

Rural Health Research Brief

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Rapid Analysis: Examining the Impact of COVID-19 on Rural Communities and The Need for Per Capita Measures

INTRODUCTION

“Rural Oklahoma didn’t think it (COVID-19) was going to be that big of deal.”

–Mangum Mayor Mary Jane Scott¹

Every night at 7 p.m., residents of Mangum, Oklahoma stand on their lawns and sing “God Bless America” at the encouragement of their mayor, and at 8 p.m., they turn on their porch lights to show support for health care workers and first responders on the front lines of the fight against COVID-19.²

Located approximately halfway between Oklahoma City and Amarillo, Texas, Mangum is one of many rural communities where the combination of an older population, poor health status, limited local health care, and remote location elevates the risk of death from COVID-19. As the seat of Greer County, Mangum’s population of about 2,700 is roughly half that of the county, where nearly one-third of the adult population is considered obese, about 1 in 10 has diabetes, 1 in 5 smokes, and nearly 18% are over age 65.³ The county is served by Mangum’s sole hospital with 18 beds, none designated as ICU beds.⁴ Patients in need of more intensive care are usually sent 150 miles away to Oklahoma City.⁵

As of April 8, Greer County had 32 confirmed cases of COVID-19 and 4 associated deaths.⁶ Of these, 18 cases and 3 deaths were among residents at the county’s only nursing home in Mangum, where 11 staff also tested positive.^{1,7} The Oklahoma State Department of Health confirmed Greer County’s first 2 cases and first death on March 31, about 2 weeks after a traveling evangelist from Tulsa visited

What is COVID-19?

Coronavirus disease (COVID-19) is an infectious disease caused by a new coronavirus, named SARS-CoV-2. The virus originated in Wuhan, Hubei Province, China in fall 2019. The World Health Organization (WHO) declared the outbreak a global pandemic in March 2020. COVID-19 can cause mild to severe illness. Most severe illness occurs in adults 65 years and older and people of any age with serious underlying medical problems. For more information, visit the [CDC’s website](#).

What are Per Capita Measures?

Per capita measures refer to quantities per person. To calculate a per capita measure, the quantity of the measure is divided by the underlying population. The result is then multiplied by 1,000 or 10,000 or 100,000 to allow for “apples-to-apples” comparisons across populations of various sizes. Per capita measures are more meaningful than raw numbers for assessing population impact.



Mangum and stopped by the nursing home. The minister died three days later, Oklahoma’s first reported COVID-19-associated death.^{6,8}

While Greer County’s COVID-19 cases and deaths are considerably less than in major metropolitan areas such as Oklahoma City and Tulsa, examining data by raw numbers alone obscures an important trend: remote Greer County has quickly emerged as a state hotspot. It took the county’s first death for Mangum’s mayor to issue a shelter-in-place order for all city residents and prohibit visits to hospitals, clinics, and childcare and long-term care facilities as of April 1.⁸ A prior emergency declaration effective March 24 limited such visits to a minimum at the discretion of facility directors.⁹

Mangum’s first order came the same day Oklahoma’s governor announced social-distancing orders that closed non-essential businesses and included a “safer-at-home” mandate for populations over age 65 and/or with underlying medical conditions. At the time, the governor’s orders only targeted the state’s 19 counties with confirmed COVID-19 cases, which meant Greer was excluded.¹⁰ A week later, the governor extended orders to all Oklahoma counties, which was the same time Mangum’s mayor issued the town’s more restrictive order.¹¹

Across the U.S., about two-thirds of rural counties (1,109) had at least one confirmed case of COVID-19 as of April 5, and over 200 rural counties had reported associated deaths.¹² Much of the media attention and state-level messaging about the disease, however, have focused on urban areas with the largest numbers of cases. This approach obscures the true scope of the situation in rural areas. To effectively mitigate and increasingly contain COVID-19, numbers must be examined in context of the population.

