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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



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

Domain	Measure	Outcome / 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

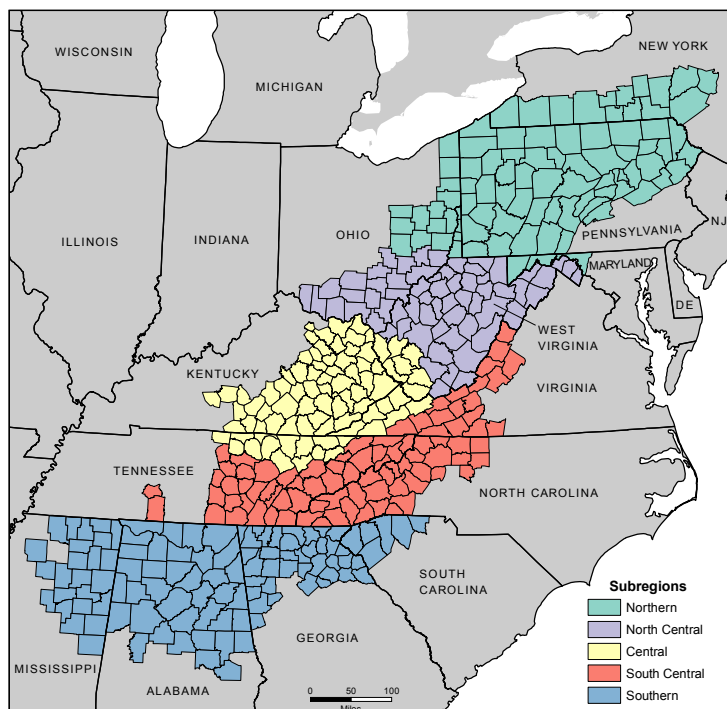
This report explores health disparities by geography and economic status across the Appalachian Region. Specifically, the report focuses on the difference between the Region and the United States as a whole; differences across Appalachian subregions; differences between the Appalachian and non-Appalachian 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



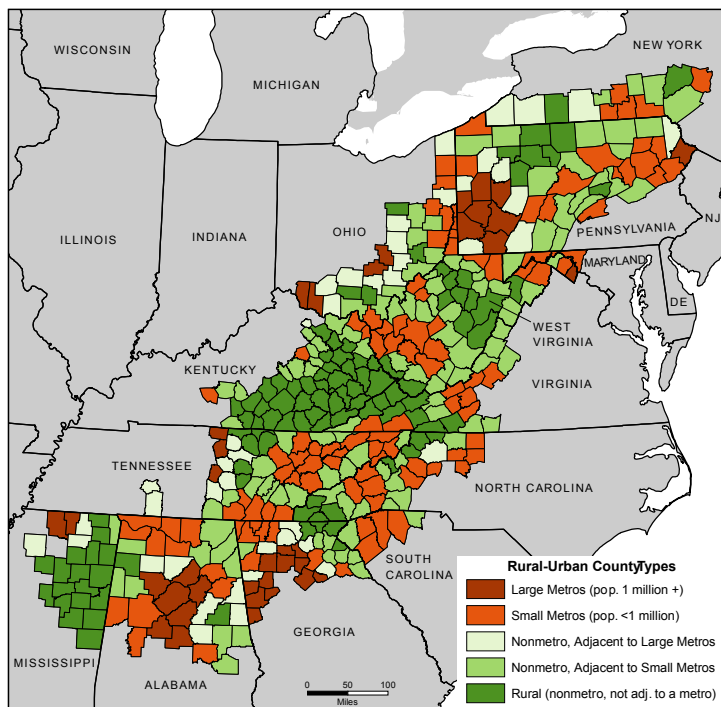
Source: Appalachian Regional Commission, Created November 2009

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

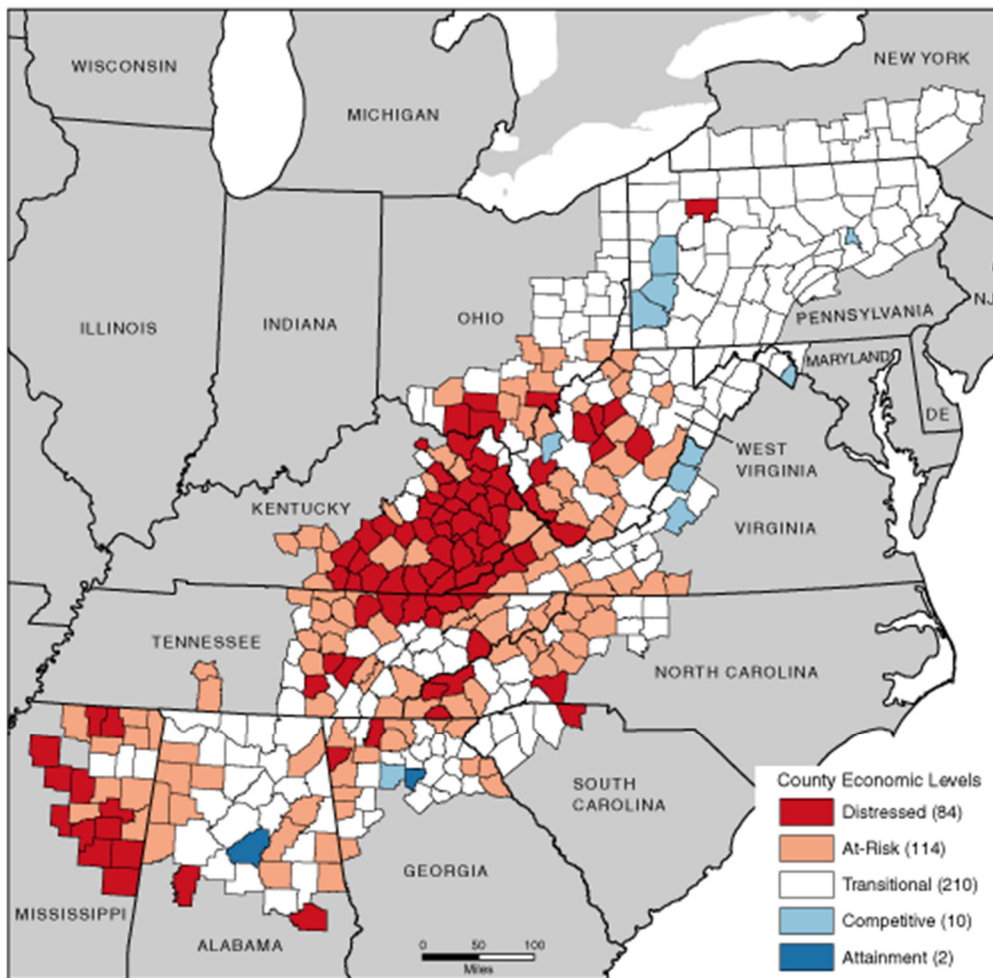
Attainment counties are the economically strongest counties. Counties ranking in the best 10 percent of the nation's counties are classified attainment.

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%

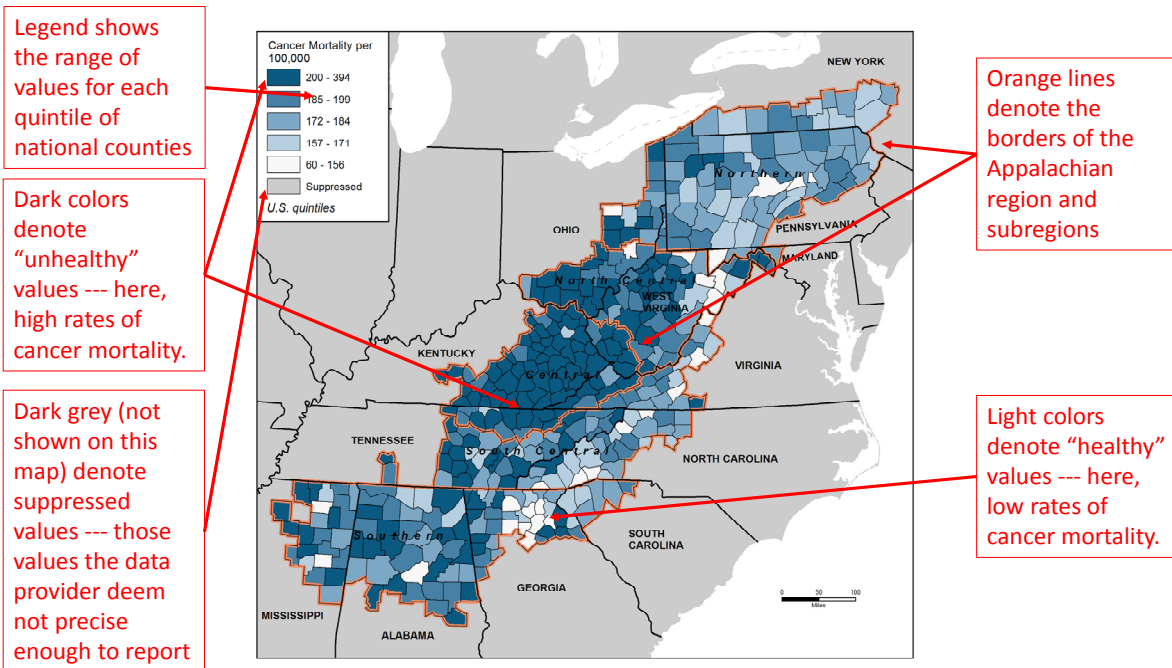
Data source for authors’ calculations shown above: Appalachian_Health_Disparities_Data.xlsx. The number of counties across all five quintiles for each indicator may not sum to 420 due to missing or suppressed values.

