



## Health Care Systems

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Primary Care Physicians

Mental Health Providers

Specialty Physicians

Dentists

Uninsured Population

Heart Disease Hospitalizations

Chronic Obstructive Pulmonary Disease  
Hospitalizations

Further Reading

**CREATING A CULTURE OF  
HEALTH IN APPALACHIA**  
DISPARITIES AND BRIGHT SPOTS





KEY FINDINGS | Supply of Primary Care Physicians

- The supply of primary care physicians per 100,000 population in the Appalachian Region is 12 percent lower than the national average.
- Central Appalachia (33 percent lower) and Southern Appalachia (21 percent lower) both report a lower supply of primary care physicians than the national average.
- The supply of primary care physicians in the Appalachian Region's rural counties is 20 percent lower than the supply in the Region's large metro counties.
- The supply of primary care physicians in the Appalachian Region's distressed counties is 40 percent lower than the supply in the Region's non-distressed counties.

## Background

This indicator measures the number of primary care physicians per 100,000 population. The figures for this measure come from a similar County Health Rankings indicator—the population to primary care physician ratio—and are based on 2013 data provided by the American Medical Association and Area Health Resources Files, a dataset provided by the U.S. Department of Health and Human Services. Primary care physicians include non-federal, practicing physicians (M.D.s and D.O.s) under age 75 specializing in general practice medicine, family medicine, internal medicine, and pediatrics. Higher physician numbers indicate a greater supply of primary care physicians, which is associated with a greater availability of primary medical care in a community.

Higher numbers of primary care physicians are a fundamental element for increasing access to primary medical care. Greater access to primary medical care is associated with improved health outcomes (Macinko, Starfield, & Shi, 2007). Greater access is also associated with more timely and cost-effective use of health services (Ricketts & Holmes, 2007). With increased access to primary care, individuals are less likely to delay care until the condition or illness requires more extensive treatment (Starfield, Shi, & Macinko, 2005).

Defining a universal target for the number of primary care physicians for an area is difficult because a range of factors influence the primary care needs of a community, such as: total population, the age profile of the population, and the area's employment mix. However, the Health Resources and Services Administration (HRSA), part of the U.S. Department of Health and Human Services, has established a minimum threshold, and defines Primary Care Health Professional Shortage Areas as communities with one or fewer primary care physicians per 3,500 people (Health Resources and Services Administration, 2016). Converting this ratio to the number of primary care physicians per 100,000 population, the HRSA definition of a shortage area is roughly equivalent to fewer than 29 primary care physicians per 100,000 population. Using 2016 data from the Area Health Resources Files, Appalachian residents are more likely

to live in a full county Primary Care Health Professional Shortage Area than residents in the rest of the United States (7.2 percent compared to 4.5 percent).

There is currently a national debate focused on the prospect of future primary care physician shortages. Although there is disagreement over whether the supply of primary care physicians will meet demand, there is general consensus that there is a problem of uneven distribution, and rural areas, in particular, suffer from primary care physician shortages (Bodenheimer & Pham, 2010). Several federal and state policies and programs aim to increase physician supply in rural and underserved areas, and medical schools and residency programs are becoming more deliberate in their efforts to improve supply (Bodenheimer & Pham, 2010). However, due to the lag between the initiation of medical training and placing physicians in communities, any new programs and policy changes require a great deal of time before benefits—locating primary care physicians in underserved communities—can be fully realized.

### Overview: Supply of Primary Care Physicians in the Appalachian Region

The Appalachian Region has 66.8 primary care physicians per 100,000 population, which is 12 percent lower than the national average of 75.6 primary care physicians per 100,000. The supply of primary care physicians in South Central Appalachia (76.9 per 100,000) and North Central Appalachia (72.7 per 100,000) is comparable to the national average. Central Appalachia has the lowest physician supply in the Region, with 50.9 primary care physicians per 100,000 population, followed by Southern Appalachia with 59.5 per 100,000.

The supply of primary care physicians for rural counties (55.6 per 100,000 population) in Appalachia is 20 percent lower than the average for large metro counties (69.4 per 100,000), and 26 percent lower than the nation as a whole. The economic status of the county also plays a role in physician supply; economically distressed counties in Appalachia report 40.9 primary care physicians per 100,000 population, which is 40 percent lower than the 68.7 primary care physicians per 100,000 population in non-distressed counties, and 46 percent lower than the national average.

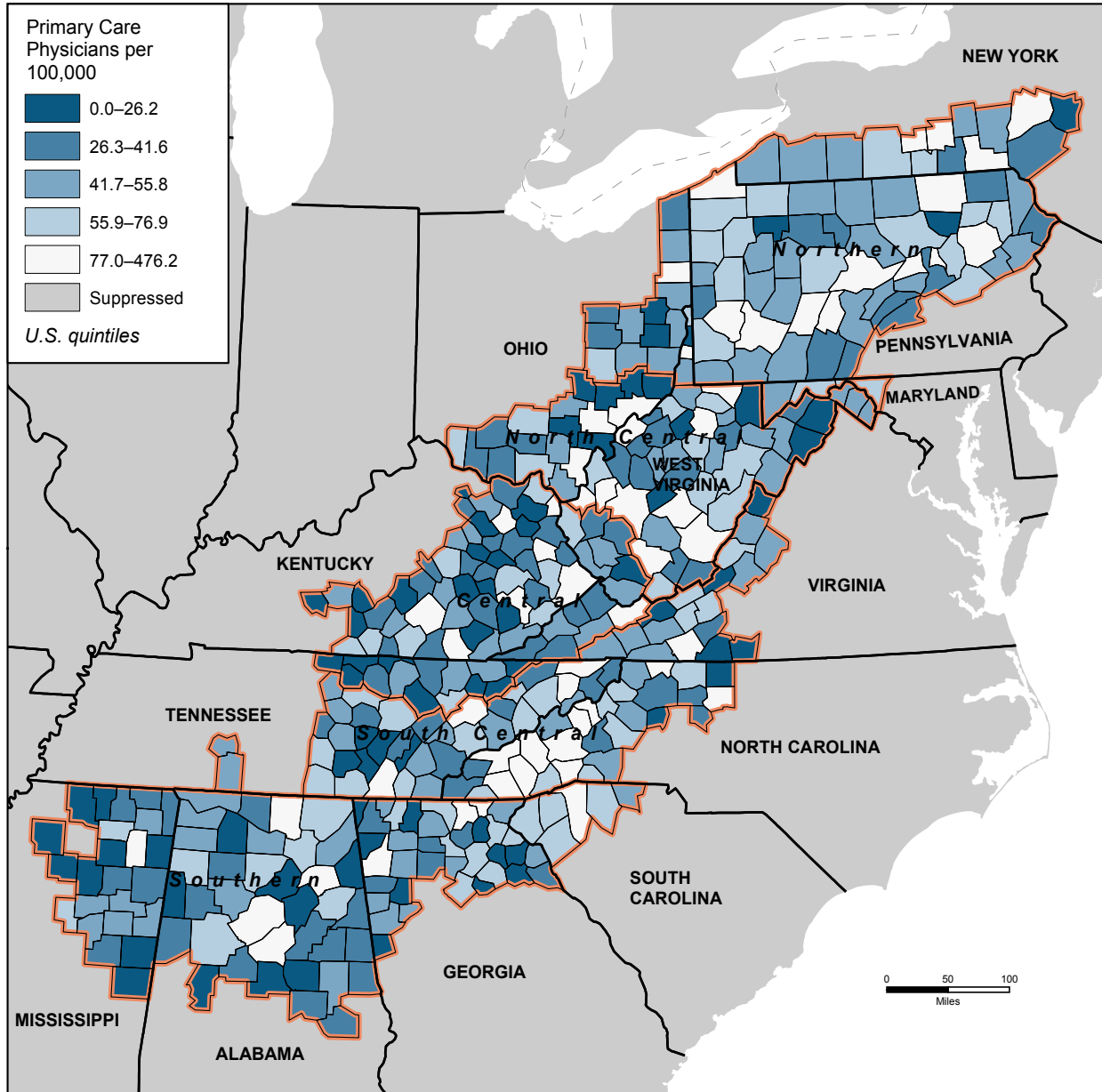
Within states, the supply of primary care physicians varies between the Appalachian and non-Appalachian portions. The greatest intrastate differences in the number of primary care physicians are evident in Maryland and New York. In Appalachian Maryland, the primary care physician supply is 58.9 per 100,000, compared with 90.6 per 100,000 in non-Appalachian Maryland, a difference of 35 percent. Likewise, in Appalachian New York, the primary care physician supply is 64.0 per 100,000, compared to the non-Appalachian supply of 84.4 per 100,000, a difference of 24 percent. Appalachian Mississippi's primary care physician supply of 42.1 per 100,000 is the lowest in the Region, while Appalachian North Carolina's supply of 79.5 per 100,000 is the highest. The Appalachian portions of North Carolina, South Carolina, and Tennessee all have a higher supply of primary care physicians than their non-Appalachian portions. For these three states, the Appalachian portions report a supply equal to or greater than the national average.

Figure 113 shows the number of primary care physicians per 100,000 population for Appalachian counties, grouped by national quintiles. Darker colors indicate lower numbers of primary care physicians; for this measure, higher values are associated with better health. Although there are pockets of both good and poor performance throughout the Region, there are few patterns to be discerned, as each state in the Region reports at least one county in both the best-performing and worst-performing national quintiles. It should be noted that the best-performing counties in terms of primary care physician supply tend to also have large medical centers in the vicinity.

Figure 114 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout

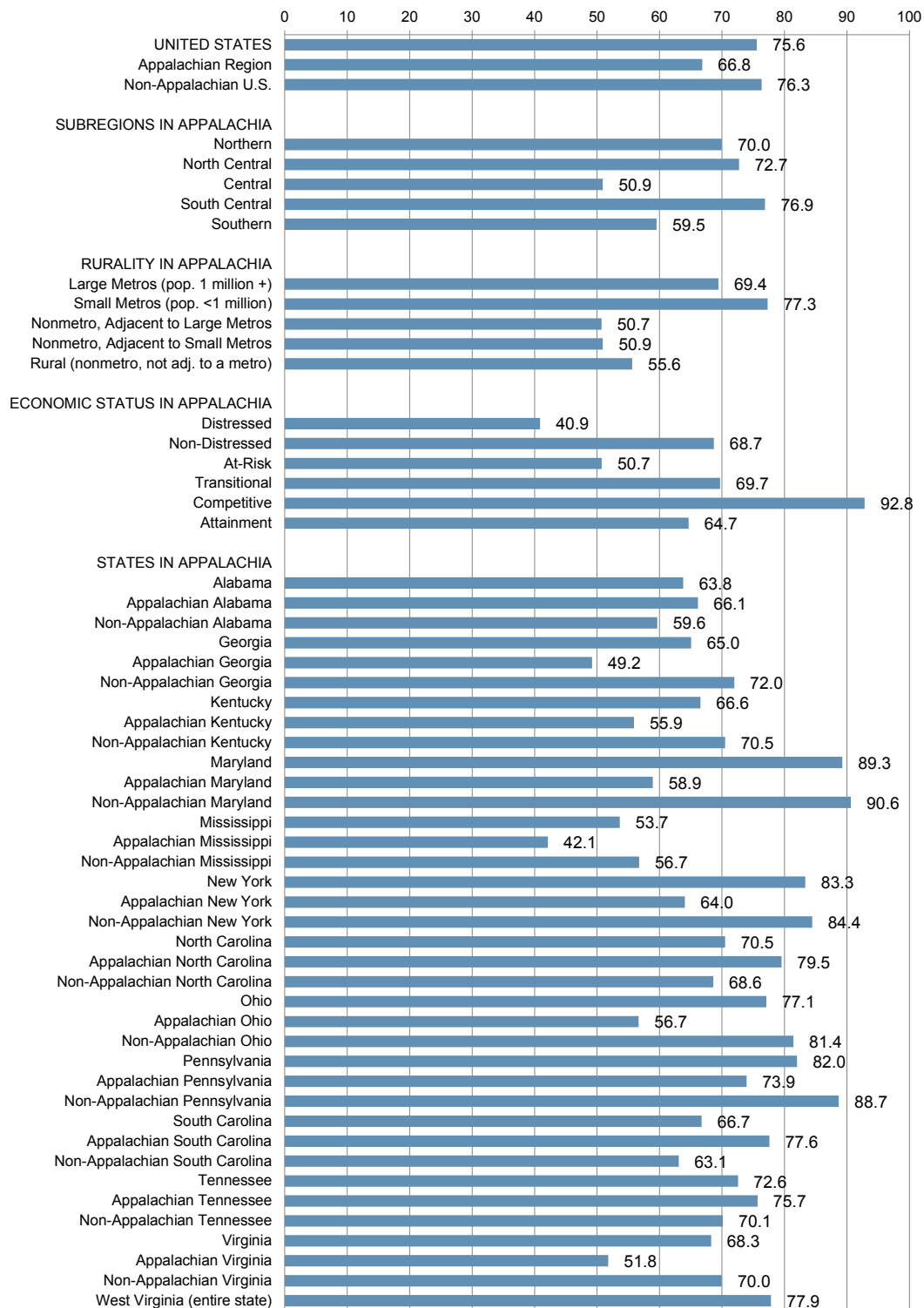
Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

**Figure 113: Map of Primary Care Physicians per 100,000 Population in the Appalachian Region, 2013**



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

Figure 114: Chart of Primary Care Physicians per 100,000 Population, 2013

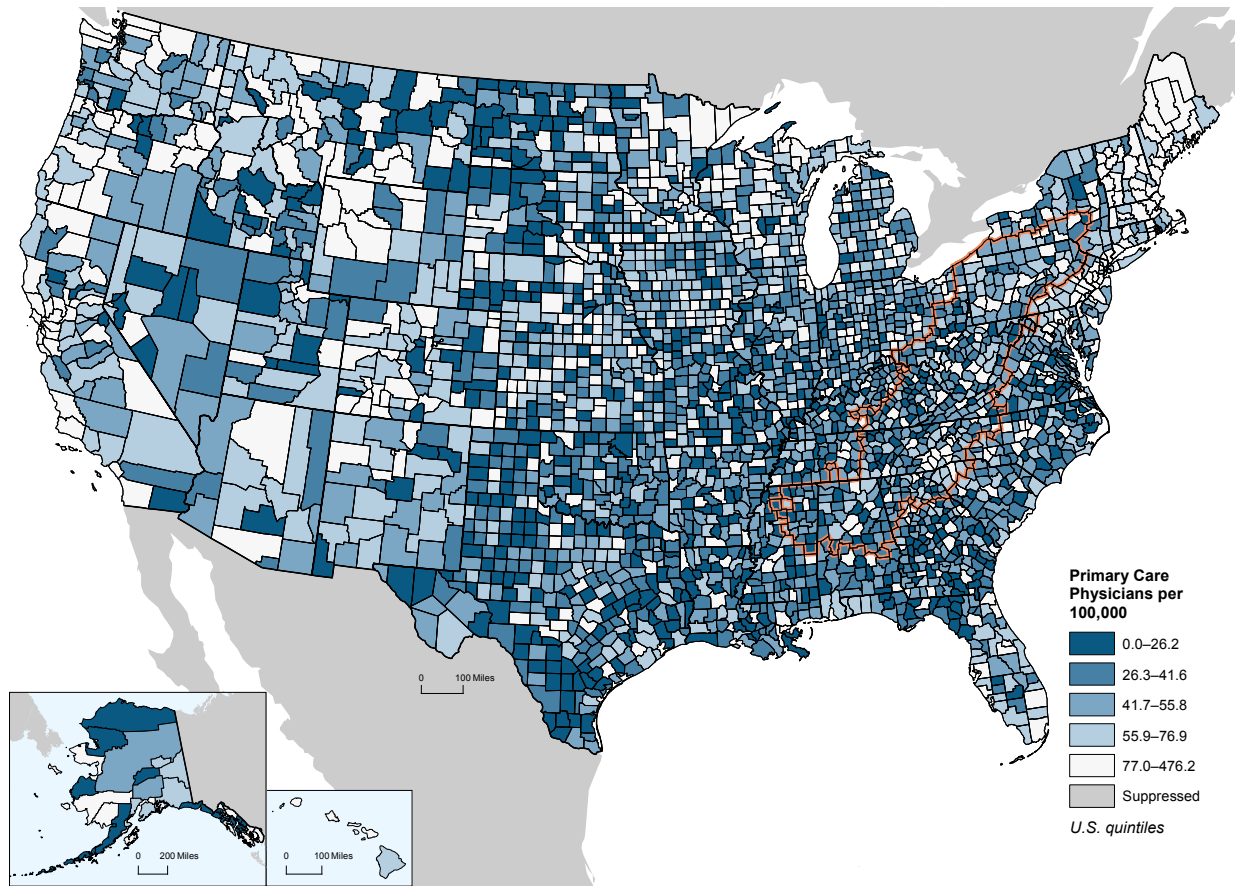


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation <http://www.countyhealthrankings.org/rankings/data>.

### Overview: Supply of Primary Care Physicians in the United States

Figure 115 highlights the variation in primary care physician supply across the United States. There appears to be no obvious regional or state-based dimension to these numbers. The spread of poorly-performing counties throughout much of the United States indicates that there are indeed primary care physician shortages in many parts of the country. New England and parts of the western United States—most notably, counties along the Pacific Coast—tend to have concentrations of counties with a high supply of primary care physicians. Outside of these areas, the differences in the number of providers does not appear to be concentrated in specific areas or in multi-county clusters. This suggests primary care physician supply may be more a function of the local healthcare system rather than anything related to state or regional policies.

**Figure 115: Map of Primary Care Physicians per 100,000 Population in the United States, 2013**

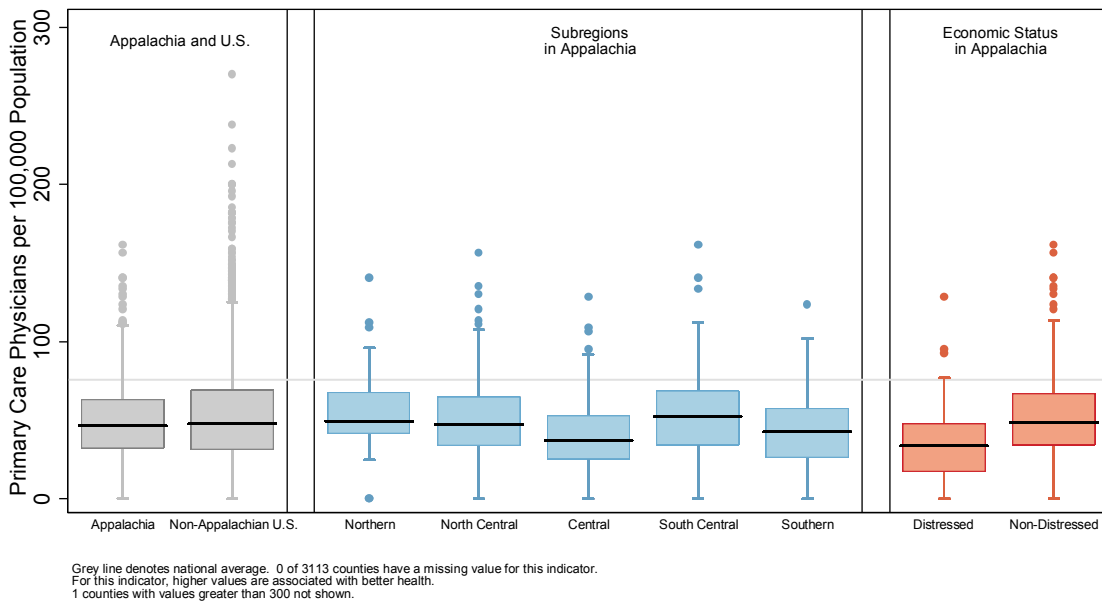


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation <http://www.countyhealthrankings.org/rankings/data>.

### Distribution of Primary Care Physicians

Figure 116 shows the distribution in the supply of primary care physician by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator, and one county with a value greater than 300 is not represented in the box plot.

**Figure 116: Box Plot of Primary Care Physicians per 100,000 Population by Geography and Economic Status, 2013**



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

The distribution in the supply of primary care physicians among national quintiles for Appalachian counties is shown in Table 40. Of the 420 counties in the Region, 79 (19 percent) rank in the worst-performing national quintile, while 56 (13 percent) rank in the best-performing national quintile.

**Table 40: Distribution of Primary Care Physicians per 100,000 Population among National Quintiles for Appalachian Counties**

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	Pct.	#	Pct.	#	Pct.	#	Pct.	#	Pct.
Primary care physicians	56	13%	84	20%	106	25%	95	23%	79	19%

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





KEY FINDINGS | Supply of Mental Health Providers

- The supply of mental health providers per 100,000 population in the Appalachian Region is 35 percent lower than the national average.
- All five Appalachian subregions have a lower supply of mental health providers than the national average, with North Central Appalachia and Southern Appalachia both reporting figures approximately 50 percent lower than the national number.
- The two nonmetro adjacent classifications—those adjacent to large metro areas, as well as those adjacent to small metro areas—report the lowest mental health provider supplies in the Region, with supplies that are approximately 50 percent below the national average.
- The supply of mental health providers in the Appalachian Region’s distressed counties is six percent lower than the supply in non-distressed counties.

Background

This indicator measures the number of mental health providers per 100,000 population. The figures for this measure come from a similar County Health Rankings indicator—the population to mental health provider ratio—based on 2015 data provided by the National Plan and Provider Enumeration System (NPPES) through the Centers for Medicare & Medicaid Services (CMS). In this report, mental health providers include: psychiatrists, psychologists, licensed clinical social workers, counselors, marriage and family therapists, and advanced practice nurses specializing in mental health care. These providers can address a wide variety of conditions, and a higher supply of providers indicates greater availability of mental health services in a community.

Mental health is an important component of overall well-being and is also directly related to physical health. Receipt of mental health services can help reduce medical costs and improve physical health outcomes, especially among individuals with chronic medical conditions (Kolappa, Henderson, & Kishore, 2013). People with severe mental illnesses tend to suffer worse physical health and excess mortality compared to the general population (Druss, Zhao, Von Esenwein, Morrato, & Marcus, 2011).

The Health Resources and Services Administration (HRSA), part of the U.S. Department of Health and Human Services, defines Mental Health Professional Shortage Areas as communities with one or fewer psychiatrists per 30,000 population (3.3 per 100,000), or one or fewer core providers per 9,000 population (11.1 per 100,000) (Health Resources and Services Administration, 2016). Core mental health professionals are: clinical social workers, clinical psychologists, marriage and family therapists, psychiatrists, and advanced practice psychiatric nurses (Heisler, 2015). Based on this definition, nearly 100 million people were living in Mental Health Professional Shortage Areas as of September 2014 (Radnofsky, 2015). A larger share of Appalachian residents than non-Appalachian residents live in a county that is classified as a Mental Health Professional Shortage Area: 41 percent vs. 23 percent. The mental health provider shortage became more noticeable after passage of mental health parity laws, which

increased both the access to, and demand for, mental health services among individuals who have health insurance (Radnofsky, 2015).

Research has documented disparities in access to mental health treatment in rural versus metro areas (Hauenstein, 2007), and has shown that most mental health professionals practice in metropolitan counties (Ellis, Konrad, Thomas, & Morrissey, 2009). Increasing the supply of mental health providers increases the use of mental health services, especially among racial and ethnic minority groups that have historically had lower use of mental health services, despite reported need (Lê Cook, Doksum, Chen, Carle, & Alegría, 2013). One strategy for increasing access to mental health services in rural and underserved areas is telepsychiatry, in which a psychiatrist or other mental health provider delivers services remotely (Holton & Brantley, 2014).

### Overview: Supply of Mental Health Providers in the Appalachian Region

There are 130 mental health providers per 100,000 population in the Appalachian Region, which is 35 percent lower than the national average of 201 per 100,000 population. No Appalachian subregion has more mental health providers per 100,000 population than the national average, and there is substantial variation in the number of mental health providers throughout the Region. South Central Appalachia has the highest supply of mental health providers at 172 per 100,000 population, which is 87 percent higher than the Southern Appalachian subregion's 92 providers per 100,000 population.

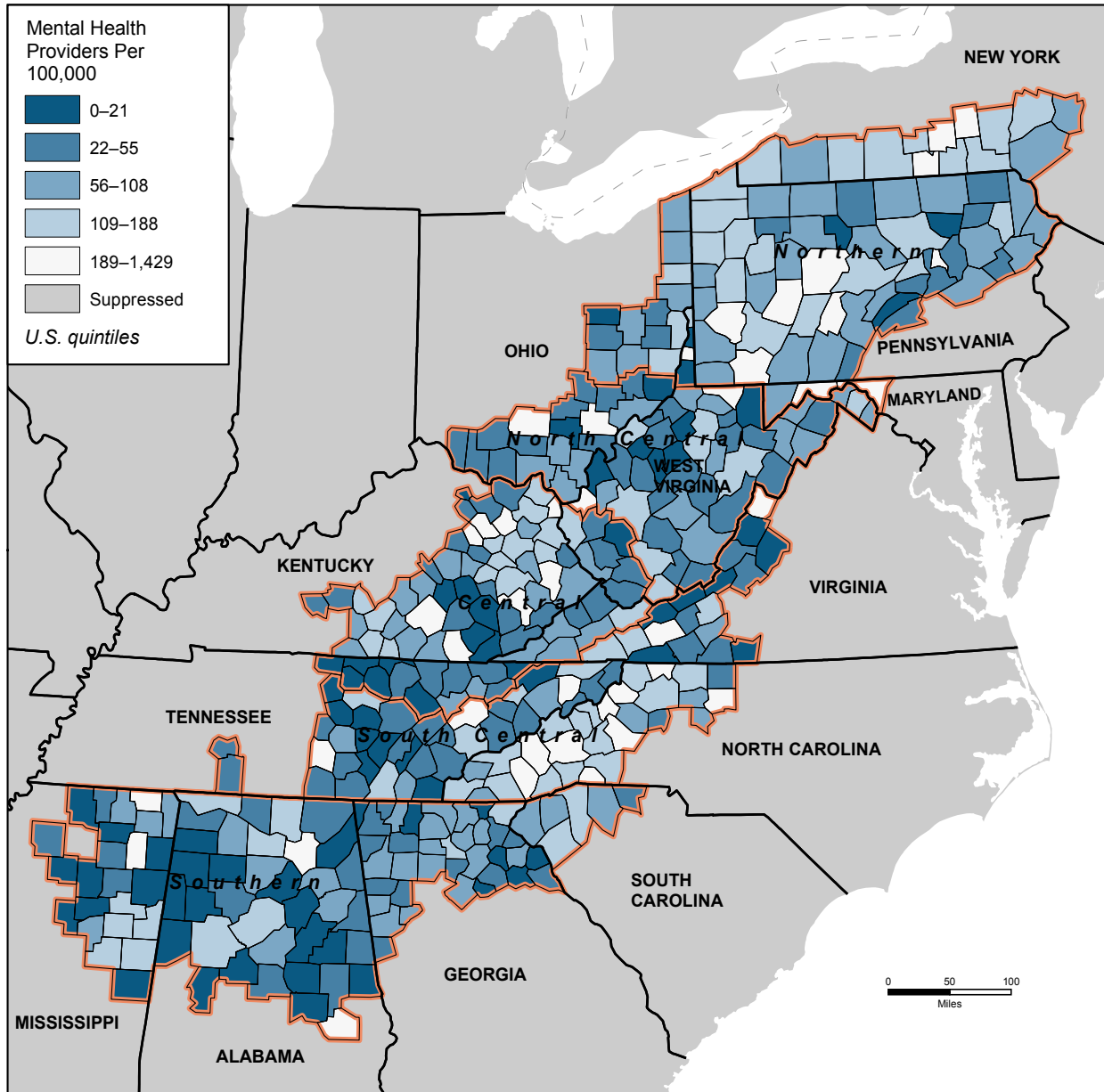
The supply of mental health providers for rural counties in Appalachia is 142 per 100,000 population, which is 10 percent higher than the 129 per 100,000 for the Region's large metro counties. The two nonmetro classifications—those adjacent to large metro areas (102 per 100,000), as well as those adjacent to small metro areas (90 per 100,000)—report the lowest supply of mental health providers in the Region, numbers that are approximately 50 percent below the national average. Unlike many of the other provider indicators discussed elsewhere in this report, the number of mental health providers does not differ much by economic status. The supply of mental health providers in distressed counties in the Appalachian Region is 123 per 100,000 population, which is just 6 percent lower than the 131 per 100,000 for the Region's non-distressed counties.

The supply of mental health providers varies between the Appalachian and non-Appalachian portions of states. The greatest intrastate differences in the number of mental health providers are in Georgia and Ohio. In Appalachian Georgia, the number of mental health providers is 72 per 100,000 population, which is 48 percent lower than the 138 providers per 100,000 population in non-Appalachian Georgia. Likewise, in Appalachian Ohio, the number of mental health providers is 99 per 100,000 population, compared to 167 mental health providers per 100,000 population in non-Appalachia Ohio, a difference of 41 percent. Appalachian North Carolina has the highest number of mental health providers in the Region at 242 per 100,000 population, which is 20 percent higher than the national average.

Figure 117 shows the number of mental health providers per 100,000 population in Appalachian counties, grouped by national quintiles. Darker colors indicate counties with lower numbers of mental health providers; for this measure, higher values are associated with better health. Although the Region as a whole falls below the national average, each of the five subregions contains several counties in the top-performing national quintile.

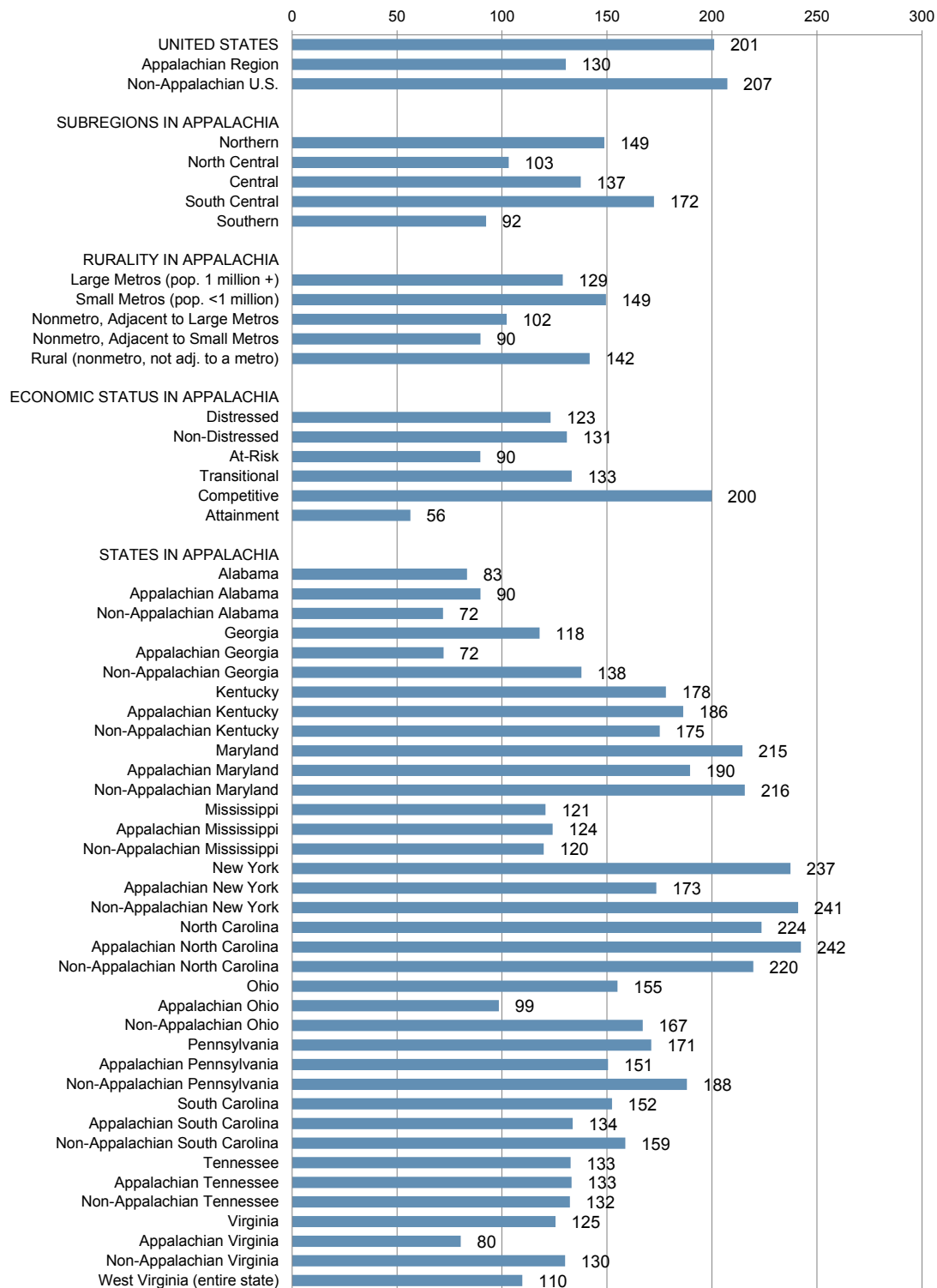
Figure 118 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

**Figure 117: Map of Mental Health Providers per 100,000 Population in the Appalachian Region, 2015**



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

Figure 118: Chart of Mental Health Providers per 100,000 population, 2015

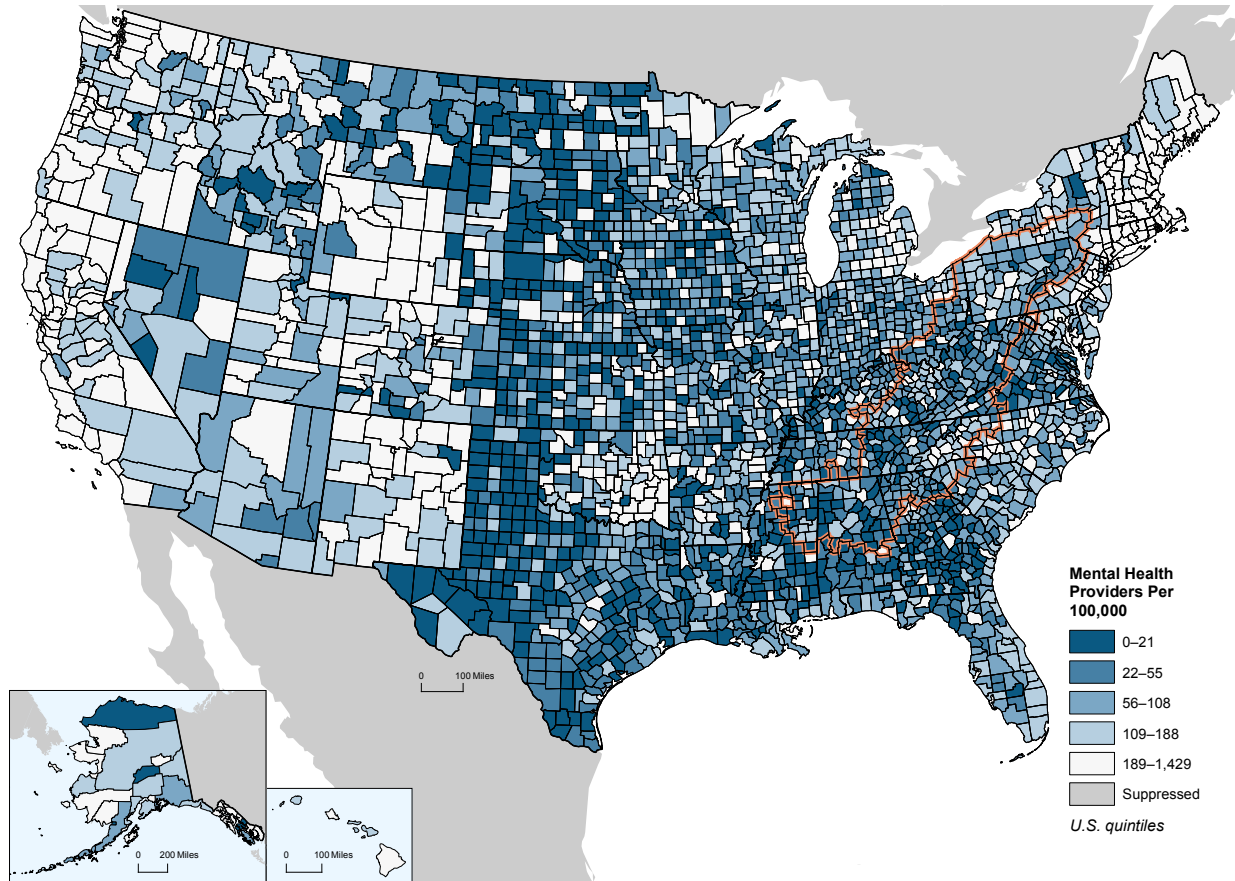


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation <http://www.countyhealthrankings.org/rankings/data>.

### Overview: Supply of Mental Health Providers in the United States

Figure 119 highlights the variation in the supply of mental health providers across the United States. While supply varies considerably across the nation, shortages of mental health providers appear to be concentrated in the middle of the country and in the Gulf Coast states. Counties in the western half of the United States—and especially those along the Pacific coast—have relatively high numbers of mental health providers. New England also reports a high supply of mental health providers

**Figure 119: Map of Mental Health Providers per 100,000 Population in the United States, 2015**

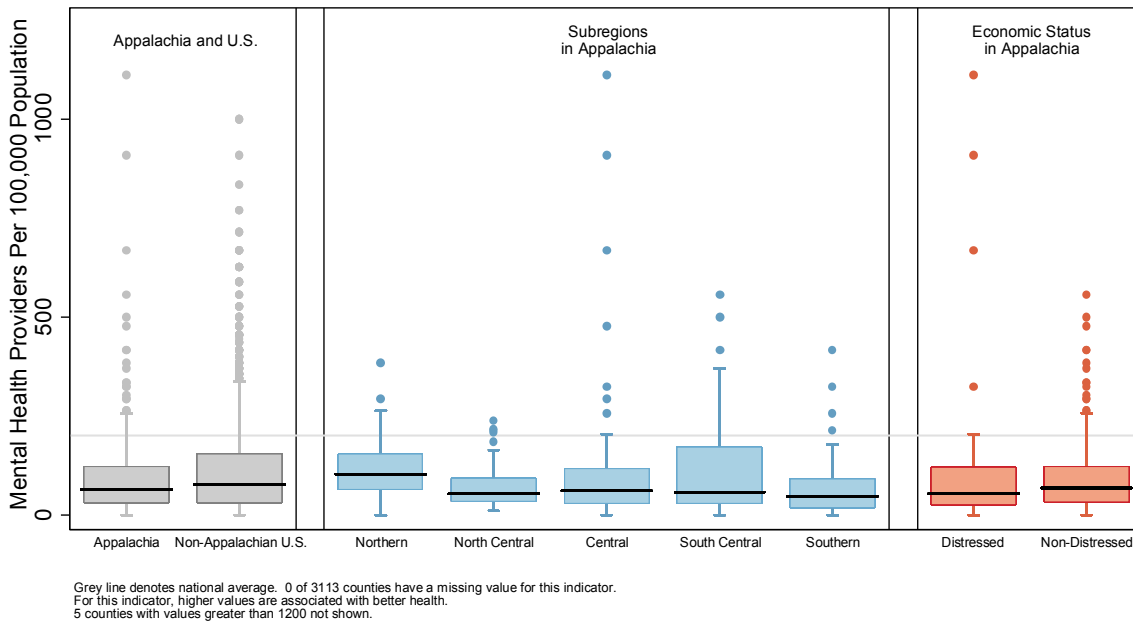


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation <http://www.countyhealthrankings.org/rankings/data>.

**Distribution of Mental Health Providers**

Figure 120 shows the distribution of mental health providers by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator. Five counties with values greater than 1,200 are not represented in the box plot.

**Figure 120: Box Plot of Mental Health Providers per 100,000 Population by Geography and Economic Status, 2015**



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

The distribution in the supply of mental health providers among national quintiles for Appalachian counties is shown in Table 41. Of the 420 counties in the Region, 76 (18 percent) rank in the worst-performing national quintile, while 42 (10 percent) rank in the best-performing national quintile.

**Table 41: Distribution of Mental Health Providers per 100,000 Population among National Quintiles for Appalachian Counties**

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	Pct.	#	Pct.	#	Pct.	#	Pct.	#	Pct.
Mental health providers	42	10%	81	19%	105	25%	116	28%	76	18%

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





**KEY FINDINGS | Supply of Specialty Physicians**

- The supply of specialty physicians per 100,000 population in the Appalachian Region is 28 percent lower than the national average.
- No Appalachian subregion matches the national average in terms of the supply of specialty physicians, and the supply in Central Appalachia is 65 percent lower than the national mark.
- The supply of specialty physicians in the Appalachian Region's rural counties is 57 percent lower than the supply in the Region's large metro counties.
- The supply of specialty physicians in the Appalachian Region's distressed counties is nearly 76 percent lower than the supply in the Region's non-distressed counties.

**Background**

This indicator measures the number of non-primary care physicians per 100,000 population. The figures for this measure come from 2013 data from the U.S. Department of Health and Human Services' Area Health Resources Files.

Access to the services of a specialist may be important for certain health conditions—especially chronic illnesses. For example, individuals with cancer benefit from having their care managed by oncologists rather than primary care physicians. Some specialist physicians can fill a similar role as a primary care physician in that they serve as the primary source of care for patients who see them regularly for chronic illnesses (Casalino, 2010).

Shortages of specialists may serve as a barrier to timely, high-quality care when residents have to travel great distances to receive needed specialty services. County population is a strong predictor of the number of specialty physicians, as these doctors typically draw from a wider market than primary care physicians. Likewise, specialists often cluster near larger health care systems, which tend to be located in metro areas. Thus, rural areas tend to have a lower supply of specialists on a per capita basis, causing rural residents to travel greater distances to receive specialty services (Chan, Hart, & Goodman, 2006). As a result, rural residents are more likely to rely on generalists for care that may best be treated by a specialist. The growing popularity of telehealth may provide an avenue for generalist physicians to provide more sophisticated services with support from remote specialty consultation. However, without policy and medical practice changes, rural areas will continue to experience barriers to receiving specialty care.

While there is no generally accepted target for the number of specialist physicians, there are a number of factors that may influence what the ideal target should be in any particular area. Broadly speaking, as a population continues to grow—as well as age—demand for both medical and surgical specialists is

expected to outpace supply, with a greater shortfall expected for surgical specialists (IHS, Inc., 2016). This is especially true in rural areas (Fraher, Knapton, Sheldon, Meyer, & Ricketts, 2013).

However, unlike primary care physician supply, some research indicates that the number of specialists does not have the same positive effect on population health (Starfield, Shi, & Macinko, 2005). Increasing the supply of specialist physicians may increase health care costs and reduce health care quality when more specialists are not necessary (Baicker & Chandra, 2004).

### **Overview: Supply of Specialty Physicians in the Appalachian Region**

The Appalachian Region's specialty physician supply of 110 per 100,000 population is 28 percent lower than the national average of 153 per 100,000 population. No Appalachian subregion has a specialty physician supply above the national average, and there is great variation within the Region. South Central Appalachia has the highest supply of specialists at 130 per 100,000 population (15 percent lower than the national average), while Central Appalachia has the lowest supply of specialists at 54 per 100,000 population (65 percent lower than the national average).

Lower supply of specialty physicians in many Appalachian counties is due, in part, to their rurality. The specialty physician supply for rural Appalachian counties is 57 percent lower than the supply in large metro counties in the Region. Economically distressed counties have a markedly lower supply of specialty physicians than non-distressed counties in Appalachia: the supply of specialists in distressed counties throughout Appalachia (28 per 100,000 population) is 76 percent lower than in the Region's non-distressed counties (115 per 100,000).

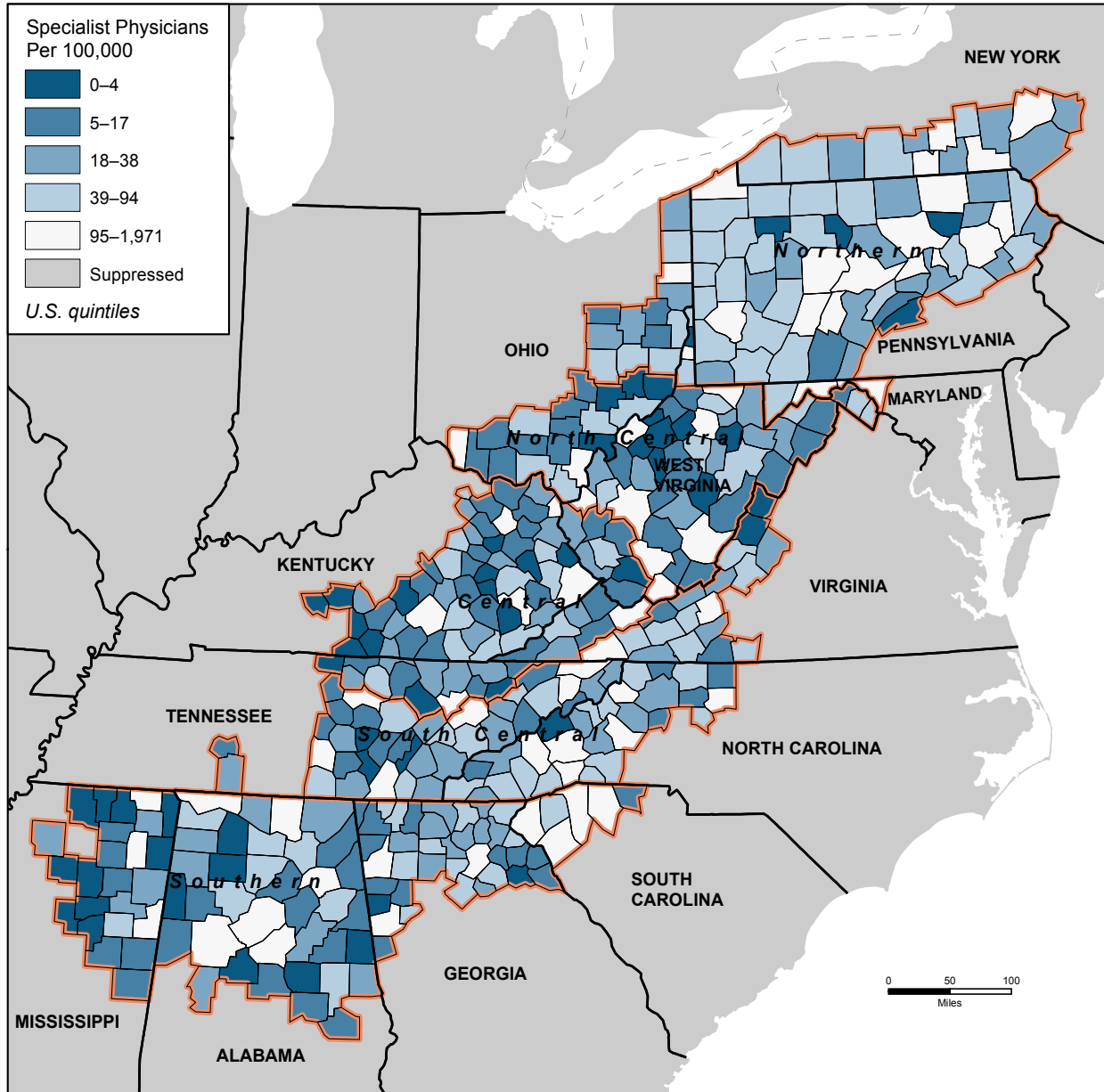
Appalachian counties in Georgia have the lowest supply of specialists in the Region at 59 per 100,000, while Appalachian counties in North Carolina represent the highest supply of specialists in the Region at 147 per 100,000 population. The supply of specialty physicians varies greatly between Appalachian portions and non-Appalachian portions of any given state. The greatest intrastate disparity in the supply of specialty physicians is found in Ohio, where the supply of specialists is 61 per 100,000 population in the Appalachian portion—65 percent lower than the 175 specialists per 100,000 found in non-Appalachian Ohio.

Figure 121 shows the supply of specialty physicians in Appalachian counties, grouped by national quintiles. Darker colors indicate a lower supply of specialty physicians; for this measure, higher values are associated with better health. While the darkest colors do not dominate the Region, the prevalence of lower numbers of specialists is more common in southern Ohio, central West Virginia, eastern Kentucky, and Mississippi. However, there are many counties throughout the Region that rank in the top-performing national quintile.

Figure 122 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

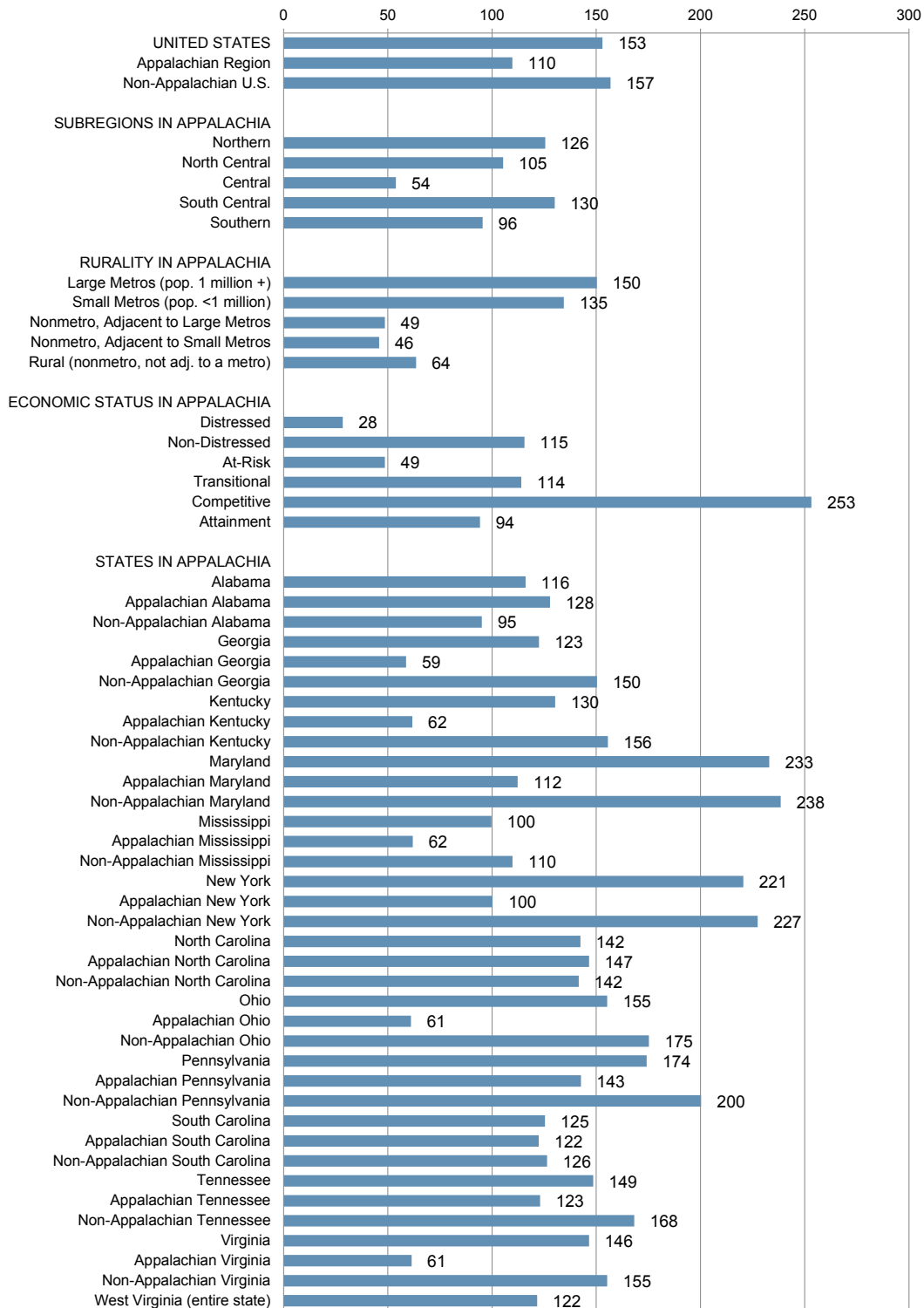


Figure 121: Map of Specialty Physicians per 100,000 Population in the Appalachian Region, 2013



Data source: Area Health Resources Files (AHRF) 2014–2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015. <http://ahrf.hrsa.gov/>

Figure 122: Chart of Specialty Physicians per 100,000 Population, 2013

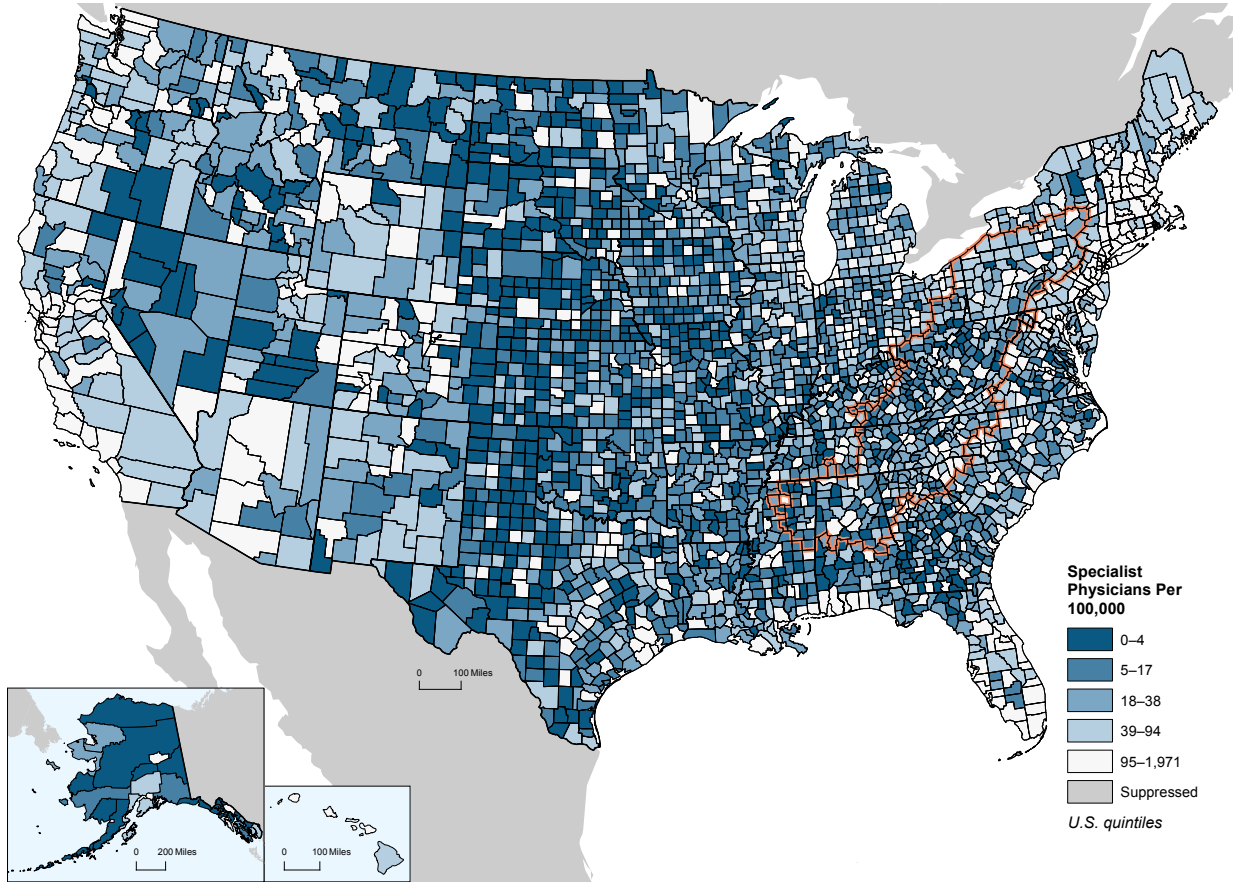


Data source: Area Health Resources Files (AHRF) 2014–2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015. <http://ahrh.hrsa.gov/>

### Overview: Supply of Specialty Physicians in the United States

Figure 123 highlights the variation in the supply of specialty physicians across the United States. While the supply of specialists varies considerably across the nation, specialist shortages appear to be concentrated in the middle of the country. The only other discernable pattern from the checkerboard nature of the national map seems to indicate that specialists tend to concentrate around large metro areas and near medical schools. Counties in the Northeast, along the Pacific Coast, and many in Florida tend to have a high supply of specialty physicians.

**Figure 123: Map of Specialty Physicians per 100,000 Population in the United States, 2013**

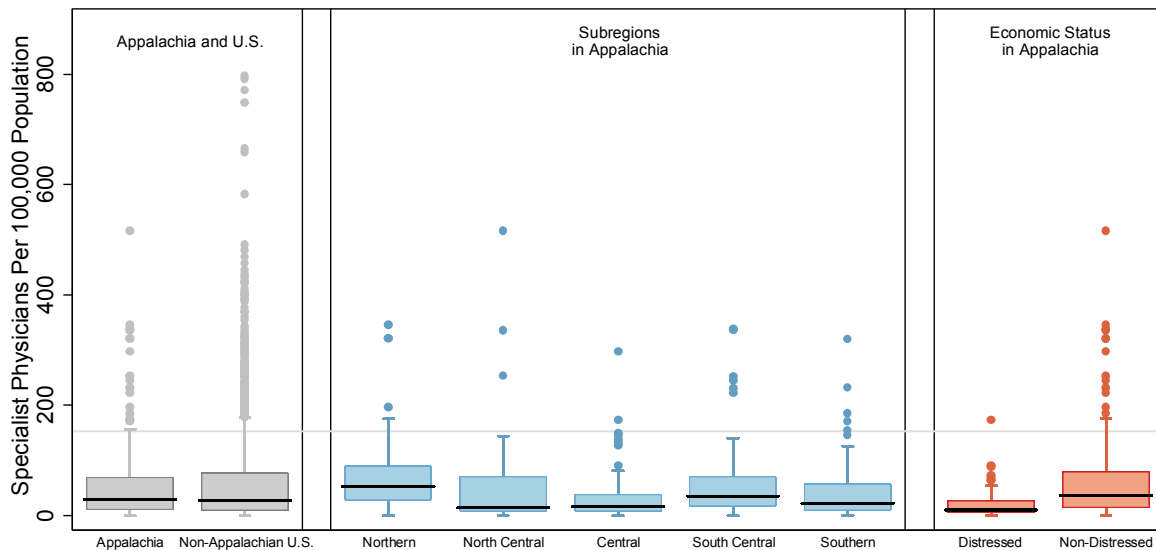


Data source: Area Health Resources Files (AHRF) 2014–2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015. <http://ahrh.hrsa.gov/>

### Distribution of Specialty Physician Supply

Figure 124 shows the distribution of specialty physicians by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator, and one county with a value greater than 1,000 is not represented in the box plot.

**Figure 124: Box Plot of Specialty Physicians per 100,000 Population by Geography and Economic Status, 2013**



Grey line denotes national average. 0 of 3113 counties have a missing value for this indicator. For this indicator, higher values are associated with better health. 1 counties with values greater than 1000 not shown.

Data source: Area Health Resources File (AHRF) 2014–2015 Release; U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Workforce, National Center for Health Workforce Analysis, June 2015. <http://ahrh.hrsa.gov/>

The distribution of the supply of specialty physicians among national quintiles for Appalachian counties is shown in Table 42. Of the 420 counties in the Region, 56 (13 percent) rank in the worst-performing national quintile, while 67 (16 percent) rank in the best-performing national quintile.

**Table 42: Distribution of Specialty Physicians per 100,000 Population among National Quintiles for Appalachian Counties**

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	Pct.	#	Pct.	#	Pct.	#	Pct.	#	Pct.
Specialty physicians	67	16%	103	25%	94	22%	100	24%	56	13%

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



### KEY FINDINGS | Supply of Dentists

- The supply of dentists per 100,000 population in the Appalachian Region is 26 percent lower than the national average.
- All five Appalachian subregions have a lower supply of dentists than the national average, and Central Appalachia's supply is 46 percent lower than the national average.
- The supply of dentists in the Appalachian Region's rural counties is 36 percent lower than the supply found in the Region's large metro counties.
- The supply of dentists in the Appalachian Region's distressed counties is 43 percent lower than the supply found in the Region's non-distressed counties.

### Background

This indicator measures the number of dentists per 100,000 population. The figures for this measure come from a similar County Health Rankings indicator—the population to dentist ratio—based on 2014 data provided by the U.S. Department of Health and Human Services' Area Health Resources Files, and the National Plan and Provider Enumeration System (NPES) through the Centers for Medicare & Medicaid Services (CMS). A higher supply of dentists indicates better access to dentists, a higher likelihood of preventive dental care, and better overall health in a community.

The link between the availability of dental care in a community and overall health status extends well beyond oral health. Oral health can influence eating habits and sleep patterns, which in turn can affect both physical and mental health (Sheiham, 2005). In most of the United States, oral and physical health services are licensed and governed separately. Yet, the growing number of emergency department visits for conditions related to poor oral health shows the relationship between oral health and physical health (Shortridge & Moore, 2010). Poor oral health is more common among individuals with lower income and lower educational attainment (Edelstein & Chinn, 2009).

Shortages of dentists are more common in rural and underserved communities (Rural Health Information Hub, 2017). The Health Resources and Services Administration, part of the U.S. Department of Health and Human Services, defines Dental Health Professional Shortage Areas as communities with one or fewer dentists per 5,000 people (Health Resources and Services Administration, 2016). Converting this ratio to dentists per 100,000 population, the HRSA definition of a dental shortage area is equivalent to 20 or fewer dentists per 100,000 population. In 2012, 60 percent of the Dentist Health Professional Shortage Areas were rural (Cohen & Stitzel, 2015). Using 2016 data from the Area Health Resources Files, Appalachian residents were found to be more likely to live in a full county Dental Health Professional Shortage Area than residents in the rest of the United States (4.3 percent compared to 3 percent). Further complicating the shortage of dental providers, only 30 percent of dentists accept public insurance; this presents an access barrier for individuals with Medicare or Medicaid (Cohen & Stitzel, 2015).

To increase the availability of dental services, states are increasingly looking to expand the use of mid-level dental providers such as dental therapists and telehealth programs that consult with dentists to provide care to underserved areas or populations (Cohen & Stitzel, 2015). However, efforts to expand the use of mid-level dental providers have been contentious, with opponents raising concerns about potential declines in the safety and quality of care (Levine, 2012).

### Overview: Supply of Dentists in the Appalachian Region

The Appalachian Region's supply of 47.8 dentists per 100,000 population is 26 percent lower than the national average of 64.6 per 100,000 population. No Appalachian subregion has a dentist supply greater than the national average. Northern Appalachia has the highest supply of dentists at 56.1 per 100,000 population, and Central Appalachia has the lowest at 35.1 per 100,000 population. Appalachian Mississippi has the lowest dentist supply in the Region at 33.8 per 100,000 population, which is 48 percent below the national average. Appalachian Pennsylvania has the highest supply of dentists in the Region at 59.3 per 100,000 population.

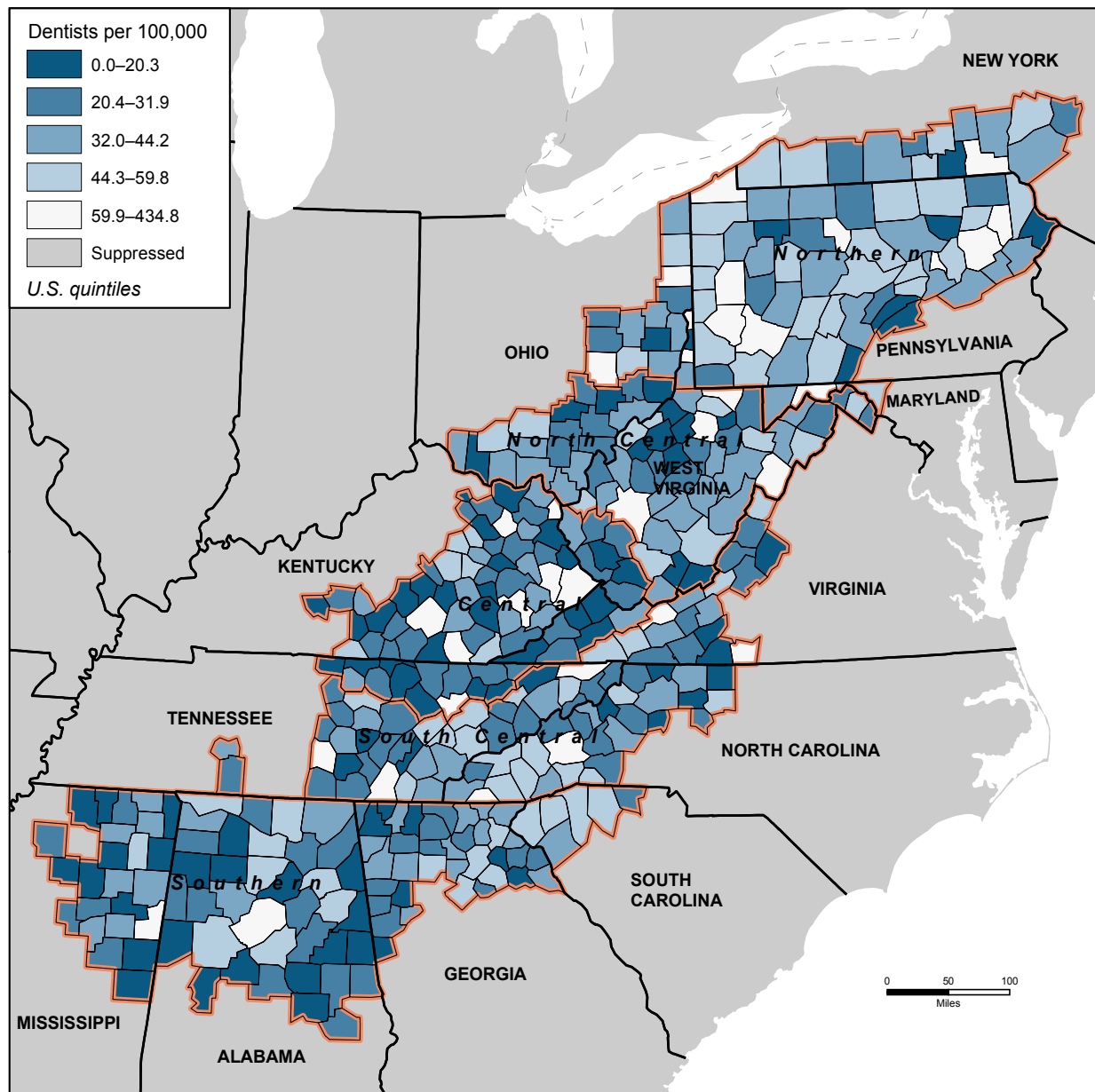
The low supply of dentists throughout much of Appalachia can partially be attributed to the rurality of many of the counties. The supply of dentists in rural counties throughout Appalachia is 36 percent lower than that reported in the Region's large metro counties. Economically distressed counties in the Appalachian Region have 27.9 dentists per 100,000 population, which is 43 percent lower than the 49.2 dentists per 100,000 population in the Region's non-distressed counties.

The supply of dentists varies widely between the Appalachian and non-Appalachian portions within any particular state. The greatest intrastate disparities are in Kentucky, New York, and Virginia. In Appalachian Kentucky, the dentist supply is 40.5 per 100,000 population, which is 42 percent lower than the 69.7 per 100,000 population in non-Appalachian Kentucky. Appalachian New York reports 46.4 dentists per 100,000 population, which is 42 percent lower than the 80.2 per 100,000 population in non-Appalachian New York. The supply of dentists in Appalachian Virginia is 34.5 per 100,000 population, which is 46 percent lower than the 64.1 per 100,000 in non-Appalachian Virginia.

Figure 125 shows the variation in the supply of dentists across the Appalachian Region, grouped by quintiles. Darker colors indicate counties with lower supplies of dentists. For this measure, lower values are associated with worse health.

Figure 126 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

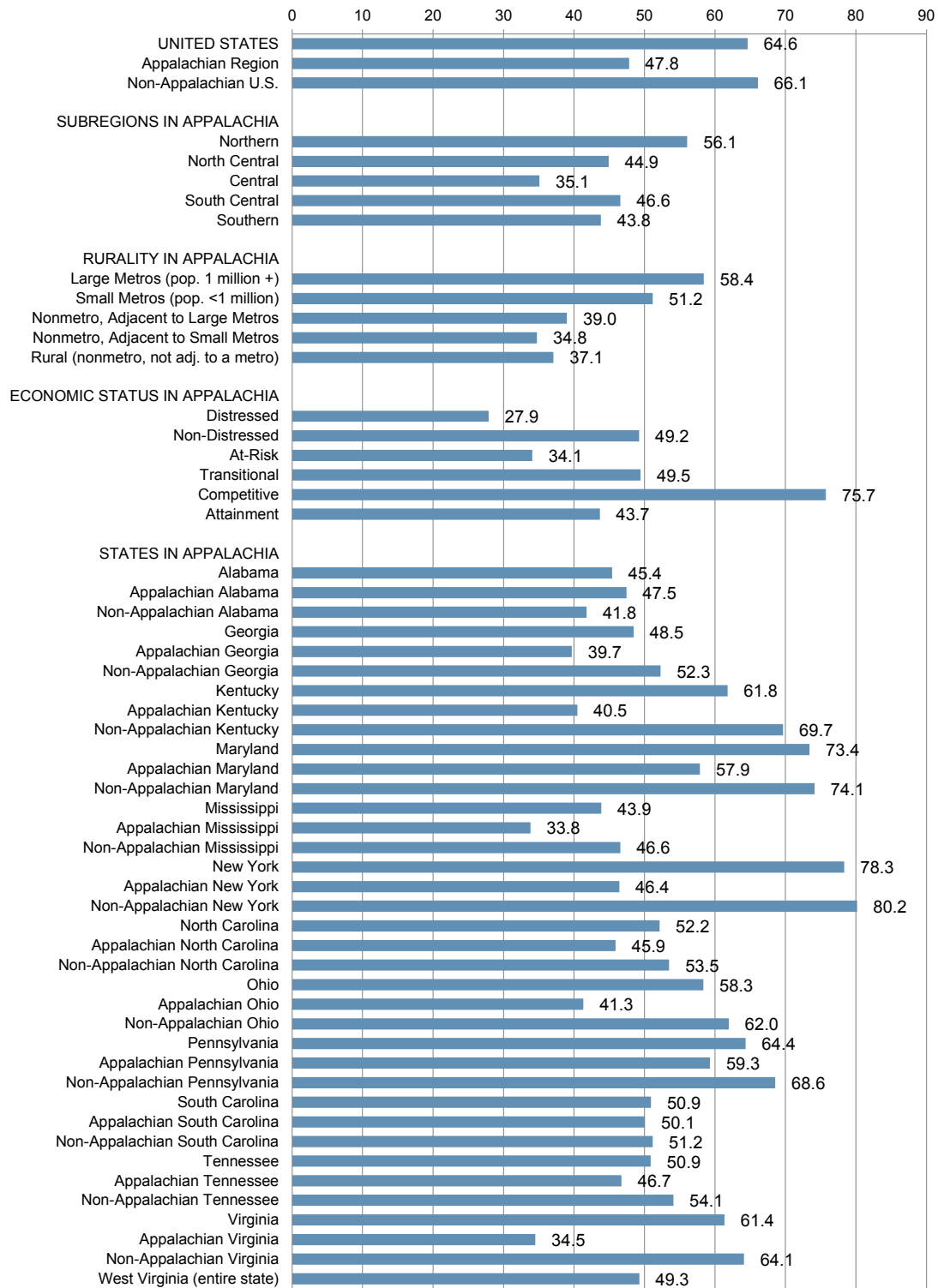
Figure 125: Map of Dentists per 100,000 Population in the Appalachian Region, 2014



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



Figure 126: Chart of Dentists per 100,000 Population, 2014



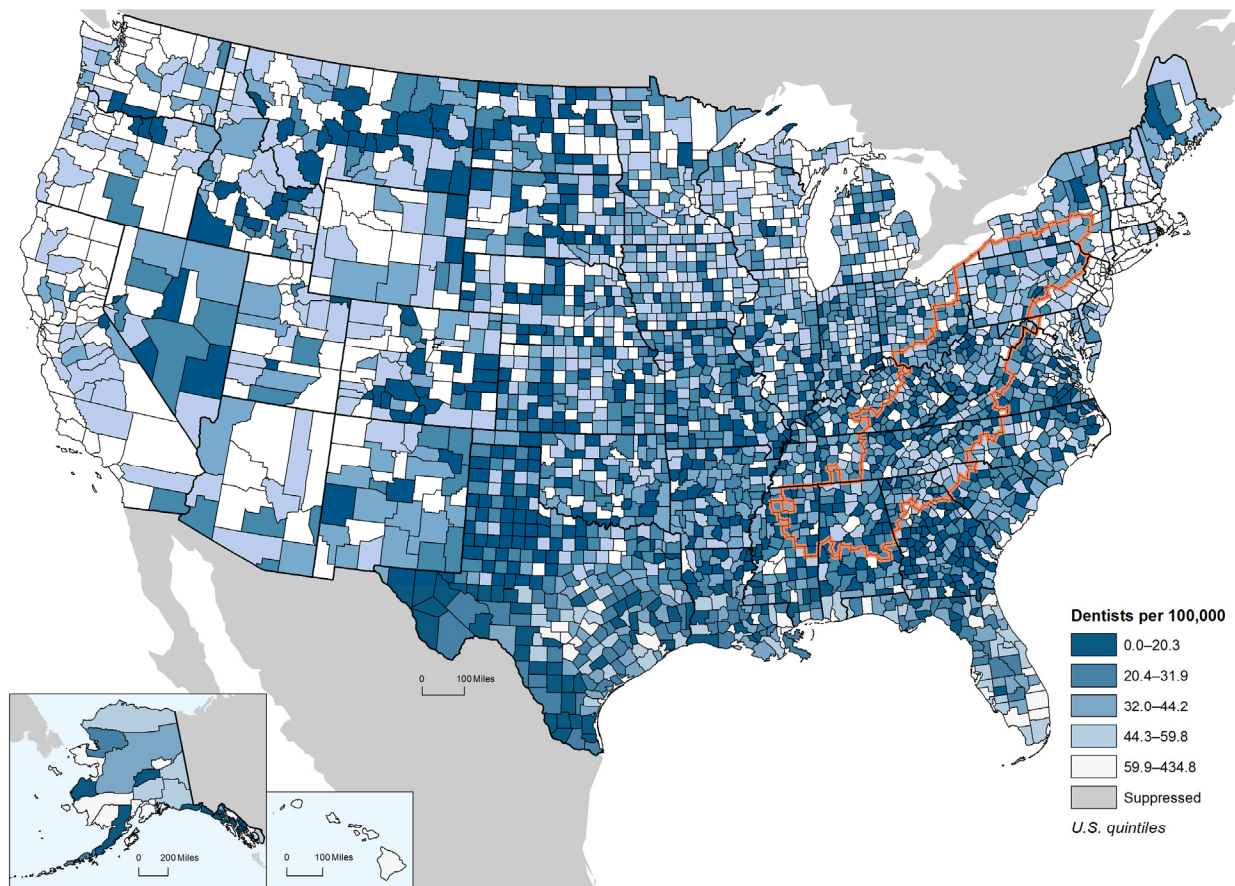
Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation <http://www.countyhealthrankings.org/rankings/data>.



### Overview: Supply of Dentists in the United States

Figure 127 highlights the variation in the supply of dentists across the United States. The supply of dentists varies considerably across the nation, with no obvious regional or state-based trends. The middle of the country, as well as much of the eastern United States, generally have counties in the worst-performing quintiles. States in the South tend to rank in the bottom quintiles, from Texas to Georgia. Meanwhile, the western half of the country—and especially the states along the Pacific Coast—report a high supply of dentists. The Northeast, as well as large metropolitan areas throughout the country, also report high supplies of dentists.

**Figure 127: Map of Dentists per 100,000 Population in the United States, 2014**

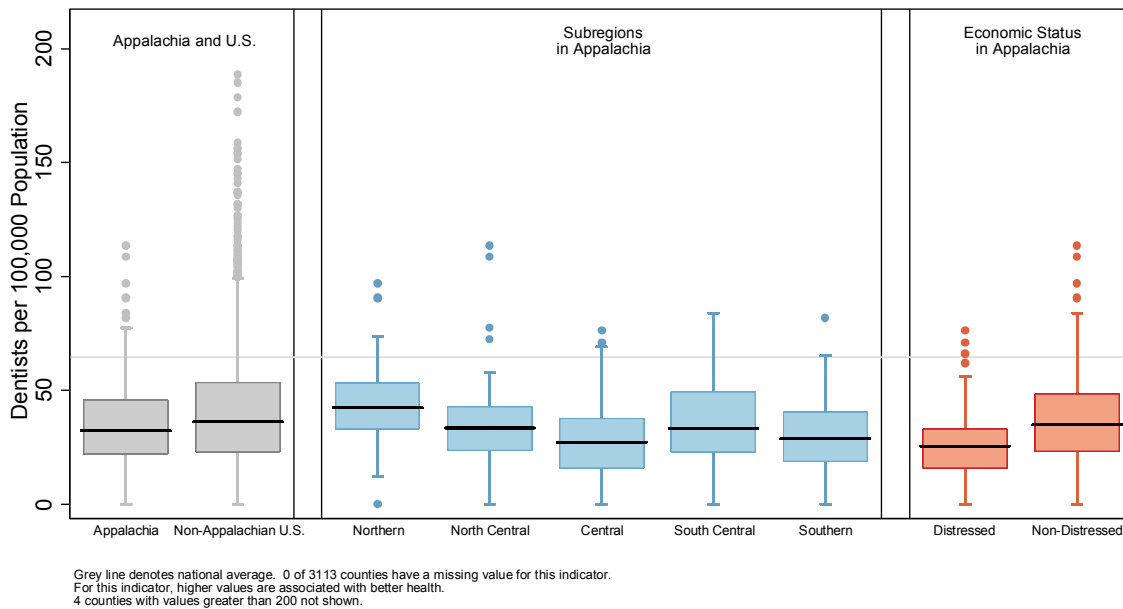


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation <http://www.countyhealthrankings.org/rankings/data>.

### Distribution of Supply of Dentists

Figure 128 shows the distribution of the supply of dentists by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, zero have a missing value for this indicator; four counties with values greater than 200 are not represented in the box plot.

**Figure 128: Box Plot of Dentists per 100,000 Population by Geography and Economic Status, 2014**



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

The distribution in the supply of dentists among national quintiles for Appalachian counties is shown in Table 43. Of the 420 counties in the Region, 91 (22 percent) rank in the worst-performing national quintile, while 35 (8 percent) rank in the best-performing national quintile.

**Table 43: Distribution of Dentists per 100,000 Population among National Quintiles for Appalachian Counties**

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	Pct.	#	Pct.	#	Pct.	#	Pct.	#	Pct.
Dentists	35	8%	80	19%	99	24%	115	27%	91	22%

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



KEY FINDINGS | Uninsured Population under Age 65

- The percentage of the population under age 65 that is uninsured in the Appalachian Region is 15.8 percent, which is slightly lower (better) than the national average of 16.8 percent.
- There is wide variation among the five Appalachian subregions' uninsured populations under age 65, with Northern Appalachia (11.6 percent) reporting a far lower percentage than Southern Appalachia (18.9 percent).
- The uninsured population under age 65 in rural counties in the Appalachian Region is 18.2 percent, compared with 14.7 percent in the Region's large metro counties.
- The uninsured population under age 65 in distressed counties in the Appalachian Region is 18.7 percent, compared with 15.6 percent in the Region's non-distressed counties.

**Background**

The uninsured population measures the percentage of people under age 65 without health insurance. The figures for this measure come from County Health Rankings and are based on 2013 data from the U.S. Census Bureau's Small Area Health Insurance Estimates (SAHIE) program. Since individuals age 65 or over are eligible for Medicare, focusing on those under 65 allows for a better comparison of the variation in access to healthcare coverage. The time period for this data predates the health insurance expansion provisions of the Affordable Care Act.

Health insurance coverage can provide access to regular health care, which contributes positively to an individual's overall health. Lack of health insurance has long been identified as a risk factor for premature mortality (Wilper, Lasser, McCormick, Bor, & Himmelstein, 2009). An insured person can receive preventive health services, as well as care for both acute and chronic conditions. The Institute of Medicine estimated that 18,000 Americans died in 2000 because they lacked health insurance; a 2008 update concluded that number had risen to 27,000 per year (Dorn, 2008).

The passage of the Affordable Care Act has helped to reverse long-running trends of increasing uninsured rates. Since its passage in 2010, the number of uninsured people in the United States has declined by approximately 20 million, and the current uninsured rate for all ages stands at approximately 11 percent (Commonwealth Fund, 2016). However, the Supreme Court ruling that allowed states to choose whether to expand Medicaid has led to state-based differences in Medicaid eligibility (Commonwealth Fund, 2016). As of 2016, among the thirteen Appalachian states, six states—Kentucky, Maryland, New York, Ohio, Pennsylvania, and West Virginia—had expanded Medicaid, while seven states—Alabama, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia—had not (Kaiser Family Foundation, 2016).

In 2016, twenty-eight million people still lacked health insurance in the United States, and most live in states that did not expand Medicaid (Kaiser Family Foundation, 2016). Among uninsured adults, 39 percent have incomes below the federal poverty line, and the majority of those who have unsuccessfully attempted to enroll in coverage cite affordability as a reason for not signing up. In 2015, one in five uninsured adults went without needed medical care due to cost (Kaiser Family Foundation, 2016).

### **Overview: Uninsured Population under Age 65 in the Appalachian Region**

The percentage of the population under age 65 that is uninsured in the Appalachian Region is 15.8 percent, which is slightly lower (better) than the national average of 16.8 percent. However, there is wide variation across subregions. The uninsured population in Northern Appalachia is 11.6 percent, while 18.9 percent of the population in the Southern Appalachian subregion is uninsured.

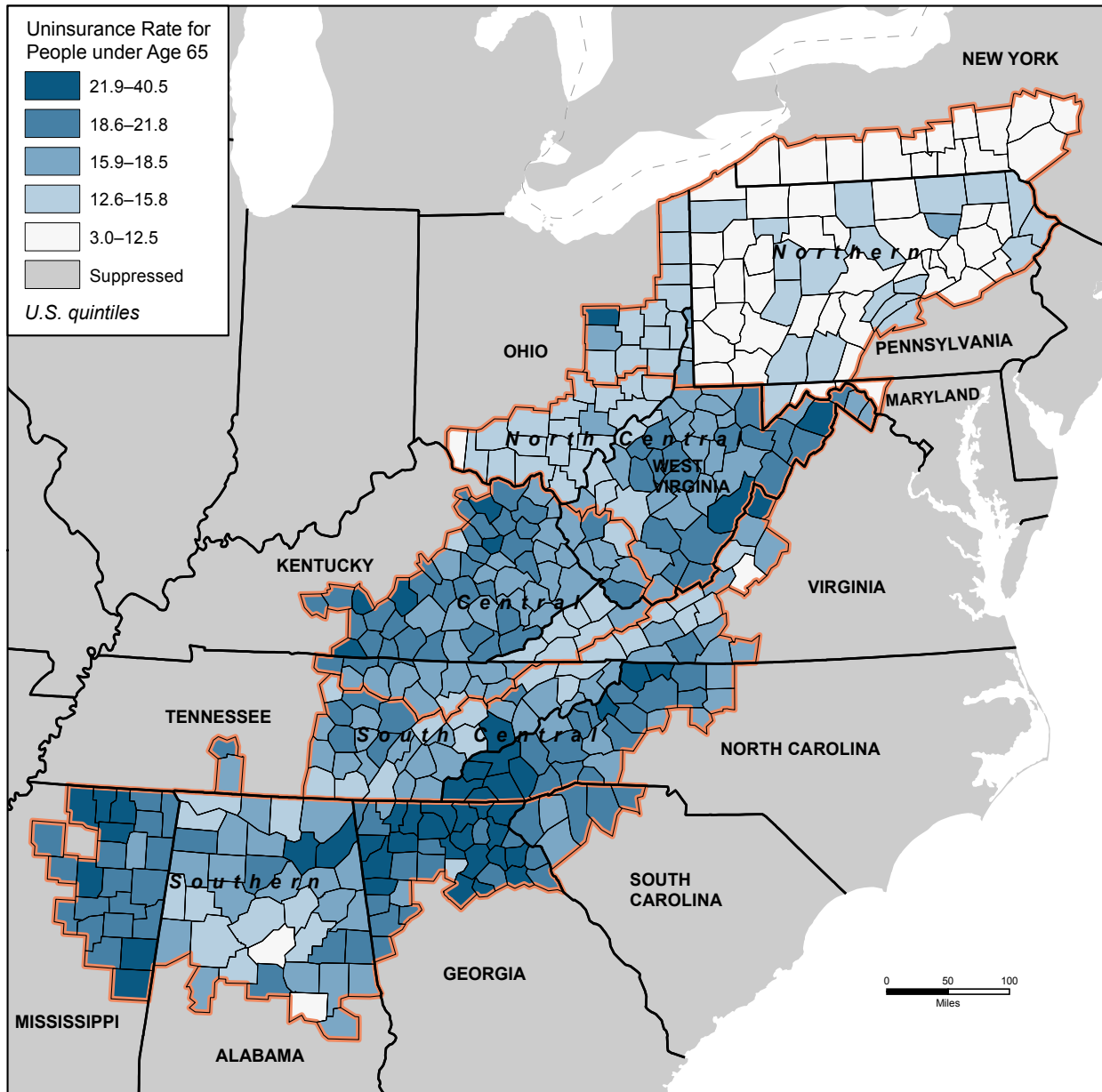
There is a relationship between rurality and the percentage of the population that is uninsured. The percentage of the population that is uninsured in Appalachia's rural counties is 18.2 percent, compared with 14.7 percent in large metro counties. There is also a divide in the uninsured population based on economic status. In distressed counties throughout Appalachia, 18.7 percent of the population under age 65 is uninsured, compared to 15.6 percent of the population in non-distressed counties.

Following the subregional trends, the Appalachian portions of Maryland (11.3 percent), New York (10.6 percent), and Pennsylvania (11.2 percent) report the lowest uninsured populations in the Region. The Appalachian portions of Georgia (21.9 percent), Mississippi (20.5 percent), North Carolina (19.5 percent), and South Carolina (19.0 percent) have the highest percentages of uninsured residents.

Figure 129 shows the percentage of people under age 65 in Appalachia without health insurance, grouped by national quintiles. Darker blue indicates a higher percentage of uninsured individuals; for this measure, higher values are associated with worse health. The percentage of the population that is uninsured increases as one moves from north to south through the Region, which is consistent with historically higher percentages of uninsured people in the southern United States (Kaiser Family Foundation, 2016).

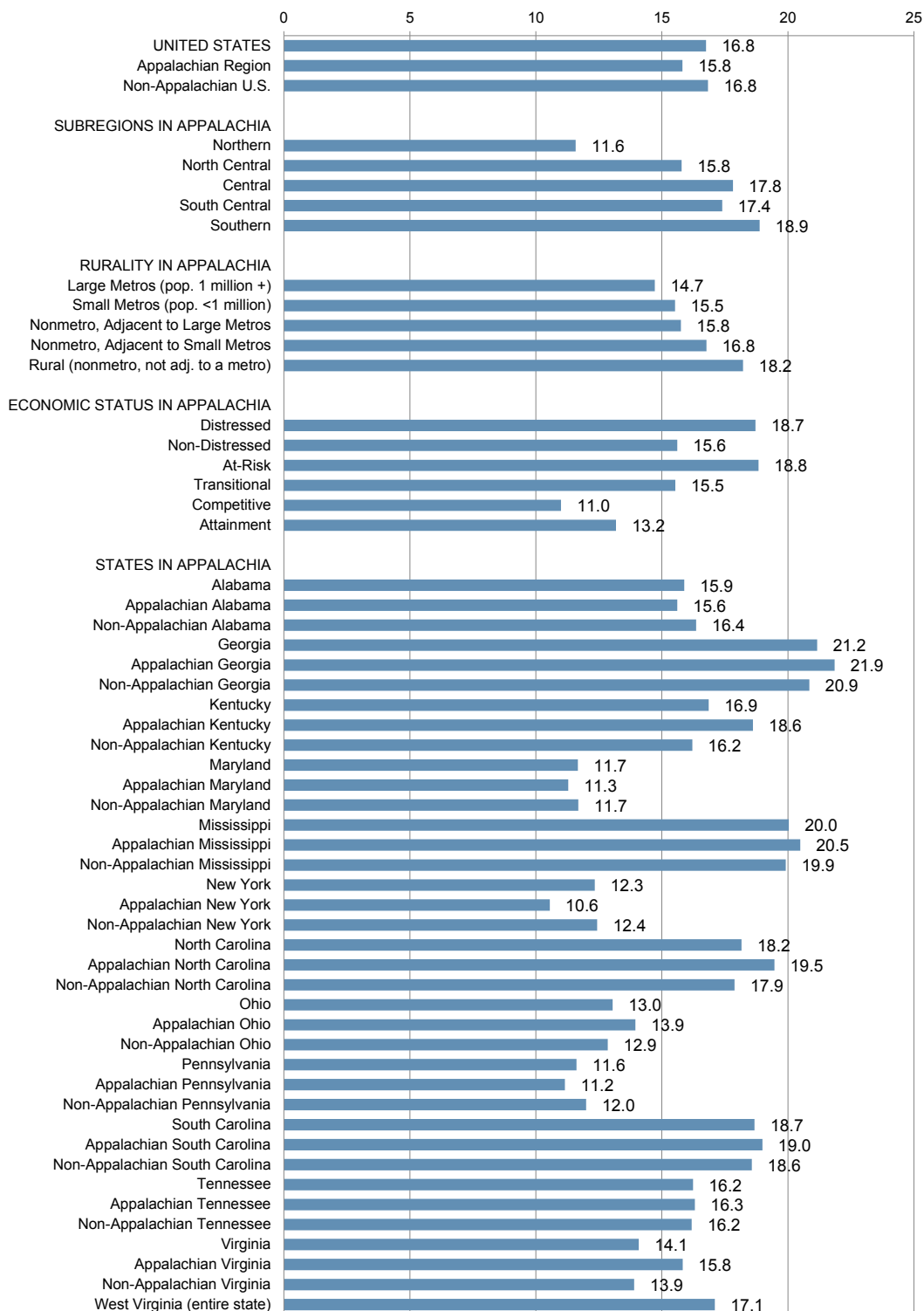
Figure 130 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

Figure 129: Map of Uninsurance Rate for People under Age 65 in the Appalachian Region, 2013



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

Figure 130: Chart of Uninsurance Rate for People under Age 65, 2013



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

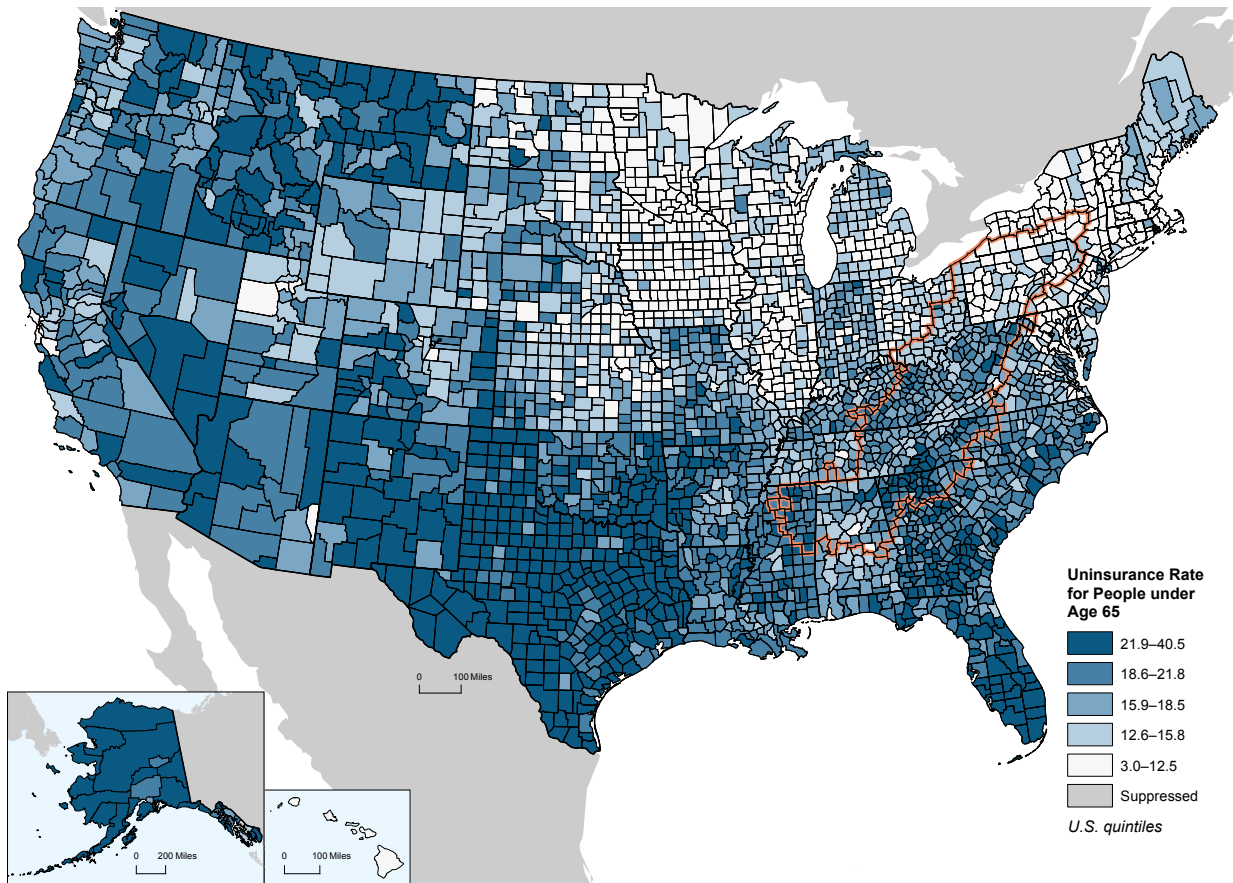


### Overview: Uninsured Population under Age 65 in the United States

Figure 131 shows the variation in the percentage of the population under age 65 that is uninsured across the United States. There are many counties in the Northeast and Midwest where the uninsured percentage ranges from three to 12 percent, ranking in the best-performing national quintile. Massachusetts, Connecticut, Vermont, New York, Iowa, and Minnesota have especially low rates.

Almost all of the South, from North Carolina to Texas, ranks in the two worst-performing national quintiles, meaning counties in those states have uninsured rates of 19 percent or higher, compared to the national average of 16.8 percent. Many counties throughout the West have relatively high percentages of uninsured residents under age 65.

**Figure 131: Map of Uninsurance Rate for People under Age 65 in the United States, 2013**

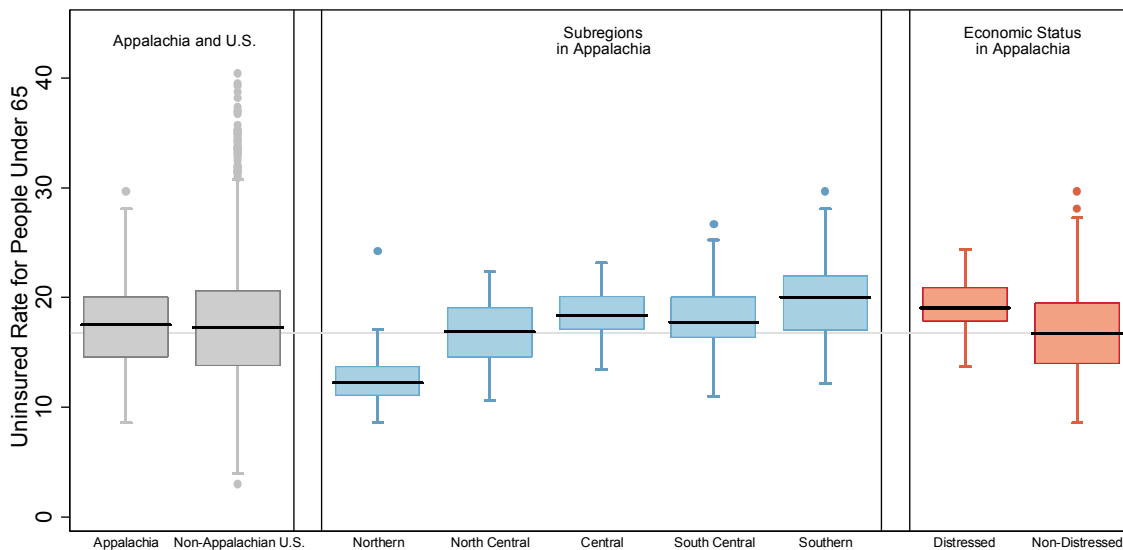


Data source: County Health Rankings & Roadmaps, 2016 edition. University of Wisconsin Population Health Institute supported by Robert Wood Johnson Foundation <http://www.countyhealthrankings.org/rankings/data>.

### Distribution of the Uninsured Population under Age 65

Figure 132 shows the distribution of the uninsured population under age 65 by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, one has a missing value for this indicator.

**Figure 132: Box Plot of Uninsurance Rate for People under Age 65 by Geography and Economic Status, 2013**



Grey line denotes national average. 1 of 3113 counties have a missing value for this indicator. For this indicator, higher values are associated with worse health.

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

The distribution of the uninsured population under age 65 among national quintiles for Appalachian counties is shown in Table 44. Of the 420 counties in the Region, 48 (11 percent) rank in the worst-performing national quintile, while 53 (13 percent) rank in the best-performing national quintile.

**Table 44: Distribution of Uninsurance Rate for People under Age 65 among National Quintiles for Appalachian Counties**

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	Pct.	#	Pct.	#	Pct.	#	Pct.	#	Pct.
Uninsured population	53	13%	91	22%	117	28%	111	26%	48	11%

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





KEY FINDINGS | Heart Disease Hospitalization Rate

- Hospitalization rates for heart disease in the Appalachian Region are 17 percent higher than the national average.
- All five Appalachian subregions have heart disease hospitalization rates higher than the national average, with Central Appalachia reporting a rate 47 percent higher than the national mark.
- The heart disease hospitalization rate in the Appalachian Region's rural counties is 13 percent higher than the rate in the Region's large metro counties.
- The heart disease hospitalization rate in the Appalachian Region's distressed counties is 20 percent higher than the rate in the Region's non-distressed counties.

**Background**

This indicator measures the number of hospitalizations among Medicare fee-for-service beneficiaries for heart disease conditions, expressed as the number of hospitalizations per 1,000 Medicare fee-for-service beneficiaries, per year. The figures for this measure come from the Atlas for Heart Disease and Stroke and are based on 2012 data provided by the Centers for Disease Control and Prevention. This indicator provides information on beneficiaries in Medicare's fee-for-service option only, and does not include Medicare's managed care beneficiaries. Therefore, this measure captures only a subset of the Medicare population and represents approximately 12 percent of the total population in the nation (Kaiser Family Foundation, 2015); (Centers for Medicare & Medicaid Services, 2017).

This indicator is just one of more than a dozen measures that can be used to assess the quality of care for *ambulatory care sensitive conditions*, which are conditions where high-quality outpatient care may reduce complications, slow progression, and reduce the need for hospitalization (U.S. Department of Health and Human Services, Prevention Quality Indicators Overview, 2017). Although this indicator measures hospitalizations, it can be used to provide insight into the health care system outside of a hospital setting. Often, with good preventive services and primary care, hospitalizations due to a number of illnesses (including heart disease) can be reduced or avoided altogether. Thus, this measure is included in this domain as it may be used to help assess the performance of the health care system.

Nationwide, rates of heart disease hospitalizations declined from 1999 to 2011, suggesting improvements in the prevention and treatment of heart disease (Krumholz, Normand, & Wang, 2014). Coronary heart disease remains the most common heart disease subtype for heart disease hospitalizations (Greer, Nwaise, & Casper, 2010). Heart disease is associated with higher cholesterol and blood pressure, diabetes, smoking, and obesity, all of which follow predictable socioeconomic patterns (American Heart Association, 2016). Compared to urban areas, rural communities have higher rates of coronary heart disease, as well as higher rates of poverty and obesity (O'Connor & Wellenius, 2012).

## Overview: Medicare Heart Disease Hospitalization Rates in the Appalachian Region

The heart disease hospitalization rate in the Appalachian Region is 56.2 per 1,000 Medicare beneficiaries, which is 17 percent higher than the national rate of 48.0 per 1,000 Medicare beneficiaries. While heart disease hospitalization rates differ among the five Appalachian subregions, all five have rates higher than the national rate. The heart disease hospitalization rate in the South Central subregion is 50.4 per 1,000 beneficiaries, which is only slightly higher than the national rate. Central Appalachia has the highest rate of heart disease hospitalizations, at 70.6 per 1,000 beneficiaries, which is 47 percent higher than the national rate.

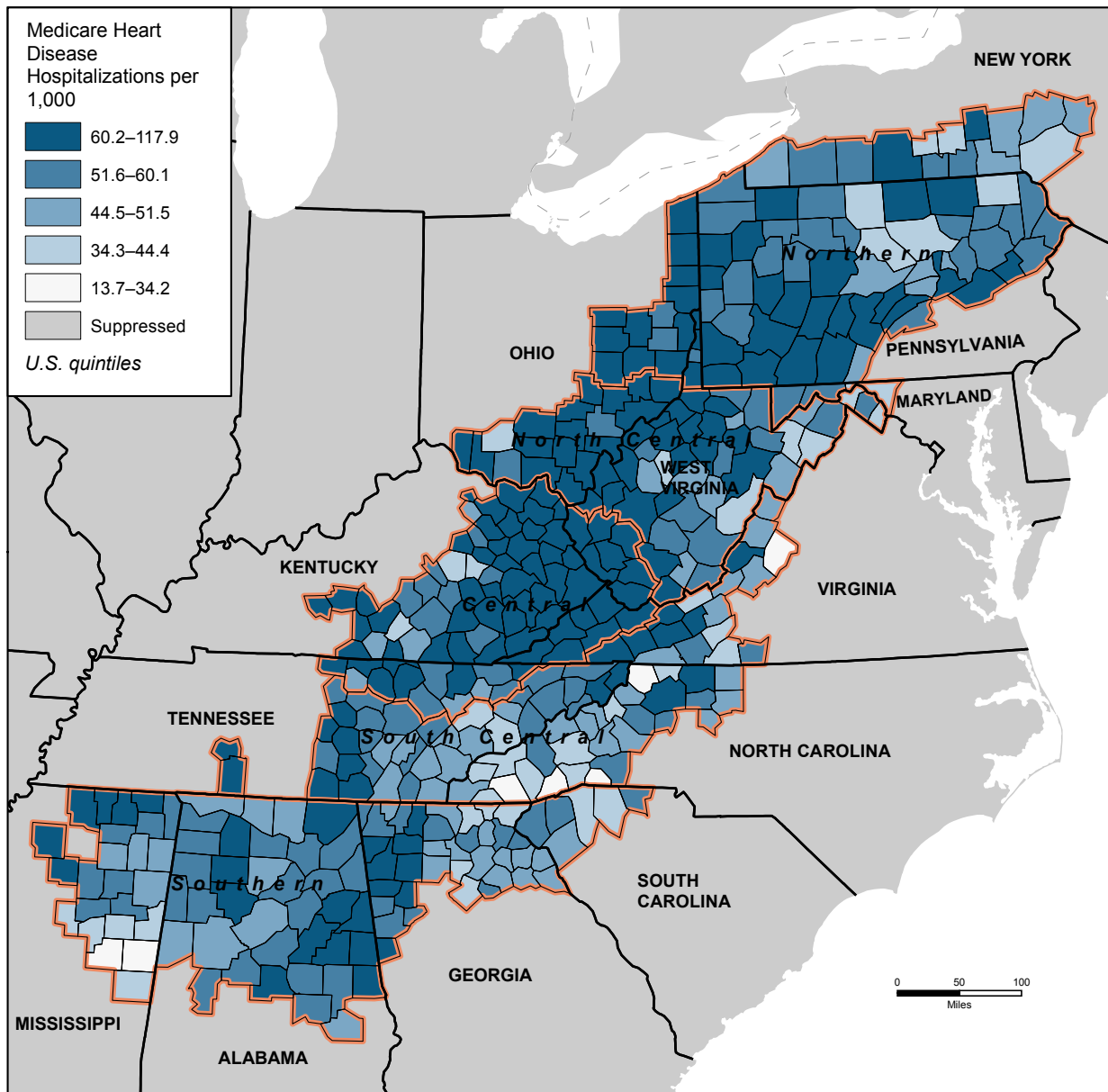
Rural areas in Appalachia experience higher heart disease hospitalization rates than the Region's more urbanized areas. The hospitalization rate for rural counties in the Appalachian Region is 61.6 per 1,000 beneficiaries, which is 13 percent higher than the large metro rate of 54.5 per 1,000 beneficiaries. Economic status also plays a role in determining population health; economically distressed counties have a heart disease hospitalization rate of 66.4 per 1,000 beneficiaries, which is 20 percent higher than the non-distressed county rate of 55.5 per 1,000, and 38 percent higher than the national rate.

The Appalachian portions of Kentucky (71.2 per 1,000), Ohio (67.0 per 1,000), and Virginia (61.3 per 1,000) have notably higher rates than the non-Appalachian portions of those states. With the exceptions of Appalachian Maryland (46.8 per 1,000), Appalachian North Carolina (46.6 per 1,000), and Appalachian South Carolina (45.7 per 1,000), the Appalachian portions of all states are at or above the national rate for heart disease hospitalizations.

Figure 133 shows the heart disease hospitalization rate for Appalachian counties, grouped by national quintiles. Darker blue indicates higher rates; for this measure, higher values are associated with worse health. There are large concentrations of counties in Northern, North Central, and Central Appalachia ranking in the worst-performing quintile for this measure. There are very few Appalachian counties in any subregion that perform well on this measure when compared to the nation as a whole.

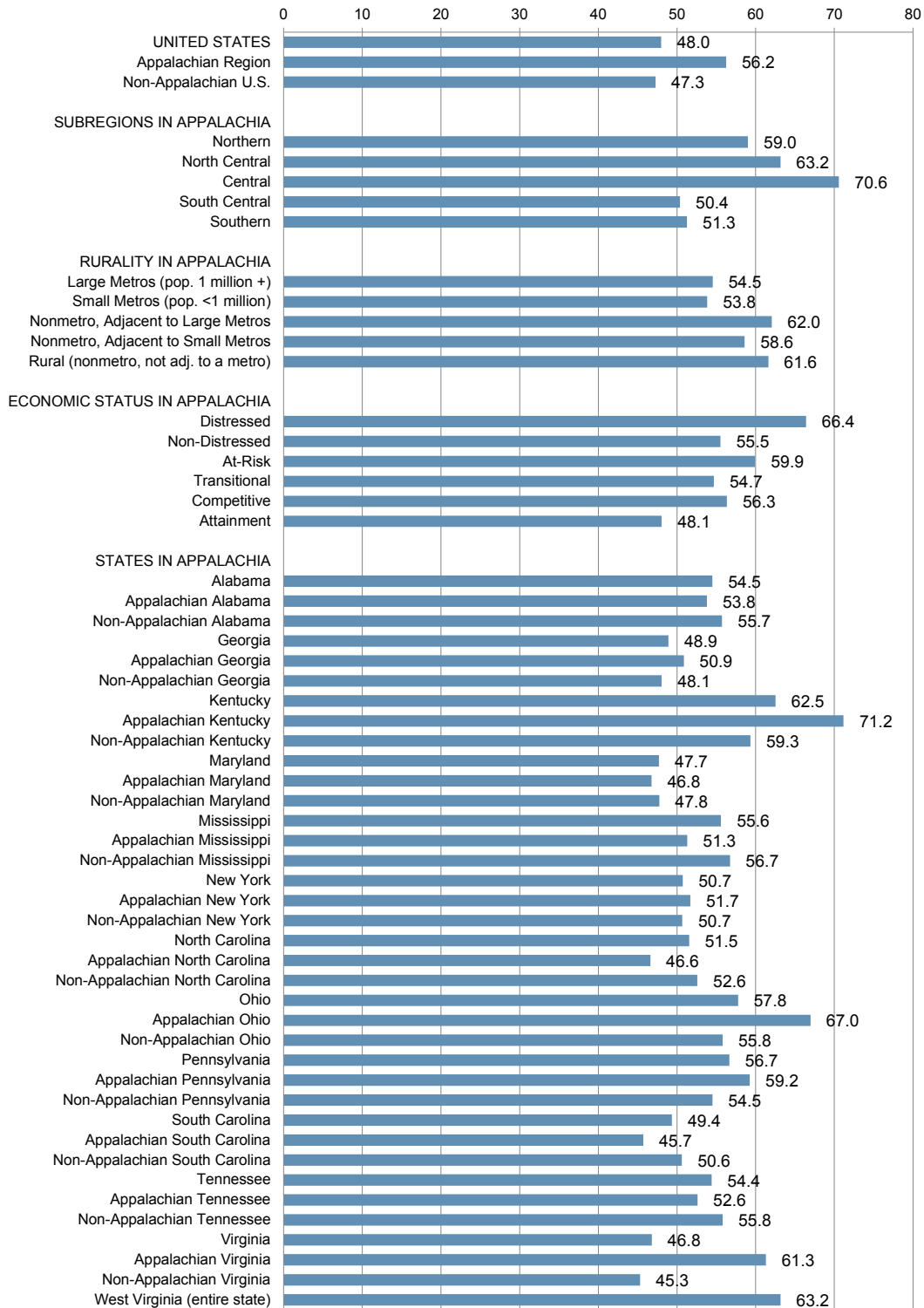
Figure 134 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

**Figure 133: Map of Heart Disease Hospitalizations per 1,000 Medicare Beneficiaries in the Appalachian Region, 2012**



Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. <http://nccd.cdc.gov/dhdspatlas/>.

Figure 134: Chart of Heart Disease Hospitalizations per 1,000 Medicare Beneficiaries, 2012

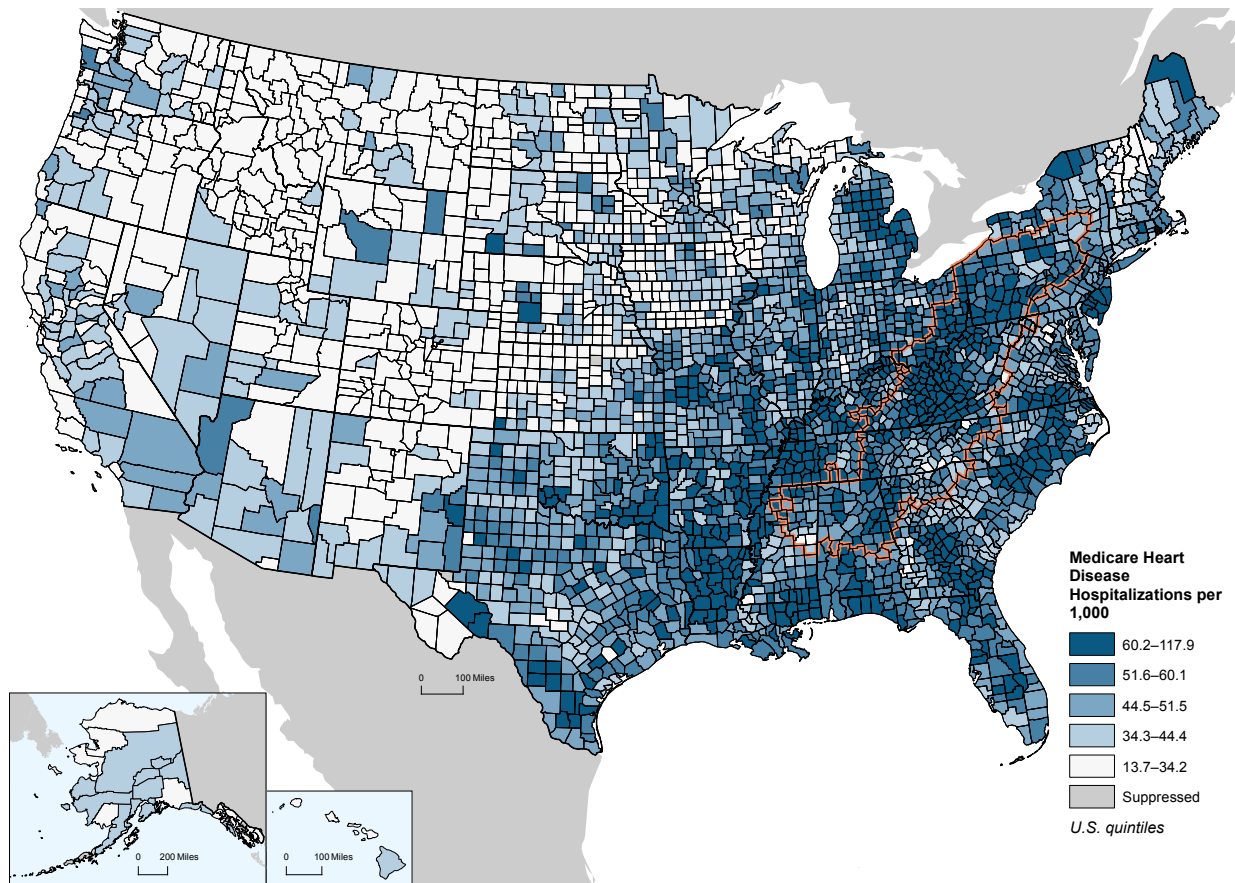


Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. <http://nccd.cdc.gov/dhdspatlas>.

### Overview: Medicare Heart Disease Hospitalization Rates in the United States

Figure 135 shows the variation in heart disease hospitalization rates across the country. There is a clear difference between rates in the eastern and western parts of the United States. High rates stretch from Appalachia into the coastal Southeast, and then across the Mississippi Delta into Texas. Most counties in the Upper Midwest, as well as those west of the Rocky Mountains, tend to have counties ranking in the best-performing national quintiles. Outside of a pocket of counties in New England, almost all of the eastern United States is populated by counties with high heart disease hospitalization rates.

**Figure 135: Map of Heart Disease Hospitalizations per 1,000 Medicare Beneficiaries in the United States, 2012**

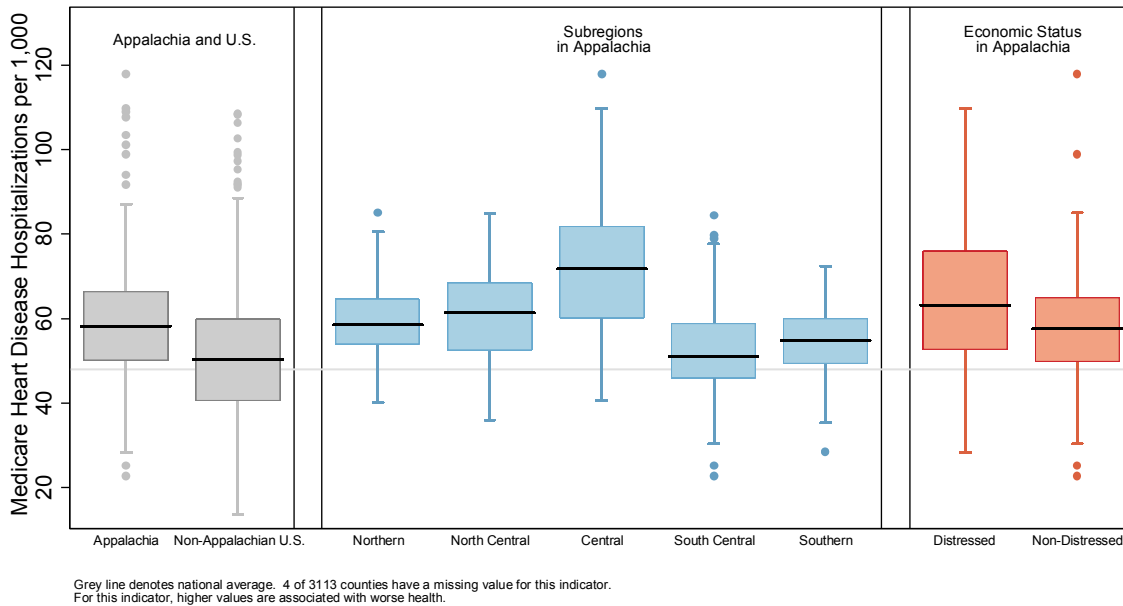


Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. <http://nccd.cdc.gov/dhdspatlas/>.

### Distribution of Medicare Heart Disease Hospitalizations

Figure 136 shows the distribution of heart disease hospitalization rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties in the nation, four have a missing value for this indicator.

**Figure 136: Box Plot of Heart Disease Hospitalizations per 1,000 Medicare Beneficiaries by Geography and Economic Status, 2012**



Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. <http://nccd.cdc.gov/dhdspatlas/>.

The distribution of heart disease hospitalization rates among national quintiles for Appalachian counties is shown in Table 45. Of the 420 counties in the Region, 179 (43 percent) rank in the worst-performing national quintile, while 7 (2 percent) rank in the best-performing national quintile.

**Table 45: Distribution of Heart Disease Hospitalization Rates per 1,000 Medicare Beneficiaries among National Quintiles for Appalachian Counties**

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	Pct.	#	Pct.	#	Pct.	#	Pct.	#	Pct.
Heart disease hospitalizations	7	2%	43	10%	74	18%	117	28%	179	43%

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



KEY FINDINGS | Chronic Obstructive Pulmonary Disease Hospitalization Rates

- The COPD hospitalization rate in the Appalachian Region is 23 percent higher than the national average.
- All five subregions have COPD hospitalization rates above the national average, and the rate in Central Appalachia is 75 percent higher than the national mark.
- The COPD hospitalization rate in the Appalachian Region's rural counties is 39 percent higher than the rate in the Region's large metro counties.
- The COPD hospitalization rate in distressed counties throughout Appalachia is 42 percent higher than the rate in the Region's non-distressed counties.

## Background

This indicator measures the number of chronic obstructive pulmonary disease (COPD) hospitalizations per 1,000 Medicare fee-for-service beneficiaries, per year. The data for this measure come from the Atlas for Heart Disease and Stroke and are based on 2012 data provided by the Centers for Disease Control and Prevention. This indicator provides information on beneficiaries in Medicare's fee-for-service option only, and does not include Medicare's managed care beneficiaries. Therefore, this measure captures only a subset of the Medicare population and represents approximately 12 percent of the total population in the nation (Kaiser Family Foundation, 2015); (Centers for Medicare & Medicaid Services, 2017).

This indicator is just one of more than a dozen measures that can be used to assess the quality of care for *ambulatory care sensitive conditions*, which are conditions where high-quality outpatient care may reduce complications, slow progression, and reduce the need for hospitalization (U.S. Department of Health and Human Services, Prevention Quality Indicators Overview, 2017). Although this indicator measures hospitalizations, it can be used to provide insight into the health care system outside of a hospital setting. Often, with good preventive services and primary care, hospitalizations due to a number of illnesses (including COPD) can be reduced or avoided altogether. Thus, this measure is included in this domain as it may be used to help assess the performance of the health care system.

Predictors of COPD hospitalization include advanced age, smoking, poverty, and rurality (Wier, Elixhauser, Pfunter, & Au, 2011). Exacerbation of symptoms due to environmental triggers such as air pollution is also a major risk factor for hospitalization (Gan, FitzGerald, Carlsten, Sadatsafavi, & Brauer, 2013). Additional evidence suggests that patients who use providers that have high Medicaid caseloads and limited access to ancillary services are more likely to be hospitalized for COPD (D'Souza, Shah, Dhamane, & Dalal, 2014).

Despite recent declines in hospitalization rates, COPD remains a common diagnosis for inpatient admissions (Baillargeon, Wang, Kuo, Holmes, & Sharma, 2013). In 2008, 20 percent of all hospitalized



adults age 40 and older had a diagnosis of COPD (Wier, Elixhauser, Pfunter, & Au, 2011). Effective self-management strategies for COPD are still in development, thus limiting the ability of those with the condition to manage their own care.

There are known geographic patterns to COPD hospitalization rates, with higher rates in Appalachia, the Mississippi Delta, and along the southern Great Lakes (Holt, Zhang, Presley-Cantrell, & Croft, 2011). These patterns are believed to stem from regionalized socioeconomic factors, as well as occupational and environmental exposures.