To determine the potential for a COVID-19 surge on rural communities, we extracted county-level data for COVID-19 cases in three geographically and demographically similar rural states – Arkansas, Kansas, and Oklahoma – and mapped per capita rates for each county. As shown in Figure 1, which presents COVID-19 cases per 10,000 population as of April 8, the highest case rates were all located in noncore or rural counties. Greer County had the highest case rate of all counties with nearly 54 cases per 10,000, about 13 times the rates for heavily populated Oklahoma and Tulsa counties. Greer’s 4 confirmed COVID-19-associated deaths equated to 7 deaths per 10,000 compared to an average of about .22 per 10,000 for Oklahoma and Tulsa counties. Cases in rural counties also are growing quickly. From April 3-5, the number of reported COVID-19 cases in rural counties increased by 26% compared to 22% for the nation.¹²

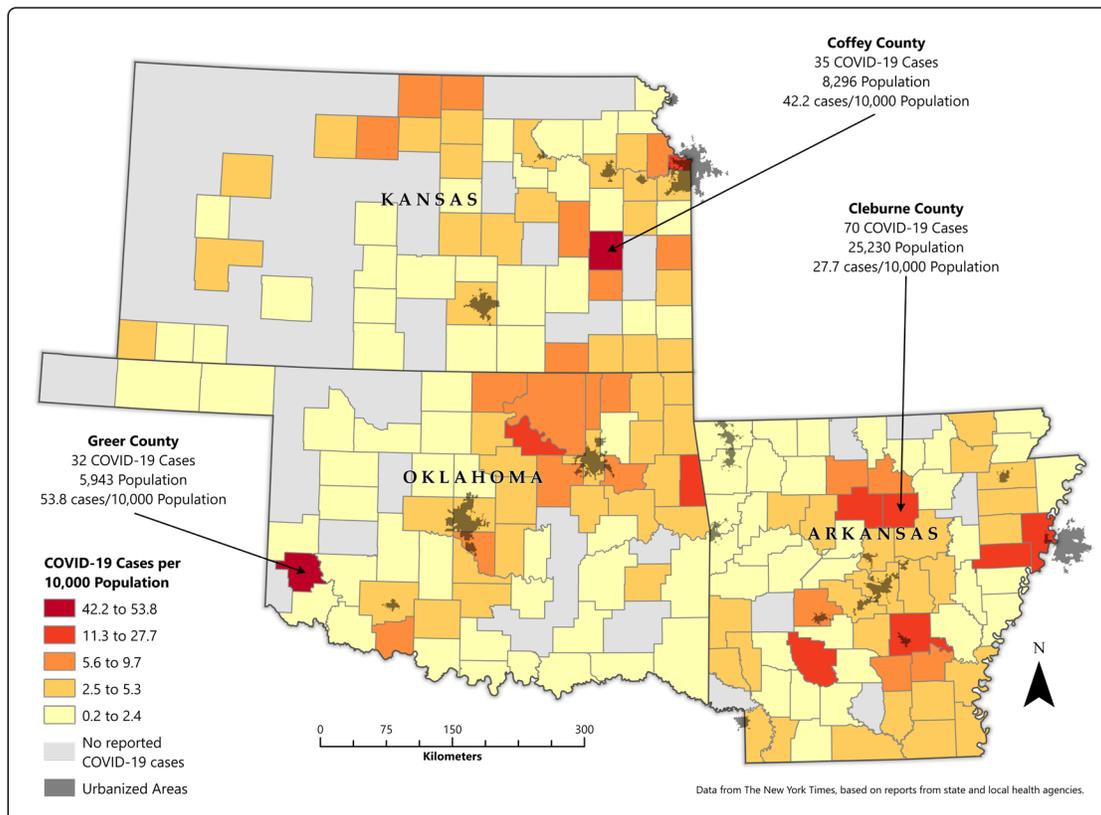


FIGURE 1. COUNTY COVID-19 CASE RATES IN ARKANSAS, KANSAS, AND OKLAHOMA (AS OF APRIL 8, 2020)

Compounding the problem for rural counties is the considerable lack of health care resources. Rural hospitals have few beds overall and many lack ICU beds entirely. Moreover, rural hospitals usually have a limited number of ventilators. A survey of ventilator and personal protective equipment (PPE) availability among Oklahoma hospitals showed that as of April 8, hospitals had approximately 1,100 total ventilators, with 76% available, and 10.7 average days of PPE in stock, ranging from 0 to 62 days.⁷

Hospital closures, including Critical Access Hospitals (CAH), have further strained rural America’s access to health care in some markets. Since 2010, more than 100 rural hospitals have closed and nearly half of rural hospitals operate in the red.^{13,14} Among remaining rural hospitals, 1 in 4 are at high risk for closing, with COVID-19 exacerbating already fragile financial situations¹⁵ and making it difficult to ensure adequate resources such as PPE are available for hospital staff.¹⁶

Of particular concern are counties without confirmed cases that may be lulled into a false sense of security. For example, the mayor of Watonga, Oklahoma, a town of about 5,000 residents that serves as the seat of Blaine County, has said the town will “*decide if we’ll do anything*” once someone tests positive.¹⁷ As of April 8, the county had yet to report a single COVID-19 case, yet it is surrounded on nearly all sides by other rural counties with confirmed cases.

