are several pockets of poor performance throughout Appalachia, and each subregion has multiple counties ranking in the worst-performing national quintile. A significant concentration of these poorly-performing counties are found in the western half of the Southern Appalachian subregion.

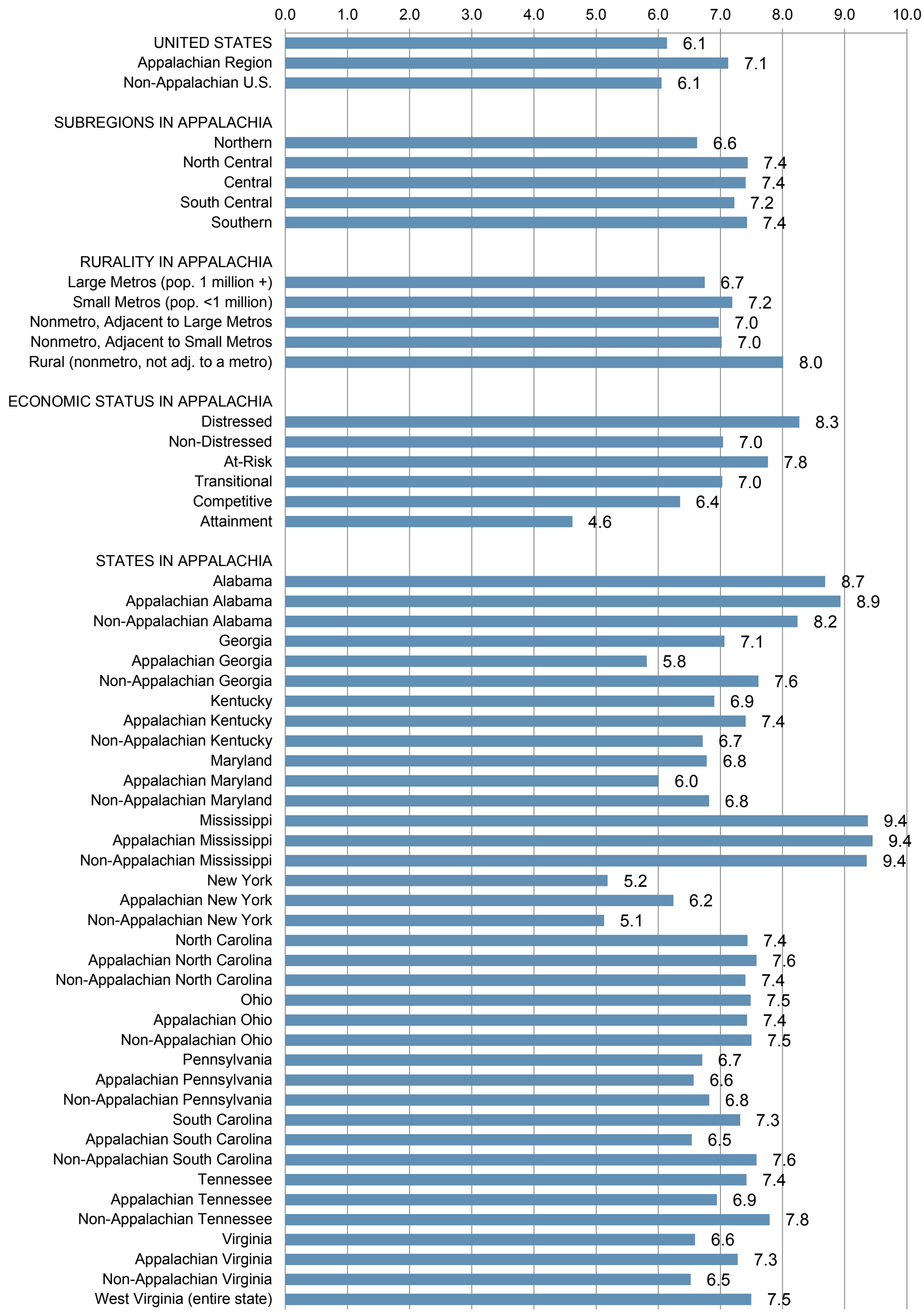
Figure 78 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 77: Map of Infant Mortality Rates in the Appalachian Region, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Figure 78: Chart of Infant Mortality Rates, 2008–2014

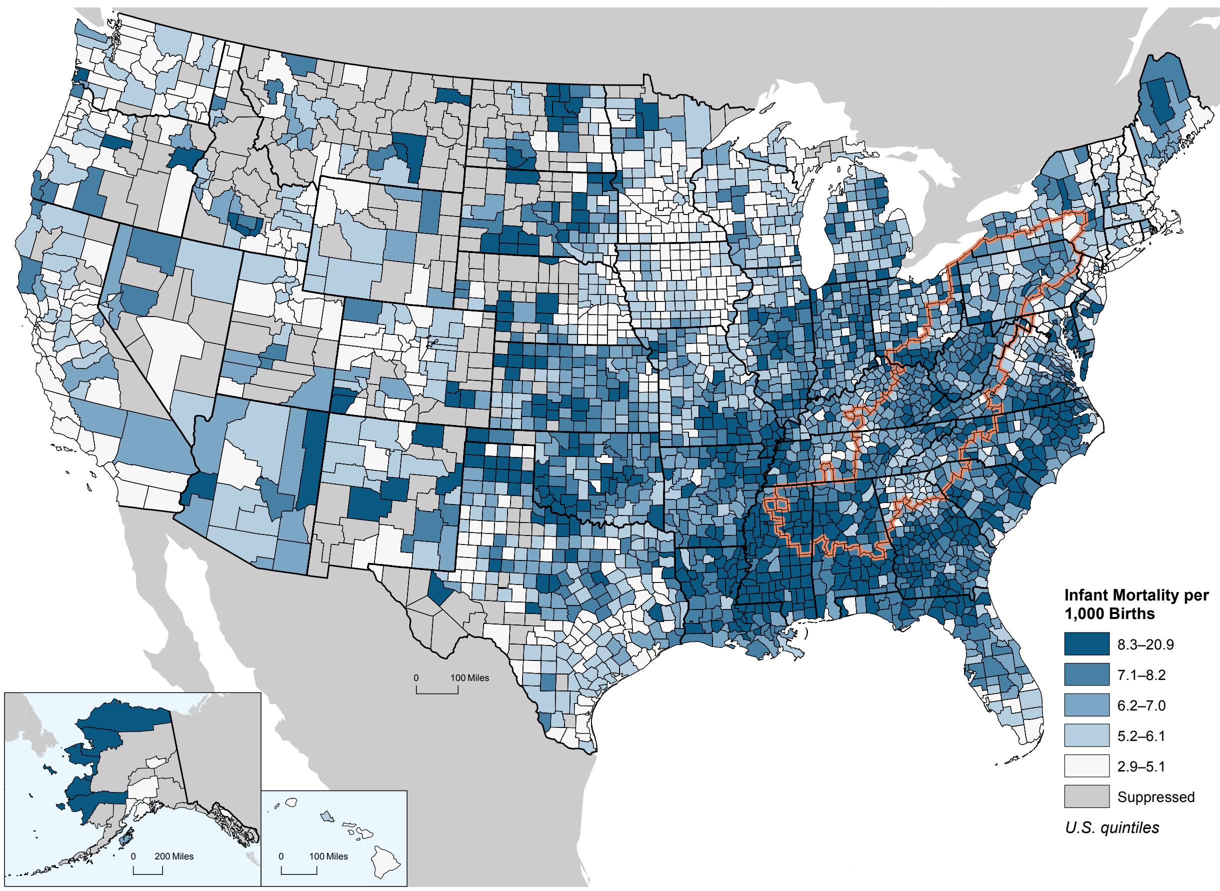


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD￾ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Overview: Infant Mortality in the United States

Figure 79 shows the variation in infant mortality rates across the United States. Infant mortality rates are high throughout much of the eastern half of the country, with high rates particularly pronounced throughout the coastal Southeast and Mississippi Delta. These high rates extend into the Midwest and central part of the country. Although counties ranking in the worst-performing quintile are found in the Upper Midwest, a large number of counties there rank in the top-performing national quintile. The Pacific Coast and Northeast also generally report low infant mortality rates. Due to data suppression, it is difficult to obtain a complete picture of infant mortality throughout much of the western half of the United States.

Figure 79: Map of Infant Mortality Rates in the United States, 2008–2014

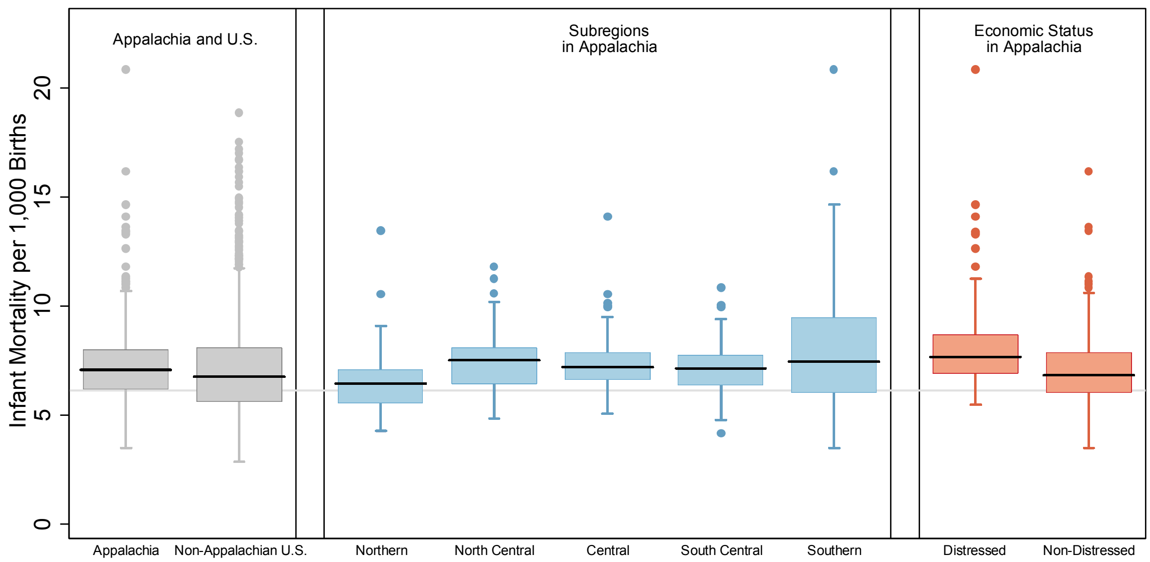


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD‐ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

Distribution of Infant Mortality Rates

Figure 80 shows the distribution of infant mortality rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 243 have a missing value for this indicator.

Figure 80: Box Plot of Infant Mortality Rates by Geography and Economic Status, 2008–2014



Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The distribution of infant mortality rates among national quintiles for Appalachian counties is shown in Table 31. Of the 420 counties in the Region, 87 (21 percent) rank in the worst-performing national quintile, while 24 (6 percent) are in the best-performing national quintile.

Table 31: Distribution of Infant Mortality Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Infant mortality	24	*6%*	73	*17%*	112	*27%*	124	*30%*	87	*21%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Low Birth Weight

KEY FINDINGS | Low Birth Weight Incidence

- The incidence of low birth weight in Appalachia is 8.7 percent of all newborns, a percentage higher than the national average of 8.1 percent.
- Northern Appalachia, with a 7.8 percent incidence of low birth weight, performs better than the nation as a whole on this measure. The other four subregions all report percentages above the national average, with performance in Central Appalachia especially poor at 9.9 percent, a figure much higher than the national average of 8.1 percent.
- There is an urban-rural divide in low birth weight incidence, with the Appalachian Region's rural counties reporting a higher incidence (9.4 percent) than that found in the Region's large metro areas (8.2 percent).
- Distressed Appalachian counties report a low birth weight incidence of 10.2 percent, compared to the 8.6 percent in the Region's non-distressed counties.

Background

Low birth weight incidence is the percentage of newborns that weigh less than 2,500 grams (or 5.5 pounds) at birth. The data for this measure come from County Health Rankings and are based on data provided by CDC's National Center for Health Statistics and National Vital Statistics System covering the 2007–2013 period. Because low birth weights have both immediate and lifetime consequences, disparities in this indicator may lead to disparities in other health measures that persist for generations.

Low birth weights are associated with poor health outcomes throughout both childhood and later into adulthood, as low birth weights have repeatedly been shown to increase the likelihood of developmental delays, respiratory problems, and even premature death (McCormick, 1985). Insufficient prenatal care, smoking, drinking alcohol, and poor maternal health are among the many risk factors linked to a higher incidence of low birth weight (Centers for Disease Control and Prevention, Reproductive and Birth Outcomes, 2016).

Despite advances in prenatal and maternal health, the national incidence of low birth weight has actually increased from 6.8 percent in 1980 to 8.0 percent in 2013 (Child Trends, 2016). Improvements in neonatal care may have led to an increase in this rate, as low birth weight infants are now more likely to survive due to these improvements.

Overview: Low Birth Weight Incidence in the Appalachian Region

With 8.7 percent of babies born in Appalachia classified as having a low birth weight, the chances of a baby being born with a low birth weight are greater in the Region than in the nation as a whole, where this figure is 8.1 percent. Northern Appalachia is the best-performing subregion, and with an incidence of 7.8 percent, is lower than the national mark. The other four Appalachian subregions all perform worse than the U.S. and Central Appalachia has the highest incidence (9.9 percent) among the subregions.

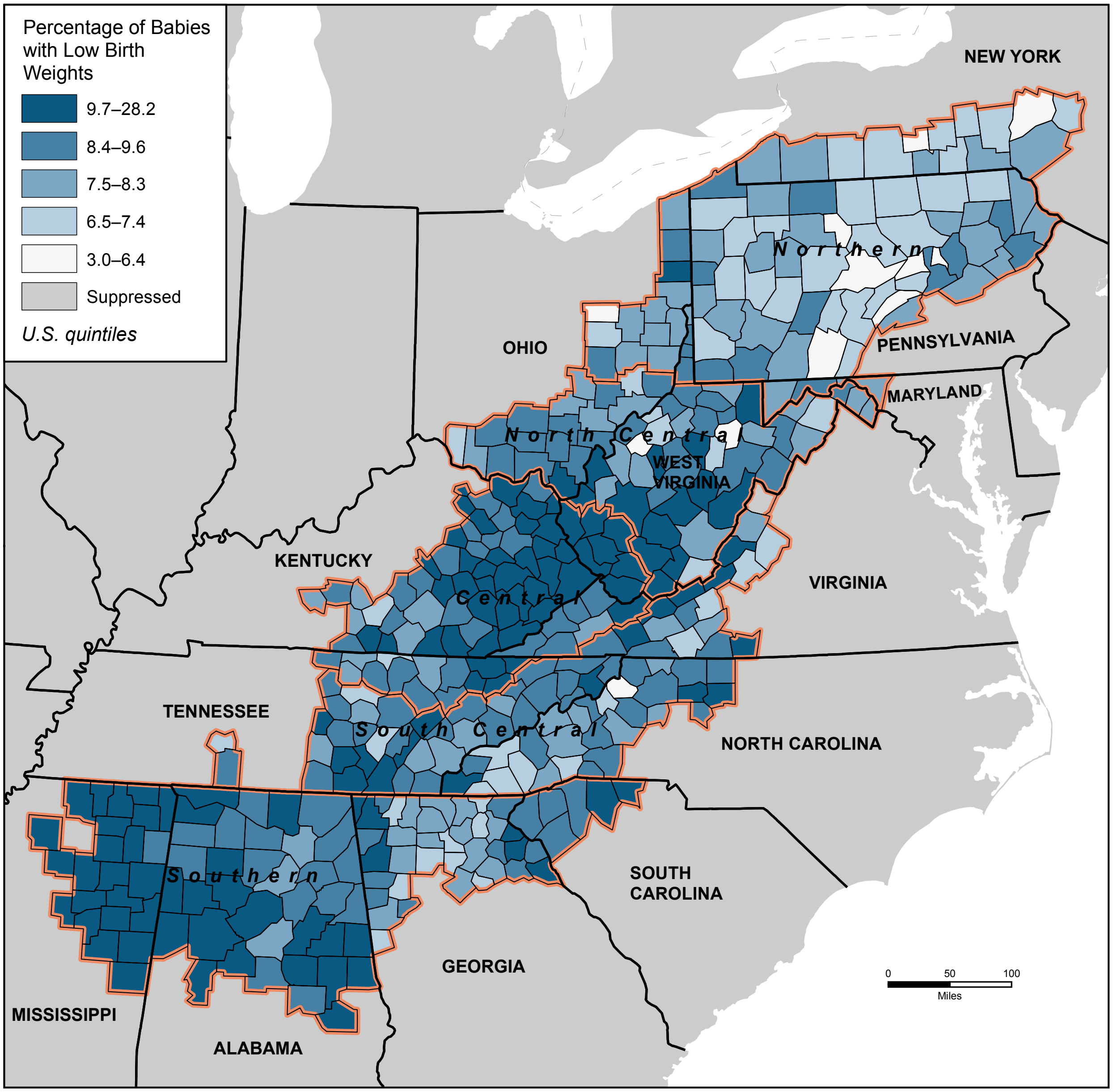
There is an urban-rural divide in the incidence of low birth weight, with rural counties in the Region reporting a higher incidence than that found in the Region's large metro areas (9.4 percent compared to 8.2 percent). There is an additional divide based on a county's economic status. The Appalachian Region's distressed counties report a low birth weight incidence of 10.2 percent, a figure higher than the 8.6 percent reported by the Region's non-distressed counties.

The Appalachian portions of Mississippi (11.5 percent) and Alabama (10.0 percent) have the highest incidence of low birth weight among the states in the Region. However, the percentages for the Appalachian portions are actually lower than those found in the non-Appalachian portions of those states. This also occurs—Appalachian portions outperforming non-Appalachian portions—in the following states: Georgia, Maryland, New York, North Carolina, Ohio, Pennsylvania, South Carolina, and Tennessee. Although the incidence of low birth weight for the Appalachian portions of these states are largely well above the national average, they are, at the same time, better-performing than the states' non-Appalachian portions.

Figure 81 shows the variation in low birth weight incidence across the Appalachian Region. Darker blue indicates a higher incidence; for this measure, higher values are associated with worse health. There are several pockets of poor performance throughout Appalachia— particularly in the central and southern areas—where a large number of counties rank in the two worst-performing quintiles.

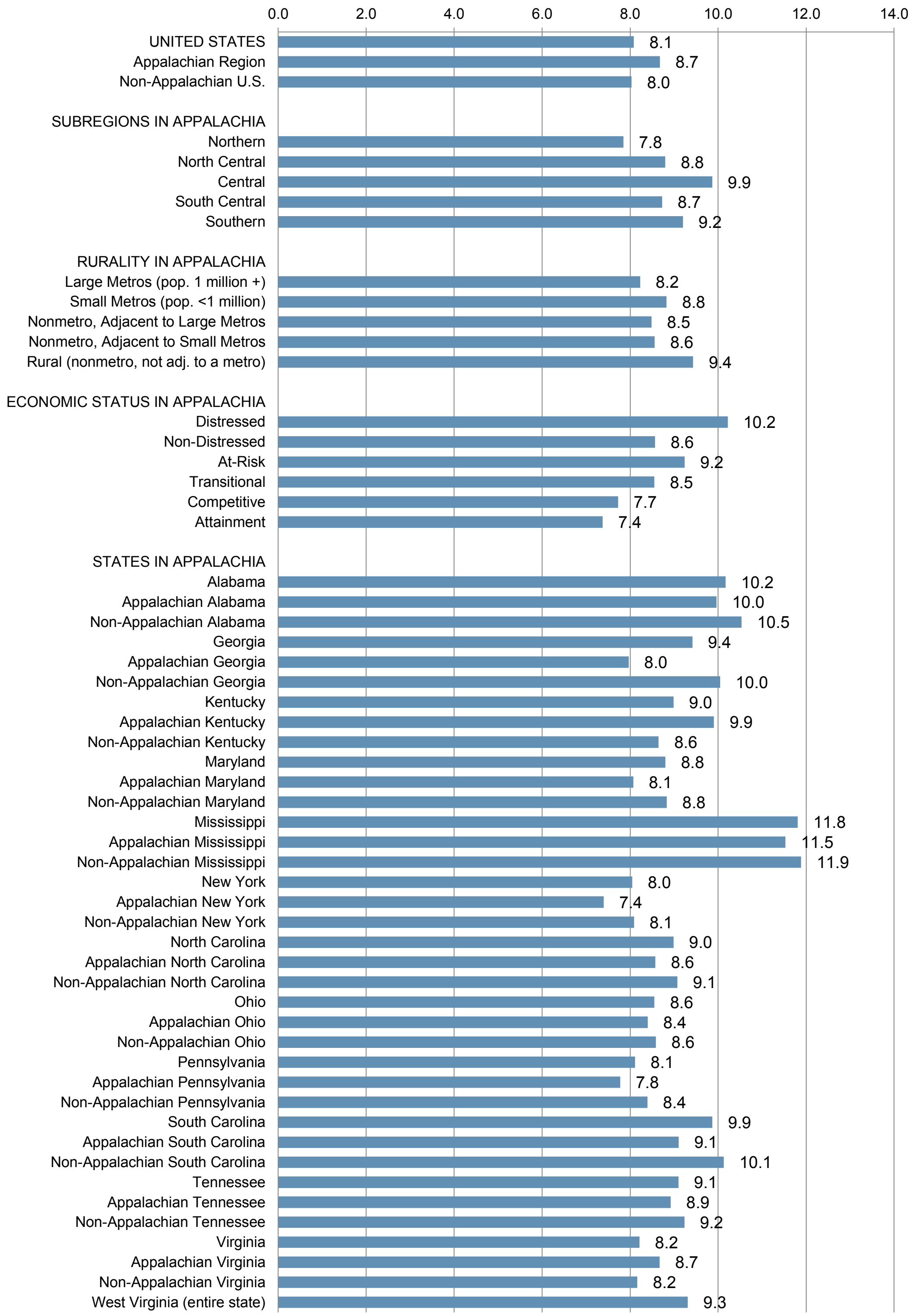
Figure 82 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 81: Map of Percentage of Babies born with a Low Birth Weight in the Appalachian Region, 2007–2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 82: Chart of Percentage of Babies born with a Low Birth Weight, 2007–2013

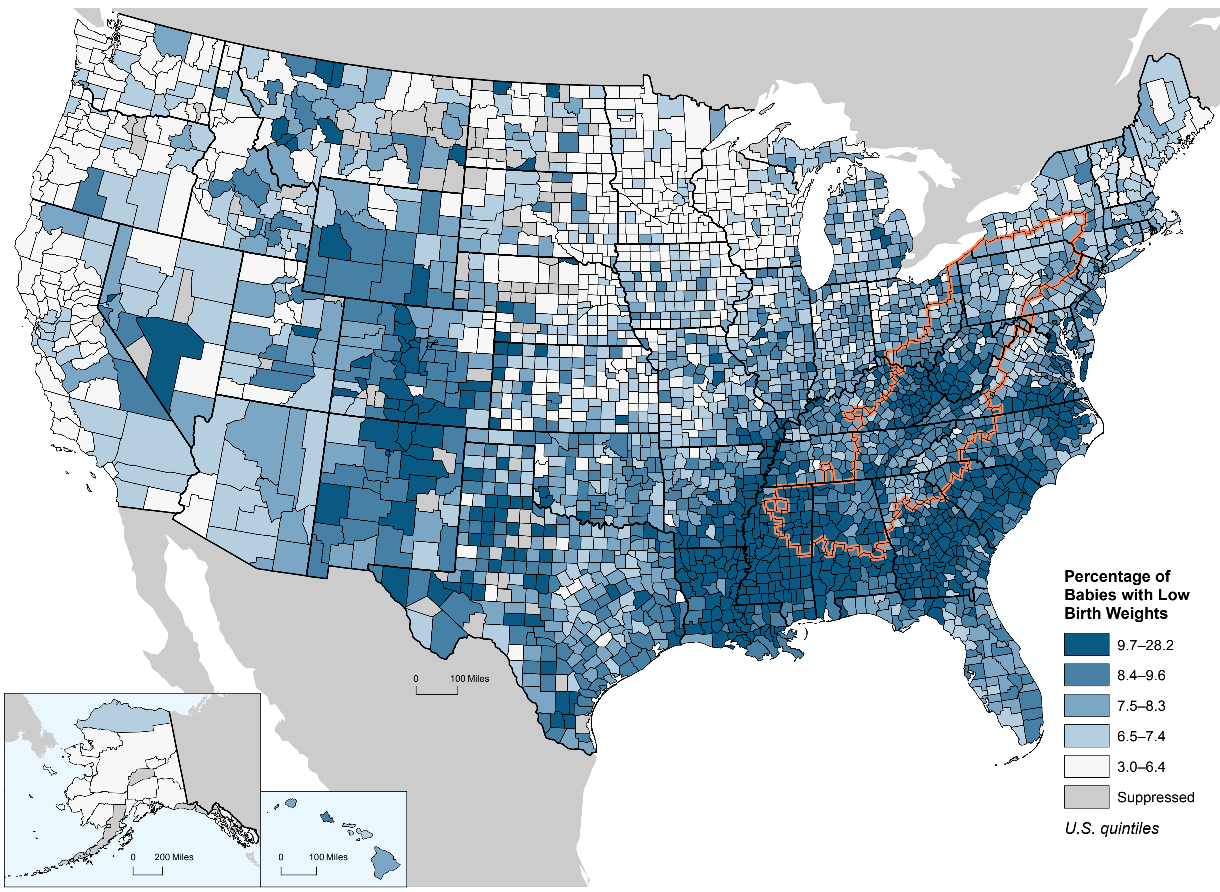


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Low Birth Weight Incidence in the United States

Figure 83 shows the variation in low birth weight incidence across the United States. Much of the Southeast ranks in the two worst-performing quintiles, with poor rates particularly noticeable in the Mississippi Delta region, as well as along coastal areas stretching from Virginia to Georgia. There are also some pockets of poor performance elsewhere in the country, including many counties in both New Mexico and Colorado. Many counties west of the Rocky Mountains, as well as those in the upper Midwest, report percentages among the lowest in the nation.

Figure 83: Map of Percentage of Babies born with a Low Birth Weight in the United States, 2007–2013

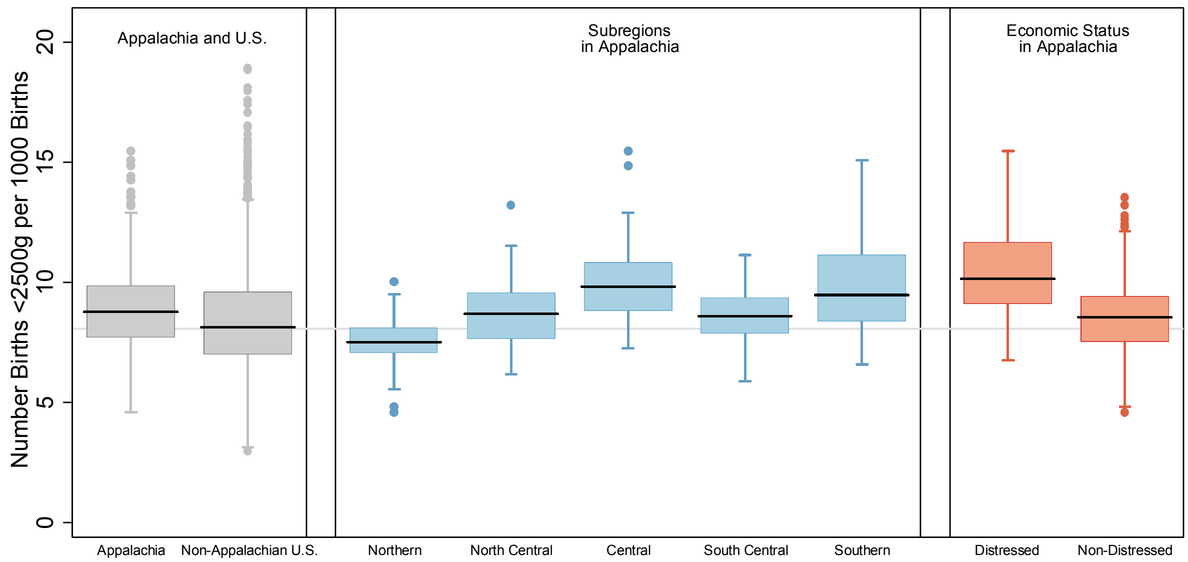


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Low Birth Weight Incidence

Figure 84 shows the distribution of low birth weight rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 99 have a missing value for this indicator, and one county with a value greater than 20 percent was not included in the box plot.

Figure 84: Box Plot of Percentage of Babies born with a Low Birth Weight by Geography and Economic Status, 2007–2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of the percentage of babies born with low birth weight among national quintiles for Appalachian counties is shown in Table 32. Of the 420 counties in the Region, 127 (30 percent) rank in the worst-performing national quintile, while 12 (3 percent) rank in the best-performing national quintile.

Table 32: Distribution of Low Birth Weight Incidence among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Low birth weight	12	*3%*	58	*14%*	90	*21%*	132	*31%*	127	*30%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Teen Births

KEY FINDINGS | Teen Birth Rates

- The teen birth rate in the Appalachian Region is 10 percent higher than the national rate.
- Central Appalachia has a teen birth rate 63 percent higher than the national rate.
- The Appalachian Region's rural counties have a teen birth rate 72 percent higher than the rate found in the Region's large metro areas.
- The Appalachian Region's distressed counties report a teen birth rate 61 percent higher than the Region's non-distressed counties.

Background

The teen birth rate is the number of live births per 1,000 females ages 15–19, per year. The data for this measure come from County Health Rankings and are based on data provided by CDC's National Center for Health Statistics and National Vital Statistics System covering the 2007–2013 period. According to CDC, a number of social determinants—including high unemployment, low income, and low education—are associated with higher teen birth rates (Centers for Disease Control and Prevention, Social Determinants and Eliminating Disparities in Teen Pregnancy, 2017).

Teen births are more likely to be unintended and lead to poor outcomes for both teenage mothers and their children. The children of teenage mothers are more likely to have lower school achievement, drop out of high school, have more health problems, be incarcerated at some time during adolescence, give birth as a teenager, and face unemployment as a young adult (Centers for Disease Control and Prevention, About Teen Pregnancy, 2017). According to one summary of available research, pregnant teens are more likely than older women to receive late prenatal care, if any, and also experience gestational hypertension, anemia, and inadequate maternal weight gain (Kentucky Department for Public Health, 2013). In addition to the direct health problems related to both child and mother, high teen birth rates are also associated with unsafe sexual activity and its inherent risks. There are also economic impacts, as nearly one-fifth of teen mothers will have two children before age 20, which can limit both academic and workforce opportunities for young parents (Stewart & Kaye, 2013).

While the teen birth rate in the United States has declined over the past 20 years, the rate remains higher than in many other developed countries (Office of Adolescent Health, 2016). The variation found within the United States has a number of potential causes, including the policies affecting adolescents' access to health care and variation in school-based sexual education curricula. The Children's Health Insurance Programs (CHIP), Medicaid family planning waiver programs, federally funded family planning clinics (Title X), and programs that expand access to contraception are among the many strategies utilized to reduce teen pregnancy (Centers for Disease Control and Prevention, Reproductive Health: About Teen Pregnancy, 2016).

Overview: Teen Birth Rates in the Appalachian Region

With a rate of 38.2 births per 1,000 females ages 15–19, the incidence of teen births is 10 percent higher in the Appalachian Region than in the nation as a whole (34.6 per 1,000). Northern Appalachia reports a teen birth rate of 26.6 per 1,000, which is 23 percent lower than the national rate. Teen birth rates in the other four subregions are all well above the national rate, however, Central Appalachia has the highest rate at 56.3 per 1,000, a rate 63 percent higher than the national mark.

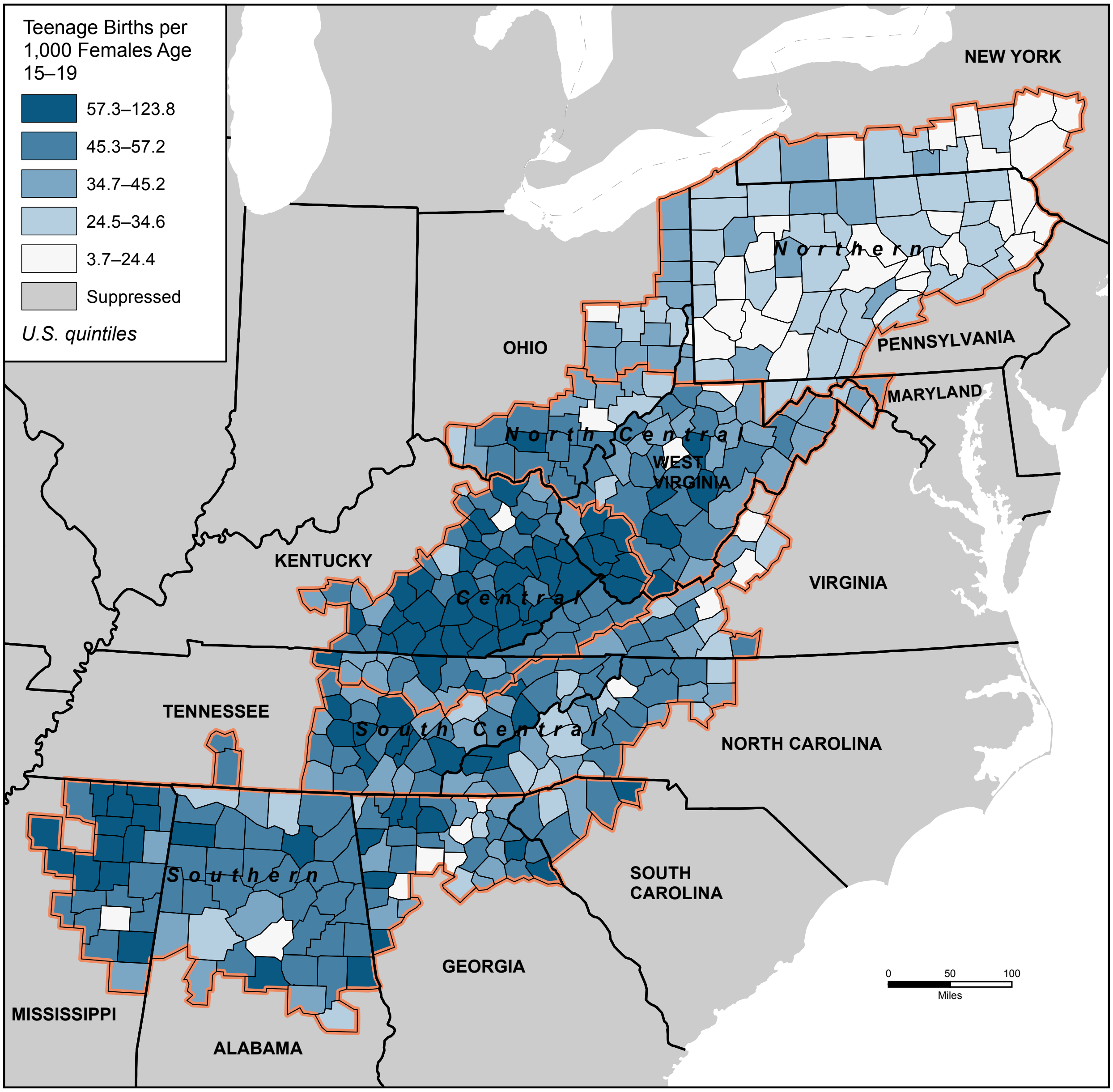
There is an urban-rural divide in the incidence of teen births. As one travels from metro to rural areas throughout the Region, these rates gradually increase. In the Appalachian Region's large metro areas, the teen birth rate is 29.6 per 1,000, a figure well below the 51.0 per 1,000 reported in the Region's rural areas. There is also a divide based on economic status, with distressed Appalachian counties reporting a much higher rate than the Region's non-distressed counties (59.1 births per 1,000 females ages 15–19, compared to 36.7).

Many of the counties in Appalachian Kentucky report teen birth rates in the worst-performing national quintile. The rate for Appalachian Kentucky is 58.1 per 1,000 females ages 15–19, a figure 34 percent higher than the non-Appalachian portion of the state (43.5 per 1,000). Appalachian Mississippi, with an overall rate of 58.3 per 1,000 females ages 15–19, also has many counties reporting teen birth rates in the worst-performing national quintile. This high figure, however, is not much different than the rate found in non-Appalachian Mississippi (56.0 per 1,000). Appalachian New York (24.4 per 1,000) and Appalachian Pennsylvania (24.5 per 1,000) report the lowest rates in the Region.

Figure 85 shows the variation in teen birth rates across the Appalachian Region. Darker blue indicates higher rates of teen births, and for this measure, higher values are associated with worse health. Northern Appalachia stands out from the other subregions due to its low rates. Central Appalachia, and Kentucky in particular, has the largest concentration of counties with high teen birth rates.

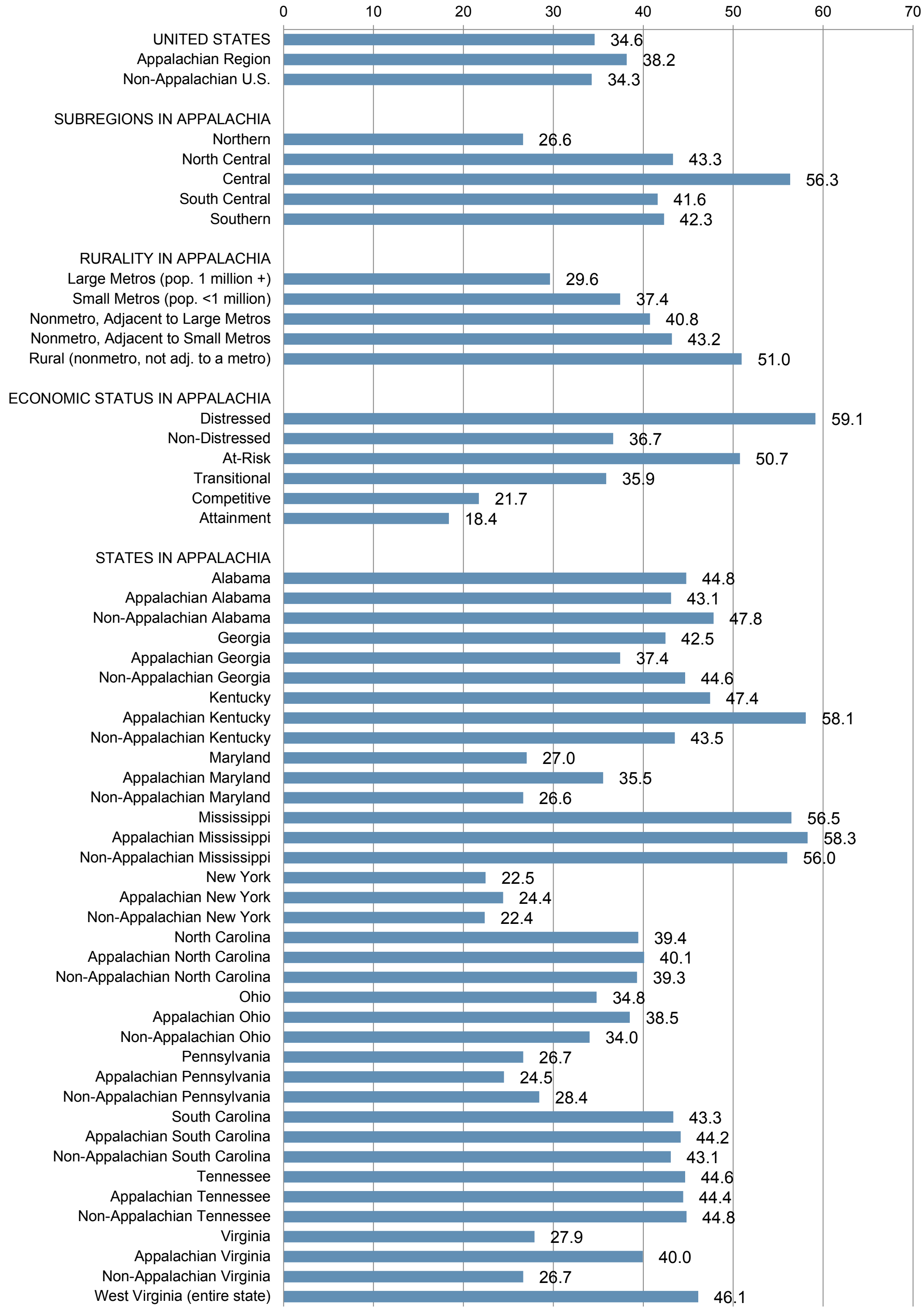
Figure 86 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 85: Map of Teen Birth Rates in the Appalachian Region, 2007–2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 86: Chart of Births per 1,000 Females ages 15–19, 2007–2013

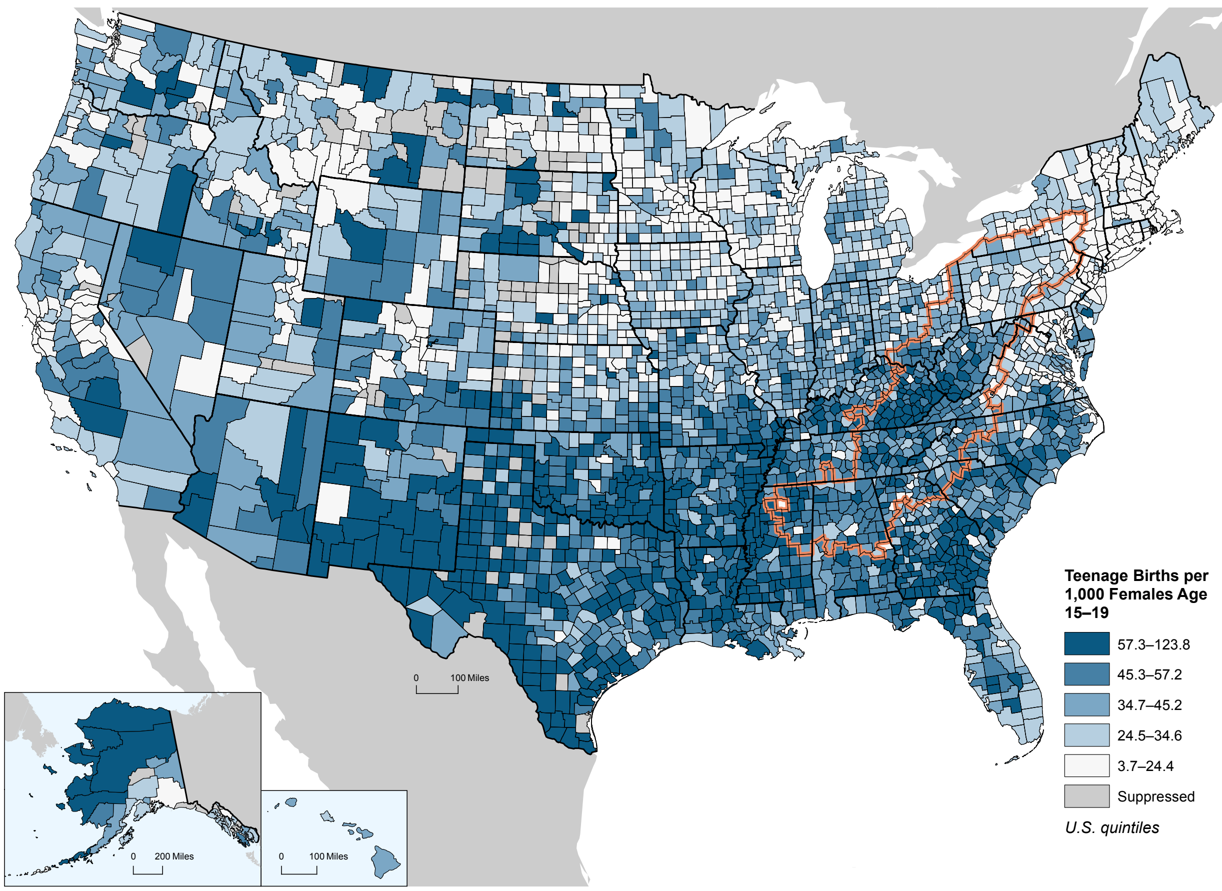


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Teen Birth Rates in the United States

Figure 87 shows the variation in teen birth rates across the United States. Much of the southern half of the country reports high teen birth rates. These poorly performing counties are found in the coastal Southeast and Mississippi Delta regions, as well as into Texas and the Southwest. Both the Northeast and Upper Midwest report low teen birth rates, with few counties in these two regions ranking outside of the two top-performing national quintiles.

Figure 87: Map of Teen Birth Rates in the United States, 2007–2013

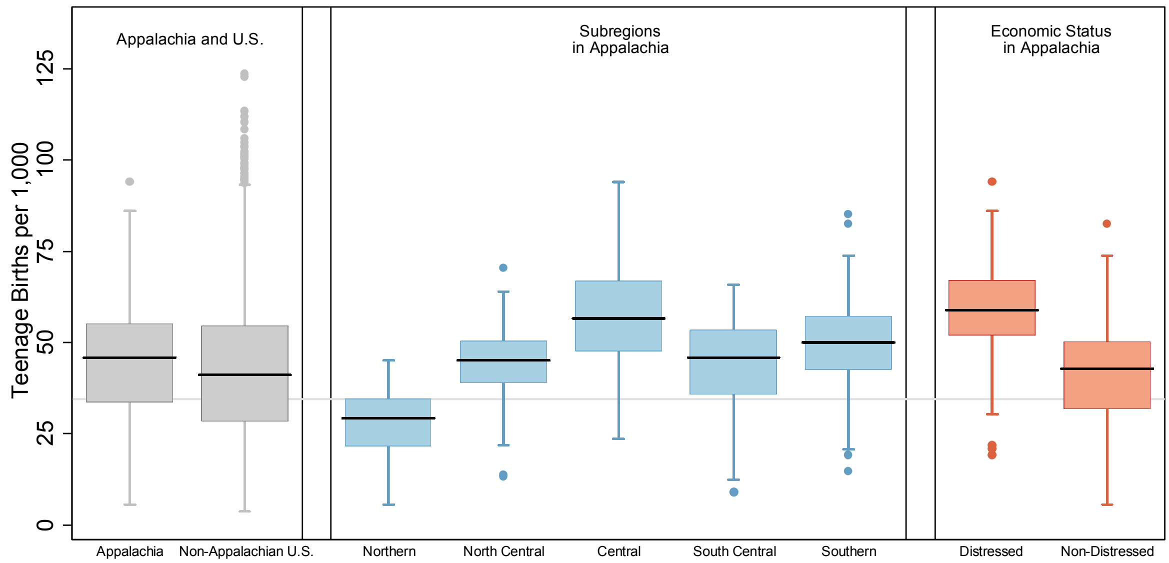


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Teen Birth Rates

Figure 88 shows the distribution of teen birth rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 99 have a missing value for this indicator.

Figure 88: Box Plot of Teen Birth Rates by Geography and Economic Status, 2007–2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of teen birth rates among national quintiles for Appalachian counties is shown in Table 33. Of the 420 counties in the Region, 83 (20 percent) rank in the worst-performing national quintile, while 44 (10 percent) rank in the best-performing.

Table 33: Distribution of Teen Birth Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Teen births	44	*10%*	66	*16%*	95	*23%*	131	*31%*	83	*20%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Further Reading

Infant Mortality

He, X., Akil, L., Aker, W. G., Hwang, H.M., & Ahmad, H. A. (2015). Trends in Infant Mortality in United States: A Brief Study of the Southeastern States from 2005–2009. International Journal of Environmental Research and Public Health, 12(5), 4908–4920

County Health Rankings. Infant Mortality. http://www.countyhealthrankings.org/measure/infant-mortality

Low Birth Weight

County Health Rankings. Low Birthweight. http://www.countyhealthrankings.org/measure/low-birthweight

Teen Births

Hamilton BE, Martin JA, Osterman JK. *National Vital Statistics Reports* 2016;65(3). Available at: http://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_03.pdf

The National Campaign to Prevent Teen and Unplanned Pregnancy. National and State Data. Available at: https://thenationalcampaign.org/data/landing

Stewart Ng, A, & Kaye K. (2013). Why It Matters: Teen Childbearing and Child Welfare. Retrieved July 22, 2016, from https://thenationalcampaign.org/resource/why-it-matters-teen-childbearing-and-child-welfare.

Klein J. Adolescent Pregnancy: Current Trends and Issues. *American Academy of Pediatrics* 2005 281-286.

County Health Rankings & Roadmaps: http://www.countyhealthrankings.org/measure/teen-births

Community Characteristics

Travel Time to Work

KEY FINDINGS | Average Travel Time to Work

- The average travel time to work in the Appalachian Region is 24.8 minutes, which is comparable to the national average of 25.7 minutes.
- Three of the five Appalachian subregions have commute times roughly equal to the nation, and both Northern and South Central Appalachia have average commute times slightly lower than the national average.
- The average travel time to work for the Appalachian Region's rural counties is five minutes less than for the Region's large metro counties.
- The average travel time to work for the Appalachian Region's distressed counties is nearly one-and-a-half minutes longer than for the Region's non-distressed counties.

Background

The average travel time to work measures the average number of minutes commuting to work using any transportation mode. This measure is collected by the U.S. Census Bureau in the American Community Survey and covers the period 2010–2014. Travel time captures multiple factors that may impact health status, including sedentary behavior, social isolation (from either driving alone or time spent away from family and friends), and risk of injury while commuting.

Research has found that people who spend an extra 60 minutes of their day commuting spend less time sleeping and exercising, suggesting that long commute times may be a predictor of poor health outcomes (Christian T. , 2012). One study found that longer commuting distances were associated with less physical activity and higher body mass index (BMI), waist circumference, and blood pressure (Hoehner, Barlow, Allen, & Schootman, 2012). Long commutes also occur at the expense of time spent at home and other social activities, and are thus associated with stress on family and relationships (Besser, Marcus, & Frumkin, 2008).

Negative effects related to longer commuting times are not limited to those who commute by automobile. The British Office of National Statistics found higher anxiety and lower happiness levels among survey respondents who had time-consuming commutes by public transit, walking, and private motor vehicle.

Overview: Travel Time to Work in the Appalachian Region

Average commute times throughout the Appalachian Region are comparable to the national average. The average travel time to work in the Appalachian Region is 24.8 minutes, which is comparable to the national average of 25.7 minutes. The average commuting times in three of the five Appalachian subregions are at or below the national average. With an average commute time of 22.9 minutes, South Central Appalachia has the lowest average among the five subregions. There is little variation among the subregions in Appalachia, with a difference of only three-and-a-half minutes between the longest and shortest average commutes.

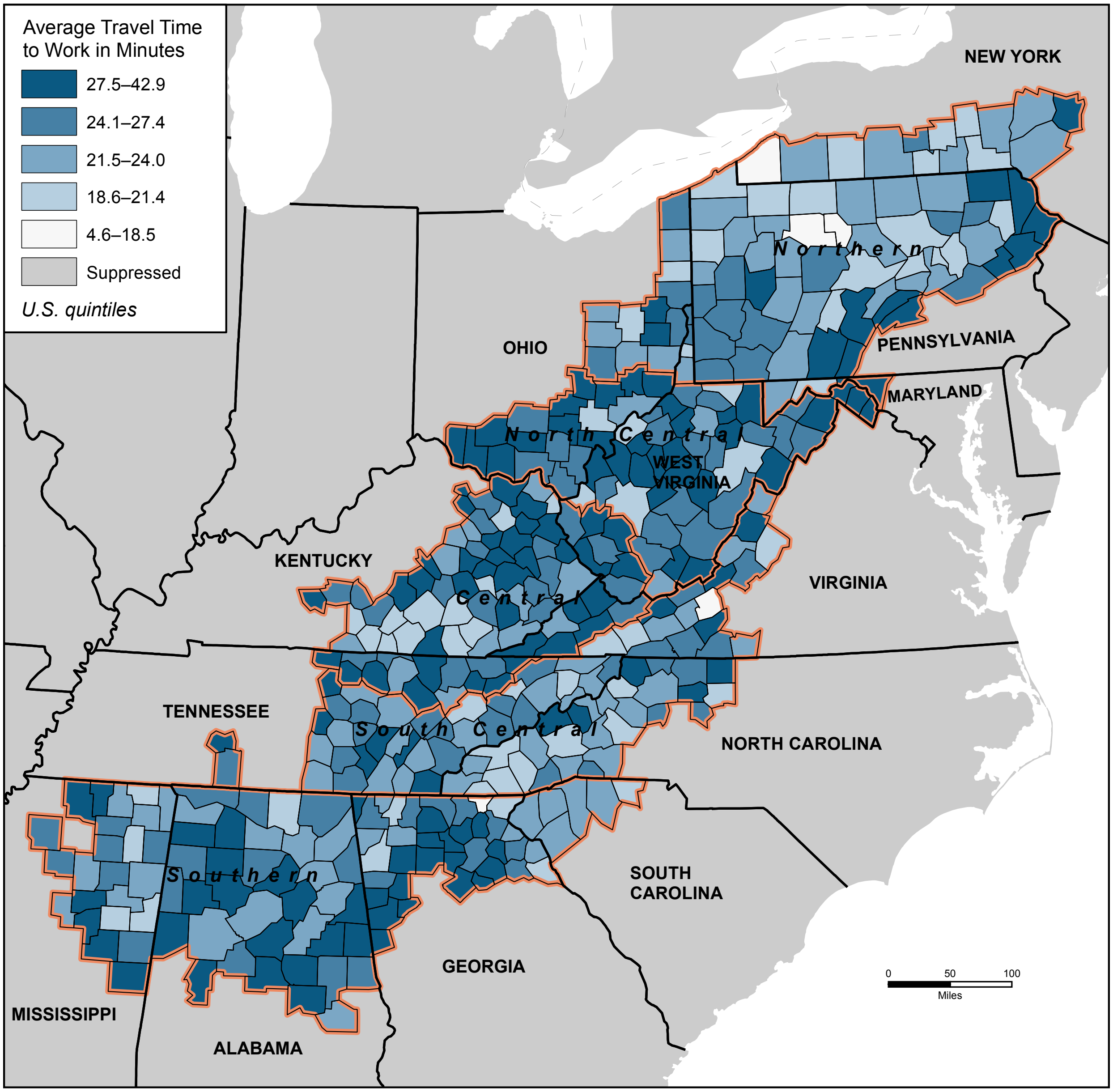
Rural areas in Appalachia have lower average commute times than more urbanized areas. Large metropolitan areas in Appalachia have an average commute of 28.6 minutes, compared to the national average of 25.7 minutes. The Appalachian Region's rural counties have average commute times of 23.7 minutes, which is lower than the average time in the Region's large metro counties, as well as in the nation as a whole. The pattern of commuting times in the Region is consistent with national trends, which show that commuting times are longer in large metropolitan areas. There is little variation between counties of different economic status levels, with just over one minute difference in commute times between the Appalachian Region's distressed counties (26.1 minutes) and its non-distressed counties (24.7 minutes).

At 20.7 minutes, Appalachian New York has the lowest average commute time in the Region, while non-Appalachian New York has the highest average commute of 32.7 minutes—the largest intrastate disparity. With the exceptions of Maryland and New York, differences in the average commuting times between the Appalachian and non-Appalachian portions of the 13 states are relatively small. After Appalachian New York, the Appalachian portions of both North Carolina and South Carolina report the next lowest average commute times among the Appalachian portions of states in the Region, at just over 22 minutes.

Figure 89 shows the average travel time to work for Appalachian counties, grouped by national quintiles. Darker colors indicate higher commute times; for this measure, higher values are associated with worse health. The distribution of commute times varies throughout the Region, although few counties rank in the best-performing quintile. Longer commutes appear near large metro areas, such as Atlanta, Birmingham, Cincinnati, Pittsburgh, and Tuscaloosa. Longer commutes also appear in southeast Ohio, a number of counties in eastern Pennsylvania, and throughout much of West Virginia.

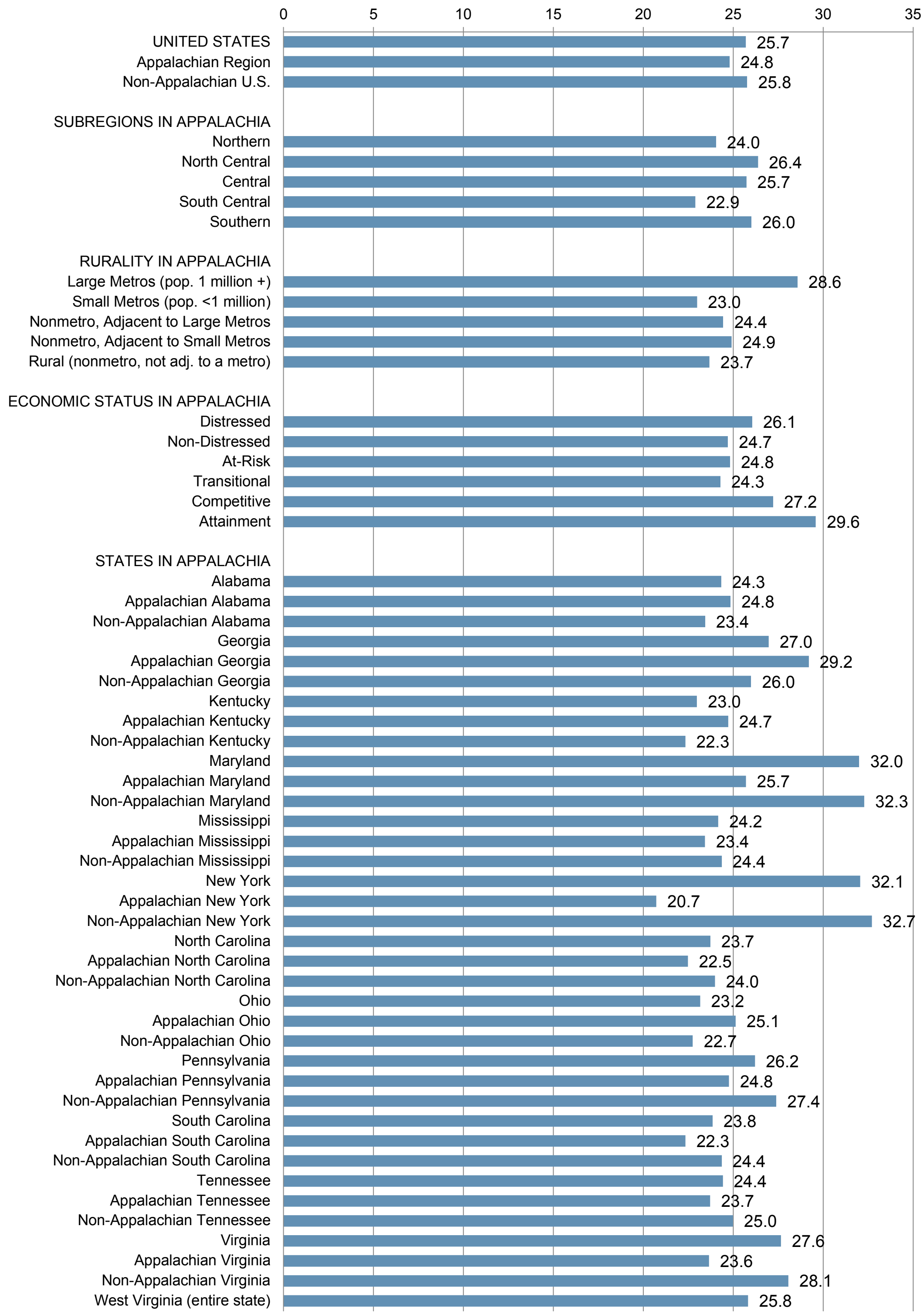
Figure 90 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 89: Map of Average Travel Time to Work in the Appalachian Region, 2010–2014



Data source: United States Census Bureau. "Summary File." 2010–2014 American Community Survey. U.S. Census Bureau's American Community Survey Office, 2015. Web. 13 January 2016 https://www.census.gov/programs-surveys/acs/.

Figure 90: Chart of Average Travel Time to Work, 2010–2014

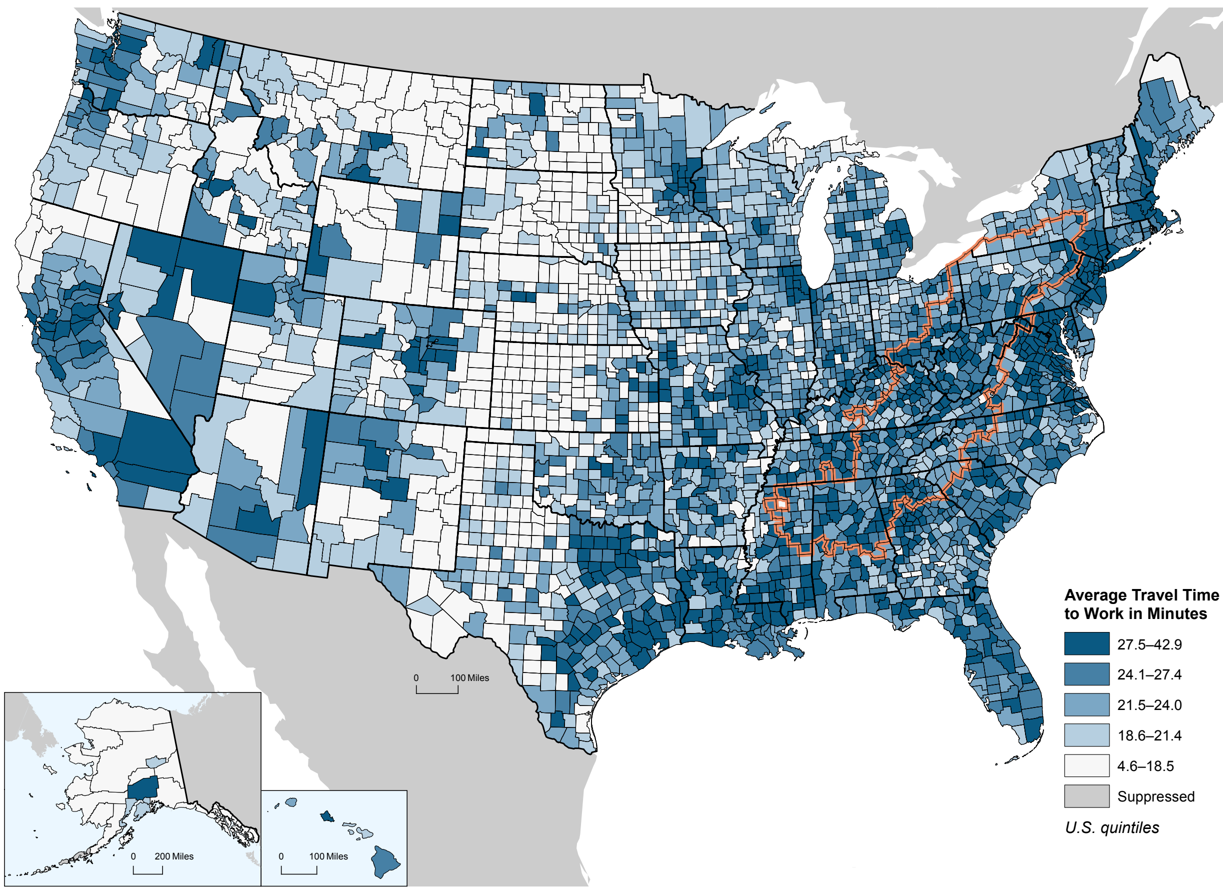


Data source: United States Census Bureau. "Summary File." 2010–2014 American Community Survey. U.S. Census Bureau's American Community Survey Office, 2015. Web. 13 January 2016 https://www.census.gov/programs-surveys/acs/.

Overview: Travel Time to Work in the United States

Figure 91 shows the variation in average commute times across the United States. Average travel times to work in the Appalachian Region are consistent with the rest of the eastern United States. Average commute times tend to be lower in the Midwest, Upper Midwest, and the Southwest, with averages in the Plains states being particularly low. Each of the national quintiles is represented in the western half of the country. Counties surrounding large metro areas have relatively high commuting times.

Figure 91: Map of Average Travel Time to Work in the United States, 2010–2014

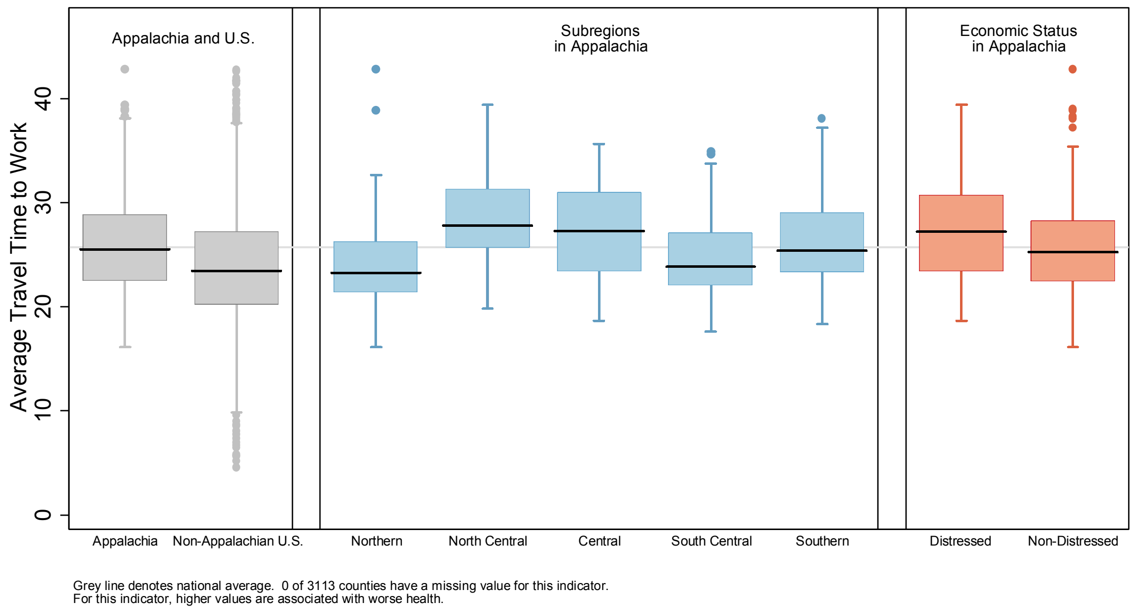


Data source: United States Census Bureau. “Summary File." 2010–2014 American Community Survey. U.S. Census Bureau's American Community Survey Office, 2015. Web. 13 January 2016 https://www.census.gov/programs-surveys/acs/.

Distribution of Travel Time to Work

Figure 92 shows the distribution of average travel times to work by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group.

Figure 92: Box Plot of Average Travel Time to Work by Geography and Economic Status, 2010–2014



Data source: United States Census Bureau. "Summary File." 2010–2014 American Community Survey. U.S. Census Bureau's American Community Survey Office, 2015. Web. 13 January 2016 https://www.census.gov/programs-surveys/acs/.

The distribution of the average travel time to work among national quintiles for Appalachian counties is shown in Table 34. Of the 420 counties in the Region, 142 (34 percent) rank in the worst-performing national quintile, while 5 (1 percent) rank in the best-performing national quintile.

Table 34: Distribution of Average Travel Time to Work among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Travel time to work	5	*1%*	62	*15%*	101	*24%*	110	*26%*	142	*34%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Grocery Store Availability

- There are 14 percent fewer grocery stores per 1,000 population in Appalachia than in the United States as a whole.
- Among the five subregions, only Central Appalachia has more grocery stores per 1,000 population than the national average. Southern Appalachia has the lowest rate in the Region, a figure 24 percent lower than the national mark.
- Rural areas throughout the Region have 41 percent more grocery stores per 1,000 population than large metro areas.
- Economically distressed counties in Appalachia have 28 percent more grocery stores per 1,000 population than non-distressed counties.

Background

This indicator measures the number of grocery stores in a county per 1,000 population in 2012, as reported by the U.S. Department of Agriculture. Grocery stores typically offer healthier food options than other outlets such as dollar stores, neighborhood markets, and convenience stores. Making healthy dietary choices is associated with better health outcomes, and as such, the availability of nutritious and affordable foods can have a large impact on community health (Centers for Disease Control and Prevention, Healthy Foods, 2016); (Bell, Mora, Hagan, Rubin, & Karpyn, 2013).

Communities that have limited access to healthier food options—and instead have higher numbers of restaurants and stores that provide processed, sugar- and fat-laden foods—face higher obesity rates and other related health problems (Treuhaft & Karpyn, 2010). Residents of communities with full-service grocery stores often eat more fruits and vegetables, which can help combat obesity and may have other direct health benefits, such as decreasing the risk of cancer (Centers for Disease Control and Prevention, Increase Access to Healthy Foods and Beverages, 2016).

The number of grocery stores is just one way to gauge a community's access to healthy food options; other possibilities include the presence of superstores and farmers markets. While this measure shows the presence (or absence) of grocery stores in a county per 1,000 population, it doesn't indicate the distance to grocery stores or whether the population has transportation to a store, which can be a particularly important consideration in rural areas. Ideally, this variable would include the average distance—and not merely presence/supply—to the nearest healthy food option in any given county.

Overview: Grocery Store Availability in the Appalachian Region

The average number of grocery stores per 1,000 population in the Appalachian Region is 0.18, which is 14 percent less than the national average of 0.21 per 1,000. The number of grocery stores in all five of the Appalachian subregions is below the national average except for Central Appalachia, whose rate of 0.24 is 14 percent above the national average. Southern Appalachia has the lowest rate in the Region with 0.16 grocery stores per 1,000 population, a figure 24 percent less than the national mark.

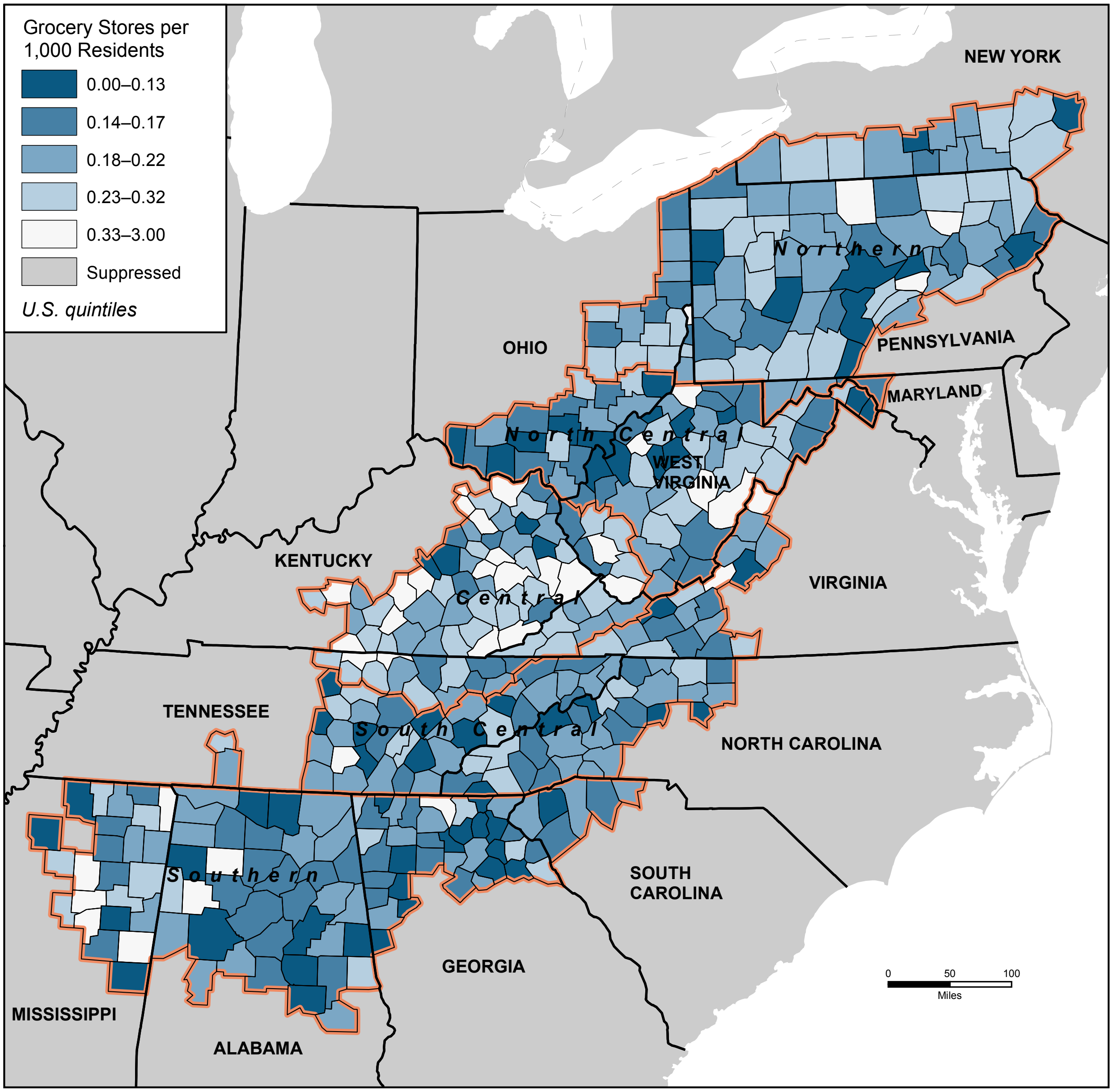
There are higher numbers of grocery stores in rural counties; this may be a function of population, as counties with higher and denser populations may have larger, busier grocery stores leading to lower numbers of grocery stores on a per capita basis. Large metro counties in Appalachia have a rate of 0.17 grocery stores per 1,000 population, versus 0.24 grocery stores per 1,000 population in rural areas. The Appalachian Region's distressed counties have 0.23 grocery stores per 1,000 population, while non-distressed counties have a lower rate of 0.18 stores per 1,000 population.

The Appalachian portions of Georgia, Maryland, New York, Pennsylvania, and South Carolina all have fewer grocery stores than the non-Appalachian portions of those states, while Appalachian Kentucky has more grocery stores than non-Appalachian Kentucky. For the remaining states throughout the Region, intrastate differences are marginal.

Figure 93 shows the number of grocery stores per 1,000 population in the Appalachian Region, grouped by national quintiles. Darker blue indicates a lower number of grocery stores; for this indicator, lower values are associated with worse health. There is considerable variation in the number of grocery stores throughout the Region. There are clusters of counties in Appalachia that have few, if any, grocery stores, while other areas throughout the Region perform quite well.