### **Overview: Medicare COPD Hospitalization Rates in the Appalachian Region**

The COPD hospitalization rate in the Appalachian Region is 13.4 per 1,000 Medicare beneficiaries, which is 23 percent higher than the 10.9 per 1,000 beneficiaries in the nation as a whole. All five subregions have higher rates than the national rate. Central Appalachia has the highest COPD hospitalization rate at 19.1 per 1,000 Medicare beneficiaries, which is 75 percent higher than the national average. The rate in Southern Appalachia (12.4 per 1,000), the lowest of the five subregions, is still higher than the national rate.

Areas that are more rural experience higher COPD hospitalization rates than more urbanized areas. The COPD hospitalization rate in the Appalachian Region's rural counties is 16.3 per 1,000 beneficiaries, compared to 11.7 per 1,000 in large metro counties, a difference of 39 percent. Economically distressed counties throughout Appalachia have a COPD hospitalization rate of 18.5 per 1,000 beneficiaries, which is 42 percent higher than the rate in non-distressed counties (13.0 per 1,000), and 70 percent higher than the national rate.

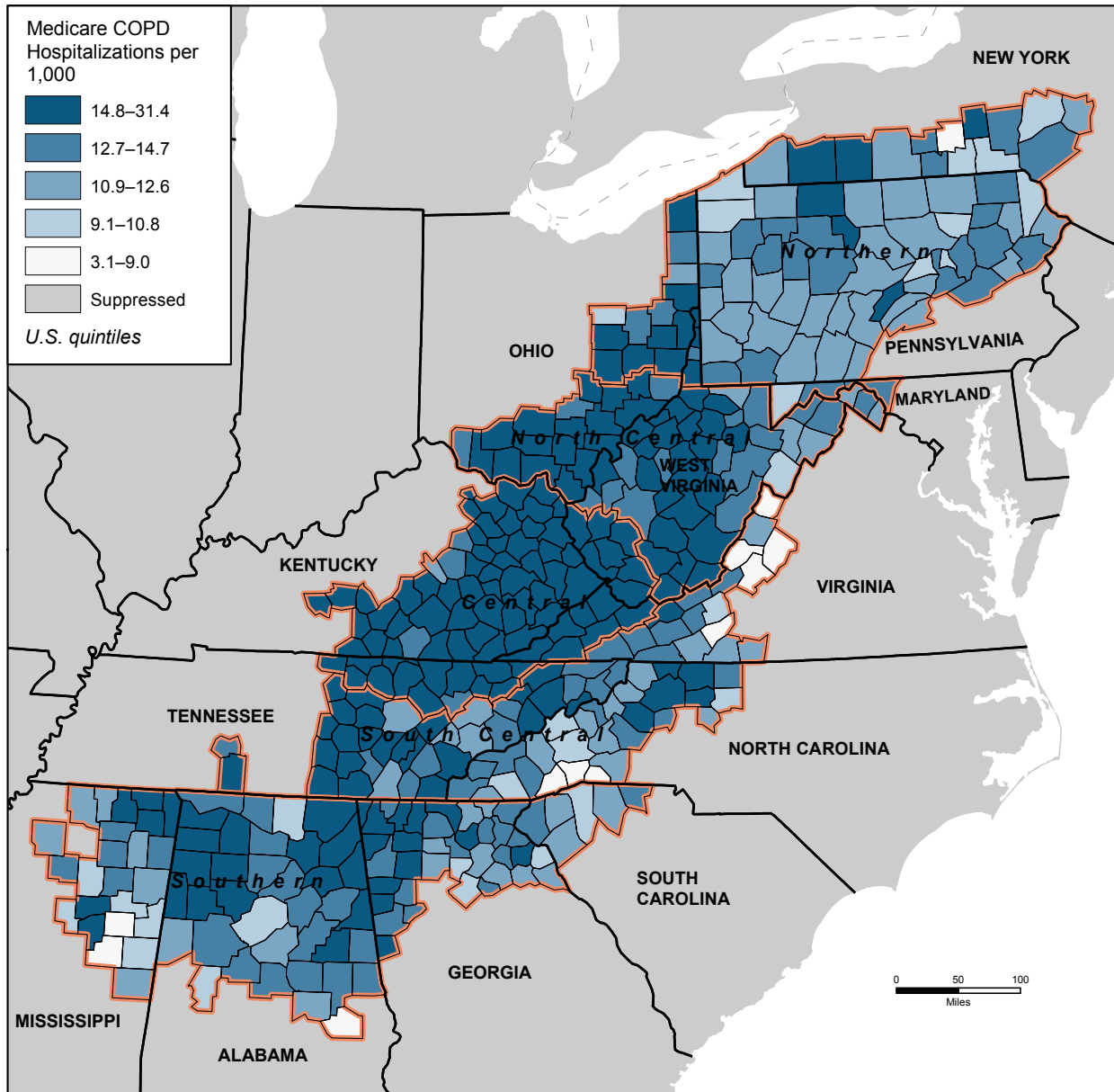
Appalachian Kentucky (19.2 per 1,000 beneficiaries), Appalachian Ohio (15.5 per 1,000), and West Virginia (15.4 per 1,000) have the highest COPD hospitalization rates in the Region, while Appalachian South Carolina (11.3 per 1,000) has the lowest rate. Kentucky, Maryland, and Virginia have the largest intrastate differences in hospitalization rates between their Appalachian and non-Appalachian counties.

Figure 137 shows the variation of COPD hospitalization rates across the Appalachian Region. Darker colors indicate higher rates; for this measure, higher values are associated with worse health. Overall, many counties throughout the Region rank in the worst-performing national quintiles, and especially those in North Central and Central Appalachia. Southern Appalachia is also home to a large number of poorly performing counties.

Figure 138 aggregates the data for a variety of geographies useful for comparison: the Region compared to both the U.S. as a whole and the non-Appalachian portion of the country, subregions throughout Appalachia, levels of rurality in Appalachia, and economic status in Appalachia. State-level aggregation is done at three levels: the entire state, and then both the Appalachian and non-Appalachian portions of each state.

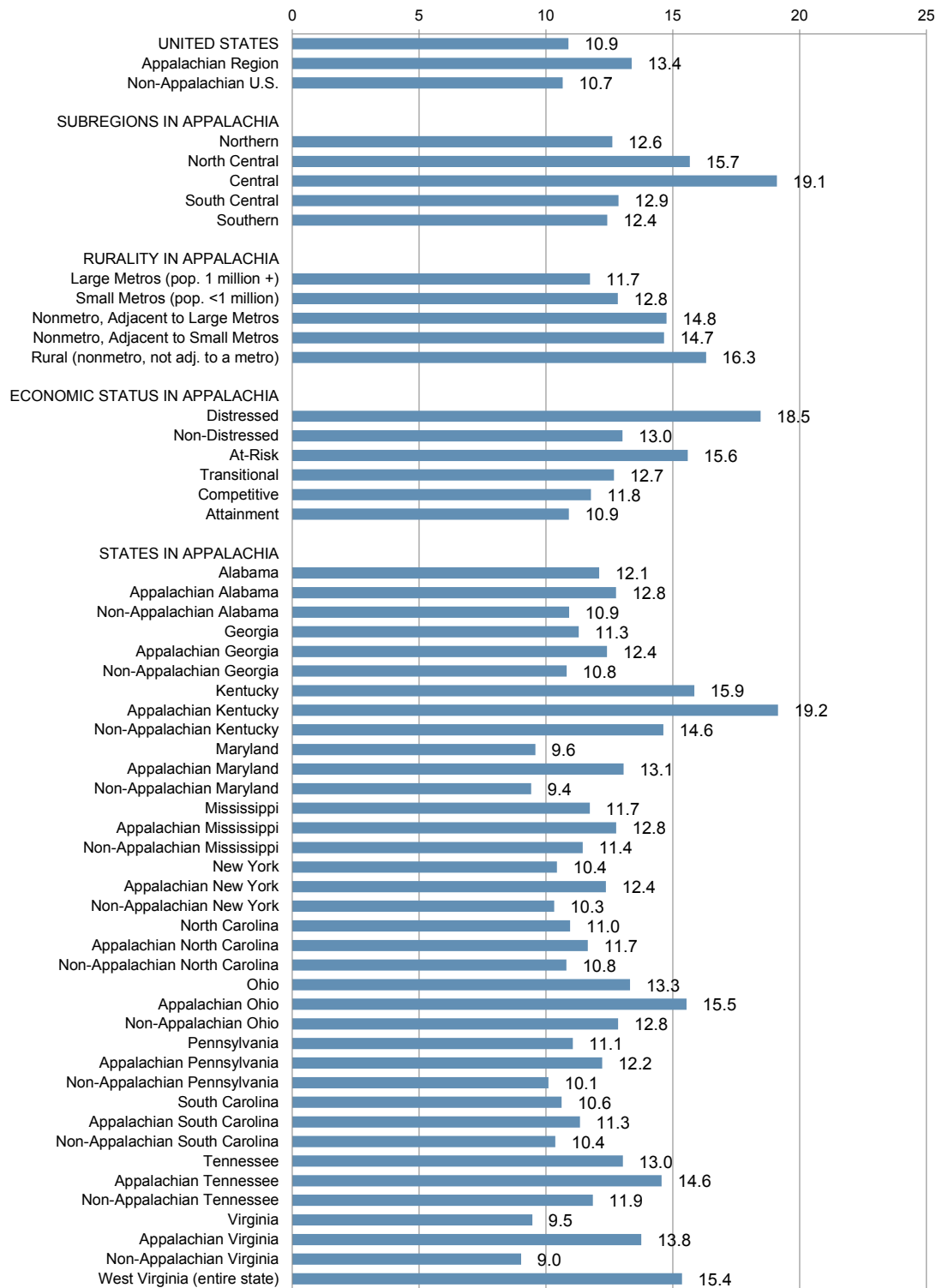


**Figure 137: Map of COPD Hospitalizations per 1,000 Medicare Beneficiaries in the Appalachian Region, 2012**



Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. <http://nccd.cdc.gov/dhdspatlas/>.

Figure 138: Chart of COPD Hospitalizations per 1,000 Medicare Beneficiaries, 2012

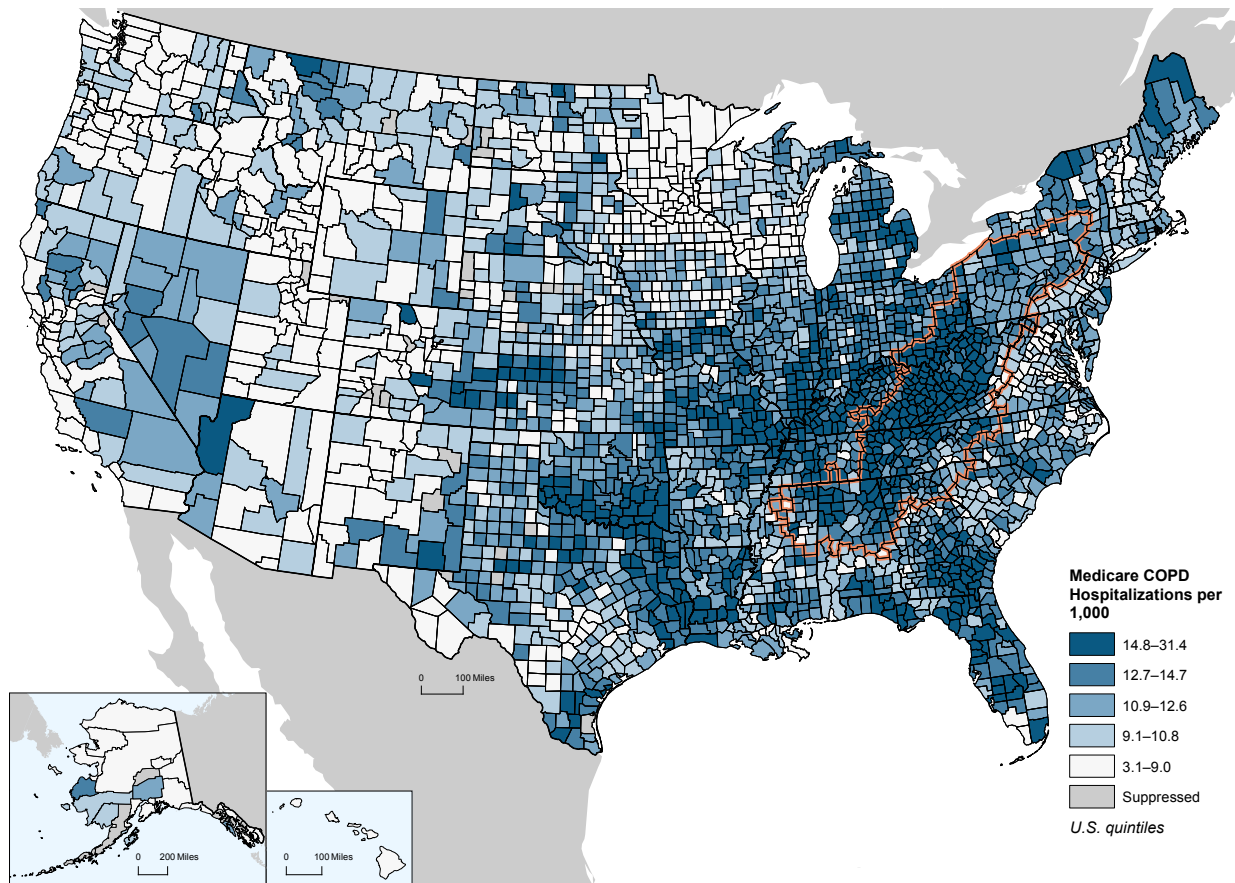


Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. <http://nccd.cdc.gov/dhdspatlas/>.

### Overview: Medicare COPD Hospitalization Rates in the United States

Figure 139 shows the variation in the COPD hospitalization rates across the United States. The high rates found in Appalachia stand in marked contrast to the low rates found to the east of the Region’s borders. Higher rates are found in Florida, southern Georgia, much of the Midwest, and Oklahoma. Much of the Upper Midwest reports low rates, as do many counties found in the Pacific Northwest and Rocky Mountain states.

**Figure 139: Map of COPD Hospitalizations per 1,000 Medicare Beneficiaries in the United States, 2012**

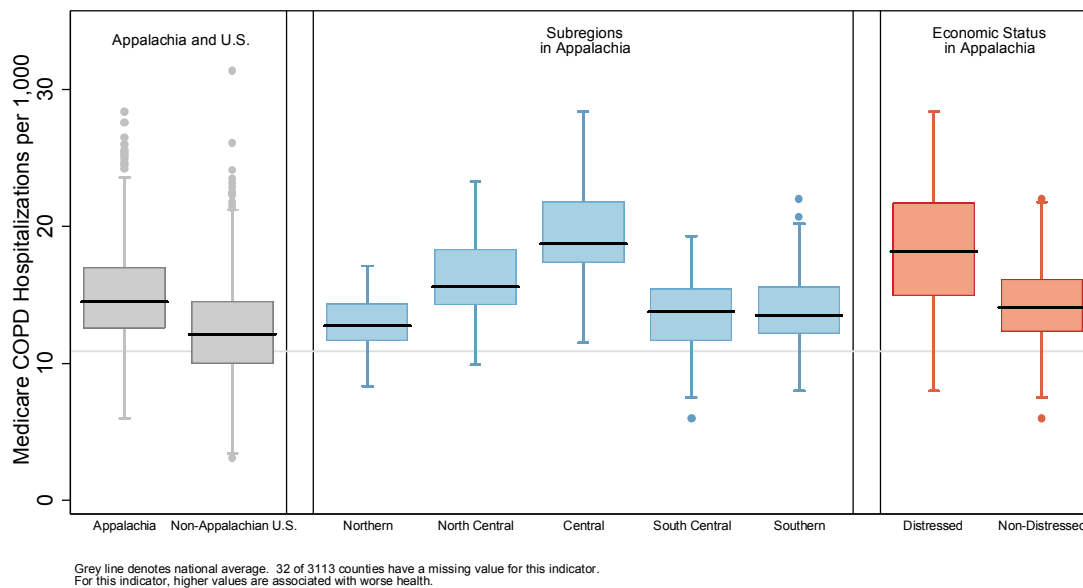


Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. <http://nccd.cdc.gov/dhdspatlas/>.

### Distribution of Medicare COPD Hospitalizations

Figure 140 shows the distribution of COPD hospitalization rates by geography and economic status. The shaded boxes show the middle 50 percent of values for each group, with dots representing unusually high or low values. The gray line stretching across the width of the graph indicates the national average, and the black lines inside the shaded boxes indicate the median for each respective group. Of all 3,113 counties, 32 have a missing value for this indicator.

**Figure 140: Box Plot of COPD Hospitalizations per 1,000 Medicare Beneficiaries by Geography and Economic Status, 2012**



Data source: CDC Atlas of Heart Disease and Stroke. Centers for Disease Control and Prevention. <http://nccd.cdc.gov/dhdspatlas/>.

The distribution of COPD hospitalization rates among national quintiles for Appalachian counties is shown in Table 46. Of the 420 counties in the Region, 203 (48 percent) rank in the worst-performing national quintile, while 12 (3 percent) rank in the best-performing national quintile.

**Table 46: Distribution of COPD Hospitalization Rates per 1,000 Medicare Beneficiaries among National Quintiles for Appalachian Counties**

Indicator	Best Quintile		2nd Best Quintile		Middle Quintile		2nd Worst Quintile		Worst Quintile	
	#	Pct.	#	Pct.	#	Pct.	#	Pct.	#	Pct.
COPD hospitalizations	12	3%	29	7%	75	18%	101	24%	203	48%

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



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