



## Since 1990, Rural Hospital Closures Have Increasingly Occurred in Counties that Are More Urbanized, Diverse, and Economically Unequal

Arrianna Marie Planey, PhD; Julie R. Perry; Erin E. Kent, PhD; Sharita R. Thomas, MPP; Hannah Friedman, MPH; Randy K. Randolph, MRP; G. Mark Holmes, PhD

### BACKGROUND

Rural hospital closures have long been of interest to policymakers. In the late 1980s, after the advent of the Prospective Payment System, a dramatic increase in rural hospital closures led to reports by the U.S. Government Accountability Office (GAO),<sup>1,2</sup> and the U.S. Department of Health and Human Services (HHS) Office of Inspector General (OIG), and ultimately led to new payment rules for certain types of rural hospitals, culminating in the creation of the Critical Access Hospital (CAH) program in 1997. The CAH program moderated the rate of closures for a while, but closures began increasing in frequency in the later part of the first decade of the 2000s. Although research has considered the drivers and effects of closures over the last 31 years, little attention has been paid to changes in the characteristics of communities affected over this time frame: do communities affected by closures in the 1990s differ from those affected today?

The purpose of this brief is to describe the socio-economic, demographic, and health system characteristics for rural counties with and without hospital closures between 1990 and 2020. We sought to answer the question: Do the characteristics of counties that experienced rural hospital closures from 2010-2020 differ from those of counties with rural hospital closures from 1990-2009.

Counties were classified in the following categories:

1) lost  $\geq 1$  hospital in the 1990s, 2) lost  $\geq 1$  hospital in the 2000s, and 3) lost  $\geq 1$  hospital in the 2010s. We defined rural counties as those having a Rural-Urban Continuum Code (RUCC 2013) of 4-9. For the purposes of this analysis, we omitted counties in Alaska and Hawaii, due to their isolated nature and low number of closures in this period. We also combined Virginia's independent cities with county boundaries to enable analysis across the decades. The resulting sample included 3,080 counties, of which 1,939 were classified as rural, per the RUCC 2013 classification.

For the purposes of this analysis, we defined closures as either 1) facilities where health care services are no longer provided ("complete closures"), or 2) facilities where health care services (such as primary care, skilled nursing care, and rehabilitation) are provided, but inpatient services are no longer provided ("converted closures"). Our analysis does not include hospitals that closed and subsequently reopened during the 31-year study period. Between 1990 and 2020, there were 334 documented rural hospital closures in 44 states (see Figure 1).<sup>3</sup> Between 1990-1999, there were 119 rural hospital closures in the U.S. Thereafter, the number of rural hospital closures declined to 74 between 2000-2009 and increased to 141 between 2010-2020.

### KEY FINDINGS

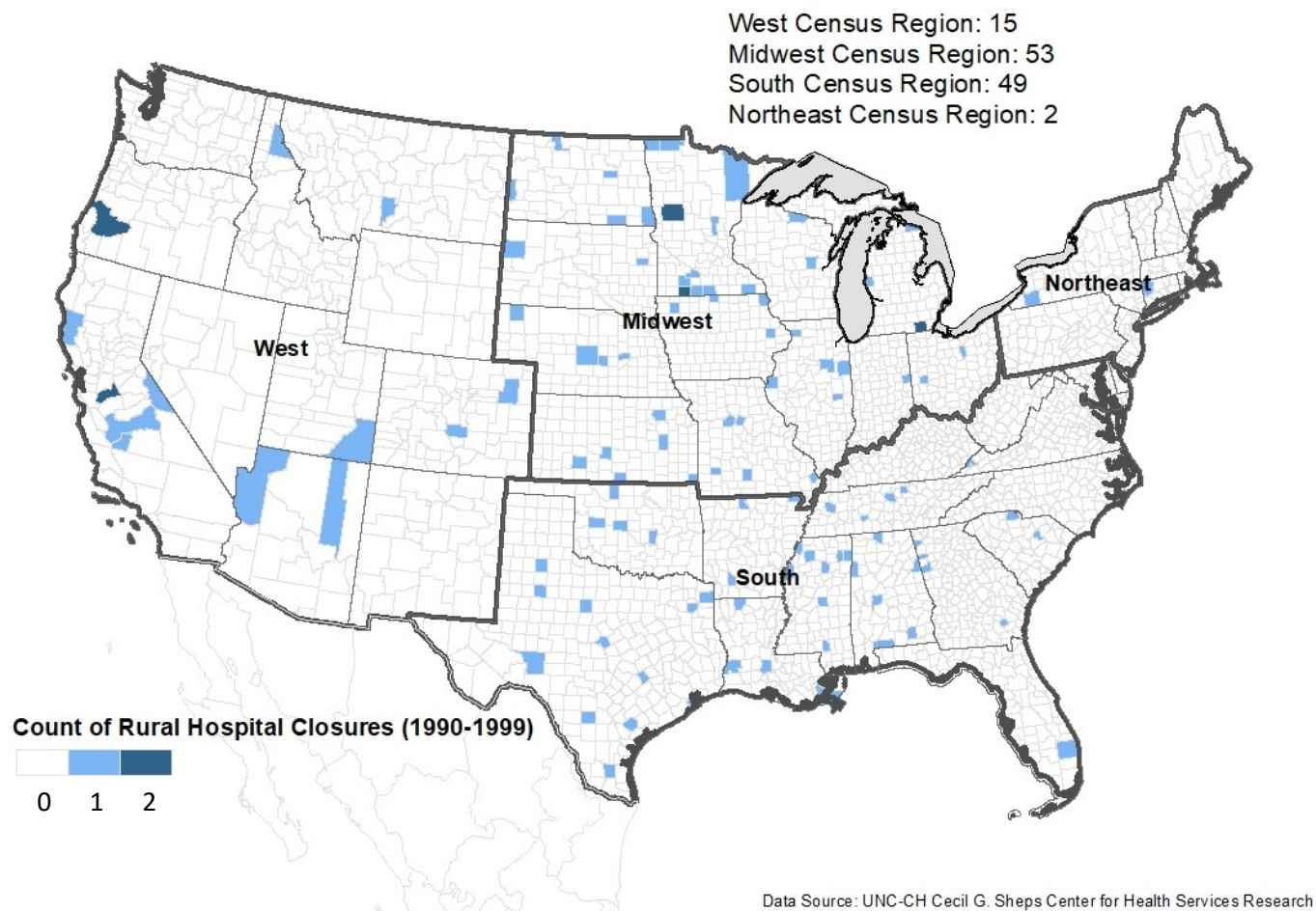
- Between 2010-2020, rural counties with hospital closures were more urbanized, had higher shares of Black and Hispanic residents, and were more likely to be in the South compared with prior decades (1990s and 2000s).
- Rural closure counties were more likely to have higher-than-median levels of income inequality, lower per capita income, and higher unemployment compared with the median rural county.