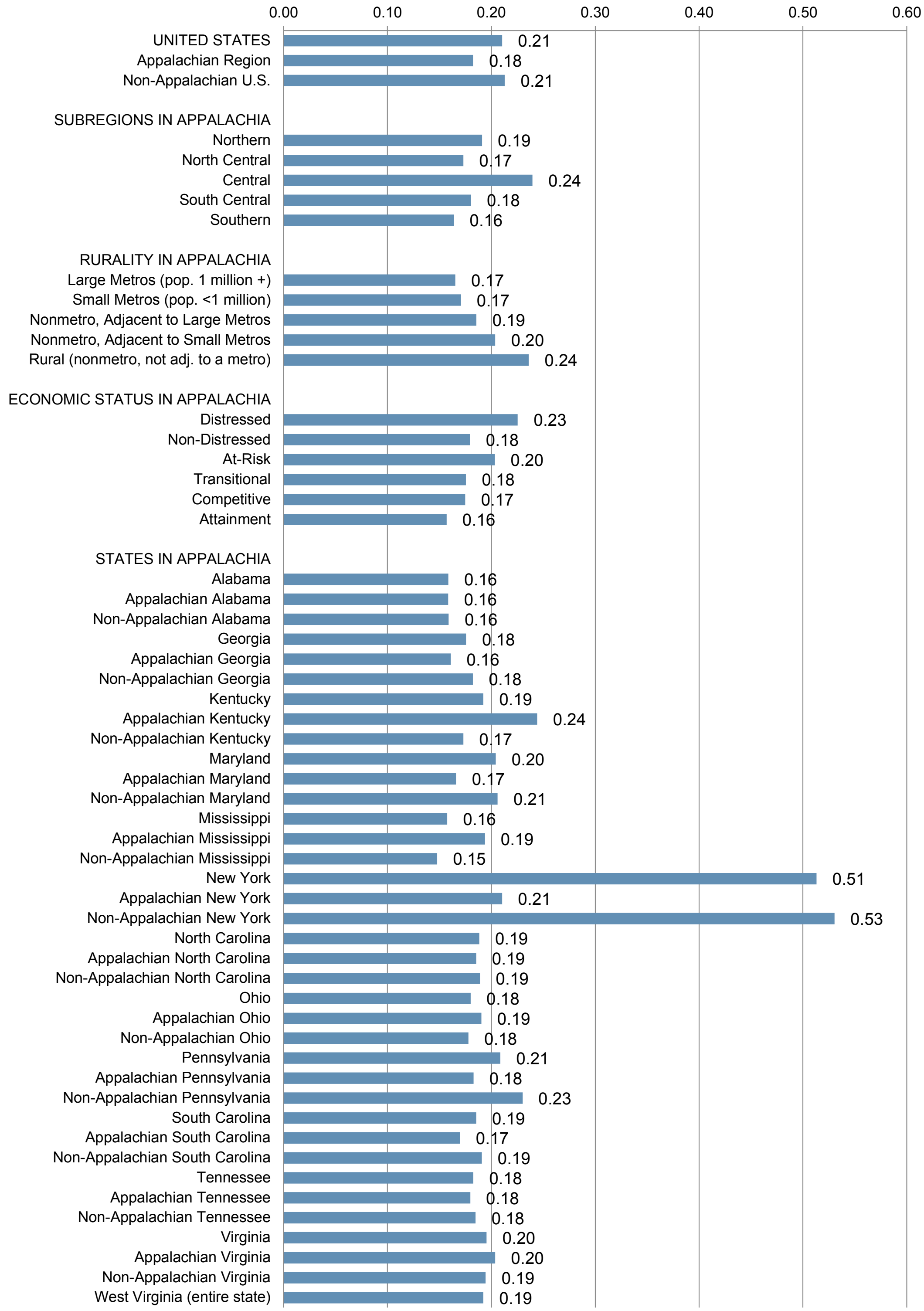
Figure 94 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 93: Map of Grocery Stores per 1,000 Population in the Appalachian Region, 2012



Data source: USDA Food Environment Atlas, 2015 edition. U.S. Department of Agriculture. http://www.ers.usda.gov/data-products/food-environment-atlas/data-access-and-documentation-downloads.aspx.

Figure 94: Chart of Grocery Stores per 1,000 Population, 2012

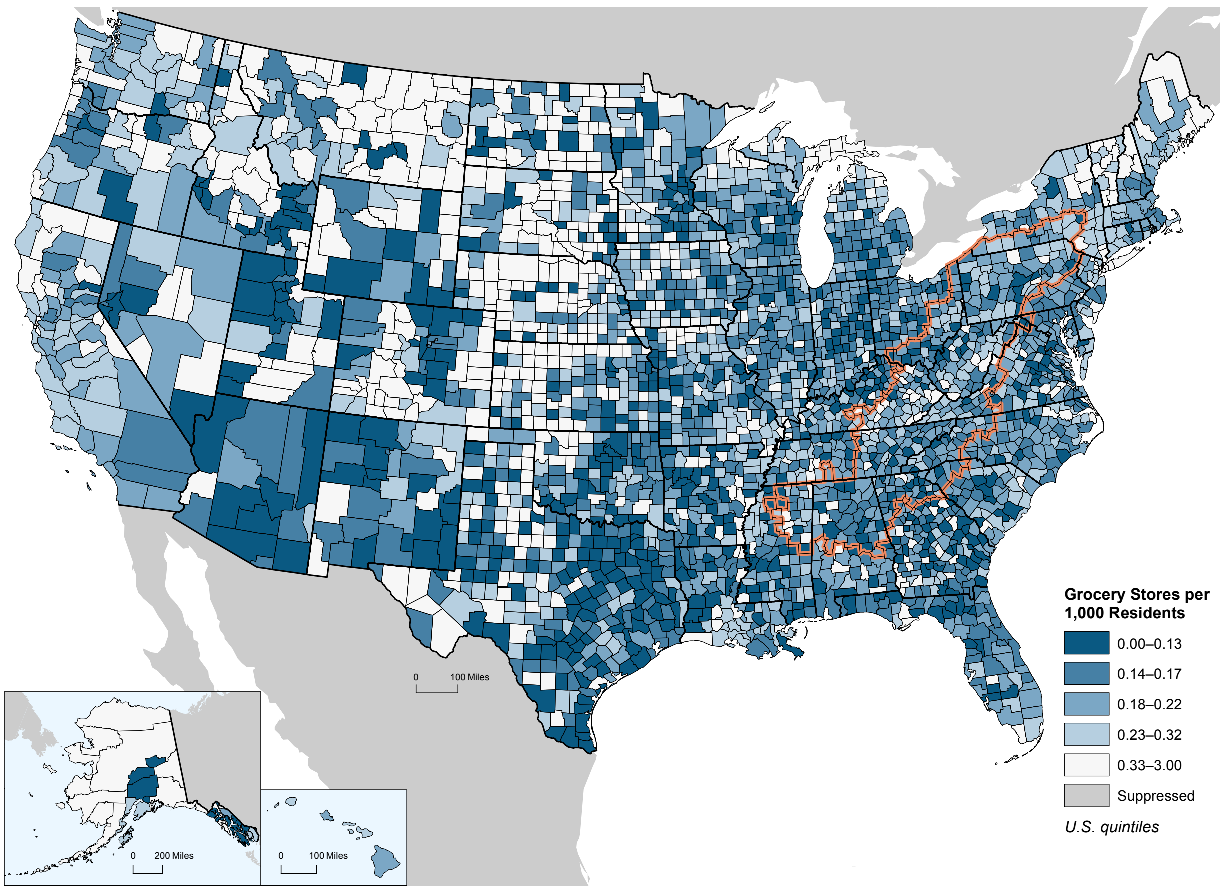


Data source: USDA Food Environment Atlas, 2015 edition. U.S. Department of Agriculture. http://www.ers.usda.gov/data-products/food-environment-atlas/data-access-and-documentation-downloads.aspx.

Overview: Grocery Store Availability in the United States

Figure 95 shows the variation in the number of grocery stores per 1,000 population across the United States. Much of the eastern United States hovers around the national average. There is less access in the South, throughout parts of Texas, and into the Southwest. Parts of the northern Rocky Mountains, as well as pockets in the Plains states, have high grocery store availability. Overall, there is substantial variation from region to region, as well as within individual states.

Figure 95: Map of Grocery Stores per 1,000 Population in the United States, 2012

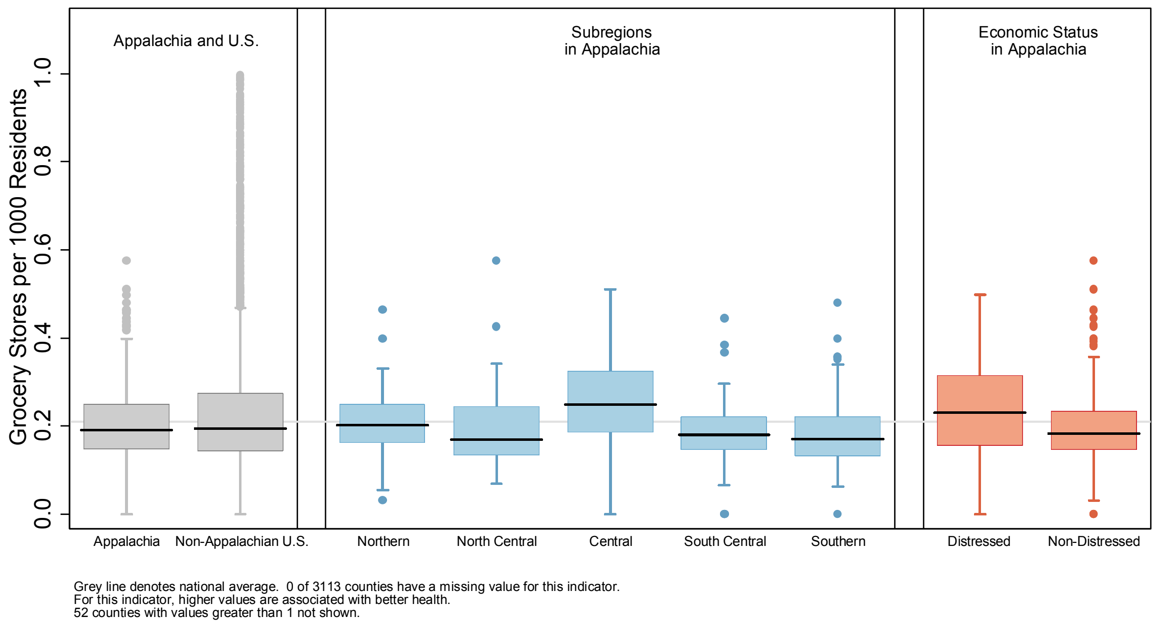


Data source: USDA Food Environment Atlas, 2015 edition. U.S. Department of Agriculture. http://www.ers.usda.gov/data-products/food-environment-atlas/data-access-and-documentation-downloads.aspx.

Distribution of Grocery Store Availability

Figure 96 shows the distribution of grocery stores by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of the 3,113 counties in the nation, zero have a missing value for this indicator, and 52 counties with values greater than 1 are not represented in the box plot.

Figure 96: Box Plot of Grocery Stores per 1,000 Population by Geography and Economic Status, 2012



Data source: USDA Food Environment Atlas, 2015 edition. U.S. Department of Agriculture. http://www.ers.usda.gov/data-products/food-environment-atlas/data-access-and-documentation-downloads.aspx.

The distribution of grocery stores among national quintiles for Appalachian counties is shown in Table 35. Of the 420 counties in the Region, 70 (17 percent) rank in the worst-performing national quintile, while 39 (9 percent) rank in the best-performing national quintile.

Table 35: Distribution of Grocery Stores per 1,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Grocery store availability	39	*9%*	99	*24%*	116	*28%*	96	*23%*	70	*17%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Student-Teacher Ratio

KEY FINDINGS | Student-Teacher Ratio

- The Appalachian Region's student-teacher ratio is 14.3, which is a lower (better) ratio than the national average of 16.5.
- There is little difference in the student-teacher ratios among the five Appalachian subregions, with values ranging from 13.6 to 15.0, all of which are lower (better) than the national mark.
- The Appalachian Region's student-teacher ratio in rural counties is 13.7, which is better than the 14.7 ratio in the Region's metro counties.
- The Appalachian Region's student-teacher ratio in distressed counties is 14.7, which is only slightly higher than the 14.3 in the Region's non-distressed counties.

Background

The student-teacher ratio measures the supply of teachers per K–12 student. The data cover the 2013–14 period and are reported by the U.S. Department of Education's National Center for Education Statistics. Higher quality education is associated with greater levels of health literacy, which allows students and then adults, to make smarter, more-informed decisions regarding their health.

Research has shown that class size is a significant predictor of student achievement and that lower student-teacher ratios represent better educational systems. These improved educational outcomes—and greater health literacy—can then be expected to lead to better overall health over a lifetime (National Institutes of Health, Office of Behavioral and Social Sciences Research, 2015).

This measure differs from other class size variable calculations, as it includes resource teaching staff members along with teachers. However, it remains comparable in interpretation. The student-teacher ratio gives an approximation of the amount of individualized attention from teachers that is available to each student. Higher values represent lower availability of teaching staff, and thus suggest lower education quality.

Overview: Student-Teacher Ratios in the Appalachian Region

The average student-teacher ratio in the Appalachian Region is 14.3, which is lower (better) than the national average of 16.5. All of the subregions in Appalachia have lower student-teacher ratios than the national average. The Central Appalachian subregion has the highest ratio, at 15.0, while the Northern Appalachian subregion has the lowest ratio, at 13.6.

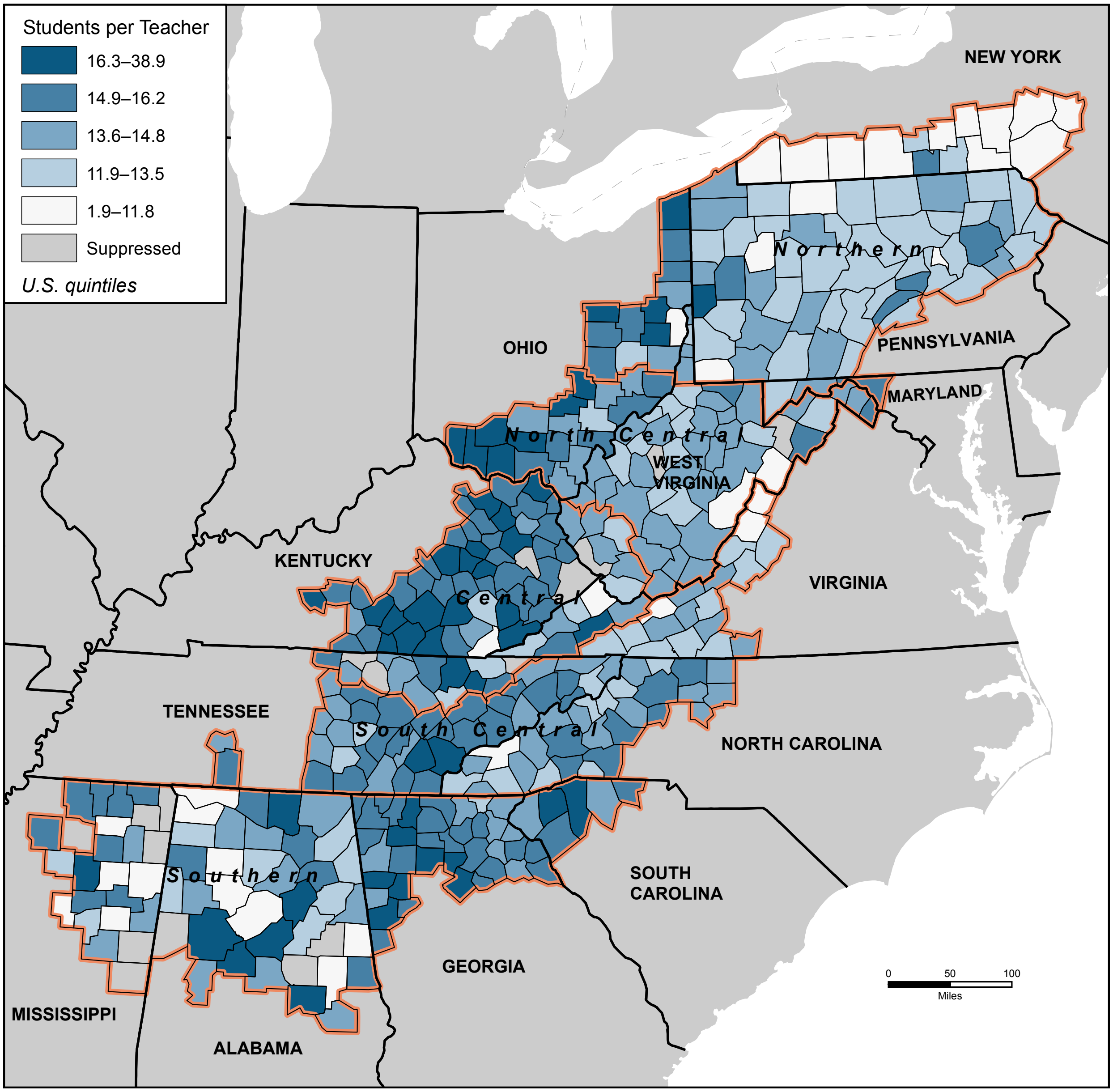
The Appalachian Region's student-teacher ratio in rural counties is 13.7, which is somewhat better than the 14.7 reported in the Region's metro counties. The Appalachian Region's student-teacher ratio in distressed counties is 14.7, compared to 14.3 in non-distressed counties.

Among the Appalachian portions of states, Appalachian New York has the lowest student-teacher ratio at 11.2 and Appalachian Georgia has the highest student-teacher ratio at 16.1. This ratio in Appalachian Georgia is slightly below the national average. Outside of Georgia and South Carolina, the Appalachian portions of each state in the Region report lower (better) student-teacher ratios than the non-Appalachian portions.

Figure 97 shows the student-teacher ratios for Appalachian counties, grouped by national quintiles. Darker blue indicates higher numbers of students per teacher; for this measure, higher values are associated with worse health. There is considerable variation throughout the Region for this measure. There are concentrations of counties with high student-teacher ratios in all five of the subregions. Likewise, there are counties with low student-teacher ratios in each subregion, with noticeable pockets in both Northern and Southern Appalachia.

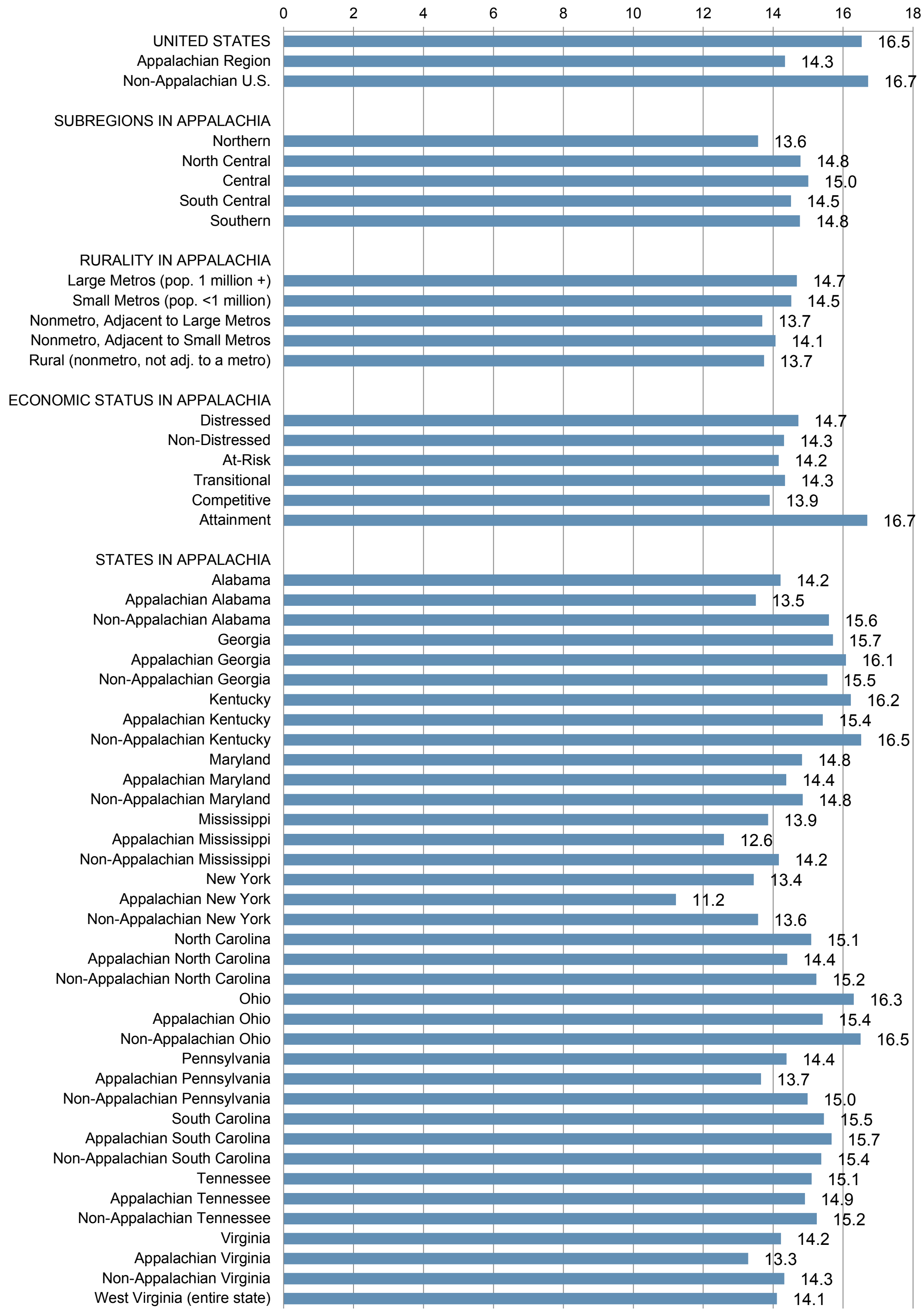
Figure 98 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 97: Map of Student-Teacher Ratios in the Appalachian Region, 2013–2014



Data source: National Center for Education Statistics. U.S. Department of Education. https://nces.ed.gov/ccd/elsi/tableGenerator.aspx.

Figure 98: Chart of Student-Teacher Ratios, 2013–2014

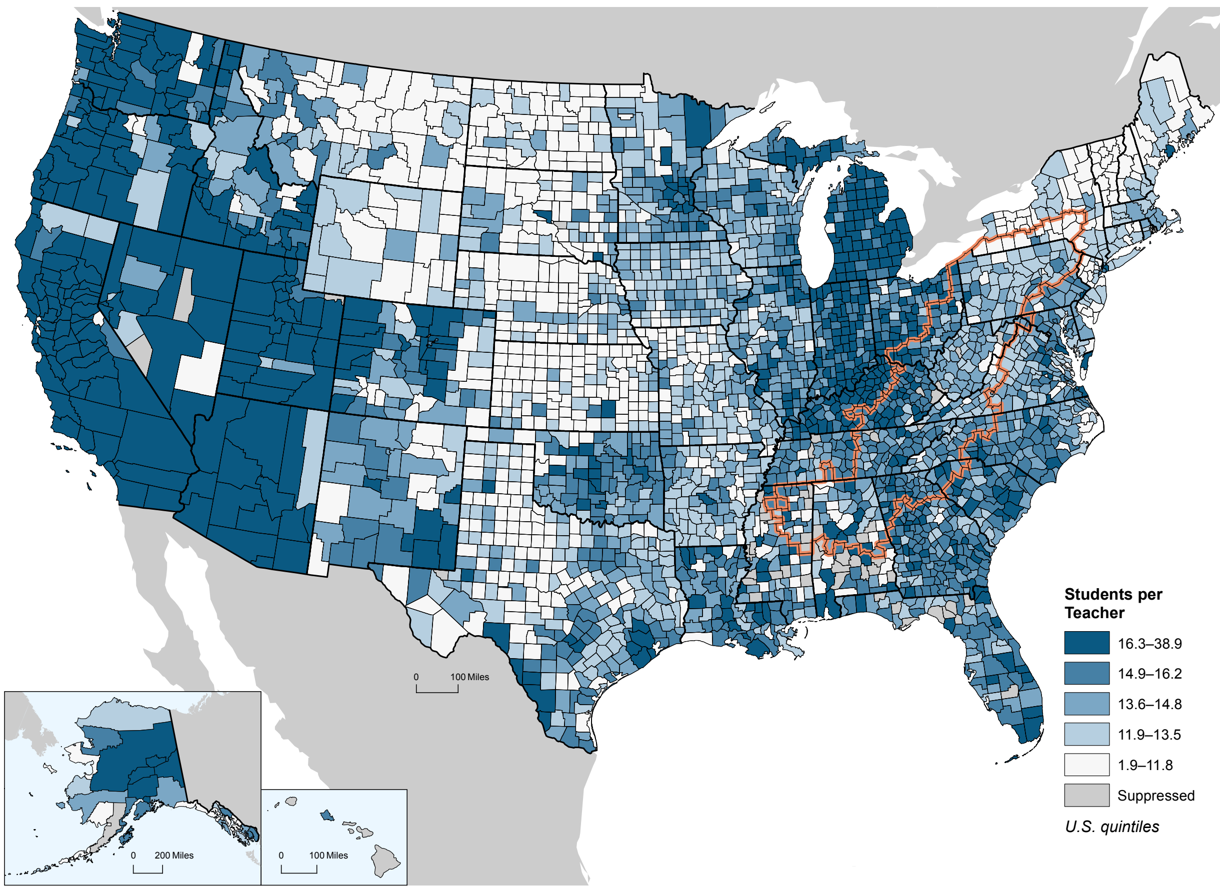


Data source: National Center for Education Statistics. U.S. Department of Education. https://nces.ed.gov/ccd/elsi/tableGenerator.aspx.

Overview: Student-Teacher Ratios in the United States

Figure 99 shows the variation in student-teacher ratios across the United States. Appalachia and much of the eastern half of the country is a blended mix of counties ranking in each of the national quintiles. Non-Appalachian Kentucky, Ohio, and Michigan all report very high ratios, as does much of the West. The western half of the Upper Midwest, Great Plains, and northern Rocky Mountains all have a large number of counties ranking in the best-performing national quintile. New England also reports very low ratios.

Figure 99: Map of Student-Teacher Ratios in the United States, 2013–2014

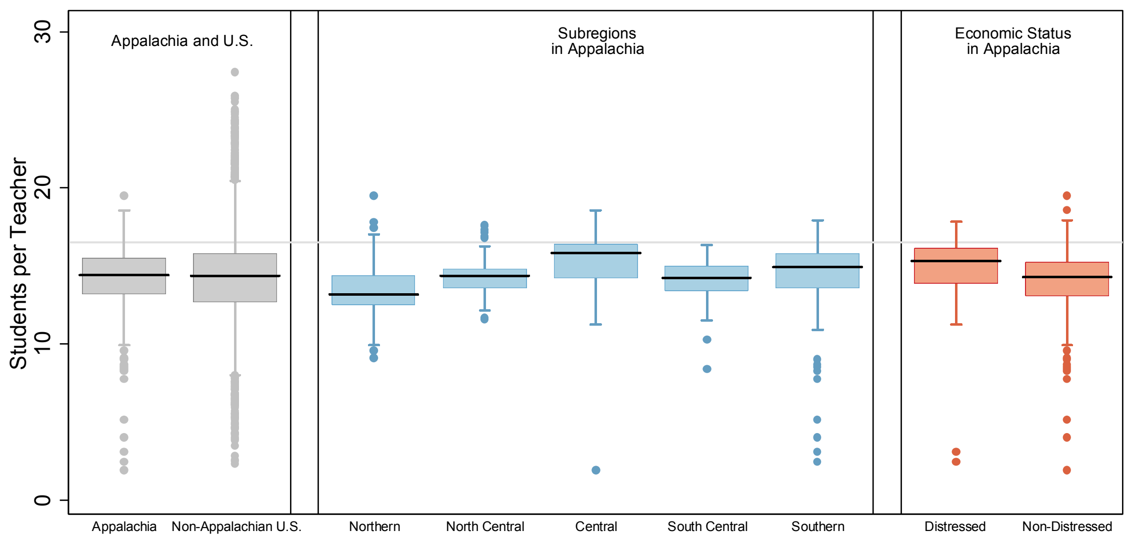


Data source: National Center for Education Statistics. U.S. Department of Education. https://nces.ed.gov/ccd/elsi/tableGenerator.aspx.

Distribution of Student-Teacher Ratios

Figure 100 shows the distribution of student-teacher ratios by geography and economic status. The shaded boxes show the middle 50 percent of all values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of the 3,113 counties in the nation, 58 have a missing value for this indicator, and two counties with values greater than 30 are not represented. For this measure, higher values are associated with worse health.

Figure 100: Box Plot of Student-Teacher Ratios by Geography and Economic Status, 2013–2014



Grey line denotes national average. 58 of 3113 counties have a missing value for this indicator.
For this indicator, higher values are associated with worse health.
2 counties with values greater than 30 not shown.

Data source: National Center for Education Statistics. U.S. Department of Education.
https://nces.ed.gov/ccd/elsi/tableGenerator.aspx.

The distribution of student-teacher ratios among national quintiles for Appalachian counties is shown in Table 36. Of the 420 counties in the Region, 52 (12 percent) rank in the worst-performing national quintile, while 37 (9 percent) rank in the best-performing national quintile.

Table 36: Distribution of Student-Teacher Ratios among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Student-teacher ratio	37	*9%*	85	*20%*	116	*28%*	115	*27%*	52	*12%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Further Reading

Travel Time to Work

Brody, Jane E. "Commuting's Hidden Cost." New York Times. October 28, 2013. http://well.blogs.nytimes.com/2013/10/28/commutings-hidden-cost/

Grocery Store Availability

USDA. Food Access Research Atlas. June 29, 2016. Available at: http://www.ers.usda.gov/data-products/food-access-research-atlas.aspx

Handbury J, Rahkovsky I, Schnell M. What Drives Nutritional Disparities? Retail Access and Food Purchases Across the Socioeconomic Spectrum. National Bureau of Economic Research Working Paper No. 21126. Issued in April 2015. Available at: http://www.nber.org/papers/w21126

Student-Teacher Ratio

West P, Sweeting H, Leyland A. School effects on pupils' health behaviours: evidence in support of the health promoting school. Research Papers in Education 2004; 19(3), pp. 261–291.

Lifestyle

KEY FINDINGS | Physical Inactivity

- In the Appalachian Region, 28.4 percent of people report being physically inactive, a figure higher than the 23.1 percent reported for the United States as a whole.
- Physical inactivity in the Appalachian subregions range from 26.2 percent in Northern Appalachia to 33.8 percent in Central Appalachia, all of which are above the national average.
- There is an urban-rural divide in physical inactivity. In the Appalachian Region's rural counties, 31.8 percent of residents report being physically inactive, a figure much higher than the 25.2 percent reported in the Region's large metro areas.
- In the Appalachian Region's distressed counties, 33.9 percent of residents report being physically inactive, compared to 28.0 percent of residents in the Region's non-distressed counties.

Background

Physical inactivity measures the percentage of adults age 20 and over that report engaging in no leisure-time physical activity in a typical week. The data for this measure come from County Health Rankings and are based on 2012 data from CDC's Behavioral Risk Factor Surveillance System survey.

Physical inactivity is a risk factor for developing a number of chronic conditions discussed elsewhere in this report, including heart disease, obesity, diabetes, and stroke, many of which may ultimately lead to premature mortality (Centers for Disease Control and Prevention, Physical Activity, 2016). Regular physical activity, including activities as simple as walking, can help prevent weight gain and reduce the likelihood of developing diseases such as hypertension, diabetes, heart disease, and even cancer. Regular physical activity also improves physical fitness, mental health, and cognitive function (Kenny, 2015).

There are many strategies to increase physical activity levels in communities. Examples include increasing physical activity in schools, creating safe and accessible places to be active, providing transportation alternatives that make walking and biking more accessible, and increasing workplace wellness opportunities (Centers for Disease Control and Prevention, Physical Activity, 2016). A survey of older Appalachian adults concluded that strategies that build self-efficacy may be most effective in increasing physical activity (Zizzi, et al., 2006). Self-efficacy involves designing interventions around what the individuals currently do, and finding strategies to increase physical activity in a manner that the individuals feel confident they can achieve. For example, if local high schools provide residents with the opportunity to walk around the track in the evenings and on weekends, this gives the residents a course of action for improving their fitness levels more so than generic advice such as, "You need to walk more." Likewise, embracing important elements of local culture (e.g., dancing) and incorporating them into the physical activity plan may be more realistic than suggesting that everyone should ride a bicycle.

One limitation of this measure is that the question focuses specifically on leisure-time activity and does not include work-related physical activity (County Health Rankings, Physical Inactivity, 2016). Many occupations require a great deal of physical activity, and this indicator also does not capture household chores and maintenance. However, despite any shortcomings, the measure remains commonly used when studying the physical activity levels of a population.

Overview: Physical Inactivity in the Appalachian Region

With 28.4 percent of people reporting being physically inactive, Appalachia is less physically active than the nation as a whole, where this figure stands at 23.1 percent. Among the subregions, Northern Appalachia (26.2 percent) and Southern Appalachia (27.6 percent) are the best-performing, although their percentages are still higher than the national average. The three central Appalachian subregions all report physical inactivity above 30 percent: Central Appalachia (33.8 percent), North Central Appalachia (31.1 percent), and South Central Appalachia (30.1 percent).

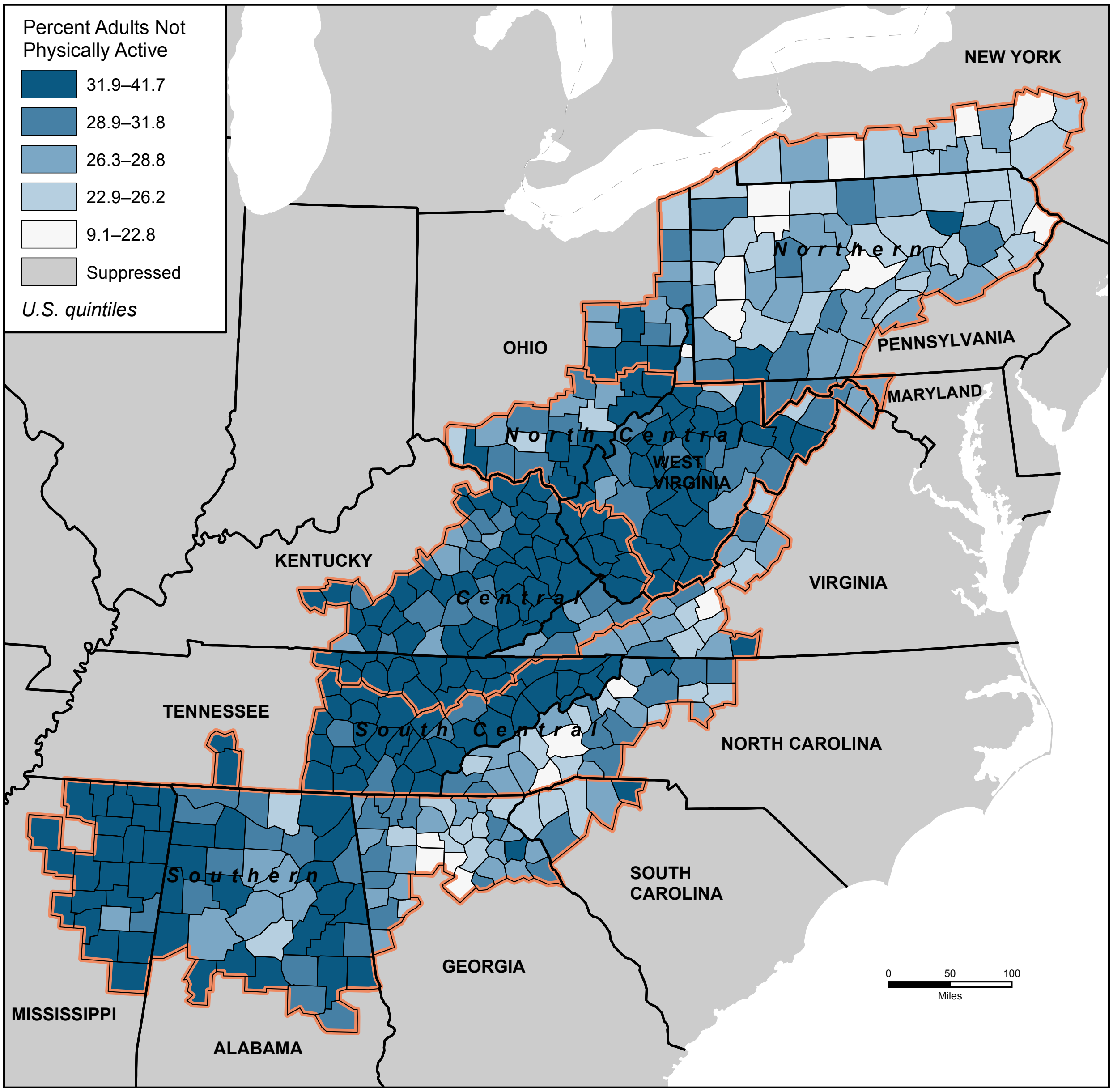
There is an urban-rural divide in physical inactivity, with 31.8 percent of the Region’s residents living in rural areas reporting physical inactivity, a figure much higher than the 25.2 percent in the Region’s large metro areas. The economic status of Appalachian counties is also an indicator of leisure-time physical inactivity—33.9 percent of residents in the Appalachian Region’s distressed counties report physical inactivity, compared to 28.0 percent for those living the Region’s non-distressed counties.

Although Southern Appalachia is the second best-performing among the Region’s five subregions, Appalachian Mississippi is the worst-performing among the Appalachian portions of states. The percentage of adults reporting being physically inactive here is 35.1 percent, well above the national, regional, and subregional figures. However, non-Appalachian Mississippi also reports high physical inactivity among adults, at 33.0 percent of the adult population. Appalachian Tennessee (34.2 percent) and Appalachian Kentucky (32.8 percent) report the next highest percentages of physical inactivity; both numbers are much higher than the figures found in non-Appalachian Tennessee (30.6 percent) and non-Appalachian Kentucky (27.1 percent). No Appalachian portion of any state outperforms the non-Appalachian portion in this measure.

Figure 101 shows the variation in the percentage of adults reporting physical inactivity across the Appalachian Region. Darker colors indicate higher percentages of adults reporting physical inactivity. Outside of Northern Appalachia and some pockets in the southeastern parts of the Region, physical inactivity in many counties throughout Appalachia rank in the two worst-performing national quintiles.

Figure 102 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 101: Map of Percentage of Adults Physically Inactive in the Appalachian Region, 2012



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.
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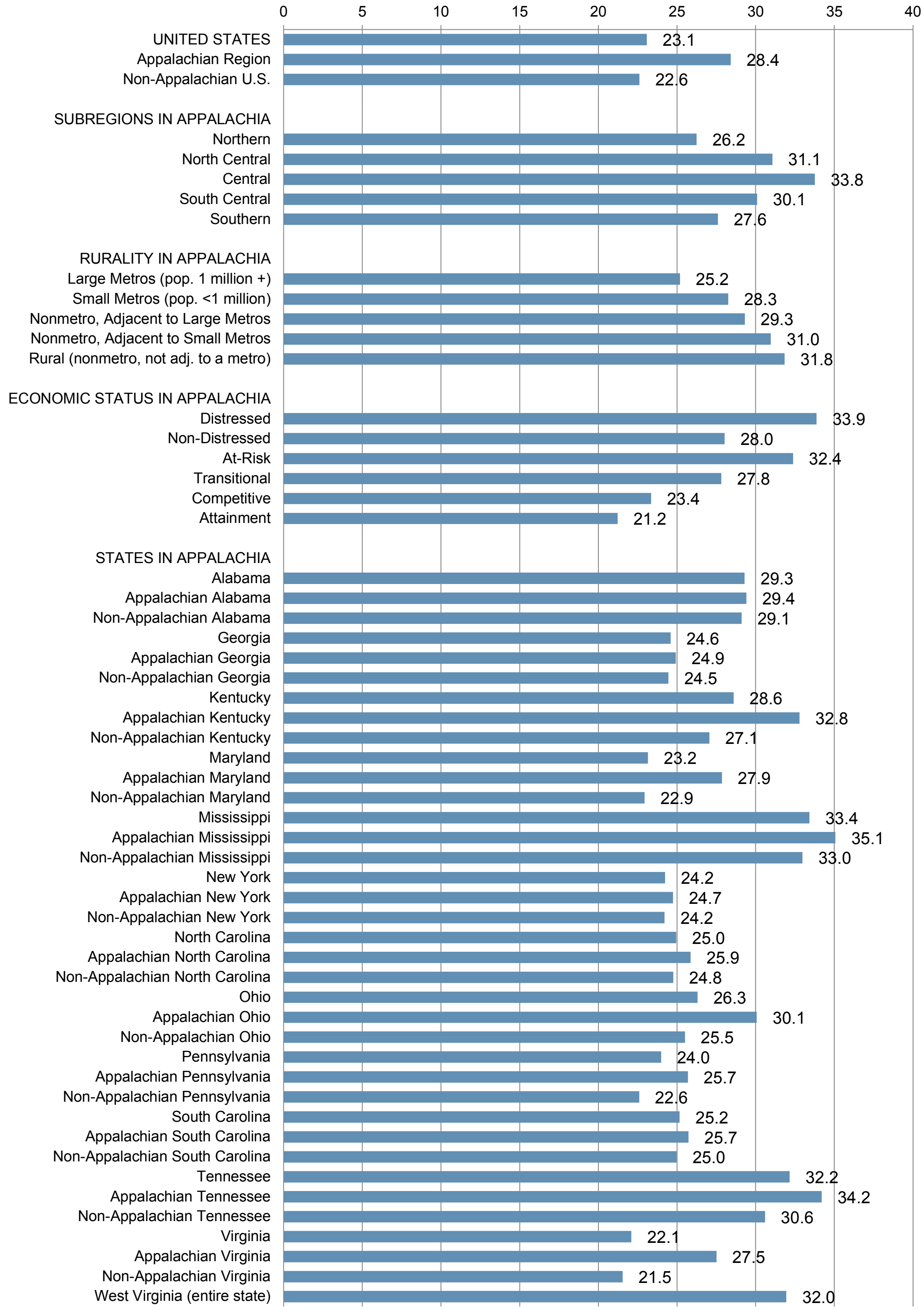
Figure 102: Chart of Percentage of Adults Physically Inactive, 2012

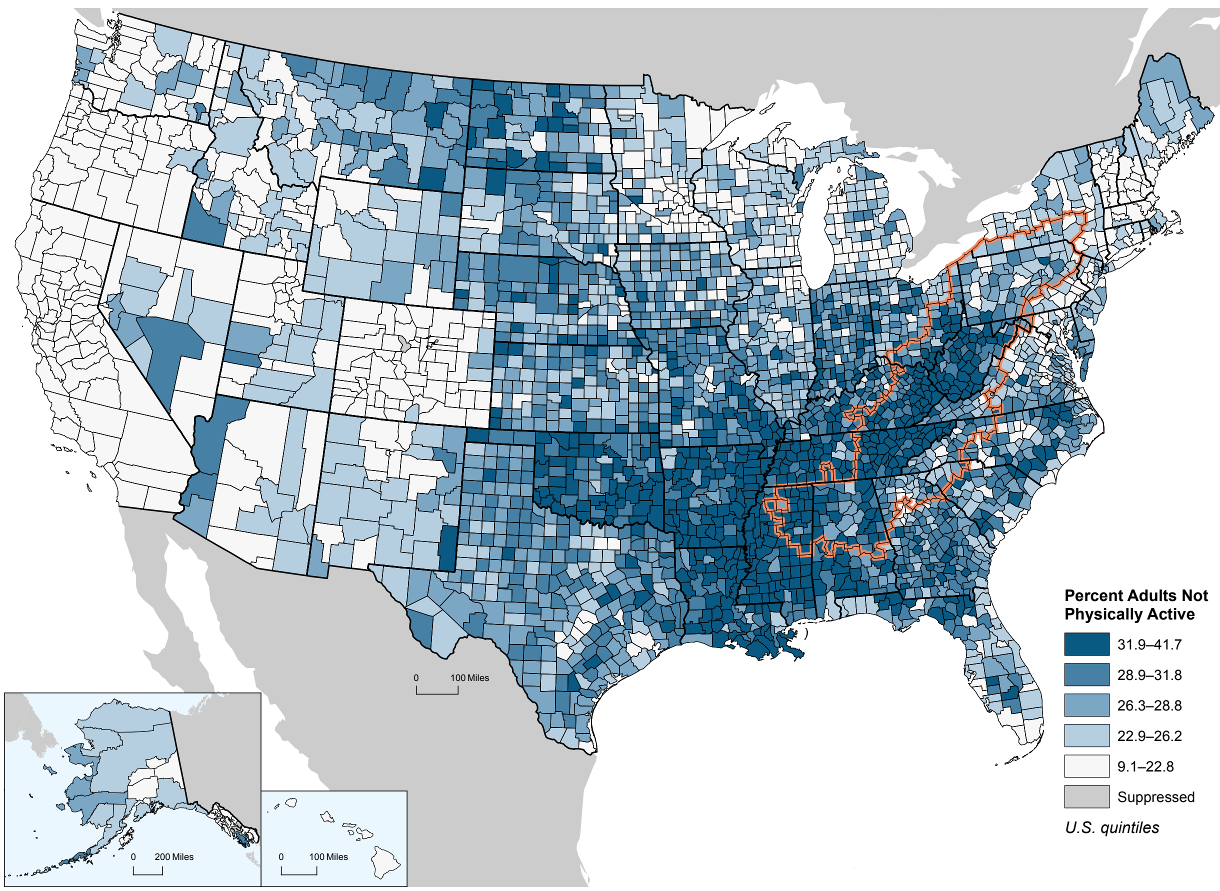


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Physical Inactivity in the United States

Figure 103 shows the variation in physical inactivity across the United States. The high percentages of adults in Appalachia reporting physical inactivity extend into parts of the Southeast, as well as into the Mississippi Delta Region. Much of the Midwest and Upper Midwest report high percentages, with many counties in the two worst-performing quintiles stretching from Texas in the South to the Dakotas and Montana in the North. The northeastern and western portions of the country are the best-performing regions and have low percentages of adults reporting physical inactivity. Nearly every county in California, Oregon, and Colorado ranks in the top-performing national quintile.

Figure 103: Map of Percentage of Adults Physically Inactive in the United States, 2012

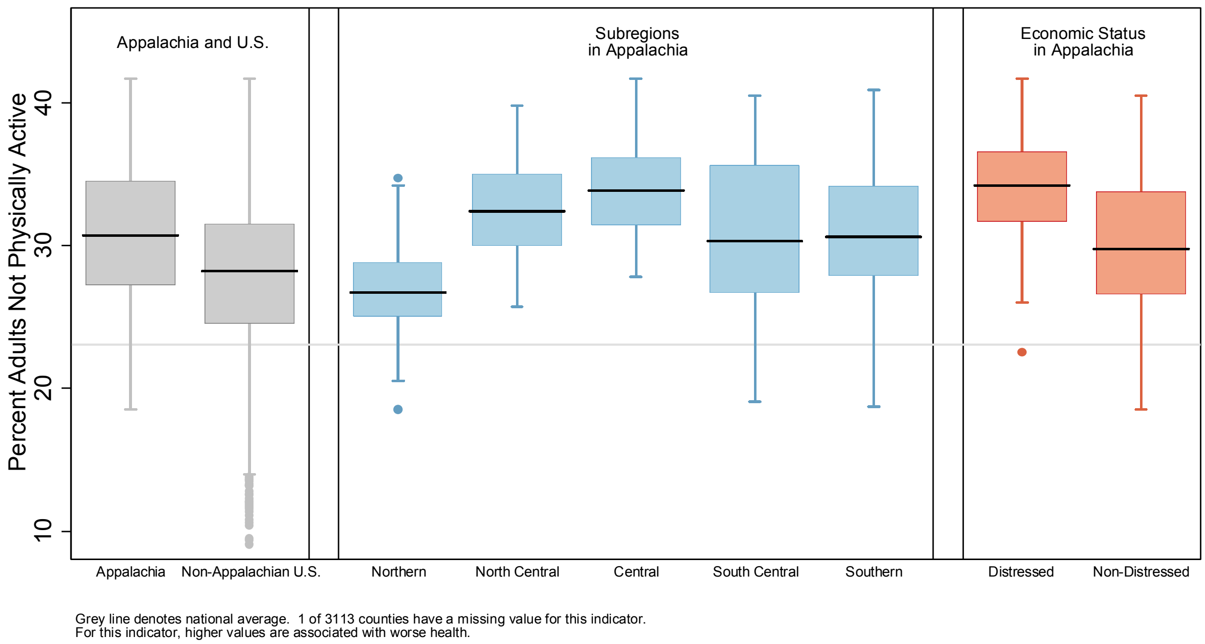


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Physical Inactivity

Figure 104 shows the distribution of the percentage of physically inactive adults by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, only one has a missing value for this indicator. For this measure, higher values are associated with worse health.

Figure 104: Box Plot of Percentage of Adults Physically Inactive by Geography and Economic Status, 2012



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of physical inactivity among national quintiles for Appalachian counties is shown in Table 37. Of the 420 counties in the Region, 179 (43 percent) rank in the worst-performing national quintile, while 18 (4 percent) rank in the best-performing national quintile.

Table 37: Distribution of Percentage of Adults Physically Inactive among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Physical inactivity	18	*4%*	60	*14%*	79	*19%*	84	*20%*	179	*43%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Adult Smoking Prevalence

- Nearly 20 percent of all adults in the Appalachian Region report being cigarette smokers, a figure higher than the 16.3 percent at the national level.
- Smoking is an especially pronounced problem in Central Appalachia, where 25.2 percent of adults report being smokers.
- There is an urban-rural divide in smoking prevalence throughout the Appalachian Region. In the Region's rural counties, 22.5 percent of adults report being cigarette smokers, compared to just 17.3 percent of those living in large metro areas.
- In the Appalachian Region's distressed counties, 24.7 percent of adults are cigarette smokers, compared to 19.4 percent of residents in the Region's non-distressed counties.

Background

Adult smoking prevalence measures the percentage of adults age 18 and over that report that they currently smoke cigarettes. The figures for this measure come from County Health Rankings and are based on 2014 data from CDC's Behavioral Risk Factor Surveillance System survey.

Cigarette smoking negatively affects the entire body, causes a number of diseases, and reduces the overall health of smokers (Centers for Disease Control and Prevention, Health Effects of Cigarette Smoking, 2017). Smoking is a risk factor for a number of illnesses, such as COPD, heart disease, cancer, and stroke, many of which are profiled elsewhere in this report (Centers for Disease Control and Prevention, Fast Facts, 2017). Smoking also impacts pregnancy and infant health, bone health, the management of diabetes, and oral health (Centers for Disease Control and Prevention, Health Effects of Cigarette Smoking, 2017). Quitting smoking reduces the risk of heart disease and heart attack, stroke, cancer, and COPD, and reduces the symptoms of respiratory conditions (Centers for Disease Control and Prevention, Quitting Smoking, 2017).

Nationally, smoking prevalence follows similar socioeconomic patterns found elsewhere: percentages are highest among people with lower levels of education, those living in poverty, as well as among minorities (Centers for Disease Control and Prevention, Smoking 2016). Due to the characteristics of Appalachian communities, smoking cessation programs may be less effective in Appalachia if they do not recognize the local culture, available resources, and environment (Kruger, et al., 2012). For example, Kruger et al. identify lack of transportation to smoking cessation programs and childcare options as barriers to participating in these kinds of programs in the Appalachian Region.

Overview: Adult Smoking Prevalence in the Appalachian Region

With 19.8 percent of adult residents in the Appalachian Region self-identifying as smokers, smoking is more prevalent throughout the Region than the nation as a whole, where this number is 16.3 percent. Southern Appalachia has the lowest prevalence among the subregions, with 17.8 percent of its residents identifying as smokers, a number still higher than the national figure. Smoking is especially pronounced in both Central (25.2 percent) and North Central Appalachia (22.8 percent). In Central Appalachia, every county has an adult smoking prevalence at least three percentage points higher than the national average; for many counties, it is much higher still.

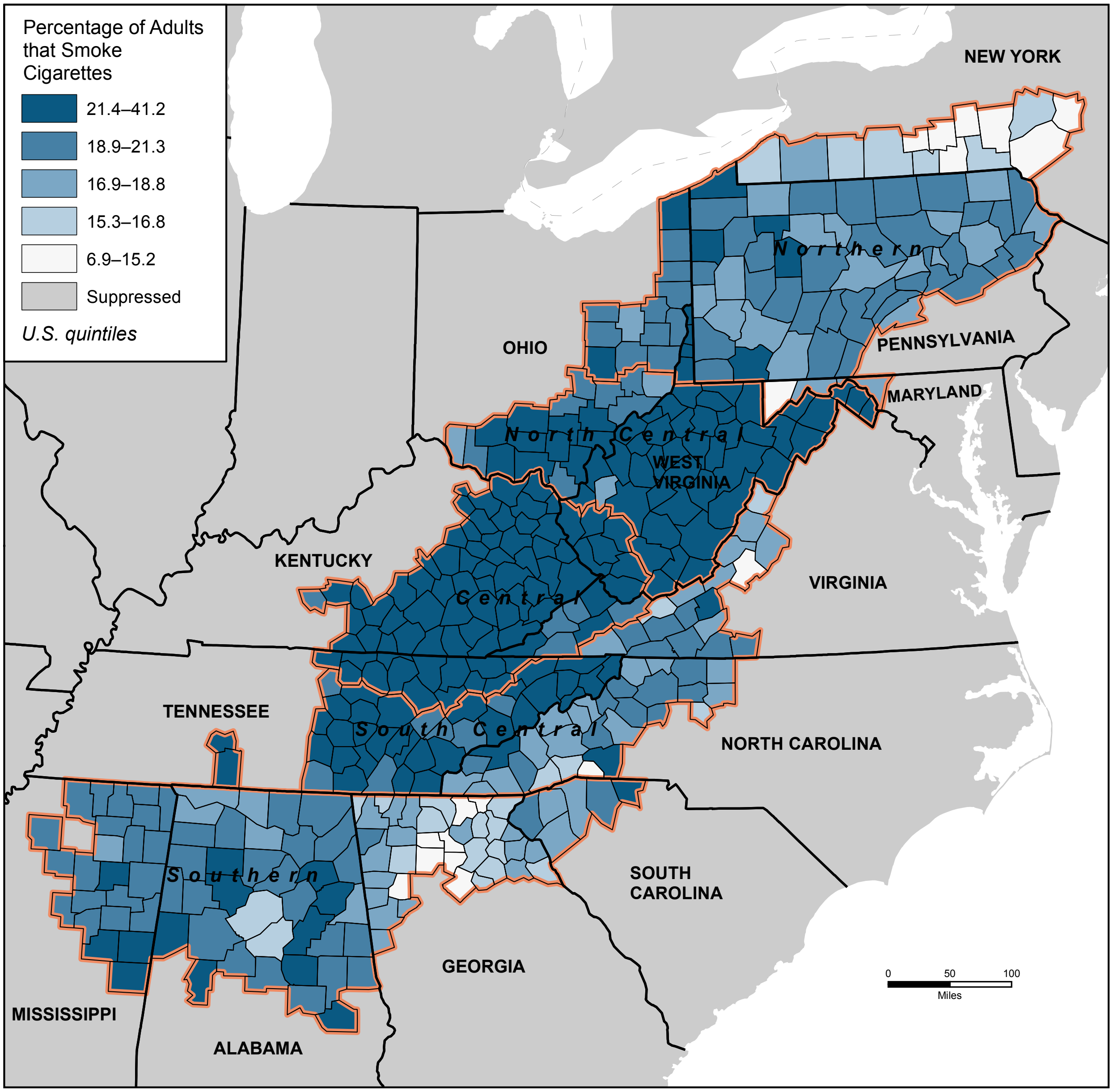
As one moves from large metro areas to rural areas throughout the Region, the prevalence of smoking gradually increases, with 17.3 percent of Appalachian residents living in large metro areas self-identifying as smokers versus 22.5 percent in rural areas. There is also a divide based on the economic status of a county: the Appalachian Region's distressed counties (24.7 percent) report a much higher percentage of smokers than the Region's non-distressed counties (19.4 percent).

Appalachian Kentucky stands out among the thirteen states—25.9 percent of adults report being smokers—and all but one of its counties rank in the worst-performing national quintile. This figure is higher than both West Virginia (23.9 percent) and Appalachian Tennessee (22.5 percent), the next two highest percentages in the Region. Appalachian Georgia (15.4 percent) and Appalachian New York (15.8 percent) both have lower smoking prevalence than the nation as a whole.

Figure 105 shows the variation in smoking prevalence across the Appalachian Region. Darker blue indicates a higher percentage of a county's residents that report being smokers; for this measure, higher values are associated with worse health. High percentages are especially pronounced throughout the Central and North Central subregions.

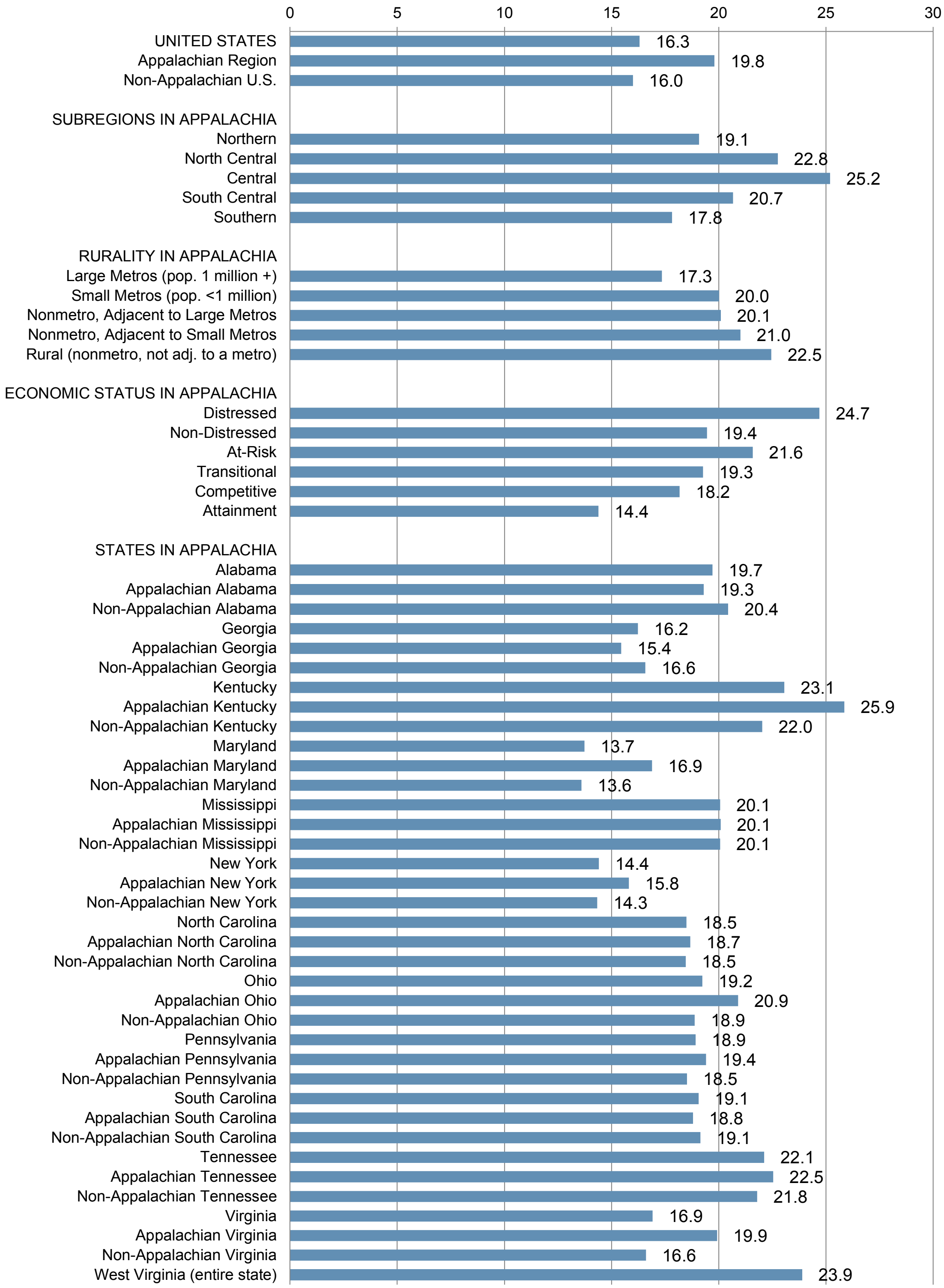
Figure 106 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 105: Map of Percentage of Adults that Smoke Cigarettes in the Appalachian Region, 2014



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 106: Chart of Percentage of Adults that Smoke Cigarettes, 2014

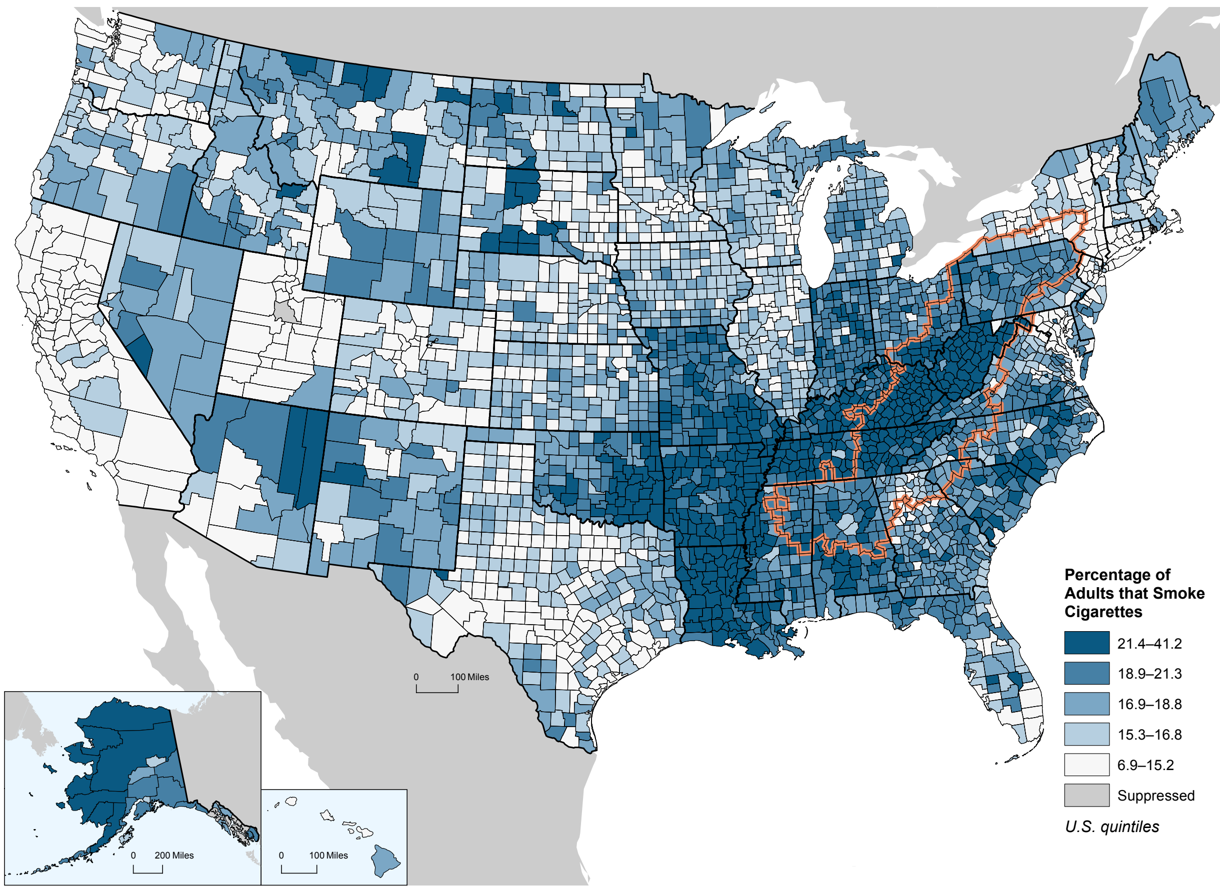


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Adult Smoking Prevalence in the United States

Figure 107 shows the variation in adult smoking prevalence across the United States. Smoking prevalence is pronounced in North Central and Central Appalachia, as well as in the Mississippi Delta region, including large areas of Missouri, Oklahoma, Arkansas, and Louisiana. Portions of the mid-Atlantic and coastal Southeast also display high smoking prevalence. Although pockets of high smoking prevalence appear in nearly every region, the West, Upper Midwest, and Northeast tend to have the lowest values in the country.

Figure 107: Map of Percentage of Adults that Smoke Cigarettes in the United States, 2014

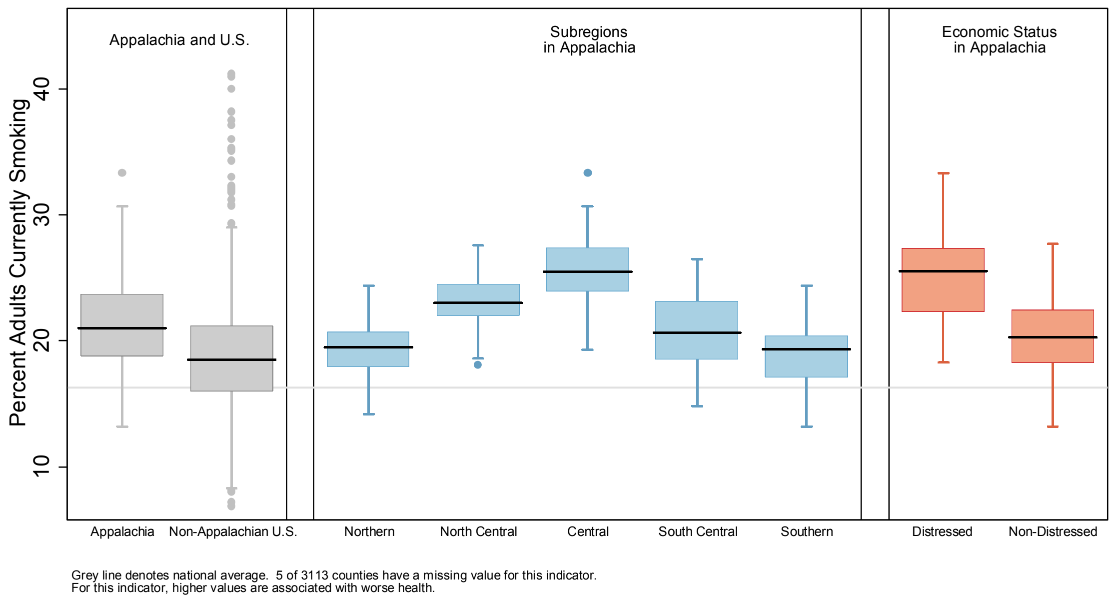


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Adult Smoking Prevalence

Figure 108 shows the distribution of adult smoking prevalence by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, five have a missing value for this indicator.

Figure 108: Box Plot of Percentage of Adults that Smoke Cigarettes by Geography and Economic Status, 2014



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of adult smoking prevalence among national quintiles for Appalachian counties is shown in Table 38. Of the 420 counties in the Region, 189 (45 percent) rank in the worst-performing national quintile, while 17 (4 percent) rank in the best-performing national quintile.

Table 38: Distribution of Percentage of Adults that Smoke Cigarettes among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Smoking prevalence	17	*4%*	27	*6%*	67	*16%*	120	*29%*	189	*45%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Chlamydia Incidence

- Chlamydia incidence in the Appalachian Region is 27 percent lower than the national average.
- All five subregions have lower chlamydia incidence than the nation as a whole, and Central Appalachia's rate is 52 percent lower than the national mark.
- Chlamydia incidence is 23 percent lower in the Appalachian Region's rural counties than the incidence in the Region's large metro counties.
- Non-distressed Appalachian counties report a 12 percent higher incidence of chlamydia than the Region's distressed counties.

Background

Chlamydia incidence measures the number of new cases of chlamydia reported per 100,000 population, per year. Data for this measure come from County Health Rankings and are based on 2013 data from CDC's National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Chlamydia is the most common bacterial sexually transmitted infection (STI) in the United States.

Higher chlamydia prevalence may reflect barriers to accessing STI prevention services, possibly due to cost, limited transportation options, or stigma (Barry & Sherrod, 2014). However, increased incidence rates may also be higher in areas that dedicate more resources to comprehensive screening programs. When comparing chlamydia incidence across geographies, it is important to note that low rates are not necessarily markers of good health outcomes. Rather, low incidence levels may actually serve as markers of poor detection or prevention services.

There are a number of risk factors for chlamydia, including: being younger than age 25, cervical ectopy, having multiple sex partners within the past year, not using a condom consistently, and a history of previous sexually transmitted infections (Centers for Disease Control and Prevention, Chlamydia-CDC Fact Sheet, 2017). The risk of chlamydia can be reduced by abstaining from sex, reducing the number of sexual partners, and proper condom use (Centers for Disease Control and Prevention, Chlamydia-CDC Fact Sheet, 2017). Rates of chlamydia are higher among women, minorities, and people ages 15–24. Numbers for men are likely underreported, as they are often not recommended for routine screening for the disease (Centers for Disease Control and Prevention, Trends in Reportable Sexually Transmitted Diseases in the United States, 2009).

In some cases, chlamydia can be symptomless, so it is often unreported. If undetected or untreated, it can cause serious damage to a woman's reproductive system and make pregnancy dangerous or even impossible. Because the problem is so prevalent and the complications so severe, the U.S. Preventive Services Task Force recommends that clinicians screen all sexually active women for chlamydia infection, including all those who are pregnant, and especially among young women who belong to subpopulations known for higher incidence (Office of Disease Prevention and Health Promotion, Gonorrhea and Chlamydia: Screening – Women, 2016).

The interpretation of these values may be approached from a variety of viewpoints. This indicator may simply capture the incidence of chlamydia among the population of a region. However, chlamydia incidence must be considered with an important caveat: identification and diagnosis vary significantly across counties, states, and regions. As such, low values in this measure may not indicate lower incidence of chlamydia, but rather, less success in the identification and diagnosis of the sexually transmitted infection. In this report, high levels of chlamydia incidence are interpreted as an indicator of poor health, though these important caveats should be kept in mind.

Overview: Chlamydia Incidence in the Appalachian Region

Overall, with an incidence of 321 cases per 100,000 population, the chlamydia rate in Appalachia is 27 percent lower than the national rate of 441 per 100,000. Each of the Appalachian Region's five subregions have rates lower than the national figure, and Central Appalachia's rate of 210 cases per 100,000 population is 52 percent lower than the national rate. Southern Appalachia, with a rate of 390 per 100,000, has the highest chlamydia incidence of all of the subregions, yet is still 12 percent lower than the national rate.

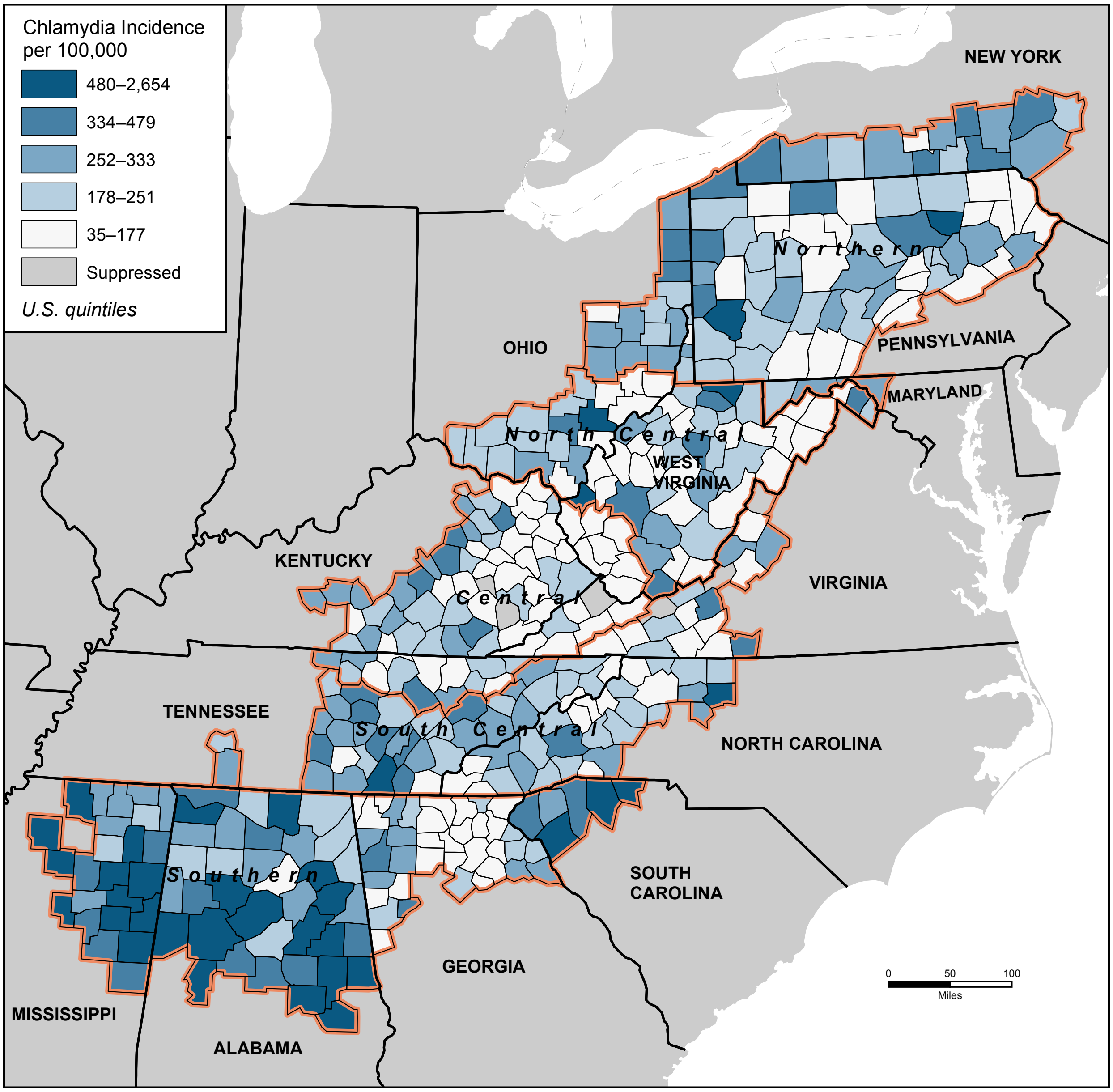
Incidence is generally lower among rural areas throughout the Region. Nonmetro areas adjacent to small metro areas report the lowest incidence, with a rate of 248 cases per 100,000 population, slightly better than the rate reported by rural areas (263 per 100,000). Small metro areas report the highest incidence with a rate of 359 per 100,000, slightly higher than that reported by large metro areas (341 per 100,000). Economic status plays a role, but not the one typically expected: chlamydia incidence is higher in the Appalachian Region's non-distressed counties (324 per 100,000) than in its distressed counties (290 per 100,000).

For each state in the Region, the Appalachian portions all have lower chlamydia rates than their respective non-Appalachian portions. The Appalachian portions of Georgia (196 per 100,000), Virginia (214), and Kentucky (231) report the lowest rates. Only the Appalachian portions of Alabama (532 per 100,000), Mississippi (521), and South Carolina (445) report rates higher than the national average.

Figure 109 shows the variation in chlamydia incidence across the Appalachian Region. Darker blue indicates higher rates of chlamydia incidence; for this measure, higher values are associated with worse health. Much of the Region performs better than the national rate, with only a few pockets in Southern Appalachia standing out for poor performance.

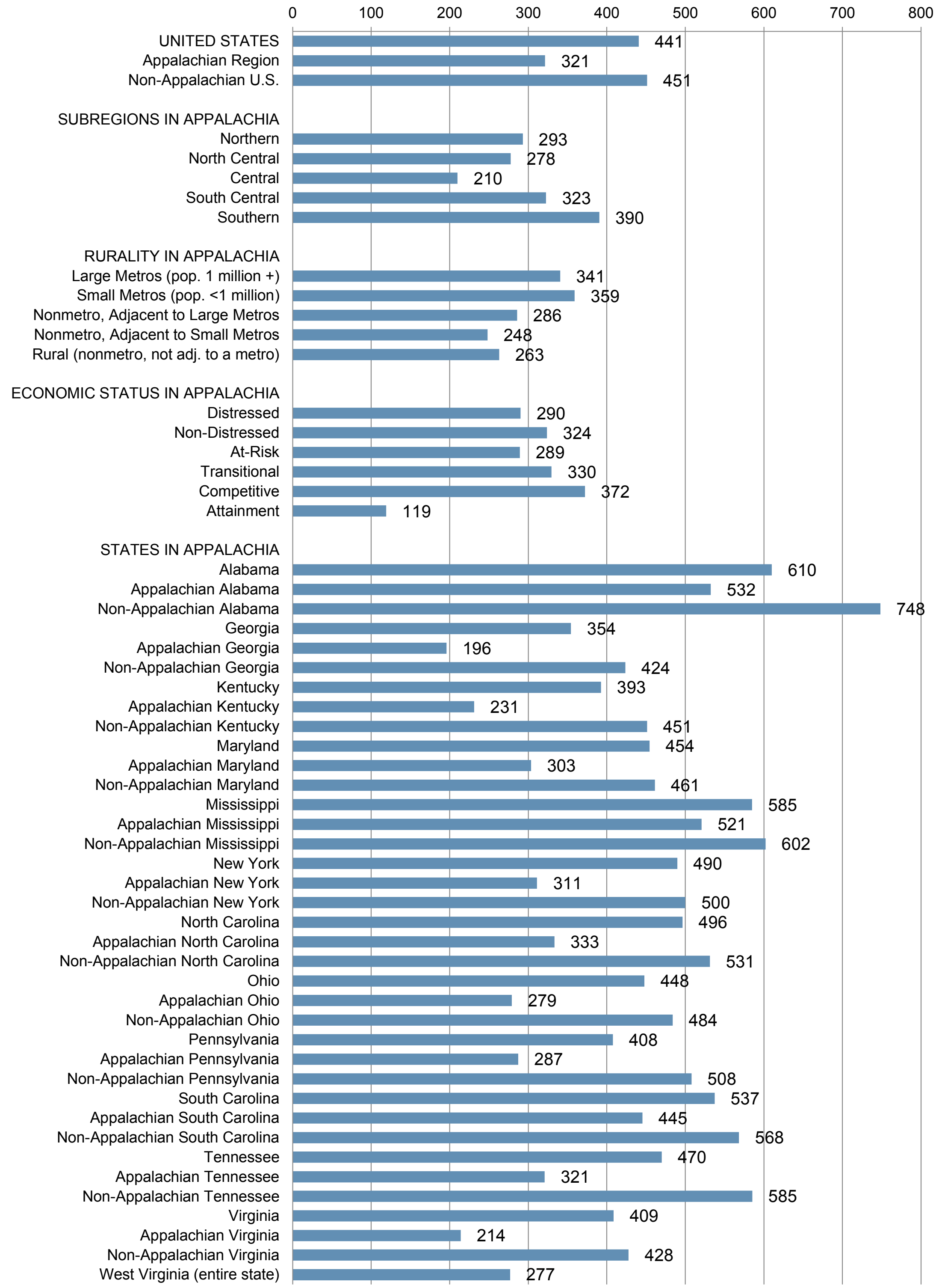
Figure 110 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 109: Map of Chlamydia Incidence per 100,000 Population in the Appalachian Region, 2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 110: Chart of Chlamydia Incidence per 100,000 Population, 2013

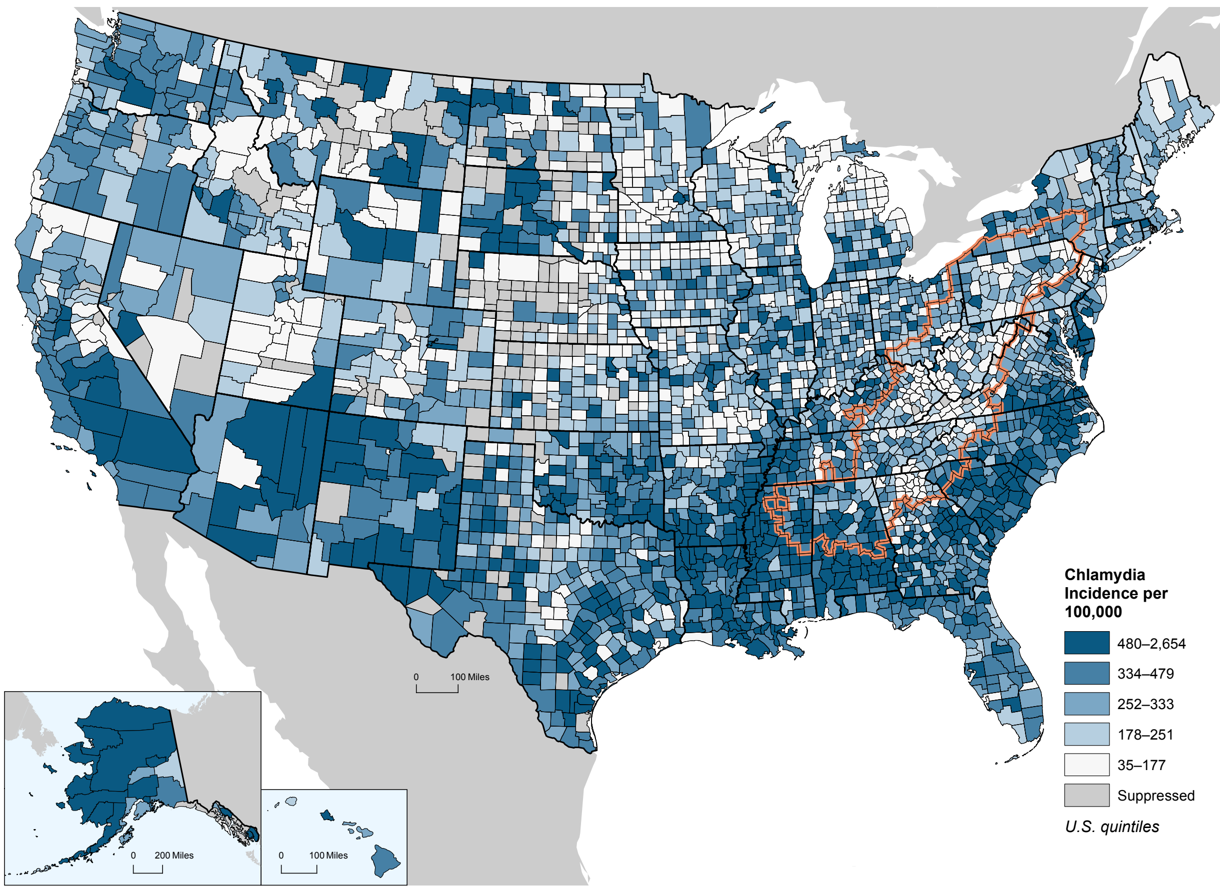


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Chlamydia Incidence in the United States

Figure 111 shows the variation in chlamydia incidence across the United States. The rates in Appalachia are among the nation's lowest and are similar to those reported in areas throughout the Midwest. High rates are reported along the southeastern coast, as well as in the Mississippi Delta region. High rates of chlamydia are reported in pockets throughout the West, as well as around large metropolitan areas throughout the country.

Figure 111: Map of Chlamydia Incidence per 100,000 Population in the United States, 2013

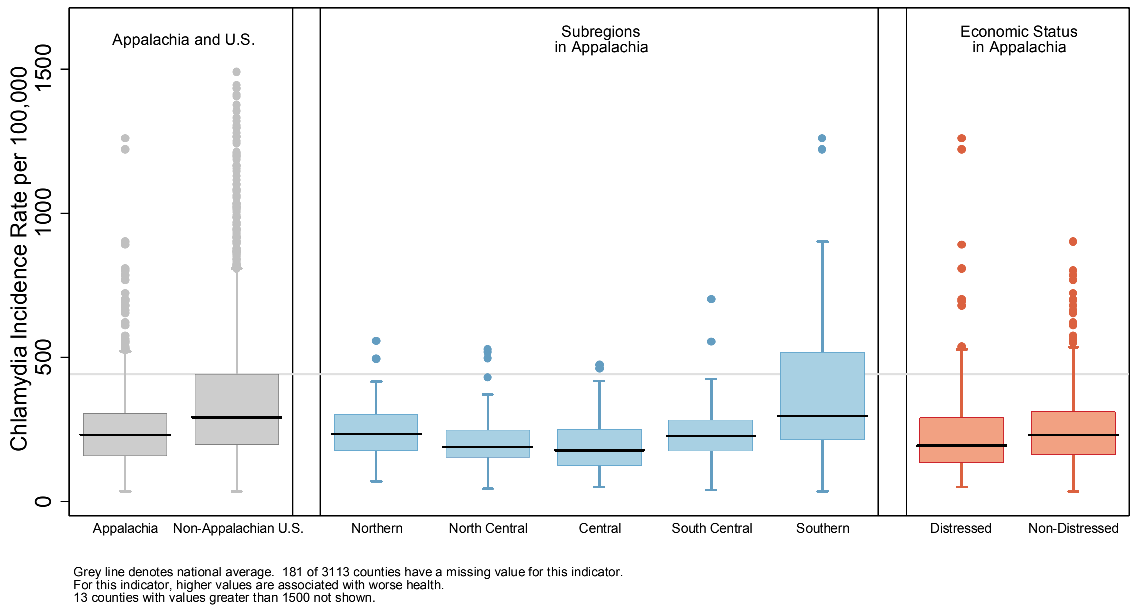


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Chlamydia Incidence

Figure 112 shows the distribution of chlamydia incidence by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 181 have a missing value for this indicator, and 13 counties with values greater than 1,500 are not included in the box plot.

Figure 112: Box Plots of Chlamydia Incidence per 100,000 Population by Geography and Economic Status, 2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of chlamydia prevalence among national quintiles for Appalachian counties is shown in Table 39. Of the 420 counties in the Region, 36 (9 percent) rank in the worst-performing national quintile, while 132 (31 percent) rank in the best-performing national quintile.

Table 39: Distribution of Chlamydia Incidence per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Chlamydia incidence	132	*31%*	111	*26%*	84	*20%*	50	*12%*	36	*9%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Further Reading

Physical Inactivity

Centers for Disease Control and Prevention. Physical Activity. Available at: https://www.cdc.gov/physicalactivity/index.html

County Health Rankings & Roadmaps. Physical Inactivity. Available at: http://www.countyhealthrankings.org/measure/physical-inactivity

Miles, L. (2007). Physical activity and health. Nutrition Bulletin, 32(4), 314-363.

Robert Wood Johnson. The State of Obesity. Better Policies for a Healthier America. Available at: http://stateofobesity.org/physical-inactivity/

Centers for Disease Control and Prevention. Physical Activity. Community Strategies. Available at: https://www.cdc.gov/physicalactivity/community-strategies/index.htm

Pelicer, F., Nagamine, K., & Faria, M. (2016). Health-Related Physical Fitness in School Children and Adolescents. International Journal of Sports Science, 19-24.

Smoking

Woloshin, S., Schwartz, L. M., & Welch, H. G. (2008). The Risk of Death by Age, Sex, and Smoking Status in the United States: Putting Health Risks in Context. JNCI Journal of the National Cancer Institute, 100(12), 845-853.

Schane, R., Ling, P., & Glantz, S. (2010). Health Effects of Light and Intermittent Smoking. Circulation, 1518-1523.

Kruger TM, Britteny M. Howell, BM, Alicia Haney A, Rian E. Davis RE, BA, Nell Fields N, and Nancy E. Schoenberg NE. Perceptions of Smoking Cessation Programs in Rural Appalachia. Am J Health Behav. 2012 Mar; 36(3): 373–384. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3297972/

Centers for Disease Control and Prevention (CDC). Smoking & Tobacco Use. Current Cigarette Smoking Among Adults in the United States. Available at: http://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/

Chlamydia Incidence

County Health Rankings. Sexually transmitted infection rate. http://www.countyhealthrankings.org/measure/sexually-transmitted-infection-rate, August 31, 2016.

Health Care Systems

Primary Care Physicians

KEY FINDINGS | Supply of Primary Care Physicians

- The supply of primary care physicians per 100,000 population in the Appalachian Region is 12 percent lower than the national average.
- Central Appalachia (33 percent lower) and Southern Appalachia (21 percent lower) both report a lower supply of primary care physicians than the national average.
- The supply of primary care physicians in the Appalachian Region's rural counties is 20 percent lower than the supply in the Region's large metro counties.
- The supply of primary care physicians in the Appalachian Region's distressed counties is 40 percent lower than the supply in the Region's non-distressed counties.

Background

This indicator measures the number of primary care physicians per 100,000 population. The figures for this measure come from a similar County Health Rankings indicator—the population to primary care physician ratio—and are based on 2013 data provided by the American Medical Association and Area Health Resources Files, a dataset provided by the U.S. Department of Health and Human Services. Primary care physicians include non-federal, practicing physicians (M.D.s and D.O.s) under age 75 specializing in general practice medicine, family medicine, internal medicine, and pediatrics. Higher physician numbers indicate a greater supply of primary care physicians, which is associated with a greater availability of primary medical care in a community.

Higher numbers of primary care physicians are a fundamental element for increasing access to primary medical care. Greater access to primary medical care is associated with improved health outcomes (Macinko, Starfield, & Shi, 2007). Greater access is also associated with more timely and cost-effective use of health services (Ricketts & Holmes, 2007). With increased access to primary care, individuals are less likely to delay care until the condition or illness requires more extensive treatment (Starfield, Shi, & Macinko, 2005).

Defining a universal target for the number of primary care physicians for an area is difficult because a range of factors influence the primary care needs of a community, such as: total population, the age profile of the population, and the area's employment mix. However, the Health Resources and Services Administration (HRSA), part of the U.S. Department of Health and Human Services, has established a minimum threshold, and defines Primary Care Health Professional Shortage Areas as communities with one or fewer primary care physicians per 3,500 people (Health Resources and Services Administration, 2016). Converting this ratio to the number of primary care physicians per 100,000 population, the HRSA definition of a shortage area is roughly equivalent to fewer than 29 primary care physicians per 100,000 population. Using 2016 data from the Area Health Resources Files, Appalachian residents are more likely to live in a full county Primary Care Health Professional Shortage Area than residents in the rest of the United States (7.2 percent compared to 4.5 percent).

There is currently a national debate focused on the prospect of future primary care physician shortages. Although there is disagreement over whether the supply of primary care physicians will meet demand, there is general consensus that there is a problem of uneven distribution, and rural areas, in particular, suffer from primary care physician shortages (Bodenheimer & Pham, 2010). Several federal and state policies and programs aim to increase physician supply in rural and underserved areas, and medical schools and residency programs are becoming more deliberate in their efforts to improve supply (Bodenheimer & Pham, 2010). However, due to the lag between the initiation of medical training and placing physicians in communities, any new programs and policy changes require a great deal of time before benefits—locating primary care physicians in underserved communities—can be fully realized.

Overview: Supply of Primary Care Physicians in the Appalachian Region

The Appalachian Region has 66.8 primary care physicians per 100,000 population, which is 12 percent lower than the national average of 75.6 primary care physicians per 100,000. The supply of primary care physicians in South Central Appalachia (76.9 per 100,000) and North Central Appalachia (72.7 per 100,000) is comparable to the national average. Central Appalachia has the lowest physician supply in the Region, with 50.9 primary care physicians per 100,000 population, followed by Southern Appalachia with 59.5 per 100,000.

The supply of primary care physicians for rural counties (55.6 per 100,000 population) in Appalachia is 20 percent lower than the average for large metro counties (69.4 per 100,000), and 26 percent lower than the nation as a whole. The economic status of the county also plays a role in physician supply; economically distressed counties in Appalachia report 40.9 primary care physicians per 100,000 population, which is 40 percent lower than the 68.7 primary care physicians per 100,000 population in non-distressed counties, and 46 percent lower than the national average.

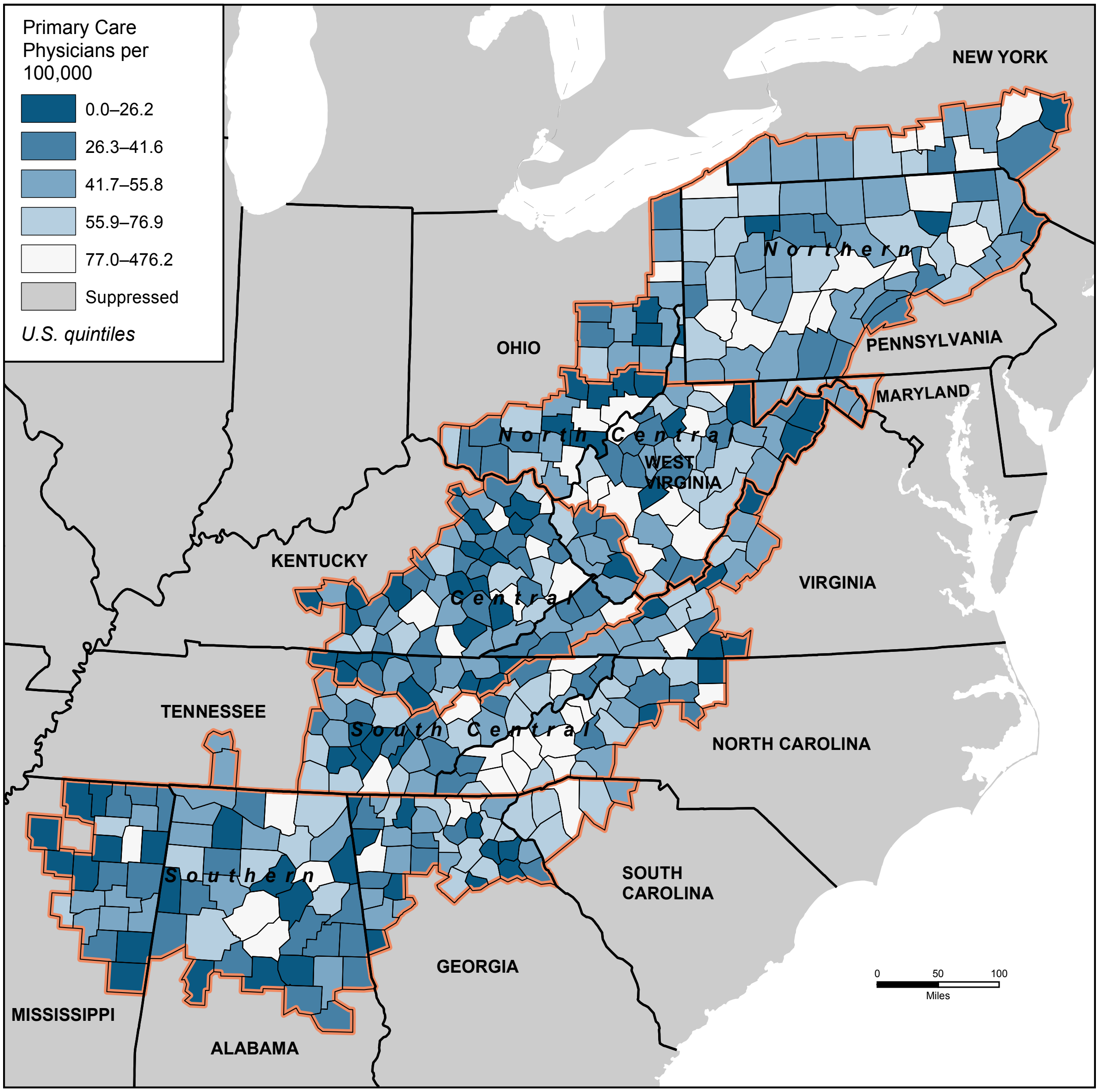
Within states, the supply of primary care physicians varies between the Appalachian and non-Appalachian portions. The greatest intrastate differences in the number of primary care physicians are evident in Maryland and New York. In Appalachian Maryland, the primary care physician supply is 58.9 per 100,000, compared with 90.6 per 100,000 in non-Appalachian Maryland, a difference of 35 percent. Likewise, in Appalachian New York, the primary care physician supply is 64.0 per 100,000, compared to the non-Appalachian supply of 84.4 per 100,000, a difference of 24 percent. Appalachian Mississippi's primary care physician supply of 42.1 per 100,000 is the lowest in the Region, while Appalachian North Carolina's supply of 79.5 per 100,000 is the highest. The Appalachian portions of North Carolina, South Carolina, and Tennessee all have a higher supply of primary care physicians than their non-Appalachian portions. For these three states, the Appalachian portions report a supply equal to or greater than the national average.

Figure 113 shows the number of primary care physicians per 100,000 population for Appalachian counties, grouped by national quintiles. Darker colors indicate lower numbers of primary care physicians; for this measure, higher values are associated with better health. Although there are pockets of both good and poor performance throughout the Region, there are few patterns to be discerned, as each state in the Region reports at least one county in both the best-performing and worst-performing national quintiles. It should be noted that the best-performing counties in terms of primary care physician supply tend to also have large medical centers in the vicinity.

Figure 114 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout

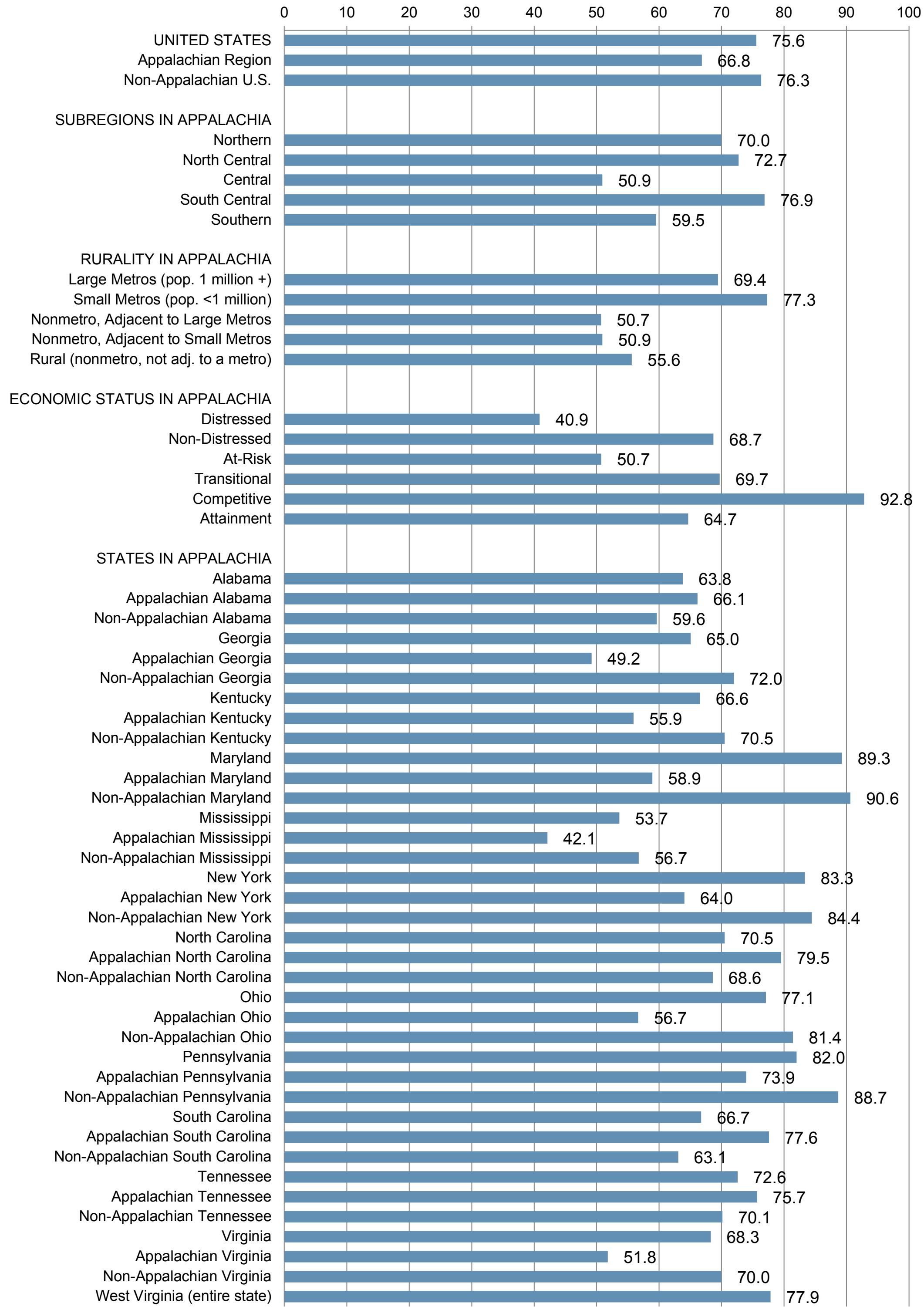
Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 113: Map of Primary Care Physicians per 100,000 Population in the Appalachian Region, 2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 114: Chart of Primary Care Physicians per 100,000 Population, 2013

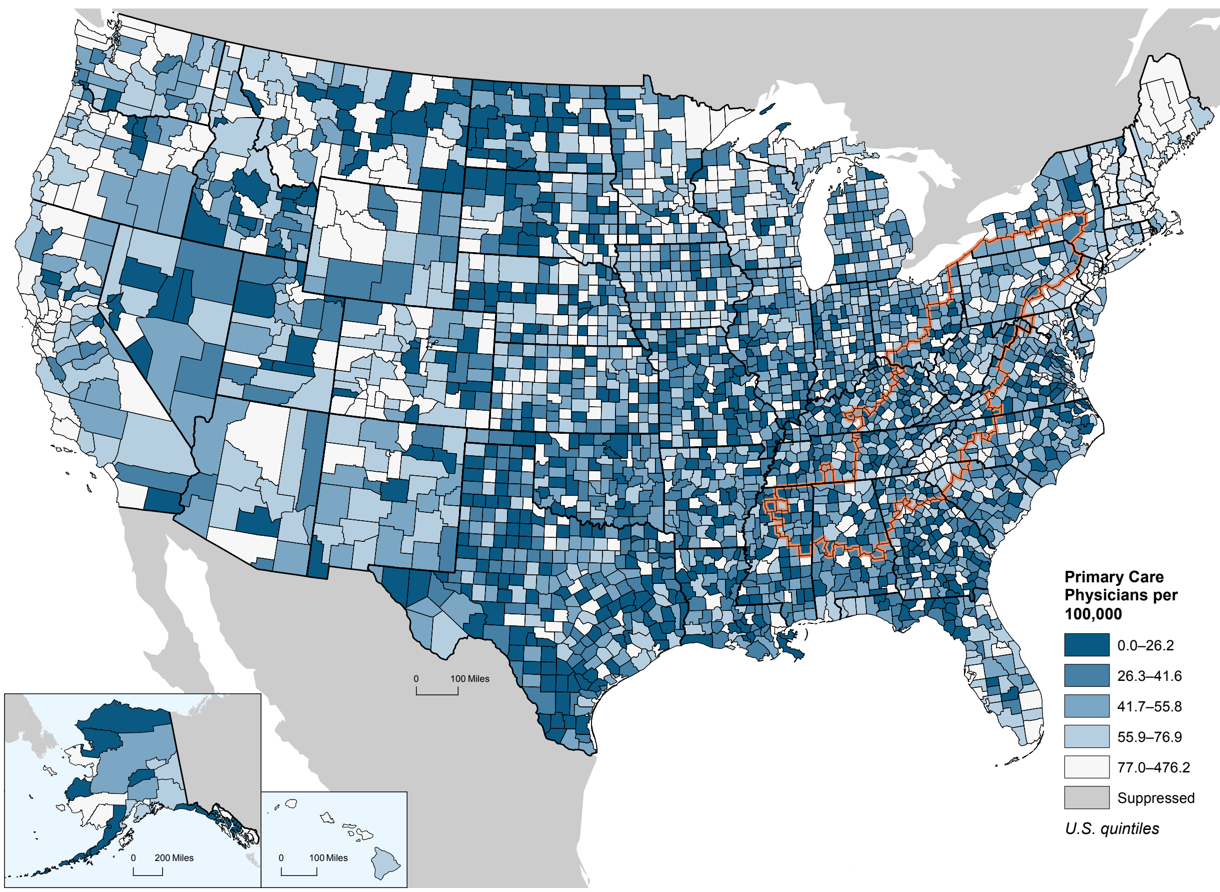


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Supply of Primary Care Physicians in the United States

Figure 115 highlights the variation in primary care physician supply across the United States. There appears to be no obvious regional or state-based dimension to these numbers. The spread of poorly-performing counties throughout much of the United States indicates that there are indeed primary care physician shortages in many parts of the country. New England and parts of the western United States—most notably, counties along the Pacific Coast—tend to have concentrations of counties with a high supply of primary care physicians. Outside of these areas, the differences in the number of providers does not appear to be concentrated in specific areas or in multi-county clusters. This suggests primary care physician supply may be more a function of the local healthcare system rather than anything related to state or regional policies.

Figure 115: Map of Primary Care Physicians per 100,000 Population in the United States, 2013

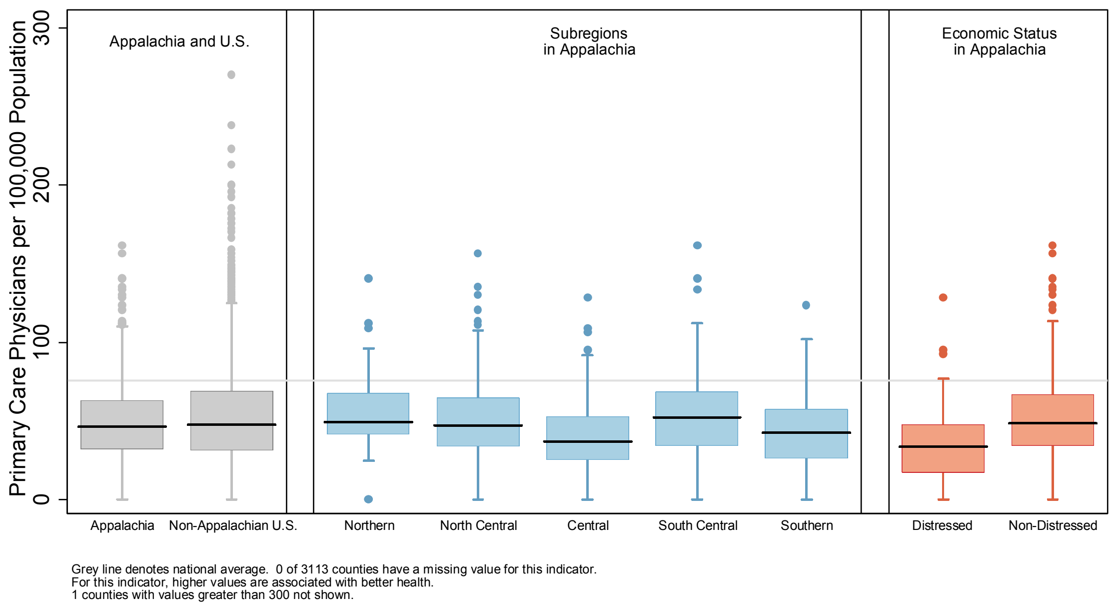


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Primary Care Physicians

Figure 116 shows the distribution in the supply of primary care physician by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator, and one county with a value greater than 300 is not represented in the box plot.

Figure 116: Box Plot of Primary Care Physicians per 100,000 Population by Geography and Economic Status, 2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution in the supply of primary care physicians among national quintiles for Appalachian counties is shown in Table 40. Of the 420 counties in the Region, 79 (19 percent) rank in the worst-performing national quintile, while 56 (13 percent) rank in the best-performing national quintile.

Table 40: Distribution of Primary Care Physicians per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Primary care physicians	56	*13%*	84	*20%*	106	*25%*	95	*23%*	79	*19%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Mental Health Providers

KEY FINDINGS | Supply of Mental Health Providers

- The supply of mental health providers per 100,000 population in the Appalachian Region is 35 percent lower than the national average.
- All five Appalachian subregions have a lower supply of mental health providers than the national average, with North Central Appalachia and Southern Appalachia both reporting figures approximately 50 percent lower than the national number.
- The two nonmetro adjacent classifications—those adjacent to large metro areas, as well as those adjacent to small metro areas—report the lowest mental health provider supplies in the Region, with supplies that are approximately 50 percent below the national average.
- The supply of mental health providers in the Appalachian Region's distressed counties is six percent lower than the supply in non-distressed counties.

Background

This indicator measures the number of mental health providers per 100,000 population. The figures for this measure come from a similar County Health Rankings indicator—the population to mental health provider ratio—based on 2015 data provided by the National Plan and Provider Enumeration System (NPPES) through the Centers for Medicare & Medicaid Services (CMS). In this report, mental health providers include: psychiatrists, psychologists, licensed clinical social workers, counselors, marriage and family therapists, and advanced practice nurses specializing in mental health care. These providers can address a wide variety of conditions, and a higher supply of providers indicates greater availability of mental health services in a community.

Mental health is an important component of overall well-being and is also directly related to physical health. Receipt of mental health services can help reduce medical costs and improve physical health outcomes, especially among individuals with chronic medical conditions (Kolappa, Henderson, & Kishore, 2013). People with severe mental illnesses tend to suffer worse physical health and excess mortality compared to the general population (Druss, Zhao, Von Esenwein, Morrato, & Marcus, 2011).

The Health Resources and Services Administration (HRSA), part of the U.S. Department of Health and Human Services, defines Mental Health Professional Shortage Areas as communities with one or fewer psychiatrists per 30,000 population (3.3 per 100,000), or one or fewer core providers per 9,000 population (11.1 per 100,000) (Health Resources and Services Administration, 2016). Core mental health professionals are: clinical social workers, clinical psychologists, marriage and family therapists, psychiatrists, and advanced practice psychiatric nurses (Heisler, 2015). Based on this definition, nearly 100 million people were living in Mental Health Professional Shortage Areas as of September 2014 (Radnofsky, 2015). A larger share of Appalachian residents than non-Appalachian residents live in a county that is classified as a Mental Health Professional Shortage Area: 41 percent vs. 23 percent. The mental health provider shortage became more noticeable after passage of mental health parity laws, which increased both the access to, and demand for, mental health services among individuals who have health insurance (Radnofsky, 2015).

Research has documented disparities in access to mental health treatment in rural versus metro areas (Hauenstein, 2007), and has shown that most mental health professionals practice in metropolitan counties (Ellis, Konrad, Thomas, & Morrissey, 2009). Increasing the supply of mental health providers increases the use of mental health services, especially among racial and ethnic minority groups that have historically had lower use of mental health services, despite reported need (Lê Cook, Doksum, Chen, Carle, & Alegría, 2013). One strategy for increasing access to mental health services in rural and underserved areas is telepsychiatry, in which a psychiatrist or other mental health provider delivers services remotely (Holton & Brantley, 2014).

Overview: Supply of Mental Health Providers in the Appalachian Region

There are 130 mental health providers per 100,000 population in the Appalachian Region, which is 35 percent lower than the national average of 201 per 100,000 population. No Appalachian subregion has more mental health providers per 100,000 population than the national average, and there is substantial variation in the number of mental health providers throughout the Region. South Central Appalachia has the highest supply of mental health providers at 172 per 100,000 population, which is 87 percent higher than the Southern Appalachian subregion's 92 providers per 100,000 population.

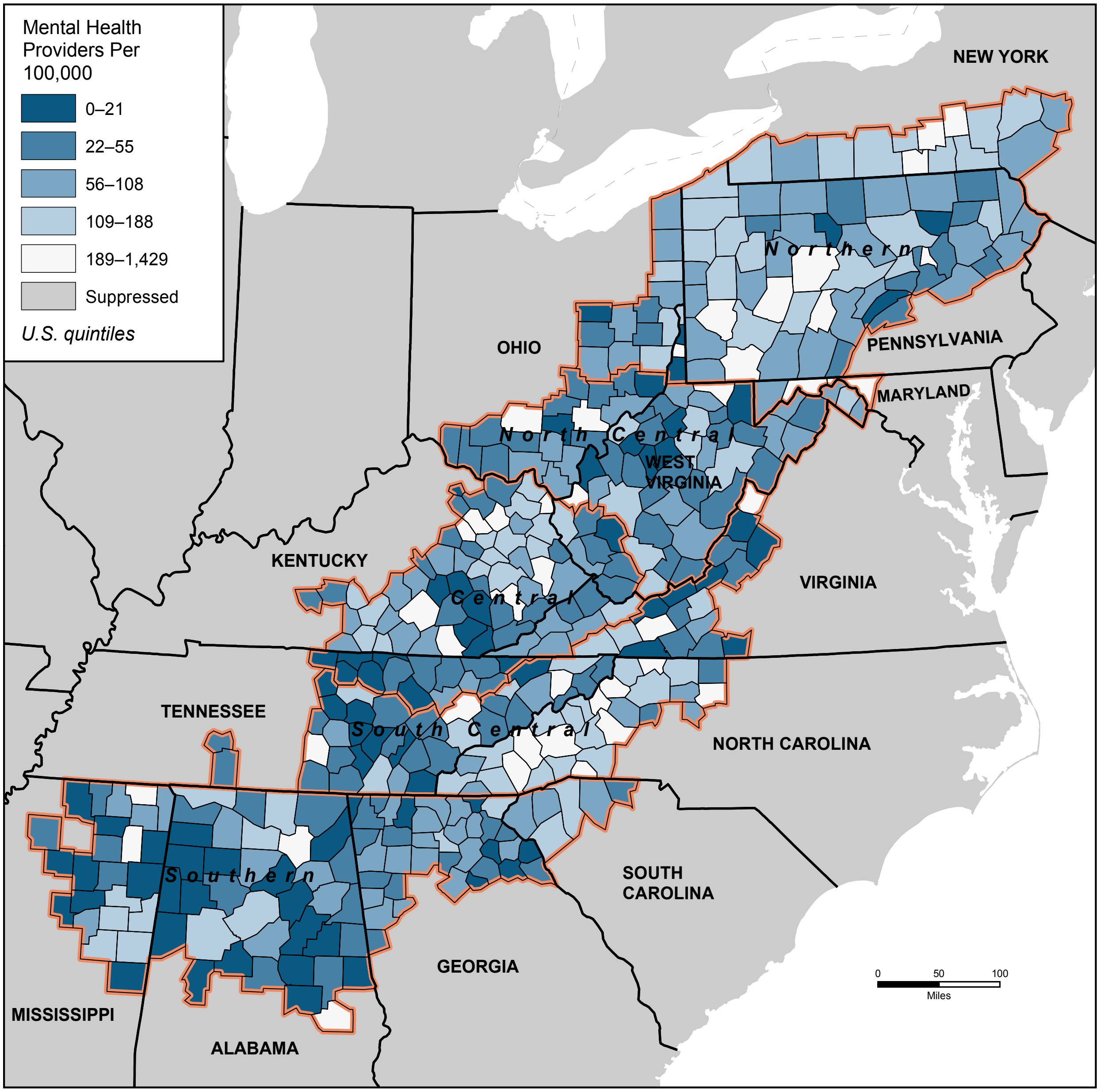
The supply of mental health providers for rural counties in Appalachia is 142 per 100,000 population, which is 10 percent higher than the 129 per 100,000 for the Region's large metro counties. The two nonmetro classifications—those adjacent to large metro areas (102 per 100,000), as well as those adjacent to small metro areas (90 per 100,000)—report the lowest supply of mental health providers in the Region, numbers that are approximately 50 percent below the national average. Unlike many of the other provider indicators discussed elsewhere in this report, the number of mental health providers does not differ much by economic status. The supply of mental health providers in distressed counties in the Appalachian Region is 123 per 100,000 population, which is just 6 percent lower than the 131 per 100,000 for the Region's non-distressed counties.

The supply of mental health providers varies between the Appalachian and non-Appalachian portions of states. The greatest intrastate differences in the number of mental health providers are in Georgia and Ohio. In Appalachian Georgia, the number of mental health providers is 72 per 100,000 population, which is 48 percent lower than the 138 providers per 100,000 population in non-Appalachian Georgia. Likewise, in Appalachian Ohio, the number of mental health providers is 99 per 100,000 population, compared to 167 mental health providers per 100,000 population in non-Appalachia Ohio, a difference of 41 percent. Appalachian North Carolina has the highest number of mental health providers in the Region at 242 per 100,000 population, which is 20 percent higher than the national average.

Figure 117 shows the number of mental health providers per 100,000 population in Appalachian counties, grouped by national quintiles. Darker colors indicate counties with lower numbers of mental health providers; for this measure, higher values are associated with better health. Although the Region as a whole falls below the national average, each of the five subregions contains several counties in the top-performing national quintile.

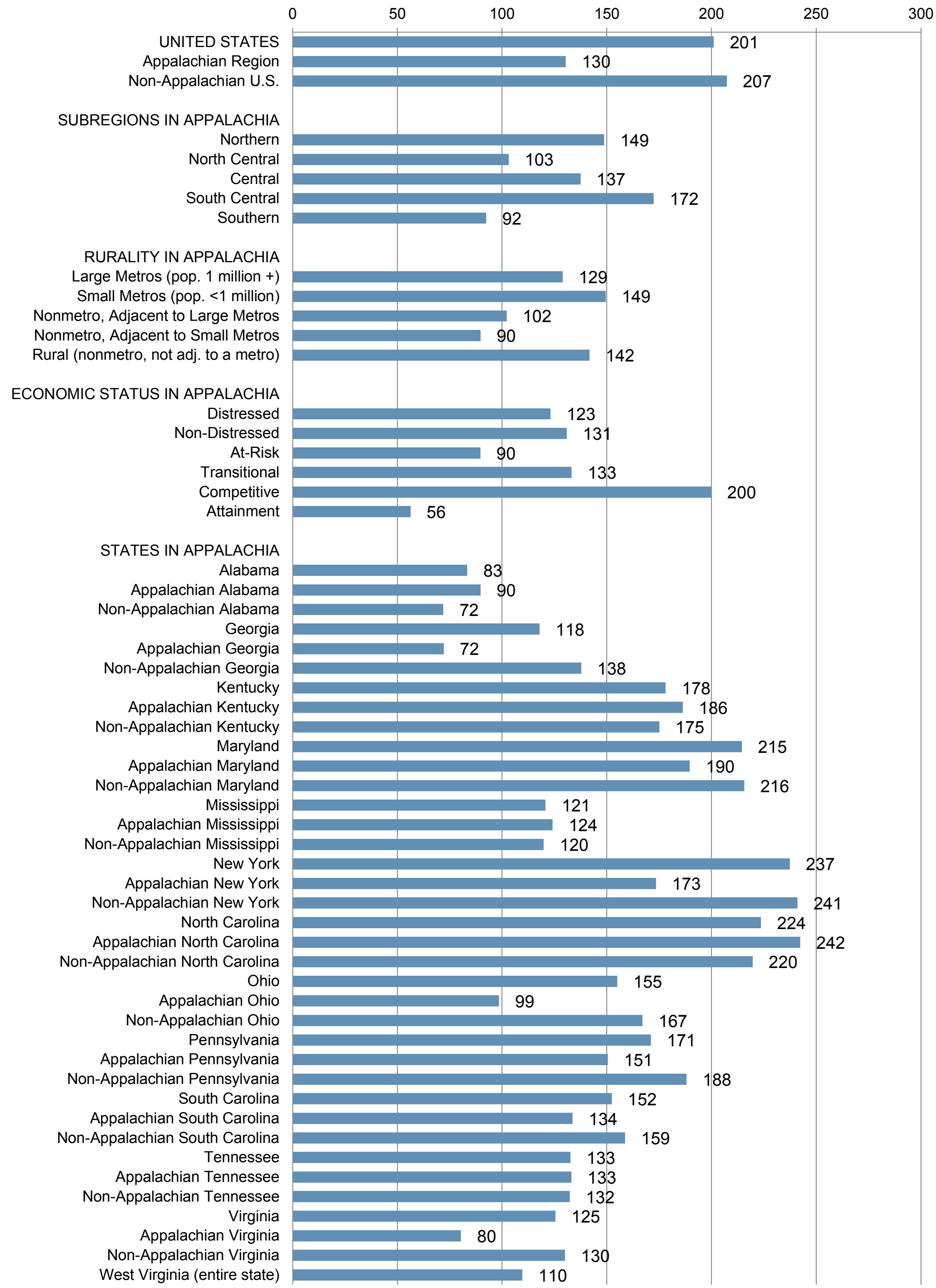
Figure 118 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 117: Map of Mental Health Providers per 100,000 Population in the Appalachian Region, 2015



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 118: Chart of Mental Health Providers per 100,000 population, 2015

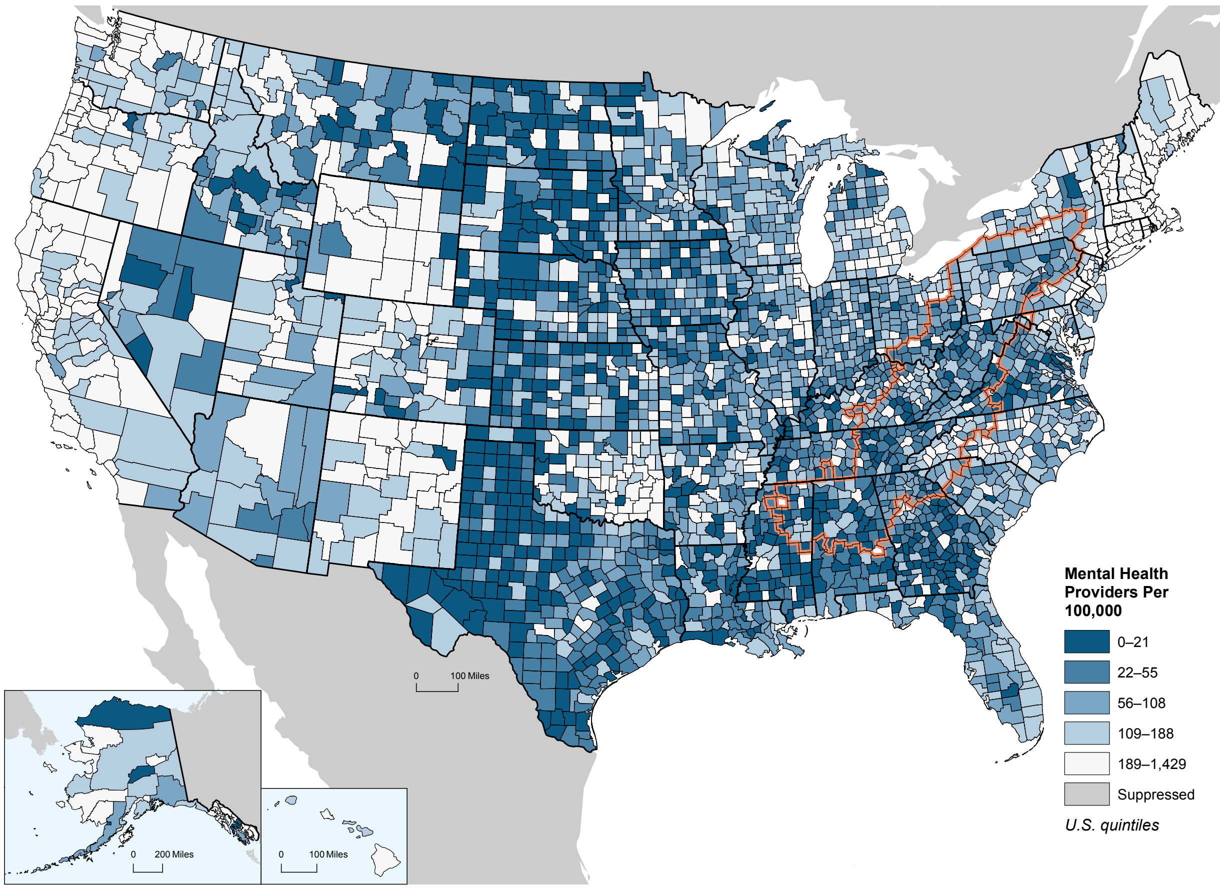


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Supply of Mental Health Providers in the United States

Figure 119 highlights the variation in the supply of mental health providers across the United States. While supply varies considerably across the nation, shortages of mental health providers appear to be concentrated in the middle of the country and in the Gulf Coast states. Counties in the western half of the United States—and especially those along the Pacific coast—have relatively high numbers of mental health providers. New England also reports a high supply of mental health providers

Figure 119: Map of Mental Health Providers per 100,000 Population in the United States, 2015

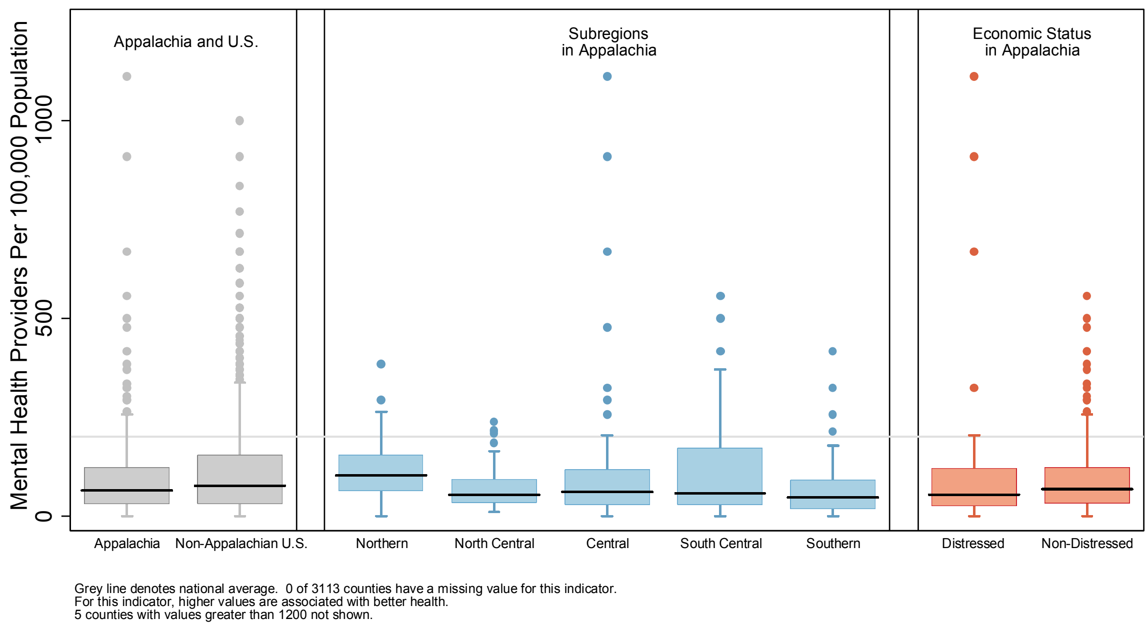


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Mental Health Providers

Figure 120 shows the distribution of mental health providers by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator. Five counties with values greater than 1,200 are not represented in the box plot.

Figure 120: Box Plot of Mental Health Providers per 100,000 Population by Geography and Economic Status, 2015



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution in the supply of mental health providers among national quintiles for Appalachian counties is shown in Table 41. Of the 420 counties in the Region, 76 (18 percent) rank in the worst-performing national quintile, while 42 (10 percent) rank in the best-performing national quintile.

Table 41: Distribution of Mental Health Providers per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Mental health providers	42	*10%*	81	*19%*	105	*25%*	116	*28%*	76	*18%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Specialty Physicians

KEY FINDINGS | Supply of Specialty Physicians

- The supply of specialty physicians per 100,000 population in the Appalachian Region is 28 percent lower than the national average.
- No Appalachian subregion matches the national average in terms of the supply of specialty physicians, and the supply in Central Appalachia is 65 percent lower than the national mark.
- The supply of specialty physicians in the Appalachian Region's rural counties is 57 percent lower than the supply in the Region's large metro counties.
- The supply of specialty physicians in the Appalachian Region's distressed counties is nearly 76 percent lower than the supply in the Region's non-distressed counties.

Background

This indicator measures the number of non-primary care physicians per 100,000 population. The figures for this measure come from 2013 data from the U.S. Department of Health and Human Services' Area Health Resources Files.

Access to the services of a specialist may be important for certain health conditions—especially chronic illnesses. For example, individuals with cancer benefit from having their care managed by oncologists rather than primary care physicians. Some specialist physicians can fill a similar role as a primary care physician in that they serve as the primary source of care for patients who see them regularly for chronic illnesses (Casalino, 2010).

Shortages of specialists may serve as a barrier to timely, high-quality care when residents have to travel great distances to receive needed specialty services. County population is a strong predictor of the number of specialty physicians, as these doctors typically draw from a wider market than primary care physicians. Likewise, specialists often cluster near larger health care systems, which tend to be located in metro areas. Thus, rural areas tend to have a lower supply of specialists on a per capita basis, causing rural residents to travel greater distances to receive specialty services (Chan, Hart, & Goodman, 2006). As a result, rural residents are more likely to rely on generalists for care that may best be treated by a specialist. The growing popularity of telehealth may provide an avenue for generalist physicians to provide more sophisticated services with support from remote specialty consultation. However, without policy and medical practice changes, rural areas will continue to experience barriers to receiving specialty care.

While there is no generally accepted target for the number of specialist physicians, there are a number of factors that may influence what the ideal target should be in any particular area. Broadly speaking, as a population continues to grow—as well as age—demand for both medical and surgical specialists is expected to outpace supply, with a greater shortfall expected for surgical specialists (IHS, Inc., 2016). This is especially true in rural areas (Fraher, Knapton, Sheldon, Meyer, & Ricketts, 2013).

However, unlike primary care physician supply, some research indicates that the number of specialists does not have the same positive effect on population health (Starfield, Shi, & Macinko, 2005). Increasing the supply of specialist physicians may increase health care costs and reduce health care quality when more specialists are not necessary (Baicker & Chandra, 2004).

Overview: Supply of Specialty Physicians in the Appalachian Region

The Appalachian Region's specialty physician supply of 110 per 100,000 population is 28 percent lower than the national average of 153 per 100,000 population. No Appalachian subregion has a specialty physician supply above the national average, and there is great variation within the Region. South Central Appalachia has the highest supply of specialists at 130 per 100,000 population (15 percent lower than the national average), while Central Appalachia has the lowest supply of specialists at 54 per 100,000 population (65 percent lower than the national average).

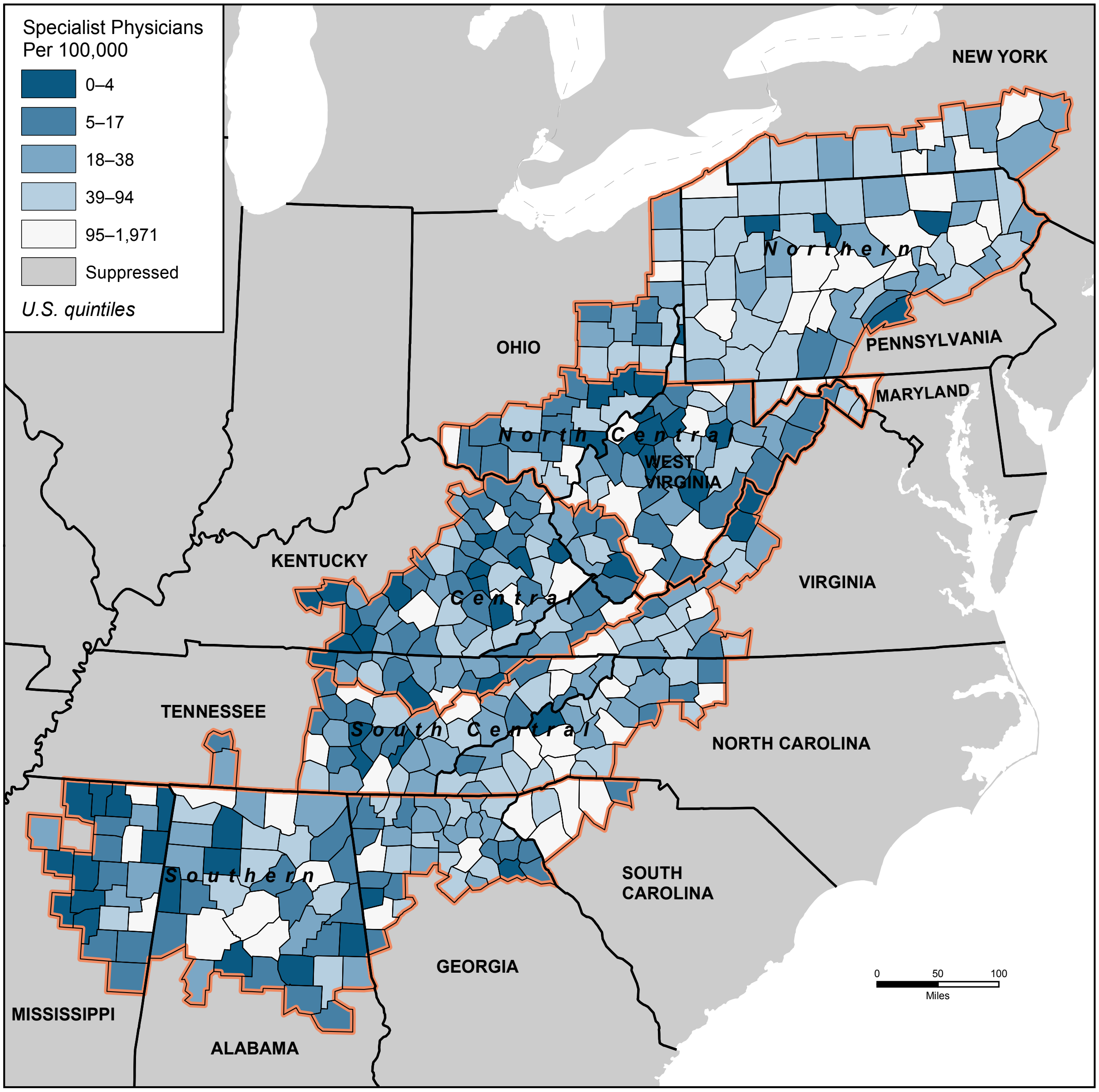
Lower supply of specialty physicians in many Appalachian counties is due, in part, to their rurality. The specialty physician supply for rural Appalachian counties is 57 percent lower than the supply in large metro counties in the Region. Economically distressed counties have a markedly lower supply of specialty physicians than non-distressed counties in Appalachia: the supply of specialists in distressed counties throughout Appalachia (28 per 100,000 population) is 76 percent lower than in the Region's non-distressed counties (115 per 100,000).

Appalachian counties in Georgia have the lowest supply of specialists in the Region at 59 per 100,000, while Appalachian counties in North Carolina represent the highest supply of specialists in the Region at 147 per 100,000 population. The supply of specialty physicians varies greatly between Appalachian portions and non-Appalachian portions of any given state. The greatest intrastate disparity in the supply of specialty physicians is found in Ohio, where the supply of specialists is 61 per 100,000 population in the Appalachian portion—65 percent lower than the 175 specialists per 100,000 found in non-Appalachian Ohio.

Figure 121 shows the supply of specialty physicians in Appalachian counties, grouped by national quintiles. Darker colors indicate a lower supply of specialty physicians; for this measure, higher values are associated with better health. While the darkest colors do not dominate the Region, the prevalence of lower numbers of specialists is more common in southern Ohio, central West Virginia, eastern Kentucky, and Mississippi. However, there are many counties throughout the Region that rank in the top-performing national quintile.

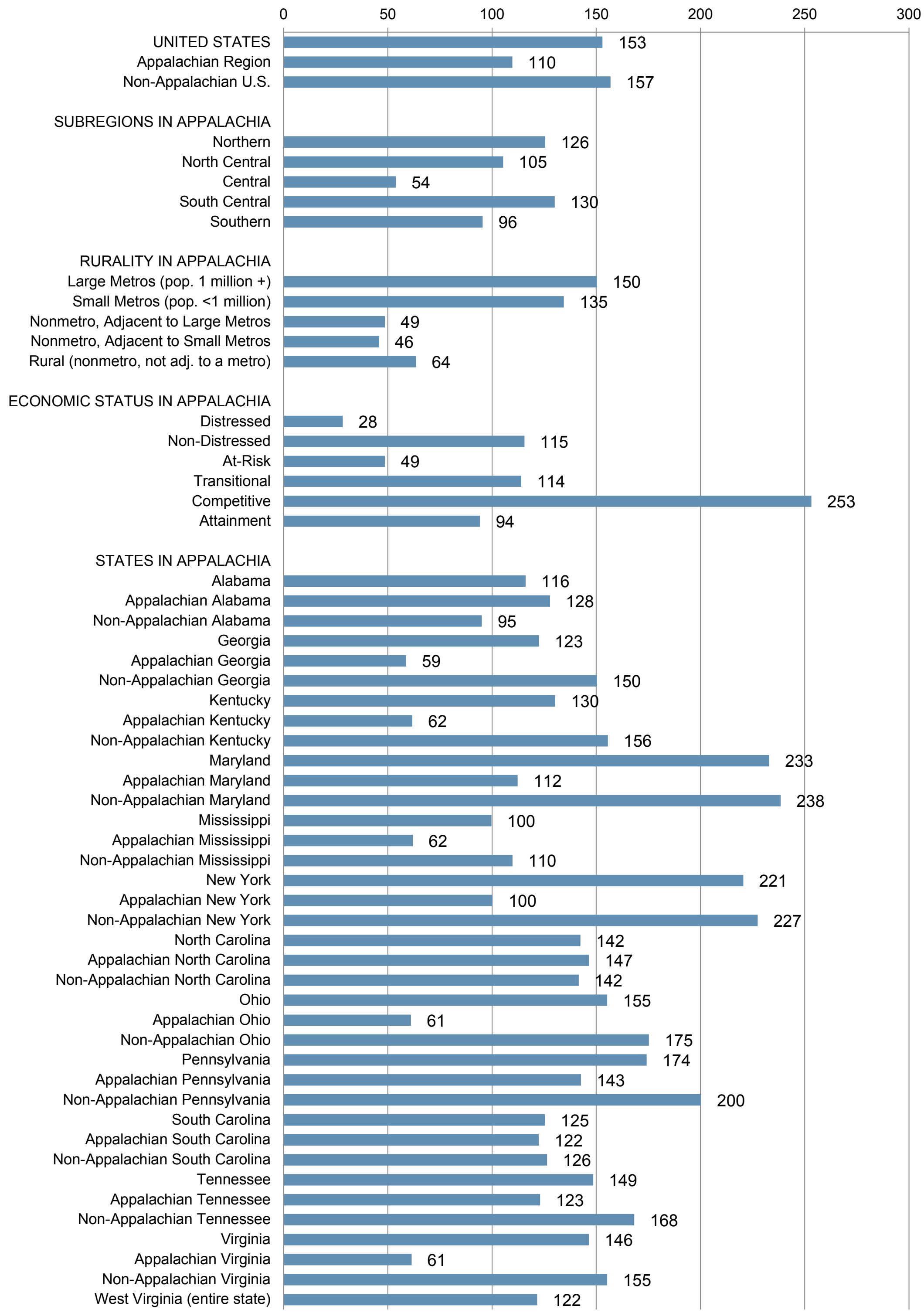
Figure 122 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 121: Map of Specialty Physicians per 100,000 Population in the Appalachian Region, 2013



Data source: Area Health Resources Files (AHRF) 2014–2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015. http://ahrf.hrsa.gov/

Figure 122: Chart of Specialty Physicians per 100,000 Population, 2013

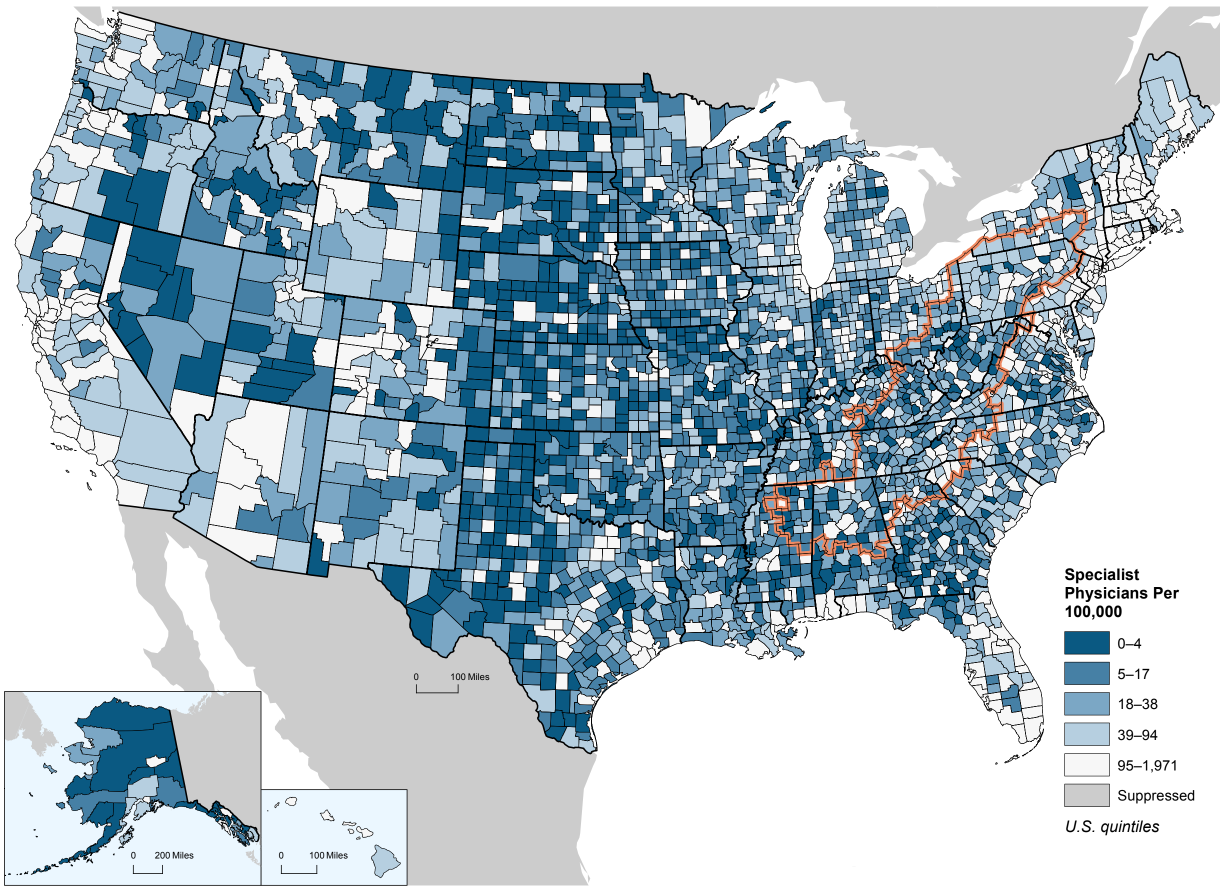


Data source: Area Health Resources Files (AHRF) 2014–2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015. http://ahrf.hrsa.gov/

Overview: Supply of Specialty Physicians in the United States

Figure 123 highlights the variation in the supply of specialty physicians across the United States. While the supply of specialists varies considerably across the nation, specialist shortages appear to be concentrated in the middle of the country. The only other discernable pattern from the checkerboard nature of the national map seems to indicate that specialists tend to concentrate around large metro areas and near medical schools. Counties in the Northeast, along the Pacific Coast, and many in Florida tend to have a high supply of specialty physicians.

Figure 123: Map of Specialty Physicians per 100,000 Population in the United States, 2013

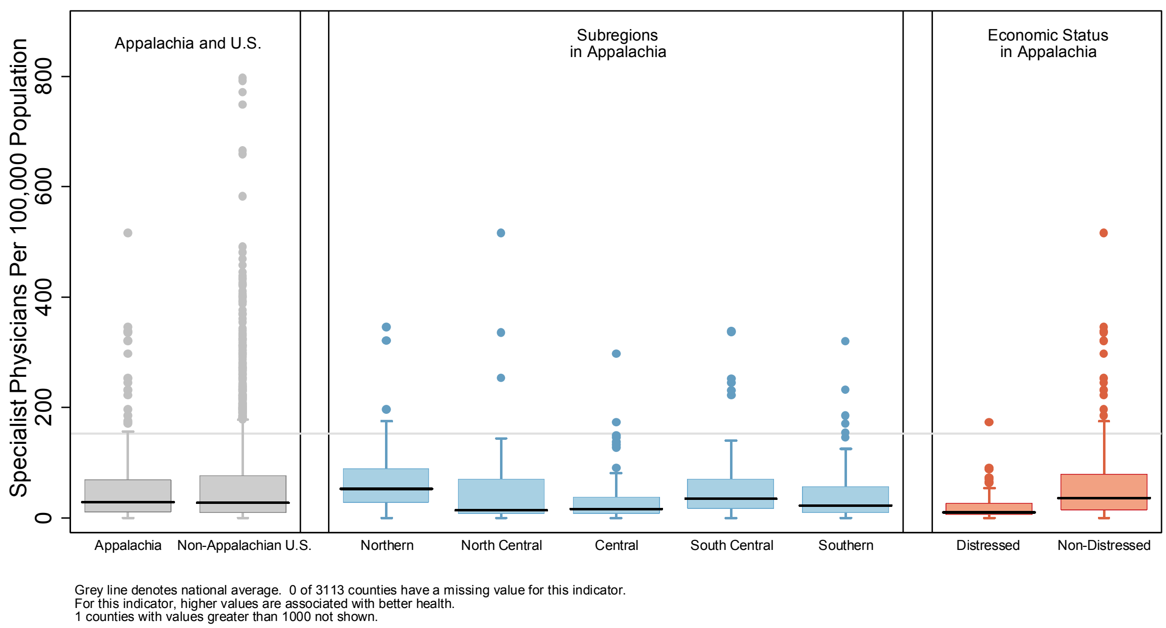


Data source: Area Health Resources Files (AHRF) 2014–2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015. http://ahrf.hrsa.gov/

Distribution of Specialty Physician Supply

Figure 124 shows the distribution of specialty physicians by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator, and one county with a value greater than 1,000 is not represented in the box plot.

Figure 124: Box Plot of Specialty Physicians per 100,000 Population by Geography and Economic Status, 2013



Data source: Area Health Resources File (AHRF) 2014–2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015. http://ahrf.hrsa.gov/

The distribution of the supply of specialty physicians among national quintiles for Appalachian counties is shown in Table 42. Of the 420 counties in the Region, 56 (13 percent) rank in the worst-performing national quintile, while 67 (16 percent) rank in the best-performing national quintile.

Table 42: Distribution of Specialty Physicians per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Specialty physicians	67	*16%*	103	*25%*	94	*22%*	100	*24%*	56	*13%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

KEY FINDINGS | Supply of Dentists

- The supply of dentists per 100,000 population in the Appalachian Region is 26 percent lower than the national average.
- All five Appalachian subregions have a lower supply of dentists than the national average, and Central Appalachia's supply is 46 percent lower than the national average.
- The supply of dentists in the Appalachian Region's rural counties is 36 percent lower than the supply found in the Region's large metro counties.
- The supply of dentists in the Appalachian Region's distressed counties is 43 percent lower than the supply found in the Region's non-distressed counties.

Background

This indicator measures the number of dentists per 100,000 population. The figures for this measure come from a similar County Health Rankings indicator—the population to dentist ratio—based on 2014 data provided by the U.S. Department of Health and Human Services' Area Health Resources Files, and the National Plan and Provider Enumeration System (NPPES) through the Centers for Medicare & Medicaid Services (CMS). A higher supply of dentists indicates better access to dentists, a higher likelihood of preventive dental care, and better overall health in a community.

The link between the availability of dental care in a community and overall health status extends well beyond oral health. Oral health can influence eating habits and sleep patterns, which in turn can affect both physical and mental health (Sheiham, 2005). In most of the United States, oral and physical health services are licensed and governed separately. Yet, the growing number of emergency department visits for conditions related to poor oral health shows the relationship between oral health and physical health (Shortridge & Moore, 2010). Poor oral health is more common among individuals with lower income and lower educational attainment (Edelstein & Chinn, 2009).

Shortages of dentists are more common in rural and underserved communities (Rural Health Information Hub, 2017). The Health Resources and Services Administration, part of the U.S. Department of Health and Human Services, defines Dental Health Professional Shortage Areas as communities with one or fewer dentists per 5,000 people (Health Resources and Services Administration, 2016). Converting this ratio to dentists per 100,000 population, the HRSA definition of a dental shortage area is equivalent to 20 or fewer dentists per 100,000 population. In 2012, 60 percent of the Dentist Health Professional Shortage Areas were rural (Cohen & Stitzel, 2015). Using 2016 data from the Area Health Resources Files, Appalachian residents were found to be more likely to live in a full county Dental Health Professional Shortage Area than residents in the rest of the United States (4.3 percent compared to 3 percent). Further complicating the shortage of dental providers, only 30 percent of dentists accept public insurance; this presents an access barrier for individuals with Medicare or Medicaid (Cohen & Stitzel, 2015).

To increase the availability of dental services, states are increasingly looking to expand the use of mid-level dental providers such as dental therapists and telehealth programs that consult with dentists to provide care to underserved areas or populations (Cohen & Stitzel, 2015). However, efforts to expand the use of mid-level dental providers have been contentious, with opponents raising concerns about potential declines in the safety and quality of care (Levine, 2012).

Overview: Supply of Dentists in the Appalachian Region

The Appalachian Region's supply of 47.8 dentists per 100,000 population is 26 percent lower than the national average of 64.6 per 100,000 population. No Appalachian subregion has a dentist supply greater than the national average. Northern Appalachia has the highest supply of dentists at 56.1 per 100,000 population, and Central Appalachia has the lowest at 35.1 per 100,000 population. Appalachian Mississippi has the lowest dentist supply in the Region at 33.8 per 100,000 population, which is 48 percent below the national average. Appalachian Pennsylvania has the highest supply of dentists in the Region at 59.3 per 100,000 population.

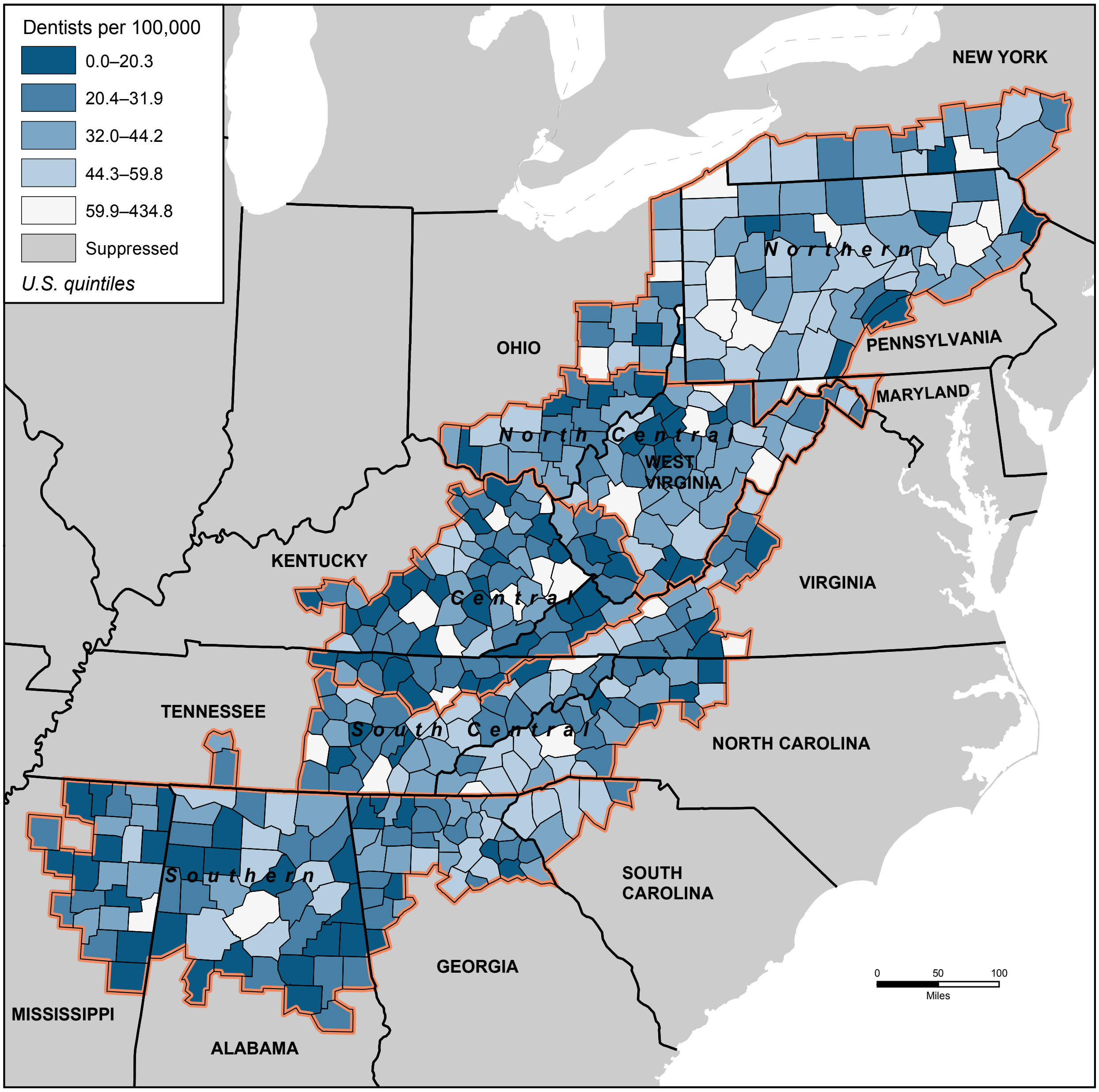
The low supply of dentists throughout much of Appalachia can partially be attributed to the rurality of many of the counties. The supply of dentists in rural counties throughout Appalachia is 36 percent lower than that reported in the Region's large metro counties. Economically distressed counties in the Appalachian Region have 27.9 dentists per 100,000 population, which is 43 percent lower than the 49.2 dentists per 100,000 population in the Region's non-distressed counties.

The supply of dentists varies widely between the Appalachian and non-Appalachian portions within any particular state. The greatest intrastate disparities are in Kentucky, New York, and Virginia. In Appalachian Kentucky, the dentist supply is 40.5 per 100,000 population, which is 42 percent lower than the 69.7 per 100,000 population in non-Appalachian Kentucky. Appalachian New York reports 46.4 dentists per 100,000 population, which is 42 percent lower than the 80.2 per 100,000 population in non-Appalachian New York. The supply of dentists in Appalachian Virginia is 34.5 per 100,000 population, which is 46 percent lower than the 64.1 per 100,000 in non-Appalachian Virginia.

Figure 125 shows the variation in the supply of dentists across the Appalachian Region, grouped by quintiles. Darker colors indicate counties with lower supplies of dentists. For this measure, lower values are associated with worse health.

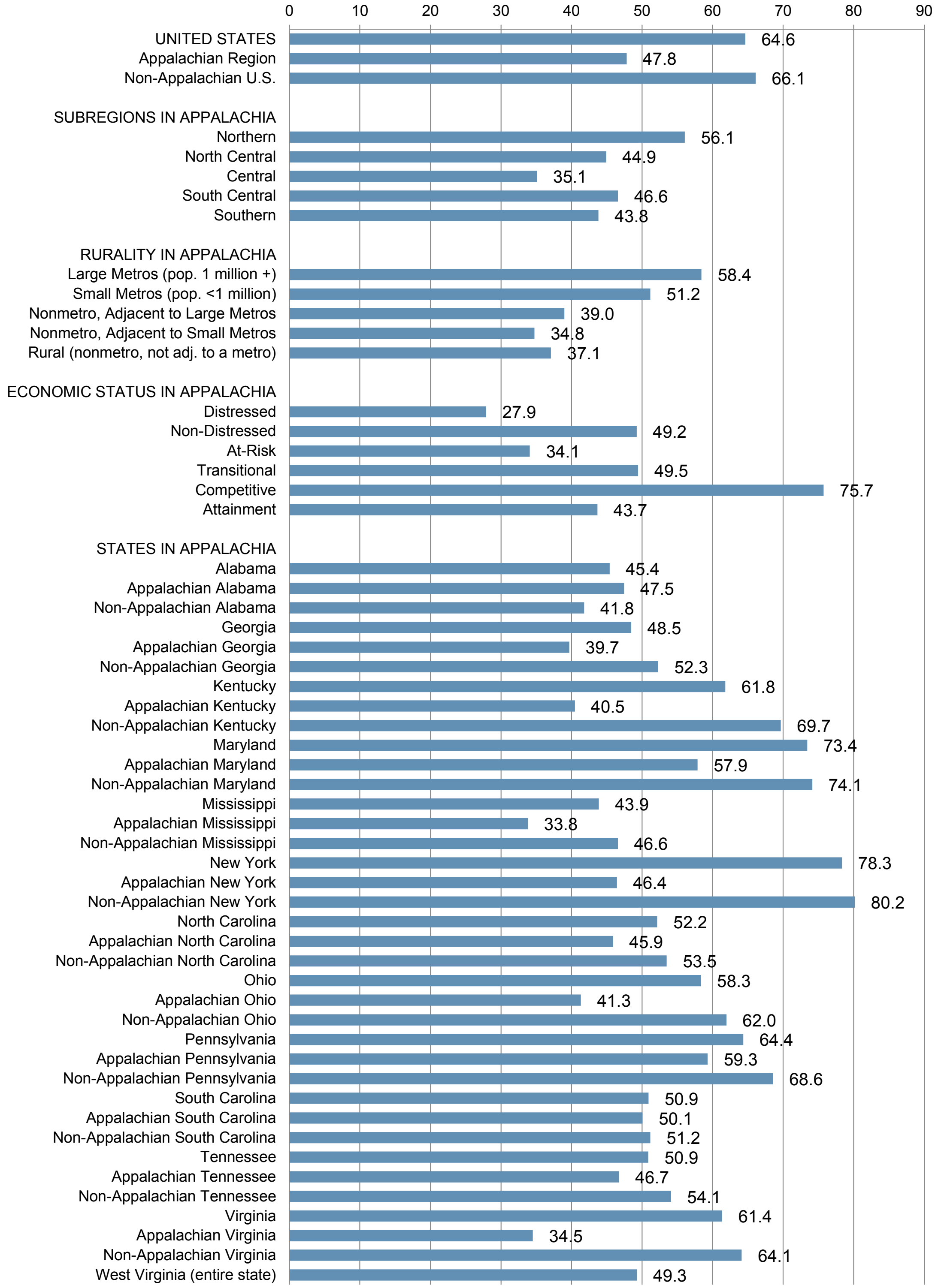
Figure 126 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 125: Map of Dentists per 100,000 Population in the Appalachian Region, 2014



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 126: Chart of Dentists per 100,000 Population, 2014

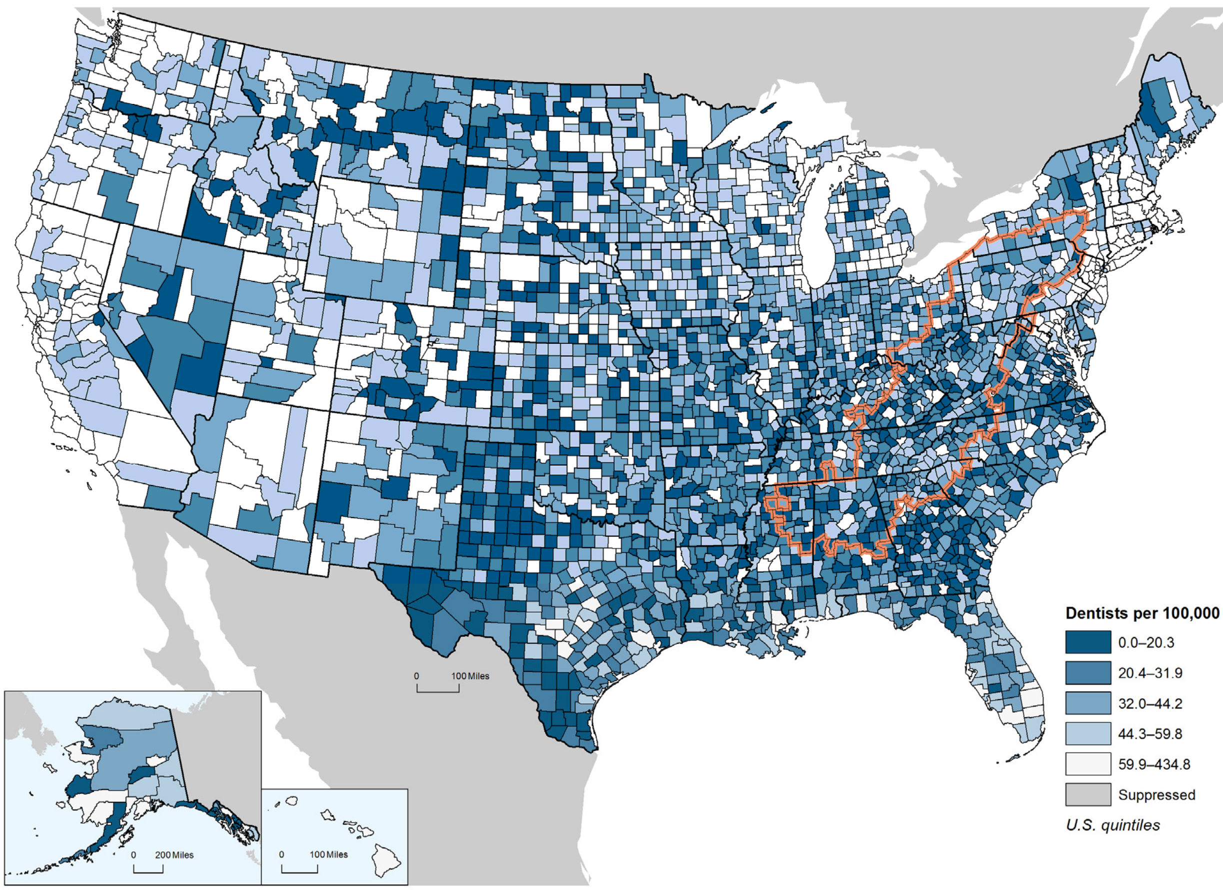


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Supply of Dentists in the United States

Figure 127 highlights the variation in the supply of dentists across the United States. The supply of dentists varies considerably across the nation, with no obvious regional or state-based trends. The middle of the country, as well as much of the eastern United States, generally have counties in the worst-performing quintiles. States in the South tend to rank in the bottom quintiles, from Texas to Georgia. Meanwhile, the western half of the country—and especially the states along the Pacific Coast—report a high supply of dentists. The Northeast, as well as large metropolitan areas throughout the country, also report high supplies of dentists.

Figure 127: Map of Dentists per 100,000 Population in the United States, 2014

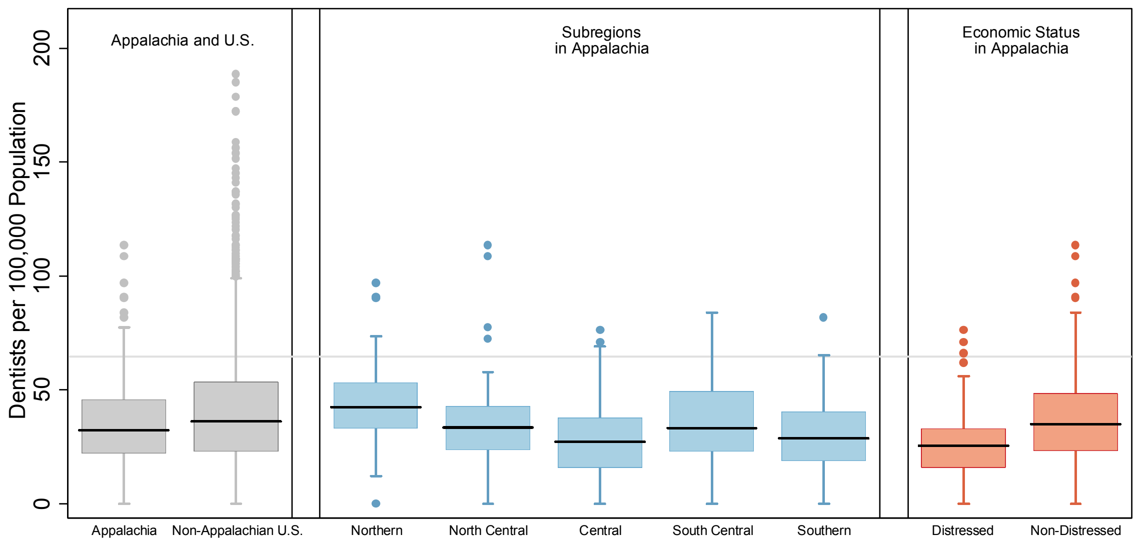


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Supply of Dentists

Figure 128 shows the distribution of the supply of dentists by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator; four counties with values greater than 200 are not represented in the box plot.

Figure 128: Box Plot of Dentists per 100,000 Population by Geography and Economic Status, 2014



Grey line denotes national average. 0 of 3113 counties have a missing value for this indicator.
For this indicator, higher values are associated with better health.
4 counties with values greater than 200 not shown.

Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution in the supply of dentists among national quintiles for Appalachian counties is shown in Table 43. Of the 420 counties in the Region, 91 (22 percent) rank in the worst-performing national quintile, while 35 (8 percent) rank in the best-performing national quintile.

Table 43: Distribution of Dentists per 100,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Dentists	35	*8%*	80	*19%*	99	*24%*	115	*27%*	91	*22%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Uninsured Population

KEY FINDINGS | Uninsured Population under Age 65

- The percentage of the population under age 65 that is uninsured in the Appalachian Region is 15.8 percent, which is slightly lower (better) than the national average of 16.8 percent.
- There is wide variation among the five Appalachian subregions' uninsured populations under age 65, with Northern Appalachia (11.6 percent) reporting a far lower percentage than Southern Appalachia (18.9 percent).
- The uninsured population under age 65 in rural counties in the Appalachian Region is 18.2 percent, compared with 14.7 percent in the Region's large metro counties.
- The uninsured population under age 65 in distressed counties in the Appalachian Region is 18.7 percent, compared with 15.6 percent in the Region's non-distressed counties.

Background

The uninsured population measures the percentage of people under age 65 without health insurance. The figures for this measure come from County Health Rankings and are based on 2013 data from the U.S. Census Bureau's Small Area Health Insurance Estimates (SAHIE) program. Since individuals age 65 or over are eligible for Medicare, focusing on those under 65 allows for a better comparison of the variation in access to healthcare coverage. The time period for this data predates the health insurance expansion provisions of the Affordable Care Act.

Health insurance coverage can provide access to regular health care, which contributes positively to an individual's overall health. Lack of health insurance has long been identified as a risk factor for premature mortality (Wilper, Lasser, McCormick, Bor, & Himmelstein, 2009). An insured person can receive preventive health services, as well as care for both acute and chronic conditions. The Institute of Medicine estimated that 18,000 Americans died in 2000 because they lacked health insurance; a 2008 update concluded that number had risen to 27,000 per year (Dorn, 2008).

The passage of the Affordable Care Act has helped to reverse long-running trends of increasing uninsured rates. Since its passage in 2010, the number of uninsured people in the United States has declined by approximately 20 million, and the current uninsured rate for all ages stands at approximately 11 percent (Commonwealth Fund, 2016). However, the Supreme Court ruling that allowed states to choose whether to expand Medicaid has led to state-based differences in Medicaid eligibility (Commonwealth Fund, 2016). As of 2016, among the thirteen Appalachian states, six states—Kentucky, Maryland, New York, Ohio, Pennsylvania, and West Virginia—had expanded Medicaid, while seven states—Alabama, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia—had not (Kaiser Family Foundation, 2016).

In 2016, twenty-eight million people still lacked health insurance in the United States, and most live in states that did not expand Medicaid (Kaiser Family Foundation, 2016). Among uninsured adults, 39 percent have incomes below the federal poverty line, and the majority of those who have unsuccessfully attempted to enroll in coverage cite affordability as a reason for not signing up. In 2015, one in five uninsured adults went without needed medical care due to cost (Kaiser Family Foundation, 2016).

Overview: Uninsured Population under Age 65 in the Appalachian Region

The percentage of the population under age 65 that is uninsured in the Appalachian Region is 15.8 percent, which is slightly lower (better) than the national average of 16.8 percent. However, there is wide variation across subregions. The uninsured population in Northern Appalachia is 11.6 percent, while 18.9 percent of the population in the Southern Appalachian subregion is uninsured.

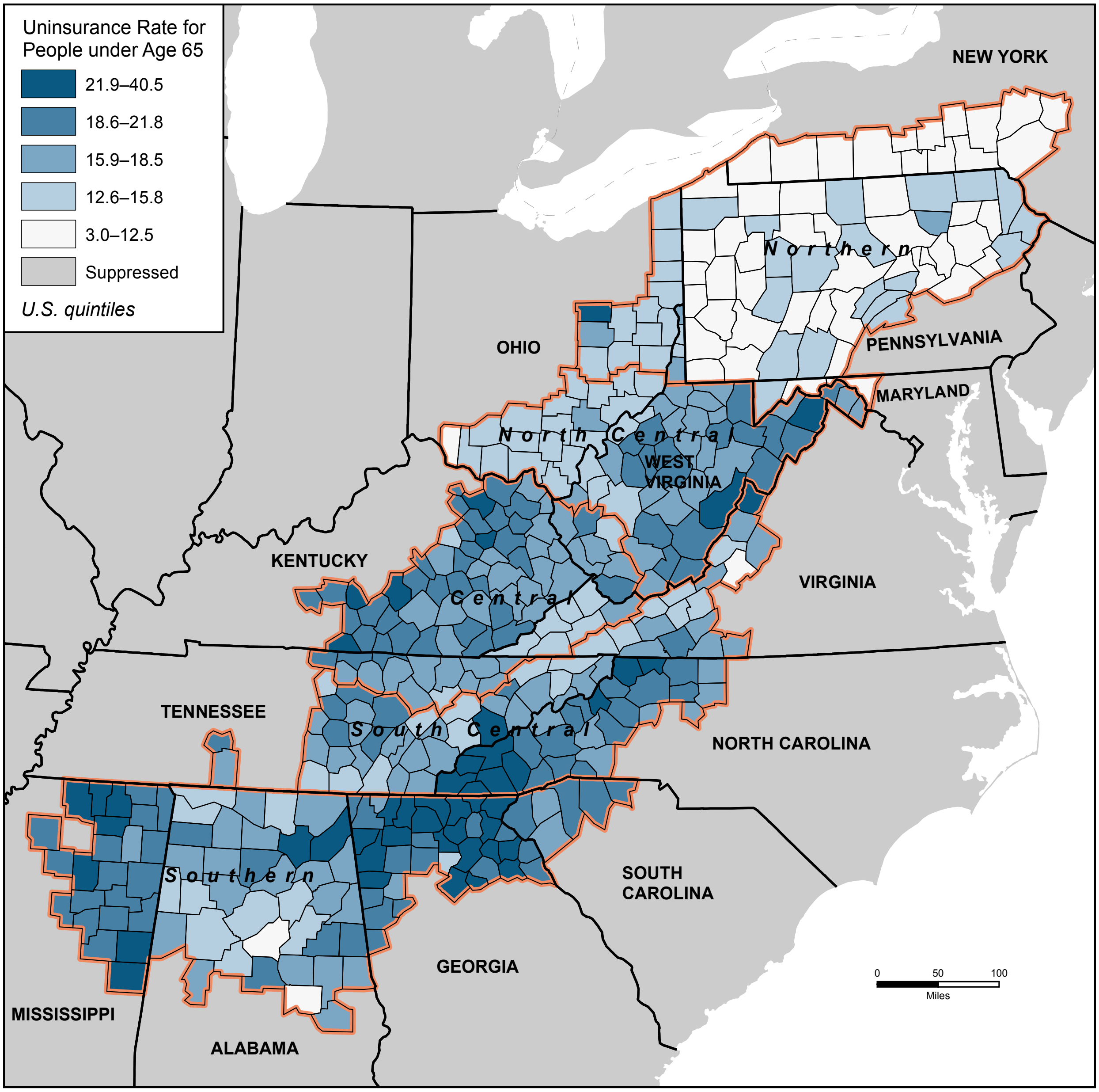
There is a relationship between rurality and the percentage of the population that is uninsured. The percentage of the population that is uninsured in Appalachia's rural counties is 18.2 percent, compared with 14.7 percent in large metro counties. There is also a divide in the uninsured population based on economic status. In distressed counties throughout Appalachia, 18.7 percent of the population under age 65 is uninsured, compared to 15.6 percent of the population in non-distressed counties.

Following the subregional trends, the Appalachian portions of Maryland (11.3 percent), New York (10.6 percent), and Pennsylvania (11.2 percent) report the lowest uninsured populations in the Region. The Appalachian portions of Georgia (21.9 percent), Mississippi (20.5 percent), North Carolina (19.5 percent), and South Carolina (19.0 percent) have the highest percentages of uninsured residents.

Figure 129 shows the percentage of people under age 65 in Appalachia without health insurance, grouped by national quintiles. Darker blue indicates a higher percentage of uninsured individuals; for this measure, higher values are associated with worse health. The percentage of the population that is uninsured increases as one moves from north to south through the Region, which is consistent with historically higher percentages of uninsured people in the southern United States (Kaiser Family Foundation, 2016).

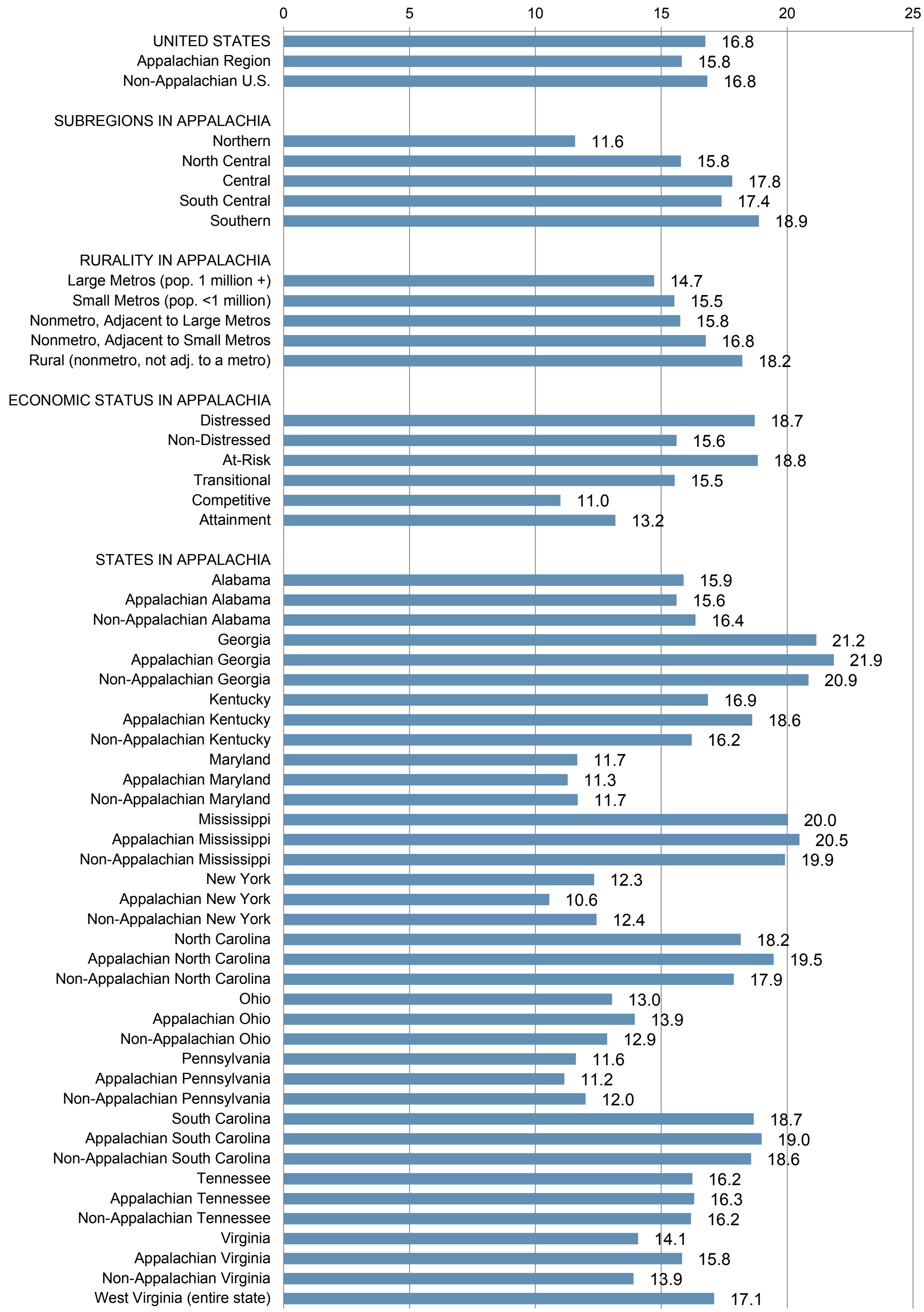
Figure 130 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 129: Map of Uninsurance Rate for People under Age 65 in the Appalachian Region, 2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 130: Chart of Uninsurance Rate for People under Age 65, 2013



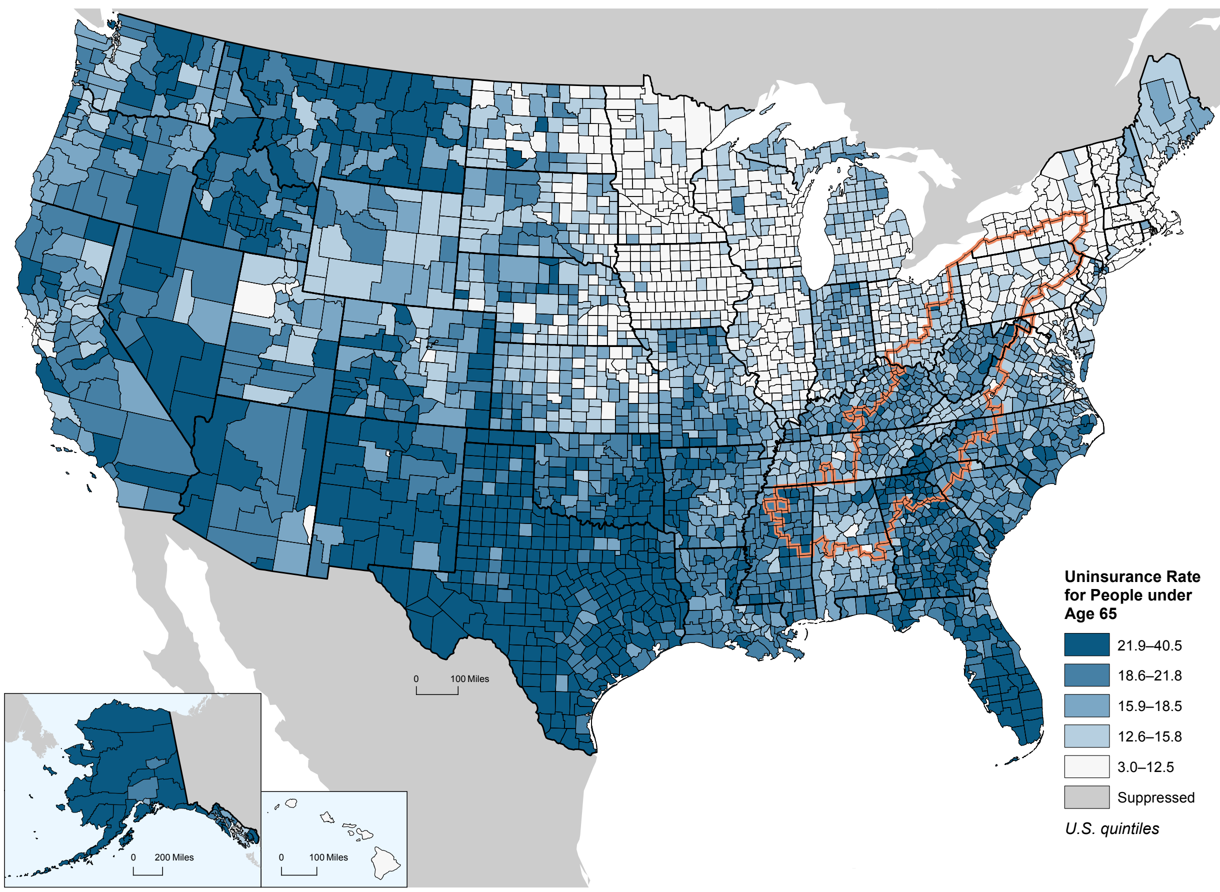
Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Uninsured Population under Age 65 in the United States

Figure 131 shows the variation in the percentage of the population under age 65 that is uninsured across the United States. There are many counties in the Northeast and Midwest where the uninsured percentage ranges from three to 12 percent, ranking in the best-performing national quintile. Massachusetts, Connecticut, Vermont, New York, Iowa, and Minnesota have especially low rates.

Almost all of the South, from North Carolina to Texas, ranks in the two worst-performing national quintiles, meaning counties in those states have uninsured rates of 19 percent or higher, compared to the national average of 16.8 percent. Many counties throughout the West have relatively high percentages of uninsured residents under age 65.

Figure 131: Map of Uninsurance Rate for People under Age 65 in the United States, 2013

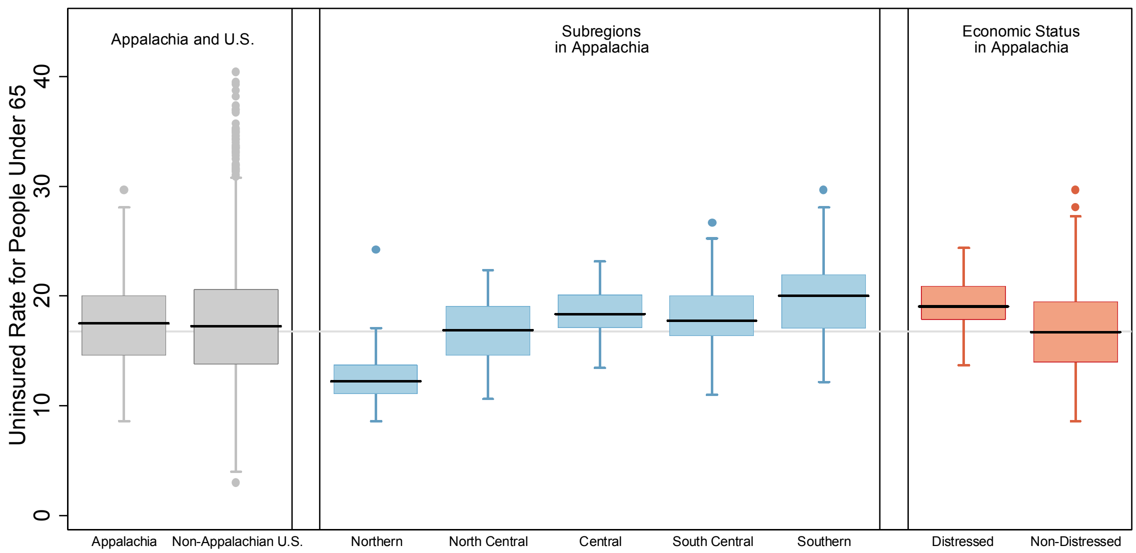


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of the Uninsured Population under Age 65

Figure 132 shows the distribution of the uninsured population under age 65 by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, one has a missing value for this indicator.

Figure 132: Box Plot of Uninsurance Rate for People under Age 65 by Geography and Economic Status, 2013



Grey line denotes national average. 1 of 3113 counties have a missing value for this indicator.
For this indicator, higher values are associated with worse health.

Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of the uninsured population under age 65 among national quintiles for Appalachian counties is shown in Table 44. Of the 420 counties in the Region, 48 (11 percent) rank in the worst-performing national quintile, while 53 (13 percent) rank in the best-performing national quintile.

Table 44: Distribution of Uninsurance Rate for People under Age 65 among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Uninsured population	53	*13%*	91	*22%*	117	*28%*	111	*26%*	48	*11%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Heart Disease Hospitalizations

KEY FINDINGS | Heart Disease Hospitalization Rate

- Hospitalization rates for heart disease in the Appalachian Region are 17 percent higher than the national average.
- All five Appalachian subregions have heart disease hospitalization rates higher than the national average, with Central Appalachia reporting a rate 47 percent higher than the national mark.
- The heart disease hospitalization rate in the Appalachian Region's rural counties is 13 percent higher than the rate in the Region's large metro counties.
- The heart disease hospitalization rate in the Appalachian Region's distressed counties is 20 percent higher than the rate in the Region's non-distressed counties.

Background

This indicator measures the number of hospitalizations among Medicare fee-for-service beneficiaries for heart disease conditions, expressed as the number of hospitalizations per 1,000 Medicare fee-for-service beneficiaries, per year. The figures for this measure come from the Atlas for Heart Disease and Stroke and are based on 2012 data provided by the Centers for Disease Control and Prevention. This indicator provides information on beneficiaries in Medicare's fee-for-service option only, and does not include Medicare's managed care beneficiaries. Therefore, this measure captures only a subset of the Medicare population and represents approximately 12 percent of the total population in the nation (Kaiser Family Foundation, 2015); (Centers for Medicare & Medicaid Services, 2017).

This indicator is just one of more than a dozen measures that can be used to assess the quality of care for *ambulatory care sensitive conditions*, which are conditions where high-quality outpatient care may reduce complications, slow progression, and reduce the need for hospitalization (U.S. Department of Health and Human Services, Prevention Quality Indicators Overview, 2017). Although this indicator measures hospitalizations, it can be used to provide insight into the health care system outside of a hospital setting. Often, with good preventive services and primary care, hospitalizations due to a number of illnesses (including heart disease) can be reduced or avoided altogether. Thus, this measure is included in this domain as it may be used to help assess the performance of the health care system.

Nationwide, rates of heart disease hospitalizations declined from 1999 to 2011, suggesting improvements in the prevention and treatment of heart disease (Krumholz, Normand, & Wang, 2014). Coronary heart disease remains the most common heart disease subtype for heart disease hospitalizations (Greer, Nwaise, & Casper, 2010). Heart disease is associated with higher cholesterol and blood pressure, diabetes, smoking, and obesity, all of which follow predictable socioeconomic patterns (American Heart Association, 2016). Compared to urban areas, rural communities have higher rates of coronary heart disease, as well as higher rates of poverty and obesity (O'Connor & Wellenius, 2012).

Overview: Medicare Heart Disease Hospitalization Rates in the Appalachian Region

The heart disease hospitalization rate in the Appalachian Region is 56.2 per 1,000 Medicare beneficiaries, which is 17 percent higher than the national rate of 48.0 per 1,000 Medicare beneficiaries. While heart disease hospitalization rates differ among the five Appalachian subregions, all five have rates higher than the national rate. The heart disease hospitalization rate in the South Central subregion is 50.4 per 1,000 beneficiaries, which is only slightly higher than the national rate. Central Appalachia has the highest rate of heart disease hospitalizations, at 70.6 per 1,000 beneficiaries, which is 47 percent higher than the national rate.

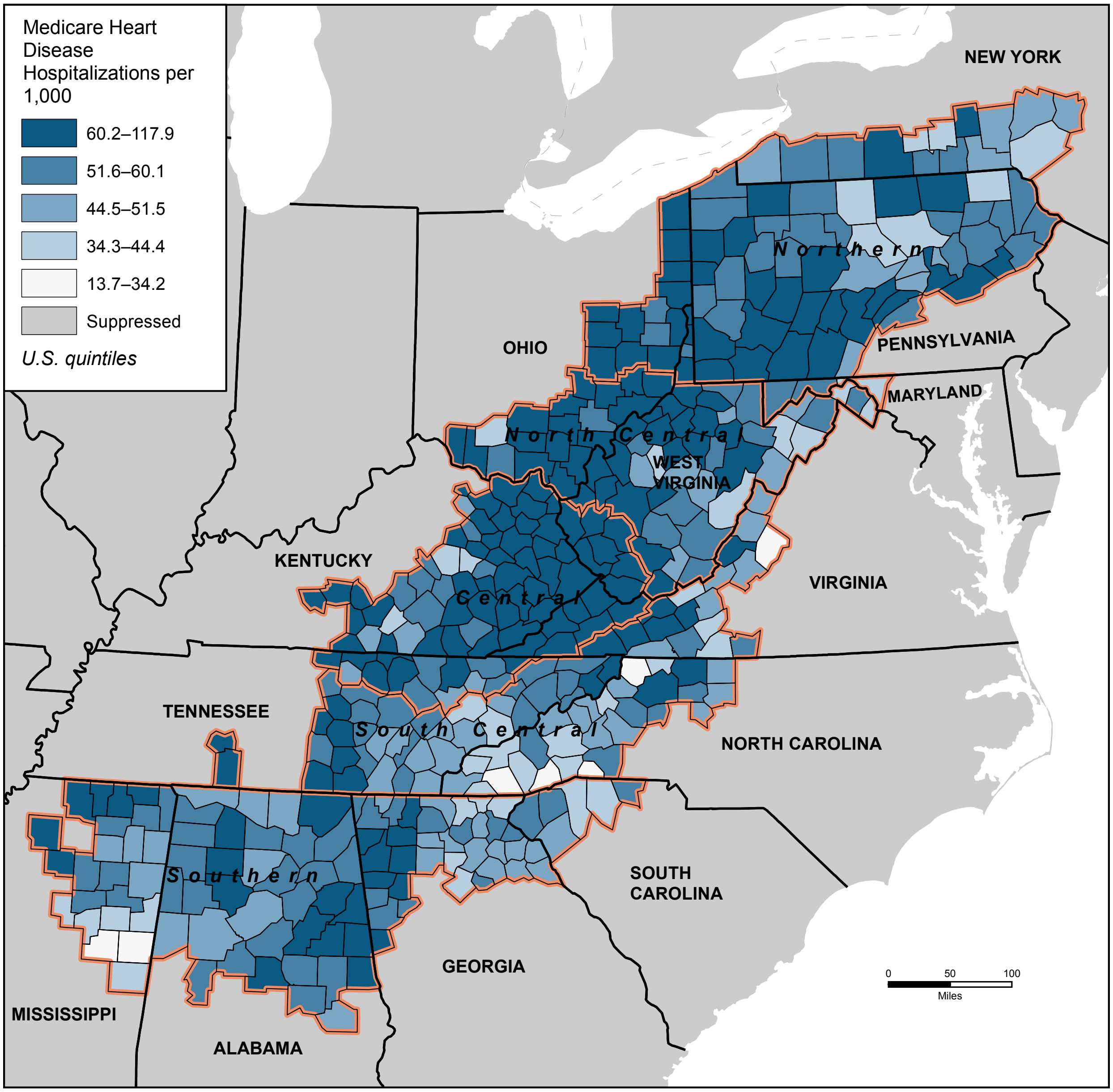
Rural areas in Appalachia experience higher heart disease hospitalization rates than the Region's more urbanized areas. The hospitalization rate for rural counties in the Appalachian Region is 61.6 per 1,000 beneficiaries, which is 13 percent higher than the large metro rate of 54.5 per 1,000 beneficiaries. Economic status also plays a role in determining population health; economically distressed counties have a heart disease hospitalization rate of 66.4 per 1,000 beneficiaries, which is 20 percent higher than the non-distressed county rate of 55.5 per 1,000, and 38 percent higher than the national rate.

The Appalachian portions of Kentucky (71.2 per 1,000), Ohio (67.0 per 1,000), and Virginia (61.3 per 1,000) have notably higher rates than the non-Appalachian portions of those states. With the exceptions of Appalachian Maryland (46.8 per 1,000), Appalachian North Carolina (46.6 per 1,000), and Appalachian South Carolina (45.7 per 1,000), the Appalachian portions of all states are at or above the national rate for heart disease hospitalizations.

Figure 133 shows the heart disease hospitalization rate for Appalachian counties, grouped by national quintiles. Darker blue indicates higher rates; for this measure, higher values are associated with worse health. There are large concentrations of counties in Northern, North Central, and Central Appalachia ranking in the worst-performing quintile for this measure. There are very few Appalachian counties in any subregion that perform well on this measure when compared to the nation as a whole.

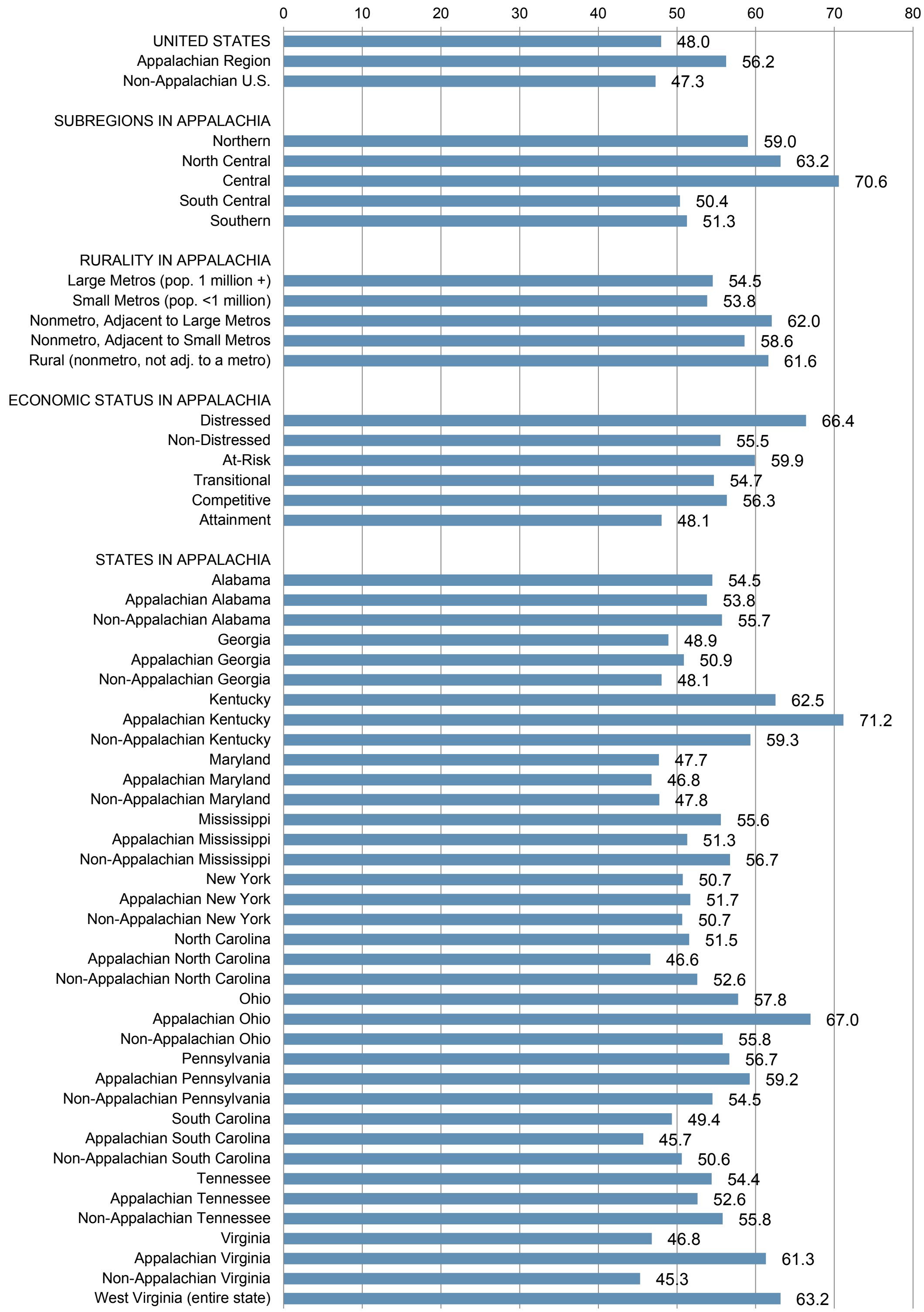
Figure 134 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 133: Map of Heart Disease Hospitalizations per 1,000 Medicare Beneficiaries in the Appalachian Region, 2012



Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. http://nccd.cdc.gov/dhdspatlas/.

Figure 134: Chart of Heart Disease Hospitalizations per 1,000 Medicare Beneficiaries, 2012

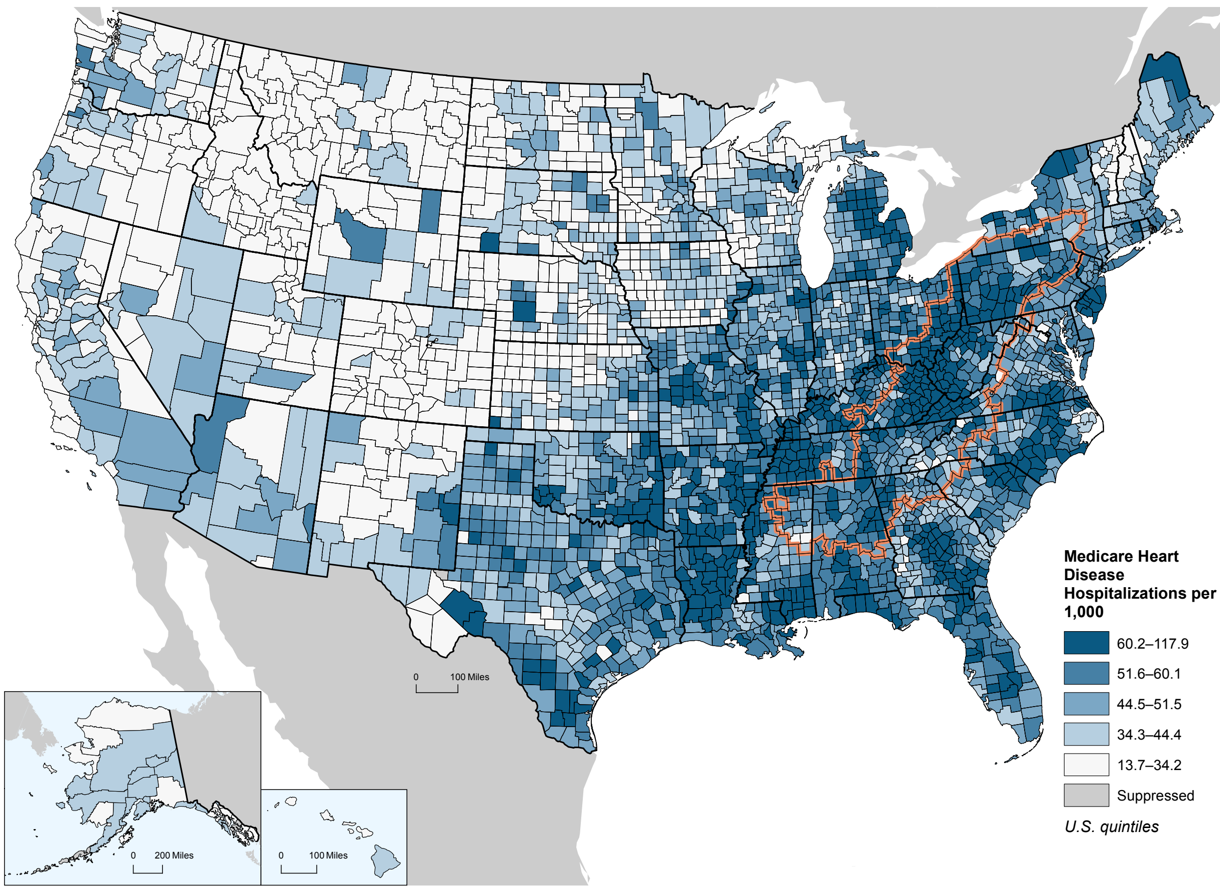


Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. http://nccd.cdc.gov/dhdspatlas.

Overview: Medicare Heart Disease Hospitalization Rates in the United States

Figure 135 shows the variation in heart disease hospitalization rates across the country. There is a clear difference between rates in the eastern and western parts of the United States. High rates stretch from Appalachia into the coastal Southeast, and then across the Mississippi Delta into Texas. Most counties in the Upper Midwest, as well as those west of the Rocky Mountains, tend to have counties ranking in the best-performing national quintiles. Outside of a pocket of counties in New England, almost all of the eastern United States is populated by counties with high heart disease hospitalization rates.

Figure 135: Map of Heart Disease Hospitalizations per 1,000 Medicare Beneficiaries in the United States, 2012

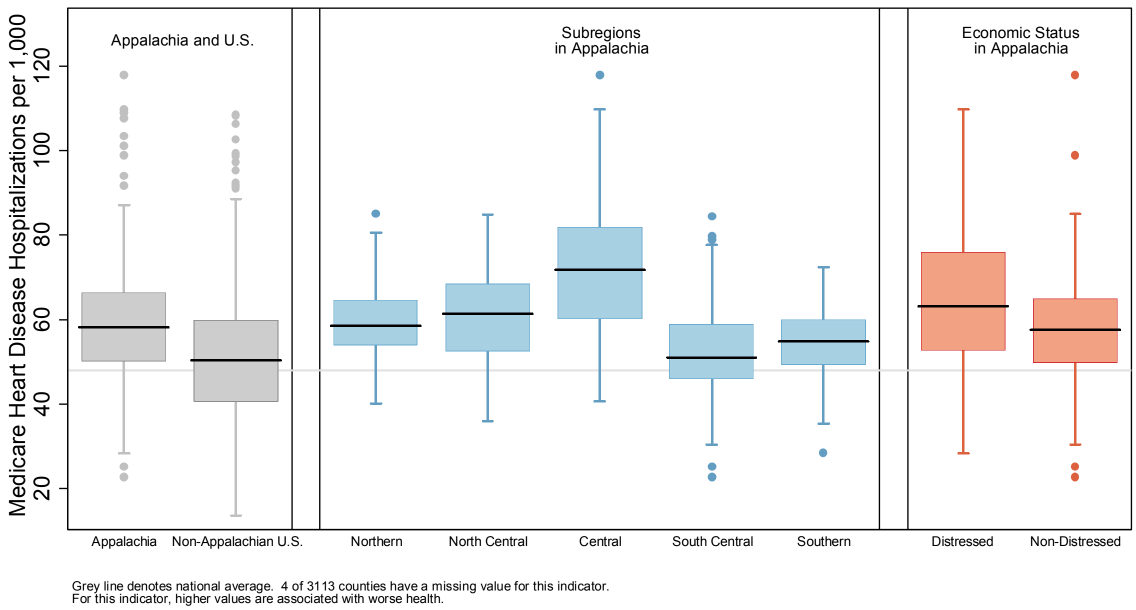


Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. http://nccd.cdc.gov/dhdspatlas/.

Distribution of Medicare Heart Disease Hospitalizations

Figure 136 shows the distribution of heart disease hospitalization rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, four have a missing value for this indicator.

Figure 136: Box Plot of Heart Disease Hospitalizations per 1,000 Medicare Beneficiaries by Geography and Economic Status, 2012



Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. http://nccd.cdc.gov/dhdspatlas/.

The distribution of heart disease hospitalization rates among national quintiles for Appalachian counties is shown in Table 45. Of the 420 counties in the Region, 179 (43 percent) rank in the worst-performing national quintile, while 7 (2 percent) rank in the best-performing national quintile.

Table 45: Distribution of Heart Disease Hospitalization Rates per 1,000 Medicare Beneficiaries among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Heart disease hospitalizations	7	*2%*	43	*10%*	74	*18%*	117	*28%*	179	*43%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Chronic Obstructive Pulmonary Disease Hospitalizations

KEY FINDINGS | Chronic Obstructive Pulmonary Disease Hospitalization Rates

- The COPD hospitalization rate in the Appalachian Region is 23 percent higher than the national average.
- All five subregions have COPD hospitalization rates above the national average, and the rate in Central Appalachia is 75 percent higher than the national mark.
- The COPD hospitalization rate in the Appalachian Region's rural counties is 39 percent higher than the rate in the Region's large metro counties.
- The COPD hospitalization rate in distressed counties throughout Appalachia is 42 percent higher than the rate in the Region's non-distressed counties.

Background

This indicator measures the number of chronic obstructive pulmonary disease (COPD) hospitalizations per 1,000 Medicare fee-for-service beneficiaries, per year. The data for this measure come from the Atlas for Heart Disease and Stroke and are based on 2012 data provided by the Centers for Disease Control and Prevention. This indicator provides information on beneficiaries in Medicare's fee-for-service option only, and does not include Medicare's managed care beneficiaries. Therefore, this measure captures only a subset of the Medicare population and represents approximately 12 percent of the total population in the nation (Kaiser Family Foundation, 2015); (Centers for Medicare & Medicaid Services, 2017).

This indicator is just one of more than a dozen measures that can be used to assess the quality of care for *ambulatory care sensitive conditions*, which are conditions where high-quality outpatient care may reduce complications, slow progression, and reduce the need for hospitalization (U.S. Department of Health and Human Services, Prevention Quality Indicators Overview, 2017). Although this indicator measures hospitalizations, it can be used to provide insight into the health care system outside of a hospital setting. Often, with good preventive services and primary care, hospitalizations due to a number of illnesses (including COPD) can be reduced or avoided altogether. Thus, this measure is included in this domain as it may be used to help assess the performance of the health care system.

Predictors of COPD hospitalization include advanced age, smoking, poverty, and rurality (Wier, Elixhauser, Pfunter, & Au, 2011). Exacerbation of symptoms due to environmental triggers such as air pollution is also a major risk factor for hospitalization (Gan, FitzGerald, Carlsten, Sadatsafavi, & Brauer, 2013). Additional evidence suggests that patients who use providers that have high Medicaid caseloads and limited access to ancillary services are more likely to be hospitalized for COPD (D'Souza, Shah, Dhamane, & Dalal, 2014).

Despite recent declines in hospitalization rates, COPD remains a common diagnosis for inpatient admissions (Baillargeon, Wang, Kuo, Holmes, & Sharma, 2013). In 2008, 20 percent of all hospitalized adults age 40 and older had a diagnosis of COPD (Wier, Elixhauser, Pfunter, & Au, 2011). Effective self-management strategies for COPD are still in development, thus limiting the ability of those with the condition to manage their own care.

There are known geographic patterns to COPD hospitalization rates, with higher rates in Appalachia, the Mississippi Delta, and along the southern Great Lakes (Holt, Zhang, Presley-Cantrell, & Croft, 2011). These patterns are believed to stem from regionalized socioeconomic factors, as well as occupational and environmental exposures.

Overview: Medicare COPD Hospitalization Rates in the Appalachian Region

The COPD hospitalization rate in the Appalachian Region is 13.4 per 1,000 Medicare beneficiaries, which is 23 percent higher than the 10.9 per 1,000 beneficiaries in the nation as a whole. All five subregions have higher rates than the national rate. Central Appalachia has the highest COPD hospitalization rate at 19.1 per 1,000 Medicare beneficiaries, which is 75 percent higher than the national average. The rate in Southern Appalachia (12.4 per 1,000), the lowest of the five subregions, is still higher than the national rate.

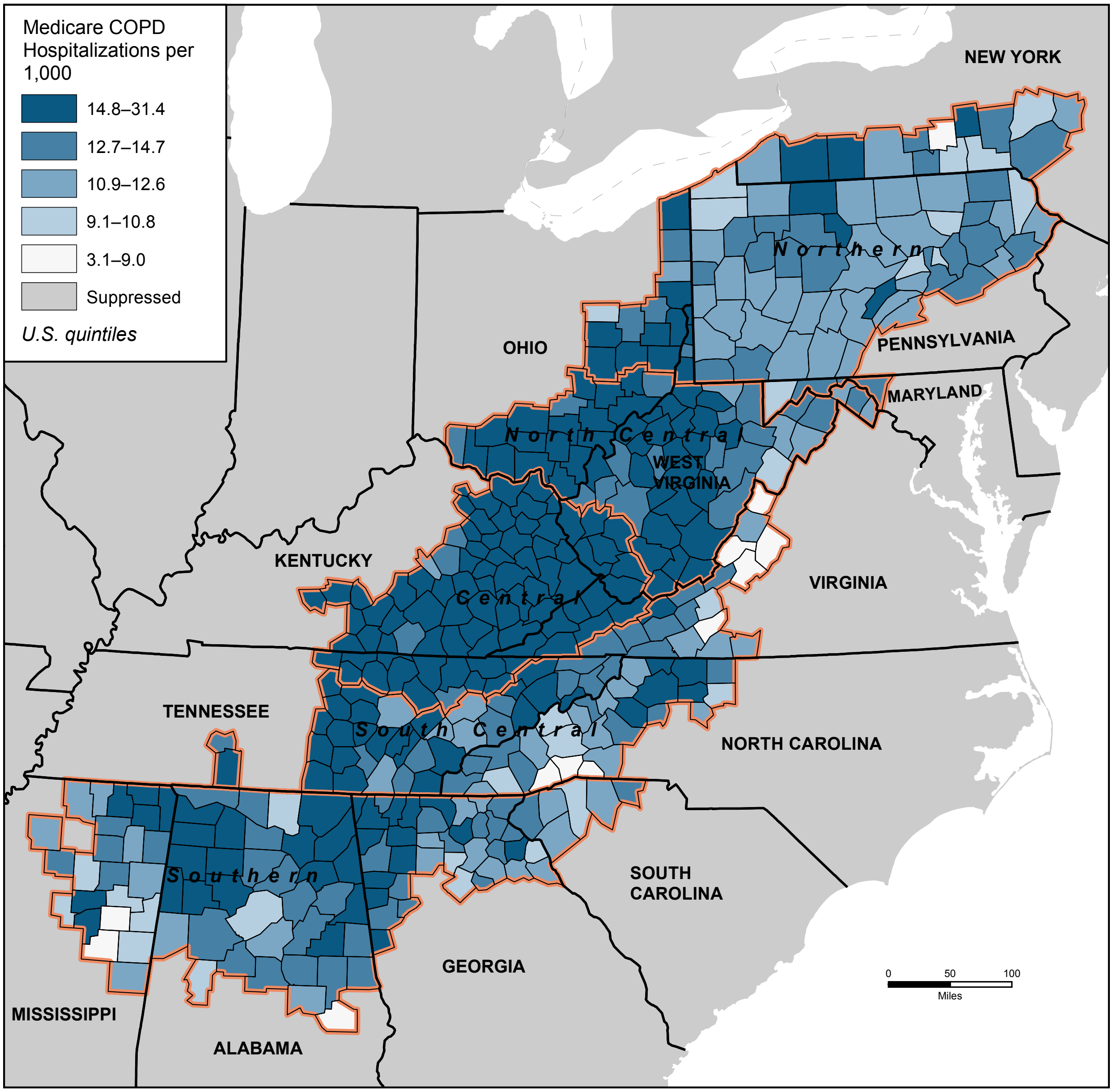
Areas that are more rural experience higher COPD hospitalization rates than more urbanized areas. The COPD hospitalization rate in the Appalachian Region's rural counties is 16.3 per 1,000 beneficiaries, compared to 11.7 per 1,000 in large metro counties, a difference of 39 percent. Economically distressed counties throughout Appalachia have a COPD hospitalization rate of 18.5 per 1,000 beneficiaries, which is 42 percent higher than the rate in non-distressed counties (13.0 per 1,000), and 70 percent higher than the national rate.

Appalachian Kentucky (19.2 per 1,000 beneficiaries), Appalachian Ohio (15.5 per 1,000), and West Virginia (15.4 per 1,000) have the highest COPD hospitalization rates in the Region, while Appalachian South Carolina (11.3 per 1,000) has the lowest rate. Kentucky, Maryland, and Virginia have the largest intrastate differences in hospitalization rates between their Appalachian and non-Appalachian counties.

Figure 137 shows the variation of COPD hospitalization rates across the Appalachian Region. Darker colors indicate higher rates; for this measure, higher values are associated with worse health. Overall, many counties throughout the Region rank in the worst-performing national quintiles, and especially those in North Central and Central Appalachia. Southern Appalachia is also home to a large number of poorly performing counties.

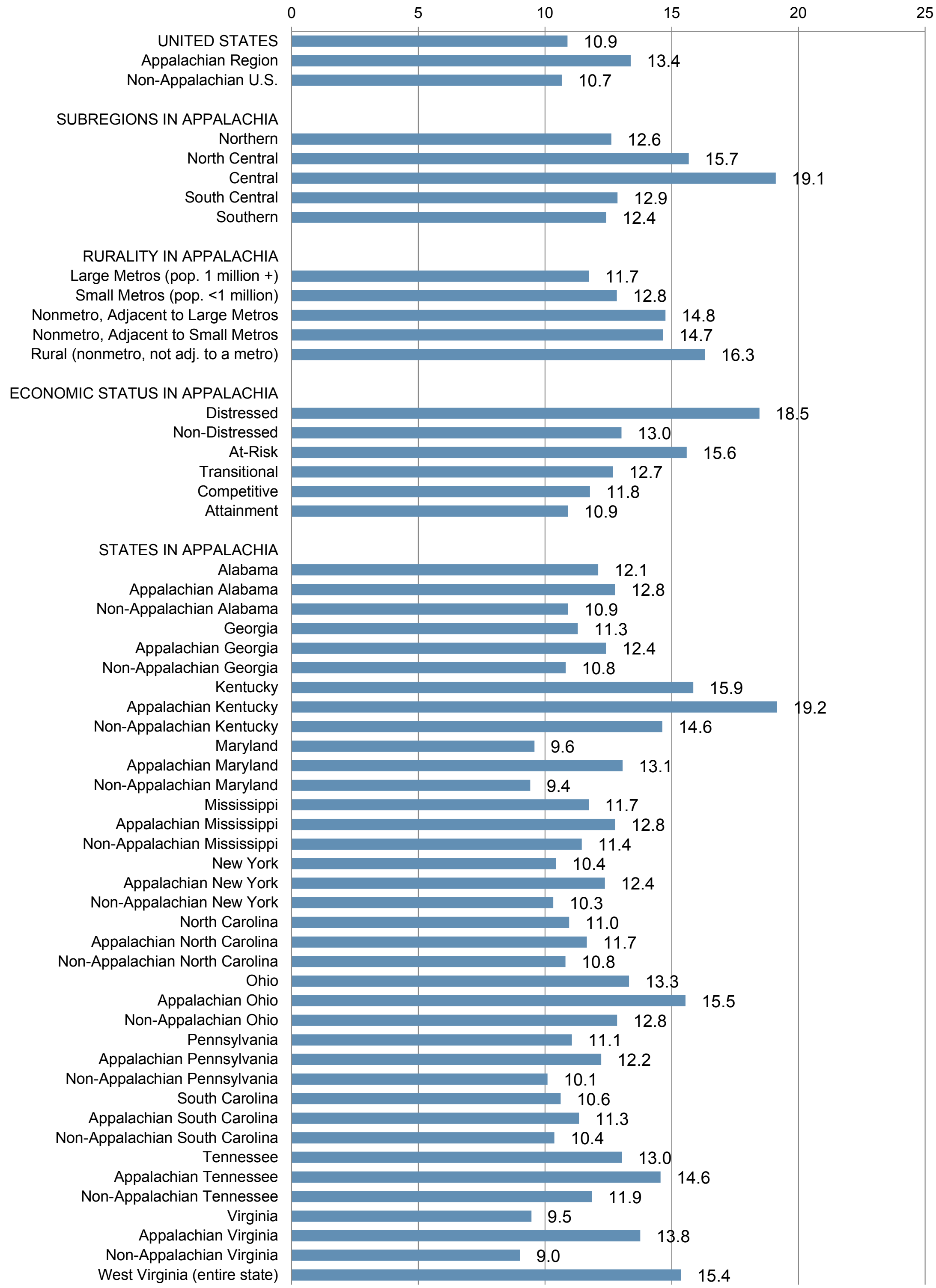
Figure 138 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 137: Map of COPD Hospitalizations per 1,000 Medicare Beneficiaries in the Appalachian Region, 2012



Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. http://nccd.cdc.gov/dhdspatlas/.

Figure 138: Chart of COPD Hospitalizations per 1,000 Medicare Beneficiaries, 2012

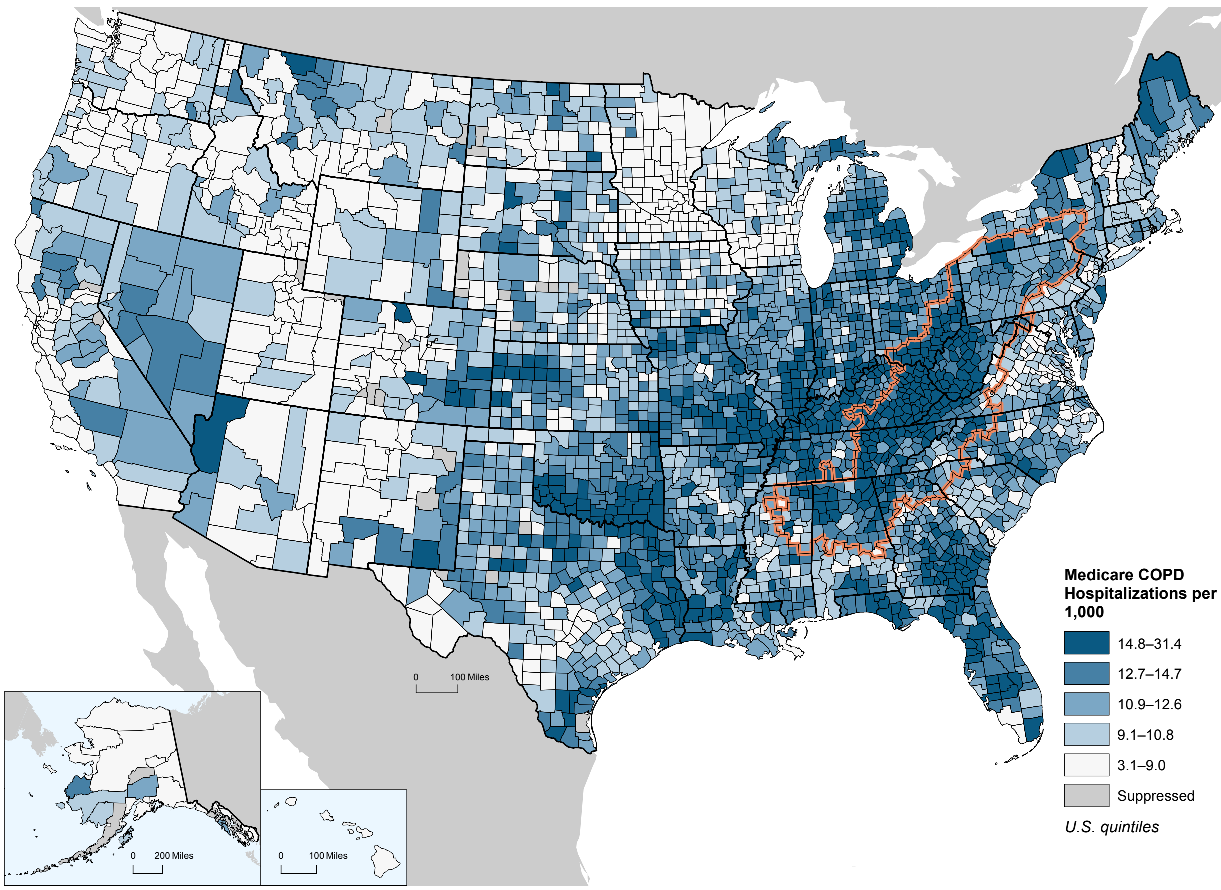


Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. http://nccd.cdc.gov/dhdspatlas/.

Overview: Medicare COPD Hospitalization Rates in the United States

Figure 139 shows the variation in the COPD hospitalization rates across the United States. The high rates found in Appalachia stand in marked contrast to the low rates found to the east of the Region's borders. Higher rates are found in Florida, southern Georgia, much of the Midwest, and Oklahoma. Much of the Upper Midwest reports low rates, as do many counties found in the Pacific Northwest and Rocky Mountain states.

Figure 139: Map of COPD Hospitalizations per 1,000 Medicare Beneficiaries in the United States, 2012

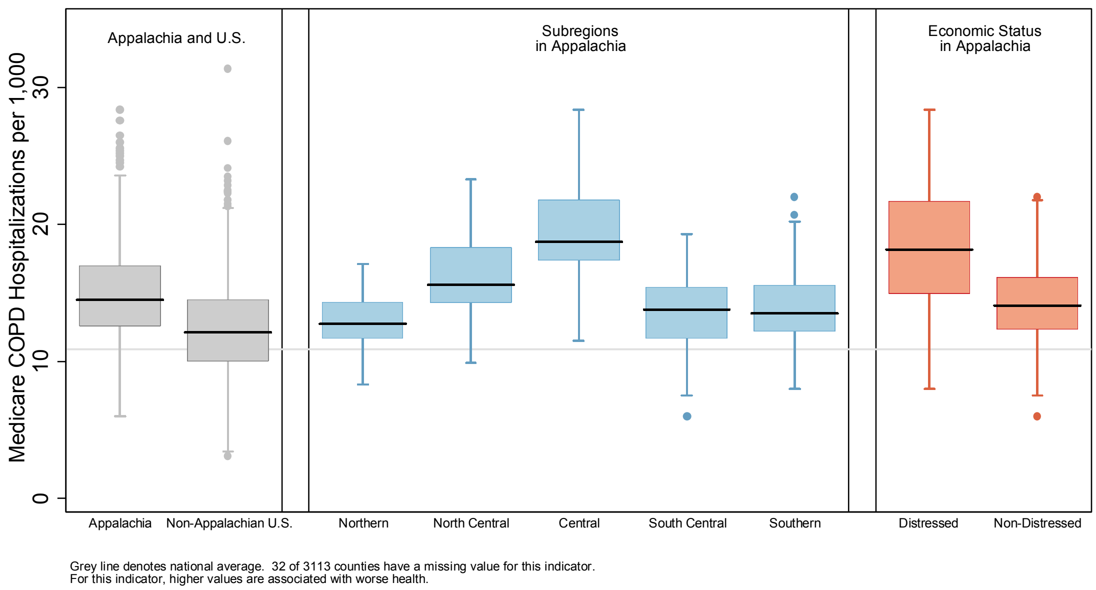


Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. http://nccd.cdc.gov/dhdspatlas/.

Distribution of Medicare COPD Hospitalizations

Figure 140 shows the distribution of COPD hospitalization rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties, 32 have a missing value for this indicator.

Figure 140: Box Plot of COPD Hospitalizations per 1,000 Medicare Beneficiaries by Geography and Economic Status, 2012



Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. http://nccd.cdc.gov/dhdspatlas/.

The distribution of COPD hospitalization rates among national quintiles for Appalachian counties is shown in Table 46. Of the 420 counties in the Region, 203 (48 percent) rank in the worst-performing national quintile, while 12 (3 percent) rank in the best-performing national quintile.

Table 46: Distribution of COPD Hospitalization Rates per 1,000 Medicare Beneficiaries among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
COPD hospitalizations	12	*3%*	29	*7%*	75	*18%*	101	*24%*	203	*48%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Further Reading

Primary Care Physicians

Primary care physicians. County Health Rankings & Roadmaps. Available: http://www.countyhealthrankings.org/measure/primary-care-physicians

Naomi Freundlich and staff of The Commonwealth Fund, Primary Care: Our First Line of Defense, The Commonwealth Fund, June 2013. Available: http://www.commonwealthfund.org/publications/health-reform-and-you/primary-care-our-first-line-of-defense

Laditka JN, Laditka SB, Probst JC. More may be better: Evidence of a negative relationship between physician supply and hospitalization for ambulatory care sensitive conditions. Health Serv Res. 2005;40:1148-1166.

Goodman DC, Grumbach K. Does having more physicians lead to better health system performance? JAMA. 2008;299:335-337.

Mental Health Providers

SAMHSA, Report to Congress on the Nation's Substance Abuse and Mental Health Workforce Issues. (2013). Available: http://store.samhsa.gov/shin/content//PEP13-RTC-BHWORK/PEP13-RTC-BHWORK.pdf

Chaple, M., Searcy, M., Rutkowski, B. & Cruz, M. (2016). Building the Capacity for Behavioral Health Services within Primary Care and Medical Settings. Addiction Technology Transfer Center Network. Available: http://attcnetwork.org/advancingintegration/ATTC_WhitePaper5_10_16Final.pdf

Specialists

Bodenheimer T., Chen, E., & Bennett, H.D. (2009). Confronting the Growing Burden of Chronic Disease: Can the U.S. Health Care Workforce Do the Job? *Health Affairs,* 28(1): 64-74.

Dentists

Dentists. County Health Rankings & Roadmaps. http://www.countyhealthrankings.org/measure/dentists

Uninsured Population

County Health Rankings & Roadmaps. Uninsured. http://www.countyhealthrankings.org/measure/uninsured

DeNavas-Walt, Carmen and Bernadette D. Proctor, U.S. Census Bureau, Current Population Reports, P60-252, Income and Poverty in the United States: 2014, U.S. Government Printing Office, Washington, DC, 2015

Heart Disease Hospitalizations

Agency for Healthcare Research and Quality. Guide to Prevention Quality Indicators. https://www.ahrq.gov/downloads/pub/ahrqqi/pqiguide.pdf

American Heart Association. Hospitalizations, deaths from heart disease, stroke drop in last decade. http://newsroom.heart.org/news/hospitalizations-deaths-from-heart-disease-stroke-drop-in-last-decade. Aug 18, 2014.

COPD Hospitalizations

Agency for Healthcare Research and Quality. Guide to Prevention Quality Indicators. https://www.ahrq.gov/downloads/pub/ahrqqi/pqiguide.pdf

Evensen, Ann E. "Management of COPD Exacerbations." American Family Physician. http://www.aafp.org/afp/2010/0301/p607.html

Quality of Care

Electronic Prescribing

KEY FINDINGS | Electronic Prescribing

- Electronic prescribing is less common in the Appalachian Region (63.8 percent of prescriptions) than in the nation as a whole (65.8 percent).
- Use of electronic prescriptions is higher in North Central (68.5 percent) and Northern Appalachia (67.1 percent) than in the nation as a whole, while Central Appalachia (53.3 percent) lags far behind.
- There is an urban-rural divide in the use of electronic prescribing throughout the Region, with large metro areas (64.7 percent) and small metro areas (65.6 percent) reporting a higher rate than rural areas (60.6 percent).
- Health care providers in the Appalachian Region's non-distressed counties are more likely to utilize electronic prescribing than those in the Region's distressed counties (64.2 percent compared to 57.7 percent).

Background

Electronic prescribing measures the percentage of physicians who use electronic delivery technology when writing and sending their patients' prescriptions to pharmacies. The figures for this measure come from 2014 data released by the Office of the National Coordinator for Health Information Technology. These data analyze the usage of the Surescripts network, an e-prescription service utilized by most community pharmacies throughout the United States. The measure includes both new and renewal prescriptions, excluding controlled substances.

Electronic prescribing is a method of delivering a patient's prescription directly from the provider to the pharmacy rather than relying on the patient to transport the prescription. A review of the practice concluded that in addition to being more efficient and convenient, e-prescribing reduced the risk of adverse drug events and medication errors (Ammenwerth, Schnell-Inderst, Machan, & Siebert, 2008).

There is variation among communities in the use of electronic health records, of which e-prescribing is one component (Samuel, 2014). Because this is a relatively new development from a public health standpoint, community impact and determinants of e-prescribing are not yet well known. E-prescribing requires broadband access to carry the level and type of data associated with this technology, and patterns of low use may simply reflect a lack of access to broadband.

Overview: Electronic Prescribing in the Appalachian Region

Electronic prescribing is less commonly used in the Appalachian Region than in the United States as a whole, although the difference is modest: 63.8 percent in the Region compared to 65.8 percent at the national level. There is a great deal of variation among the subregions, however, with North Central (68.5 percent) and Northern Appalachia (67.1 percent) reporting numbers much higher than Central (53.3 percent) and Southern Appalachia (61.5 percent). South Central Appalachia reports that 63.5 percent of its prescriptions are filled electronically, a figure similar to the overall Regional mark.

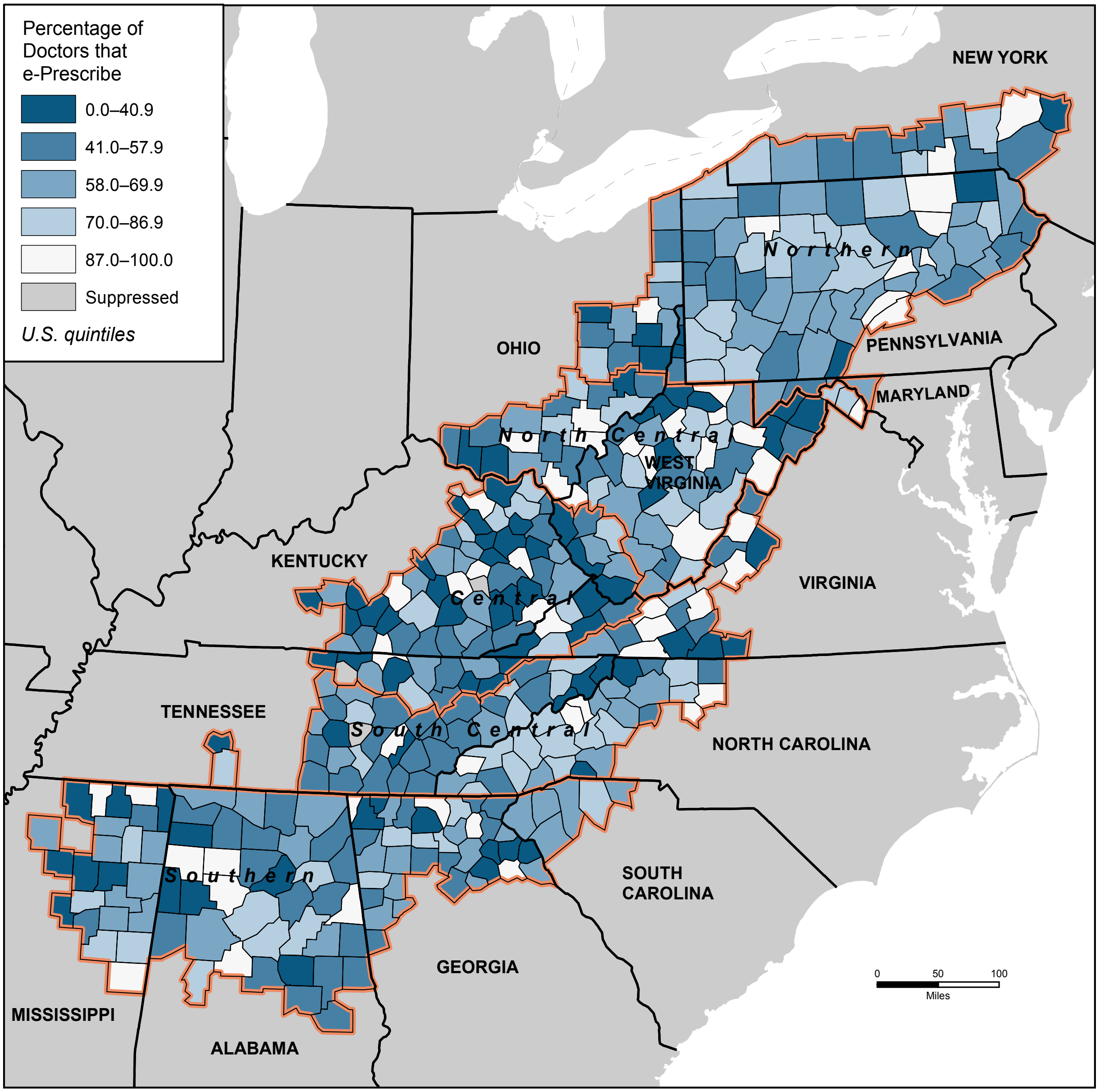
There is an urban-rural divide in the prevalence of electronic prescribing throughout the Region, with large metro areas (64.7 percent) and small metro areas (65.6 percent) reporting higher percentages than rural areas (60.6 percent). There is also a divide based on a county's economic status, as health care providers in non-distressed Appalachian counties (64.2 percent) are more likely to utilize electronic prescribing than those in the Region's distressed counties (57.7 percent).