Researchers at the University of Texas believe that among counties not reporting COVID-19 cases, the chance an outbreak is already underway is about 9%, and if a county has 1 case, the likelihood of community spread is about 51%, with chances increasing with every new case added.¹⁸ Like Oklahoma, Texas is one of the states where testing is particularly problematic,¹⁹ leaving many communities and counties in the dark about the true extent of the outbreak and crippling response efforts.

ANALYSIS OF RURAL BURDEN FROM COVID-19

To better understand the impact of COVID-19 on rural communities, we analyzed data for the three-state region mentioned previously – Arkansas, Kansas, and Oklahoma. We determined “rurality” by using the Index of Relative Rurality (IRR).²⁰ The IRR is a continuous scale that assesses a county’s degree of rurality by population size, population density, remoteness, and built-up area. An IRR score of 0 is the most urban, while an IRR score of 1 is the most rural. The developers of the scale noted an IRR of 0.40 and above is considered rural or nonmetropolitan.^{21,22}

County-level data on four characteristics and comorbidities – over age 65, obesity, diabetes, and smoking – associated with higher rates of death from COVID-19 were downloaded from the Robert Wood Johnson County Health Rankings.³ Information on hospital beds came from Definitive Healthcare, and COVID-19 case and mortality data through April 8 were acquired from *The New York Times*.⁶ Of the 257 counties in the three-state region, the majority (248, 96%) are considered rural as measured by an IRR \geq .40. To generate more balanced group sizes for analyses, we limited the study sample to 39 counties reporting at least 1 death associated with COVID-19.

Using independent samples t-tests, we found that rural counties had statistically significantly higher rates of populations over age 65 and higher rates of diabetes, obesity, and smoking than urban counties (see Table 1).

	Urban Counties (n=8)	Rural Counties (n=31)	P Value
Population over 65	14.6%	18.4%	.002
Adult diabetes	10.8%	14.1%	.014
Adult smoking	16.9%	19.6%	.015
Adult obesity	33.3%	36.5%	.036
N = 39 counties			

TABLE 1. CHARACTERISTICS AND COMORBIDITIES ASSOCIATED WITH COVID-19 DEATHS BY COUNTY TYPE

The risk for disease surge in rural counties is worsened by a lack of resources. Availability of hospital beds, particularly ICU beds, is limited if not non-existent in some rural counties. We examined staffed, ICU, and total hospital beds per 10,000 population as a proxy for rural health capacity to treat COVID-19 patients with complications. As shown in Table 2, the sampled rural counties have considerably fewer beds overall than urban counties, with only 1 ICU bed per 10,000 for rural counties compared to 3 ICU beds per 10,000 for urban counties. Some closures included in reported totals are a result of fire, hurricane or other natural disasters. Others are due to local leadership and operational decisions, such as choosing NOT to participate in the critical access hospital (CAH) program when initially given the opportunity to do so through a state waiver, or fraud and abuse allegations which led to hospital bankruptcy death spirals (lack of local governance internal controls).

	Urban Counties (n = 8)	Rural Counties (n = 30)
Staffed Beds	38	17
ICU Beds	3	1
Total Beds	52	23

N = 38 counties (1 county with a COVID-19-related death did not report hospital information)

TABLE 2 MEAN NUMBER OF HOSPITAL BEDS PER 10,000 BY BED AND COUNTY TYPE

CONCLUSION

Our analysis demonstrates that rural communities are at high risk for COVID-19-related deaths due to a combination of greater rates of comorbidities associated with deaths and considerably fewer hospital beds per capita than urban areas. However, data are commonly presented in terms of numbers of cases and deaths rather than per capita rates.