## RESULTS

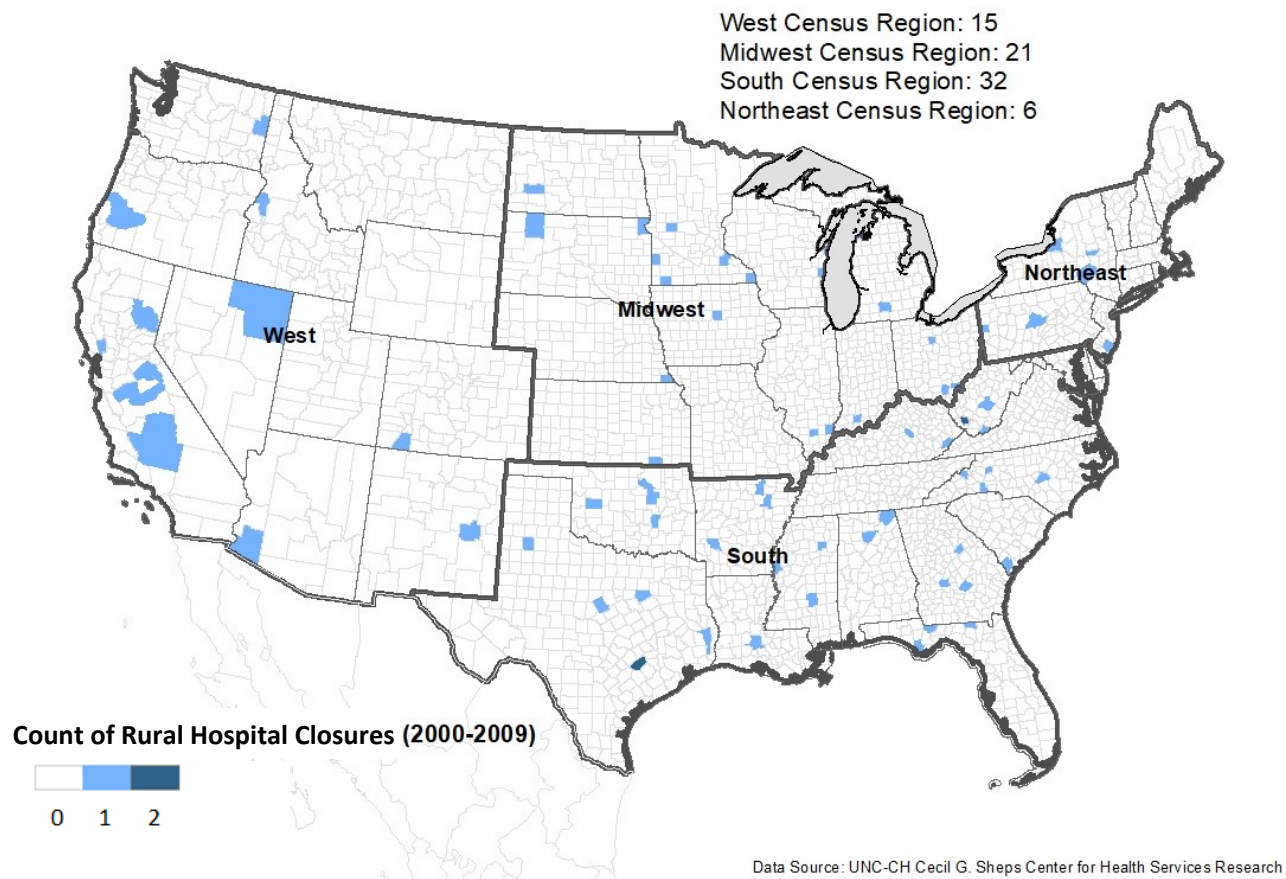
### Geographic Distribution of Closures

Over the study period, the South census region had the highest number of rural hospital closures between 1990-2020 (175 closures), followed by the Midwest region (100 closures). By census *division*, the West North Central (IA, KS, MN, MO, ND, NE, SD) had