Unlike many other measures included in this report, e-prescribing appears to be largely localized in nature, with few concentrated areas of counties ranking in the same national quintile. Each of the five subregions contains multiple counties in both the best- and worst-performing national quintiles. The same can be said for many of the states throughout the Region, with many instances of counties in the bottom quintile bordering those in the top quintile. The Appalachian portions of Tennessee (54.7 percent), Kentucky (56.1 percent), and Virginia (57.7) all report low levels of e-prescription usage, all of which are well below the numbers reported by the non-Appalachian portions of the three states. Both Appalachian North Carolina (76.3 percent) and Appalachian South Carolina (70.5 percent) report percentages higher than both the national figure, as well as the non-Appalachian portions of the two states.

Figure 141 shows the variation in the use of e-prescriptions across the Appalachian Region, grouped by national quintiles. Darker colors indicate lower usage; for this measure, higher values are associated with better health. The checkerboard nature of the map suggests that the measure is highly variable at a local level.

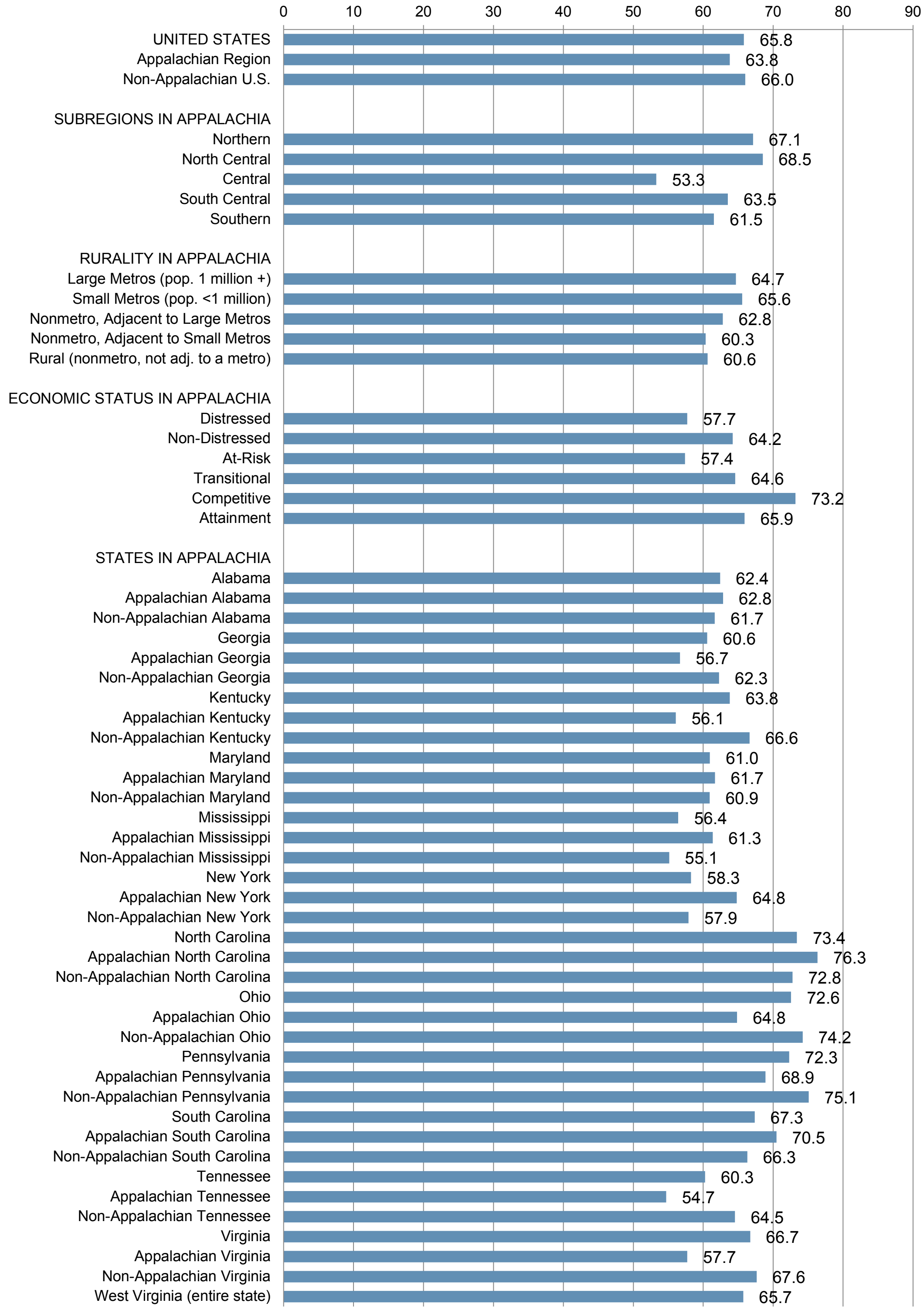
Figure 142 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 141: Map of Percentage of Physicians that e-Prescribe in the Appalachian Region, 2014



Data source: The Office of the National Coordinator for Health Information Technology. U.S. Department of Health and Human Services. http://dashboard.healthit.gov/datadashboard/documentation/electronic-prescribing-adoption-use-data-documentation.php.

Figure 142: Chart of Percentage of Physicians that e-Prescribe, 2014

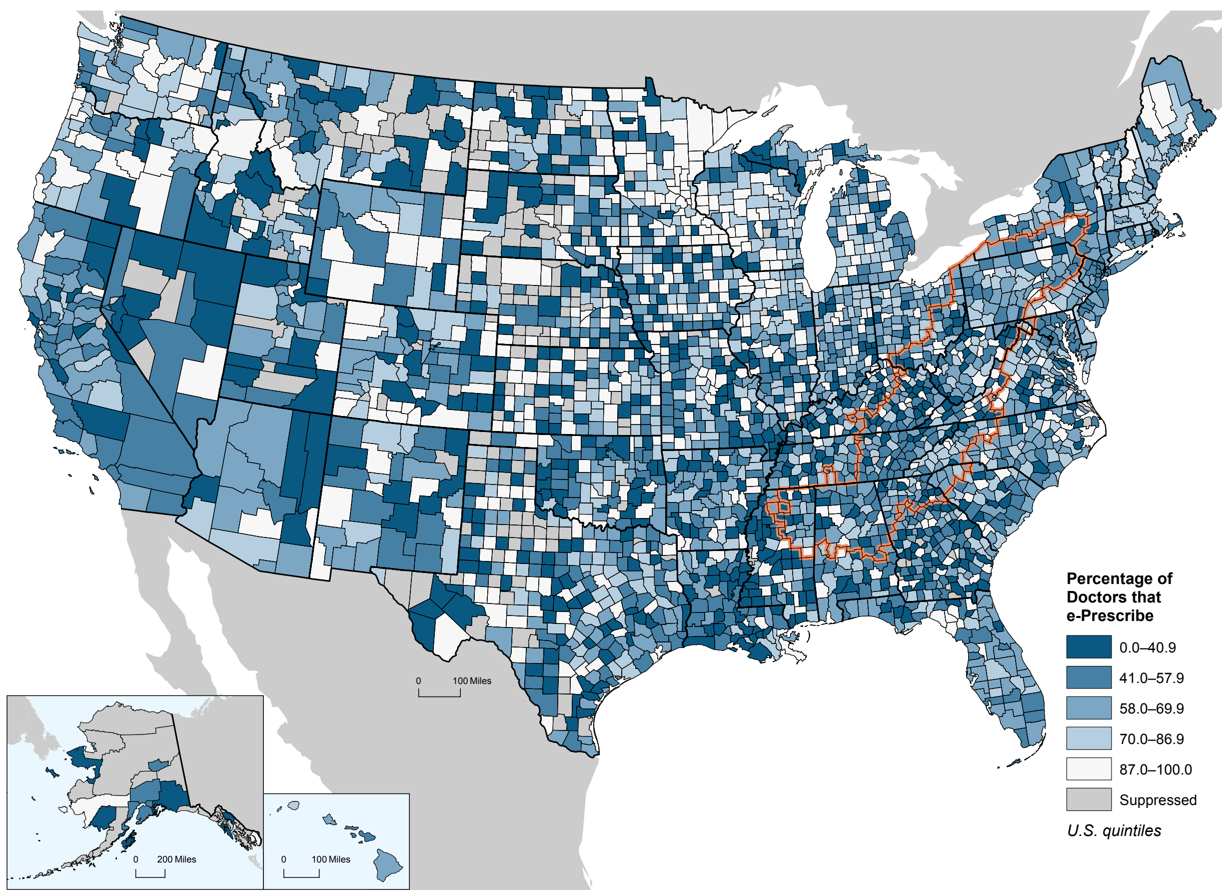


Data source: The Office of the National Coordinator for Health Information Technology. U.S. Department of Health and Human Services. http://dashboard.healthit.gov/datadashboard/documentation/electronic-prescribing-adoption-use-data-documentation.php.

Overview: Electronic Prescribing in the United States

Figure 143 shows the variation in the prevalence of electronic prescribing across the United States. Similar to the map of the Appalachian Region, the national map resembles a checkerboard, with few regional patterns discernible. Areas throughout the upper Midwest and Northeast tend to display higher percentages than elsewhere, although many counties ranking in the worst-performing quintiles can still be found. The Mississippi Delta and parts of the Southeast, meanwhile, tend to have larger numbers of counties ranking in the worst-performing quintile, although counties ranking in the top-performing quintile can still be found. Overall, there is significant variation across the country, including within both regions and states.

Figure 143: Map of Percentage of Physicians that e-Prescribe in the United States, 2014

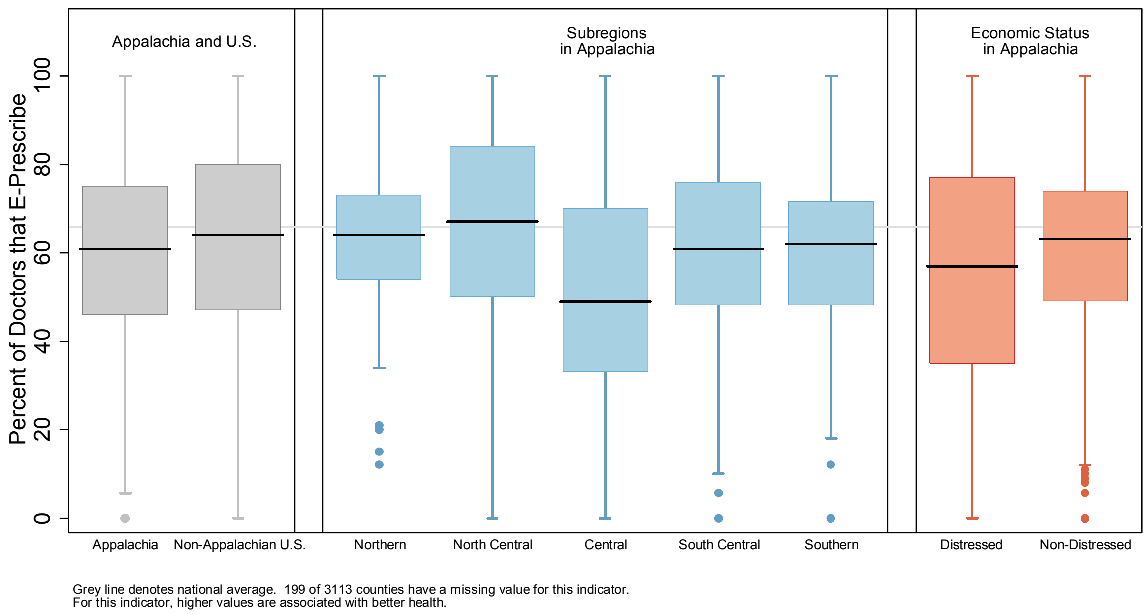


Data source: The Office of the National Coordinator for Health Information Technology. U.S. Department of Health and Human Services. http://dashboard.healthit.gov/datadashboard/documentation/electronic-prescribing-adoption-use-data-documentation.php.

Distribution of Electronic Prescribing

Figure 144 shows the distribution of e-prescribing percentages by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties, 199 have a missing value for this indicator.

Figure 144: Box Plot of Percentage of Physicians that e-Prescribe by Geography and Economic Status, 2014



Data source: The Office of the National Coordinator for Health Information Technology. U.S. Department of Health and Human Services. http://dashboard.healthit.gov/datadashboard/documentation/electronic-prescribing-adoption-use-data-documentation.php.

The distribution of e-prescribing percentages among national quintiles for Appalachian counties is shown in Table 47. Of the 420 counties in the Region, 82 (20 percent) rank in the worst-performing national quintile, while 58 (14 percent) rank in the best-performing national quintile.

Table 47: Distribution of Percentage of Physicians that e-Prescribe among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Electronic prescriptions	58	*14%*	74	*18%*	94	*22%*	107	*25%*	82	*20%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Mammogram Screenings

KEY FINDINGS | Medicare Mammogram Screenings

- The percentage of Medicare-covered women undergoing mammogram screenings in the Appalachian Region is comparable to the percentage at the national level. In the Region, 61.4 percent of Medicare-covered women ages 67 to 69 have had a recent mammogram, a number similar to the 62.1 percent reported in the nation as a whole.
- Mammogram screenings are not nearly as prevalent in Central Appalachia, where only 53.7 percent of Medicare-covered women ages 67 to 69 have had a recent screening.
- There is little difference in mammogram screening percentages of Medicare-covered women in terms of rurality in the Appalachian Region, with large metro areas (58.9 percent) and rural areas (57.3 percent) reporting similar figures.
- A county's economic status is an indicator of mammogram screening prevalence, with Medicare-covered women in the Appalachian Region's non-distressed counties (61.9) reporting a much higher screening percentage than the Region's distressed counties (53.9 percent).

Background

This indicator measures the percentage of female fee-for-service Medicare beneficiaries ages 67 to 69 that have received a mammogram in the past two years. The figures for this measure are based on 2013 data provided to County Health Rankings from the Dartmouth Atlas of Health Care. In general, a higher percentage of women undergoing mammogram screenings reflects a better quality of care available in a community.

Breast cancer is the second most common cause of cancer death among females in the United States, and getting regular mammograms can lower a woman's risk of dying from the disease (Centers for Disease Control and Prevention, Breast Cancer, 2017). The national mortality rate from breast cancer has been declining since 1990, and some estimates suggest that the rate has dropped approximately 10 percent due in large part to screening and early detection (National Cancer Institute, 2017). The U.S. Preventive Services Task Force recommends regular mammograms every two years for women ages 50 to 74 (U.S. Preventive Services Task Force, Final Recommendation Statement: Breast Cancer: Screening, 2016). Past research based in several Appalachian states found that counties with lower socioeconomic statuses and lower mammogram screening percentages had, in turn, higher rates of late stage breast cancer (Anderson, et al., 2014).

While the measure itself represents only a subset of women recommended for screening, it may be useful as a proxy for the delivery system for breast cancer screenings available to all women. With nearly all women ages 67 to 69 eligible for or covered by Medicare, and Medicare covering one mammogram screening every 12 months, lack of health insurance is not an access barrier for this group. Hence, this indicator attempts to capture the quality of the delivery system and its ability to provide procedures to all qualified beneficiaries, an important indicator of overall health care system quality.

Overview: Medicare Mammogram Screening Rates in the Appalachian Region

Overall, 61.4 percent of all Medicare-covered women ages 67 to 69 in the Appalachian Region have received a recent mammogram, compared to 62.1 percent in the nation as a whole. While both South Central Appalachia (65.0 percent) and Southern Appalachia (62.8 percent) have figures marginally above the national mark, Central Appalachia has a large number of counties ranking in the worst-performing quintile, with the mammogram screening percentage in the subregion at 53.7 percent.

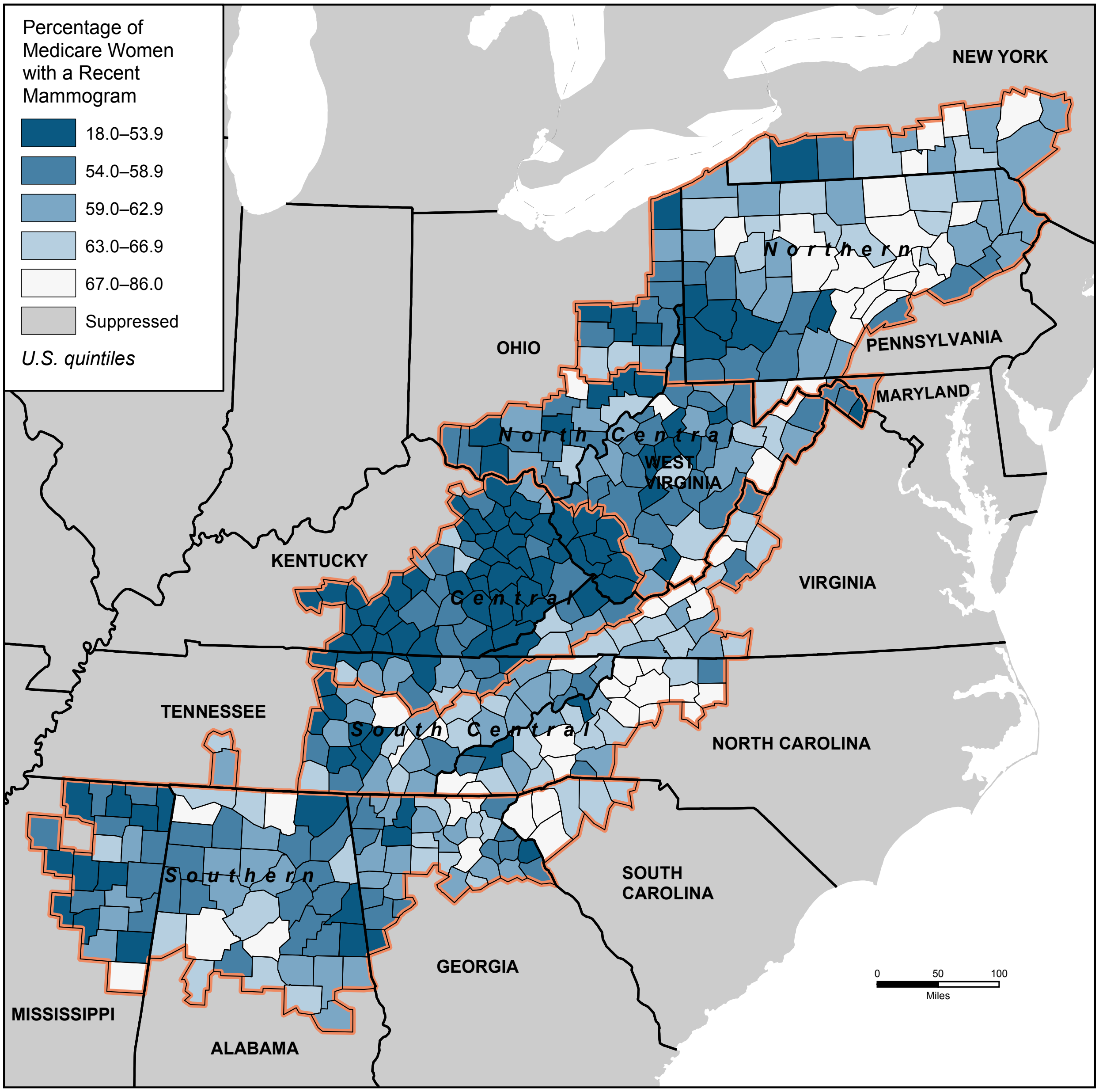
Unlike many other measures included in this report, there is no stark urban-rural divide in terms of mammogram screening prevalence throughout the Region. Of the five urban-rural classifications, the two ends of the spectrum—large metro areas (58.9 percent) and rural areas (57.3 percent)—have similar percentages. The three classifications found within the large metro and rural areas all have percentages above these figures, with small metro areas (63.8 percent) reporting the highest. Similar to many other measures in this report, a county's economic status is an indicator of mammogram screening prevalence, as non-distressed Appalachian counties report a much higher percentage than the Region's distressed counties (61.9 percent compared to 53.9 percent).

Following the subregional trends, Appalachian Kentucky reports the lowest mammogram screening percentage in the Region at 52.2 percent. Seven of the Appalachian portions of states report figures higher than the national mark: South Carolina (67.6 percent), North Carolina (67.0 percent), Maryland (65.8 percent), New York (64.8 percent), Alabama (63.6 percent), Virginia (63.1 percent), and Tennessee (63.1 percent).

Figure 145 shows the variation in mammogram screenings among female Medicare beneficiaries ages 67 to 69, grouped by national quintiles. Darker blue indicates that a lower percentage of women have had this screening; for this measure, higher values are associated with better health. The map displays a high level of variation within each subregion and within states. Central Appalachia and Appalachian Kentucky are noticeable for having a large number of counties classified in the worst-performing national quintile.

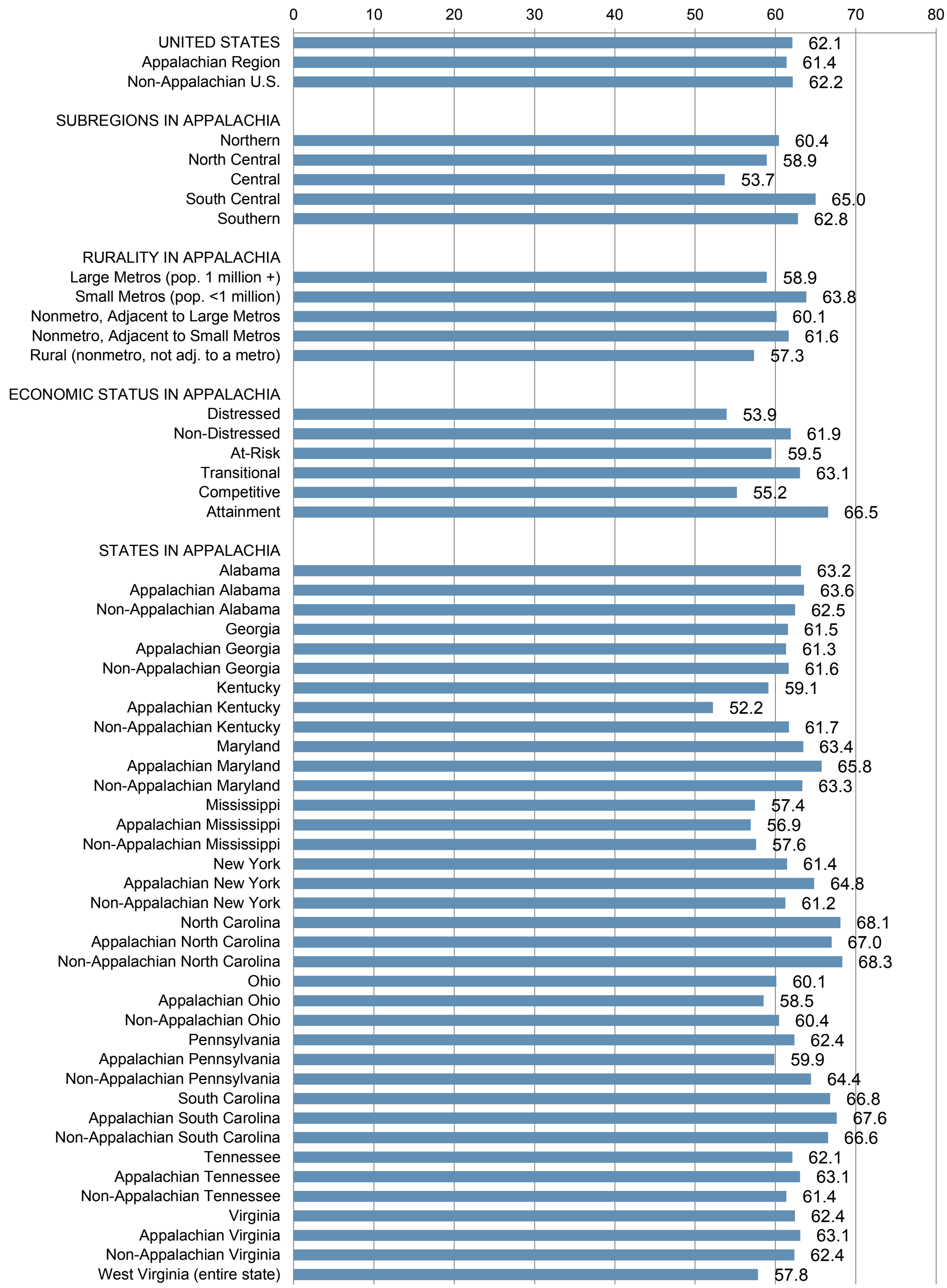
Figure 146 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 145: Map of Percentage of Medicare-covered Women Ages 67 to 69 with a Recent Mammogram Screening in the Appalachian Region, 2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation. http://www.countyhealthrankings.org/rankings/data.

Figure 146: Chart of Percentage of Medicare-covered Women Ages 67 to 69 with a Recent Mammogram Screening, 2013

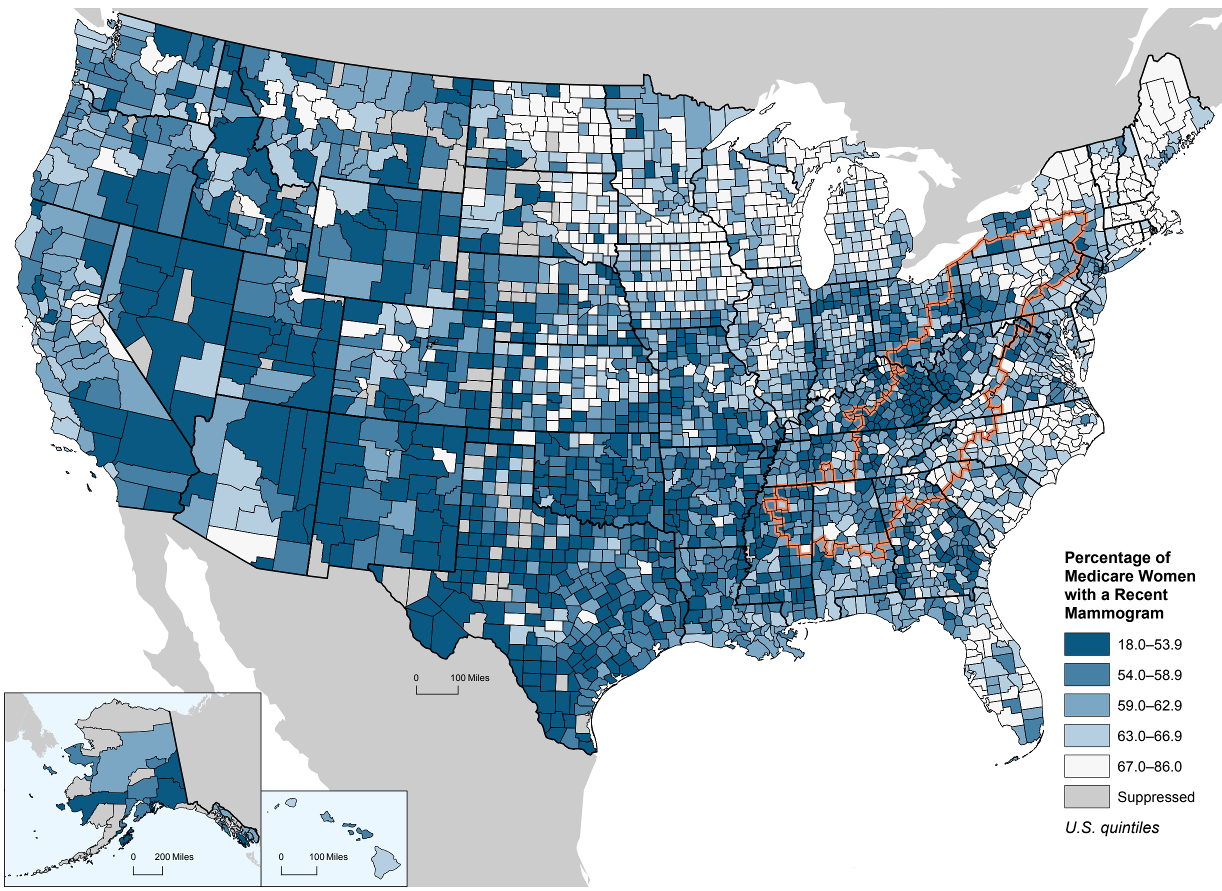


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation. http://www.countyhealthrankings.org/rankings/data

Overview: Medicare Mammogram Screening Rates in the United States

Figure 147 shows the variation in mammogram screening percentages across the United States for Medicare-covered women ages 67 to 69. Much of the East Coast reports high levels, with counties in the top-performing quintile stretching from Maine to Florida. The upper Midwest also contains a large number of counties ranking in the top-performing quintile. The concentration of poor-performing counties in Central Appalachia is noticeable in the otherwise well-performing eastern part of the country. Percentages are low in the Mississippi Delta and stretch across the country to many areas throughout the West.

Figure 147: Map of Percentage of Medicare-covered Women Ages 67 to 69 with a Recent Mammogram Screening in the United States, 2013

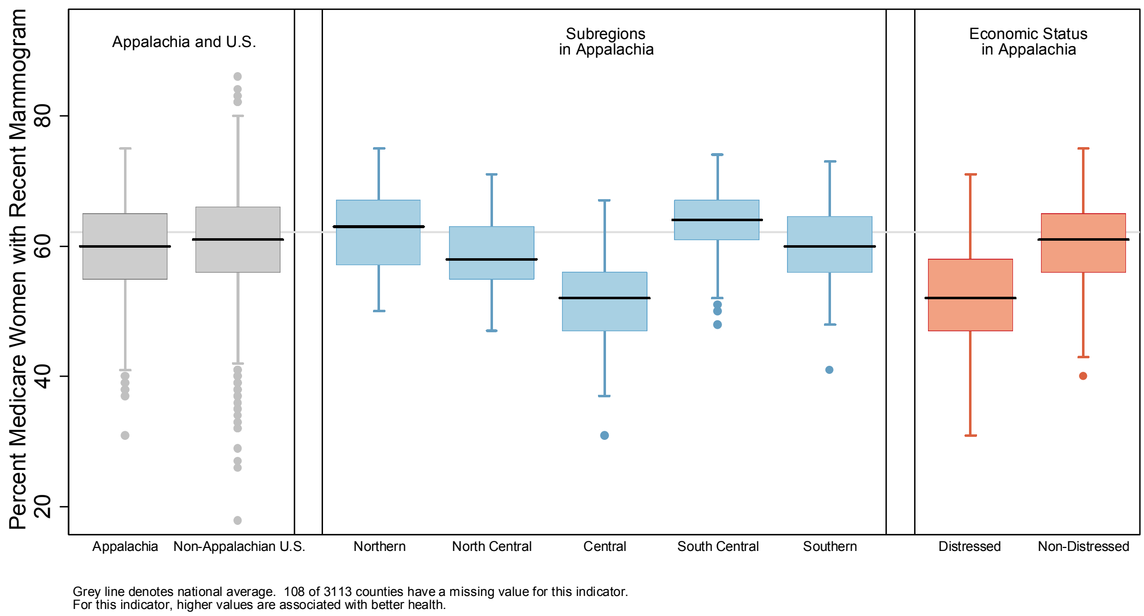


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation. http://www.countyhealthrankings.org/rankings/data

Distribution of Mammogram Screening Rates

Figure 148 shows the distribution of mammogram screenings by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 108 have a missing value for this indicator.

Figure 148: Box Plot of Percentage of Medicare-covered Women Ages 67 to 69 with a Recent Mammogram Screening by Geography and Economic Status, 2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data

The distribution of mammogram screening levels among national quintiles for Appalachian counties is shown in Table 48. Of the 420 counties in the Region, 104 (25 percent) rank in the worst-performing national quintile, while 56 (13 percent) rank in the top-performing national quintile.

Table 48: Distribution of Percentage of Medicare-covered Women Ages 67 to 69 with a Recent Mammogram Screening among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	Pct.	#	Pct.	#	Pct.	#	Pct.	#	Pct.
Mammogram screenings	56	13%	69	16%	91	22%	99	24%	104	25%

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Diabetes Monitoring

KEY FINDINGS | Medicare Diabetes Monitoring

- Diabetes monitoring is slightly higher among Medicare patients in the Appalachian Region (85.9 percent) than among Medicare patients in the United States as a whole (84.7 percent).
- There is little variation in diabetes monitoring across the subregions, with the lowest figure (North Central, 84.3 percent) and the highest (South Central, 88.0) separated by less than four percentage points.
- There is not a clear urban-rural divide in diabetes monitoring, with all five rurality classifications reporting percentages between 84.9 percent and 86.4 percent.
- There is a marginal difference in diabetes monitoring percentages based on a county's economic status. The Appalachian Region's non-distressed counties (85.9 percent) and distressed counties (84.6 percent) report similar rates.

Background

Diabetes monitoring measures the percentage of diabetic fee-for-service Medicare patients ages 65 to 75 that have tested their glycated hemoglobin (HbA1c) levels in the past year. The figures for this measure are based on 2012 data provided to County Health Rankings from the Dartmouth Atlas of Health Care. This indicator provides information on beneficiaries in Medicare's fee-for-service option only, and does not include Medicare's managed care beneficiaries. Therefore, this measure captures only a subset of the Medicare population and represents approximately 12 percent of the total population in the nation (Kaiser Family Foundation, 2015); (Centers for Medicare & Medicaid Services, 2017).

The successful management of diabetes requires a multi-faceted approach and includes healthy eating, staying active, reducing risk factors, and preventing complications. Elevated HbA1c levels are a risk factor for further complications from diabetes, such as heart attack, kidney disease, and neuropathy.

More frequent monitoring enables healthcare providers to better manage a patient's diabetes and potentially avoid the complications of poor management, such as amputation. This measure captures the *monitoring* of HbA1c—not the control of it. A county with a high monitoring percentage may very well have either a high or low incidence of elevated levels of HbA1c throughout its population (National Center for Health Statistics, HbA1c Test: Diabetic Medicare Beneficiaries, 2016).

Diabetes is 22 percent more prevalent among adults in Appalachia than in the nation as a whole, and the mortality rate from the disease is nearly 11 percent higher in Appalachia than the national rate. As such, regular monitoring of HbA1c levels in the population is an especially important issue for the Region.

Even after accounting for access barriers, research shows that older diabetics living in rural areas are less likely to receive adequate care compared to the non-rural, elderly diabetics (Lutfiyya, 2011).

Diabetes mortality and the prevalence of diabetes in the Region are profiled elsewhere in this report.

Overview: Medicare Diabetes Monitoring in the Appalachian Region

The Appalachian Region reports that 85.9 percent of Medicare fee-for-service patients with diabetes undergo HbA1c monitoring, a figure higher than the national mark of 84.7 percent. Four of the five subregions are at or above the national percentage, and the lone subregion below this number—North Central Appalachia (84.3 percent)—is less than one percentage point off the national mark.

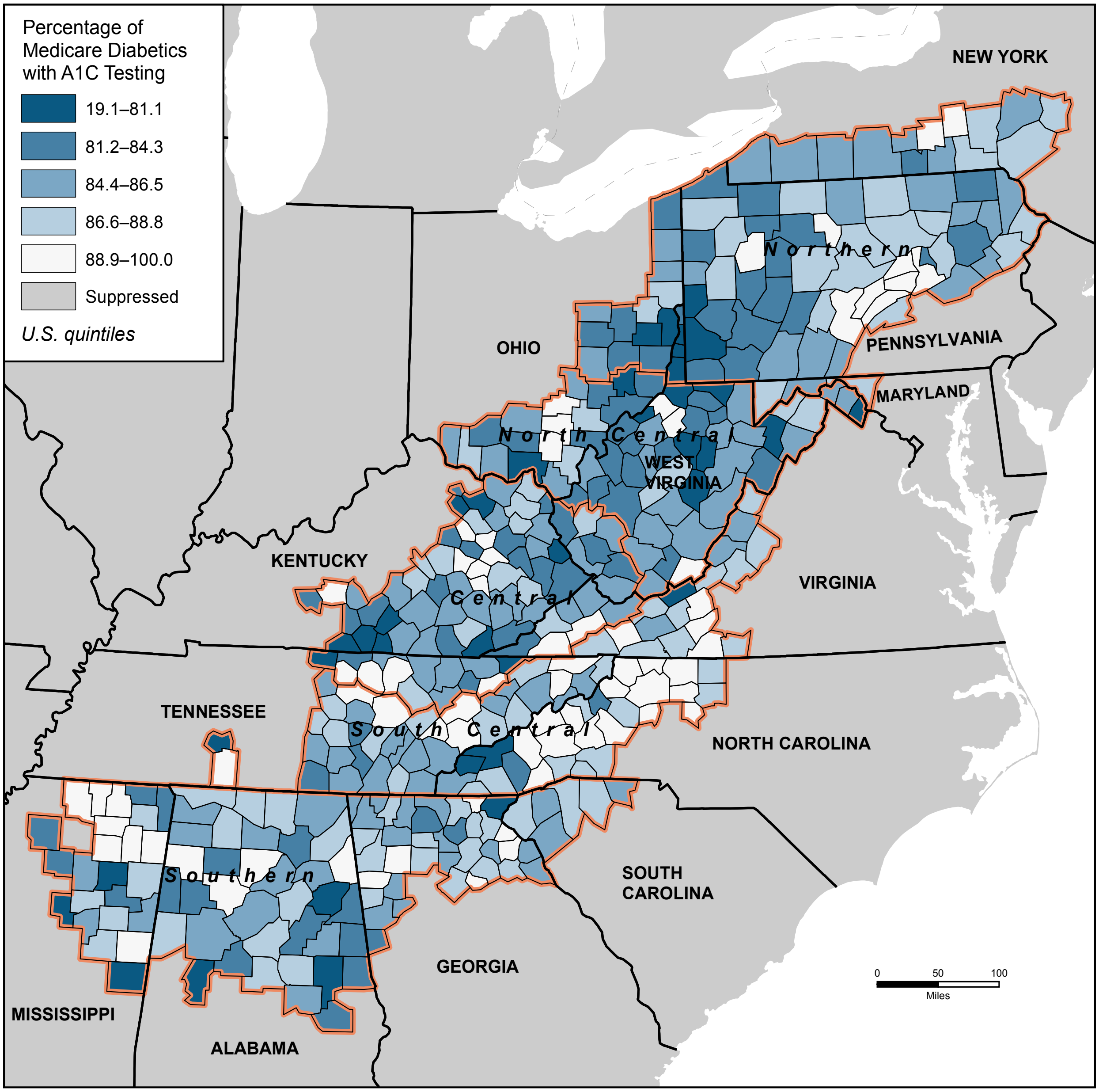
Unlike many other measures in this report, there is no urban-rural divide in diabetes monitoring, with all five classifications reporting percentages between 84.9 percent and 86.4 percent. There is a marginal difference in HbA1c testing percentages based on a county's economic status, with non-distressed Appalachian counties (85.9 percent) and distressed counties (84.6 percent) reporting similar percentages.

There is little variation in diabetes monitoring across the Appalachian portions of states within the Region. West Virginia reports the lowest percentage throughout the Region, with 83.5 percent of diabetic Medicare fee-for-service patients in the state having recently undergone HbA1c testing. In addition to West Virginia, only Appalachian Ohio (84.6 percent) and Appalachian Pennsylvania (84.5 percent) report percentages below the national mark, and the differences are small (the national level is 84.7 percent). The Appalachian portions in the following states report higher diabetes monitoring percentages than the non-Appalachian portions: Alabama, Georgia, Maryland, Mississippi, New York, South Carolina, Tennessee, and Virginia.

Figure 149 shows the variation in HbA1c testing among diabetic fee-for-service Medicare patients ages 65 to 75 across the Appalachian Region, grouped by national quintile. Darker colors indicate counties with lower testing prevalence; for this measure, higher values are associated with better health. There is a great deal of variation within the Region at both the subregional and state levels.

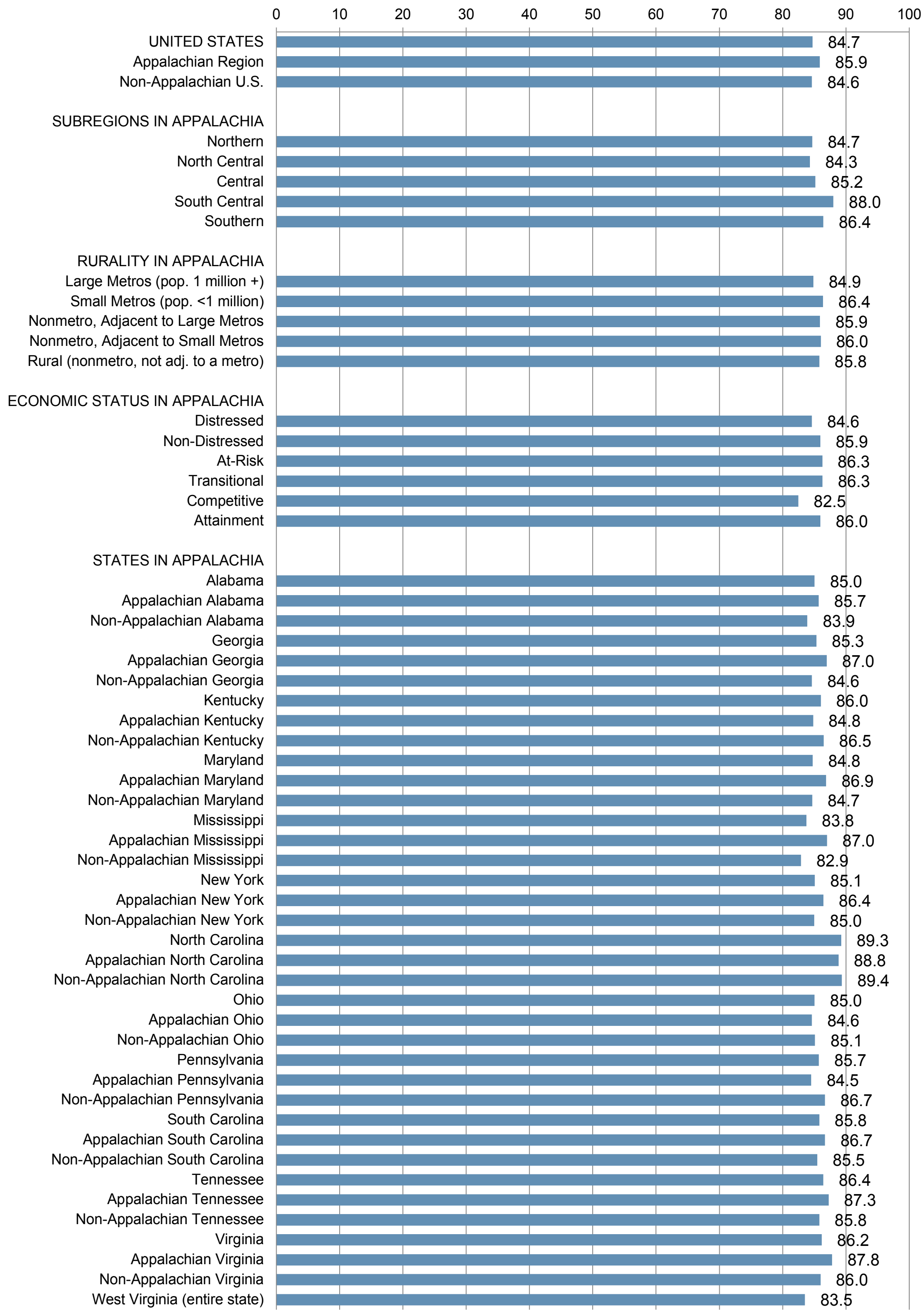
Figure 150 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 149: Map of Percentage of Medicare Patients Ages 65 to 75 with an HbA1C Screening in the Past Year in the Appalachian Region, 2012



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation and the http://www.countyhealthrankings.org/rankings/data.

Figure 150: Chart of Percentage of Medicare Patients Ages 65 to 75 with an HbA1C Screening in the Past Year, 2012

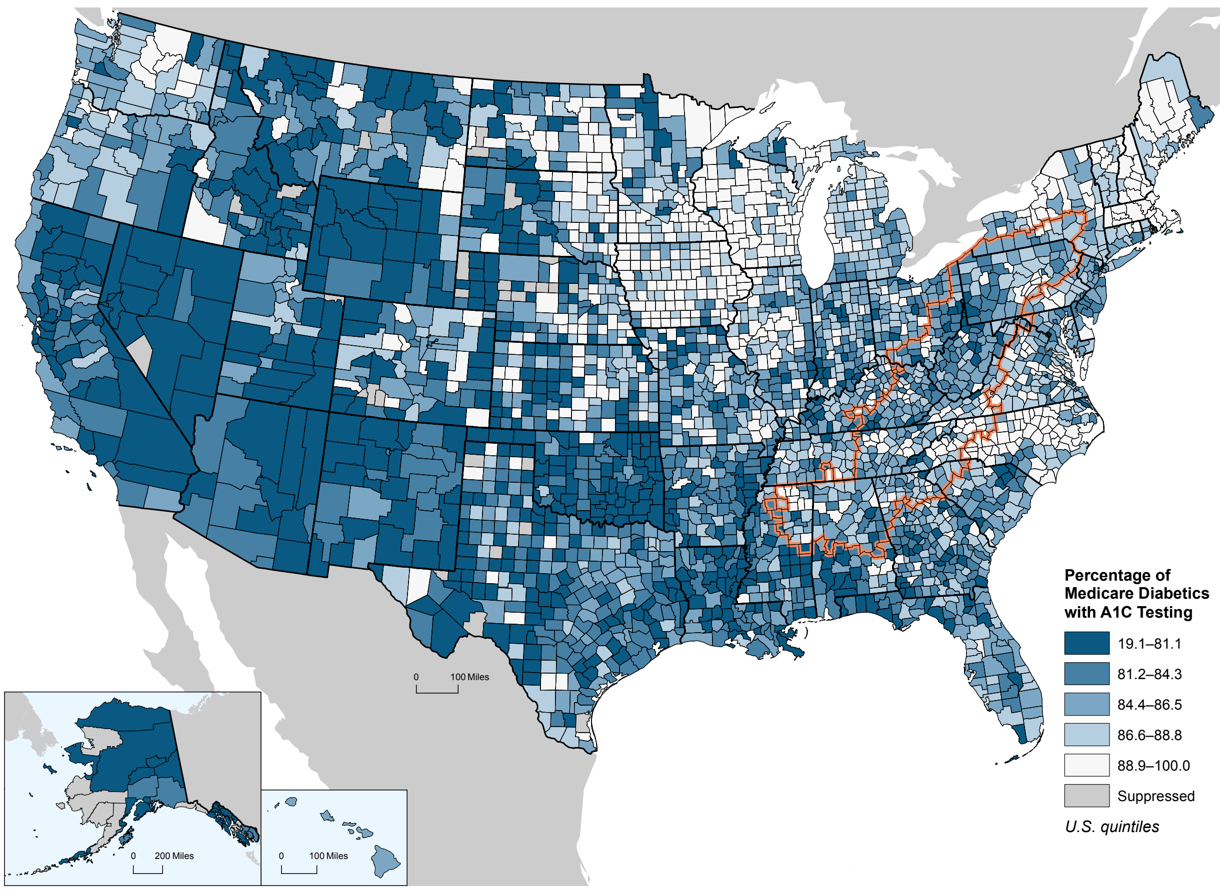


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation and the. http://www.countyhealthrankings.org/rankings/data.

Overview: Medicare Diabetes Monitoring in the United States

Figure 151 highlights variation in the percentages of diabetes monitoring across the United States. Much of the Upper Midwest and New England report high percentages. Many counties throughout North Carolina rank in the best-performing national quintile. Low testing levels begin in the Mississippi Delta, stretch across Texas and Oklahoma, and occur through much of the western half of the country. The Southwest, in particular, reports very low percentages of diabetes monitoring.

Figure 151: Map of Percentage of Medicare Patients Ages 65 to 75 with an HbA1C Screening in the Past Year in the United States, 2012

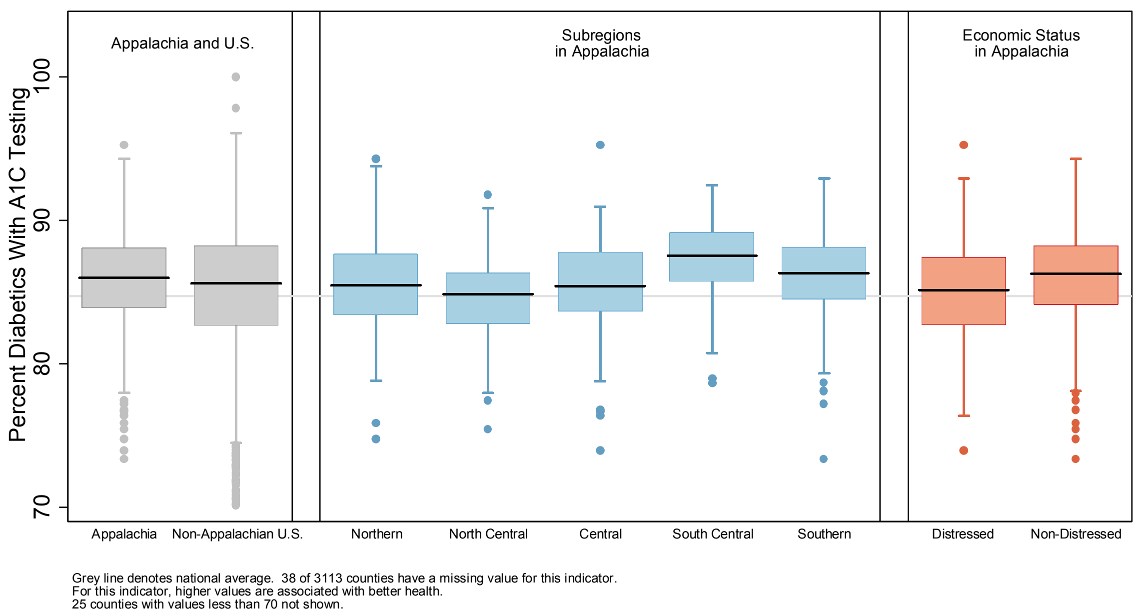


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation and the http://www.countyhealthrankings.org/rankings/data.

Distribution of Medicare Diabetes Monitoring

Figure 152 shows the distribution of HbA1c screening percentages by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, 38 have a missing value for this indicator, and 25 counties with values less than 70 percent are not represented.

Figure 152: Box Plot of Percentage of Medicare Patients Ages 65 to 75 with an HbA1C Screening in the Past Year by Geography and Economic Status, 2012



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation and the. http://www.countyhealthrankings.org/rankings/data.

The distribution of HbA1c screening levels among national quintiles for Appalachian counties is shown in Table 49. Of the 420 counties in the Region, 38 (9 percent) rank in the worst-performing national quintile, while 74 (18 percent) rank in the best-performing national quintile.

Table 49: Distribution of Percentage of Medicare Patients Ages 65 to 75 with an HbA1C Screening in the Past Year among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Diabetes monitoring	74	*18%*	103	*25%*	120	*29%*	85	*20%*	38	*9%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Further Reading

Electronic Prescriptions

Pallardy, Carrie. 25 things to know about e-prescribing. *Becker's Hospital Review*. April 7 2016. http://www.beckershospitalreview.com/healthcare-information-technology/25-things-to-know-about-e-prescribing.html

Mammogram Screenings

County Health Rankings & Roadmaps. Mammography Screening. http://www.countyhealthrankings.org/measure/mammography-screening

Centers for Disease Control and Prevention (CDC). Breast Cancer. Available at: https://www.cdc.gov/cancer/breast/

Health Resources and Services Administration. Breast Cancer Screening. Available at: https://www.hrsa.gov/quality/toolbox/measures/breastcancer/part6.html#8

American Cancer Society. Cancer Prevention & Early Detection Facts & Figures, 2015-2016. American Cancer Society, 2015. Available at: http://www.cancer.org/research/cancerfactsstatistics/cancer-prevention-early-detection

Diabetes Monitoring

Diabetes Monitoring. County Health Rankings. http://www.countyhealthrankings.org/measure/diabetic-monitoring

American Diabetes Association Standards of Medical Care in Diabetes – 2016. (2016). Diabetes Care, 39(S1). Available: http://care.diabetesjournals.org/content/suppl/2015/12/21/39.Supplement_1.DC2/2016-Standards-of-Care.pdf

Social Determinants

Median Household Income

KEY FINDINGS | Median Household Income

- The median household income in the Appalachian Region is 19 percent less than the national median.
- The median household income in all five Appalachian subregions is below the national figure. The median is especially low in Central Appalachia, where it is 38 percent less than the national median.
- There is a stark urban-rural divide in median household income throughout the Region, with rural households earning 34 percent less than those in the Region's large metro areas.
- The median household income in the Appalachian Region's distressed counties is 30 percent less than that found in the Region's non-distressed counties.

Background

Median household income is the value at which half of the households in an area earn more and half earn less. The measure includes wages and salaries, unemployment insurance, disability payments, child support, regular rental receipts, and any personal business income. The figures for this measure are based on 2010–2014 American Community Survey data collected by the U.S. Census Bureau. Households with higher incomes generally have greater access to health care, safer housing, and an increased ability to afford resources that lead to healthier outcomes (e.g., healthier food and higher education).

Members of higher-income households typically also have more stable and flexible jobs that provide good benefits, such as health insurance, paid leave, and workplace wellness programs. As such, higher incomes are associated with lower incidences of disease and premature death. In general, it is more difficult for individuals with lower incomes to afford quality medical care and a healthy lifestyle (Woolf, et al., 2015).

Because U.S. household income data have a number of very high-earning households, measures of median household income are usually well below any measure examining mean household income, as these high-earners inflate the mean well above the midpoint of the distribution. Median household income is generally the preferred indicator for representing the *typical* household in an area, as extremely high-income households that have a disproportionate effect on mean values have much less effect on median values.

Overview: Median Household Income in the Appalachian Region

Overall, median household income in Appalachia is substantially less than the national median. The Region's median household income of $45,585 is 19 percent less than the national figure of $56,135. Despite many counties ranking in the worst-performing quintile, Southern Appalachia ($48,668) reports the highest value among the subregions. Some of this may be attributed to the high incomes found among metro counties located near Atlanta, Birmingham, and Huntsville. Central Appalachia is the worst-performing subregion—median household income is $34,628 which is 38 percent less than the national figure.

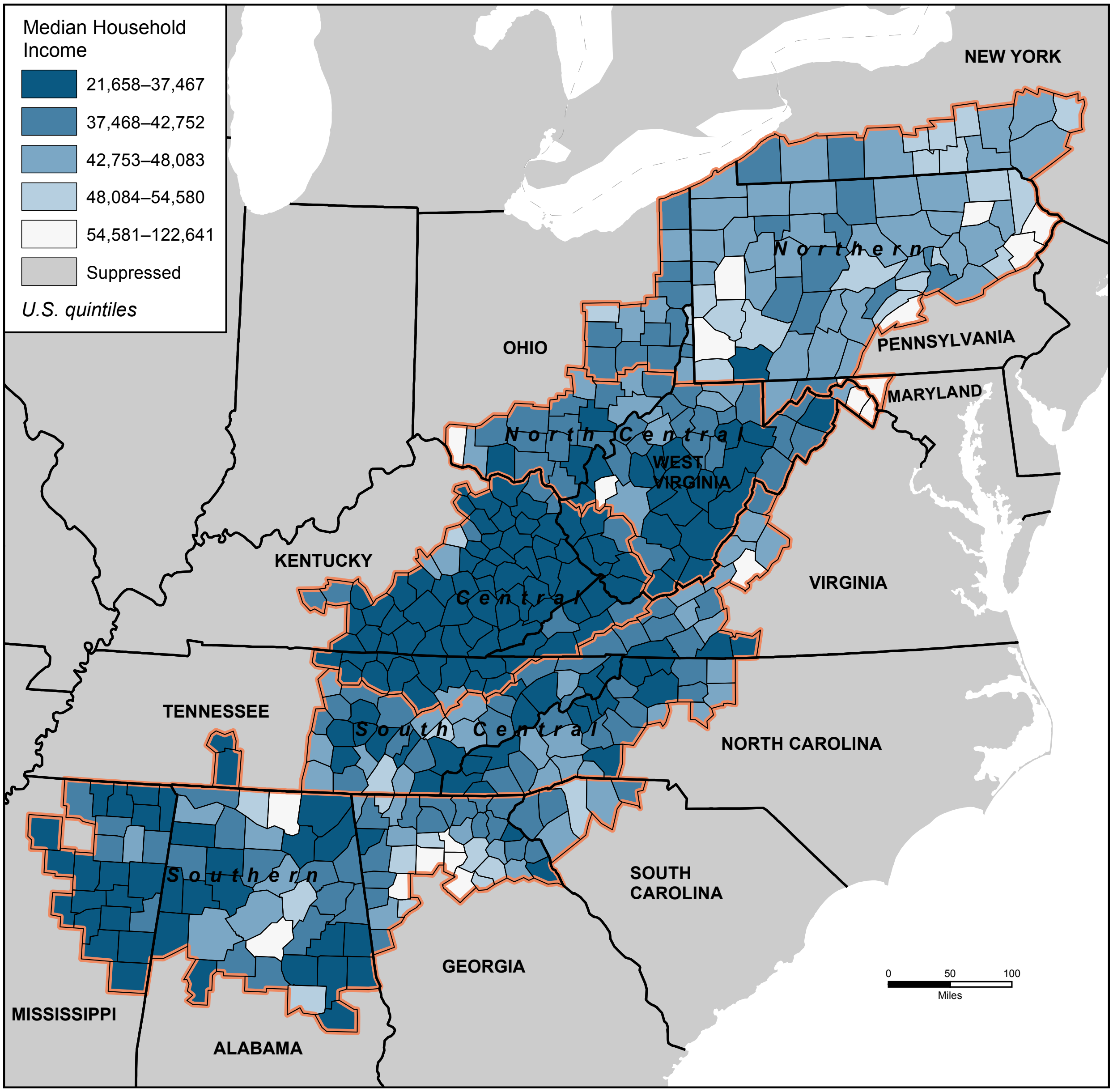
There is a large urban-rural divide in median household income throughout the Region, with rural households ($36,265) making 34 percent less than those in large metro areas ($54,743). As one moves away from large metro areas, each subsequent change in urban classification experiences a decline in income. Since a county's economic status is largely dependent upon median household income—this indicator accounts for one-third of the equation used by ARC when designating economic status classifications—it follows that distressed Appalachian counties ($32,777) report a value 30 percent less than non-distressed counties ($46,499).

Appalachian Kentucky reports the lowest median household income throughout the Region at just $33,840 per household, a number 40 percent less than the national figure. Only two states report higher incomes among the Appalachian portions of their respective states when compared to the non-Appalachian portions: Alabama and Georgia. While the difference in Alabama is only slight, Appalachian Georgia ($55,077) reports a median income 12 percent higher than non-Appalachian Georgia ($48,998). Although still below the national median and the non-Appalachian portions of the respective states, Maryland ($49,428) and Pennsylvania ($48,717) report the next highest values among the Appalachian portions of states in the Region.

Figure 153 shows the variation in median household income across the Appalachian Region, grouped by national quintiles. Darker colors indicate lower income levels; for this measure, higher values are associated with better health. Outside of Northern Appalachia, much of the region consists of counties ranked in the two worst-performing national quintiles. Almost all of the counties in Central Appalachia rank in the bottom quintile.

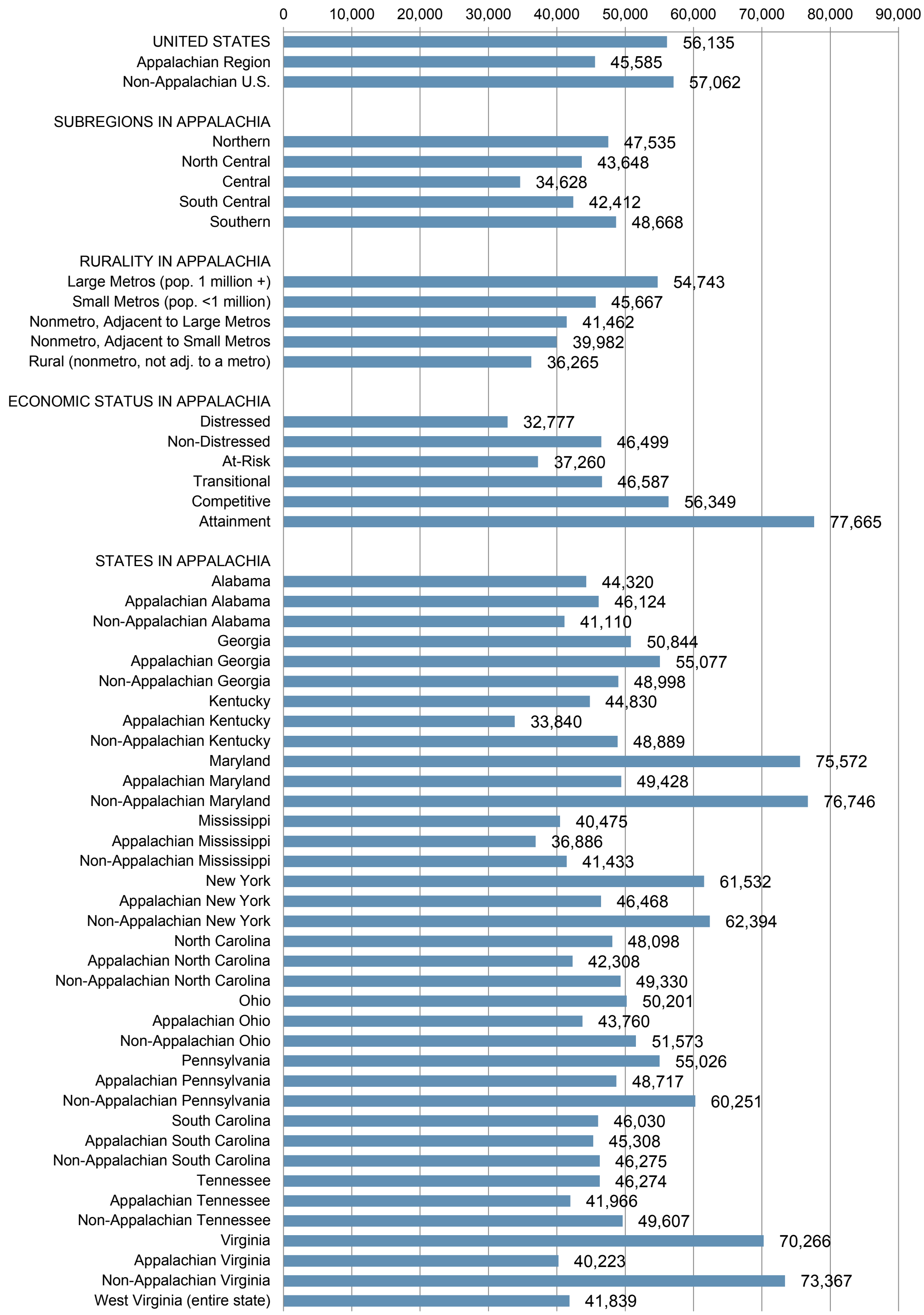
Figure 154 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 153: Map of Median Household Income in the Appalachian Region, 2010–2014



Data source: United States Census Bureau. "Summary File." 2010–2014 American Community Survey. U.S. Census Bureau's American Community Survey Office, 2015. Web. 13 January 2016 http://ftp2.census.gov/.

Figure 154: Chart of Median Household Income, 2010–2014

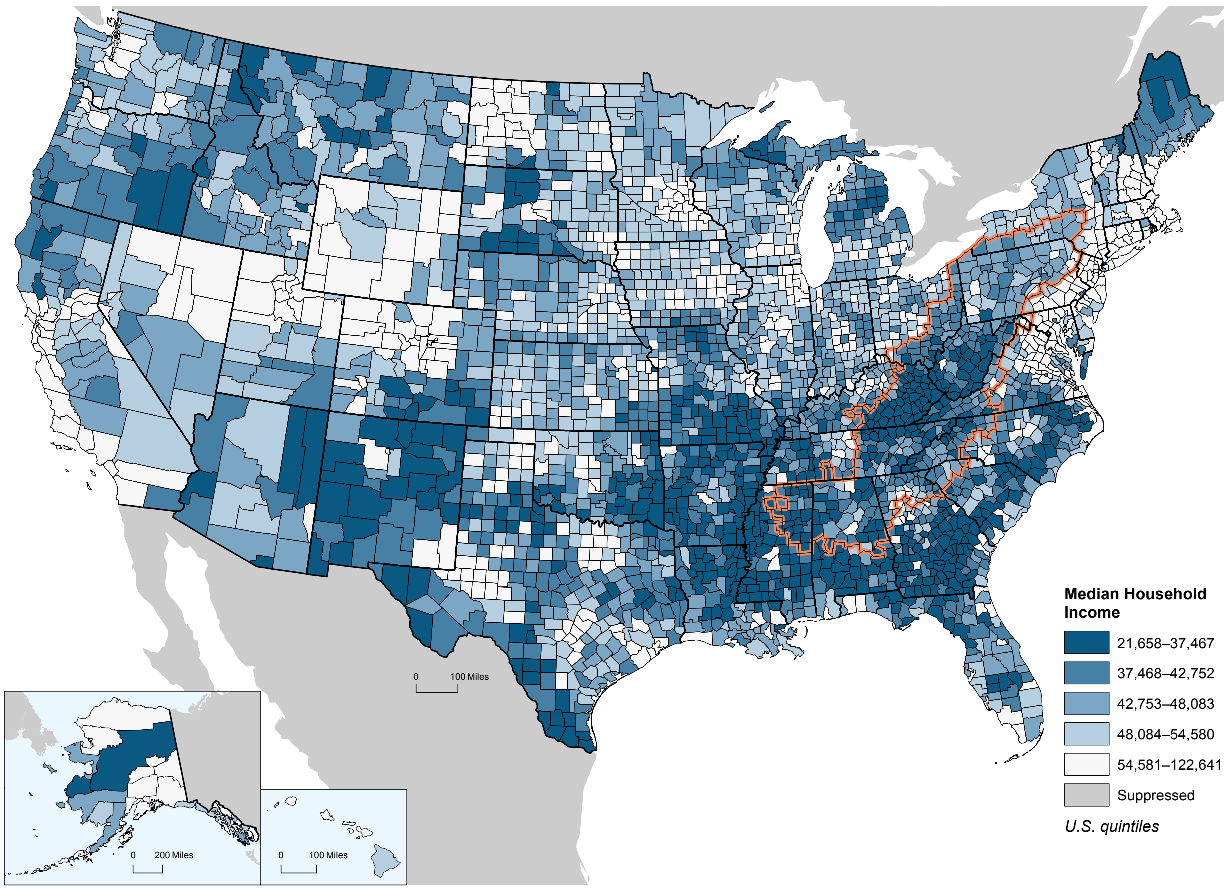


Data source: United States Census Bureau. "Summary File." 2010–2014 American Community Survey. U.S. Census Bureau's American Community Survey Office, 2015. Web. 13 January 2016 http://ftp2.census.gov/.

Overview: Median Household Income in the United States

Figure 155 shows the variation in median household income across the United States. In addition to Central Appalachia, a large number of counties in the worst-performing quintile are also found throughout much of the Southeast and Mississippi Delta regions. Pockets of poor performance also exist throughout the country, including Maine and areas of both the Southwest and Pacific Northwest. Metropolitan areas consistently rank in the top-performing quintile. Many areas throughout the Upper Midwest and Rocky Mountains also report high median household incomes.

Figure 155: Map of Median Household Income in the United States, 2010–2014

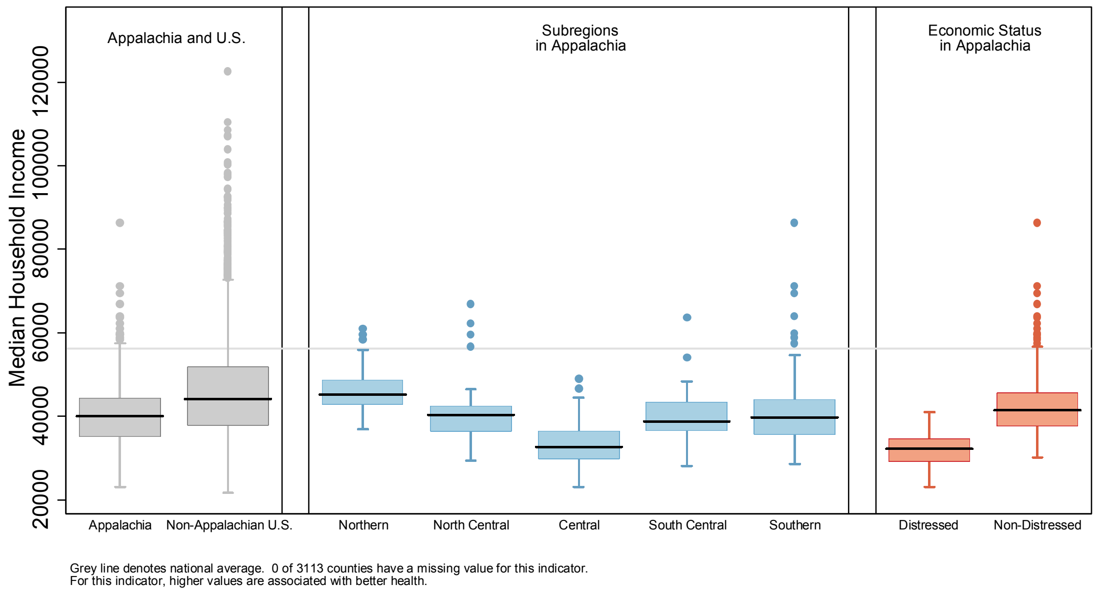


Data source: United States Census Bureau. "Summary File." 2010–2014 American Community Survey. U.S. Census Bureau's American Community Survey Office, 2015. Web. 13 January 2016 [http://ftp2.census.gov/.](http://ftp2.census.gov/)

Distribution of Median Household Income

Figure 156 shows the distribution of median household income by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator.

Figure 156: Box Plot of Median Household Income by Geography and Economic Status, 2010-2014



Data source: United States Census Bureau. "Summary File." 2010–2014 American Community Survey. U.S. Census Bureau's American Community Survey Office, 2015. Web. 13 January 2016 http://ftp2.census.gov/.

The distribution of median household income among national quintiles for Appalachian counties is shown in Table 50. Of the 420 counties in the Region, 159 (38 percent) rank in the worst-performing national quintile, while 19 (5 percent) rank in the best-performing national quintile.

Table 50: Distribution of Median Household Income among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Median household income	19	*5%*	33	*8%*	91	*22%*	118	*28%*	159	*38%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Poverty

KEY FINDINGS | Household Poverty Rates

- The household poverty rate is 17.2 percent in the Appalachian Region, a figure slightly higher than the national rate of 15.6 percent.
- At 14.8 percent, Northern Appalachia is the only subregion reporting a household poverty rate less than the nation as a whole. Central Appalachia reports that nearly one-quarter of all households in the subregion are below the poverty line (24.9 percent).
- Poverty increases as the level of rurality increases. In the Appalachian Region's large metro counties, 13.6 percent of households are below the poverty line, while 23.0 percent of households in the Region's rural areas are below the poverty line.
- The poverty rate in the Appalachian Region's distressed counties is much higher (26.9 percent) than the poverty rate in the Region's non-distressed counties (16.5 percent).

Background

The household poverty rate is the percentage of households with incomes below the poverty line. The figures for this measure are based on 2014 Small Area Income and Poverty Estimates data collected by the U.S. Census Bureau. Household poverty status not only reflects income levels, but also the size of the family, number of children, and for one- and two-person households, the age of the householder. People living in households below the poverty line generally have less access to resources that lead to better health outcomes, including health insurance and healthcare, as well as the types of diets and activities that are part of healthy, active lifestyles.

In addition to the lack of resources associated with living in poverty, the stress of living in a state of economic insecurity can lead to negative physical and mental health consequences, especially among children (Brody, et al., 2013). The social, economic, and physical environments typically found in high-poverty areas—at both the individual household and community levels—are also not conducive to good health outcomes (Health Equity Alliance, 2016). The issues with these environments can range from being located near storage facilities of hazardous substances, to being located near high concentrations of fast food restaurants and liquor stores. Additional issues may also include the housing units themselves, with substandard units leading to exposure to lead paint, mold, or pest infestations (Commission to Build a Healthier America, 2008).

Overview: Household Poverty Rates in the Appalachian Region

While poverty rates have improved dramatically in the Appalachian Region since ARC was established over 50 years ago, the household poverty rate throughout the Region (17.2 percent) is still above the national figure (15.6 percent). While Northern Appalachia (14.8 percent) reports a poverty rate below the national rate, and Southern Appalachia (16.9 percent) performs better than the Region as a whole, the central subregions all report higher rates. Central Appalachia reports the highest rate, with 24.9 percent of its households below the poverty line. North Central and South Central Appalachia both report household poverty rates of 18.2 percent.