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

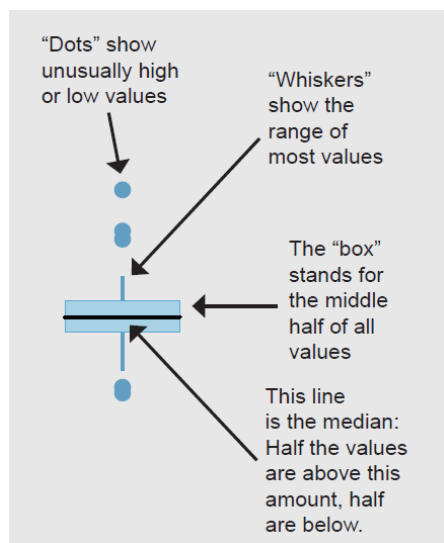


² Technically, the number may vary by one between groups. For example, there are 3113 counties analyzed, which does not divide equally into groups of five, meaning for indicators with complete data, three groups will have 623 and two will have 622.

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



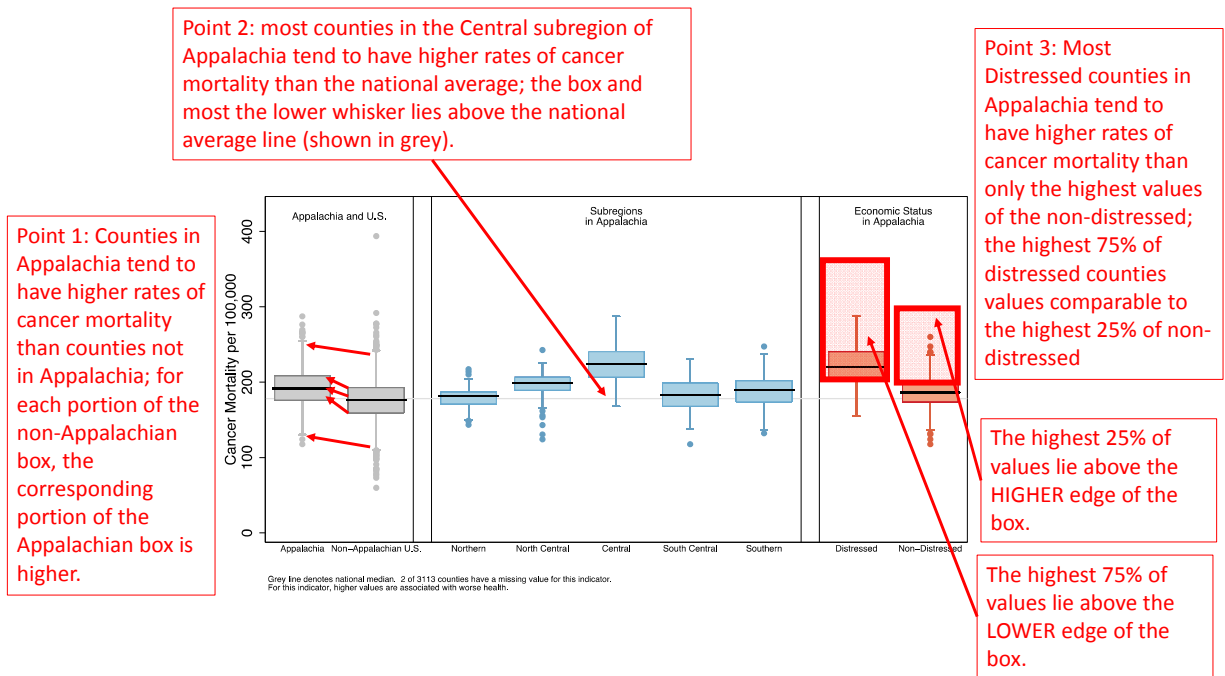
The edges of the whiskers and the black line represent specific statistics calculated from the data. For example, the black line denotes the median (half of values are greater than this value, half are less than this value). The lower and upper edges of the box represent the 25th and 75th percentiles, 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.