the most with 70 closures, followed by the West South Central (AR, LA, OK, TX). Closures had a nationwide impact; Texas was the state with the most closures (39), followed by Minnesota (22), Tennessee (20), and California (18).

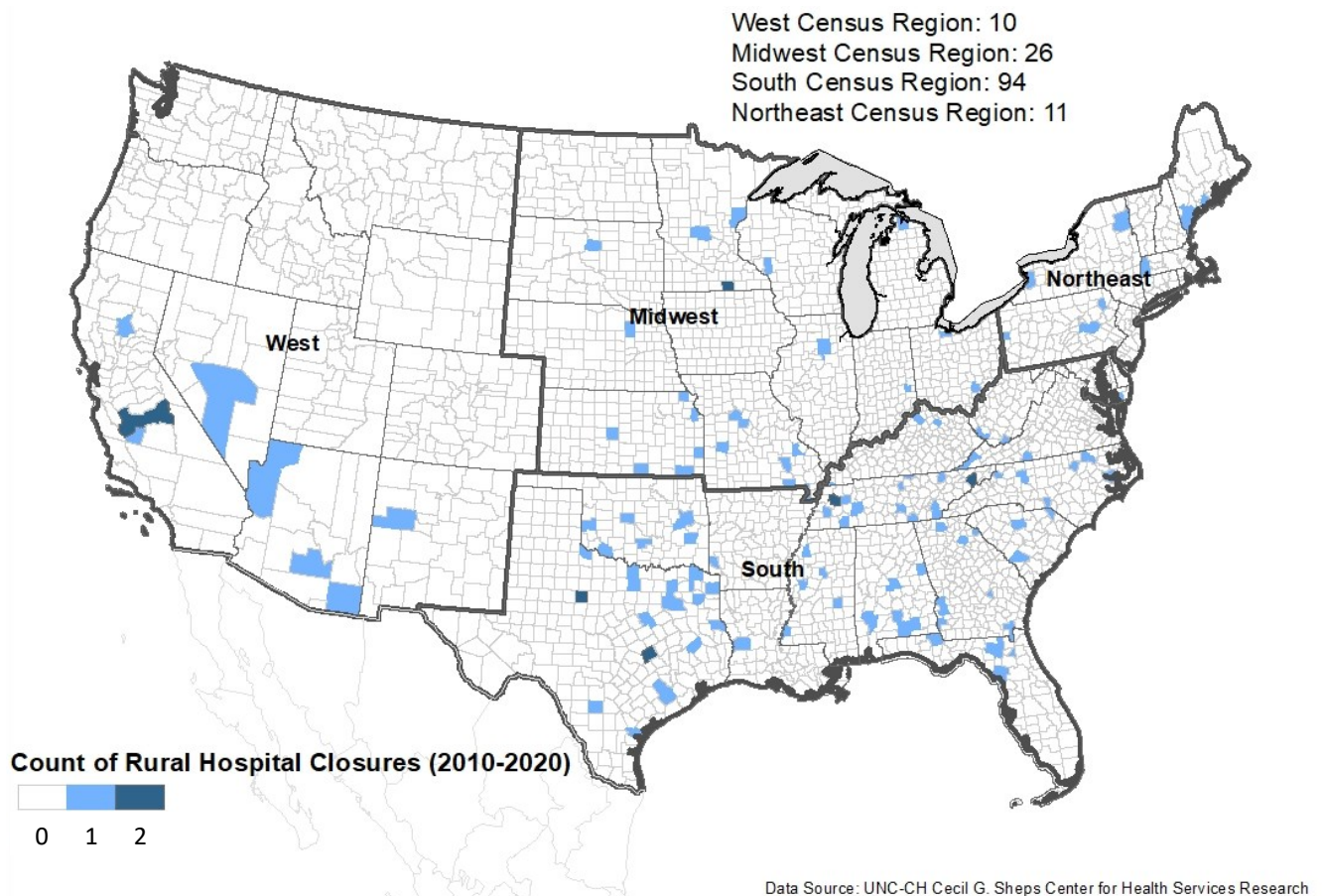
Table 1a. U.S. Rural Hospital Closures by Census Region by Decade (1990-1999)



**Table 1b. U.S. Rural Hospital Closures by Census Region by Decade (2000-2009)**



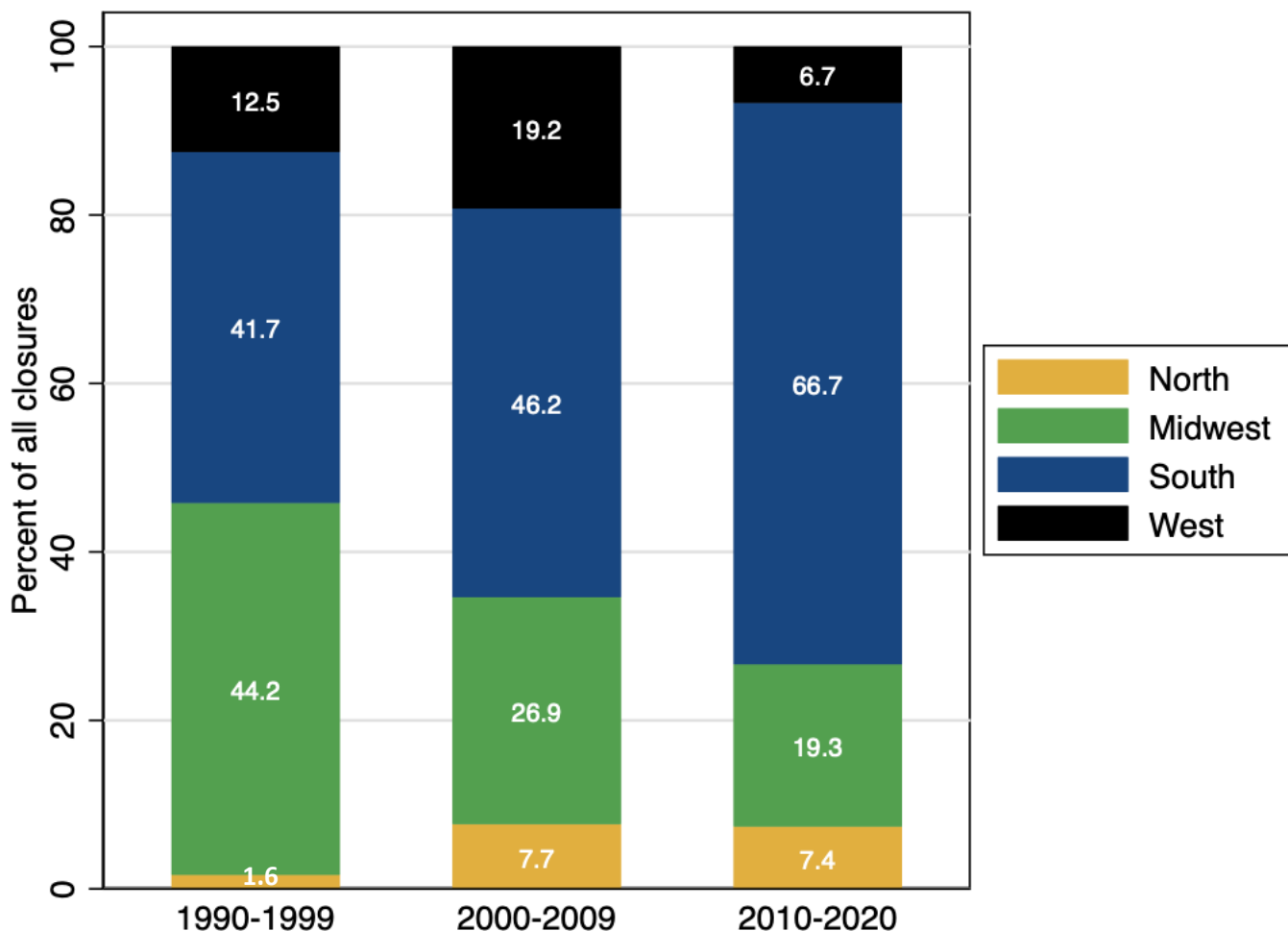
**Table 1c. U.S. Rural Hospital Closures by Census Region by Decade (2010-2020)**





Over time, the U.S. South region has increasingly borne the brunt of rural hospital closures. Figure 2 shows that during the 1990s, the number of closures in the South and Midwest regions were roughly equal. However, in the 2010s, closures were 3.5 times more common on the South, such that two-thirds of all closures nationally were in the South.

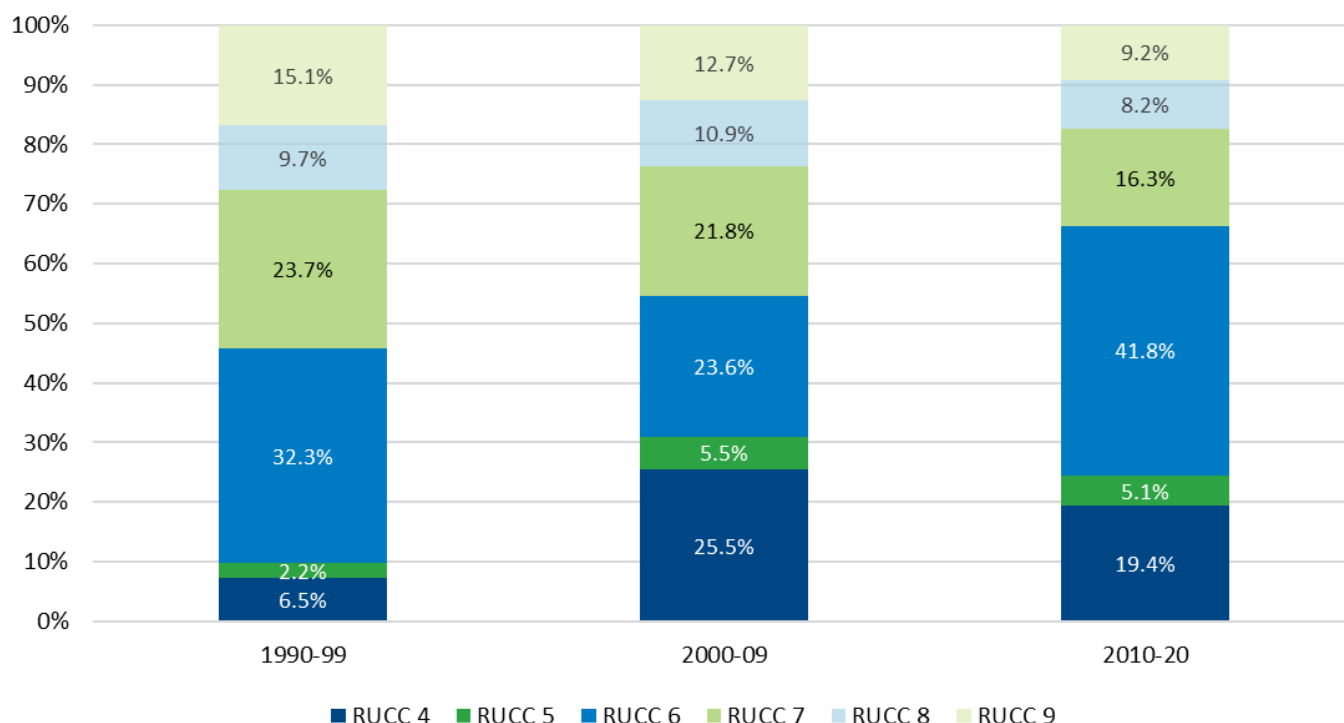
**Figure 2. Share (%) of Rural Hospital Closures by Census Region for each Decade between 1990 and 2020:  
Rural Hospital Closures Became Concentrated in the South**



#### **Distribution of Closure Counties by Rurality by Decade (1990-1999; 2000-2009; 2010-2020)**

Across the three decades (1990-1999, 2000-2009, and 2010-2020), hospital closures clustered differentially by county rurality (per the 2013 Rural-Urban Continuum Code classification system). In the 1990s, closure counties were more rural [RUCCs 8 (“Nonmetro - Completely rural or less than 2,500 urban population, adjacent to a metro area”) and 9 (“Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro area”), while 2010-2020 closures occurred more frequently in more populous counties that neighbor metro counties (RUCC 4 (“Nonmetro - Urban population of 20,000 or more, adjacent to a metro area”) and 6 (“Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area”) counties]. Put another way, between 2010-2020, rural hospital closures grew rapidly in rural counties that neighbor metro areas. Across the 31-year study period, rural hospital closures were largely clustered in counties classified as RUCC 6 (Figure 3).

**Figure 3. Proportion (%) of Counties Classified as RUCC 4-9 that Had Closures in the 1990s, 2000s, and 2010s\***



\*RUCC definition is used contemporaneously for each decade (1990 for 1990-1999; 2003 for 2000-2009; 2013 for 2010-2020).

Figure 3 shows that approximately 32.3% of closure counties between 1990-1999 were in RUCC 6 counties, compared with 23.6% between 2000-2009, and 41.8% in the latter decade. Notably, there was greater variation in the share of closure counties classified as RUCC 4 across the study period (6.5% between 1990-1999, rising to 25.5% between 2000-2009, thereafter falling slightly to 19.4% between 2010-2020). Notably, populations in more remote and non-metro adjacent counties decreased over the study period,<sup>4</sup> perhaps contributing to the shift in closure counties by degree of rurality. If we use a constant definition (e.g., RUCC 2003) to account for shifts in population rurality, the same pattern generally holds. Notably, the percent of closures occurring in nonmetro counties adjacent to a metro county (RUCCs 4, 6, and 8) increased from 48.5% of closures between 1990-1999 to 69.4% between 2010-2020. Conversely, the percent of closures in non-adjacent counties (RUCCs 5, 7, and 9) fell from 41.0% between 1990-1999 to 30.6% between 2010-2020. Put another way, the burden of closures has shifted from more remote nonmetro places toward nonmetro counties that neighbor a metro area.

### Racial & Ethnic Composition of Closure Counties, 1990-2020

Between 1990 and 2020, closure counties had increasing shares of Black and Hispanic residents. Specifically, the median share of Black residents in closure counties was higher between 2010-2020 (5.0%), compared with prior decades (0.7% between 2000-2009, and 0.4% between 1990-1999) (see Table 1). Compared with rural counties in the same period, rural closure counties were in the 55<sup>th</sup> percentile in terms of Black share of population between 1990 and increased to the 65<sup>th</sup> percentile between 2010-2020. Put another way, closure counties in the 2010s had higher-than-median shares of Black residents, compared with all rural counties. This suggests that rural hospital closures between 2010-2020 may have had a more racially disparate impact<sup>5</sup> compared with previous decades. This pattern is partly explained by (1) the disproportionate clustering of rural hospital closures in the U.S. South region after 2010 where most states have not expanded Medicaid post-ACA<sup>6</sup> and (2) the growing concentration of closures in rural counties that neighbor metro counties. Simply, the U.S. South, where most rural hospital closures in the past 31 years occurred, is also home to over half of Black people in the U.S.

Similarly, between 1990-2020, rural closure counties had higher median shares of Hispanic residents, compared with rural counties over all. Between 1990-1999, closure counties had a median share of 0.7% Hispanic residents, which increased to 1.6% between 2000-2009, and 3.9% between 2010-2020. In terms of percentiles, rural closure counties consistently had shares of Hispanic residents above the median for rural counties between 1990-2020 (see Table 1). Notably, during this period, the share of Hispanic residents residing in rural counties increased.<sup>7</sup>

**Table 1. Median Share of Racial & Ethnic Groups in Rural Closure Counties by Decade, with Percentiles (Relative to all Rural Counties)**

Racial & Ethnic Composition (median/percentile) of Rural Closure Counties, 1990-2020						
Racial/Ethnic Group Composition	≥ 1 Rural Hospital Closure in the 1990s		≥ 1 Rural Hospital Closure in the 2000s		≥ 1 Rural Hospital Closure in the 2010s	
	Median	Percentile	Median	Percentile	Median	Percentile
Black	0.54%	55 <sup>th</sup>	0.7%	40 <sup>th</sup>	5.9%	65 <sup>th</sup>
Hispanic	0.7%	55 <sup>th</sup>	1.6%	55 <sup>th</sup>	2.8%	55 <sup>th</sup>
American Indian	0.3%	45 <sup>th</sup>	0.3%	40 <sup>th</sup>	0.4%	50 <sup>th</sup>
White	95.1%	45 <sup>th</sup>	93.5%	50 <sup>th</sup>	85.1%	35 <sup>th</sup>

Reporting median shares of each racial and ethnic group by county closure status by decade; analysis of U.S. Census Bureau decennial (1990, 2000, 2010) and American Community Survey (5-year estimates; 2014-19) data

Percentile is a contemporaneous comparison with all other rural counties (RUCC 4-9 in 1990, 2003, and 2013); percentiles are rounded to the nearest fifth.

### Socio-economic Status of Closure Counties, 1990-2020

We also find that the median per capita income for closure counties increased over the study period (Table 2), but their position relative to rural counties overall declined. Between 1990-1999, the median per capita income for closure counties was equivalent to \$30,950 (55<sup>th</sup> percentile among rural counties), compared with \$36,958 (40<sup>th</sup> percentile among rural counties in 2010) for closure counties between 2010-2020.

In terms of income inequality, rural closure counties had lower levels of income inequality compared with rural counties overall in the 1990s, but the converse was true in the 2000s and 2010s. We measured income inequality using the ratio of 20th percentile income (lowest quintile income) to 80th percentile income (highest quintile income). Between 2000-2009 (0.438; 55<sup>th</sup> percentile) and 2010-2020 (0.436; 55<sup>th</sup> percentile), rural closure counties had levels of income inequality that exceeded the median for rural counties overall (Table 2).

**Table 2. Summary Table of Socioeconomic Indicators among Rural Closure Counties by Decade, 1990-2020**

Socioeconomic Factors (median/percentile) of Rural Closure Counties, 1990-2020						
Socioeconomic Indicators	≥ 1 Rural Hospital Closure in the 1990s		≥ 1 Rural Hospital Closure in the 2000s		≥ 1 Rural Hospital Closure in the 2010s	
	Median	Percentile	Median	Percentile	Median	Percentile
Unemployment Rate (%)	6.3%	55 <sup>th</sup>	5.1%	60 <sup>th</sup>	10.2%	65 <sup>th</sup>
Per Capita Income**	\$30,951	55 <sup>th</sup>	\$35,085	55 <sup>th</sup>	\$36,958	40 <sup>th</sup>
Median Income (\$)**	\$45,381	50 <sup>th</sup>	\$49,813	45 <sup>th</sup>	\$44,360	30 <sup>th</sup>
Poverty Rate (%)	14.5%	45 <sup>th</sup>	14.6%	60 <sup>th</sup>	16.9%	50 <sup>th</sup>
Income Inequality (Gini coefficient)	0.421	45 <sup>th</sup>	0.438	55 <sup>th</sup>	0.436	55 <sup>th</sup>

Analysis of U.S. Census Bureau decennial (1990, 2000, 2010) and American Community Survey (5-year estimates; 2014-19) data, Bureau of Labor Statistics, and the U.S. Census Bureau's Small Area Income and Poverty Estimates.

Percentile is a contemporaneous comparison with all other rural counties (RUCC 4-9 in 1990, 2003, and 2013)

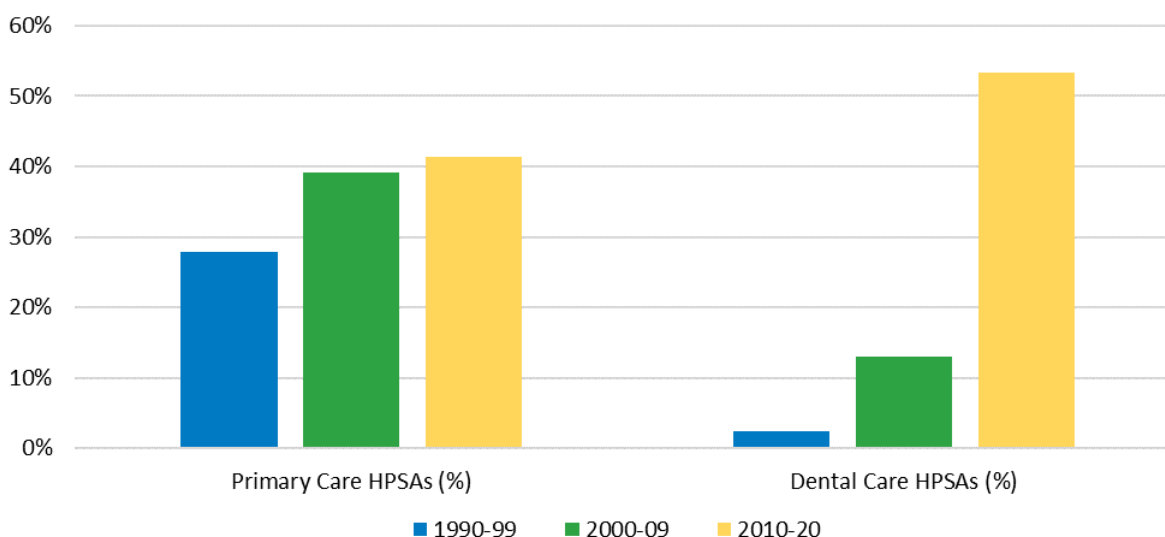
\*\*All dollar figures normalized to the 2019 U.S. Dollar (USD)

## Health Care System Characteristics, 1990-2020

Over the study period (1990-2020), closure counties were increasingly likely to be primary care and dental health professional shortage areas (HPSAs) prior to a rural hospital closure (Figure 4). Between 1990-1999, 27.9% (or 22/79) of rural closure counties were classified as primary care HPSAs, compared with 39.1% (18/46) between 2000-2009. In the latter period (2010-2020), 41.3% (38/92) of rural closure counties were classified as primary care HPSAs. Likewise, the proportion of closure counties classified as whole-county dental HPSAs increased from 2.5% (or 2/79) between 1990-99 to 53.3% (or 49/92) between 2010-2020.

This trend can be understood in the context of growing rural-urban disparities in health care provider supply in the United States. Between 2009-2017, there was a slight increase in primary care physician supply per capita across urban and rural counties, but the latter experienced a more attenuated increase.<sup>8</sup>

**Figure 4. Share of Rural Counties Classified as Whole-County HPSAs Prior to Closure, 1990-2020**



Data source: HRSA Area Health Resource File

## DISCUSSION

In this research brief, we provided descriptive statistics about the demographic, socioeconomic, and health system characteristics of closure counties between 1990-2020. We show that closures were more likely to occur in a county with more non-white residents between 1990 and 2020; and conversely, the share of white residents decreased in rural closure counties. This also bore out in the percentiles, where rural closure counties had higher-than-median proportions of Black, Hispanic, and American Indian residents, compared with rural counties overall. We also found that between 1990 and 2020, rural closure counties became more economically unequal, with higher unemployment, lower per capita income, and lower median household incomes compared with rural counties overall. Finally, we found that between 1990 and 2020, rural closure counties were increasingly likely to be primary care and dental health service professional shortage areas prior to the closure of a hospital within their borders.