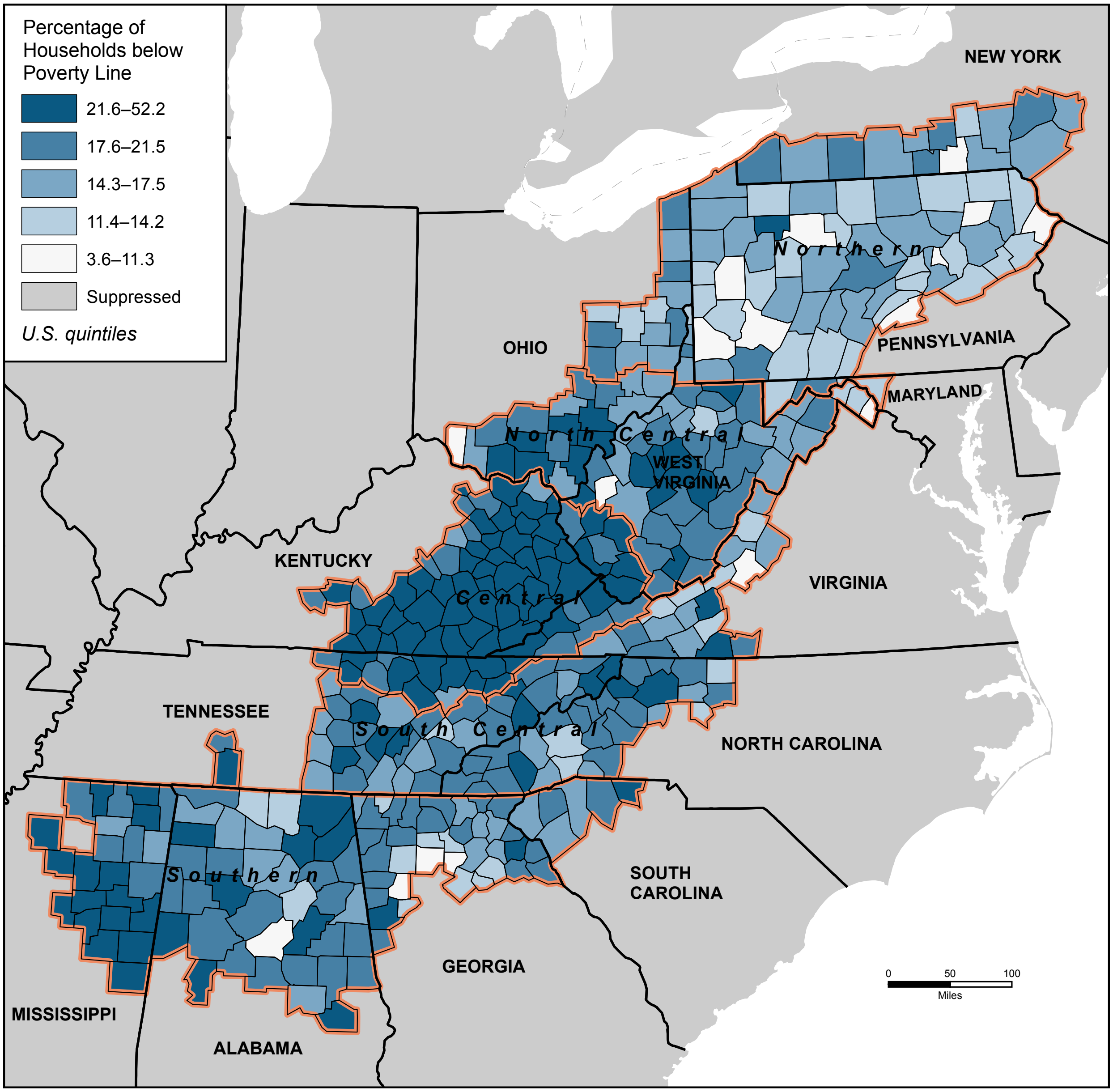
In Appalachia, poverty increases as one moves away from large metro areas and as the level of rurality increases. In the Appalachian Region's large metro areas, 13.6 percent of households are below the poverty line, while rural areas report 23.0 percent below the poverty line. Since poverty rates account for one-third of the equation used by ARC to designate the economic status of a county, it is expected that distressed Appalachian counties report a much higher poverty rate than those classified as non-distressed (26.9 percent compared to 16.5 percent).

Over one-quarter of all households in Appalachian Kentucky are below the poverty line (26.7 percent), the highest rate in the Region, and a much higher figure than that reported in non-Appalachian Kentucky (16.3 percent). Appalachian Mississippi (22.5 percent) reports the next highest household poverty rate in the Region, although this number is not much different than the 22.0 percent in non-Appalachian Mississippi. The Appalachian portions of three states report lower household poverty rates than those found in the non-Appalachian portions of the states: Alabama, Georgia, and South Carolina.

Figure 157 shows the variation in the percentage of households classified below the federal poverty line throughout the Appalachian Region, grouped by national quintiles. Darker blue indicates a higher percentage of households living below the poverty line; for this measure, higher values are associated with worse health. Much of Central Appalachia ranks in the worst-performing national quintile, and there are also pockets of poor performance throughout both North Central and Southern Appalachia.

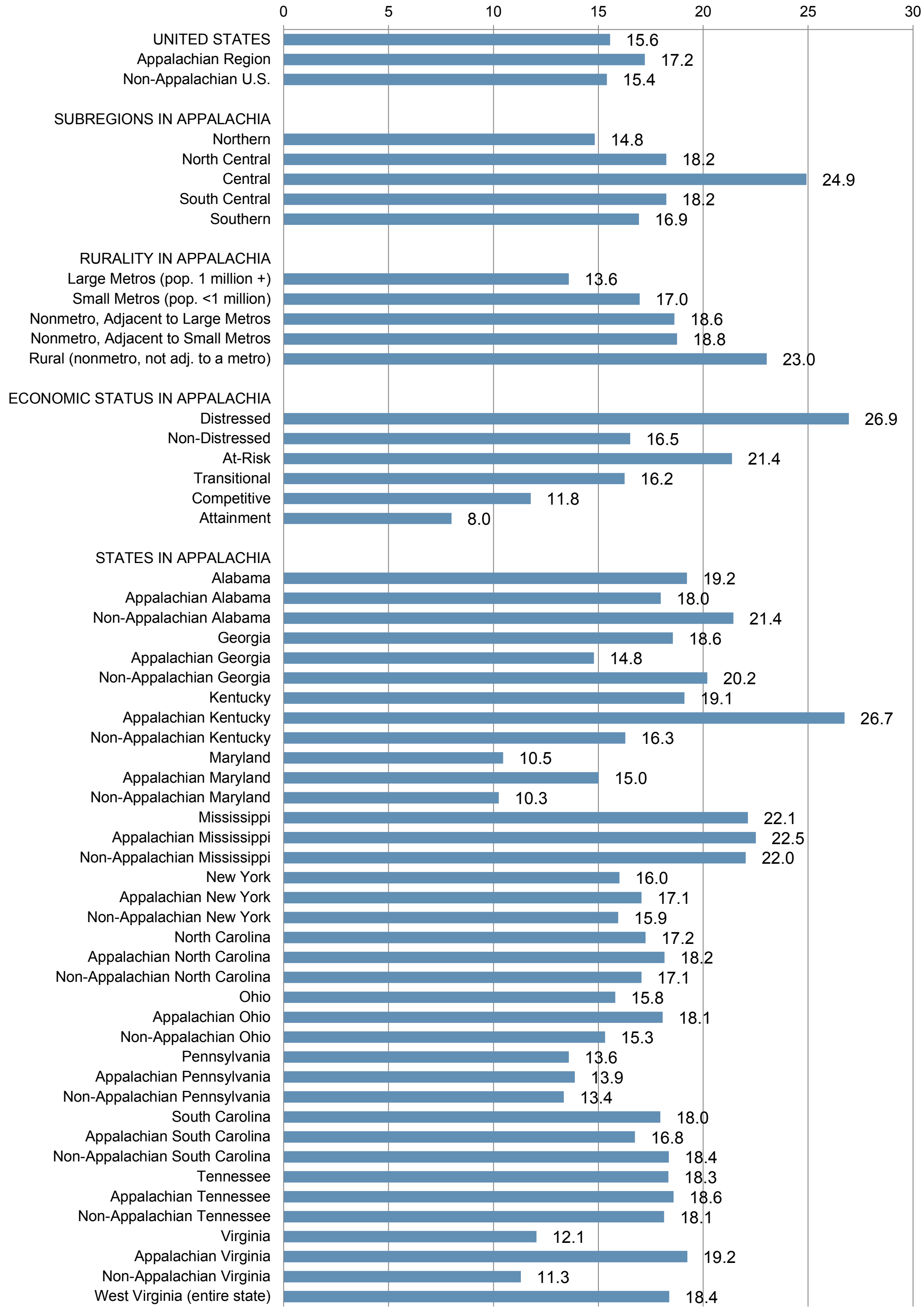
Figure 158 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 157: Map of Household Poverty Rates in the Appalachian Region, 2014



Data source: 2014 Poverty and Median Household Income Estimates - Counties, States, and National; Source: U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program, Release date: December 2015.

Figure 158: Chart of Household Poverty Rates, 2014

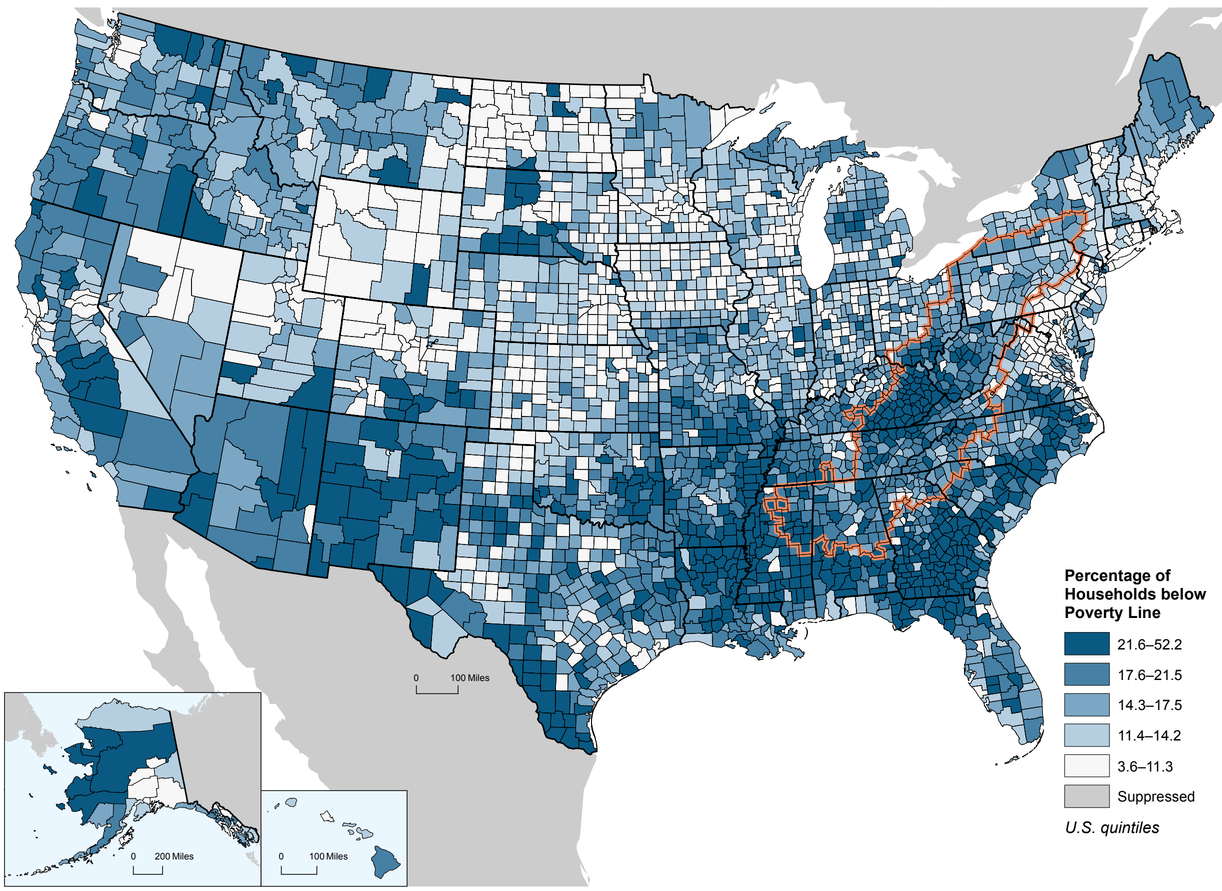


Data source: 2014 Poverty and Median Household Income Estimates - Counties, States, and National; Source: U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program, Release date: December 2015.

Overview: Household Poverty Rates in the United States

Figure 159 shows the variation in the household poverty rate across the United States. In addition to the poor-performing counties located in Central Appalachia, many counties throughout the Southeast and Mississippi Delta regions also rank in the worst-performing national quintile. Poverty persists throughout much of the Southwest, including Arizona, New Mexico, and many counties in Texas along the U.S.-Mexico border. The Upper Midwest and Northeast report a large number of counties in the top-performing national quintile.

Figure 159: Map of Household Poverty Rates in the United States, 2014

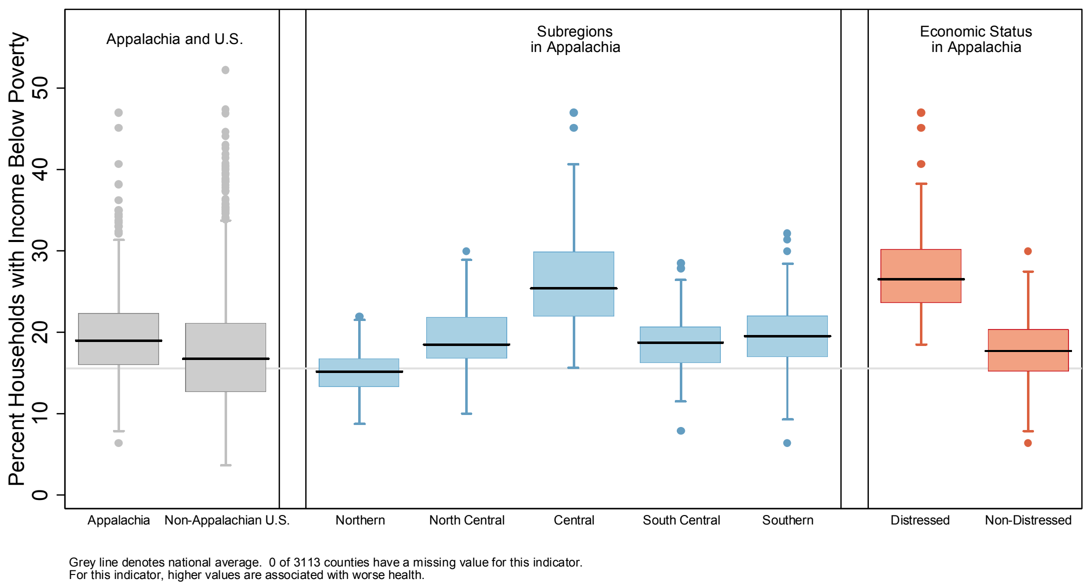


Data source: 2014 Poverty and Median Household Income Estimates - Counties, States, and National; Source: U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program, Release date: December 2015.

Distribution of Household Poverty Rates

Figure 160 shows the distribution of household poverty rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator.

Figure 160: Box Plot of Household Poverty Rates by Geography and Economic Status, 2014



Data source: 2014 Poverty and Median Household Income Estimates - Counties, States, and National; Source: U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program, Release date: December 2015.

The distribution of household poverty rates among national quintiles for Appalachian counties is shown in Table 51. Of the 420 counties in the Region, 122 (29 percent) rank in the worst-performing national quintile, while 17 (4 percent) rank in the best-performing national quintile.

Table 51: Distribution of Household Poverty Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Household poverty	17	*4%*	52	*12%*	95	*23%*	134	*32%*	122	*29%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Disability

KEY FINDINGS | Percentage Receiving Disability Benefits

- The percentage of people receiving disability benefits is higher in the Appalachian Region (7.3 percent) than in the United States as a whole (5.1 percent).
- All five Appalachian subregions report higher percentages of their populations receiving disability benefits than the nation as a whole, with Central Appalachia having a particularly high figure of 13.9 percent.
- There is a clear urban-rural divide in the receipt of disability benefits. Residents in the Appalachian Region's rural counties are more likely to receive benefits (11.2 percent) than residents in the Region's large metro areas (5.5 percent).
- In the Appalachian Region's distressed counties, 13.6 percent of residents receive disability benefits, compared to 6.9 percent living in the Region's non-distressed counties.

Background

This indicator measures the portion of the population receiving disability benefits from the Social Security Administration, either through the Old-Age, Survivors, and Disability Insurance (OASDI) program or the Supplemental Security Income (SSI) program. Figures for this measure come from 2014 data from the Social Security Administration. People receiving disability benefits necessarily have at least one health issue—whether an injury or illness—that prevents them from earning wages to support themselves. A higher percentage of a county's residents receiving disability benefits thus indicates a less healthy population overall.

People receiving disability benefits do not have the capacity to earn wages and therefore rely on disability benefits for basic needs like food and shelter, as well as life-sustaining medications. In addition to being an indicator of present medical issues, recipients of disability benefits often have a shorter life expectancy than their able-bodied peers (Keeler, Guralnik, Tian, Wallace, & Reuben, 2010). Higher disability rates among a county's population—especially among older residents—also indicates a need for additional services, such as long-term institutional care and home health care assistance (Harris-Kojetin, Sengupta, Park-Lee, & Valverde, 2013).

Overview: Percentage Receiving Disability Benefits in the Appalachian Region

With 7.3 percent of residents receiving some form of disability benefits, the receipt of these benefits is more common in the Appalachian Region than in the nation as a whole (5.1 percent). Each of the five subregions have values above the national mark, and even the best-performing Northern Appalachia subregion (6.5 percent) is still well above the national average. Central Appalachia has the highest percentage among the subregions, with 13.9 percent of its residents receiving disability benefits.

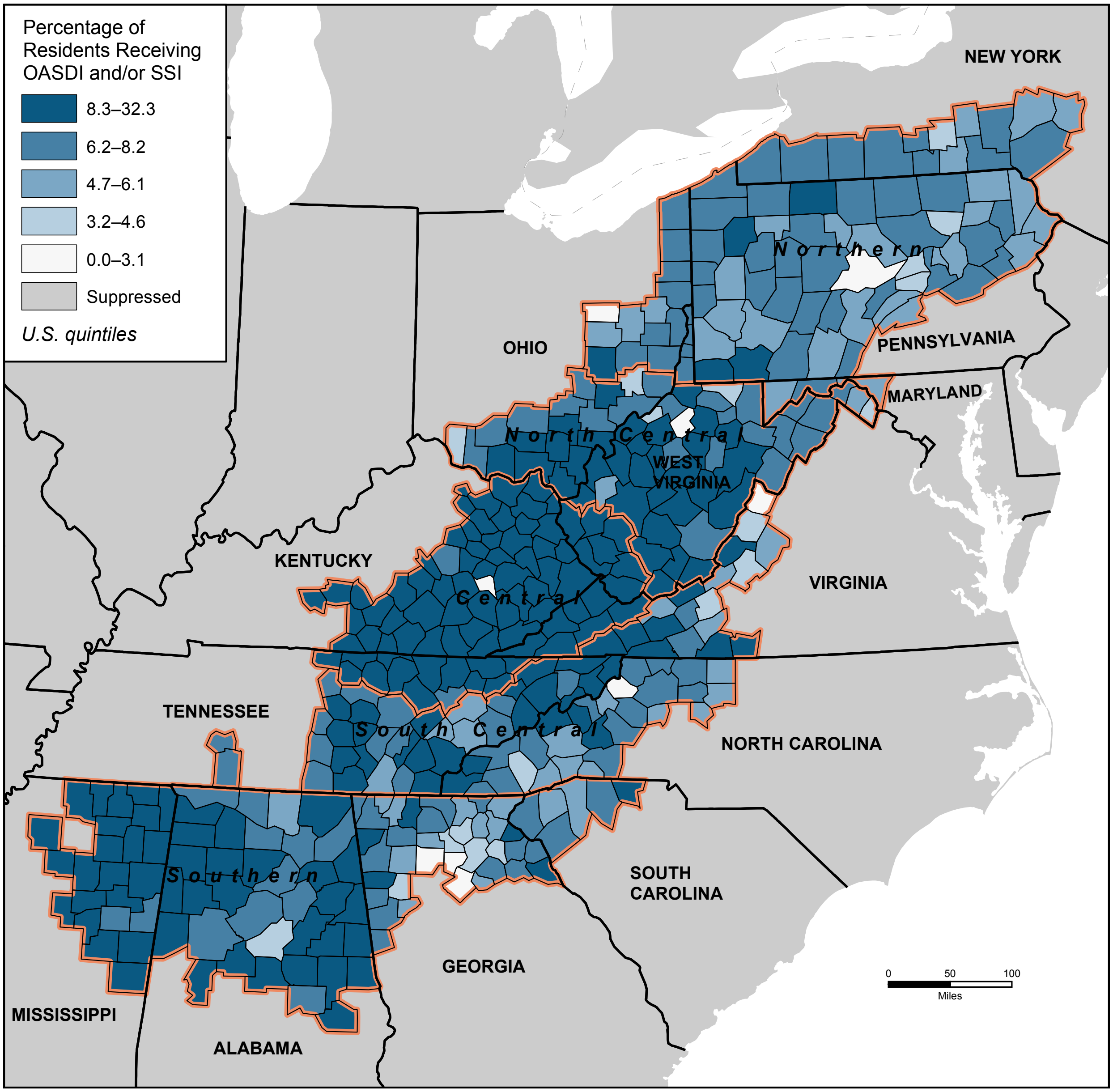
As one moves from large metro areas to rural areas, the percentage of a population receiving disability benefits increases with each change in classification. Appalachian residents in large metro areas (5.5 percent) are less likely to receive any type of disability benefit than residents in the Region's rural areas (11.2 percent). The economic status of a county also serves as an indicator. In Appalachian counties classified as economically distressed, 13.6 percent of residents receive disability benefits, compared to 6.9 percent in non-distressed counties.

With 14.3 percent of its residents receiving disability benefits, Appalachian Kentucky reports a number far higher than both the national figure (5.1 percent) and the non-Appalachian portion of the state (6.8 percent). Appalachian Virginia (9.3 percent) reports a high figure, and a value much larger than that found in non-Appalachian Virginia (3.7 percent). Appalachian Mississippi (9.7 percent) also reports a value greater than its non-Appalachian portion (8.0 percent). Only Appalachian Georgia has a value lower than the national mark.

Figure 161 shows the variation in the percentage of a county's population receiving disability benefits across the Appalachian Region, grouped by national quintiles. Darker colors indicate higher values; for this measure, higher values are associated with worse health. High values are pronounced throughout much of the Central Appalachia subregion, with a large number of counties ranking in the worst-performing national quintile.

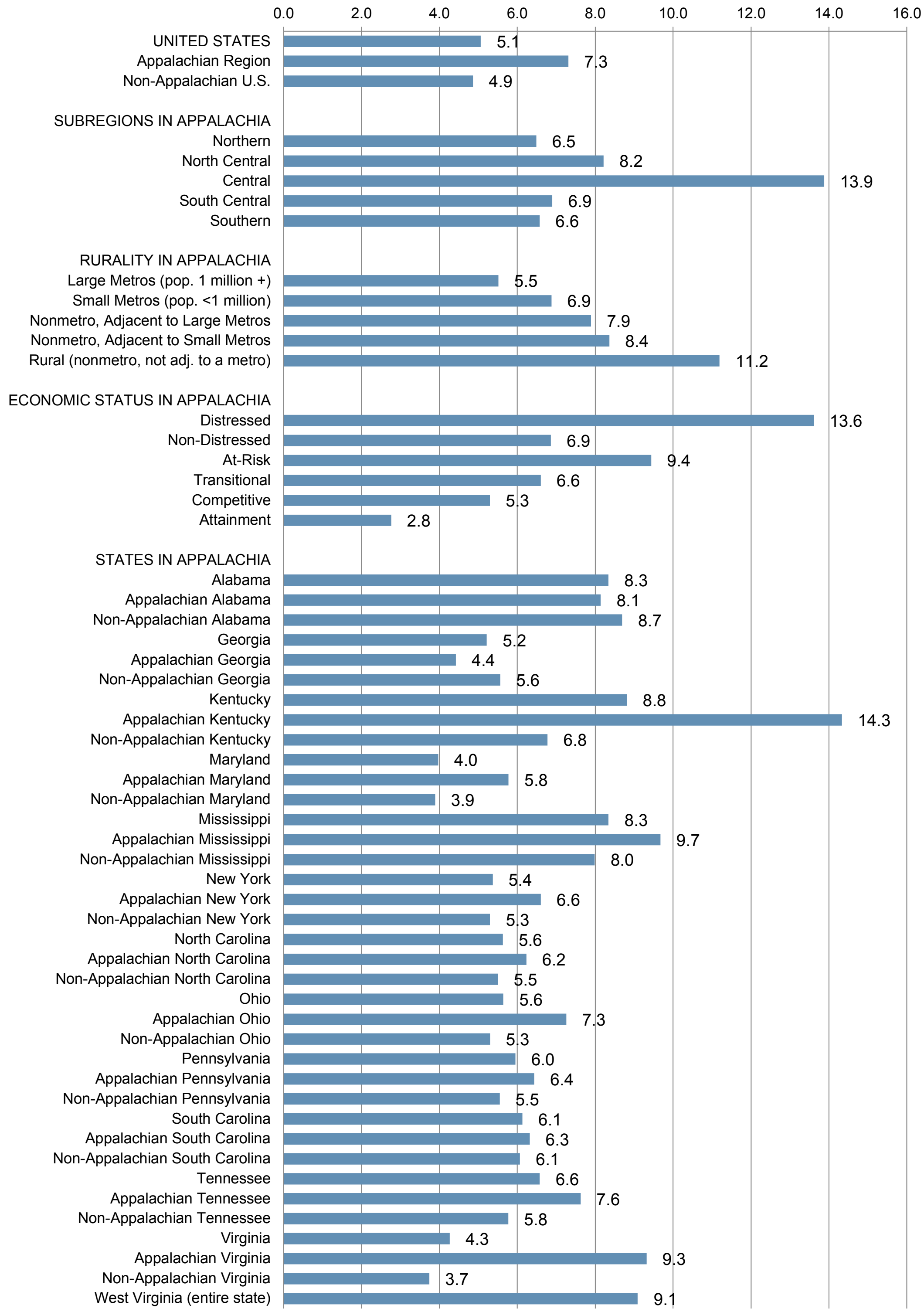
Figure 162 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 161: Map of Percentage of Residents Receiving Disability Benefits in the Appalachian Region, 2014



Data source: SSA OASDI Beneficiaries. Social Security Administration. https://www.ssa.gov/policy/data_sub12.html.

Figure 162: Chart of Percentage of Residents Receiving Disability Benefits, 2014

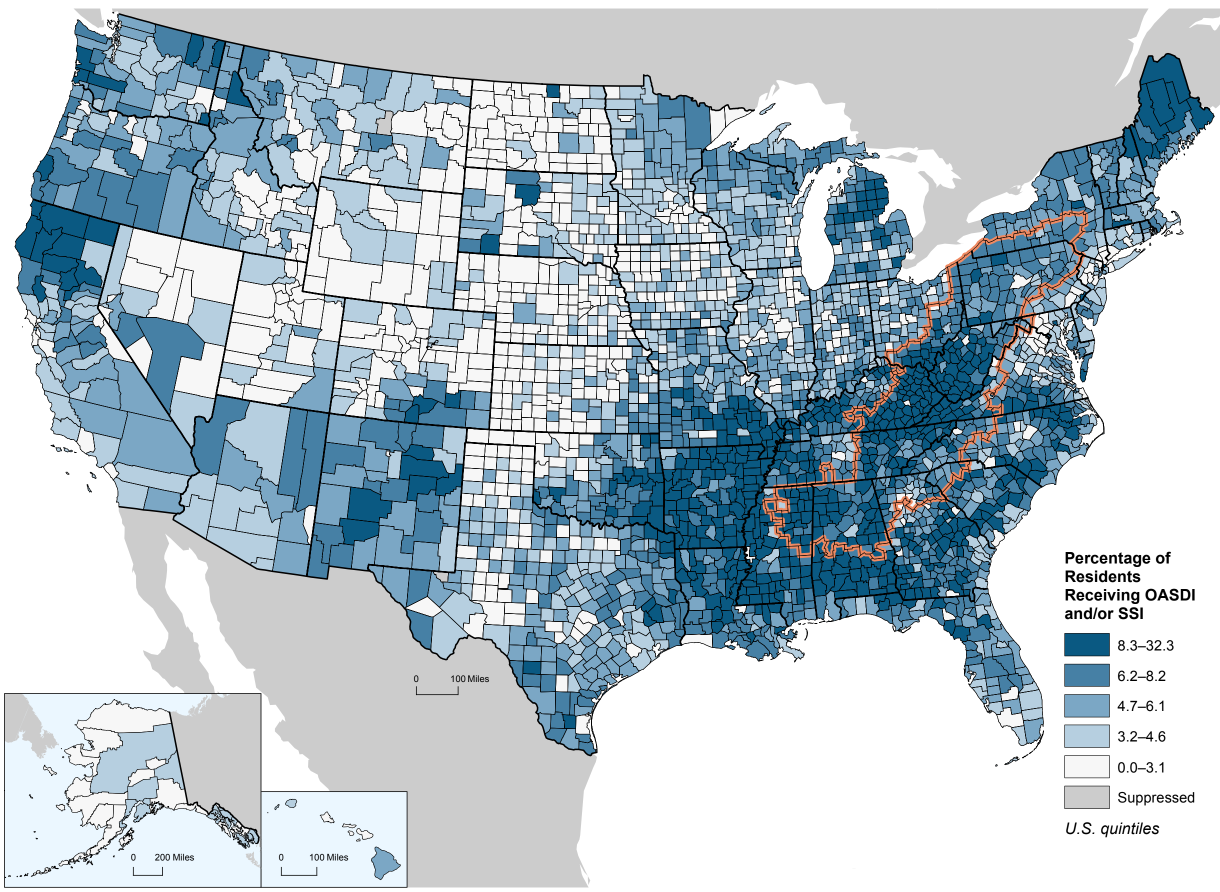


Data source: SSA OASDI Beneficiaries. Social Security Administration. https://www.ssa.gov/policy/data_sub12.html.

Overview: Percentage Receiving Disability Benefits in the United States

Figure 163 shows the variation in the percentage of a county's population receiving disability benefits across the United States. Much of the Appalachian Region stands out for having a large percentage of the population receiving benefits. The northern part of the Mississippi Delta region, including most of Arkansas and southern Missouri, have a large number of counties ranking in the worst-performing national quintile. Other concentrations of poor performance exist throughout the country, including multiple pockets in the Northwest, northern Michigan, and Maine. Much of Central and Southern California consists of counties in the best-performing national quintile. The Rocky Mountain region and upper Midwest also contain a large number of counties among the best-performing quintiles. Southern Florida and the metropolitan areas stretching from Boston to Washington, D.C. also report very low percentages of their populations receiving disability benefits.

Figure 163: Map of Percentage of Residents Receiving Disability Benefits in the United States, 2014

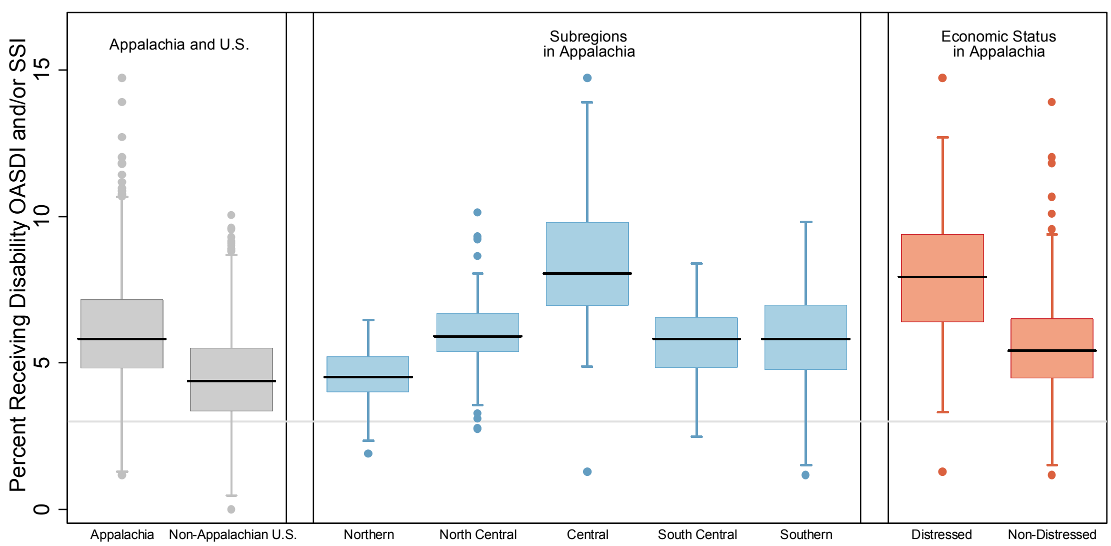


Data source: SSA OASDI Beneficiaries. Social Security Administration. https://www.ssa.gov/policy/data_sub12.html.

Distribution of Percentage Receiving Disability Benefits

Figure 164 shows the distribution of the percentage of a population receiving disability benefits by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator.

Figure 164: Box Plot of Percentage of Residents Receiving Disability Benefits by Geography and Economic Status, 2014



Grey line denotes national average. 0 of 3113 counties have a missing value for this indicator.
For this indicator, higher values are associated with worse health.

Data source: SSA OASDI Beneficiaries. Social Security Administration. https://www.ssa.gov/policy/data_sub12.html.

The distribution of the percentage of a population receiving disability benefits among national quintiles for Appalachian counties is shown in Table 52. Of the 420 counties in the Region, 203 (48 percent) rank in the worst-performing national quintile, while 9 (2 percent) rank in the top-performing national quintile.

Table 52: Distribution of Percentage of Residents Receiving Disability Benefits among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Disability	9	*2%*	19	*5%*	59	*14%*	130	*31%*	203	*48%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Education

KEY FINDINGS | Percentage of Adults with Some College Education

- In the Appalachian Region, 57.1 percent of adults ages 25 to 44 have some type of post-secondary education, compared to 63.3 percent in the nation as a whole.
- Among the subregions, Central Appalachia (46.7 percent) has the lowest percentage of its population with some type of post-secondary education.
- There is an urban-rural divide in education throughout the Region. Adults in the Appalachian Region's large metro areas (65.1 percent) are more likely to have attended a post-secondary institution than those in the Region's rural areas (49.0 percent).
- The economic status of a county is an indicator of education levels throughout Appalachia. In the Region, 57.9 percent of adults living in non-distressed counties have attended a post-secondary institution, compared to just 45.0 percent of those living in distressed counties.

Background

The percentage of adults with some college education is the percentage of adults ages 25 to 44 who have attended a post-secondary institution. The figures for this measure come from County Health Rankings and are based on 2010-2014 American Community Survey data collected by the U.S. Census Bureau. For the measurement of this variable, post-secondary educational institutions include vocational and technical schools, two-year colleges, as well as four-year colleges. The measure includes both those who completed a program or earned a degree, as well as those who attended but did not complete a program or receive a degree.

Higher levels of education are associated with greater levels of health literacy, which allow people to make smarter, more-informed decisions regarding their health.

High levels of health literacy are one of the largest predictors of positive health outcomes (Berkman, et al., 2004). The National Poverty Center at the University of Michigan reports that individuals with four years or more of higher education are less likely to report being in poor health, depressed, suffer from obesity, smoke, or abuse alcohol (Cutler, 2007). In addition to the improved behaviors that come from a higher level of health literacy, higher levels of education are also associated with higher incomes, which allow people to afford health insurance, health care, and additional resources related to a healthy lifestyle.

Overview: Percentage of Adults with Some College Education in the Appalachian Region

Overall, 57.1 percent of the Appalachian Region's population has attended a post-secondary institution, compared to the national average of 63.3 percent. At a subregional level, the three central subregions report the lowest levels of education, with Central Appalachia (46.7 percent) far lower than both North Central (53.5 percent) and South Central Appalachia (57.0 percent).

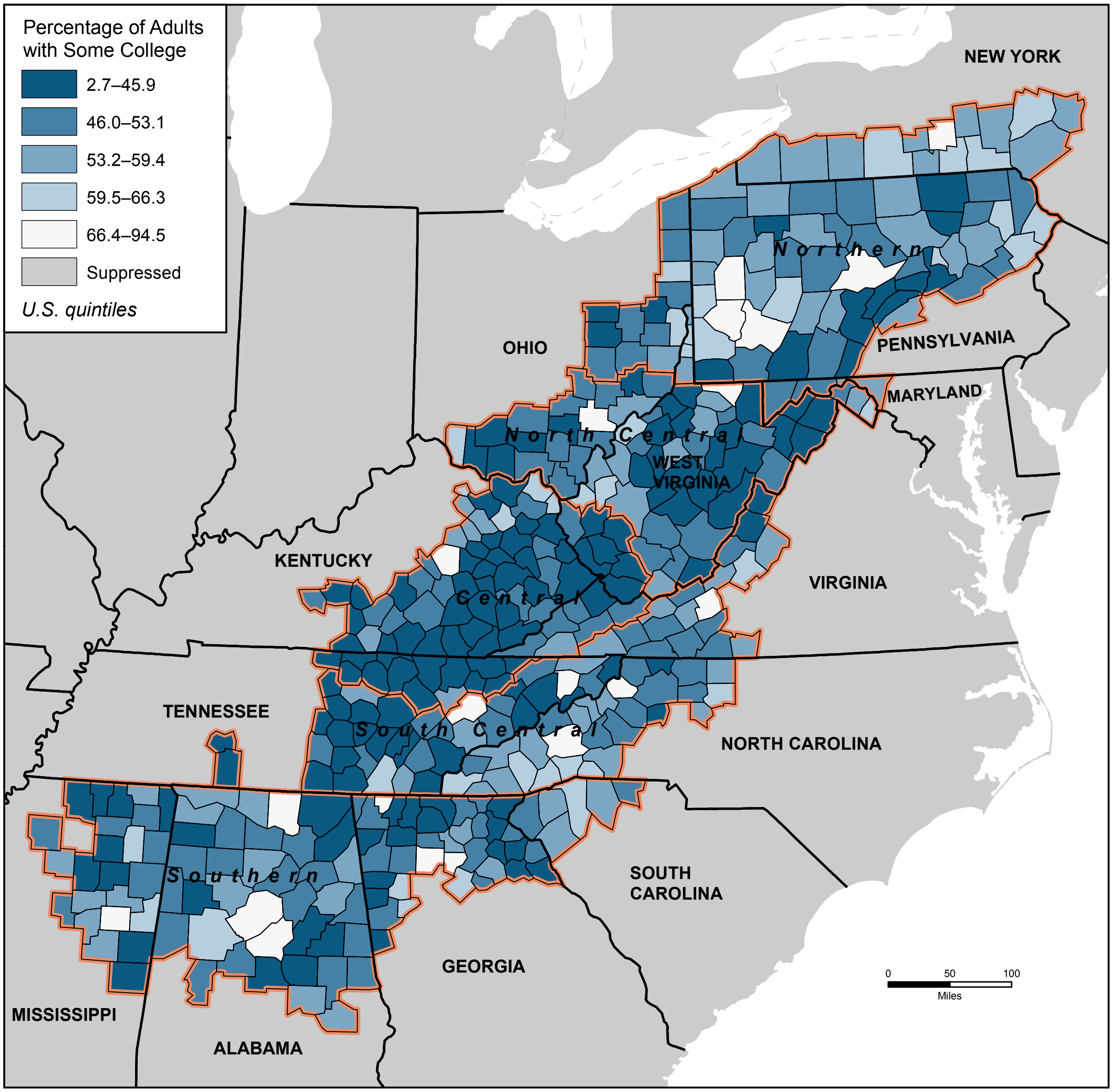
There is a strong urban-rural component to education levels, with those living in the Appalachian Region's large metro areas (65.1 percent) more likely to have attended a post-secondary institution than those in the Region's rural areas (49.0 percent). The lowest percentage is found among residents living in nonmetro areas adjacent to small metro areas, where the figure stands at 48.6 percent. The economic status of an Appalachian county is a strong indicator of education levels, with the Appalachian Region's non-distressed counties reporting a higher percentage than the Region's distressed counties (57.9 percent compared to 45.0 percent).

Appalachian Kentucky reports the lowest levels of education in the Region—48.4 percent of its population ages 25 to 44 has attended a post-secondary institution. The figure for non-Appalachian Kentucky is 62.8 percent. Appalachian Ohio (52.2 percent) reports the second lowest percentage in the Region, a figure well below the mark for the non-Appalachian portion of the state (65.3 percent). West Virginia also reports a very low percentage with just 53.1 percent of its residents having attended a post-secondary institution. No Appalachian portion of any of the states in the Region report an education level that matches or exceeds the national mark.

Figure 165 shows the variation in post-secondary education levels across the Appalachian Region, grouped by national quintiles. Darker colors indicate a lower percentage of a county's population that have attended some type of post-secondary institution; for this measure, higher values are associated with better health. Each subregion has a mix of counties performing in both the best- and worst-performing national quintiles, though concentrated pockets of poor performance are noticeable throughout each of the three central subregions.

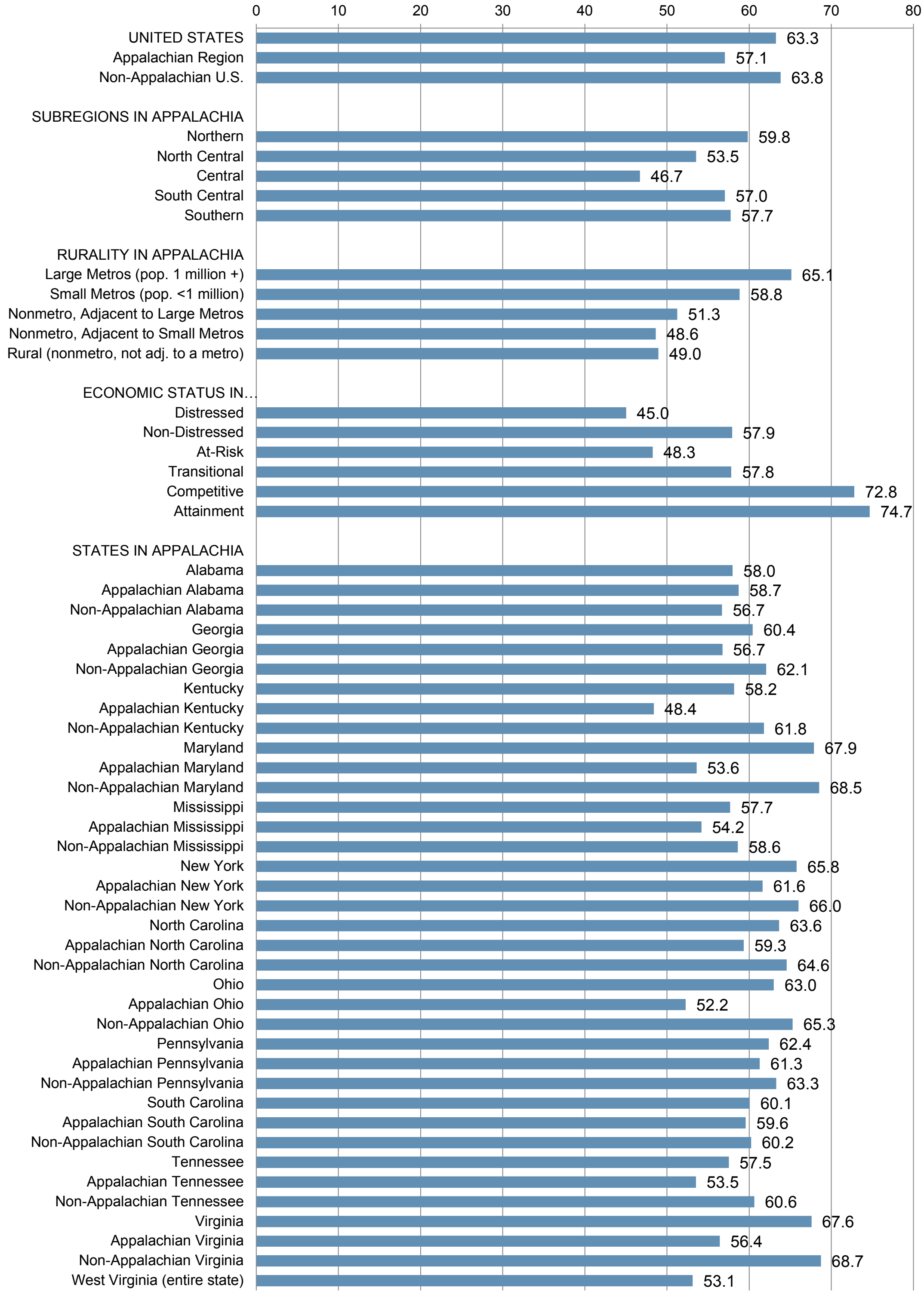
Figure 166 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 165: Map of Percentage of Adults with Some College Education in the Appalachian Region, 2010–2014



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 166: Chart of Percentage of Adults with Some College Education, 2010–2014

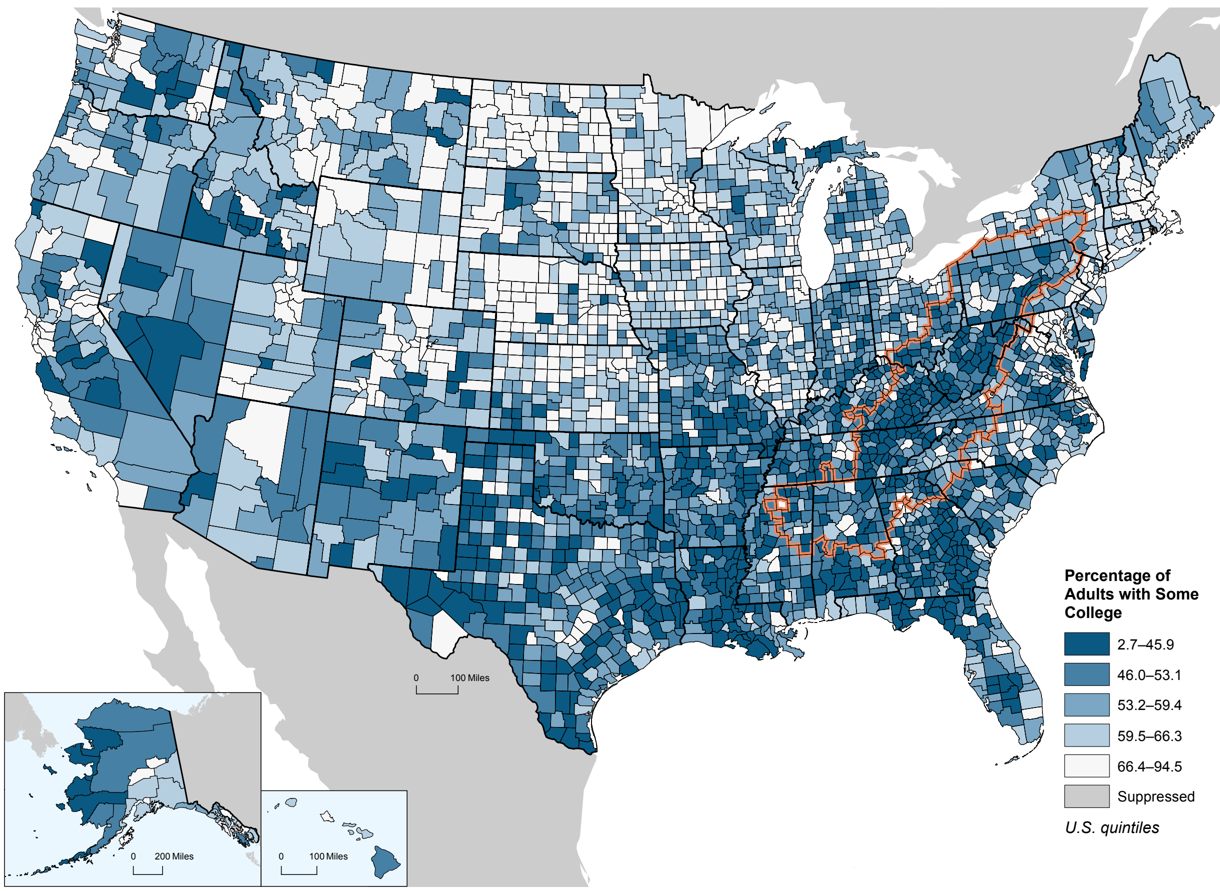


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Percentage of Adults with Some College Education in the United States

Figure 167 shows the variation in post-secondary education levels across the United States. The low percentages found in Appalachia stretch down into the Southeast and Mississippi Delta regions. Missouri, Arkansas, and Louisiana all report low levels of education that stretch west into Oklahoma, Texas, and parts of the Southwest. Much of the Upper Midwest and Northeast report high education levels. There are pockets of high education levels located around most of the large metropolitan areas throughout the country.

Figure 167: Map of Percentage of Adults with Some College Education in the United States, 2010-2014

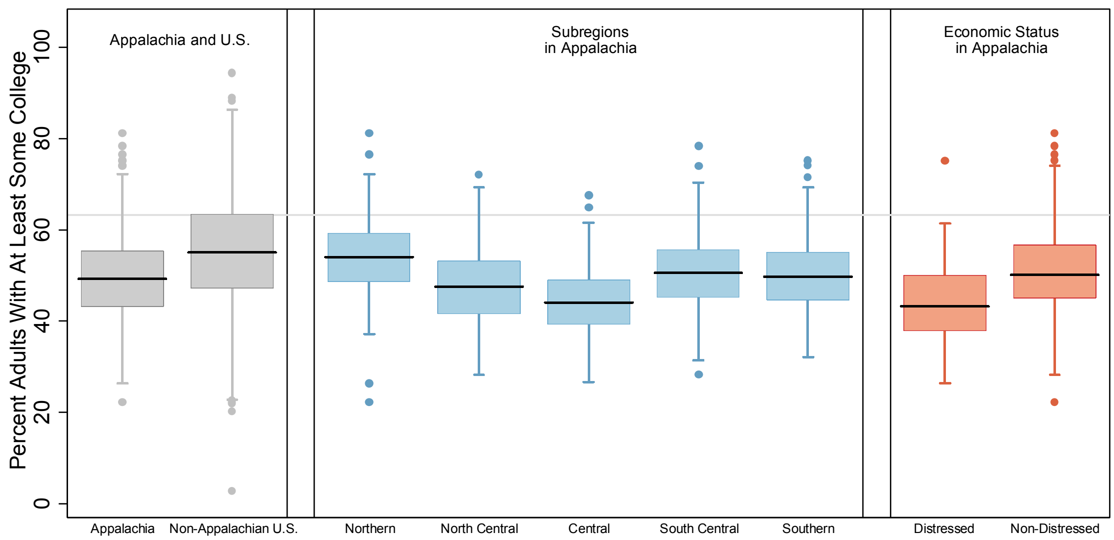


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Percentage of Adults with Some College Education

Figure 168 shows the distribution of post-secondary education percentages by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of 3,113 counties, one has a missing value for this indicator.

Figure 168: Box Plot of Percentage of Adults with Some College Education by Geography and Economic Status, 2010-2014



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of post-secondary education percentages among national quintiles for Appalachian counties is shown in Table 53. Of the 420 counties in the Region, 150 (36 percent) rank in the worst-performing national quintile, while 20 (5 percent) rank in the best-performing national quintile.

Table 53: Distribution of Percentage of Adults with Some College Education among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Education: some college	20	*5%*	39	*9%*	83	*20%*	128	*30%*	150	*36%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Social Associations

KEY FINDINGS | Social Association Rates

- The social association rate in Appalachia is 33 percent higher than the rate found in the nation as a whole.
- Social association rates are highest in Northern Appalachia (14.2 associations per 10,000 population) and South Central Appalachia (13.3 per 10,000). Only Central Appalachia (8.8 per 10,000) has a rate lower than the national figure.
- There is no clear urban-rural pattern in social association rates throughout Appalachia. The Appalachian Region's large metro counties (10.9 associations per 10,000 population) and its rural counties (11.8 per 10,000) both report rates lower than the Regional average, yet higher than the national average.
- The social association rate in the Appalachian Region's non-distressed counties is 28 percent higher than the rate found in the Region's distressed counties.

Background

The social association rate measures the number of social organizations per 10,000 population. The data come from County Health Rankings and are based on 2013 data from the Census Bureau's County Business Patterns. Greater levels of social relationships and interaction positively affect a number of outcomes, including those associated with both mental and physical health.

For this measure, social organizations include membership organizations such as bowling centers, fitness centers, golf clubs, and any type of business, civic, labor, political, professional, religious, or sports organizations.

In one seminal study examining the relationship between mortality and social and community ties, it was found that people who lacked these ties were more than twice as likely to have died in the follow-up period nine years later (Berkman & Syme, 1979). Another study found an increased risk of mortality from urgent events, such as cardiac death when one is socially isolated (Brummett, et al., 2001). In addition to these direct mortality connections, increased social involvement can lead to healthier behaviors that lower mortality risk (Berkman & Breslow, 1983). Social involvement also helps mental well-being, as close ties allow a person to deal with stress more effectively (Cohen, 2004).

Overview: Social Association Rates in the Appalachian Region

The Appalachian Region has a higher social association rate than the United States as a whole. With 12.5 social organizations per 10,000 population, the Region's rate is 33 percent higher than the rate found in the nation as a whole (9.4 per 10,000). Central Appalachia (8.8 per 10,000) is the only subregion reporting a rate below the national mark. Social association rates are highest in the Northern Appalachian (14.2 per 10,000) and South Central Appalachian (13.3 per 10,000) subregions, with many counties ranking in the two top-performing national quintiles.

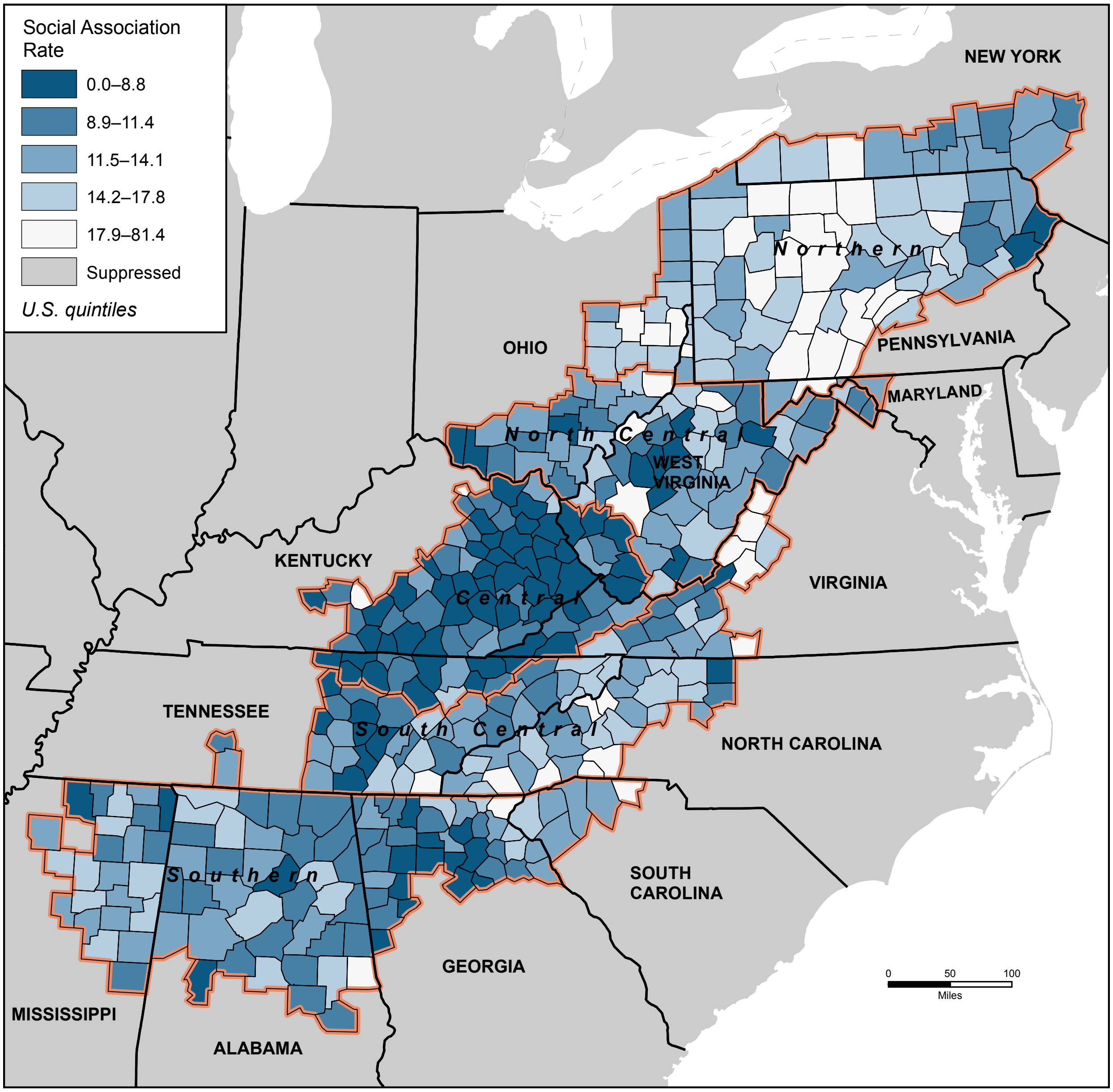
There is no clear urban-rural pattern in social association rates throughout Appalachia, with large metro areas (10.9 per 10,000) and rural areas (11.8 per 10,000) reporting the lowest rates among the five classifications. Nonmetro areas adjacent to large metro areas and nometro areas adjacent to small metro areas report the highest rates in the region at 13.6 social organizations per 10,000 population. Economic status, however, does serve as an indicator for social association rates. The social association rate among non-distressed counties (12.7 per 10,000) in Appalachia is 28 percent higher than the rate found in distressed counties (9.9 per 10,000).

Appalachian Georgia (8.3 per 10,000) reports the lowest social association rate in the Region, a figure 12 percent lower than the non-Appalachian Georgia rate (9.4 per 10,000). Appalachian Kentucky (8.6 per 10,000) reports the next lowest rate in the Region, and one much lower—25 percent lower—than the rate found in non-Appalachian Kentucky (11.5 per 10,000). However, many states report higher social association rates in the Appalachian portions, including many throughout Northern Appalachia. Appalachian Maryland, with a rate of 14.5 per 10,000 is 65 percent higher than non-Appalachian Maryland; Appalachian Pennsylvania's rate of 14.3 per 10,000 is 34 percent higher than non-Appalachian Pennsylvania; and the rate of 12.9 per 10,000 in Appalachian New York is 70 percent higher than in non-Appalachian New York.

Figure 169 shows the variation in social association rates across the Appalachian Region, grouped by national quintiles. Darker colors indicate lower levels of social association; for this measure, higher values are associated with better health. Central Appalachia stands out for having a large number of counties ranking in the worst-performing national quintile. Meanwhile, Northern Appalachia also stands out for having many counties ranking in the top-performing quintile.

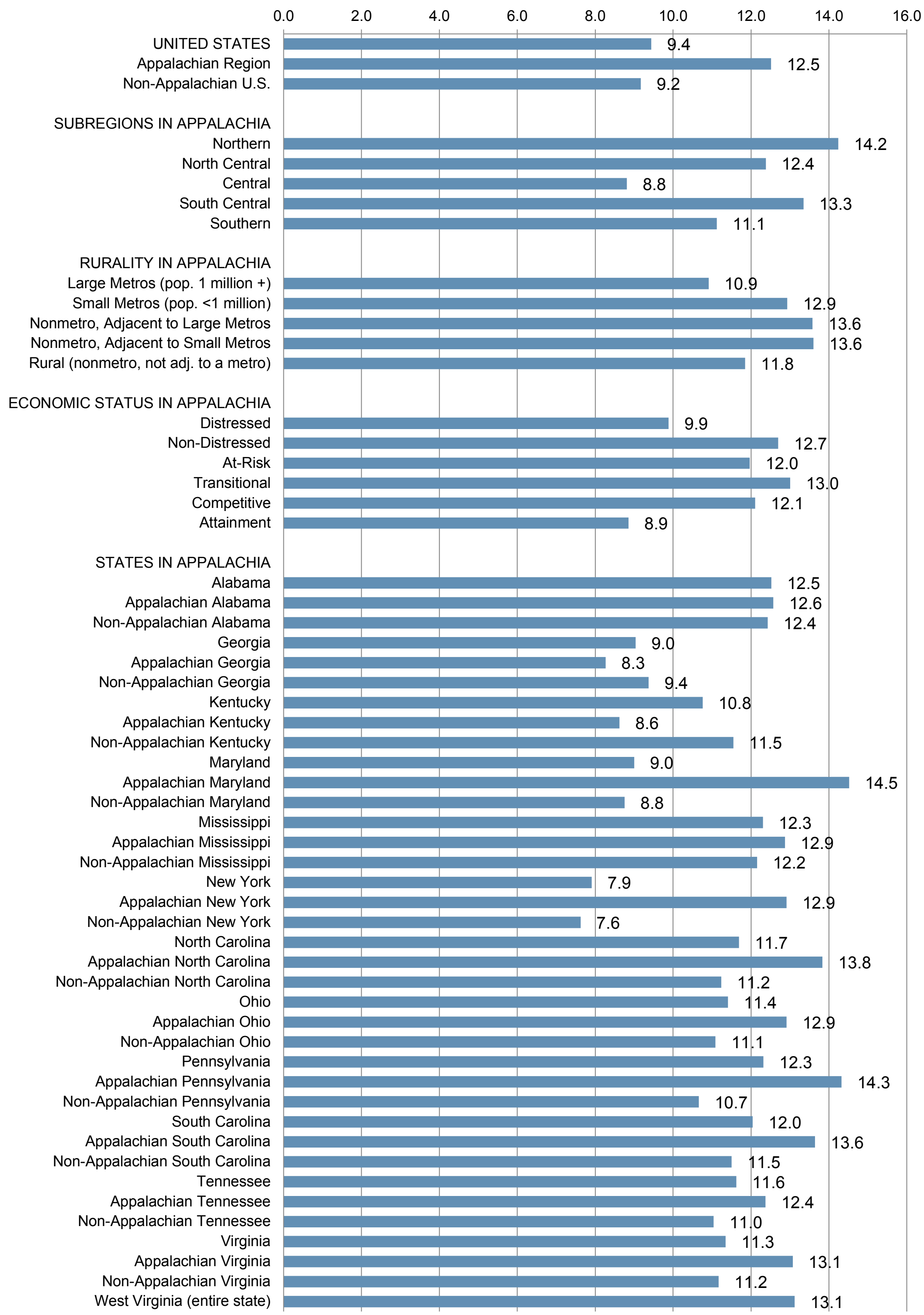
Figure 170 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 169: Map of Social Organizations per 10,000 Population in the Appalachian Region, 2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Figure 170: Chart of Social Organizations per 10,000 Population, 2013

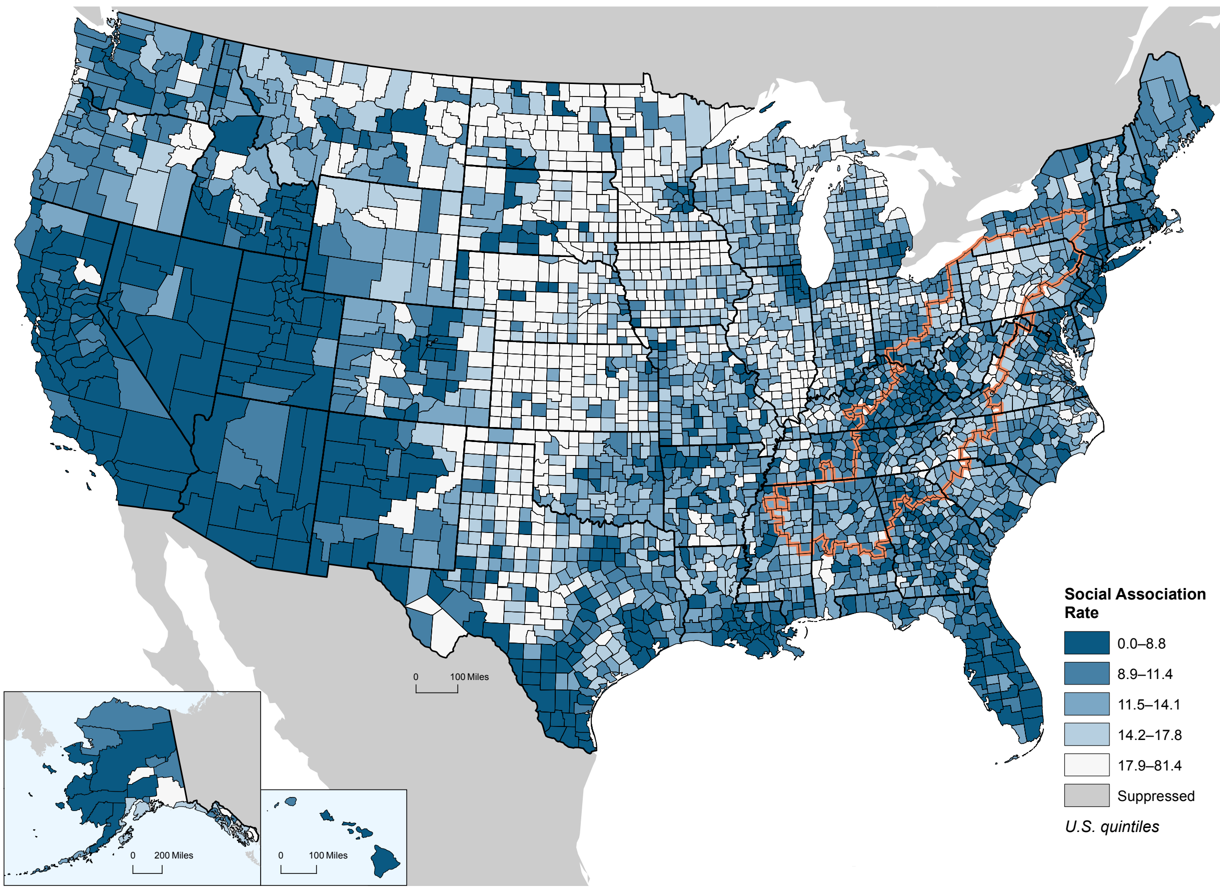


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Overview: Social Association Rates in the United States

Figure 171 shows the variation in social association rates across the United States. Outside of the dark pocket in Central Appalachia, much of the Region ranks in the middle quintiles. High rates are noticeable in Northern Appalachia, particularly Pennsylvania, and stretch into the Midwest. High rates are found throughout the middle of the country, stretching from central Texas to the Dakotas in the North. Much of the West, meanwhile, has very low social association rates, and particularly in the Southwest and California. Unlike most other measures in this report, lower values and poor performance are found around large metropolitan areas.

Figure 171: Map of Social Organizations per 10,000 Population in the United States, 2013

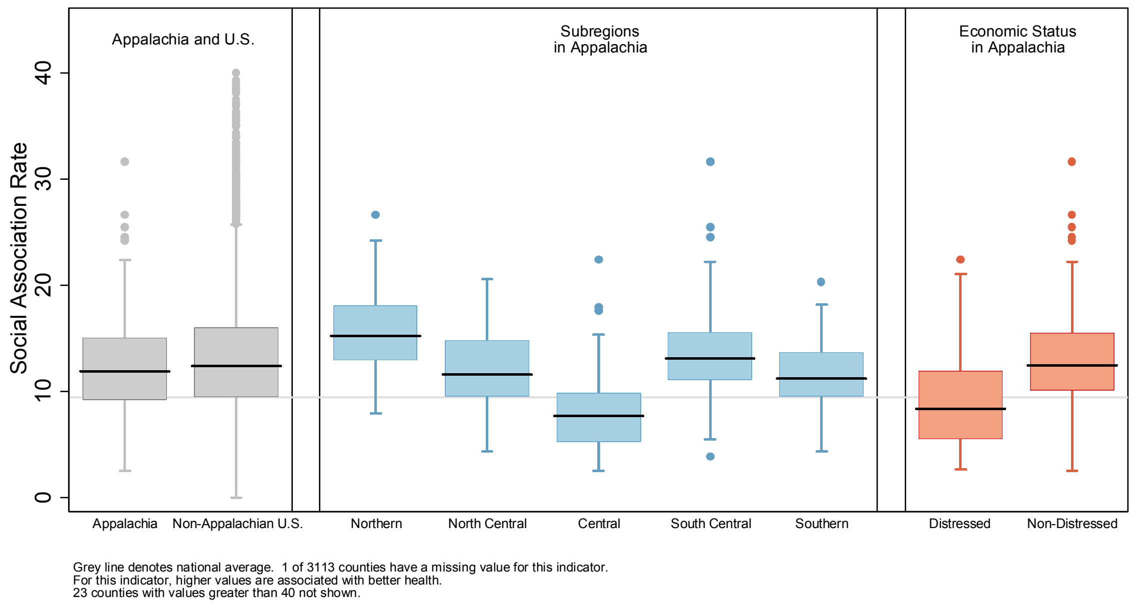


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

Distribution of Social Association Rates

Figure 172 shows the distribution of social association rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, only one has a missing value for this indicator, and 23 counties with values greater than 40 are not represented in the box plot.

Figure 172: Box Plot of Social Organizations per 10,000 Population by Geography and Economic Status, 2013



Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

The distribution of social association rates among national quintiles for Appalachian counties is shown in Table 54. Of the 420 counties in the Region, 86 (20 percent) rank in the worst-performing national quintile, while 45 (11 percent) rank in the top-performing national quintile.

Table 54: Distribution of Social Organizations per 10,000 Population among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Social associations	45	*11%*	89	*21%*	102	*24%*	98	*23%*	86	*20%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Further Reading

Median Household Income

DeNavas-Walt, Carmen and Bernadette D. Proctor, U.S. Census Bureau, Current Population Reports, P60-252, Income and Poverty in the United States: 2014, U.S. Government Printing Office, Washington, DC, 2015.

Poverty

U.S. Census Bureau. Income, Poverty and Health Insurance Coverage in the United States: 2014. Available at: http://www.census.gov/newsroom/press-releases/2015/cb15-157.html

Disability

Social Security Administration. Annual Statistical Report on the Social Security Disability Insurance Program, 2014. https://www.ssa.gov/policy/docs/statcomps/di_asr/2014/index.html

Education

County Health Rankings & Roadmaps. Some College. http://www.countyhealthrankings.org/measure/some-college

Social Associations

County Health Rankings & Roadmaps. Social Association. http://www.countyhealthrankings.org/measure/social-associations

Riumallo-Herl, C. J., Kawachi, I., & Avendano, M. (2014). Social capital, mental health and biomarkers in Chile: Assessing the effects of social capital in a middle-income country. Social Science & Medicine (1982), 105, 47–58.

Trends in Appalachian Health

KEY FINDINGS | Trends in Appalachian Health

- Although the Appalachian Region experienced improvements in seven of the eight variables considered in this section, the improvements made by the nation overall frequently outpace those made by the Region. Since Appalachia is already behind the United States as a whole, this signifies a widening gap.
- Between 1989–1995 and 2008–2014, the Region saw improvements (decreases) in the following measures, although each of these lagged behind the improvement experienced by the nation overall:
  - Years of Potential Life Lost (8 percent decline in Applachia vs. 24 percent in the U.S.)
  - Cancer Mortality Rates (14 percent decline vs. 21 percent)
  - Heart Disease Mortality Rates (39 percent decline vs. 43 percent)
  - Stroke Mortality Rates (35 percent decline vs. 40 percent)
  - Infant Mortality Rates (19 percent decline vs. 28 percent)
- Between 1990 and 2013, the Appalachian Region experienced a greater increase in the supply of Office-based Primary Care Physicians (31 percent) than the United States overall (27 percent).
- Between 1995 and 2014, the Appalachian Region saw a larger worsening in its household poverty rate (from 14.2 percent to 17.2 percent) than the United States as a whole (from 13.6 percent to 15.6 percent).
- Between 1990 and 2009–2013, the Region saw a substantial increase in the percentage of its population that had received a high school diploma (68.4 percent to 84.6 percent), which represents a significant reduction in the gap between the Region and the nation overall (the United States increased from 75.7 percent to 85.9 percent).

OVERVIEW

This section reviews the change in a few selected indicators over a period of approximately two decades. The changes in the Appalachian Region are compared to the United States as a whole for eight measures examining premature death, causes of death, child and maternal health, health care access, and socioeconomic status. Two of the indicators used in this section differ from those examined previously in the report as some variables were not available at the county level for the earlier time period.

In this section, maps display performance throughout the Region for both of the time periods, with national quintiles again dividing and ranking counties throughout Appalachia. For the mortality measures, both time periods consist of data gathered during two seven-year spans: 1989–1995 and 2008–2014. This has the effect of reducing suppressed values in low population counties, as well as smoothing single year spikes in mortality.

Although improvements have been made in most of these indicators over the past 20 years, the gains experienced by the Appalachian Region typically fall behind those made by the United States as a whole. This is not always the case, however, and there are two instances in which the improvements in the Region have outpaced those in the nation as a whole: the supply of primary care physicians and the percentage of the population with a high school diploma.

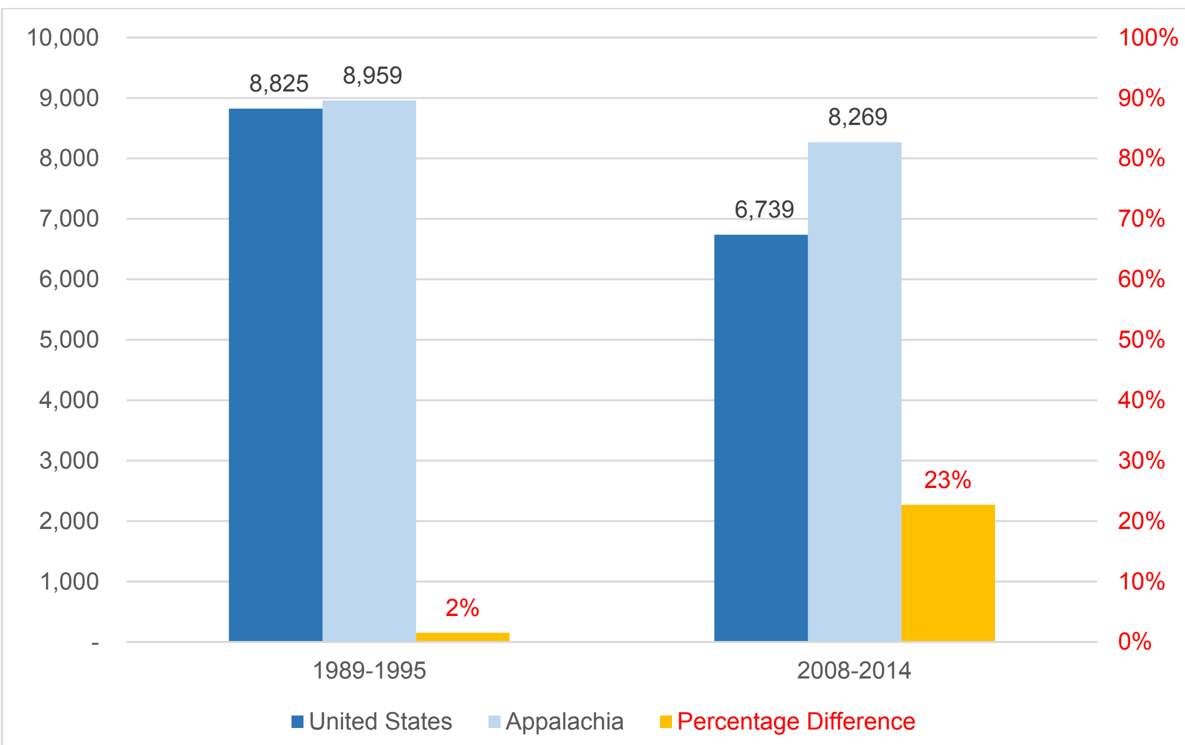
KEY TRENDS

Years of Potential Life Lost

Years of Potential Life Lost (YPLL) is a measure of premature death—higher values of YPLL indicate worse health. A decrease in this variable over time signifies an improvement in the health of a community.

Between 1989–1995 and 2008–2014,[5] the YPLL rate in the Appalachian Region decreased by 8 percent, while the United States as a whole experienced a much larger decline of 24 percent. Thus, despite the Region's improvement, the relative gap between Appalachia and the nation as a whole increased between the two time periods. As shown in Figure 173, during the 1989–1995 period, the YPLL rate in Appalachia was 2 percent higher than the rate in the United States overall, but by 2008–2014, the rate in the Region was 23 percent higher than the national rate—signifying a growing disparity.

Figure 173: Improvements in YPLL in the United States and Appalachia, 1989–1995 to 2008–2014

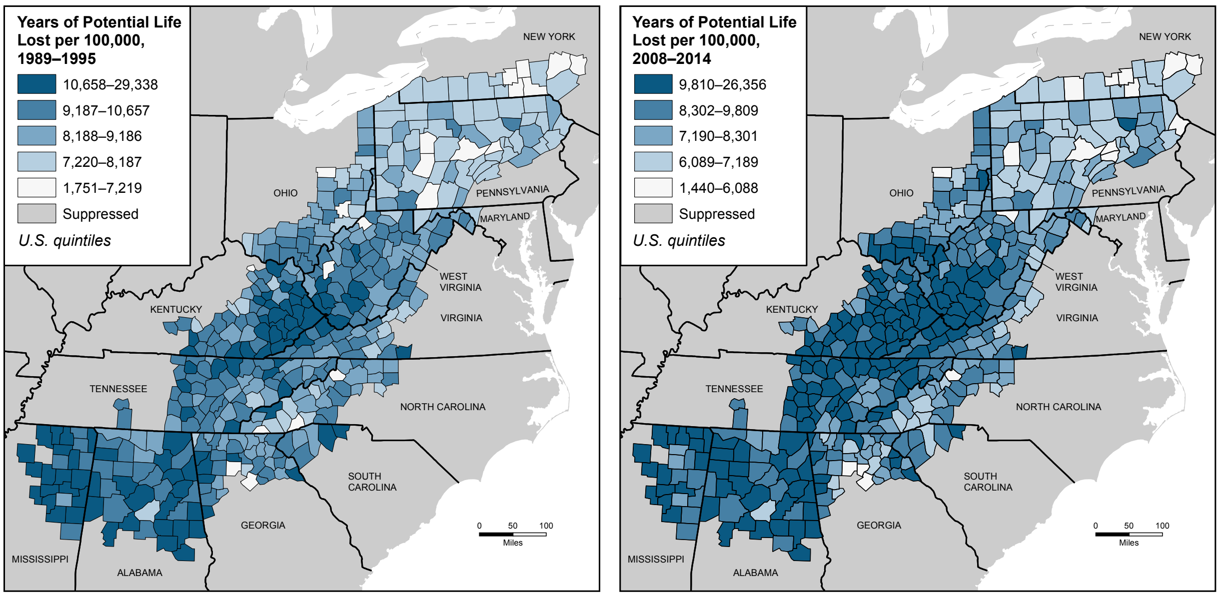


Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

[5] The data for the 2008–2014 period differ slightly from the data used for the YPLL measure found in the Mortality domain of this report. To produce an accurate trend metric and standardize the variable for the two time periods, an algorithm from County Health Rankings was used to develop a comparison measure for the period of 1989–1995, and then the same was done for the recent time span, 2008–2014.

Figure 174 maps YPLL rates for Appalachian counties during the two time periods, grouped by national quintiles. Darker colors indicate higher YPLL rates. In both time periods, the central and southern portions of the Region perform poorly, with large pockets of counties ranking in the worst national quintile. In 2008–2014, there is a considerable worsening of performance—relative to the nation overall—in the three central subregions of Appalachia, areas that were already performing poorly in 1989–1995.

Figure 174: Map of Years of Potential Life Lost per 100,000 Population in the Appalachian Region, 1989–1995 and 2008–2014



Data source: National Center for Health Statistics (2007). Compressed Mortality File, 1989-1998 (machine readable data file and documentation, CD-ROM Series 20, No. 2E) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm
National Center for Health Statistics. Compressed Mortality File, 1999-2014 (machine readable data file and documentation, CD-ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The changes in YPLL for the United States, Appalachia, and the Appalachian subregions are shown in Table 55. Central Appalachia saw a nine percent increase in its YPLL rate between the two time periods, indicating worsening health in the subregion over the past two decades. North Central Appalachia saw no change between the two time periods, and although the remaining three subregions experienced improvements, none matched the 24 percent decrease experienced by the nation as a whole.

Table 55: Change in Years of Potential Life Lost per 100,000 Population, 1989–1995 and 2008–2014

Geographic Area	1989–1995	2008–2014	Percent Change
United States	8,825	6,739	-24%
Appalachia	8,959	8,269	-8%
Rest of U.S.	8,814	6,604	-25%
Northern Appalachia	8,015	7,198	-10%
North Central Appalachia	9,078	9,033	0%
Central Appalachia	10,240	11,150	9%
South Central Appalachia	9,003	8,475	-6%
Southern Appalachia	9,584	8,347	-13%

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

The distributions of YPLL rates among national quintiles for Appalachian counties are shown in Table 56. Of the 420 counties in the Region, 89 (21 percent) ranked in the worst-performing national quintile in 1989–1995. By 2008–2014, this number jumped to 149 (35 percent). Each of the other national quintiles experienced declines in the number of Appalachian counties classified within in each. Given the darkening of the map in the central part of the Region between the two time periods, as well as the subregional trends noted above, it is clear that many of the 60 additional counties found in worst-performing national quintile are located in the three central subregions.

Table 56: Distribution of YPLL Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
YPLL, 1989–1995	20	*5%*	70	*17%*	103	*25%*	138	*33%*	89	*21%*
YPLL, 2008–2014	17	*4%*	51	*12%*	90	*21%*	113	*27%*	149	*35%*

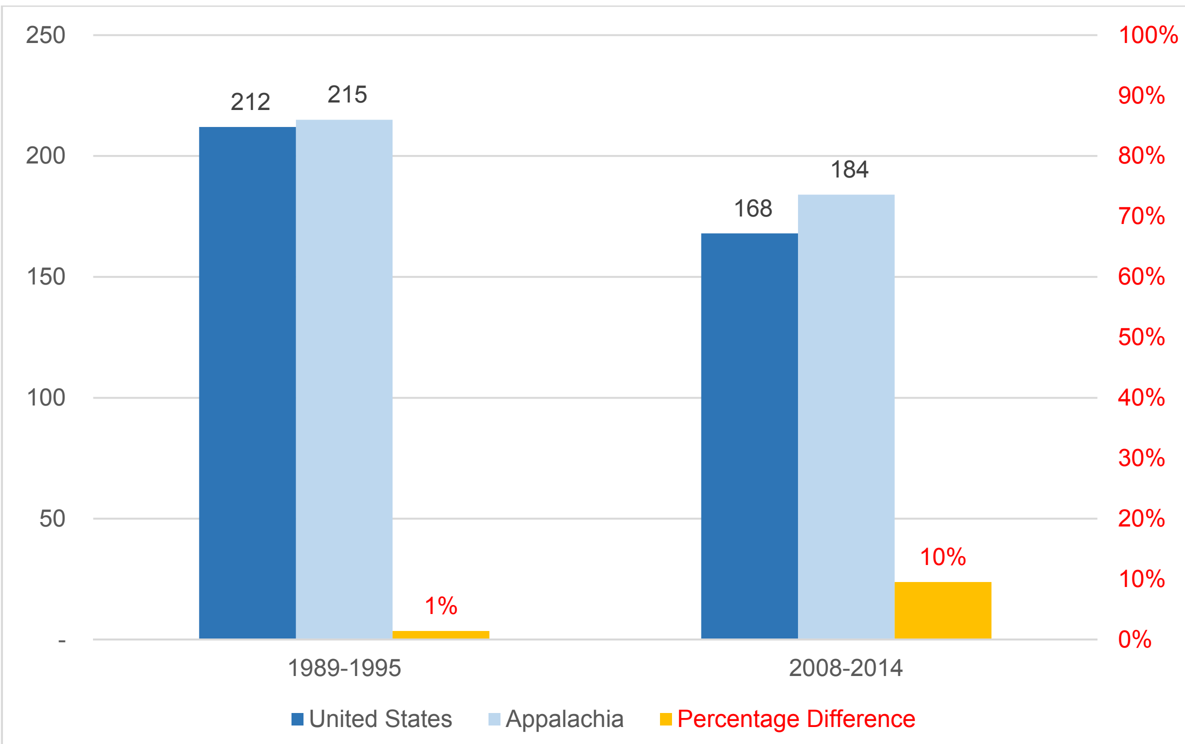
Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Cancer Mortality

The cancer mortality rate is the number of deaths with cancer as the underlying cause per 100,000 population, per year. Higher values indicate worse health, so a decrease over time marks an improvement in the health of a community.

Between 1989–1995 and 2008–2014, the cancer mortality rate in the Appalachian Region decreased by 14 percent, an improvement smaller than the 21 percent decline experienced by the United States as a whole. Thus, despite the Region's improvement, the relative gap between Appalachia and the nation as a whole increased between the two time periods. As shown in Figure 175, during the 1989–1995 period, the cancer mortality rate in Appalachia was only 1 percent higher than the rate in the United States overall, but by 2008–2014, the rate in the Region was 10 percent higher than the national rate—signifying a growing disparity.

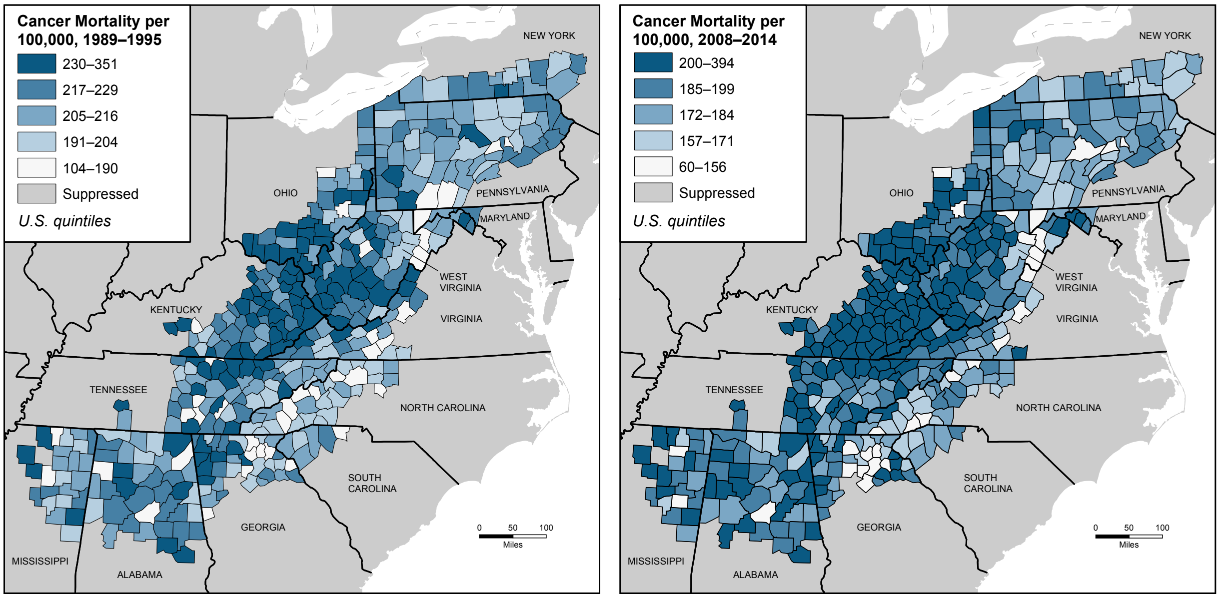
Figure 175: Improvements in Cancer Mortality in the United States and Appalachia, 1989–1995 to 2008–2014



Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

Figure 176 maps cancer mortality rates for Appalachian counties during the two time periods, grouped by national quintiles. Darker colors indicate higher cancer rates. There is a widespread increase in the number of counties ranking in the worst-performing national quintiles between 1989–1995 and 2008–2014. There is a considerable darkening throughout Central Appalachia, and although counties with low cancer mortality rates are found in the easternmost reaches of the Region in both time periods, there are fewer well-performing counties in 2008–2014. The distribution of counties in Northern Appalachia among national quintiles remains largely unchanged.

Figure 176: Map of Cancer Mortality Rates per 100,000 Population in the Appalachian Region, 1989–1995 and 2008–2014



Data source: National Center for Health Statistics (2007). Compressed Mortality File, 1989-1998 (machine readable data file and documentation, CD-ROM Series 20, No. 2E) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm
National Center for Health Statistics. Compressed Mortality File, 1999-2014 (machine readable data file and documentation, CD-ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The changes in cancer mortality rates for the United States, Appalachia, and the Appalachian subregions are shown in Table 57. All five subregions experienced decreases in rates, although Central Appalachia's improvement of just six percent lags well behind the other subregions. Among the subregions, Northern Appalachia and Southern Appalachia had the largest decreases, although these still do not match the national decline experienced over the time period.

Table 57: Change in Cancer Mortality Rates per 100,000 Population, 1989–1995 and 2008–2014

Geographic Area	1989–1995	2008–2014	Percent Change
United States	212	168	-21%
Appalachia	215	184	-14%
Rest of United States	212	167	-21%
Northern Appalachia	217	180	-17%
North Central Appalachia	226	195	-14%
Central Appalachia	236	222	-6%
South Central Appalachia	209	181	-13%
Southern Appalachia	210	177	-16%

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

The distributions of cancer mortality rates among national quintiles for Appalachian counties are shown in Table 58. Of the 420 counties in the Region, 104 (25 percent) ranked in the worst-performing national quintile in 1989–1995. This number increased to 158 (38 percent) in 2008–2014. The trend is clear with regard to distribution in the Region: over two decades, the number of counties that rank in the two worst-performing national quintiles increased, while fewer counties rank in the other three quintiles. Given the darkening of the map in the central part of the Region between the two time periods, it is clear that many of these 61 additional Appalachian counties ranking in the two worst-performing national quintiles are found in North Central, Central, and South Central subregions.

Table 58: Distribution of Cancer Mortality Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Cancer Mortality, 1989–1995	40	*10%*	77	*18%*	105	*25%*	94	*22%*	104	*25%*
Cancer Mortality, 2008–2014	29	*7%*	49	*12%*	83	*20%*	101	*24%*	158	*38%*

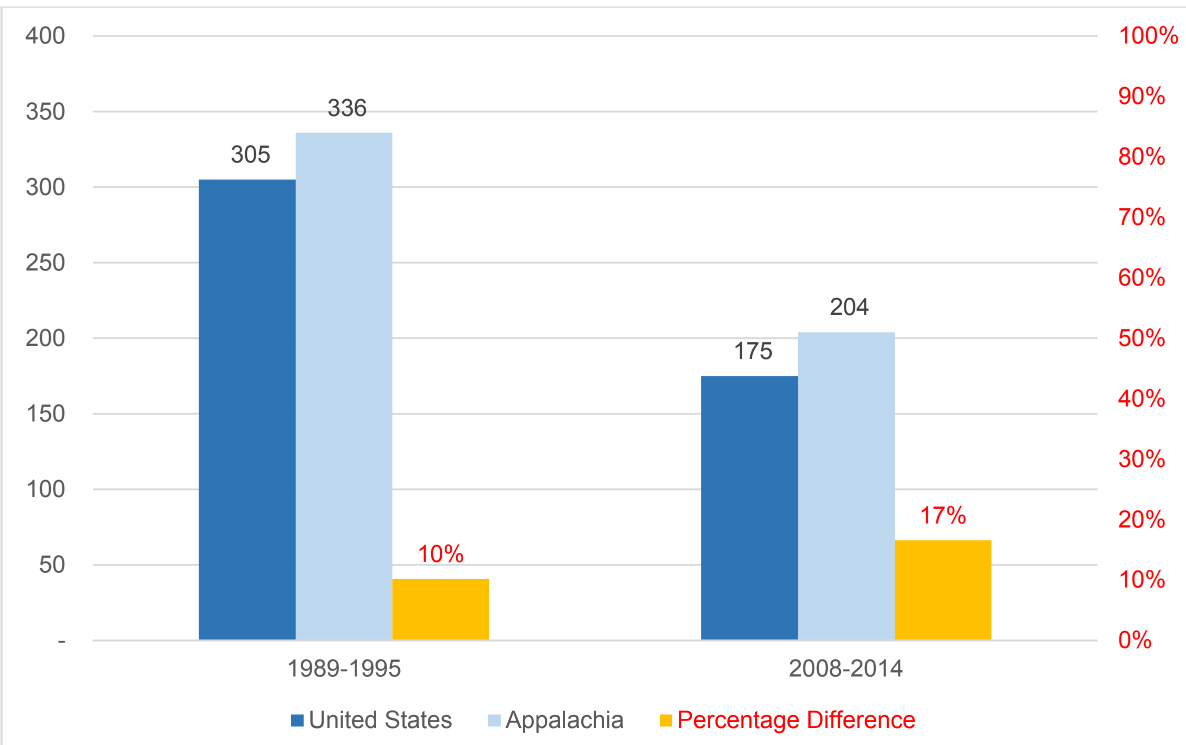
Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Heart Disease Mortality

The heart disease mortality rate is the number of deaths from all forms of heart disease per 100,000 population, per year. Higher values indicate worse health, so a decrease over time marks an improvement in the health of a community.

Between 1989–1995 and 2008–2014, the heart disease mortality rate in the Appalachian Region decreased by 39 percent, an improvement slightly less than the 43 percent decline experienced by the United States as a whole. Thus, despite the Region's improvement, the relative gap between Appalachia and the nation as a whole increased between the two time periods. As shown in Figure 177, during the 1989–1995 period, the heart disease mortality rate in Appalachia was 10 percent higher than the rate in the United States overall, but by 2008–2014, the rate in the Region was 17 percent higher than the national rate—signifying a growing disparity.

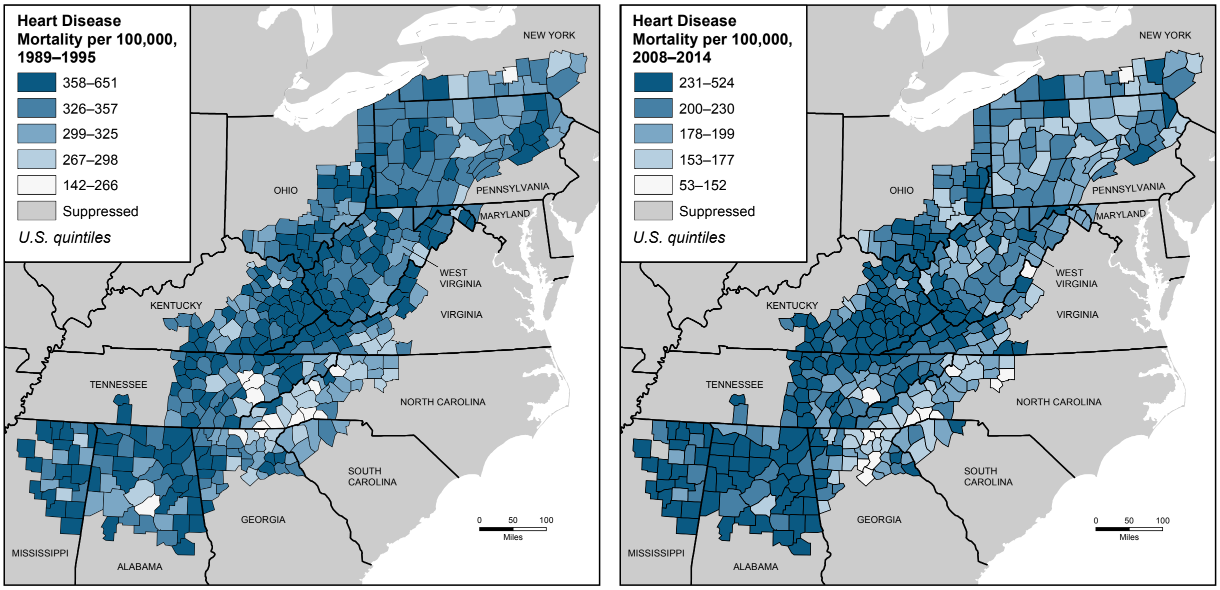
Figure 177: Improvements in Heart Disease Mortality in the United States and Appalachia, 1989–1995 to 2008–2014



Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

Figure 178 maps heart disease mortality rates for Appalachian counties during the two time periods, grouped by national quintiles. Darker colors indicate higher rates. Between 1989–1995 and 2008–2014, it appears as though counties throughout Northern Appalachia improved in their standing relative to the nation overall while those in Southern Appalachia experienced a decline. North Central Appalachia also appears to have darkened over the two decades. Central Appalachia is home to many counties ranking in the worst-performing national quintile during both the earlier and later time periods.

Figure 178: Map of Heart Disease Mortality Rates per 100,000 Population in the Appalachian Region, 1989–1995 and 2008–2014



Data source: National Center for Health Statistics (2007). Compressed Mortality File, 1989-1998 (machine readable data file and documentation, CD-ROM Series 20, No. 2E) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm
National Center for Health Statistics. Compressed Mortality File, 1999-2014 (machine readable data file and documentation, CD-ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The changes in heart disease mortality rates for the United States, Appalachia, and the Appalachian subregions are shown in Table 59. All five regions experienced decreases in their rates, with Central Appalachia experiencing the smallest improvement—a decrease of just 33 percent. Northern and North Central Appalachia had the largest decreases, although these still come up just short of the improvement experienced by the nation.

Table 59: Change in Heart Disease Mortality Rates per 100,000 Population, 1989–1995 and 2008– 2014

Geographic Area	1989–1995	2008–2014	Percent Change
United States	305	175	-43%
Appalachia	336	204	-39%
Rest of United States	303	173	-43%
Northern Appalachia	343	201	-41%
North Central Appalachia	353	206	-42%
Central Appalachia	369	249	-33%
South Central Appalachia	311	193	-38%
Southern Appalachia	329	203	-38%

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

The distributions of heart disease mortality rates among national quintiles for Appalachian counties are shown in Table 60. Of the 420 counties in the Region, 168 (40 percent) ranked in the worst-performing national quintile in 1989–1995, a number slightly higher than the 158 (38 percent) in 2008–2014. Despite the widening gap between the Region and the United States as a whole, the distribution of poor-performing counties within the Region improved over the past two decades, with 23 fewer counties ranking in the two worst-performing national quintiles in 2008–2014 than in 1989–1995.

Table 60: Distribution of Heart Disease Mortality Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Heart Disease Mortality, 1989–1995	14	*3%*	40	*10%*	70	*17%*	128	*30%*	168	*40%*
Heart Disease Mortality, 2008–2014	14	*3%*	57	*14%*	76	*18%*	115	*27%*	158	*38%*

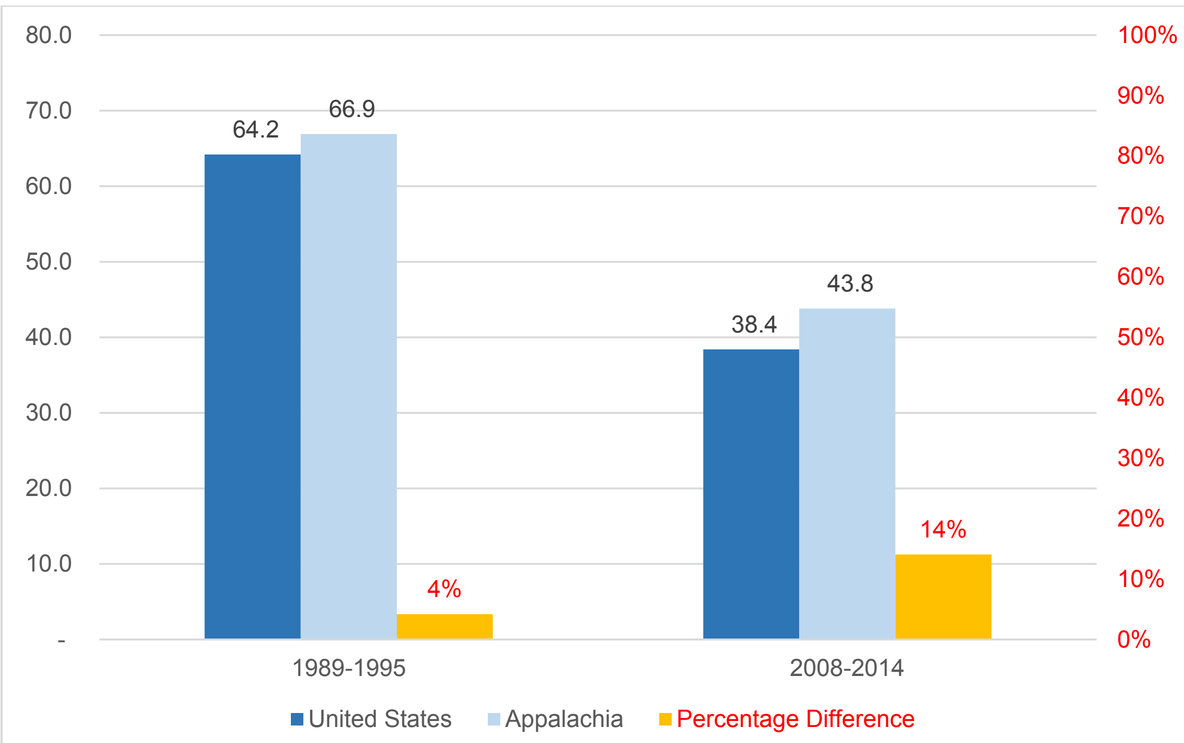
Data source for authors’ calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Stroke Mortality

The stroke mortality rate is the number of deaths in which stroke is reported as the primary cause of death per 100,000 population, per year. Higher values indicate worse health, so a decrease over time marks an improvement in the health of a community.

Between 1989–1995 and 2008–2014, the stroke mortality rates in the Appalachian Region declined by 35 percent, a smaller improvement than the 40 percent decrease experienced by the United States as a whole. Thus, despite the Region's improvement, the relative gap between Appalachia and the nation as a whole increased between the two time periods. As shown Figure 179, during the 1989–1995 period, the stroke mortality rate in Appalachia was only 4 percent higher than the rate in the United States overall, but by 2008–2014, the rate in the Region was 14 percent higher than the national rate—signifying a growing disparity.

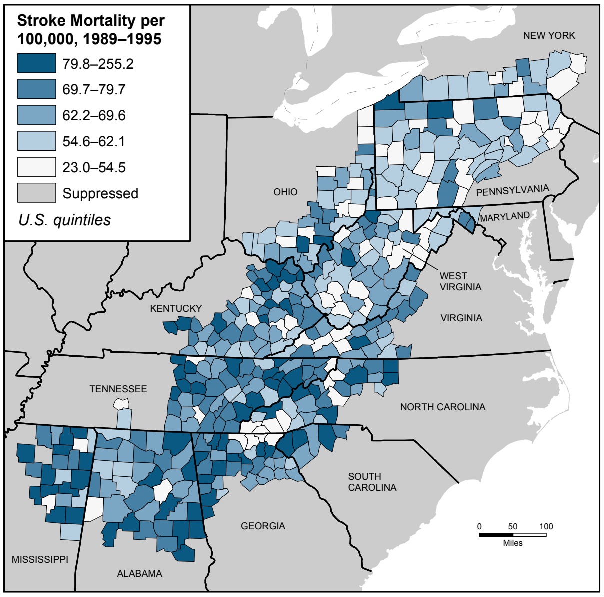
Figure 179: Improvements in Stroke Mortality in the United States and Appalachia, 1989–1995 to 2008–2014

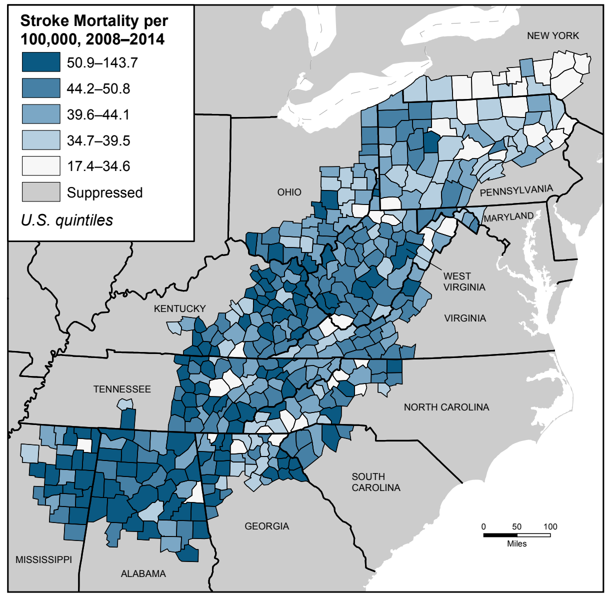


Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

Figure 180 maps stroke mortality rates for Appalachian counties during the two time periods, grouped by national quintiles. Darker colors indicate higher rates. Throughout much of the Region, there is a noticeable darkening that takes place between the two time periods. This is especially true in Central and Southern Appalachia, where there are large pockets of counties ranking in the worst-performing national quintile in 2008–2014. There are new areas of poor performance found in the western reaches of Northern Appalachia during the most recent time period, though many counties in New York rank in the best-performing national quintile.

Figure 180: Map of Stroke Mortality Rates per 100,000 Population in the Appalachian Region, 1989–1995 and 2008–2014





Data source: National Center for Health Statistics (2007). Compressed Mortality File, 1989-1998 (machine readable data file and documentation, CD-ROM Series 20, No. 2E) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm
National Center for Health Statistics. Compressed Mortality File, 1999-2014 (machine readable data file and documentation, CD-ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The changes in stroke mortality rates for the United States, Appalachia, and the Appalachian subregions are shown in Table 61. All five subregions experienced decreases in rates, with North Central Appalachia improving at the slowest pace—a decline of just 27 percent, which is well below the national trend. In 1989–1995, both Northern and North Central Appalachia had stroke mortality rates below the national average; in 2008–2014, however, the rates for both of the subregions were above the national mark.

Table 61: Change in Stroke Mortality Rates per 100,000 population, 1989–1995 and 2008–2014

Geographic Area	1989–1995	2008–2014	Percent Change
United States	64.2	38.4	-40%
Appalachia	66.9	43.8	-35%
Rest of United States	64.0	38.0	-41%
Northern Appalachia	59.2	38.9	-34%
North Central Appalachia	62.5	45.8	-27%
Central Appalachia	68.1	47.2	-31%
South Central Appalachia	72.6	44.5	-39%
Southern Appalachia	72.5	47.3	-35%

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

The distribution of stroke mortality rates among national quintiles for Appalachian counties is shown in Table 62. Of the 420 counties in the Region, 77 (18 percent) ranked in the worst-performing national quintile in 1989–1995, a number that increased to 113 (27 percent) in 2008–2014. The trend is clear throughout the Region, with 58 more counties ranking in the two worst-performing national quintiles in 2008–2014 than in 1989–1995. These counties—the ones reclassified into the two worst-performing national quintiles—are found throughout the Region, with noticeable concentrations found in Central and Southern Appalachia.

Table 62: Distribution of Stroke Mortality Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Stroke Mortality, 1989–1995	67	*16%*	96	*23%*	93	*22%*	87	*21%*	77	*18%*
Stroke Mortality, 2008–2014	39	*9%*	67	*16%*	92	*22%*	109	*26%*	113	*27%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

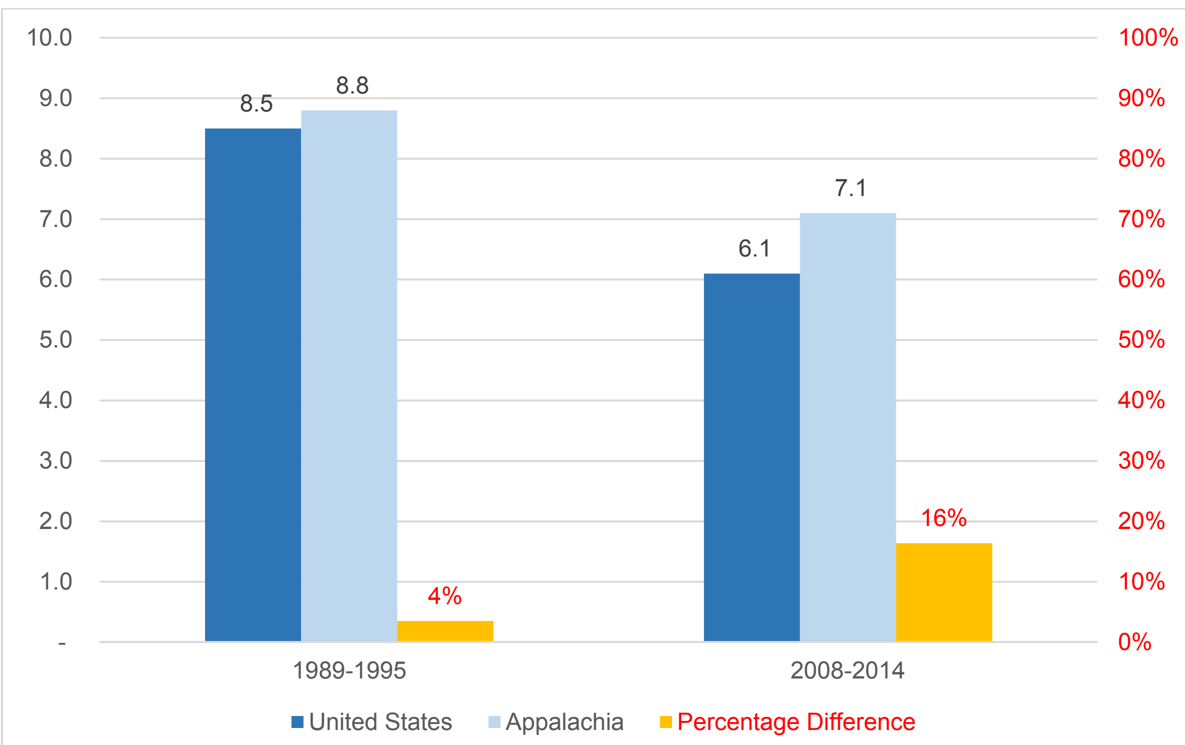
Infant Mortality

Infant mortality is the number of deaths of infants under one year old per 1,000 live births. Higher values indicate worse health, so a decrease over time marks an improvement in the health of a community.

Between 1989–1995 and 2008–2014, the infant mortality rate in the Appalachian Region decreased by 19 percent, a smaller improvement than the 28 percent decrease experienced by the United States as a whole. Thus, despite the Region's improvement, the gap between Appalachia and the nation as a whole increased between the two time periods. As shown in Figure 181, during the 1989–1995 period, the infant mortality rate in Appalachia was only 4 percent higher than the rate in the United States overall, but by 2008–2014, the rate in the Region was 16 percent higher than the national rate—signifying a growing disparity.

From 1989–1995 to 2008–2014, infant mortality rates improved in both the Appalachian Region and the United States as a whole. However, relative to the country overall (28 percent decrease), the Region experienced a smaller improvement (19 percent decrease). Among the subregions, Central Appalachia (13 percent decline) and North Central Appalachia (14 percent decline) experienced the least improvement.

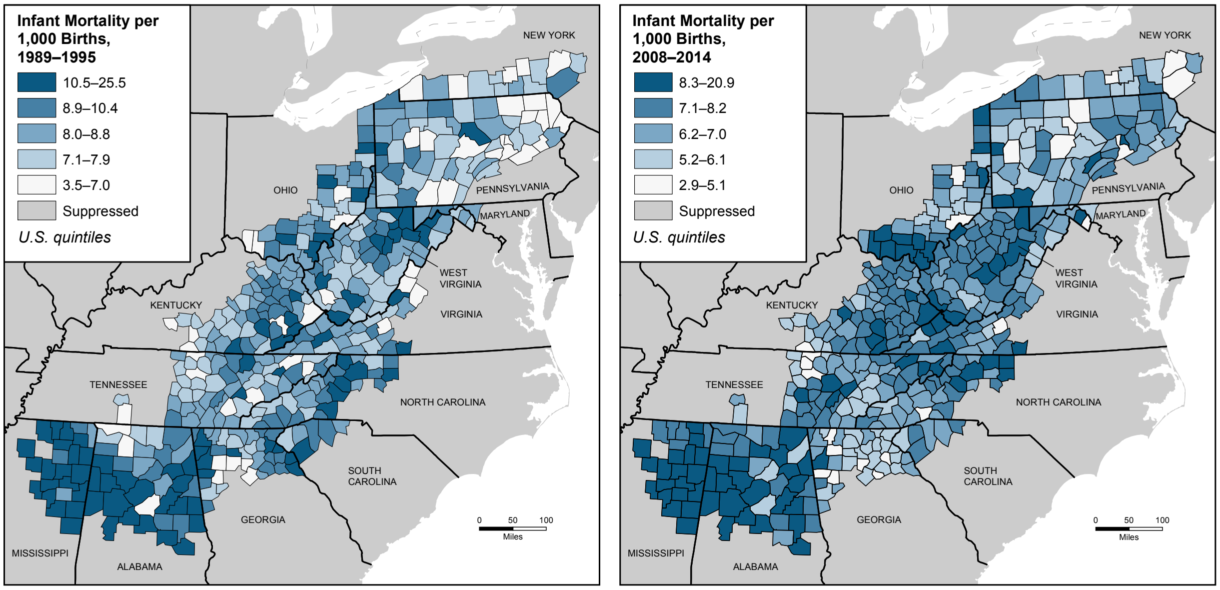
Figure 181: Improvements in Infant Mortality in the United States and Appalachia, 1989–1995 to 2008–2014



Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

Figure 182 maps infant mortality rates for Appalachian counties during the two time periods, grouped by national quintiles. Darker colors indicate higher rates. There is a noticeable darkening in the three central Appalachian subregions over time, although Southern Appalachia has the largest concentration of counties ranking in the worst-performing national quintile in both time periods. The best-performing subregion in both time periods, Northern Appalachia, still lost a large number of counties ranking in the best national quintile between 1989–1995 and 2008–2014.

Figure 182: Map of Infant Mortality Rates in the Appalachian Region, 1989–1995 and 2008–2014



Data source: National Center for Health Statistics (2007). Compressed Mortality File, 1989-1998 (machine readable data file and documentation, CD-ROM Series 20, No. 2E) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm
National Center for Health Statistics. Compressed Mortality File, 1999-2014 (machine readable data file and documentation, CD-ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2015. http://www.cdc.gov/nchs/data_access/cmf.htm

The changes in infant mortality rates for the United States, Appalachia, and the Appalachian subregions are shown in Table 64. All five subregions experienced decreases in their rates, although none of these matched the national decrease. The three central subregions experienced the smallest decreases, as each was well below the 28 percent experienced at the national level. Both Northern and Central Appalachia had lower infant mortality rates than the nation as a whole in 1989–1995; however, by 2008–2014, no Appalachian subregion had a lower rate than U.S. average.

Table 63: Change in Infant Mortality Rates, 1989–1995 and 2008–2014

Geographic Area	1989–1995	2008–2014	Percent Change
United States	8.5	6.1	-28%
Appalachia	8.8	7.1	-19%
Rest of United States	8.5	6.1	-28%
Northern Appalachia	8.3	6.6	-20%
North Central Appalachia	8.6	7.4	-14%
Central Appalachia	8.5	7.4	-13%
South Central Appalachia	8.7	7.2	-17%
Southern Appalachia	9.5	7.4	-22%

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

The distribution of infant mortality rates among national quintiles for Appalachian counties is shown in Table 64. Of the 420 counties in the Region, the number of counties ranking in the worst national quintile remained consistent between 1989–1995 and 2008–2014. However, the Region saw a large increase in the number of counties ranking in the second worst-performing national quintile (83 to 135) over the same period.

Table 64: Distribution of Infant Mortality Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Infant Mortality, 1989–1995	33	*8%*	87	*21%*	124	*30%*	83	*20%*	93	*22%*
Infant Mortality, 1989–1995	8	*2%*	66	*16%*	117	*28%*	135	*32%*	94	*22%*

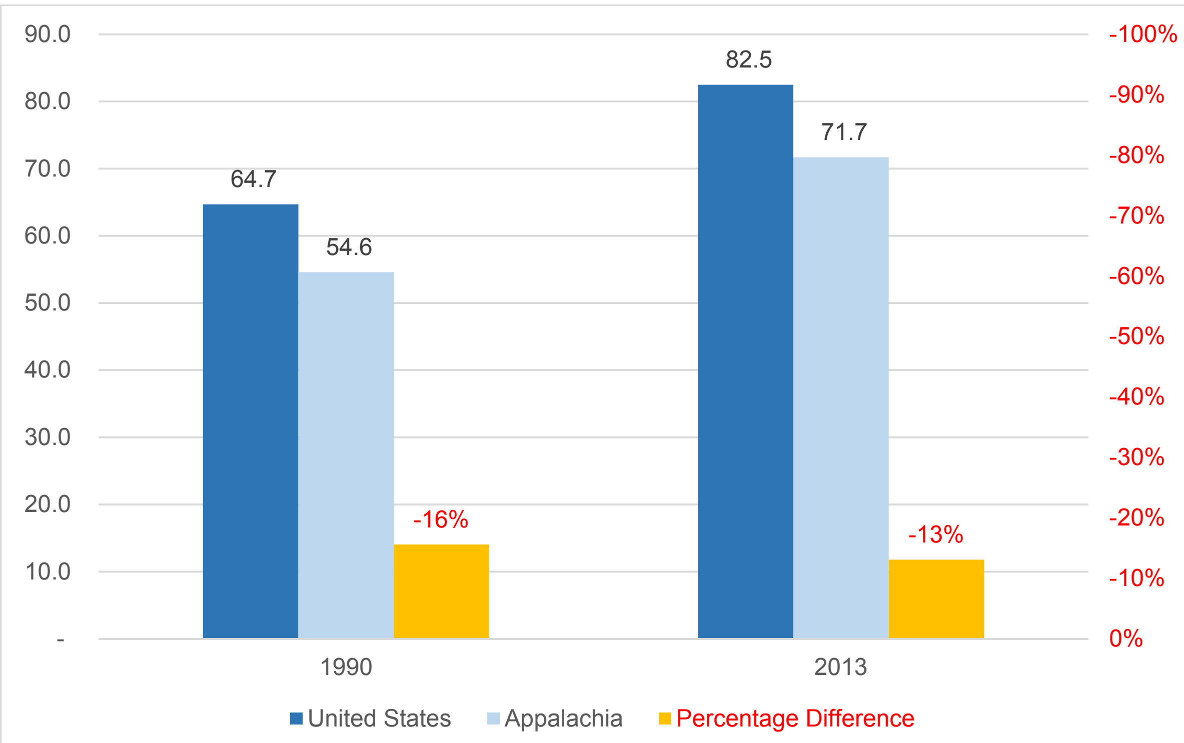
Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Office-Based Primary Care Physicians

Office-based primary care physicians represent the number of providers per 100,000 population. Higher values indicate a greater availability of physician care and health care system quality, so higher values indicate better health in a community. It is important to note that this is a different measure than that used in the Health Care Systems domain of this report.[6] Due difference to national definitions changing between 1990 and 2013, this alternative was adopted to ensure comparability across the time periods.

Between 1990 and 2013, the number of primary care physicians per 100,000 population increased for both the Appalachian Region and the United States overall. The 31 percent increase in Appalachia is slightly greater than the 27 percent increase experienced at the national level, which indicates a slight improvement in the gap between the Region and the United States as a whole. As shown in Figure 183, in 1990, the supply of primary care physicians per 100,000 population in Appalachia was 16 percent lower than in the United States overall; in 2013, the supply in the Region was 13 percent lower.

Figure 183: Improvements in Office-Based Primary Care Physicians in the United States and Appalachia, 1990 to 2013

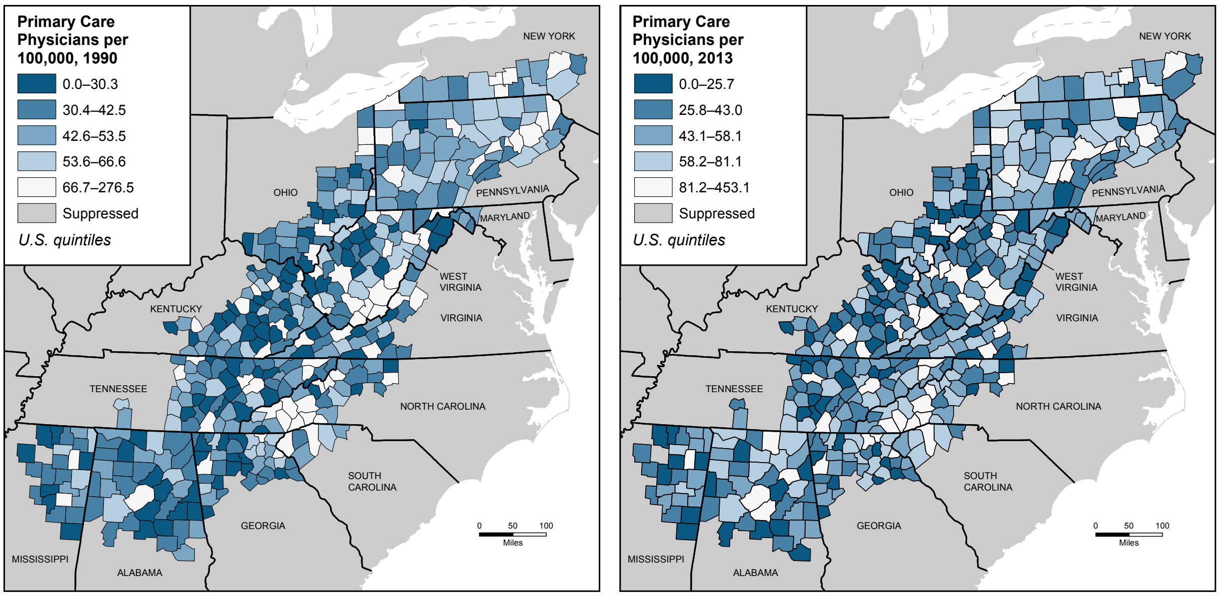


Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

[6] The data source for primary care physicians in the Trends section differs from the source used in the Health Care Systems domain. County Health Rankings, which began in 2010, is the source for the primary care physician measure in the Health Care Systems domain; the Area Health Resources Files (AHRF), which has county-level data on physician supply, are the source for the measure in the Trends section. The definitions in the two databases differ primarily on inclusion of General Obstetrics and Gynecology physicians (AHRF files include Ob/Gyn practitioners while County Health Rankings does not.

Figure 184 maps primary care physicians per 100,000 population for Appalachian counties during the two time periods, grouped by national quintiles. Darker colors indicate a lower supply. Between 1990 and 2013, there has been a perceptible lightening of the map of the Region, indicating slight improvement for each of the subregions. In particular, Southern and Central Appalachia each contain fewer counties ranking in the worst-performing national quintiles in 2013 than in 1990.

Figure 184: Map of Primary Care Physicians per 100,000 Population in the Appalachian Region, 1990 and 2013



Data source: Area Resource File (ARF) 1998; U.S. Department Of Health And Human Services, Health Resources And Services Administration, Bureau Of Health Professions, Office Of Research And Planning, February 1998. http://ahrf.hrsa.gov/
Area Health Resources File (AHRF) 2014-2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015 http://ahrf.hrsa.gov/

The changes in the supply of primary care physicians per 100,000 population for the United States, Appalachia, and the Appalachian subregions are shown in Table 65. All five subregions experienced increases, although both Central Appalachia (18 percent increase) and Northern Appalachia (22 percent increase) came up short when compared to the 27 percent increase experienced in the nation as a whole. South Central Appalachia experienced the largest increase, and the subregion now has a higher supply of primary care physicians per 100,000 population than the nation overall, although each of the other four subregions remain well below the national average.

Table 65: Change in Primary Care Physicians per 100,000 population, 1990 to 2013

Geographic Area	1990	2013	Percent Change
United States	64.7	82.5	27%
Appalachia	54.6	71.7	31%
Rest of United States	65.6	83.5	27%
Northern Appalachia	60.9	74.4	22%
North Central Appalachia	56.7	76.4	35%
Central Appalachia	45.8	54.0	18%
South Central Appalachia	59.7	83.5	40%
Southern Appalachia	46.4	64.7	39%

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

The distribution of primary care physicians among national quintiles for Appalachian counties is shown in Table 66. Of the 420 counties in the Region, 92 (22 percent) ranked in the worst-performing national quintile in 1990, a number that decreased to 77 (18 percent) in 2013. There was also a slight decrease in the number of counties ranking in the second worst-performing quintile, going from 109 counties in 1990 to 102 in 2013. The slight redistribution of Appalachian counties among national quintiles—along with the data points noted above—indicates a subtle improvement in the supply of primary care physicians throughout the Region.

Table 66: Distribution of Primary Care Physicians among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Primary Care Physicians, 1990	72	*17%*	60	*14%*	87	*21%*	109	*26%*	92	*22%*
Primary Care Physicians, 2013	58	*14%*	89	*21%*	94	*22%*	102	*24%*	77	*18%*

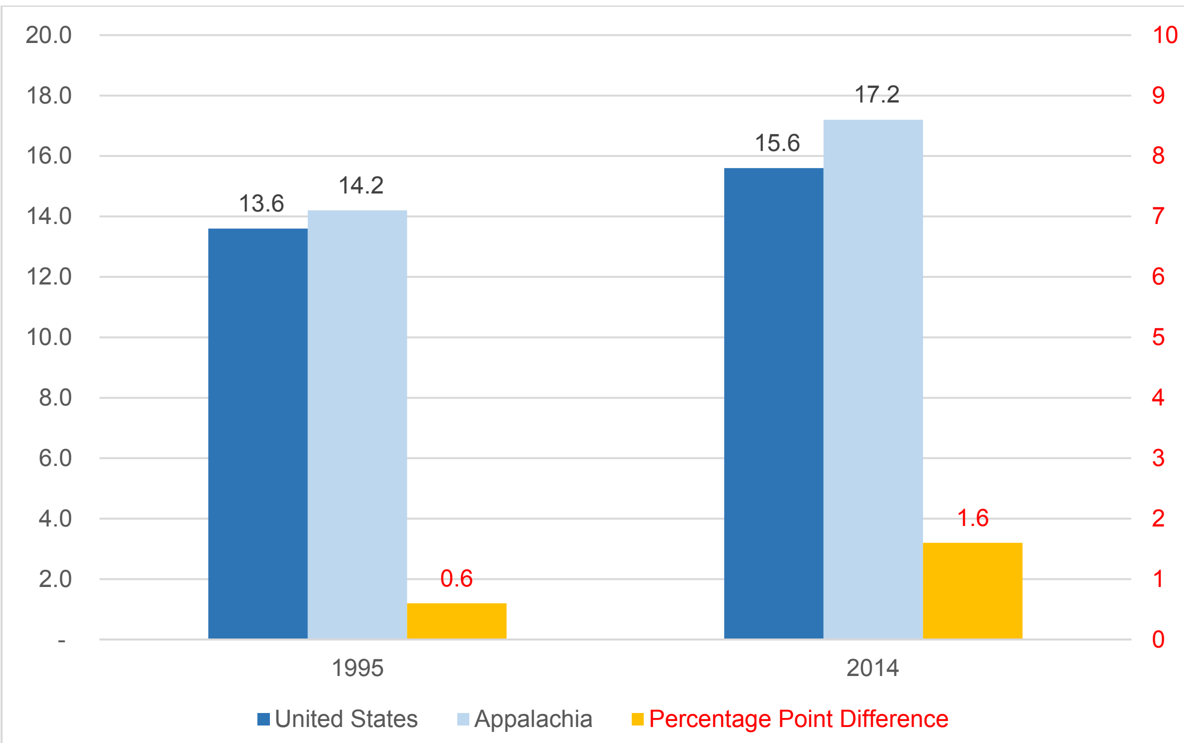
Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Percentage of Households Living in Poverty

The household poverty rate is the percentage of households with incomes below the poverty line. Living in poverty can contribute to a number of poor health outcomes, so a decrease in these rates over time may contribute to improvements in a community's health.

Between 1995 and 2014, the household poverty rate in the Appalachian Region increased from 14.2 percent to 17.2 percent, whereas the nation as a whole went from 13.6 percent to 15.6 percent. Because the increase in the United States outpaced that experienced in Appalachia, the gap between the Region and the nation overall increased between the two time periods. As shown in Figure 185, in 1995, the household poverty rate in Appalachia was only 0.6 percentage points higher than the rate in the United States overall, but by 2014, the rate in the Region was 1.6 percentage points higher than the national rate—signifying a growing disparity.

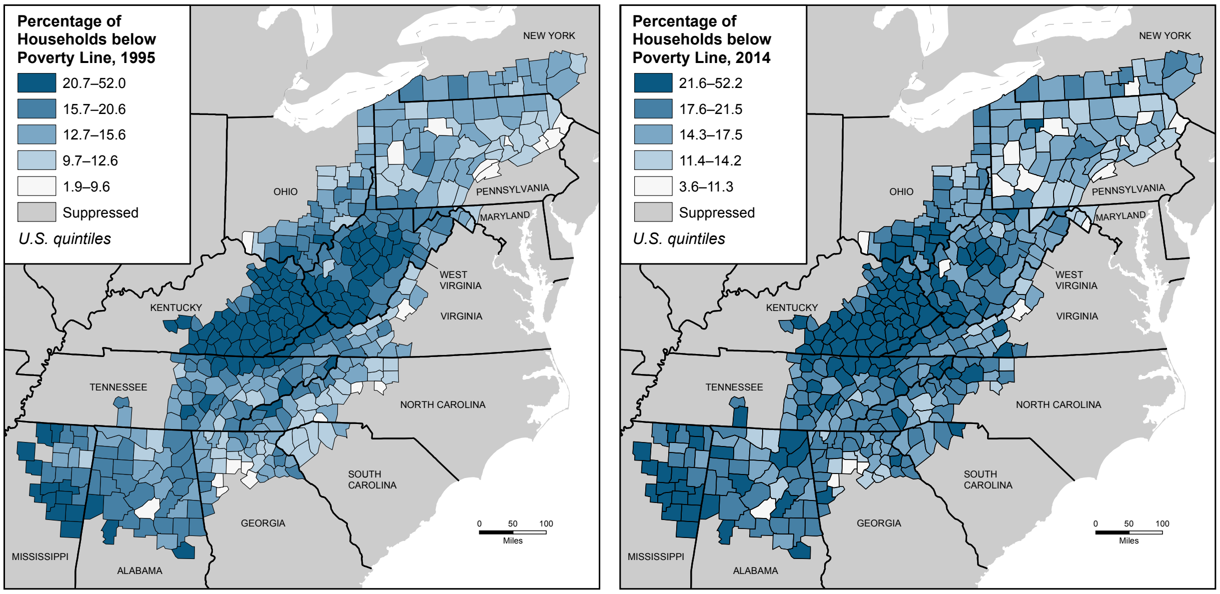
Figure 185: Changes in Household Poverty Rates in the United States and Appalachia, 1995 to 2014



Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

Figure 186 maps household poverty rates for Appalachian counties during the two time periods, grouped by national quintiles. Darker colors indicate higher rates. The changes throughout the Region are subtle, though a noticeable darkening has taken place in both the South Central and Southern subregions. Central Appalachia—and particularly eastern Kentucky—largely consists of counties ranking in the worst-performing national quintile.

Figure 186: Map of Percentage of Household Poverty Rates in the Appalachian Region, 1995 and 2014



Data source: 1995 Poverty and Median Household Income Estimates - Counties, States, and National; Source: U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program
http://www.census.gov/did/www/saipe/data/statecounty/data/1995.html
2014 Poverty and Median Household Income Estimates - Counties, States, and National; Source: U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program, Release date: December 2015
http://www.census.gov/did/www/saipe/data/statecounty/data/2014.html

The changes in household poverty rates for the United States, Appalachia, and the Appalachian subregions are shown in Table 67. All five regions experienced increases in rates, with South Central Appalachia (13.5 percent to 18.2 percent) and Southern Appalachia (12.9 percent to 16.9 percent) experiencing the biggest jumps. These two subregions had household poverty rates lower than the national average in 1995; in 2014, both were well above the national rate. Central Appalachia's household poverty rate was the highest in 1995 (24.7 percent) and remains as such in 2014 (24.9 percent).

Table 67: Change in Household Poverty Rates, 1995 to 2014

Geographic Area	1995	2014	Percentage Point Change
United States	13.6	15.6	+2.0
Appalachia	14.2	17.2	+3.0
Rest of United States	13.6	15.4	+1.8
Northern Appalachia	12.4	14.8	+2.4
North Central Appalachia	17.4	18.2	+0.8
Central Appalachia	24.7	24.9	+0.2
South Central Appalachia	13.5	18.2	+4.7
Southern Appalachia	12.9	16.9	+4.0

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

The distribution of household poverty rates among national quintiles for Appalachian counties is shown in Table 68. Of the 420 counties in the Region, 104 (25 percent) ranked in the worst-performing national quintile in 1995, a number that increased to 122 (29 percent) in 2014. There was an also increase in the number of counties ranking in the second worst-performing national quintile, going from 113 counties in 1995 to 131 counties in 2014. Based on the maps and subregional trends noted above, much of this redistribution has taken place in the South Central and Southern subregions.

Table 68: Distribution of Household Poverty Rates among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
Household Poverty, 1995	19	*5%*	62	*15%*	122	*29%*	113	*27%*	104	*25%*
Household Poverty, 2014	17	*4%*	52	*12%*	98	*23%*	131	*31%*	122	*29%*

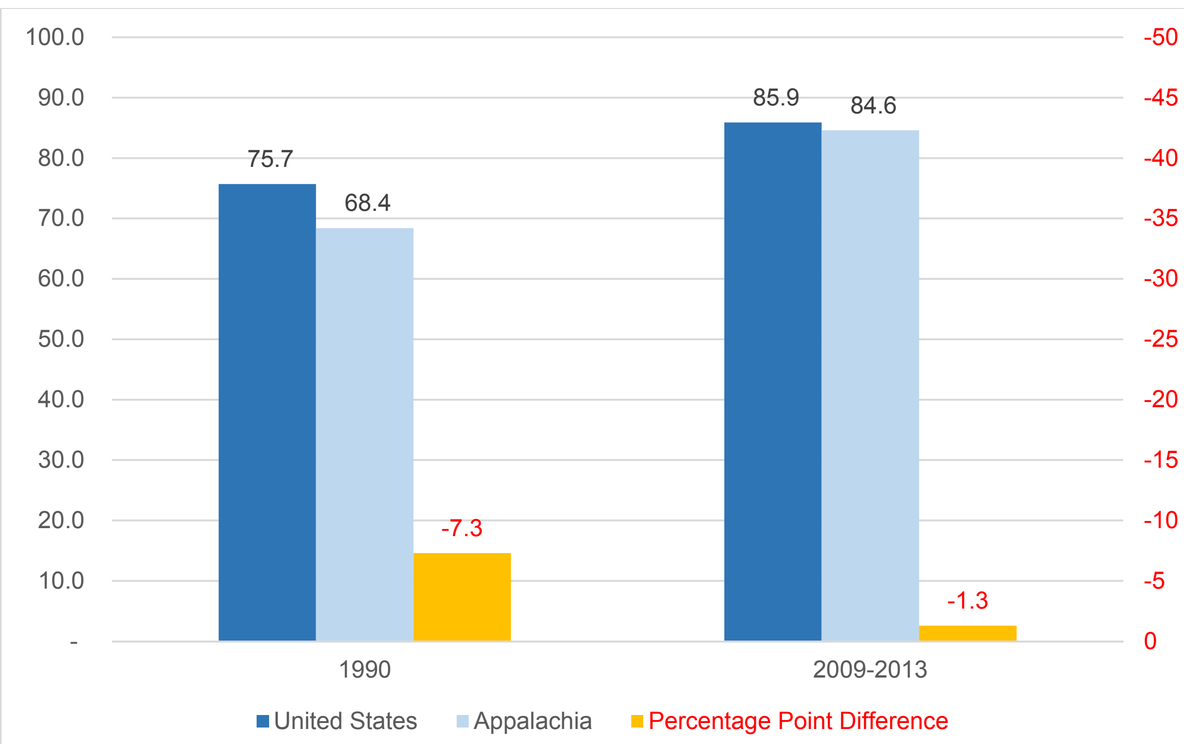
Data source for authors’ calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Percentage of Adults with at Least a High School Diploma

The percentage with at least a high school diploma is the proportion of the adult population that has earned a high school diploma. Increases in these percentages over time may signify improvement in a community's overall health, as higher education levels are associated with increased health literacy and, in turn, improved health outcomes. This measure differs from the education variable used in the Social Determinants domain of the report that looks at the percentage of a population that has attended a postsecondary educational institution.[7] A number of factors influence postsecondary attendance—including a general trend towards increased attendance in recent years—whereas high school diploma rates capture a long-standing baseline.

Between 1990 and 2009–2013, the Appalachian Region experienced a large increase in the percentage of its population that had earned a high school diploma, increasing from 68.4 percent to 84.6 percent. The United States also experienced an increase over the same time period, going from 75.7 percent to 85.9 percent. As such, the gap between Appalachia and the nation overall shrunk during this time. As shown in Figure 187, the percentage of adults with a high school diploma in Appalachia was 7.3 percentage points lower than the percentage in the United States overall in 1990, but by 2013, the rate in the Region was just 1.3 percentage points lower—signifying a decreasing disparity.

Figure 187: Improvements in the Percentage of Adults with a High School Diploma in the United States and Appalachia, 1990 to 2013

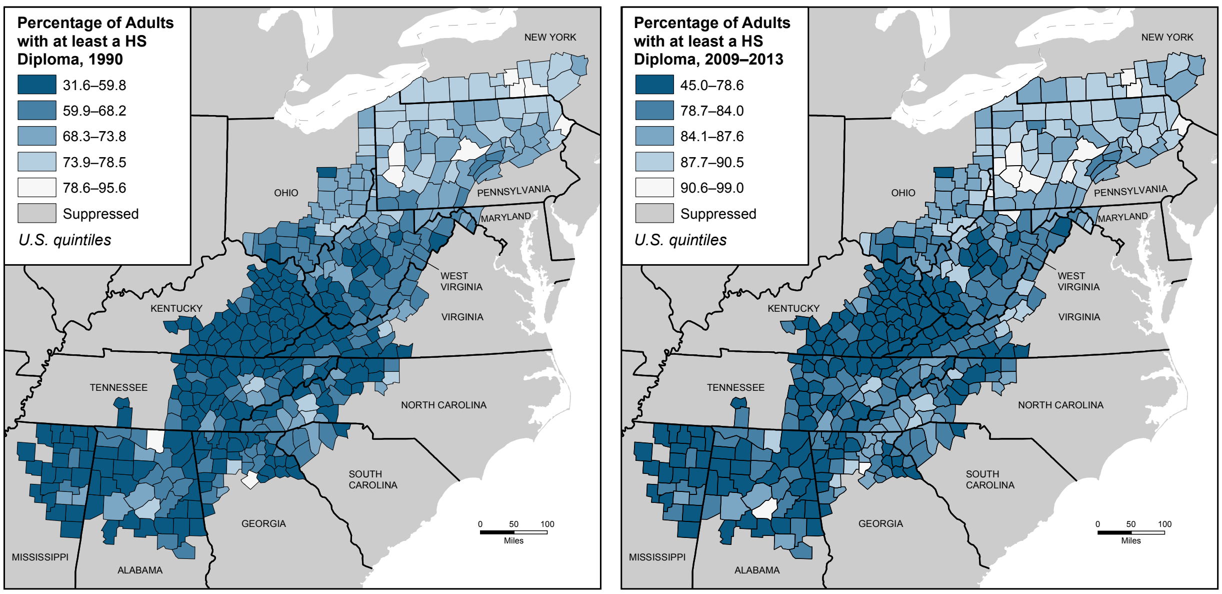


Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

[7] This indicator measures the percentage of adults that have at least high school diploma, while the indicator in the Social Determinants domain measures the percentage of adults that have attended a postsecondary institution.

Figure 188 maps household poverty rates for Appalachian counties during the two time periods, grouped by national quintiles. Darker colors indicate lower percentages. Although the South Central and Southern subregions still contain many counties ranking in the worst-performing national quintile, improvement has been made over the past two decades. However, many counties throughout the Region—and particularly those in Central Appalachia—remain in the bottom national quintile.

Figure 188: Map of Percentage of Adults with at least a High School Diploma in the Appalachian Region, 1990 and 2013



Data source: Area Resource File (ARF) 1998; U.S. Department Of Health And Human Services, Health Resources And Services Administration, Bureau Of Health Professions, Office Of Research And Planning, February 1998. http://ahrf.hrsa.gov/
Area Health Resources File (AHRF) 2014-2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015 http://ahrf.hrsa.gov/

The changes in the percentage of adults with at least a high school diploma for the United States, Appalachia, and the Appalachian subregions are shown in Table 69. Each of the five subregions experienced increases that outpace the nation as a whole, though it should be noted that only Northern Appalachia has a higher percentage than the national average. Central Appalachia improved the most among the subregions: from 52.1 percent in 1990 to 75.0 percent in 2013, although this recent figure still lags well behind the other subregions.

Table 69: Change in Percentage of Adults with at least a High School Diploma, 1990 and 2009–2013

Geographic Area	1990	2013	Percentage Point Change
United States	75.7	85.9	+10.2
Appalachia	68.4	84.6	+16.2
Rest of United States	76.3	86.0	+9.7
Northern Appalachia	74.7	89.0	+14.3
North Central Appalachia	67.8	84.8	+17.0
Central Appalachia	52.1	75.0	+22.9
South Central Appalachia	65.6	83.6	+18.0
Southern Appalachia	67.4	82.8	+15.4

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx.

The distribution of the percentage of adults with at least a high school diploma among national quintiles for Appalachian counties is shown in Table 70. Of the 420 counties in the Region, 197 (47 percent) ranked in the worst-performing national quintile in 1990, a number that decreased to 161 (38 percent) in 2013. Although progress has been made, the distribution of low education levels throughout Appalachia remains disproportionate, with 65 percent of Appalachian counties ranking in the two worst-performing national quintiles.

Table 70: Distribution of Percentage of Adults with at least a High School Diploma among National Quintiles for Appalachian Counties

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*	#	*Pct.*
High School Diploma, 1990	9	*2%*	41	*10%*	76	*18%*	97	*23%*	197	*47%*
High School Diploma, 2009-2013	13	*3%*	57	*14%*	77	*18%*	112	*27%*	161	*38%*

Data source for authors' calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for this indicator may not sum to 420 due to missing or suppressed values.

Appendices

A. BIBLIOGRAPHY

Abramson, E., Barron, Y., Quaresimo, J., & Kaushal, R. (2011). Electronic prescribing with an electronic health record reduces ambulatory prescribing errors. *The Joint Commission Journal on Quality and Patient Safety*, 470-478.

Alamgir, H., Muazzam, S., & Nasrullah, M. (2012, Dec). Uninentional falls mortality among elderly in the United States: time for action. *Injury, 43*(12), 2065-71.

American Cancer Society. (2016, January 7). *Cancer Statistics Report: Death Rate Down 23% in 21 Years*. Retrieved from American Cancer Society: https://www.cancer.org/latest-news/cancer-statistics-report-death-rate-down-23-percent-in-21-years.html

American Diabetes Association, Standards of Medical Care in Diabetes—2016. (2016). Retrieved from Diabetes Care 39(S1): http://care.diabetesjournals.org/content/suppl/2015/12/21/39.Supplement_1.DC2/2016-Standards-of-Care.pdf

American Diabetes Association, Statistics About Diabetes. (2016, August 31). Retrieved from Diabetes Basics: http://www.diabetes.org/diabetes-basics/statistics/

American Heart Association. (2016, Aug 31). *Coronary Artery Disease - Coronary Heart Disease*. Retrieved from http://www.heart.org/HEARTORG/Conditions/More/MyHeartandStrokeNews/Coronary-Artery-Disease---Coronary-Heart-Disease_UCM_436416_Article.jsp#.V9aVvjtEzmF

Ammenwerth, E., Schnell-Inderst, P., Machan, C., & Siebert, U. (2008, Sep-Oct). The Effect of Electronic Prescribing on Medication Errors and Adverse Drug Events: A Systematic Review. *Journal of the American Medical Informatics Association, 15*(5), pp. 585-600.

Andale. (2017, April 1). *Propensity Score Matching: Definition & Overview*. Retrieved April 17, 2017, from Statistics How TO: http://www.statisticshowto.com/propensity-score-matching/

Anderson, R. T., Yang, T.-C., Matthews, S. A., Camacho, F., Kern, T. M., Kimmick, G., . . . Yao, N. (2014, Apr). Breast Cancer Screening, Area Deprivation, and Later-Stage Breast Cancer in Appalachia: Does Geography Matter? *Health Services Research, 49*(2), 546-67.

Baicker, K., & Chandra, A. (2004). Medicare spending, the physician workforce, and beneficiaries' quality of care. *Health Affairs*, W4-184-97.

Baillargeon, J., Wang, Y., Kuo, Y., Holmes, H., & Sharma, G. (2013). Temporal Trends in Hospitalization Rates for Older Adults with Chronic Obstructive Pulmonary Disease. *he American Journal of Medicine, 126*(7), 607-614.

Barry, D., & Sherrod, M. (2014, October 16). *Ensuring Access to Sexually Transmitted Infection Care for All*. Retrieved from Center for American Progress: https://www.americanprogress.org/issues/women/reports/2014/10/16/99135/ensuring-access-to-sexually-transmitted-infection-care-for-all/

Behringer, B., & Friedell, G. (2006). Appalachia: Where Place Matters in Health. *Preventing Chronic Disease: Public Health Research, Practice, and Policy*, 1-4.

Bell, J., Mora, G., Hagan, E., Rubin, V., & Karpyn, A. (2013). *Access to Healthy Food and Why it Matters: A Review of the Research.* PolicyLink. Retrieved from The Food Trust: http://thefoodtrust.org/uploads/media_items/access-to-healthy-food.original.pdf

Bergen, J., Gotz, H., Richardus, J., & C., H. (2004). Prevalence of urogenital Chlamydia trachomatis increases significantly with level of urbanisation and suggests targeted screening approaches: result from the first national population based study in the Netherlands. *Sexually Transmitted Infection*, 17-23.

Berkman, L. F., & Breslow, L. (1983). Review: Health and Ways of Living: The Alameda County Study. *Journal of Public Health Policy*, 413-415. doi:10.2307/3342407

Berkman, L., & Syme, S. (1979, February). Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda County residents. *American Journal of Epidemiology* , 186-204. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/425958

Berkman, N. D., Dewalt, D. A., Pignone, M. P., Sheridan, S. L., Lohr, K. N., Lux, L., . . . Bonito, A. (2004). Literacy and Health Outcomes: Summary. *AHRQ Evidence Report Summaries*.

Besser, L. M., Marcus, M., & Frumkin, H. (2008). Commute Time and Social Capital in the U.S. *Am J Prev Med, 34*(3), 207-11.

Bhattacharya, R., Shen, C., & Sambamoorthi, U. (2014). Depression and Ambulatory Care Sensitive Hospitalizations among Medicare Beneficiaries with Chronic Physical Conditions. *National Institute of Health*, 460-465.

Bodenheimer, T., & Pham, H. (2010).). Primary Care: Current Problems and Proposed Solutions. *Health Affairs, 29*(5), 799-805.

Bodenheimer, T., Chen, E., & Bennett, H. (2009). Confronting the Growing Burden of Chronic Disease: Can the U.S. Health Care Workforce do the Job? *Health Affairs*, 28(1): 64–74.

Bolin, J. B. (2015). Rural Healthy People 2020: New Decade, Same Challenges. *Journal of Rural Health, 31*(3), 326-333.

Bradley, E., & Taylor, L. (2016, August 17). *How Social Spending Affects Health Outcomes.* Retrieved 2017, from Robert Wood Johnson Foundation Culture of Health Blog: http://www.rwjf.org/en/culture-of-health/2016/08/how_social_spending.html

Braveman, P., & Gruskin, S. (2003). Poverty, Equity, Human Rights, and Health. *Bulletin of the World Health Organization*, 539-545.

Brody, G. H., Yu, T., Chen, E., Miller, G. E., Kogan, S. M., & Beach, S. R. (2013). Is Resilience Only Skin Deep? Rural African Americans' Preadolescent Socioeconomic Status-Related Risk and Competence and Age 19 Psychological Adjustment and Allostatic Load. *Psychological Science, 24*(7), 1285-1293. doi:10.1177/0956797612471954

Brody, J. E. (2013). *Commuting's Hidden Cost.* Retrieved from New York Times: http://well.blogs.nytimes.com/2013/10/28/commutings-hidden-cost/

Brummett, B., Barefoot, J., Siegler, I., Clapp-Channing, N., Lytle, B., Bosworth, H., . . . Mark, D. (2001, Mar-Apr). Characteristics of socially isolated patients with coronary artery disease who are at elevated risk for mortality. *Psychosomatic Medicine*, 267-272.

Buchanich, J. e. (2014). Disparities in Diabetes Mellitus Mortality Rates in Coal Mining and Non-Coal Mining Areas of Appalachia. *APHA 142nd Annual Meeting and Expo.* New Orleans, LA.

Bureau of Health Workforce, Health Resources & Services Administration. (2016, October). *Health Professional Shortage Areas (HPSAs)*. Retrieved from https://bhw.hrsa.gov/shortage-designation/hpsas

Bureau of Transportation Statistics. (2000). *The Changing Face of Transportation, Chapter 3: Safety*. Retrieved from Bureau of Transportation Statistics: https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/the_changing_face_of_transportation/html/chapter_03.html

Callaghan, R., Gatley, J., Veldhuizen, S., Lev-Ran, S., & Mann, R. A. (2013, Apr). Alcohol- or drug-use disorders and motor vehicle accident mortality: a retrospective cohort study. . *Accid Anal Prev., 53*, 149-155.

Canadian Mental Health Association. (2017). *Connection Between Mental and Physical Health*. Retrieved from Canadian Mental Health Association: https://ontario.cmha.ca/documents/connection-between-mental-and-physical-health/

Cardiovascular Health Branch, Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion, CDC. (1999, August 6). Achievements in Public Health, 1900-1999: Decline in Deaths from Heart Disease and Stroke -- United States, 1900-1999. *Mortality and Morbidity Weekly Report*, 649-656.

Casalino, L. R. (2010). Speciality Physician Practices as Patient-Centered Medical Homes. *New England Journal of Medicine, 362*, 1555-1558.

Case, A., & Deaton, A. (2015, Dec 8). Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century. *Proceedings of the National Academy of Sciences, 112*(49), 15078-15083.

Catlin, B. J. (2015). *2015 County Health Rankings Key Findings Report.* University of Wisconson , Population Health Institute. Madison, Wis: County Health Rankings & Roadmaps.

Cavanaugh, K. (2011). Health Literacy in Diabetes Care: Explanation, Evidence and Equipment. *Diabetes Management, 1*(2), 191-199.

Centers for Disease Control and Prevention. (2015, August 10). *Heart Disease Facts*. Retrieved from https://www.cdc.gov/heartdisease/facts.htm

Centers for Disease Control and Prevention. (2016, August 31). *Chlamydia - CDC Fact Sheet*. Retrieved from Chlamydia - CDC Fact Sheet: https://www.cdc.gov/std/chlamydia/stdfact-chlamydia.htm

Centers for Disease Control and Prevention. (2016, March 30). *Depression*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/mentalhealth/basics/mental-illness/depression.htm

Centers for Disease Control and Prevention. (2016, Aug 31). *Heart Disease Facts*. Retrieved from Heart Disease Facts: http://www.cdc.gov/heartdisease/facts.htm

Centers for Disease Control and Prevention. (2017, April 20). *Health Effects of Cigarette Smoking*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/index.htm

Centers for Disease Control and Prevention. (Diabetes 2015, March 31). *Basics About Diabetes*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/diabetes/basics/diabetes.html

Centers for Disease Control and Prevention. (Diabetes(a) 2016, August 15). *A Snapshot: Diabetes In the U.S.* Retrieved from Centers for Disease Control and Prevention: http://www.cdc.gov/diabetes/pubs/statsreport14/diabetes-infographic.pdf

Centers for Disease Control and Prevention. (Diabetes(b) 2016, October 17). *Diabetes Home. Data and Statistics.* Retrieved from http://www.cdc.gov/diabetes/data/index.html

Centers for Disease Control and Prevention. (Obesity(a), 2016, August 15). *Adult Obesity Causes & Consequences*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/obesity/adult/causes.html

Centers for Disease Control and Prevention. (Obesity(b), 2016, Aug 31). *Overweight and Obesity. Adult Obesity Facts.* Retrieved from https://www.cdc.gov/nchs/data/databriefs/db219.pdf

Centers for Disease Control and Prevention, About Teen Pregnancy. (2017, May 9). Retrieved from Reproductive Health: Teen Pregnancy: https://www.cdc.gov/teenpregnancy/about/index.htm

Centers for Disease Control and Prevention, Alcohol and Public Health. (2016, September 7). *Text Description for Prevalence Map on Data and Maps Page*. Retrieved from https://www.cdc.gov/alcohol/data-table-text.htm#prevalence

Centers for Disease Control and Prevention, Alcohol Use. (2016, August 31). Retrieved from National Center for Health Statistics: http://www.cdc.gov/nchs/fastats/alcohol.htm

Centers for Disease Control and Prevention, Breast Cancer. (2017, May 08). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/cancer/breast/

Centers for Disease Control and Prevention, Challenges in HIV Prevention. (2016, August). *Challenges in HIV Prevention Fact Sheet.* Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/challenges-508.pdf

Centers for Disease Control and Prevention, Chlamydia-CDC Fact Sheet. (2017, March 14). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/std/chlamydia/stdfact-chlamydia.htm

Centers for Disease Control and Prevention, Chronic Obstructive Pulmonary Disease (COPD). (2016, August 31). Retrieved from Centers for Disease Control and Prevention: http://www.cdc.gov/copd/index.html

Centers for Disease Control and Prevention, Conditions that Increase the Risk for Stroke. (2017, January 17). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/stroke/conditions.htm

Centers for Disease Control and Prevention, Depression. (2016, March 30). Retrieved from Centers for Disease Control and Prevention: http://www.cdc.gov/mentalhealth/basics/mental-illness/depression.htm

Centers for Disease Control and Prevention, Diabetes. (2014). *National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States, 2014.* Atlanta, GA: U.S. Department of Health and Human Services. Retrieved from National Diabetes Statistics Report, 2014: https://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf

Centers for Disease Control and Prevention, Diabetes FastStats. (2016, August 31). *National Center for Health Statistics*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/nchs/fastats/diabetes.htm

Centers for Disease Control and Prevention, Fast Facts. (2017, March 29). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/fast_facts/index.htm

Centers for Disease Control and Prevention, Health Effects of Cigarette Smoking. (2017, April 20). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/index.htm

Centers for Disease Control and Prevention, Healthy Foods. (2016, March). Retrieved from https://www.cdc.gov/healthyplaces/healthtopics/healthyfood_environment.htm

Centers for Disease Control and Prevention, Heart Disease Facts. (2016). Retrieved from CDC: http://www.cdc.gov/heartdisease/facts.htm

Centers for Disease Control and Prevention, HIV. (2016, July 12). *HIV Basic Statistics.* Retrieved from http://www.cdc.gov/hiv/basics/statistics.html

Centers for Disease Control and Prevention, HIV and Viral Hepatitis. (2014, March). *HIV and Viral Hepatitis.* Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/hiv/pdf/library_factsheets_hiv_and_viral_hepatitis.pdf

Centers for Disease Control and Prevention, HIV by Group. (2017, March 10). *HIV by Group.* Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/hiv/group/index.html

Centers for Disease Control and Prevention, HIV Prevention. (2016, December 21). *Prevention*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/hiv/basics/prevention.html

Centers for Disease Control and Prevention, HIV Transmission. (2016, December 21). *HIV*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/hiv/basics/transmission.html

Centers for Disease Control and Prevention, How to Prevent Cancer or Find it Early. (2016, July 20). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/cancer/dcpc/prevention/other.htm

Centers for Disease Control and Prevention, Increase Access to Healthy Foods and Beverages. (2016, November 1). Retrieved from https://www.cdc.gov/nccdphp/dnpao/state-local-programs/nutrition.html

Centers for Disease Control and Prevention, Infant Mortality. (2016, Jan 12). Retrieved from http://www.cdc.gov/reproductivehealth/maternalinfanthealth/infantmortality.htm

Centers for Disease Control and Prevention, Opioid Overdose-Understanding the Epidemic. (2016, December 16). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/drugoverdose/epidemic/index.html

Centers for Disease Control and Prevention, Physical Activity. (2016, Aug 30). Retrieved from https://www.cdc.gov/physicalactivity/index.html

Centers for Disease Control and Prevention, Prescription Opioids. (2016, March 16). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/drugoverdose/opioids/prescribed.html

Centers for Disease Control and Prevention, Preventing Chronic Disease: Appalachian Health. (2006, October). *Preventing Chronic Disease: Appalachian Health*. Retrieved from https://www.cdc.gov/pcd/issues/2006/oct/toc.htm

Centers for Disease Control and Prevention, Quitting Smoking. (2017, February 1). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/cessation/quitting/

Centers for Disease Control and Prevention, Reproductive and Birth Outcomes. (2016, August 31). Retrieved from https://ephtracking.cdc.gov/showRbLBWGrowthRetardationEnv.action

Centers for Disease Control and Prevention, Reproductive Health: About Teen Pregnancy. (2016, Aug 31). Retrieved from http://www.cdc.gov/teenpregnancy/about/

Centers for Disease Control and Prevention, Social Determinants and Eliminating Disparities in Teen Pregnancy. (2017, May 18). Retrieved from https://www.cdc.gov/teenpregnancy/about/social-determinants-disparities-teen-pregnancy.htm

Centers for Disease Control and Prevention, State and Local Programs, Nutrition: Strategies and Resources. (2016, June 21). Retrieved from https://www.cdc.gov/nccdphp/dnpao/state-local-programs/nutrition.html

Centers for Disease Control and Prevention, Stroke. (2017, February 6). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/stroke/

Centers for Disease Control and Prevention, Stroke Treatment. (2017, March 27). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/stroke/treatments.htm

Centers for Disease Control and Prevention, Suicide. (2017). Retrieved from Suicide and Self-Inflicted Injury: https://www.cdc.gov/nchs/fastats/suicide.htm

Centers for Disease Control and Prevention, TB and HIV Coinfection. (2016, June 29). *TB and HIV Coinfection*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/tb/topic/basics/tbhivcoinfection.htm

Centers for Disease Control and Prevention, Trends in Reportable Sexually Transmitted Diseases in the United States. (2009, January 13). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/std/stats07/trends.htm

Centers for Disease Control and Prevention, What are Health Disparities? (2013, November 1). Retrieved from Disparities Analytics: http://www.cdc.gov/DisparitiesAnalytics/

Centers for Medicare and Medicaid Services. (2017, July 25). *Medicare Enrollment Dashboard*. Retrieved from https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Dashboard/Medicare-Enrollment/Enrollment%20Dashboard.html

Centers for Medicare and Medicaid Serivces. (2016, December 31). *Medicare.gov| Hospital compare*. Retrieved from Medicare.gov The Official US Government Site for Medicare: https://www.medicare.gov/hospitalcompare/about/what-is-HOS.html

Centers for Medicare and Medicaid Services, Depression is not a normal part of growing older. (2016). Retrieved from https://www.cms.gov/Medicare/Prevention/PrevntionGenInfo/Health-Observance-Mesages-New-Items/2015-05-14-depression.html

Chan, L., Hart, L., & Goodman, D. (2006). Geographic Access to Health Care for Rural Medicare Beneficiaries. *Journal of Rural Health, 22*, 140-146.

Chandran, A., Hyder, A., & Peek-Asa, C. (2010). The Global Burden of Unintetional Injuries and an Agenda for Progress. *Epidemiological Reviews, 32*(1), 110-120.

Chaple, M., Searcy, M., Rutkowski, B., & Cruz, M. (2016). Building the Capacity for Behavioral Health Services within Primary Care and Medical Settings. *Addiction Technology Transfer Center Network*, http://attcnetwork.org/advancingintegration/ATTC_WhitePaper5_10_16Final.pdf.

Chicago Department of Public Health. (2013, February). *Healthy Chicago: Tranforming the Health of Our City*. Retrieved from http://www.cityofchicago.org/content/dam/city/depts/cdph/CDPH/HCPolicyBrief_Feb2013.pdf

Child Trends. (2016, Aug 31). *Low and Very Low Birthweight Infants*. Retrieved from DataBank: http://www.childtrends.org/?indicators=low-and-very-low-birthweight-infants

Child Trends. (2016, November). *Teen Births*. Retrieved from Child Trends Databank: https://www.childtrends.org/indicators/teen-births/

Choi, S., Kim, T., Lim, S., & al., e. (2011, February 18). *Hemoglobin A1c as a diagnostic tool for diabetes screening and new-onset diabeties prediction: a 6-year community-based prospective study*. Retrieved from ncbi.nlm.nih.gov: http://www.ncbi.nlm.nih.gov/pubmed/21335372

Christian, T. J. (2012). Trade-Offs Between Commuting Time and Health-Related Activities. *Journal of Urban Health, 89*(5), 746-757.

Chronic Obstructive Pulmonary Disease (COPD). (2016, September 16). Retrieved from Centers for Disease Control and Prevention : https://www.cdc.gov/copd/index.html

Cohen, R., & Stitzel, J. (2015). *Improving Dental Care Access in Rural America.* Retrieved from http://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2015/11/18/improving-dental-care-access-in-rural-america)

Cohen, S. (2004, November). *Social Relationships and Health.* Retrieved from Carnegie Mellon Univeristy, American Psychologist: http://www.psy.cmu.edu/~scohen/AmerPsycholpaper.pdf

Commission to Build a Healthier America. (2008). *How could neighborhoods affect health?* Princeton, NJ: Robert Wood Johnson Foundation.

Commonwealth Fund. (2016, Aug 31). *Who Are the Remaining Uninsured and Why Haven't They Signed Up for Coverage?* Retrieved from http://www.commonwealthfund.org/publications/issue-briefs/2016/aug/who-are-the-remaining-uninsured

Cooper, R.A., Cooper, M.A., McGinley, E.L., Fan, X., & Rosenthal, J.T. (2012). Poverty, Wealth, and Health Care Utilization: A Geographic Assessment. *Journal of Urban Health : Bulletin of the New York Academy of Medicine, 89*(5), 828-847.

County Health Rankings & Roadmaps. (2016, Aug 31). *Mental Health Providers.* Retrieved from http://www.countyhealthrankings.org/app/north-carolina/2016/measure/factors/62/description

County Health Rankings & Roadmaps, Adult Obesity. (2016). Retrieved from http://www.countyhealthrankings.org/measure/adult-obesity

County Health Rankings & Roadmaps, Dentists. (2016). Retrieved from http://www.countyhealthrankings.org/measure/dentists

County Health Rankings & Roadmaps, Diabetic Monitoring. (2016). Retrieved from http://www.countyhealthrankings.org/measure/diabetic-monitoring

County Health Rankings & Roadmaps, Mammography Screening. (2016). Retrieved from http://www.countyhealthrankings.org/measure/mammography-screening

County Health Rankings & Roadmaps, Physical Inactivity. (2016). Retrieved from http://www.countyhealthrankings.org/measure/physical-inactivity

County Health Rankings & Roadmaps, Poor Mental Health Days. (2016). Retrieved from http://www.countyhealthrankings.org/measure/poor-mental-health-days

County Health Rankings & Roadmaps, Poor Physical Health Days. (2016). Retrieved from http://www.countyhealthrankings.org/measure/poor-physical-health-days

County Health Rankings & Roadmaps, Primary Care Physicians. (2016). Retrieved from http://www.countyhealthrankings.org/measure/primary-care-physicians

County Health Rankings & Roadmaps, Social Associations. (2016). Retrieved from http://www.countyhealthrankings.org/measure/social-associations

County Health Rankings & Roadmaps, Some College. (2016). Retrieved from http://www.countyhealthrankings.org/measure/some-college

County Health Rankings & Roadmaps, Uninsured. (2016). Retrieved from http://www.countyhealthrankings.org/measure/uninsured

County Health Rankings. (2016). *Sexually transmitted infection rate*. Retrieved from http://www.countyhealthrankings.org/measure/sexually-transmitted-infection-rate

Craddock Lee, S., Higashi, R., Inrig, S., Sanders, J., Zhu, H., Argenbright, K., & Tiro, J. (2016). County-level outcomes of a rural breast cancer screening outreach strategy: a decentralized hub-and-spoke model (BSPAN2). *Behavioral Medicine Practice Policy Resolution*, 427-430.

Criner, G., Bourbeau, J., & Diekemper, R. e. (2015). Review: Influenza vaccination and inhaled therapies prevent acute exacerbations in COPD. *Chest*, 894-942.

Cubbin, C., LeClere, F., & Smith, G. (2000, Jul). Socioeconomic status and injury mortality: individual and neighbourhood determinants. *J. Epidemiol Community Health, 54*(7), 517-24.

Cummins, S., Flint, E., & Matthews, A. (2014, Feb). New Neighborhood Grocery Store Increased Awareness Of Food Access But Did Not Alter Dietary Habits Or Obesity. *Health Affairs, 33*(2), 283-291.

Curtin, S. C., Warner, M., & Hedegaard, H. (2016, April). *Increase in Suicide in the United States, 1999-2014*. Retrieved from National Center for Health Statistics : https://www.cdc.gov/nchs/products/databriefs/db241.htm

Cutler, D. (2007). *Education and Health: National Poverty Center Policy Brief #9.* University of Michigan: ERIC.

David, C. (2007). *Policy Brief: Education and Health.* Ann Arbor: National Poverty Center.

Dean, O., Skopec, L., Sung, J., & Waidmann, T. (2015). Uninsured Rate Dropped by Nearly Half between December 2013 and March 2015. *Insight on the Issues*.

DeNavas-Walt, C., & Proctor, B. (2015). *Income and Poverty in the United States: 2014.* U.S. Census Bureau, Current Population Reports, P60-252.

Division of Diabetes Translation. (2015). *Diabetes Public Health Resource: Methods and Limitations*. Retrieved from Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion: http://www.cdc.gov/diabetes/statistics/incidence/methods.htm

Doescher, M., & Keppel, G. (2015). *Dentist Supply, Dental Care Utilization, and Oral Health Among Rural and Urban U.S. Residents.* University of Washington: RHRC.

Dominick, K. L., Ahern, F. M., Gold, C. H., & Heller, D. A. (2002). Relationship of health-related quality of life to health care utilization and mortality among older adults. *Aging Clin Exp Res, 14*, 499-508.

Dorn, S. (2008, January). *Updating the Institute of Medicine Analysis on the Impact of Uninsurance on Mortality.* Retrieved from Urban Institute: http://www.urban.org/sites/default/files/alfresco/publication-pdfs/411588-Uninsured-and-Dying-Because-of-It.PDF

Dragisic, T., Dickov, A., Dickov, V., & Mijatovic, V. (2015, June). *Drug Addiction as Risk for Suicide Attempts* . Retrieved from National Center for Biotechnology Information : https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4499285/

Dranger, E., & Remington, P. (2004). *YPLL: A Summary Measure of Premature Mortality Used in Measuring the Health of Communities.* Madison: Wiscosin Public Health and Health Policy Institute.

Druss, B., Zhao, L., Von Esenwein, S., Morrato, E., & Marcus, S. (2011). Understanding Excess Mortality in Persons with Mental Illness: 17-Year Follow Up of a Nationally Representative US Survey. . *Medical Care, 49*(6), 599-604.

D'Souza, A., Shah, M., Dhamane, A., & Dalal, A. (2014, October 10). Clinical and economic burden of COPD in a medicaid population. *COPD: Journal of Chronic Obstructive Pulmonary Disease*, 212-220. doi:10.3109/15412555.2013.836168

Dunn, K., Saunders, K., Rutter, C., Banta-Green, C., Merill, J., & Sullivan, M. (2010). Opioid prescriptios for chronic pain and overdose: a cohort study. *Annals of Interal Medicine*.

Eckel, R., Kahn, S., Ferrannini, E., Goldfine, A., Nathan, D., Schwartz, M., . . . Smith, S. (2011). Obesity and Type 2 Diabetes: What Can Be Unified and What Needs to Be Individualized. *J Clin Endocrinol Metab.*, 1654-1663.

Edelstein, B., & Chinn, C. (2009). Update on Disparities in Oral Health and Access to Dental Care for America’s Children. *Academic Pediatrics, 9*(6), 415-419.

Elimination of Health Disparities. (2014). Retrieved from Surgeon General: https://www.surgeongeneral.gov/priorities/prevention/strategy/elimination-of-health-disparities.html

Ellis, A., Konrad, T., Thomas, K., & Morrissey, J. (2009). County-level Estimates of Mental Health Professional Supply in the United States. . *Psychiatric Services, 60*(10), 1315-1322.

Evensen, A. E. (2010). *Management of COPD Exacerbations.* Retrieved from American Family Physician: http://www.aafp.org/afp/2010/0301/p607.html

Ferrante, J., Gonzalez, E., Pal, N., & Roetzheim, R. (2000). Effects of Physiciaan Supply on Early Detection of Breast Cancer. *JABFM*, 408-414.

Feudtner, e. a. (n.d.). Statistical Uncertainty of Mortality Rates and Rankings for Children's Hospitals.

Fingerhut, L. A. (2010, April 6). *Increases in Poisoning and Methadone-Related Deaths: United States, 1999-2005*. Retrieved from Centers for Disease Control and Prevention : https://www.cdc.gov/nchs/data/hestat/poisoning/poisoning.htm

Finkelstein, E., Trogdon, J., Cohen, J., & Dietz, W. (2009). Annual Medical Soending Attributable to Obesity: Payer- and Service-specific. *Health Affairs*, w822–w831.

Flegal, K., Carroll, M., Kit, B., & Odgen, C. (2012). Prevalence of Obesity and Trends in the Distribution of Body Mass Index Among US Adults, 1999-2010. *The Journal of American Medicial Association*, 307(5), 491-497.

Fontanella, C. A., Hiance-Steelesmith, D., Phillips, G. S., Lester, N., Sweeney, H. A., & Campo, J. V. (2015). Widening Rural-Urban Disparities in Youth Suicides, United States, 1996-2010. *JAMA Pediatr, 169*(5), 466-473.

Foundation, K. F. (2017). *Medicare Beneficiaries as a Percent of Total Population*. Retrieved from Kaiser Family Foundation.

Fraher, E., Knapton, A., Sheldon, G., Meyer, A., & Ricketts, T. (2013, May). Projecting surgeon supply using a dynamic model. *Annals of Surgery, 257*(5), 867-72.

Franz, C. (2016). Financial Empowerment and Health Related Quality of Life in Family Scholar House Participants. *Journal of Financial Therapy*, 38-57.

Froshaug, D., Dickinson, M., Fernald, D., & Green, L. (2009). Personal Health Behaviors are Associated with Physical and Mental Unhealthy Days: A Prescription for Health (P4H) Practice-Based Research Networks Study. *JABFM*, 368-374.

Gan, W., FitzGerald, J., Carlsten, C., Sadatsafavi, M., & Brauer, M. (2013). Associations of Ambient Air Pollution with Chronic Obstructive Pulmonary Disease Hospitalization and Mortality. *American Journal of Respiratory and Critical Care Medicine, 187*(7), 721-727.

Gardner, J.W., & Sanborn, J. S. (1990, July). Years of Potential Life Lost (YPLL) -What Does it Measure? *Epidemiology, 1*(4), 322-329.

Ghosh-Dastidar, B., Cohen, D., Hunter, G., Zenk, S., Huang, C., Beckman, R., & Dubowitz, T. (2014). Distance to Store, Food Prices, and Obesity in Urban Food Deserts. *American Journal of Preventive Medicine, 47*(5), 587-595.

Go, A.S. (2013). Executive Summary: Heart Disease and Stroke Statistics—2013 Update A Report From the American Heart Association. *Circulation, 127*, 143-152.

Goodman, D., & Grumbach, K. (2008). Does having more physicians lead to better health system performance? *JAMA*, 299: 335–337.

Goodman, E. (1999). The Role of Socioeconomic Status Gradients in Explaning Differences in US Adolescents' Health. *American Journal of Public Health*, 1522-1528.

Greer, S. A., Nwaise, I. A., & Casper, M. L. (2010). *Atlas of Heart Disease Hospitalizations Among Medicare Beneficiaries.* Atlanta: Centers for Disease Control and Prevention.

Guh, D.P., Zhang, W., Bansback, N., Amarsi, Z., Birmingham, C., & Anis, A. (2009). The incidence of co-morbidities related to obesity and overweight: A systematic review and meta-analysis. *BMC Public Health, 9*(88).

Halverson, J.A., Ma, L., & Harner, E. J. (2004, November). *An Analysis of Disparities in Health Status and Access to Health Care in the Appalachian Region.* Retrieved from Appalachian Regional Commission : https://www.arc.gov/research/researchreportdetails.asp?REPORT_ID=82

Hamilton, B., Martin, J., & Osterman, J. (2016). Births: Preliminary data for 2015. *National Vital Statistics Reports*, http://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_03.pdf.

Handbury, J., Rahkovsky, I., & M., S. (2015). *What Drives Nutritional Disparities? Retail Access and Food Purchases Across the Socioeconomic Spectrum.* Retrieved from National Bureau of Economic Research Working Paper No. 21126: http://www.nber.org/papers/w21126

Harris-Kojetin, L., Sengupta, M., Park-Lee, E., & Valverde, R. (2013). Long-term care services in the United States: 2013 overview. *Vital Health Stat, 3*(37).

Hauenstein, E. P. (2007). Rurality and Mental Health Treatment. *Administration and Policy in Mental Health, 34,* 255.

Hawton, K. B. (2010, May). Toxicity of Antidepressants: rates of suicide relative to prescribing and non-fatal overdose. *J Psychiatry,*, 354-358. Retrieved November 20, 2017, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2862059/

He, X., Akil, L., Aker, W., Hwang, H.-M., Ahmad, & Hafiz. (2015). Trends in Infant Mortality in United States: A Brief Study of the Southeastern States from 2005-2009. *International Journal of Environmental Research and Public Health*, 4908-4920.

Health Equity Alliance. (2016, Dec 12). *Measures/ Economic Security*. Retrieved from Health Equity Index: https://www.sdoh.org/indicators/about/povert01

Health Indicators Warehouse. (n.d.). *Mentally unhealthy days: adults (per person).* Retrieved from http://www.healthindicators.gov/Indicators/Mentally-unhealthy-days-adults-per-person_9/Profile

Health Resources and Services Administration. (2016, Aug 31). *Diabetes HbA1c {Poor Control}*. Retrieved from http://www.hrsa.gov/quality/toolbox/measures/diabetes/

Health Resources and Services Administration. (2016, Aug 31). *Mental Health HPSA Designation Overview*. Retrieved from http://bhpr.hrsa.gov/shortage/hpsas/designationcriteria/mentalhealthhpsaoverview.html

Health Resources and Services Administration. (2016, August 31). *Shortage Designation: Health Professional Shortage Areas & Medically Underserved Areas/Populations*. Retrieved from htt[://www.hrsa.gov/shortage/

Health Resources and Services Administration, Breast Cancer Screening. (2016). Retrieved from https://www.hrsa.gov/quality/toolbox/measures/breastcancer/part6.html#8

Healthy Appalachia Institute. (2011). *Leading Causes of Death,*. Wise, VA: The University of Virginia's College at Wise. Retrieved from http://www.healthyappalachia.org/files/HAI_web_Leading_cause_of_death_11_22_1-_final.pdf

Healthy People 2020. (2017, May 15). *Disparities*. Retrieved from https://www.healthypeople.gov/2020/about/foundation-health-measures/Disparities

Heisler, E.A. (2015). *The Mental Health Workforce: A Primer*. Washington, DC: Congressional Research Service. Retrieved 2017, from https://fas.org/sgp/crs/misc/R43255.pdf

Herath, J., & Brown, C. (2013, May). An Analysis of Adult Obesity and Hypertension in Appalachia. *Global Journal of Health Science, 5*(3), 127-138.

Hoehner, C. M., Barlow, C. E., Allen, P., & Schootman, M. (2012). Commuting Distance, Cardiorespiratory Fitness, and Metabolic Risk. *American Journal of Preventive Medicine, 42*(6), 571-578.

Holmes, G. M., & Fraher, E. (In press). Developing physician migration estimates for workforce models . *Health Services Research*.

Holmes, T. C. (2007, December). Mortality and Physician Supply: Does Region Hold the Key to the Paradox? *Health Services Research*, 2233-2251. doi:10.1111/j.1475-6773.2007.00728.x

Holt, J., Zhang, X., Presley-Cantrell, L., & Croft, J. (2011). Geographic Disparities in Chronic Obstructive Pulmonary Disease (COPD) Hospitalization among Medicare Beneficiaries in the United States. *International Journal of COPD, 6*, 321-328.

Holton, A., & Brantley, T. (2014). *Telepsychiatry in North Carolina: Mental Health Care Comes to You.* North Carolina Center for Public Policy Research.

Howard, V. J., Acker, J., Gomez, C. R., Griffies, A. H., Magers, W., Michael III, M., . . . Howard, G. (2004, October). *An Approach to Coordinate Efforts to Reduce the Public Health Burden of Stroke: The Delta States Stroke Consortium* . Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/pcd/issues/2004/oct/03_0037.htm

IHI. (2011). *IHI 90-day R&D Project Final Summary: Counties of Interest: Achieving Better or Worse Than Expected Health Outcomes.* Cambridge, MA: Institute for Healthcare Improvement.

IHS, Inc. (2016). *The Complexities of Physician Supply and Demand: Projections from 2014 to 2025: Final Report.* Association of American Medical Colleges. Retrieved from https://www.aamc.org/download/458082/data/2016_complexities_of_supply_and_demand_projections.pdf

Institute for Research on Poverty. (n.d.). *How is poverty measured in the United States?* University of Wisconsin-Madison.

Institute of Medicine (US) Committee on Health and Beahavior: Research, P. a. (2001). *Health and Behavior: The Interplay of Biological, Behavioral, and Societal Influences.* Retrieved from National Center for Biotechnology Information: https://www.ncbi.nlm.nih.gov/books/NBK43750/

Jia, H., Muennig, P., Lubetkin, E. I., & Gold, M. R. (2004). Predicting Geographical Variations in Behavioural Risk Factors: An Analysis of Physical And Mental Healthy Days. *J Epidemiol Community Health, 58*, 150-155.

Johns Hopkins University. (2014, August 6). *Stroke risk, related death rates have declined over past 20 years, study shows*. Retrieved from Johns Hopkins University, The Hub: https://hub.jhu.edu/2014/08/06/stroke-rate-decline-study/

Kaiser Family Foundation. (2015). *Medicare Beneficiaries as a Percent of Total Population*. Retrieved from Kaiser Family Foundation: http://kff.org/medicare/state-indicator/medicare-beneficiaries-as-of-total-pop/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D

Kaiser Family Foundation. (2016, September 09). *Key Facts about the Uninsured Population.* Retrieved from http://kff.org/uninsured/fact-sheet/key-facts-about-the-uninsured-population/

Kaiser Family Foundation. (2016, Aug 31). *Status of State Action on the Medicaid Expansion Decision.* Retrieved from http://kff.org/health-reform/state-indicator/state-activity-around-expanding-medicaid-under-the-affordable-care-act/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D

Kanny, D., Liu, Y., Brewer, R., & Lu, H. (2013, November 22). *Binge Drinking- United States, 2011*. Retrieved from Centers for Disease Control and Prevention : https://www.cdc.gov/mmwr/preview/mmwrhtml/su6203a13.htm

Kawachi, I., Kennedy, B., Lochner, K., & Prothrow-Smith, D. (1997). Social Capital, Income Inequality, and Mortality. *American Journal of Public Health*, 87(9),1491-1498.

Keeler, E., Guralnik, J. M., Tian, H., Wallace, R. B., & Reuben, D. B. (2010). The Impact of Functional Status on Life Expectancy in Older Persons. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 65*(7), 727-733.

Kenny, T. (2015, June 23). *Physical Activity for Health*. Retrieved from Patient: https://patient.info/health/physical-activity-for-health

Kentucky Department for Public Health. (2013). *State Health Assessment.* Frankfort.

Klaiman, T., Pantazis, A., Chainani, A., & Bekemeier, B. (2016). Using a positive deviance framework to identify Local Health Departments in Communities with exceptional maternal and child health outcomes: a cross sectional study. *BMC Public Health*, 602-610.

Klein, J. (2005). Adolescent Pregnancy: Current Trends and Issues. *American Academy of Pediatrics*, 281-286.

Kolappa, K., Henderson, D., & Kishore, S. (2013). No physical health without mental health: lessons unlearned? *Bull World Health Organ, 91*(3), 3-3A.

Kreider, B., Pepper, J., & Gunderson, C. a. (2012). Identifying the Effects of SNAP (Food Stamps) on Child Health Outcomes When Participation is Endogenous and Misreported. *Journal of the American Statistical Association*, 958-975. Retrieved from http://batten.virginia.edu/sites/default/files/research/attachments/JASA_KPGJ_online(1).pdf

Krishna, S., Gillespie, K., & McBride, T. (2010). Diabetes Burden and Access to Preventive Care in Rural United States. *The Journal of Rural Health*, 3-11.

Kruger, T., Howell, B., Haney, A., Davis, R., Fields, N., & Schoenberg, N. (2012, Mar). Perceptions of Smoking Cessation Programs in Rural Appalachia. *American Journal Health Behavior, 36*(3), 373-384.

Krumholz, H. M., Normand, S., & Wang, Y. (2014). Trends in Hospitalizations and Outcomes for Acute Cardiovscular Disease and Stroke: 1999-2011. *Circulation, 130*(12), 966-975.

Kuempel, E. D., Wheeler, M. W., Smith, R. J., Vallyathan, V., & Green, F. H. (2009). Contributions of Dust Exposure and Cigarette Smoking to Emphysema Severity in Coal Miners in the United States. *American Journal of Respiratory and Critical Care Medicine*, 180(3):257-64.

Kulshreshtha, A., Abhinav, G., Dabhadkar, K., Veledar, E., & Vaccarino, V. (2014, Jan/Feb). Urban-Rural Differences in Coronary Heart Disease Mortality in the United States: 1999-2009. *Public Health Reports, 129*(1), 19-29.

Laditka, J., Laditka, S., & Probst, J. (2005). More may be better: Evidence of a negative relationship between physician supply and hospitalization for ambulatory care sensitive conditions. *Health Services Research*, 40: 1148–1166.

Lafree, G. (2008). *Educational Attainment, Teacher/Student Ratio and Adult Incarceration Risk Among US Birth Cohorts Since 1910.* Lafayette: New York University.

Lane, N., Lutz, A., & Baker, K. (2012). *Health Care Costs and Access Disparities in Appalachia.* Washington D.C.: ARC.

Laney, A., & Weissman, D. (2014). Respiratory diseases caused by coal mine dust. *Journal of Occupational and Environmental Medicine*, 56; Supplement 10:S18-22.

LaVallee, R. A., & Yi, H.-y. (2011). *APPARENT PER CAPITA ALCOHOL CONSUMPTION: NATIONAL, STATE, AND REGIONAL TRENDS, 1977–2009.* National Institute on Alcohol Abuse and Alcoholism, Division of Epidemiology and Prevention Research. National Institute on Alcohol Abuse and Alcoholism.

Lavizzo-Mourey, R. (2017). *Seven Lessions I've Learned About Improving Health in America 2017 Annual Message*. Retrieved from Robert Wood Johnson Foundation: http://www.rwjf.org/en/library/annual-reports/2017-annual-message.html

Lê Cook, B., Doksum, T., Chen, C., Carle, A., & Alegría, M. (2013). The Role of Provider Supply and Organization in Reducing Racial/Ethnic Disparities in Mental Health Care in the U.S. *Social Science & Medicine, 84*, 102-109.

Levine, D. (2012, January). Why are dentists opposing expanded dental care? *Governing: States and Localities*.

Lutfiyya, M. M. (2011). Adequacy of Diabetes Care for Older U.S. Rural Adults: A Cross-Sectional Population Based Study Using 2009 BRFSS Data. *BMC Public Health, 11*(940).

Macinko, J., Starfield, B., & Shi, L. (2007). Quantifying the Health Benefits of Primary Care Physician Supply in the United States. *International Journal of Health Services*, *37*(1), 111-126.

Maqbool, N., & Viverios, J. A. (2015). *The Impacts of Affordable Housing on Health: A Research Summary*. National Housing Conference, Housing Policy Research. Washington DC: Center for Housing Policy.

Marks, R. (2011). Physical Activity and Hip Fracture Disability: A Review. *Journal of Aging Research*.

Martin, P. P., & Murphy, J. L. (2014, January). *African Americans: Description of Social Security and Supplemental Security Income Participation and Benefit Levels Using the American Community Survey*. Retrieved from Research and Statistics Note No. 2014-01: https://www.ssa.gov/policy/docs/rsnotes/rsn2014-01.html

Martino, S., Elliott, M., Kanouse, D., Farley, D., Burkhard, Q., & Hays, R. (2012). Depression and the Health Care Expenditures of Medicare Beneficiaries. *National Institute of Health*, 1883-1904.

Marty, L., Dubois, C., Gaubard, M., Maidon, A., Lesturgeon, A., Gaigi, H., & Darmon, N. (2015). Higher nutritional quality at no additional cost among low-income households: insight from food purchases of "positive deviants". *American Journal of Clinical Nutrition*, 1-9.

Matteson, W., D., Burra, J. A., & Marshall, J. R. (1998). Infant mortality: A multi-level analysis of individual and community risk factors. *Social Science and Medicine, 47*(11), 1841-1854.

McCormick, M. C. (1985, Jan 10). The Contribution of Low Birth Weight to Infant Mortality and Childhood Morbidity. *New England Journal of Medicine*.

McEwen, L., Kim, & Haan, M. e. (2006, Feb). Diabetes Reporting as a Cause of Death. *Diabetes Care, 29*(2), 247-253.

McGarvey, E., Leon-Verdin, M., Killos, L., Guterbock, T., & Cohn, W. (2011). Health Disparities Between Appalachian and Non-Appalachian Counties in Virginia USA. *J Community Health*, 348-356.

McLeroy, K., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological persepctive on health promotion programs. *Health Educ, 15*(4), 351-337.

Menke, A., Casagrande, S., Geiss, L., & Cowie, C. (2015). Prevalence of and Trends in Diabetes Among Adults in the United States, 1988-2012. *JAMA*.

Miles, L. (2007). Physical Activity and Health. *Nutrition Bulletin*, 314-363.

Moriarty, D. G., Zack, M. M., & Kobau, R. (2003). The Centers for Disease Control and Prevention's Health Days Measures – Population Tracking of Perceived Physical and Mental Health over Time. *Health Qual Life Outcomes*, *1*, 37.

Mozaffarian, D. B. (2016). Executive Summary: Heart Disease and Stroke Statistics—2016 Update:. *A Report from the American Heart Association*.

Nathan, D. M. (2009). International Expert Committee Report on the Role of the A1C Assay in the Diagnosis of Diabetes. *American Diabetes Association*, 1327-1334.

National Cancer Institute. (2016, August 31). *Cancer Statistics: Statistical Summaries*. Retrieved from Surveillance, Epidemiology, and End Results Program.: http://seer.cancer.gov/statfacts/html/all.html

National Cancer Institute. (2017). *Cancer Stat Facts: Female Breast Cancer*. Retrieved from National Cancer Institute: https://seer.cancer.gov/statfacts/html/breast.html

National Center for Health Statistics. (2017, March 17). *Leading Causes of Death*. Retrieved from Centers for Disease Control and Prevention : https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm

National Center for Health Statistics, HbA1c Test: Diabetic Medicare Beneficiaries. (2016, Aug 31). Retrieved from Health Indicators Warehouse.: http://www.healthindicators.gov/Indicators/HbA1c-test-diabetic-Medicare-beneficiaries-65-75-years-percent_29/Profile.

National Council on Aging. (2016, Aug 31). *Falls Prevention Programs*. Retrieved from http://www.ncoa.org/health-aging/falls-prevention/falls-preventon-programs-for-older-adults/

National Institute of Diabetes and Digestive and Kidney Diseases. (2016, November). *What is Diabetes?* Retrieved from National Institute of Diabetes and Digestive and Kidney Diseases: https://www.niddk.nih.gov/health-information/diabetes/overview/what-is-diabetes

National Institute of Mental Health. (2016, October). *Depression*. Retrieved from National Institute of Mental Health: https://www.nimh.nih.gov/health/topics/depression/index.shtml

National Institutes of Health, Office of Behavioral and Social Sciences Research. (2015, Nov 10). *The link between early education policy and health outcomes.* Retrieved from https://obssr.od.nih.gov/the-link-between-early-education-policy-and-health-outcomes/

National Opinion Research Center (NORC) at the University of Chicago, and East Tennessee State University. (2008). *An Analysis of Mental Health and Substance Abuse Disparities & Access to Treatment Services in the Appalachian Region.* Appalachian Regional Commission.

National Safety Council. (2016, Aug 31). *Painkillers at Root of Prescription Drug Abuse Epidemic.* Retrieved from http://www.nsc.org/learn/NSC-Initiatives/Pages/prescription-painkiller-epidemic.aspx?var=mnd

NHRA. (2014). HIV/AIDS in Rural America: Disproportionate Impact on Minority and Multicultural Populations. *Policy Brief*, 1-6.

Nicholson Jr., N. R. (2005, June). *The Relationship Between Injurious Falls, Fear of Falling, Social Isolation and Depression.* Retrieved from University of Connecticut Health Center Graduate School: http://digitalcommons.uconn.edu/cgi/viewcontent.cgi?article=1080&context=uchcgs_masters

Nietert, P. J., Wessell, A. M., Jenkins, R. G., Feifer, C., Nemeth, L. S., & Ornstein, S. M. (2007). Using a summary measure for multiple quality indicators in primary care: the Summary QUality InDex (SQUID). *Implementation Science, 2*(11).

O'Malley, A., Pham, H., Schrag, D., Wu, B., & Bach, P. (2007). Potentially Avoidable Hospitalizations for COPD and Pneumonia: The Role of Physician and Practice Characteristics. *Medical Care, 45*(6), 562-570.

O'Connor, A., & Wellenius, G. (2012). Rural–Urban Disparities in the Prevalence of Diabetes and Coronary Heart Disease. *Public Health*, *126*(10), 813-820.

Office of Adolescent Health. (2016). *Trends in Teen Pregnancy and Childbearing.* U.S. Department of Health and Human Services.

Office of Disease Prevention and Health Promotion. (2016, August 22). *General Health Status*. Retrieved from Healthy People 2020: https://www.healthypeople.gov/2020/about/foundation-health-measures/General-Health-Status

Office of Disease Prevention and Health Promotion, Gonorrhea and Chlamydia: Screening – Women. (2016, August 31). Retrieved from HealthyPeople.gov: https://www.healthypeople.gov/2020/tools-resources/evidence-based-resource/gonorrhea-and-chlamydia-screening-%E2%80%93-women

Office of National Statistics. (2013). *Personal Well-being across the UK, 2012/13.* ONS Measuring National Well-being Programme.

Ogden, C., MD, C., CD, F., & Flegal, K. (2015). *Prevalence of obesity among adults and youth: United States, 2011–2014*. Retrieved from National Center for Health Statistscs, NCHS data brief, no 219: https://www.cdc.gov/nchs/data/databriefs/db219.pdf

Olfson, M., Blanco, C., & Marcus, S. C. (2016). Treatment of Adult Depression in the United States. *JAMA Internal Medicine*, 1482-1491.

Pallardy, C. (2016). *Becker's Hospital Review.* Retrieved from http://www.beckershospitalreview.com/healthcare-information-technology/25-things-to-know-about-e-prescribing.html

Papas, M., Alberg, A., Ewing, R., & Helzlsouer, K. (2007). The Built Environment and Obesity. *Epidemiologic Reviews*, 129-143.

Park, H., & Bloch, M. (2016, Jan 19). How the Epidemic of Drug Overdose Deaths Ripples Across America. *New York Times*, pp. https://www.nytimes.com/interactive/2016/01/07/us/drug-overdose-deaths-in-the-us.html.

Park, M., Katon, W., & Wolf, F. (2013, May-June). Depression and risk of mortality in individuals with diabetes: a meta-analysis and systematic review. *General Hospital Psychiatry*, 217-225.

PDA, V. F. (2016). CON Application for Demonstration Dental Only Single Specialty Ambulatory Surgery Centers . North Carolina: North Carolina Division of Health Services Regulation.

Pelicer, F., Nagamine, K., & Faria, M. (2016). Health-Related Physical Fitness in School Children and Adolescents. *International Journal of Sports Science*, 19-24.

Plough, A. L. (2015, November 11). *Measuring What Matters: Introducing a New Action Framework*. Retrieved from Robert Wood Johnson Foundation Culture of Health Blog: http://www.rwjf.org/en/culture-of-health/2015/11/measuring_what_matte.html

Pohl, J. S. (2017). *Falls and the Social Isolation of Older Adults in the National Health and Aging Trends Study*. Retrieved from https://digital.lib.washington.edu/researchworks/handle/1773/37198

Pompili, M., Serafini, G., Innamorati, M., Dominici, G., Ferracuti, S., Kotzalidis, G. D., & Lester, D. (2010). Suicidal Behavior and Alcohol Abuse. *International Journal of Environmental Research and Public Health, 7*(4), 1392-1432.

Pope, C., Burnett, R., Krewski, D., & Jerrett, M. (2009). Cardiovasculare Mortality and Exposure to Airborne Fine Particulate Matter and Cigarette Smoke. *Cardiovascular*, 941-948.

Powell, D., Pacula, R., & Taylor, E. (2016). *How Increasing Medical Access to Opioids Constributes to the Opioid Epidemic: Evidence from Medicare Part D*. Retrieved from Rand Corporation: https://poseidon01.ssrn.com/delivery.php?ID=3520210021250000910030251221130141070360240080010190070070711241000210250970821030691210581180060411270010881080910950950790710300070040010880060951130840981131030840000840960280041251051010081210241250101191060

Preventing Chronic Disease. (2006, September 15). Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/pcd/issues/2006/oct/toc.htm

Radnofsky, L. (2015, Feb 16). Where Are the Mental-Health Providers? . *Wall Street Journal*.

Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., & Patra, J. (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *The Lancet*, 2223-2233.

Reif, S., Pence, B., Hall, I., Hu, X., Whetten, K., & Wilson, E. (2015). HIV Diagnoses, Prevalence, and Outcomes in Nine Southern States. *J Community Health*, 642-651.

Reynolds, C. (2016, November 30). *Appalachian Studies Final Project: Drug Abuse in Appalachia.* Retrieved from Blogs@VT Sites site: https://blogs.lt.vt.edu/appalachianiswhatshappenin/2016/11/30/final-project-drug-abuse-in-appalachia/

Richard Pascale, J.S. (2010). *The Power of Positive Deviance.* Boston: Harvard Business Press.

Ricketts, T., & Holmes, M. (2007). Mortality and physician supply: does region hold the key to the paradox? *Health Services Research, 42*(6), 2233-2251.

Riumallo-Herl, C., Kawachi, I., & Avendano, M. (2014). Social capital, mental health and biomarkers in Chile: assessing the effects of social capital in a middle-income country. *National Institute of Health*, 47-58.

Robert Wood Johnson Foundation. (2008, September). *Where We Live Matters for Our Health: Neighborhoods and Health.* Retrieved from Commission Health: http://www.commissiononhealth.org/PDF/888f4a18-eb90-45be-a2f8-159e84a55a4c/Issue%20Brief%203%20Sept%2008%20-%20Neighborhoods%20and%20Health.pdf

Robert Wood Johnson Foundation. (2012, December). *Why Does Education Matter So Much to Health?* Retrieved from http://www.rwjf.org/en/library/research/2012/12/why-does-education-matter-so-much-to-health-.html

Robert Wood Johnson Foundation. (2016). The State of Obesity. Better Policies for a Healthier America. http://stateofobesity.org/physical-inactivity/.

Robert Wood Johnson Foundation. (2017, March 15). *About a Culture of Health*. Retrieved from Building a Culture of Health: http://www.cultureofhealth.org/about/

Roland, S. (2002). The effects of obesity, smoking, and drinking on medical problems and costs. *Health Affairs*, 245-253.

Roux, A., Merkin, S., Arnett, D., Chambless, L., Massing, M., & Nieto, J. (2001). Neighborhood of Residence and Incidence and of Coronary Heart Disease. *The New England Journal of Medicine*, 99-106.

Rubin, P. R. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, *70*(1), 41-55. Retrieved from https://oup.silverchair-cdn.com/oup/backfile/Content_public/Journal/biomet/70/1/10.1093/biomet/70.1.41/2/70-1-41.pdf?Expires=1488584930&Signature=LoZP4uTuVqlcq3GL5p9gWzzPdcx04rglNIsOm-w~HTDofm0JqS7wO1Anq08LM4c97FmZ1BkiOoBiW985mW1adxTdIBuvHZi6OQZE57eMJq3d5

Rural Health Information Hub. (2017, February 15). *Oral Health in Rural Communities*. Retrieved from Rural Health Information Hub: https://www.ruralhealthinfo.org/topics/oral-health

Rutledge, R., Messick, J., Baker, C., Rhyne, S., Butts, J., Meyer, A., & Ricketts, T. (1992, Jul). Multivariate population-based analysis of the association of county trauma centerrs with per capita county trauma death rates. *J Trauma, 33*(1), 29-37.

Saab, H., & Klinger, D. (2010). School differences in adolescent health and wellbeing: Findings from the Canadian Health Behaviour in School-aged Children Study. *Social Science and Medicine, 70*, 850-858.

Samuel, C. (2014, Nov). Area-level factors associated with electronic health record adoption and meaningful use in the Regional Extension Center Program. *21*(6), 976-983.

Santo Tomas, L. (2011, Mar). Emphysema and chronic obstructive pulmonary disease in coal miners. *Curr Opin Pulm Med.*, *17*(2), 123-125.

Sarti, C., Rastenyte, D., Cepaitis, Z., & Tuomilehto, J. (2003). International Trends in Mortality from Stroke, 1968-1994. *Stroke*, 1588-1602.

Sauer, R., Huttner, H., Breuer, L., Engelhorn, T., Schellinger, P., Schwab, S., & Kohrmann, M. (2010). Repeated Thombolysis for Chronologically Separated Ischemic Strokes. *Stroke*, 1829-1833.

Saydah, S., Eberhardt, M., Loria, C., & FL, B. (2002). Age and the Burden of Death Attributable to Diabetes in the United States. *Am. J. Epidemiol.*, *156*(8), 714-719.

Schane, R., Ling, P., & Glantz, S. (2010). Health Effects of Light and Intermittent Smoking. *Circulation*, 1518-1523.

Schedlbauer, A., Prasad, V., Mulvaney, C., Phansalkar, S., Stanton, W., Bates, D., & Avery, A. (2009). What Evidence Supports the Use of Computerized Alerts and Prompts to Improve Clinicians' Prescribing Behavior. *Journal of American Medical Informatics Association*, 531-538.

Sheiham, A. (2005, Sep). Oral health, general health and quality of life. *Bull World Health Organ. , 83*(9), 644.

Shortridge, E., & Moore, J. (2010). *Use of Emergency Departments for Conditions Related to Poor Oral Health Care.* Retrieved from http://www.norc.org/PDFs/publications/OralHealthFinal2.pdf

Siegel, R. L., Miller, K. D., & Jemal, A. (2017). Cancer statistics, 2017. *CA Cancer J Clin*, 7-30.

Smith, C., & Barnett, E. (2005). Diabetes-related mortality among Mexian Americans, Puerto Ricans, and Cuban Americans in the United States. *Rev Panam Salud Publica*, 381-387.

Social Security Administration, Annual Statistical Report on the Social Security Disability Insurance Program. (2014). Retrieved from https://www.ssa.gov/policy/docs/statcomps/di_asr/2014/index.html

Starfield, B., Shi, L., & Macinko, J. (2005). Contribution of Primary Care to Health Systems and Health. *The Millbank Quarterly*, 457-502.

Starfield, B., Shi, L., Grover, A., & Macinko, J. (2005). The Effects of Specialist Supply on Populations' Health: Assessing the Evidence. *Health Affairs, 24*, 97-107.

Stat Trek. (2017). *Statistics and Probability Dictionary*. Retrieved from Stat Trek: http://stattrek.com/statistics/dictionary.aspx?definition=z%20score

Stewart, N., & Kaye, K. (2013). *Why it Matters: Teen Childbearing and Child Welfare*. Retrieved from The National Campaign: https://thenationalcampaign.org/resource/why-it-matters-teen-childbearing-and-child-welfare

Substance Abuse and Mental Health Services Administration. (2013). Retrieved from Report to Congress on the Nation's Substance Abuse and Mental Health Workforce Issues: http://store.samhsa.gov/shin/content//PEP13-RTC-BHWORK/PEP13-RTC-BHWORK.pdf

Substance Abuse and Mental Health Services Administration. (2013). *Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings.* NSDUH Series H-46, HHS Publication No. (SMA) 13-4795. Washington: Substance Abuse and Mental Health Services Administration.

Susan G. Komen. (2017, January 15). *Comparing Breast Cancer Screening Rates Among Different Groups*. Retrieved from Susan G. Komen: http://ww5.komen.org/BreastCancer/DisparitiesInBreastCancerScreening.html

Szreter, S., & Woolcock, M. (2004). Health by Association? Social Capital, Social Theory, and the Political Economy of Public Health. *International Journey of Epidemiology*, 650-667.

The Pew Charitable Trust. (2013, June). *In Search of Dental Care: Two Types of Dentist Shortages Limit Children's Access to Care*. Retrieved from Children Dental: http://www.pewtrusts.org/~/media/legacy/uploadedfiles/pcs_assets/2013/insearchofdentalcarepdf.pdf

Thomas, K., Ellis, A., Konrad, T., Holzer, C., & Morrissey, J. (2009). County-Level Estimates of Mental Health Professional Shortage in the United States. *Psychiatric Services*, 1323-1328.

Thorpe, K., Florence, C., & Joski, P. (2004). Which Medical Conditions Account for the Rise in Helath Care Spending? *Health Affairs*, 437-445.

Topmiller, M. (2016, March). *Geospatial Research Brief*. Retrieved from healthlandscape.org: https://www.healthlandscape.org/Brigh_Spots_Approrpriate_Diabetes_Preventive_Care.pdf

Torrone, E., Papp, J., & Weinstock, H. (2014). Prevalence of Chlamydia Trachomatic Genital Infection Among Persons Aged 14-29 Years-- United States, 2007-2012. *MMWR*, 830-845.

Toth, M., Holmes, G., Van Houtven, C., Toles, M., Weinberger, M., & PC, S. (2015). Rural Medicare Beneficiaries Have Fewer Follow-up Visits and Greater Emergency Department Use Postdischarge. *Medical Care, 53*(9), 800-8.

Treuhaft, S., & Karpyn, A. (2010). *The Grocery Gap: Who Has Access to Healthy Food and Why It Matters.* PolicyLink. Retrieved from http://thefoodtrust.org/uploads/media_items/grocerygap.original.pdf

Tukey, J. W. (1977). *Exploratory Data Analysis.* Reading, MA: Addison–Wesley.

U.S. Census Bureau. (2015). *Income, Poverty, and Health Insurance Coverage in the United States: 2014.* Washington: U.S. Census Bureau.

U.S. Department of Health and Human Services, Prevention Quality Indicators Overview. (2017, May 18). Retrieved from Agency for Healthcare Research and Quality: https://www.qualityindicators.ahrq.gov/modules/pqi_resources.aspx

U.S. Department of Health and Human Services, The Opioid Epidemic: By the Numbers. (2016, Jue). Retrieved from Factsheet-opoids - 061516: http://www.hhs.gov/sites/default/files/Factsheet-opioids-061516.pdf

U.S. Preventive Services Task Force, Final Recommendation Statement: Breast Cancer: Screening. (2016, January). Retrieved from U.S. Preventive Services Task Force: https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/breast-cancer-screening1

Umeå University. (2011, May 25). Long-distance commuters get divorced more often, Swedish study finds. *ScienceDaily*.

United Health Foundation. (2016). *American's Health Rankings: Poor Physical Health Days.* http://www.americashealthrankings.org/ALL/PhysicalHealth.

United Health Foundation. (2016). *Poor Mental Health Days.* Retrieved from http://www.americashealthrankings.org/ALL/MentalHealth

United States Department of Health and Human Services. (2012). *HHS Action Plan to Reduce Racial and Ethnic Health Disparities*. Retrieved from Minority Health: http://minorityhealth.hhs.gov/npa/files/plans/hhs/hhs_plan_complete.pdf

United States Drug Enforcement Administration. (2015). *2015 Drug Threat Assessment Summary.* Washington, DC.

Urban Institute. (2015). *How Are Income and Wealth Linked to Health and Longevity?*

U.S. DHHS Office of Disease Prevention and Promotion. (2016, November 17). *HealthyPeople.gov Topic Area Cancer*. Retrieved from www.healthypeople.gov: https://www.healthypeople.gov/2020/data-search/Search-the-Data#srch=cancer;

U.S. Preventive Services Task Force. (2016). Screening for Chronic Obstructive Pulmonary Disease US Preventive Services Task Force Recommendation Statement . *JAMA, 315*(13), 1372-77.

USDHHS Agency for Healthcare Research and Quality. (2016, December 3). *Understanding Quality Measurement*. Retrieved from Agency for Healthcare Research and Quality: http://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/chtoolbx/understand/index.html

Vyavaharkar, M., Glover, S., Leonhirth, D., & Probst, J. (2013). *HIV/AIDS in Rural America: Prevalence and Service.* SC Rural Health Research Center. .

Wagstaff, A. (2002). Poverty and Health Sector Inequalities. *Bulletin of the World Health Organization*, 80(2):97-105.

Weinstock H, e. a. (2004). Sexually transmitted diseases among America's youth: incidence and prevalence estimates, 2000. *Perspectives on Sexual and Reproductive Health, 36*(1), 6-10.

Weir, H. A. (2016). Heart Disease and Cancer Deaths - Trends and Projections in the United States, 1969-2020. *Prev Chron Dis*, 13:16021.

West P, S. H. (2004). School effects on pupils' health behaviours: evidence in support of the health promoting school. *Research Papers in Education*, 19(3), pp. 261–291.

Wier, L., Elixhauser, A., Pfunter, A., & Au, D. (2011). *Overview of Hospitalizations among Patients with COPD.* Retrieved from Healthcare Cost and Utilization Project, Statistical Brief #106.: http://www.hcup-us.ahrq.gov/reports/statbriefs/sb106.pdf

Wilper, A. P., Lasser, K. E., McCormick, D., Bor, D. H., & Himmelstein, D. U. (2009). Health Insurance and Mortality in US Adults. *American Journal of Public Health*, 2289-2295.

Woloshin, S., Schwartz, L., & Welch, G. (2008). The Risk of Death by Age, Sex, and Smoking Status in the United States: Putting Health Risks in Context. *JNCI Journal of the National Cancer Institute*, 845-853.

Woolf, S. H., Aron, L., Dubay, L., Simon, S. M., Zimmerman, E., & Luk, K. X. (2015, April). *How Are Income and Wealth LInked to Health and LongevIty?* Retrieved from Urban Institute: http://www.urban.org/sites/default/files/alfresco/publication-pdfs/2000178-How-are-Income-and-Wealth-Linked-to-Health-and-Longevity.pdf

WR Best, D.C. (1994, April). The ratio of observed to expected mortality as a quality of care indicator in non-surgical VA patients. *Medical Care, 32(4)*, 390-400.

Young, A. M., DiClemente, R. J., Halgin, D. S., Sterk, C. E., & Havens, J. R. (2014). HIV vaccine acceptability among high-risk drug users in Appalachia: a cross-sectional study. *BMC Public Health, 14*(537).

Zeiders, K., & Roosa, M. a. (2011, Marcy). Family Structure and Family Processes in Mexican American Families. *Fam Process, 50*(1), 77-91.

Zhang, Z., Infante, A., Meit, M., English, N., Dunn, M., & Bowers, K. (2008). *An Analysis of Mental Health and Substance Abuse Disparities & Access to Treatment Services in the Appalachian Region.* Appalachian Regional Commission and National Opinion Research Center.

Zizzi, S., Goodrich, D., Wu, Y., Parker, L., Rye, S., Pawar, V., . . . Tessaro, I. (2006). Correlates of Physical Activity in a Community Sample of Older Adults in Appalachia. *ournal of Aging and Physical Activity, 14*, 423-438.

B. METHODOLOGICAL AND TECHNICAL NOTES

Definition of a County

The data in this report come from more than 15 secondary data sources. Different institutions organize their data into a particular universe of spatial units based on their analytical needs. The county-level data files provided by these sources—or sub-county data aggregated from source files—were organized to meet the Appalachian Regional Commission's standard representation of the United States as consisting of 3,113 counties, which adheres to the Bureau of Economic Analysis's county-level delineation of the nation. However, many of the data sources disaggregate the country into 3,143 "county units" (with some slight variation around this number). The data from many of these secondary data sources thus have to be converted into the 3,113-county universe, and this is done by combining several county-level units. The most frequent example of this takes place in Virginia, where independent cities are combined with surrounding counties in order to meet the ARC/BEA organizational structure. If source data provided numerators and denominators, these values were used to compute figures such as rates and percentages for each indicator. When only computed figures were provided, a weighting variable from another source (such as the 2014 American Community Survey (ACS) population figures) was used to create a weighted average of values. In rare cases, data from source counties were distributed to more than one of the 3,113 counties. This was most often necessary for five Alaska boroughs/county-equivalents, which were recently reallocated from three county-equivalents. In these cases, values from the three county-equivalents were directly assigned to the new areas based on predominate geographic overlap.

Mapping Procedures

The measures included in this report are examined at the county level, with national and regional maps for each indicator displaying its variation across counties. For ease of interpretation, the maps for each variable were designed to have darker colors represent values indicating poor health status, or values for social or behavioral factors that contribute to poor health status.

The value groupings used to determine the color categories in both the national and regional maps are determined by the *national* quintiles of each respective indicator: five groupings with equal numbers of constituent counties in each category (with some variation due to rounding, clustering, and suppressed data values). The quintiles are determined by using the breaks at the 20^{th}, 40^{th}, 60^{th}, and 80^{th} percentiles of the national distribution. Since both the national and regional maps use these national groupings, the national maps will have the same number of counties in each category.[8] The maps for the Appalachian Region, however, will not necessarily have an equal distribution among categories and colors, as the quintiles are based on the *national* data. For example, if the Appalachian Region as a whole performs worse than the national average for any particular measure, it is likely that more than 20 percent of the Region's counties will be shaded in the darkest color on the map.

[8] The number of counties may vary by one between groups. For example, there are 3,113 counties analyzed, which does not divide equally into groups of five, meaning for indicators with complete data, three groups will have 623 and two will have 622.

Age Adjusting Mortality Rates

Age adjusting mortality rates allows for comparisons among counties with different age distributions. Counties with greater numbers of elderly residents can generally expect higher mortality rates than counties with less elderly residents. Thus, a county with higher unadjusted (crude) mortality rates, which suggest poor health, may actually be relatively healthy but simply have a larger number of older residents (and thus a higher overall baseline risk of death). Using data from the Compressed Mortality Files from CDC, we compared the distributions of county populations by age cohort to the standard population distribution for the country as a whole. Using these population distributions by age cohort as a base, the mortality rates in this report are age adjusted and standardized based on the Year 2000 Standard Million Population (see Table 71). This provides the reader with the ability to accurately compare mortality across counties with different age distributions. Only infant mortality is not age adjusted in this report, because the age distribution of a population is not relevant to the measure. The YPLL indicator is obtained directly from County Health Rankings & Roadmaps, which age-adjusted YPLL prior to publishing.

Table 71: Year 2000 Standard Million Population for the United States

Age	2000 Standard Population Distribution
Under 1 year	13,818
1-4 years	55,317
5-9 years	72,533
10-14 years	73,032
15-19 years	72,169
20-24 years	66,478
25-34 years	135,573
35-44 years	162,613
45-54 years	134,834
55-64 years	87,247
65-74 years	66,037
75-84 years	44,841
85 years and over	15,508
All Years	1,000,000

Source: https://wonder.cdc.gov/wonder/help/cmf.html

The formulas to convert crude rates to weighted rates by age cohort and total population age-adjusted are:

(Deaths / pop) x 100,000 = CRUDE RATE

CRUDE RATE x (standard pop in each age cohort / 1,000,000) = WEIGHTED RATE

Sum (WEIGHTED RATES) all cohorts = AGE-ADJUSTED RATE for total population

In this example, the crude data are reported in increments of 100,000 residents.

For example, consider the crude and age-adjusted mortality rates in two states: Utah and Maine, the former of which has a relatively younger population. Table 72 displays the crude and age adjusted rates using two sources: CDC Wonder, an interactive web tool that allows users to calculate mortality rates for specific queries, and then also the age adjustment process used in this report. The slight differences in the mortality rates between these two sources are due to rounding and the inclusion of deaths with unknown ages. Table 72 also shows the process of converting from crude mortality rates to age-adjusted mortality rates. While Maine has nearly double the crude rate of Utah, once the data are age adjusted, the rates become quite similar in all age cohorts.

Table 72: Comparison of Crude and Age-Adjusted Mortality Rates for Utah and Maine

Age Cohort in Years	Standard Million Population	Utah (Younger Population State)				Maine (Older Population State)			
		Deaths	Population	Crude Rate	Wtd Rate	Deaths	Population	Crude Rate	Wtd Rate
Under 1	13,818	4,383	840,336	522	7.2	1,345	229,045	587	8.1
1–4	55,317	886	3,256,680	27	1.5	227	947,922	24	1.3
5–9	72,533	501	3,862,337	13	0.9	170	1,291,131	13	1.0
10–14	73,032	600	3,669,490	16	1.2	206	1,427,186	14	1.1
15–19	72,169	1,972	3,698,192	53	3.8	843	1,520,896	55	4.0
20–24	66,478	3,047	4,021,230	76	5.0	1,166	1,314,897	89	5.9
25–34	135,573	6,974	6,764,886	103	14.0	2,568	2,537,252	101	13.7
35–44	162,613	9,417	5,545,348	170	27.6	5,060	3,157,287	160	26.1
45–54	134,834	16,789	4,839,035	347	46.8	12,660	3,540,842	358	48.2
55–64	87,247	25,609	3,575,069	716	62.5	23,653	2,888,520	819	71.4
65–74	66,037	36,825	2,198,826	1,675	110.6	37,485	1,868,337	2,006	132.5
75–84	44,841	62,962	1,308,643	4,811	215.7	61,595	1,160,897	5,306	237.9
85 and over	15,508	72,608	475,018	15,285	237.0	70,676	462,785	15,272	236.8
All Years	1,000,000	242,573	44,055,090	550.6	733.8	217,654	22,346,997	974.0	788.0

Table 73: Comparison of Calculated Age-Adjusted Rates with CDC Wonder Reported Rates

State	Utah		Maine	
Data Type	Crude	Age-Adjusted	Crude	Age-Adjusted
Calculated Rates	550.6	733.8	974.0	788.0
CDC Wonder	550.7	734.1	974.0	788.0

Data Suppression and Smoothing

Accommodations for Suppressed Values

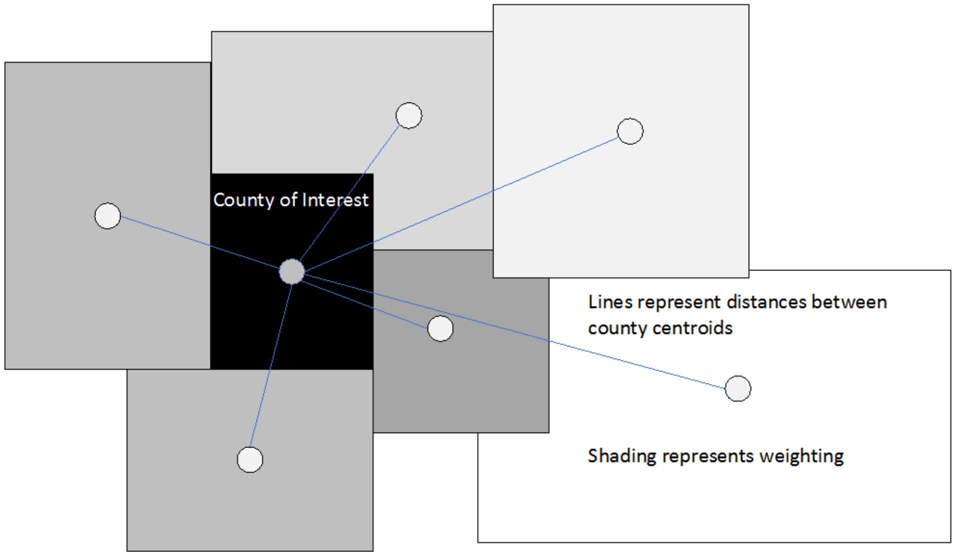
The National Center for Health Statistics of the Centers for Disease Control and Prevention prohibits the reporting of death counts and death rates when the unit is fewer than ten cases. This results in rates that are suppressed for many counties in the Appalachian Region, as well as elsewhere in the United States. To account for this issue, data for counties with deaths below this threshold were augmented by incorporating data from nearby counties. To calculate the augmented rate for any particular county, a proportion of deaths (numerator) and population (denominator) from nearby counties were added to the base numbers for the target county. The proportion of a nearby county's information that was added to the target's decreases with increasing distance between the two.

This technique is called smoothing. In addition to overcoming suppression issues, it helps correct for unstable measures resulting from small population sizes. When small populations lead to even smaller numerators—such as occurs in counties with fewer than ten poisoning deaths in a given year—rates can be smoothed to eliminate statistical instability. The ten-death criteria for spatial adjustment was applied not only for the total number of deaths for any given mortality measure, but for individual age cohorts, as well.

Overview of Smoothing Process

The smoothing process applies weights to counties surrounding the county with the suppressed value, the "county of interest" in Figure 189 below. The process results in an augmented value resulting from the combination of actual data from the county of interest with weighted values from nearby counties. The degree to which a nearby county contributes to the augmented value depends on the distance from the county of interest to any given nearby county. Figure 189 below demonstrates this principle. The county of interest receives a weight of 1.0 and is fully shaded. Closer counties (e.g., the small, dark gray county directly to the southeast) have darker shading and higher weights than more distant counties (e.g., the large, white county further to the southeast). For each county, the number of deaths and populations in each age category then multiplies the weights. These numbers are then aggregated across counties by age category, and ultimately an age-adjusted rate for the county of interest is calculated.

Figure 189: Example of Weighting Counties for Smoothing Based on Distance



Technical Detail

This approach is one we have used in the past (Ricketts & Holmes, 2007). First, we specified the general form of the weighting function:

WEIGHT = exp (λ * MILES)

where MILES is the straight-line distance between two county centroids. The parameter λ is constrained to be negative, so the weighting function is equal to one if MILES equals zero, is decreasing in MILES, and is bounded from below by zero. Values of λ that are closer to zero lead to a slower decay—for example, a λ of -0.05, will place greater weight on distant counties than a λ of, say, -0.2. In selecting the value of λ, there is a tradeoff between faster decay (averaging over counties that are located closer to the county with the suppressed value) and using more counties (leading to more precise estimates). This approach significantly reduces the number of unreportable area-cause death rates while maximizing local influence on the augmented rate.

We conducted a grid search for the optimal λ using the following approach. First, we randomly chose counties in the Appalachian Region to be labeled as suppressed. We then calculated smoothed rates using the above methods for a variety of potential λ. We repeated this exercise 1,000 times using a different λ each time. After each iteration, we calculated the mean squared error, or the average squared difference between the smoothed rate and the actual rate (the randomly chosen counties labeled as suppressed in this exercise had actual rates and served as the basis for comparison). This method allowed us to identify the λ with the smallest mean squared error. The λ satisfying this condition was **-0.125.** We specified the same λ for all mortality rates.

With λ now in hand, the approach was as follows. For each suppressed county, we calculated the distance (MILES) between that county centroid and the county centroid of all other counties. We then calculated the weight associated with each county using the weighting function noted above.

Any county with a weight of less than 0.01 was dropped from the analysis. This approach has little practical effect on the augmented rate and eases any rounding issues (e.g., a populous county that is very distant may still have more weight than a nearby county of moderate size). We aggregated the deaths and population (numerator and denominator) across nearby counties—incorporating their weights—to create an augmented numerator and denominator for the suppressed county. This augmentation includes any deaths and population reported for the suppressed county, as well. At this point, the suppressed county has a “smoothed” number of deaths and population, with closer counties contributing more to the value. The mortality rate can then be calculated directly from these numbers.

For age-adjusted mortality rates (everything except infant mortality), the augmentation occurs prior to age-adjusting. Table 74 illustrates a simple example in which only two ages are considered: children and adults. Five counties are displayed, along with the number of deaths and population for both age groups. Distance from County A’s centroid determines the weight for each county. The final four columns calculate the weighted deaths and population. Note that County E, with a weight of less than 0.01, does not contribute to the aggregation.

Table 74: Sample County Illustration of Augmentation for Suppressed Data

County	Deaths	Popula-tion	Age Group	Dis-tance in Miles	Weight	Children		Adults	
						Wtd deaths	Wtd pop	Wtd deaths	Wtd pop
A	2	1,000	Children	0	1.000	2.00	1000		
A	18	10,000	Adults	0	1.000			18.00	10,000.0
B	2	1,200	Children	5	0.535	1.07	642.0		
B	24	11,500	Adults	5	0.535			12.85	6,152.5
C	4	800	Children	10	0.287	1.15	229.6		
C	37	7,900	Adults	10	0.287			10.60	2,267.3
D	3	1,500	Children	20	0.082	0.25	123.0		
D	27	16,000	Adults	20	0.082			2.22	1,312.0
E	7	2,000	Children	40	0.007	weight < .01 => 0			
E	91	18,500	Adults	40	0.007			weight < .01 => 0	
TOTAL						***4.47***	***1,994.6***	***43.7***	***19,731.8***

After the aggregated deaths and population are calculated by age category, age-adjustment occurs using the approach outlined above (see Table 75). For purposes of this example, we specify weights of 0.1 (children) and 0.9 (adults) and thus calculate an age-adjusted rate of 221.7. Note that the example rates here—like the mortality rates in the report—are standardized per 100,000 population.

Table 75: Age-Adjusted Step for Spatial Adjustment

Metric	Children	Adults
Mortality Rate	224.11	221.32
Age-adjusted weights (for example)	0.10	0.90
Weighted rate	22.41	199.32
AUGMENTED AGE-ADJUSTED RATE		***221.73***

Reciprocal Measures

In order to report health professional supply measures consistently, we calculated the reciprocal of values pulled directly from County Health Rankings. For example, 2016 County Health Rankings Data for Bibb County, Alabama shows a Primary Care Physician Ratio of 2,814:1 (persons per physician). We use the reciprocal (1/2,814), converted to primary care physicians per 100,000 people. The calculation is as follows:

1/2,814 * 100,000 = .000355 * 100,000 = 35.5

Similarly, the dentist ratio of 5,627:1 becomes 17.8 dentists per 100,000. The only health professional supply measure that was not calculated in this manner was specialist physicians per 100,000, as County Health Rankings does not report this measure. Instead, the data for this measure come from the HRSA Area Health Resources File (AHRF).

Rurality in Appalachia

ARC, in coordination with staff at USDA’s Economic Research Service (ERS), has developed a simplified version of the 2013 Urban Influence Codes (UIC) for their research and analytical work. To create the UICs, the USDA starts with the official listing of metropolitan Core Based Statistical Areas (CBSAs/MSAs) published by the Office of Management and Budget (OMB). The USDA then distinguishes metropolitan counties by the population size of their metro areas, and nonmetropolitan counties by (i) the size of their largest city or town and (ii) proximity to metro areas. ARC simplified the USDA’s original 12-part county classification into the five levels described below.

1. **Large Metros:** Metropolitan counties in large metro areas of more than 1 million residents
2. **Small Metros:** Metropolitan counties in small metro areas of less than 1 million residents
3. **Non-metro, Adjacent to Large Metros:** Nonmetropolitan counties adjacent to a large metro area
4. **Non-metro, Adjacent to Small Metros:** Nonmetropolitan counties adjacent to a small metro area
5. **Rural (non-metro, not adj. to a metro):** Nonmetropolitan counties not adjacent to a metro area

Table 76 illustrates the USDA twelve county classification system and the crosswalk from the USDA categories to the simplified five-class scheme.

Table 76: USDA Twelve County Classification System

ARC Crosswalk Category	UIC Code	Description
	Metropolitan counties:	
1	1	In large metro area of 1+ million residents
2	2	In small metro area of less than 1 million residents
	Nonmetropolitan counties:	
3	3	Micropolitan area adjacent to large metro area
3	4	Noncore adjacent to large metro area
4	5	Micropolitan area adjacent to small metro area
4	6	Noncore adjacent to small metro area and contains a town of at least 2,500 residents
4	7	Noncore adjacent to small metro area and does not contain a town of at least 2,500 residents
5	8	Micropolitan area not adjacent to a metro area
5	9	Noncore adjacent to micro area and contains a town of at least 2,500 residents
5	10	Noncore adjacent to micro area and does not contain a town of at least 2,500 residents
5	11	Noncore not adjacent to metro or micro area and contains a town of at least 2,500 residents
5	12	Noncore not adjacent to metro or micro area and does not contain a town of at least 2,500 residents

Population-weighted Averages for Large Geographies

To create measures for geographic units larger than the county, we used population-weighted averages. We used the same method of calculating these averages for all large geographies, including the United States, the Appalachian Region, the five Appalachian subregions, and then also the Appalachian, non-Appalachian, and total values for each state. The groupings of counties based on rurality and economic status also used this same methodology. These calculations are necessary because our data sources do not contain values for many of the report's key geographies, such as the Appalachian Region or the Appalachian subregions. We thus needed a methodology to apply to all geographic groups in order to have a valid comparison. The population-weighted average approach provides a valid, consistent method.

The specific calculation used to generate population-weighted values is described here. Consider i counties that are members of an area A. Area A could be a state, a specific economic status (e.g. distressed), or any other geography or grouping described in the report. The population-weighted average for variable x is calculated as the sum of the product of x and the population of each county, divided by the sum of the 2014 ACS populations of the counties in the area.

$$AVERAGE_A = \left(\frac{1}{\sum_{i \in A} POP_i}\right) \sum_{i \in A} [POP_i \cdot x_i]$$

As a result of the population weighting, values in this report for even commonly reported geographies—such as the United States as a whole—may differ slightly from published sources. However, using this population-weighted approach across all geographies ensures an accurate, consistent comparison.

Time Periods of Mortality Measures

For the mortality measures examined in this report, the values for each represent performance over a span of years: 2008–2014. This has the effect of reducing suppressed values in low population counties, as well as helping smooth single year spikes in mortality. These seven-year periods represent the original time period of the data as they are found in the CDC's Compressed Mortality File.

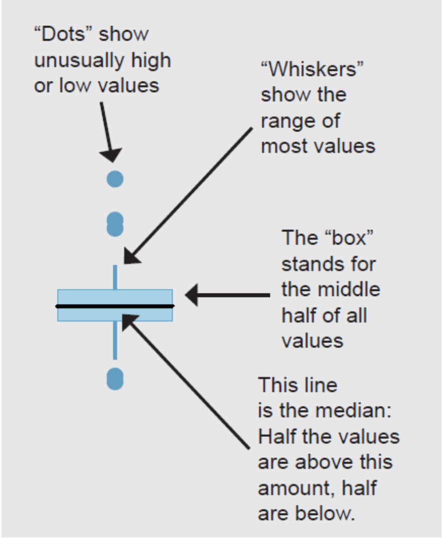
State-level effects of BRFSS Data

Many of the variables derived from the CDC's Behavioral Risk Factor Surveillance System (BRFSS) survey data show sharp state-level border effects. Because the survey is conducted at the state level, statistical modeling is utilized by County Health Rankings to develop these county-level values. Due to low numbers of responses in many counties, even with these statistical techniques, robust estimates for each county are not always possible. As such, county-level numbers oftentimes show little variation in any particular state. For more detailed information, please visit the County Health Rankings website.

Box Plots

A box plot is a type of graph that shows the distribution of data. Comparing box plots among different groups shows how the median of each group compares to the other groups, how much variation exists within each group, and how the variation compares between the groups.

Figure 190: Components of a Box Plot



The edges of the whiskers and the black line represent specific statistics calculated from the data. For example, the black line denotes the median (half of values are greater than this value, half are less than this value). The lower and upper edges of the box represent the 25th and 75th percentiles, respectively. The 25th percentile is the value for which 25 percent of county values are less, and the remainder (75 percent) are greater. The 75th percentile is defined similarly. The caps of the whiskers are defined as "adjacent values" (Tukey, 1977). The upper adjacent value ("top whisker") is the largest observed value that is less than or equal to the 75th percentile plus 3/2 of the difference between the 75th and 25th percentile. The lower adjacent value is defined similarly. Outside values —the dots described as "unusually high or low values"—are those values that lie outside the adjacent values.