It is imperative that rural residents understand the elevated risks associated with COVID-19 in their communities and heed guidance on matters such as social distancing. As Greer and other counties across the nation have learned, one case can multiply exponentially, amplifying the effects of poor health status in rural communities and overwhelming the fragile infrastructure of rural health care.

REFERENCES

- 1 Rains S. Mangum mayor says Tulsa evangelist's March visit before his death probably set off COVID-19 cases in Greer County. *The Lawton Constitution*. April 9, 2020. Accessed April 11, 2020. https://www.swoknews.com/news/mangum-mayor-says-tulsa-evangelists-march-visit-before-his-death-probably-set-off-covid-19/article_d301c1d1-979c-5e37-b49c-d82d12b131d1.html
- 2 Healy J, Tavernise S, Gebeloff R, Cai W. Coronavirus was slow to spread to rural America. Not anymore. *The New York Times*. April 8, 2020. Accessed April 8, 2020. <https://www.nytimes.com/interactive/2020/04/08/us/coronavirus-rural-america-cases.html>
- 3 *County Health Rankings & Roadmaps: measures and data sources*. Robert Wood Johnson Foundation; 2020. Accessed April 9, 2020. <https://www.countyhealthrankings.org/explore-health-rankings/measures-data-sources>
- 4 *USA hospital beds*. Definitive Healthcare; March 18, 2020. Accessed April 6, 2020. <https://nation.maps.arcgis.com/home/item.html?id=1044bb19da8d4dbfb6a96eb1b4ebf629#overview>
- 5 Brittain A, Mellnik T, Keating D, Fox J. How a surge of coronavirus patients could stretch hospital resources in your area. *Washington Post*. April 9, 2020. Accessed April 10, 2020. <https://www.washingtonpost.com/graphics/2020/investigations/coronavirus-hospitals-data/>
- 6 Coronavirus in the U.S.: Latest map and case count. *The New York Times*. April 8, 2020. Accessed April 9, 2020. <https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html>
- 7 *Executive Order COVID-19 Report April 8, 2020*. Oklahoma State Department of Health; 2020. Accessed April 9, 2020. https://coronavirus.health.ok.gov/sites/g/files/gmc786/f/eo_-_covid-19_report_-_4-8-20.pdf
- 8 Carpenter R. Mangum quickly became a hotbed for COVID-19. *The Altus Times*. April 8, 2020. Accessed April 11, 2020. <https://www.altustimes.com/stories/mangum-quickly-became-a-hotbed-for-covid-19altus-mangum-mayors-continue-to-add-emergency-orders,11634>
- 9 COVID-19 Press Release. City of Mangum; March 23, 2020.
- 10 Querry K. Gov. Stitt orders all non-essential businesses to close in counties affected by COVID-19. *KFOR.com*. March 24, 2020. Accessed April 12, 2020. <https://kfor.com/news/local/gov-stitt-orders-all-non-essential-businesses-to-close-in-counties-affected-by-covid-19/>
- 11 Campo B. Governor Stitt extends "safer at home" executive order to all 77 counties. *News9.com*. April 1, 2020. Accessed April 12, 2020. <https://www.news9.com/story/41964123/governor-stitt-extends-safer-at-home-executive-order-to-all-77-counties>
- 12 Bishop B. 171 rural counties report first case of COVID-19 in past four days. *Daily Yonder*. April 6, 2020. Accessed April 6, 2020. <https://www.dailyyonder.com/171-rural-counties-report-first-case-of-covid-19-in-past-four-days/2020/04/06/>
- 13 Balfour B. *Research update: Rural hospital closures eclipse the century mark*. The Chartis Group: Chartis Center for Rural Health; March 2019. <https://www.ivantageindex.com/rural-hospital-closures-eclipsing-the-century-mark/>
- 14 Ellison A. State-by-state breakdown of 102 rural hospital closures. *Becker's Hospital Review*. March 2019. <https://www.beckershospitalreview.com/finance/state-by-state-breakdown-of-102-rural-hospital-closures.html>
- 15 O'Brien J. A quarter of rural hospitals at "high risk" of closure, COVID-19 likely to make it worse. *Health Leaders*. April 8, 2020. Accessed April 8, 2020. <https://www.healthleadersmedia.com/finance/quarter-rural-hospitals-high-risk-closure-covid-19-likely-make-it-worse>
- 16 Weber L. