Mortality

Heart Disease Deaths
Cancer Deaths
Chronic Obstructive Pulmonary Disease Deaths
Injury Deaths
Stroke Deaths
Diabetes Deaths
Years of Potential Life Lost
Further Reading

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.

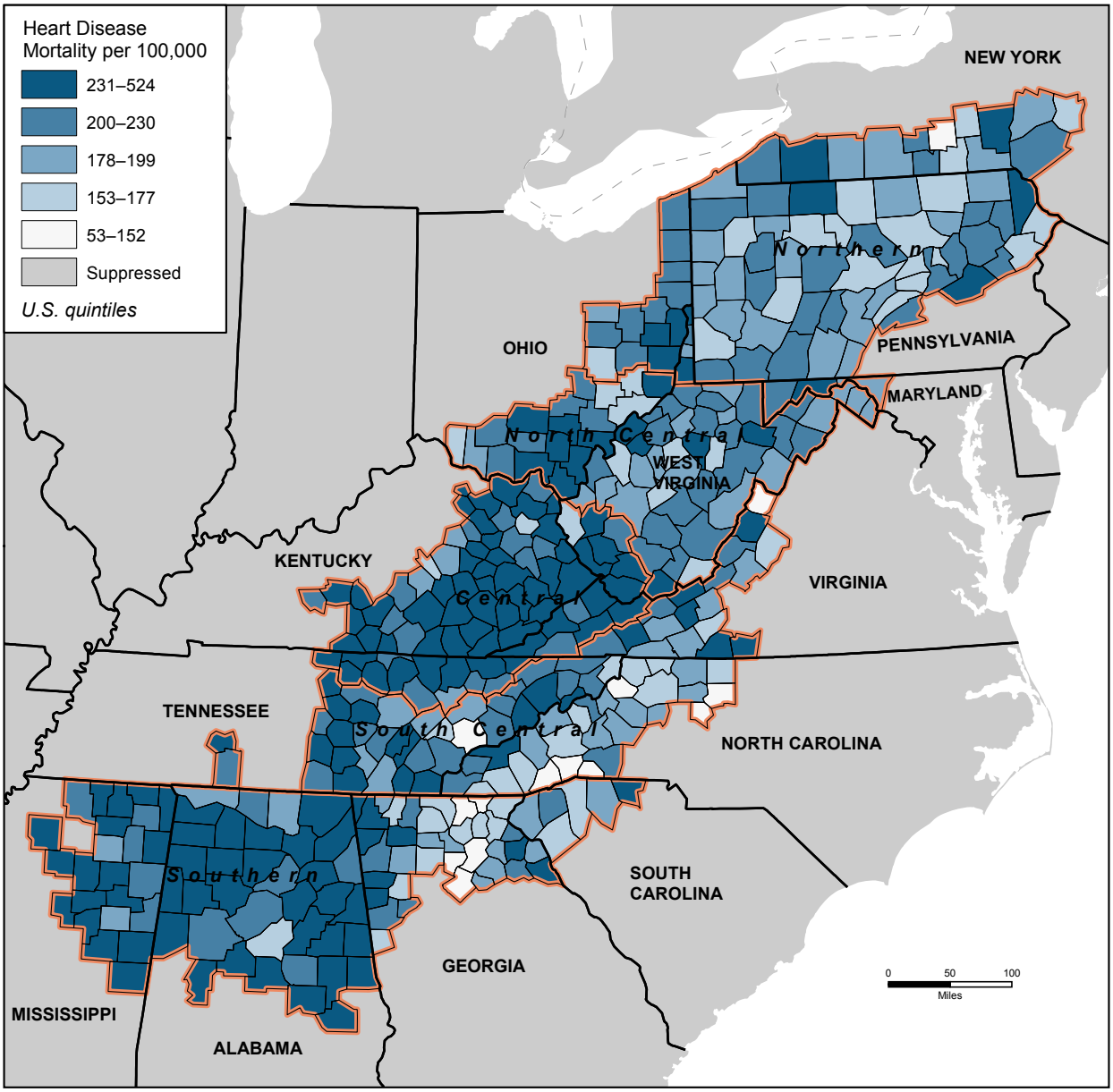
Rural areas in Appalachia experience higher heart disease mortality rates than more urbanized areas in the Region. The heart disease mortality rate for rural Appalachian counties is 234 per 100,000 population, which is 27 percent higher than the rate of 184 per 100,000 for the Region's large metro counties, 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.

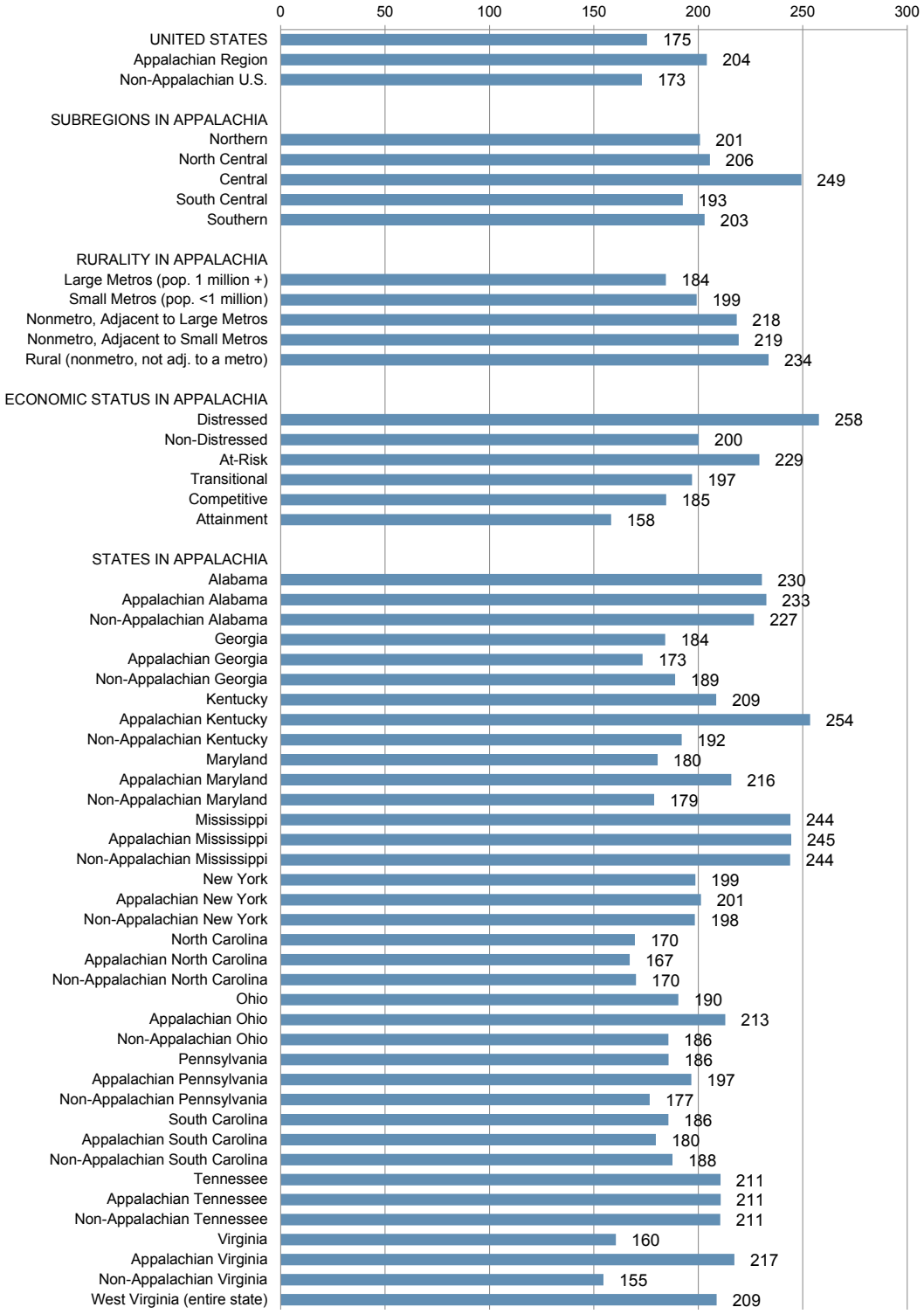
Figure 10 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation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

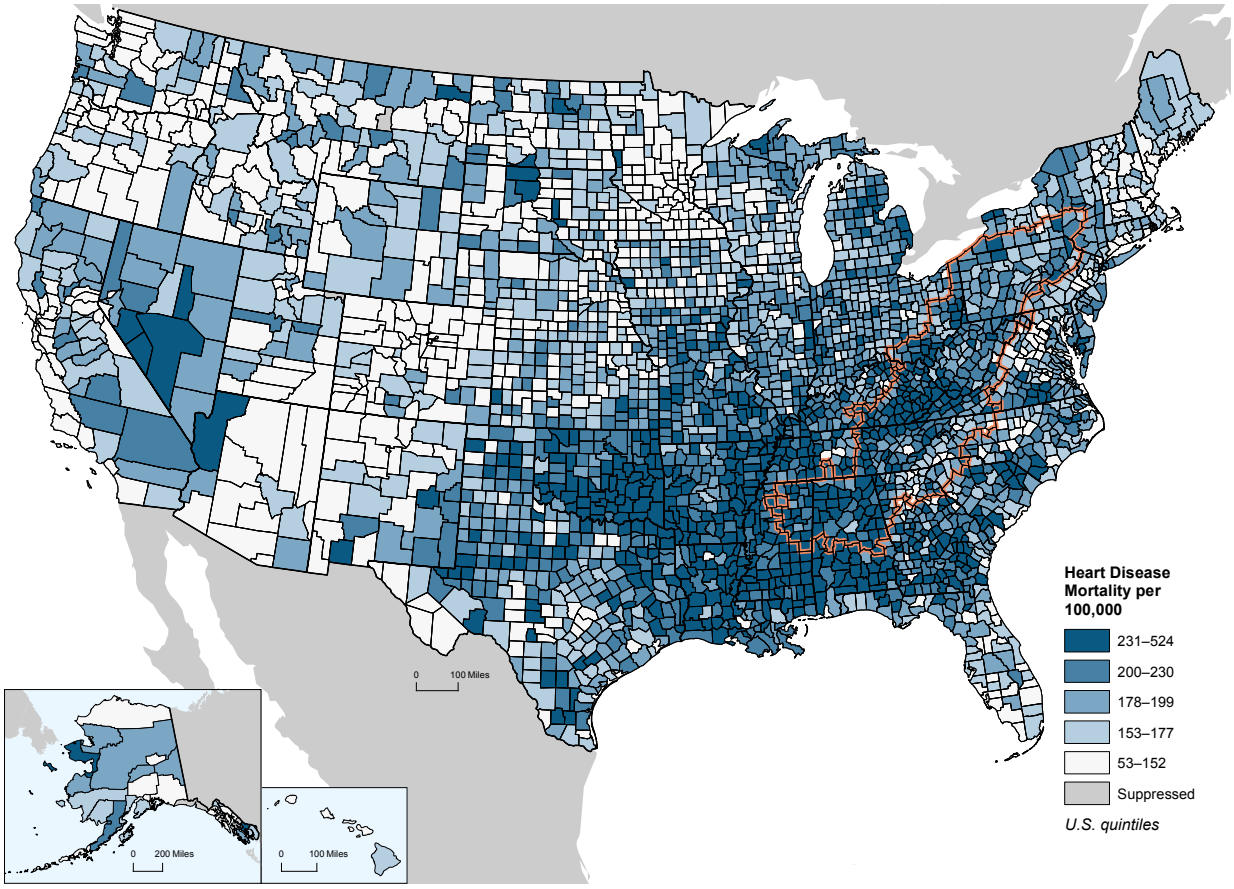


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

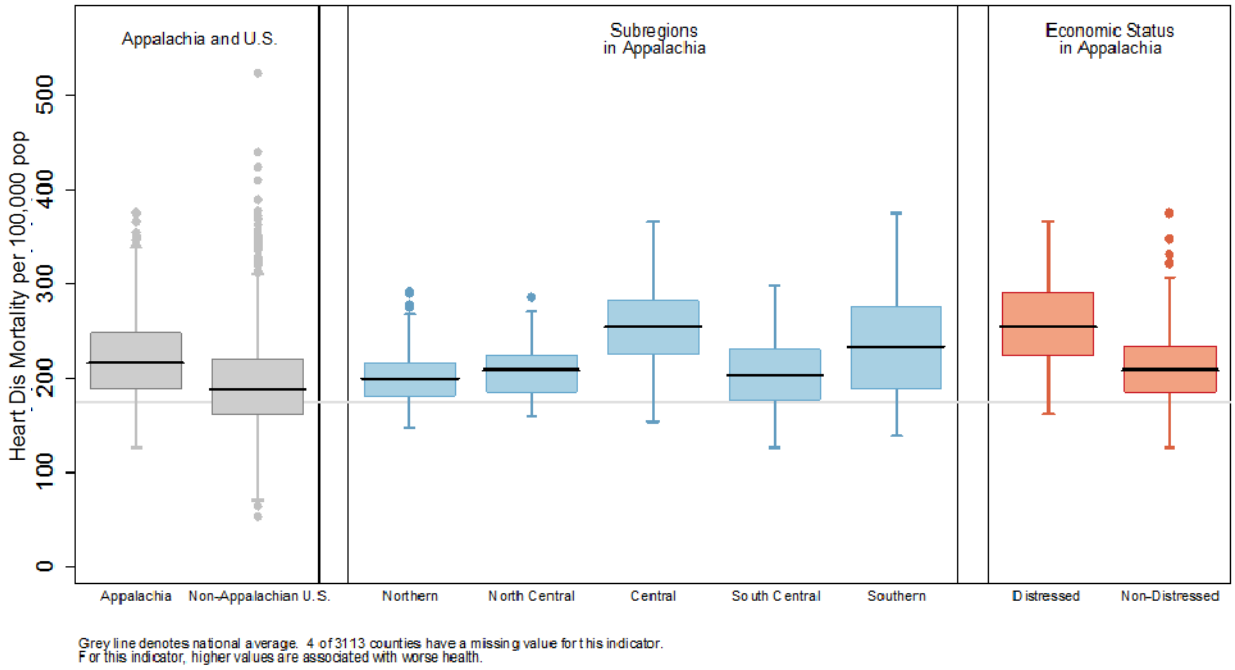


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

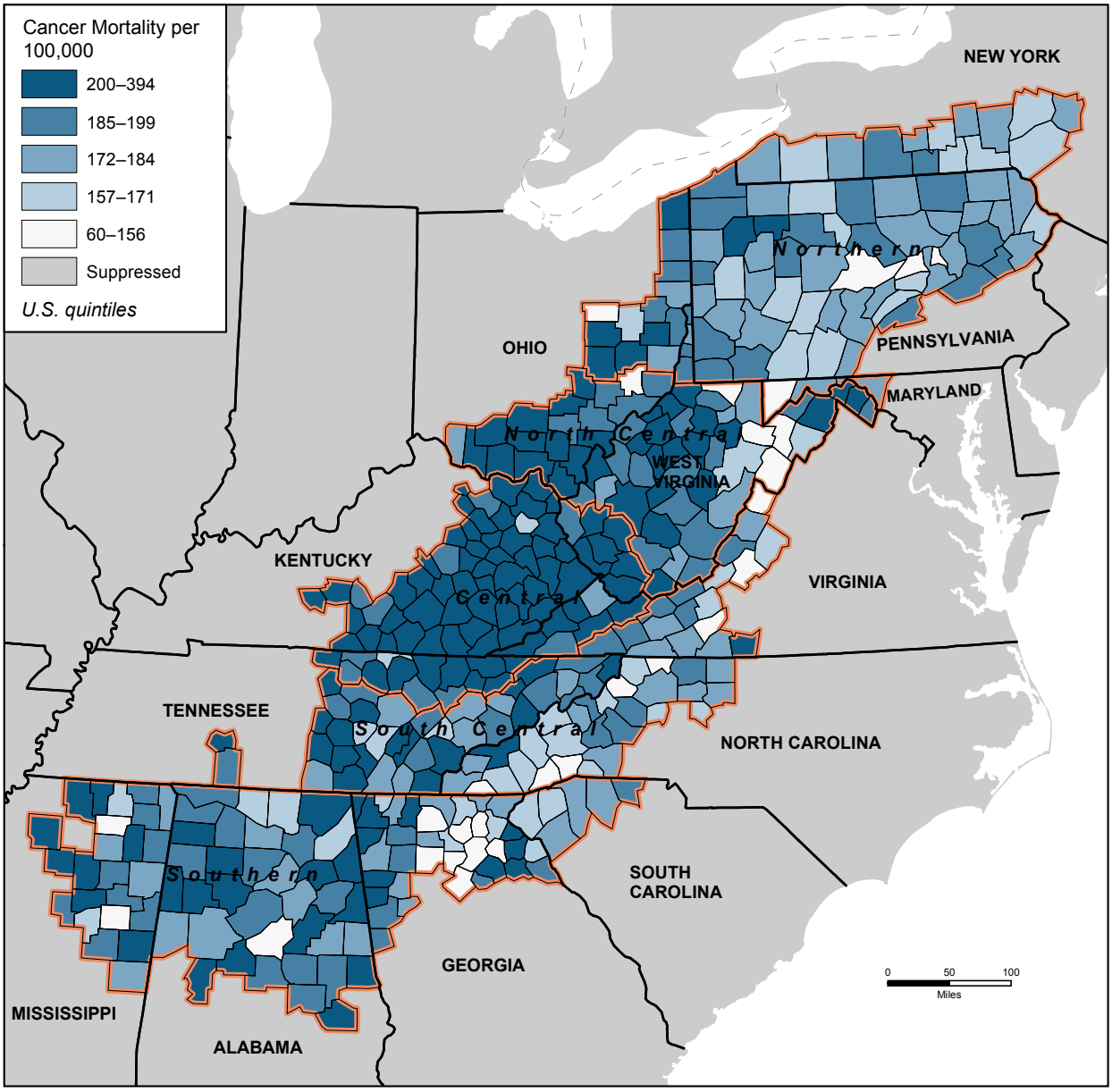
Kentucky, Mississippi, Tennessee, and West Virginia have the highest state-level cancer mortality rates in the Region. The rates in the Appalachian portions of those states all exceed 190 per 100,000, and are well above the national average of 168 per 100,000. Appalachian Kentucky's rate of 227 per 100,000 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.

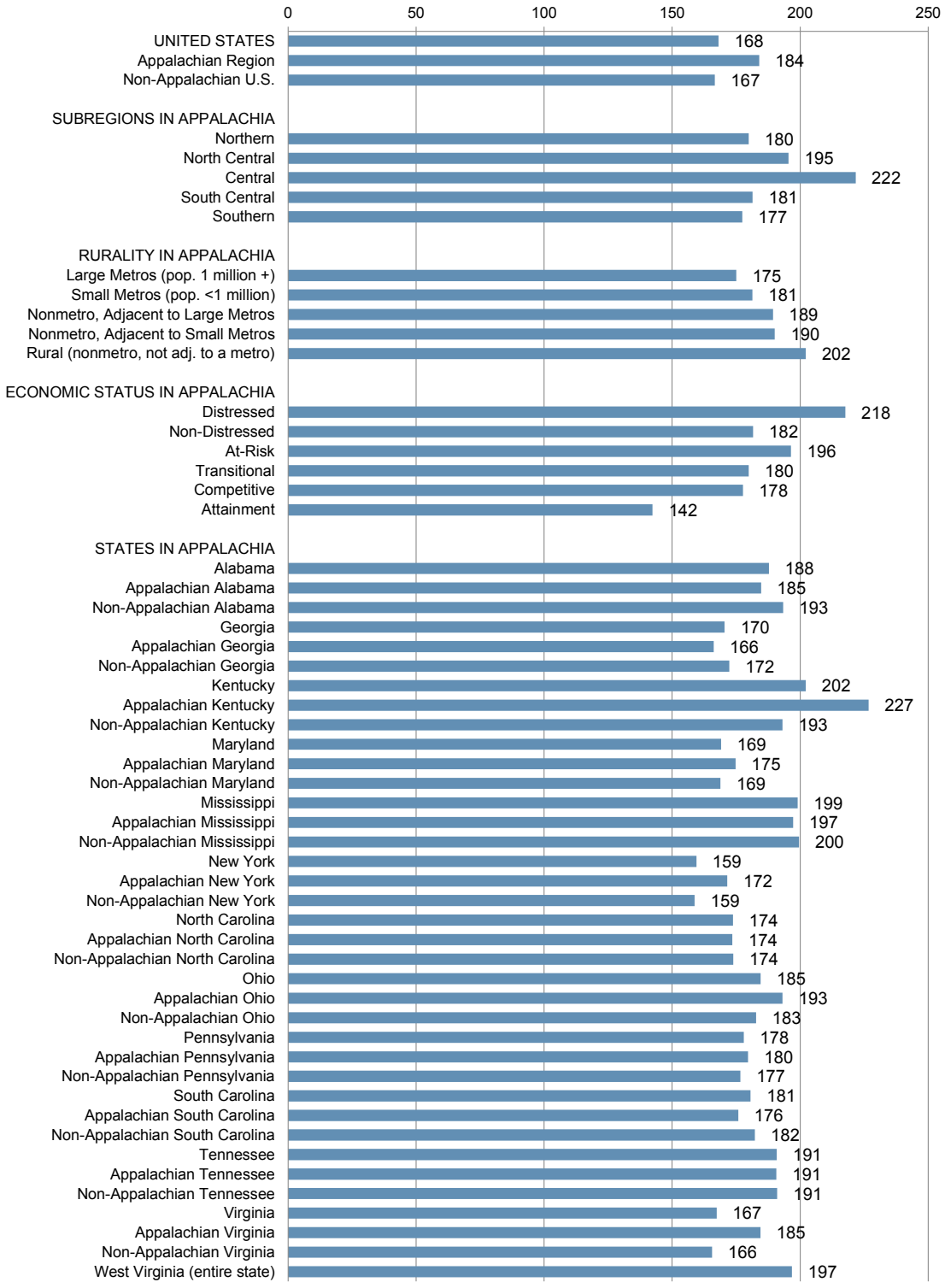
Figure 14 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation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

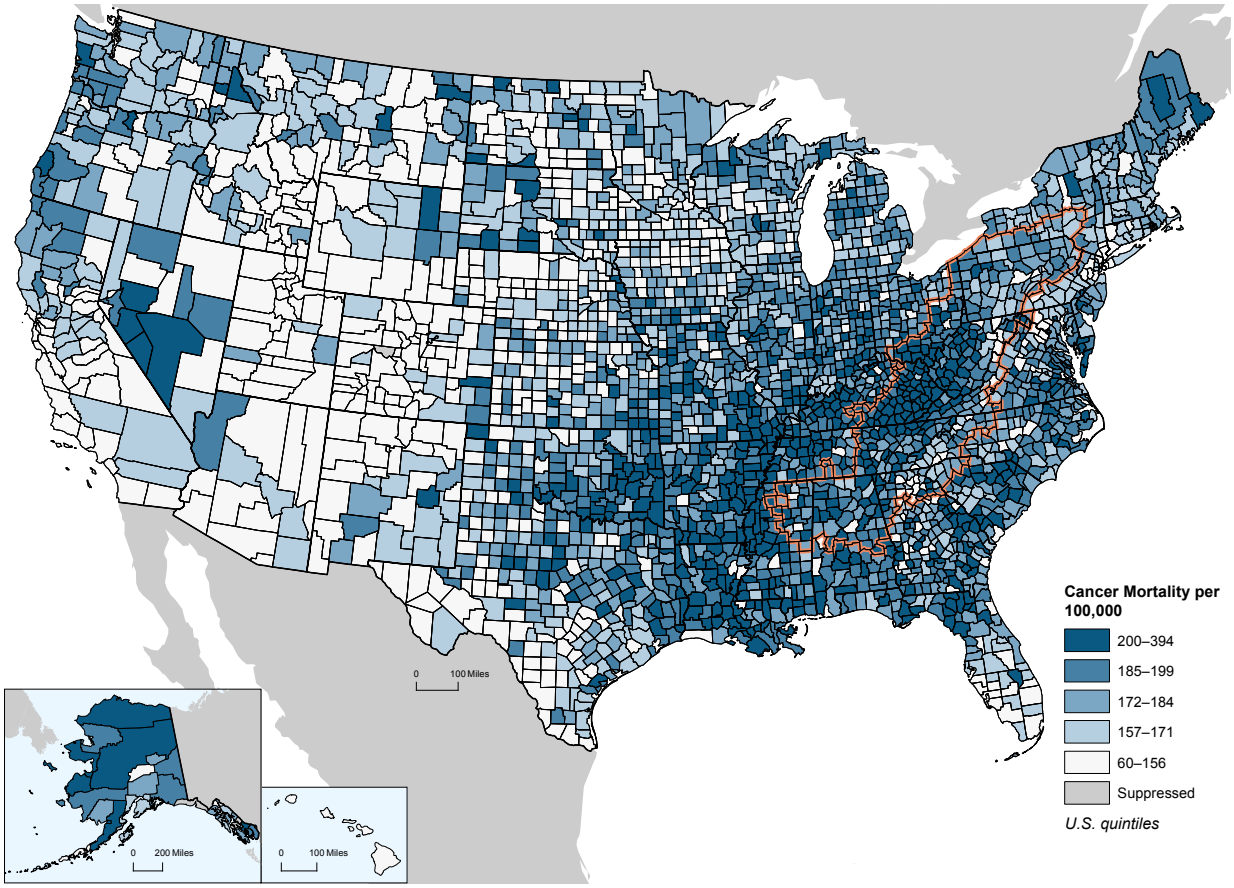


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

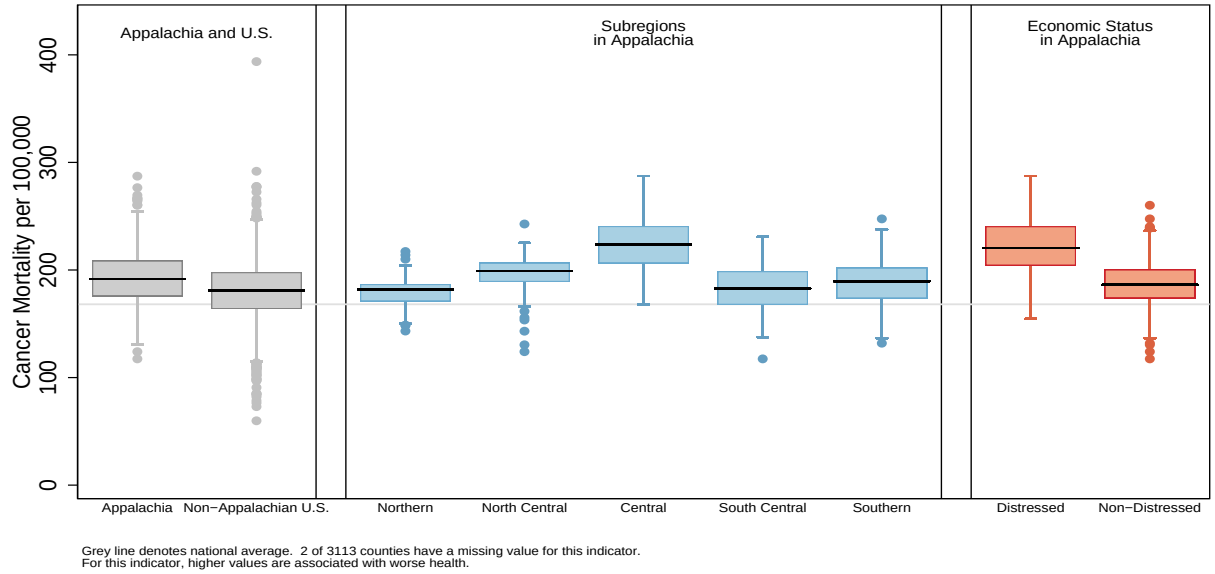


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

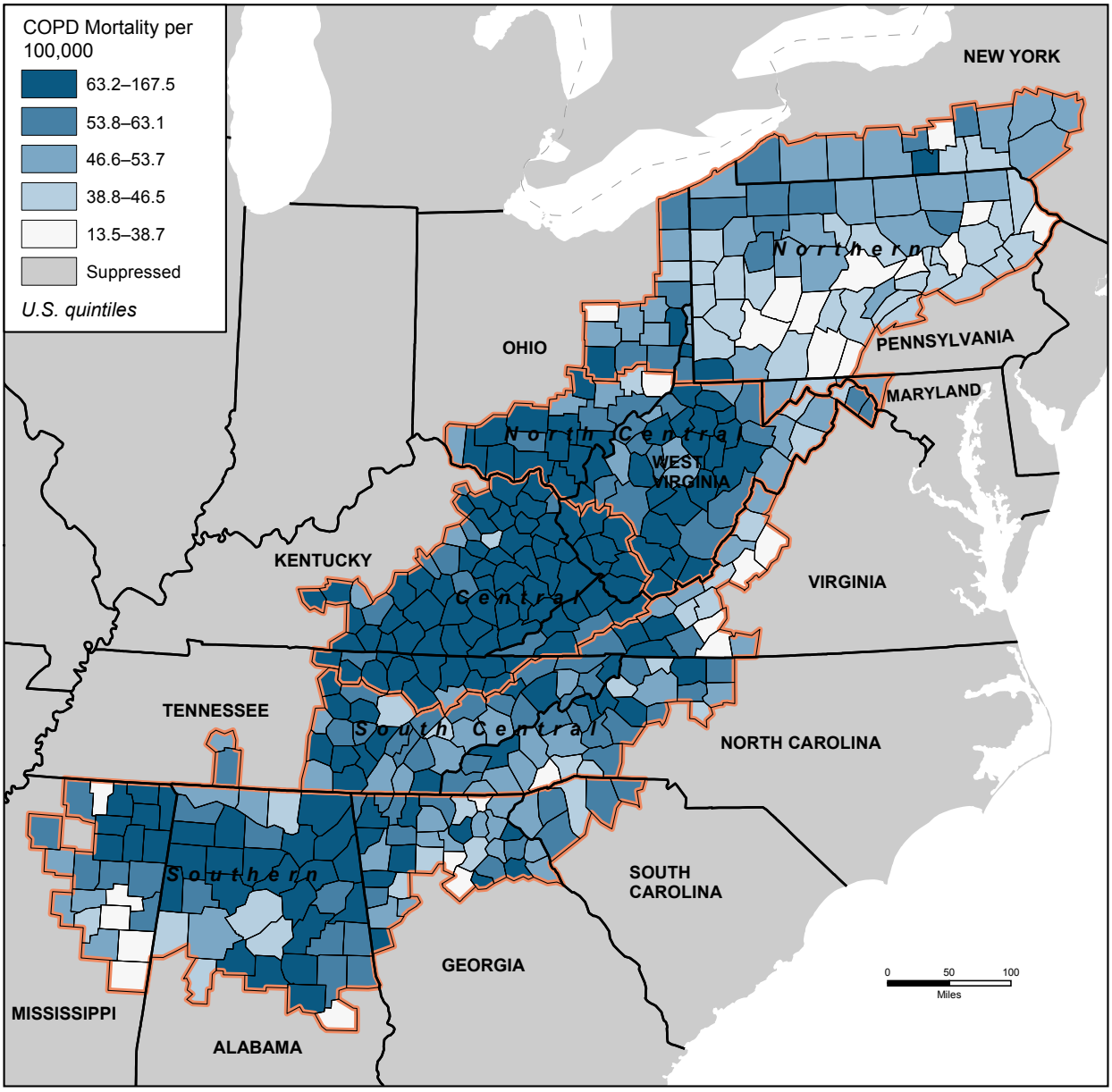
Areas throughout Appalachia that are more rural experience higher COPD mortality rates than more urbanized areas. The COPD mortality rate for the Appalachian Region's rural counties is 68.9 per 100,000 population, which is 55 percent higher than the large metro county rate of 44.5 per 100,000. Economic 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.

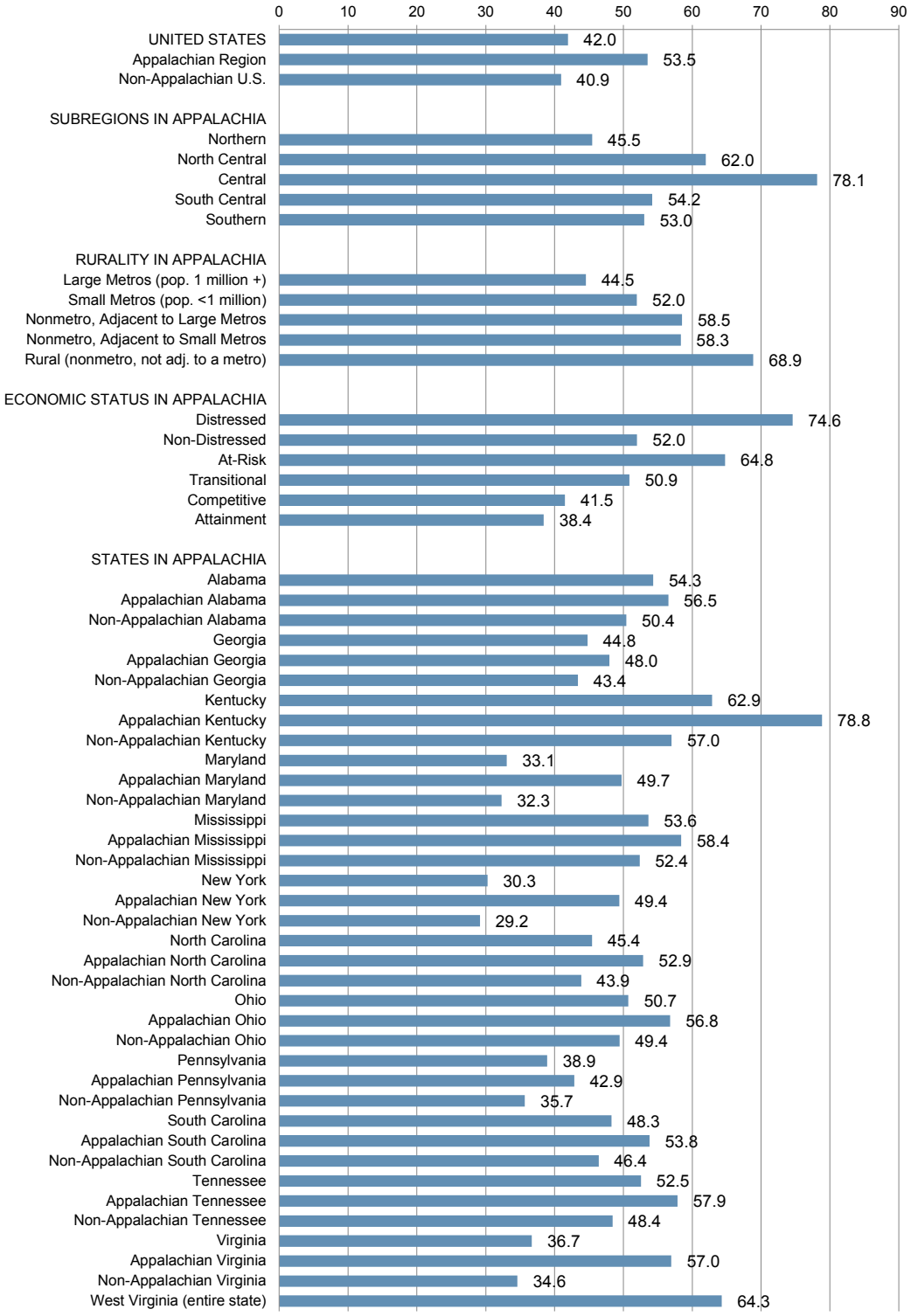
Figure 18 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation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

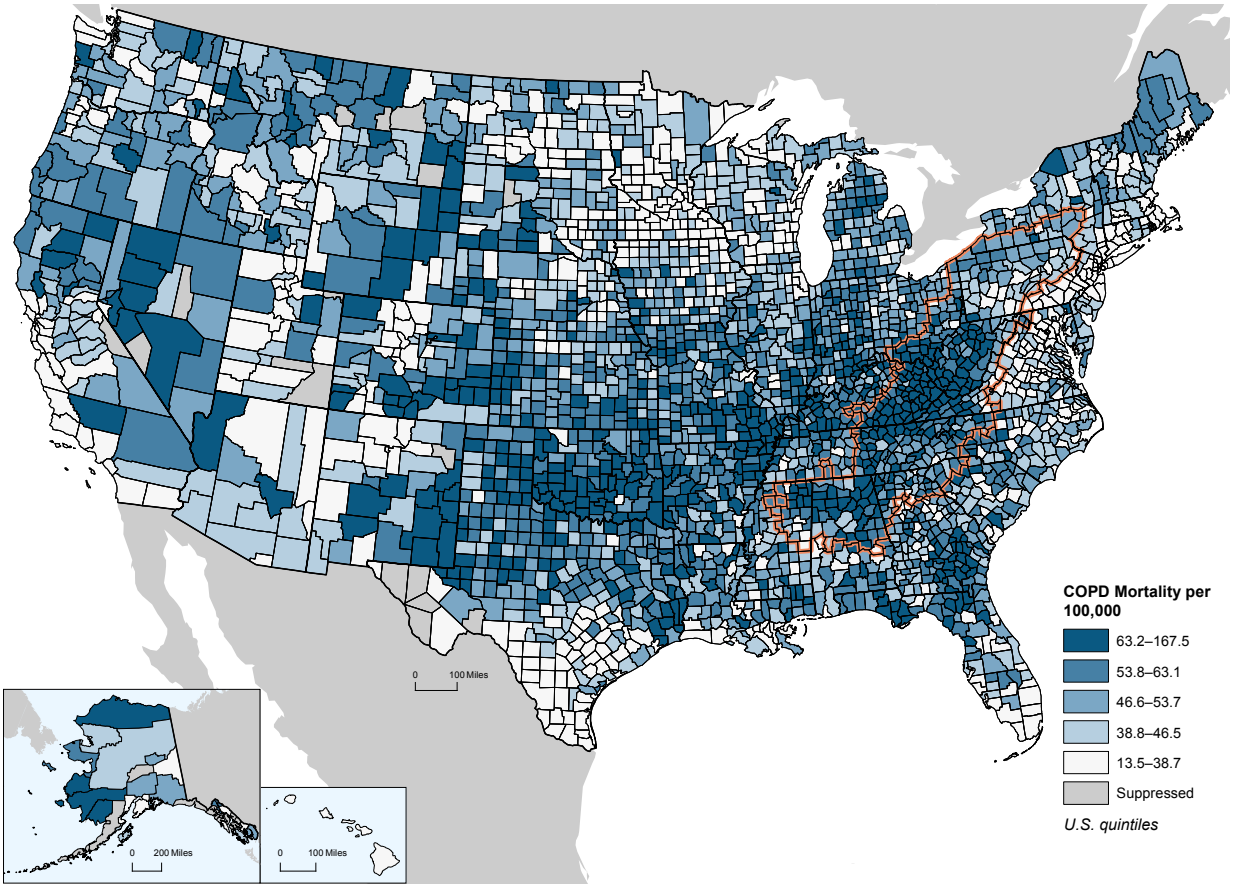


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

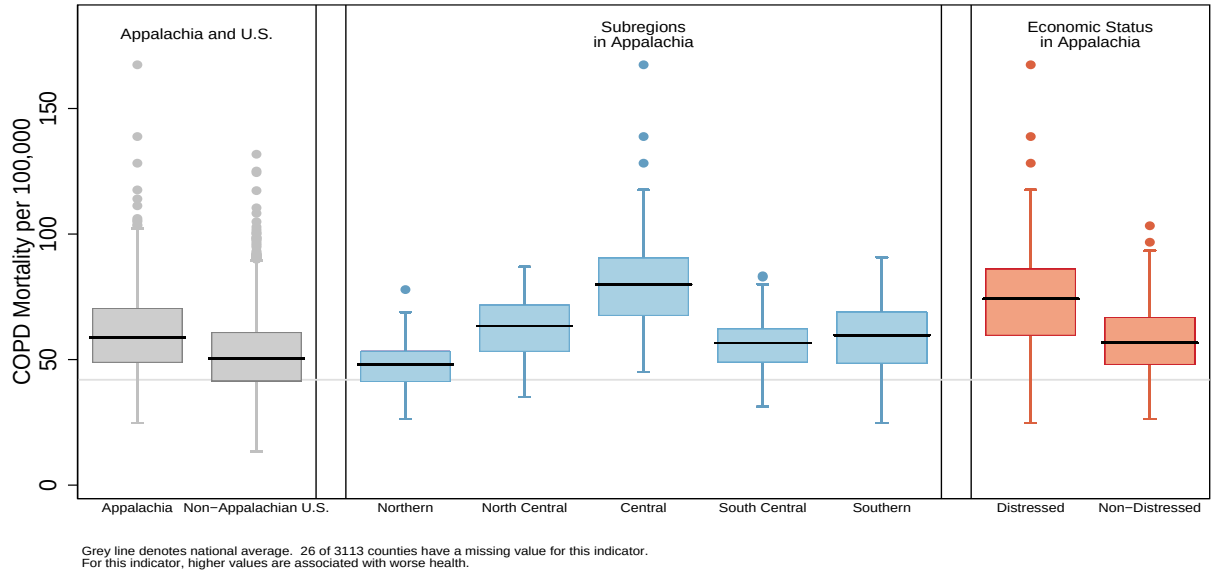


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

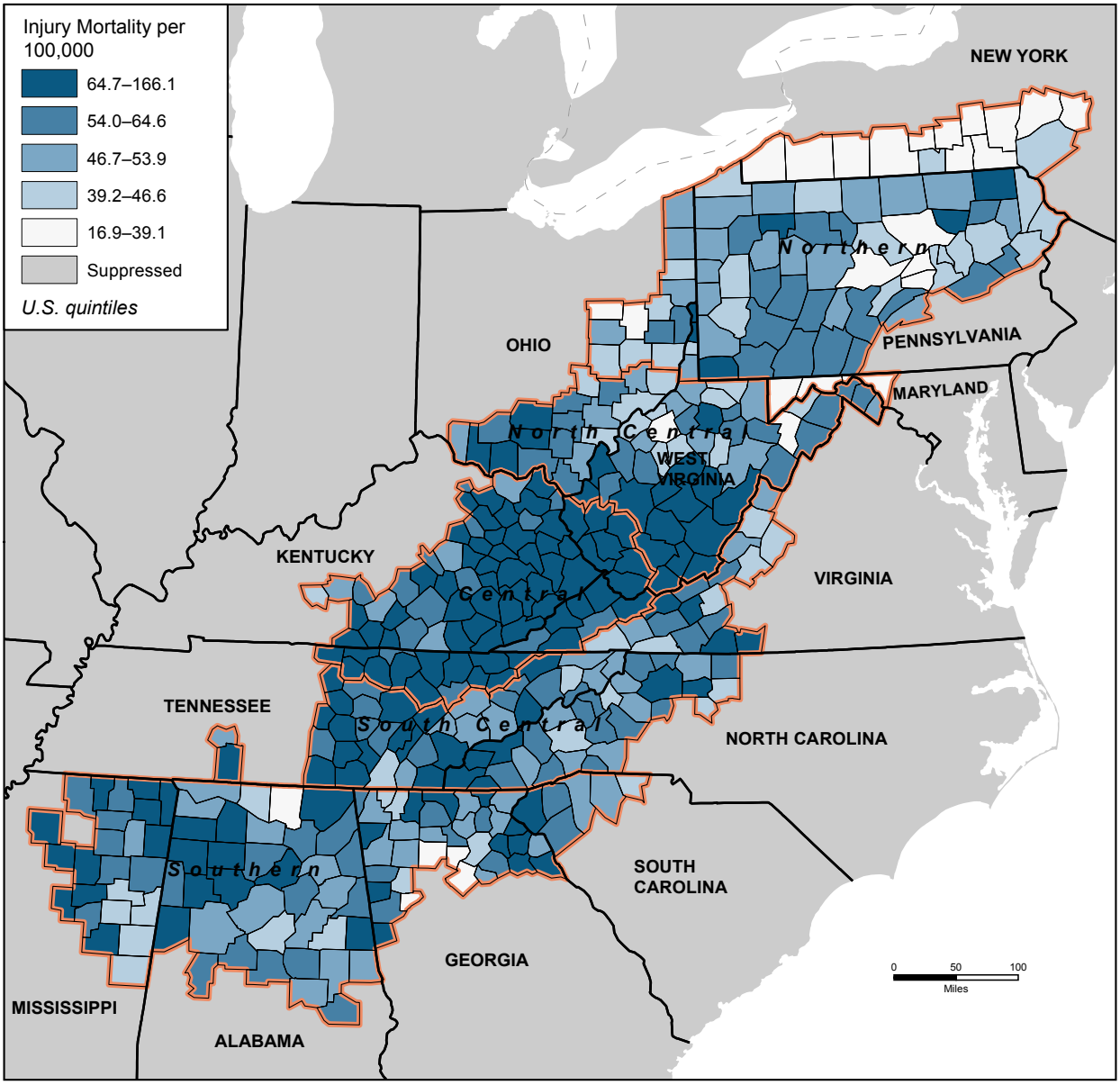
Areas in Appalachia that are more rural have higher injury mortality rates than more urbanized areas. The injury mortality rate for rural counties in the Appalachian Region is 67.4 per 100,000 population, which is 47 percent higher than the rate of 45.7 per 100,000 found in large metro counties in the 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.

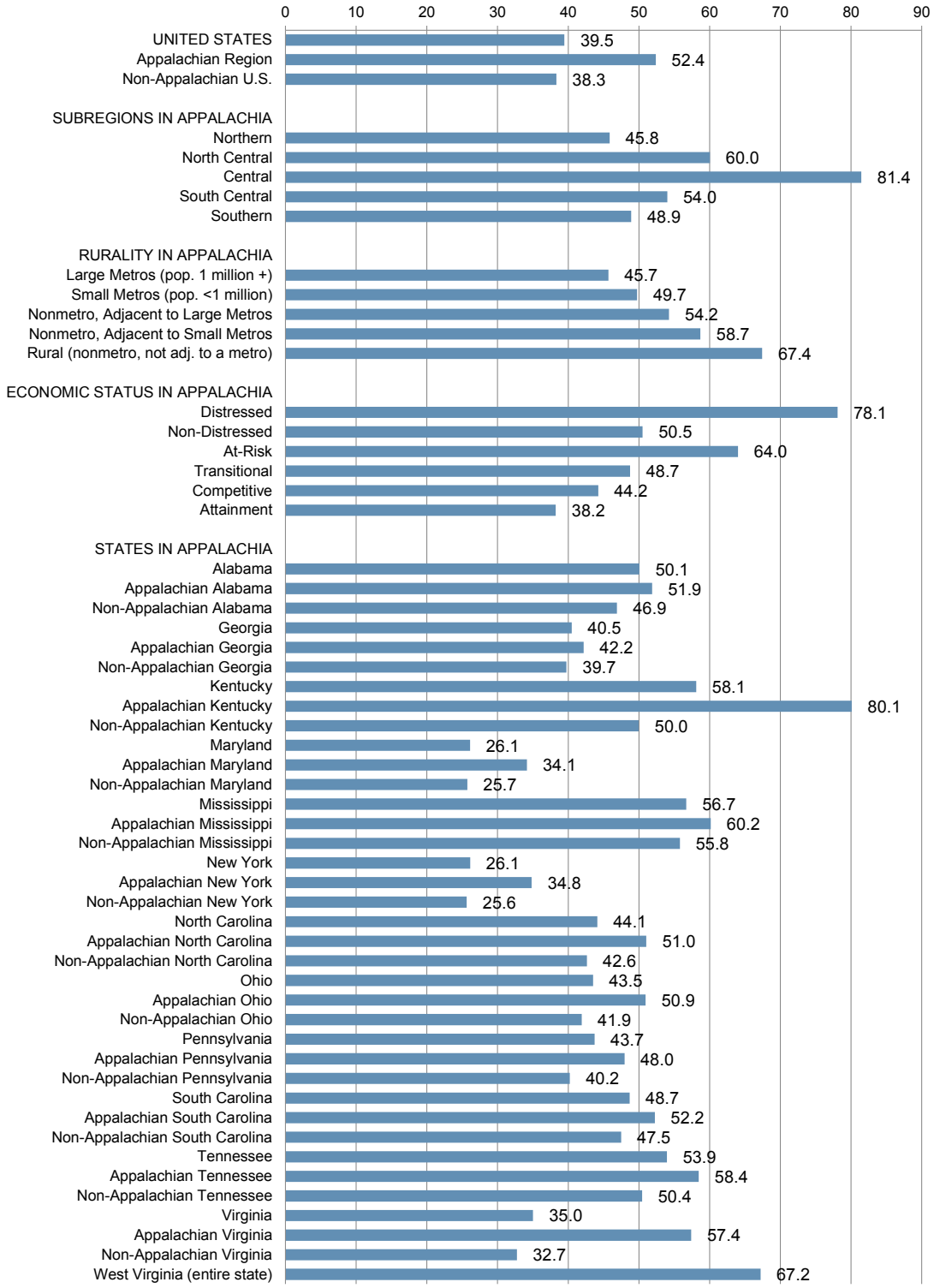
Figure 22 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation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

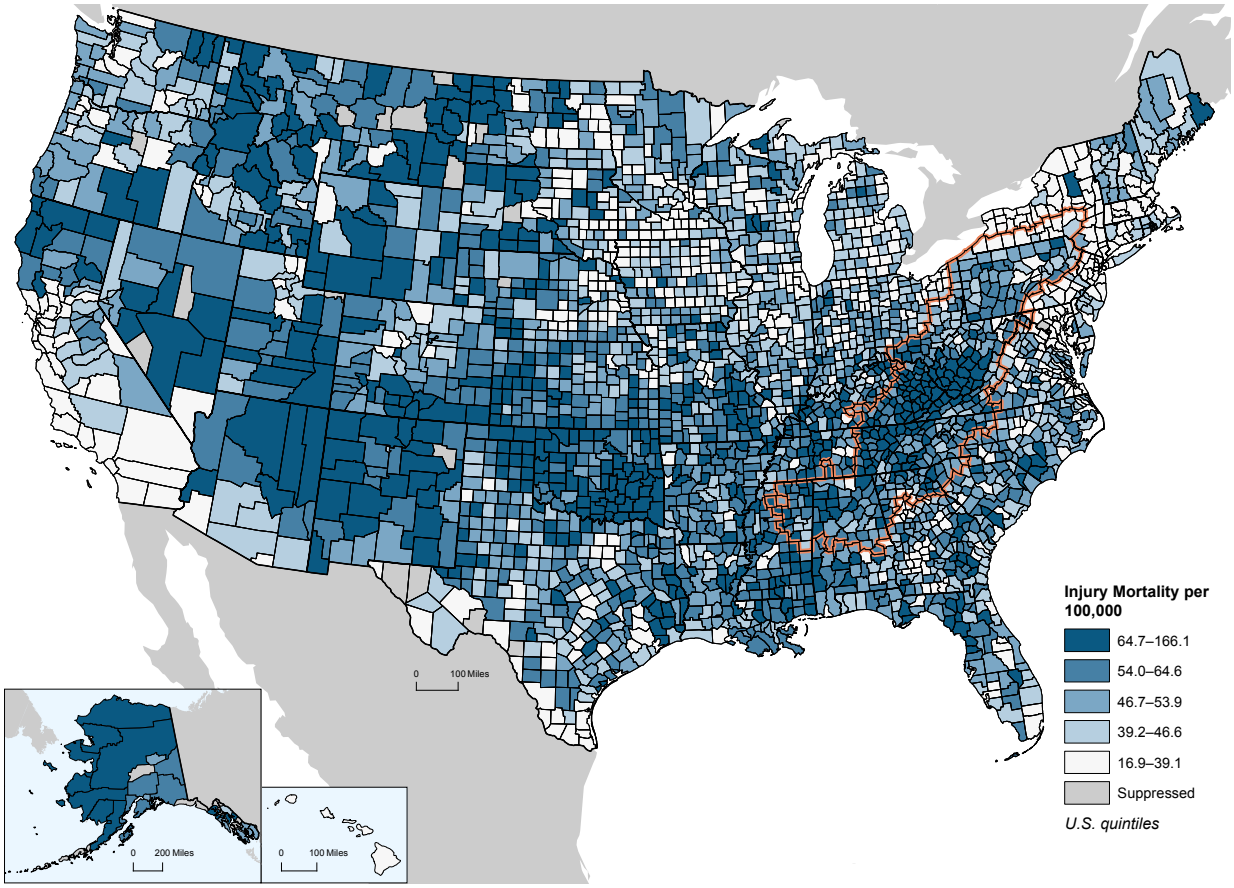


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

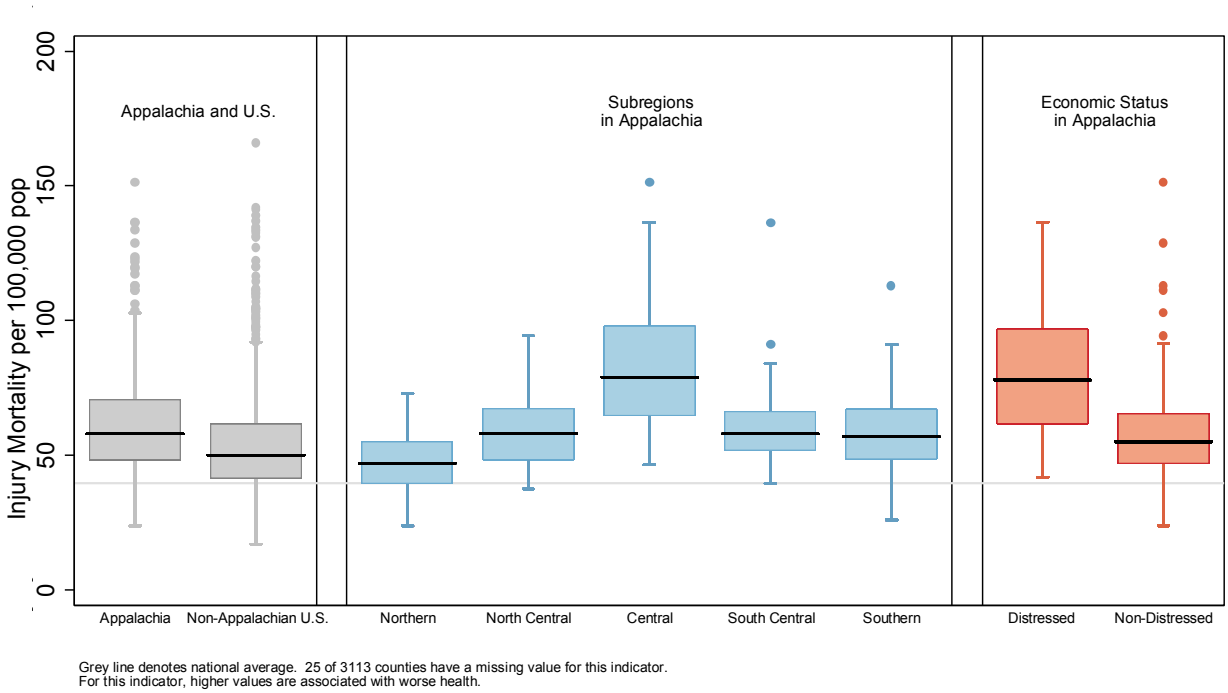


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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



Grey line denotes national average. 25 of 3113 counties have a missing value for this indicator.
For this indicator, higher values are associated with worse health.

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.

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.

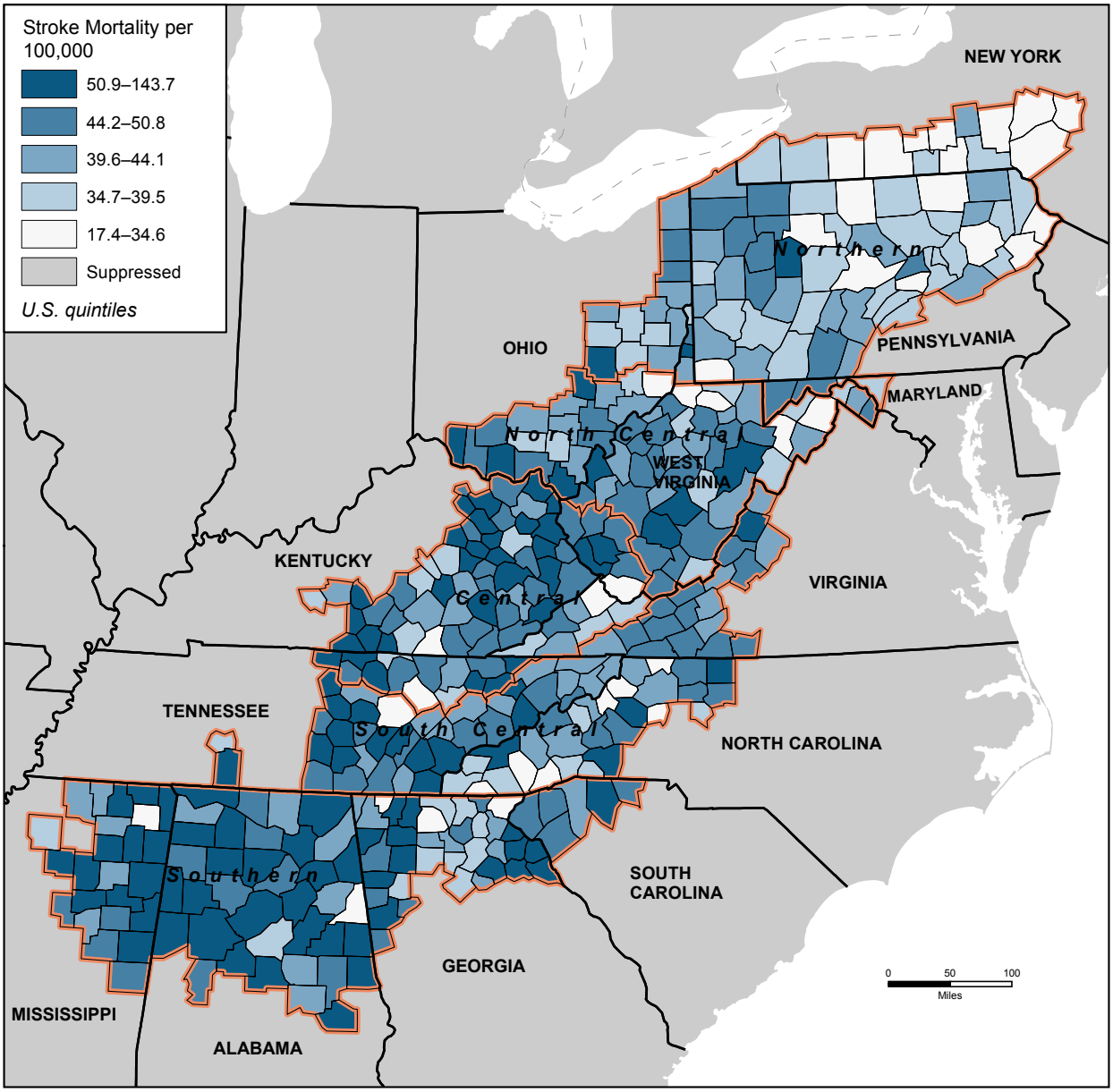
There is relatively little difference in stroke mortality rates between rural and urban areas; the rate in the Appalachian Region's rural counties is only eight percent higher than in the Region's urban counties. The Region's economically distressed counties have a stroke mortality rate of 49.5 per 100,000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

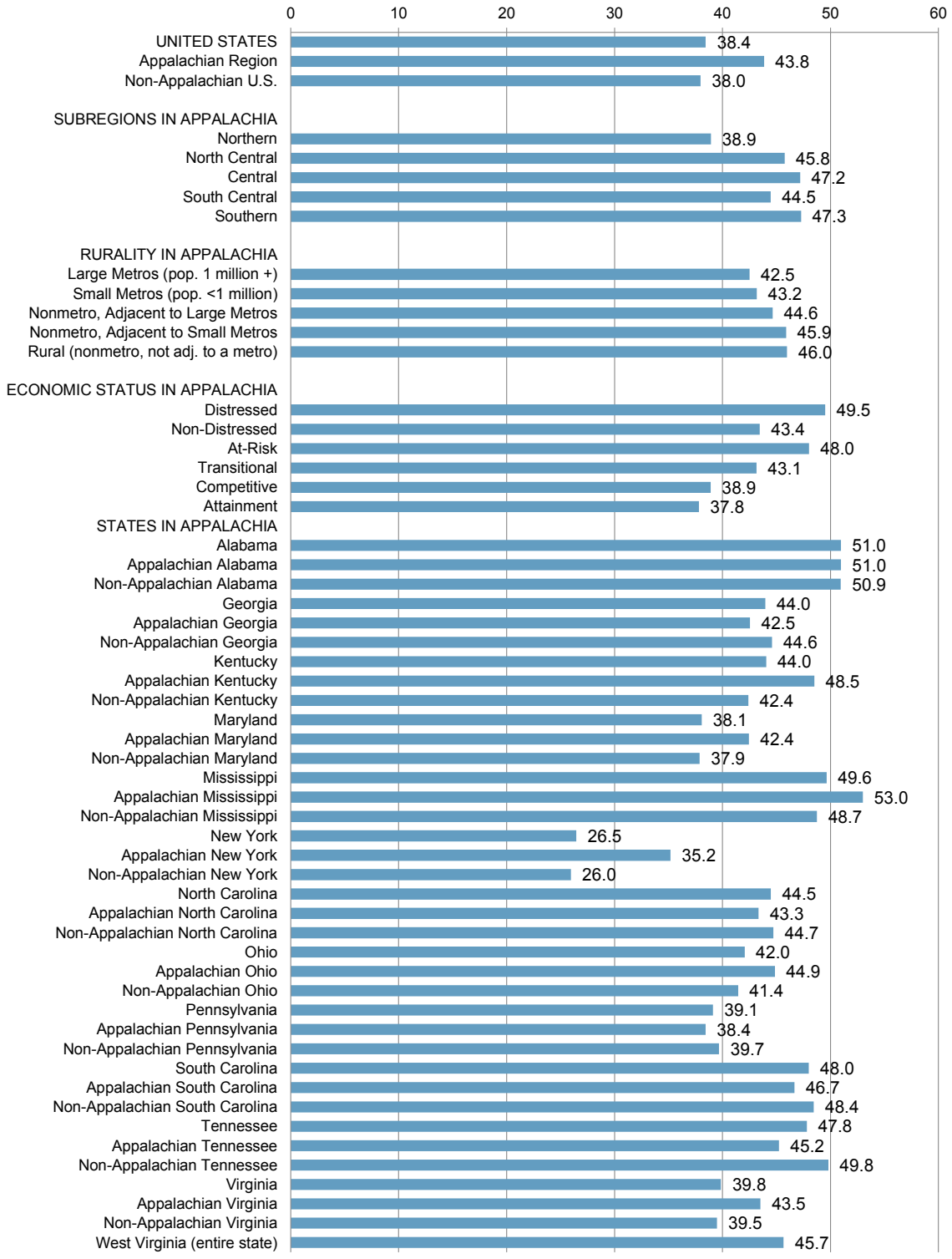
Figure 26 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation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



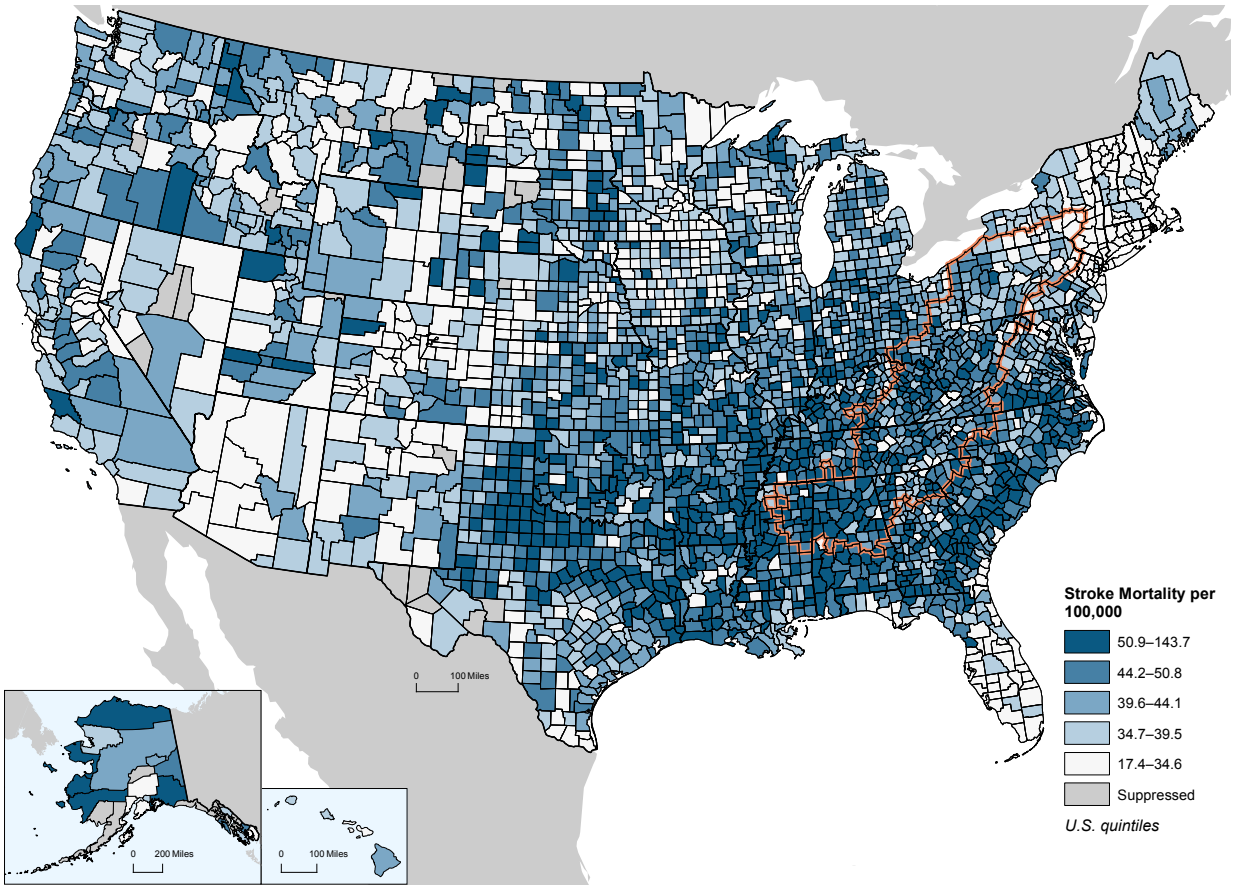
Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

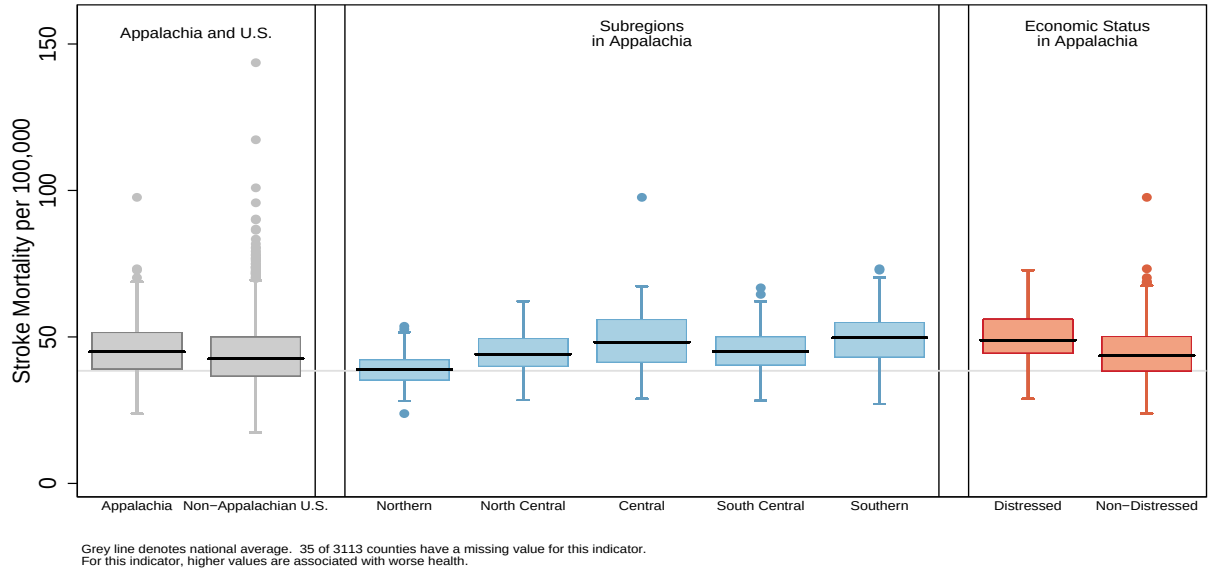


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

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.

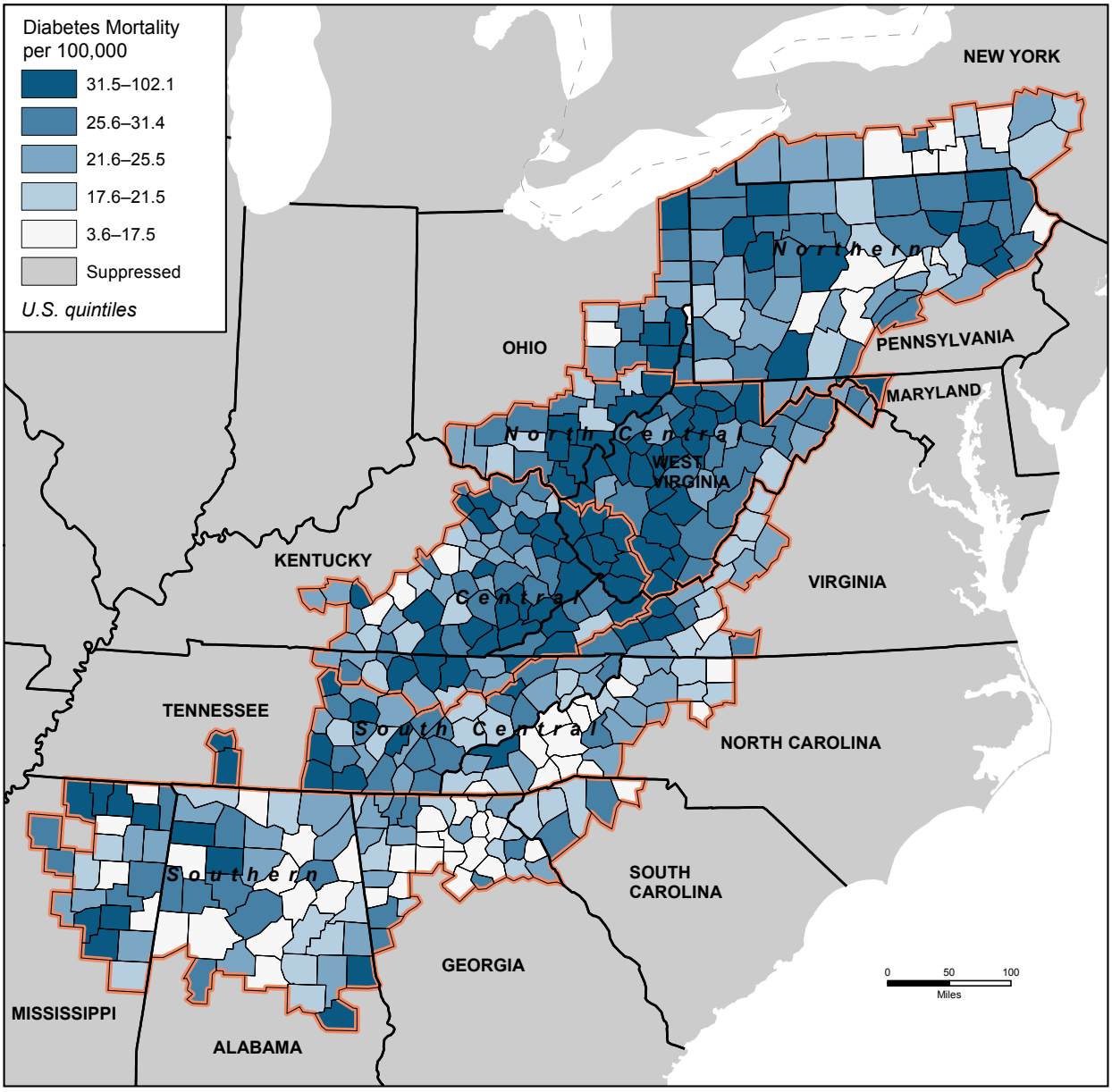
The data show an urban-rural disparity; rural counties in Appalachia have a diabetes mortality rate of 27.7 per 100,000 population, which is 36 percent higher than the Region's large metro county rate of 20.3 per 100,000. The diabetes mortality rate in the Appalachian Region's distressed counties is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