## Methods and Limitations

First, using the NC Rural Health Research Program rural hospital closures database and the Centers for Medicare & Medicaid Services (CMS) Provider of Services file, we geocoded the locations of closed and open hospitals between 1990 and 2020 and mapped them using ArcMap 10.8. Thereafter, we linked the county-level counts of open and closed rural hospitals with county-level demographic, socio-economic, and health system characteristic variables between 1990-2020 (data sources listed in Table 3). Using Stata 16, we estimated proportions for categorical variables (e.g., HPSA status) as well as median values, interquartile ranges, and percentiles for continuous demographic, socioeconomic variables.

As with any analysis, there are limitations. First, due to data availability for demographic and socioeconomic data across the 31-year study period, we rely on county-level data. Moreover, we also note that the U.S. Office of Management and Budget (OMB) changed the underlying definitions for metropolitan counties in 1990, 2003, and 2013. Therefore, the 2003 and 2013 RUCCs are not comparable to the earlier 1990 RUCCs. We note below in Table 4 how the distribution of rural counties between RUCC 4-9 changed between 1990 and 2003.

## APPENDIX TABLES

**Table 3. Summary Table of Data Sources**

Variable	Data Source	Links
Unemployment rate; 1990, 2000, 2010, 2019	Local Area Unemployment Statistics, U.S. Bureau of Labor Statistics	<a href="https://www.bls.gov/lau/#cntyaa">https://www.bls.gov/lau/#cntyaa</a>
County-level hospital supply; 1990, 2000, 2010, 2019	Provider of Services (POS) data files, U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services, Office of Information Services	<a href="https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/Provider-of-Services">https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/Provider-of-Services</a>
Income inequality (Gini coefficient); 1990, 2000, 2010, 2019	American Community Survey, Summary File [5 Year], American Community Survey Office, U.S. Census Bureau	<a href="https://www.census.gov/programs-surveys/acs/data/summary-file.html">https://www.census.gov/programs-surveys/acs/data/summary-file.html</a>
Median household income; Poverty rate; 1990, 2000, 2010, 2019	Small Area Income and Poverty Estimates, U.S. Census Bureau's Small Area Income and Poverty Estimates program, U.S. Census Bureau	<a href="https://www.census.gov/programs-surveys/saie/data.html">https://www.census.gov/programs-surveys/saie/data.html</a>
Rural-Urban Continuum Codes (RUCC); 1990, 2003, 2013	RUCC: Economic Research Service, U.S. Department of Agriculture	<a href="https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx">https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx</a>
Health workforce supply (physicians, nurses); Health Professional Shortage Area (HPSA) designations; 1990, 2000, 2010, 2019	AHRF: Area Health Resource File, National Center for Health Workforce Analysis, Bureau of Health Workforce, Health Resources and Services Administration, U.S. Department of Health and Human Services	<a href="https://data.hrsa.gov/topics/health-workforce/ahrf">https://data.hrsa.gov/topics/health-workforce/ahrf</a>
The NC Rural Health Research Program and the UNC-CH Cecil G. Sheps Center for Health Services Research thanks Randy K. Randolph for his invaluable contributions to this research brief.		

**Table 4. Share of Counties within each RUCC Category in 1990, 2003, 2013**

Rural-Urban Continuum Codes (RUCC)	1990	2003	2013
<b>1 – Metro</b> - Counties in metro areas of 1 million population or more	132 (5.5%)	404 (13.1%)	422 (13.7%)
<b>2 – Metro</b> - Counties in metro areas of 250,000 to 1 million population	318 (10.3%)	321 (10.4%)	372 (12.1%)
<b>3 – Metro</b> - Counties in metro areas of fewer than 250,000 population	199 (6.5%)	342 (11.1%)	347 (11.3%)
<b>4 – Nonmetro</b> - Urban population of 20,000 or more, adjacent to a metro area	133 (4.3%)	215 (7.0%)	212 (6.9%)
<b>5 – Nonmetro</b> - Urban population of 20,000 or more, not adjacent to a metro area	107 (3.5%)	101 (3.3%)	89 (2.9%)
<b>6 – Nonmetro</b> - Urban population of 2,500 to 19,999, adjacent to a metro area	611 (19.8%)	602 (19.6%)	588 (19.1%)
<b>7 – Nonmetro</b> - Urban population of 2,500 to 19,999, not adjacent to a metro area	640 (20.8%)	438 (14.2%)	423 (13.7%)
<b>8 – Nonmetro</b> - Completely rural or less than 2,500 urban population, adjacent to a metro area	247 (8.0%)	323 (7.5%)	219 (7.1%)
<b>9 – Nonmetro</b> - Completely rural or less than 2,500 urban population, not adjacent to a metro area	522 (17.0%)	424 (13.8%)	408 (13.3%)
<b>Missing</b>	171	1	0

Note: Due to changes in how the U.S. Office of Management and Budget (OMB) defines metropolitan areas, 2013 and 2003 Rural-Urban Continuum Codes are not comparable to 1990 RUCC.



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