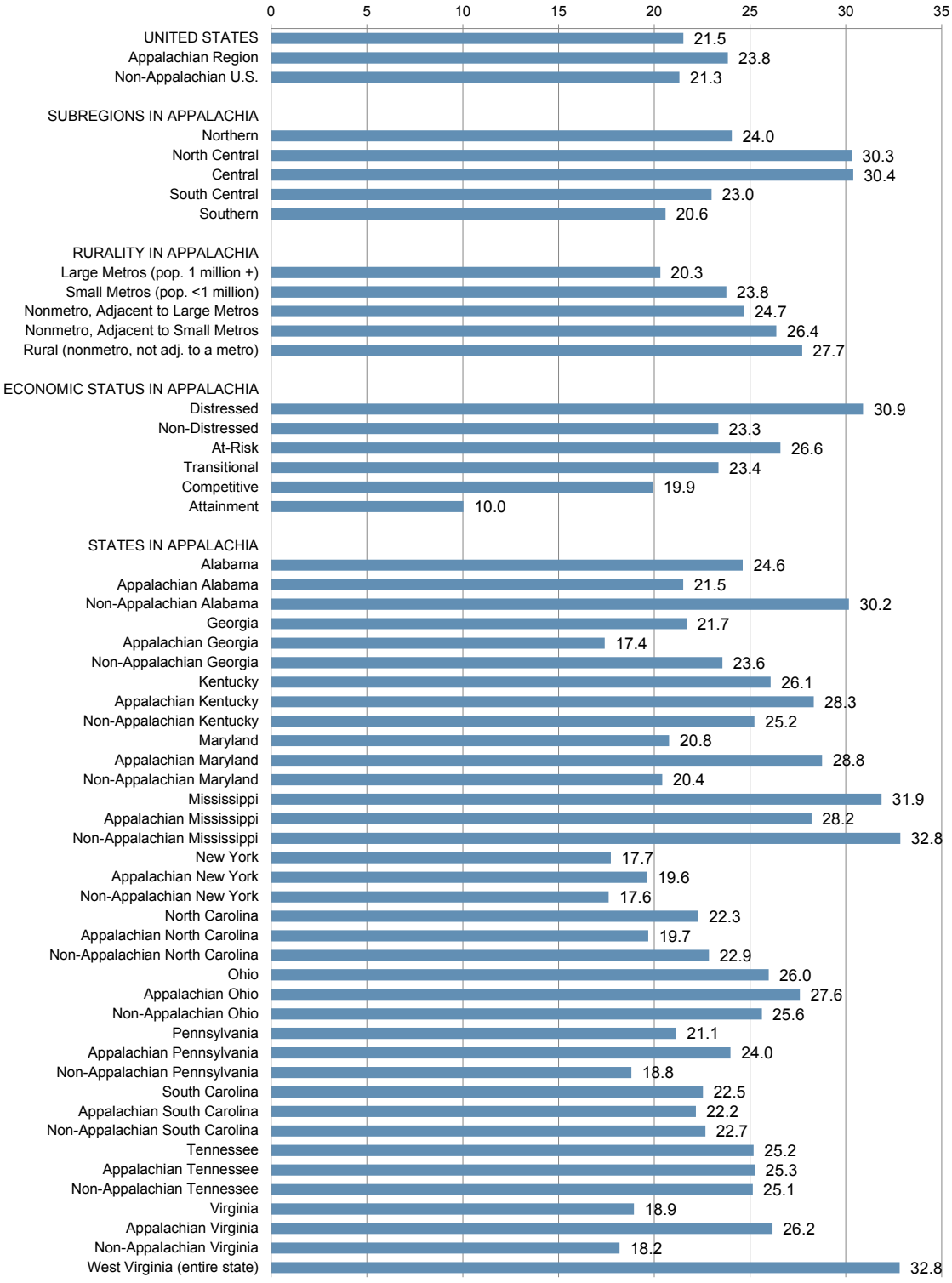
Figure 30 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation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

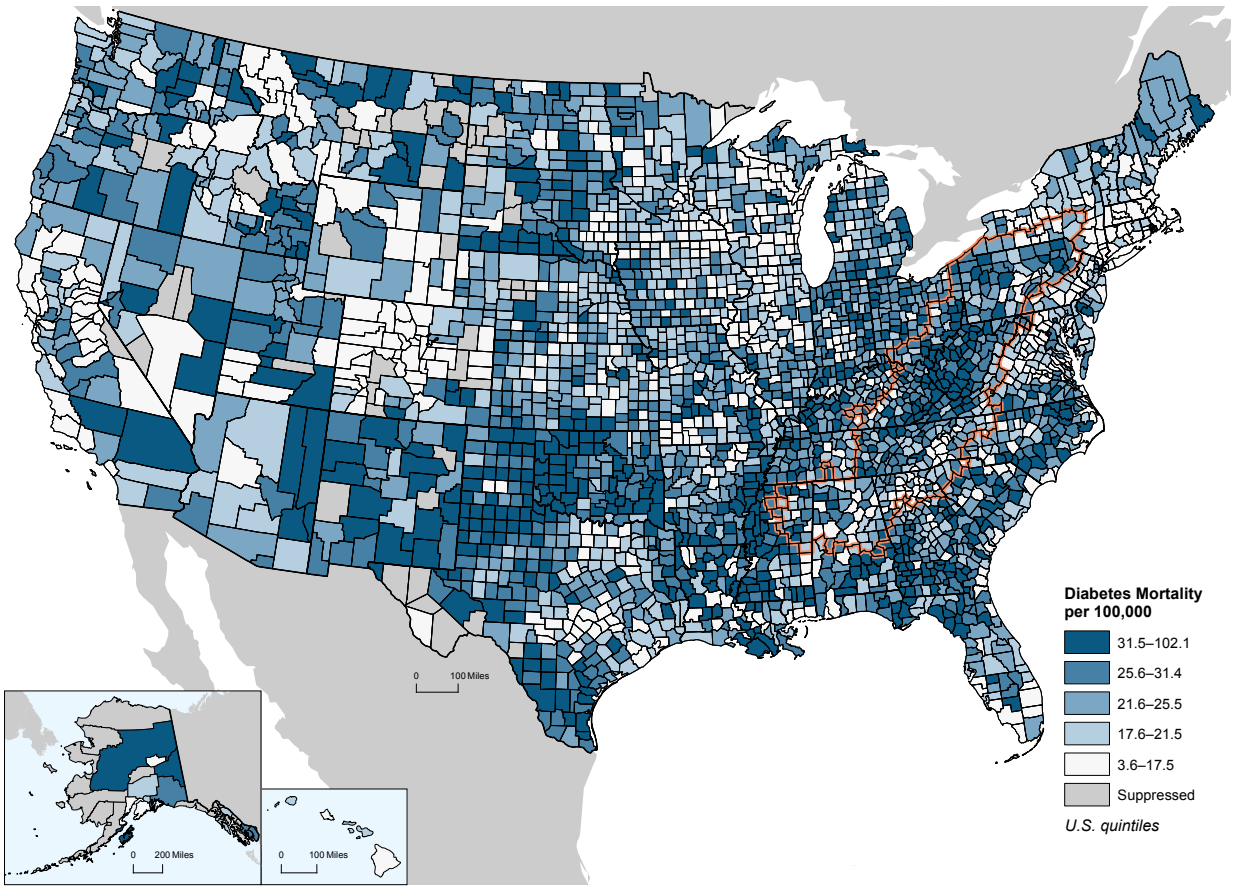


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

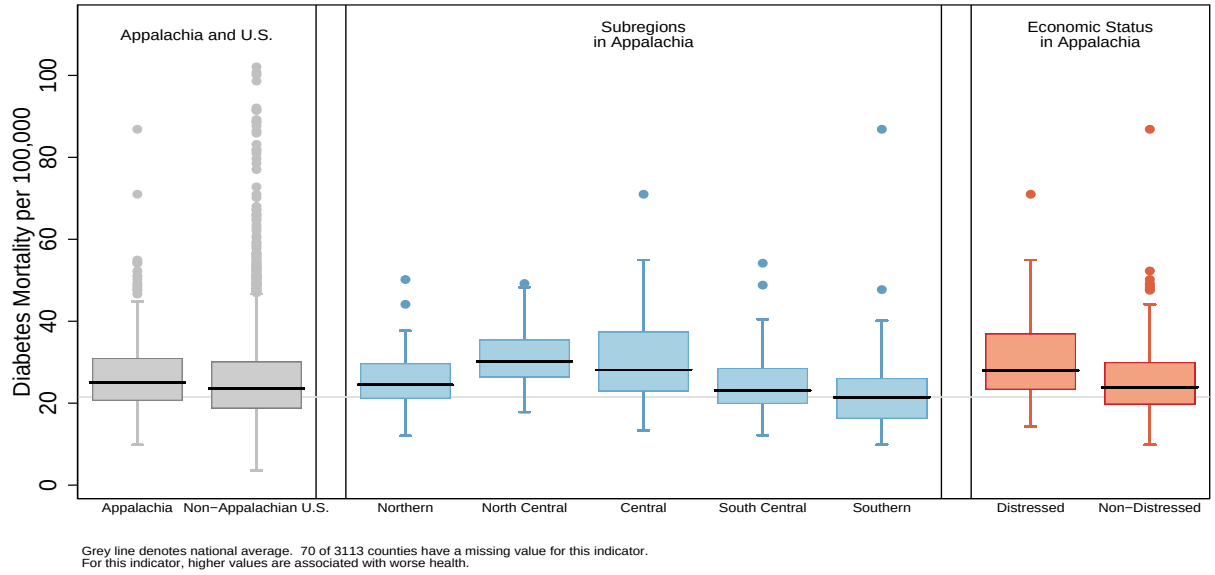


Data source: National Center for Health Statistics. Compressed Mortality File, 1999–2014 (machine-readable data file and documentation, CD ROM Series 20, No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland.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

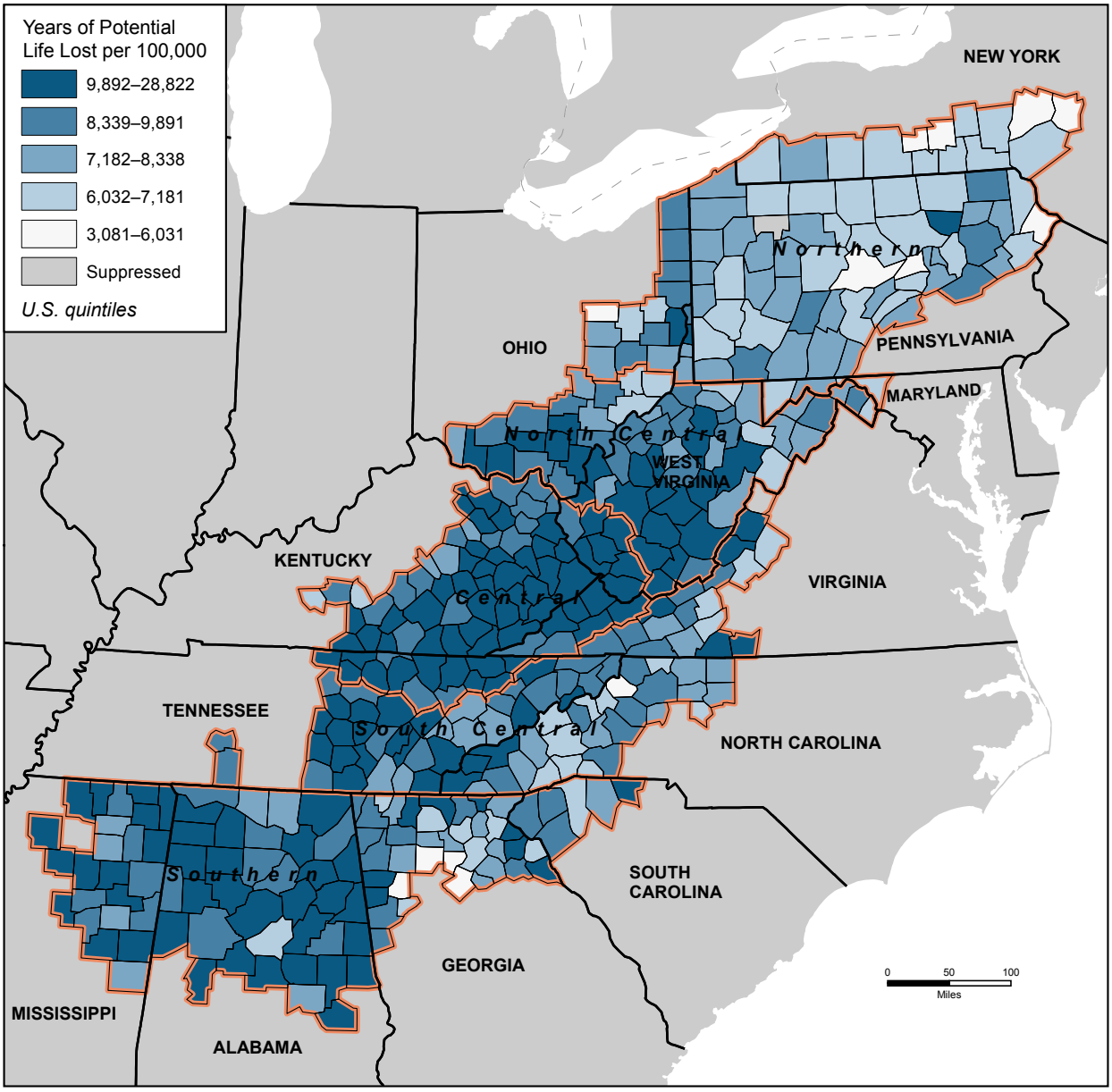
There is an urban-rural divide for YPLL in Appalachia. Rural Appalachian counties have YPLL rates approximately 40 percent higher than large metro counties in Appalachia (10,100 per 100,000 population compared to 7,221). However, even the large metro Appalachian counties have YPLL rates eight percent 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.

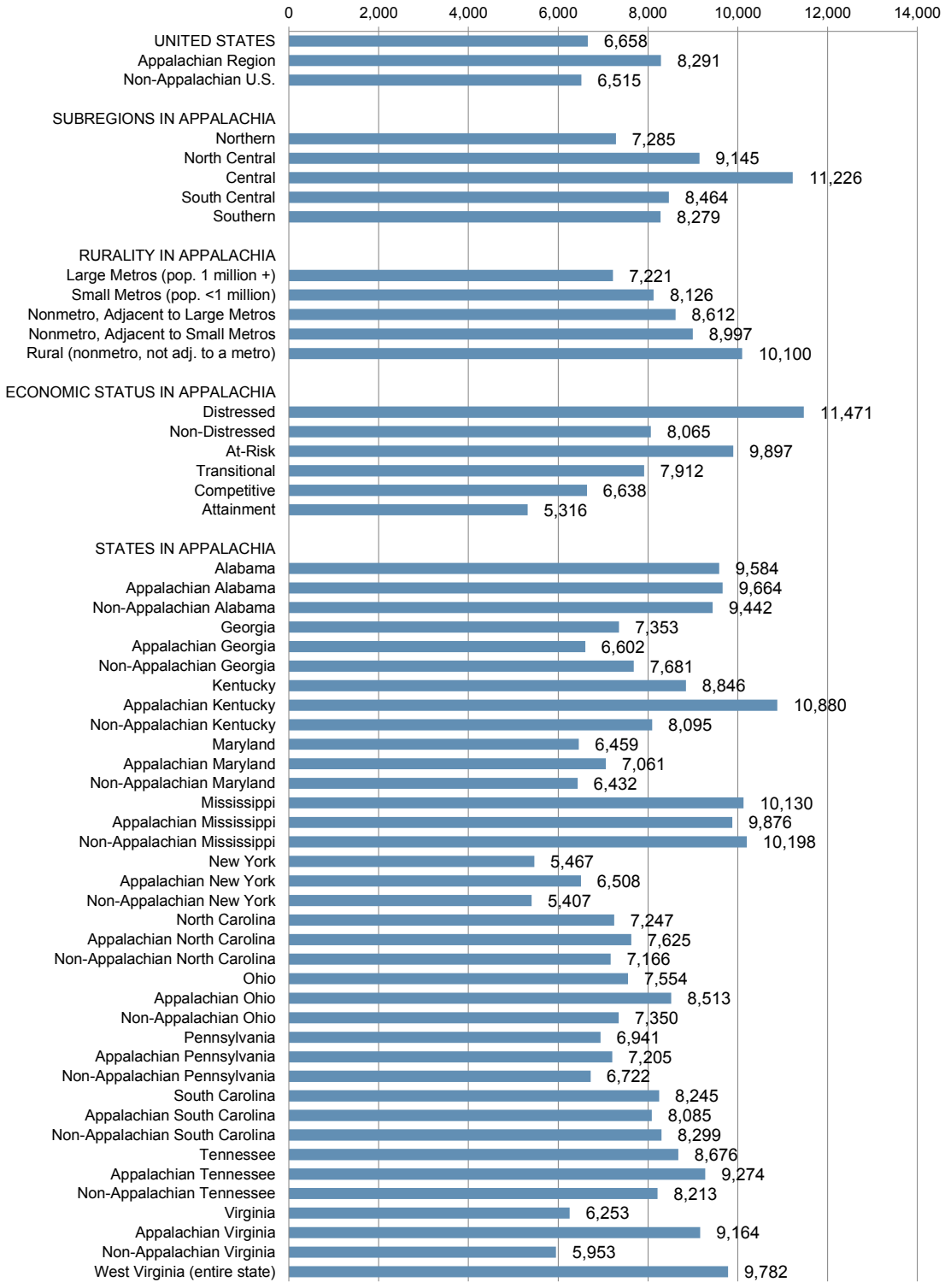
Figure 34 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation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

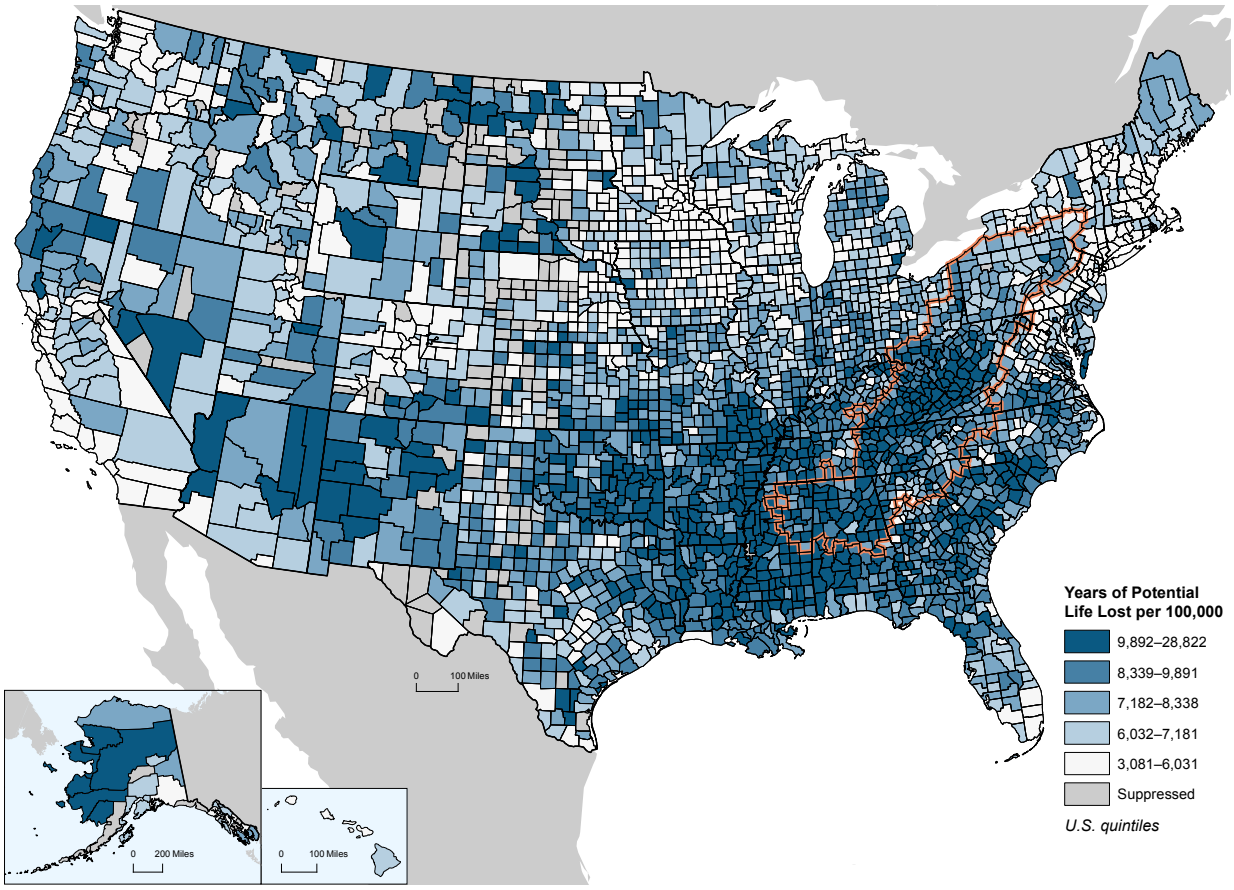


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

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

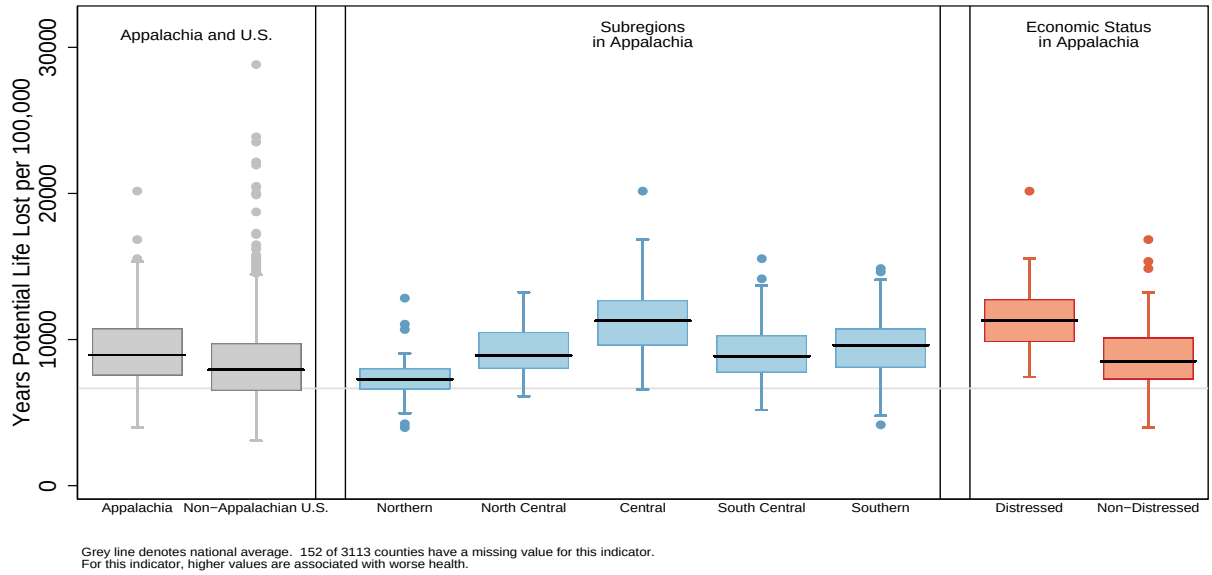


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation http://www.countyhealthrankings.org/rankings/data.

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.

Heart Disease Deaths

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Cancer Deaths

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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

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

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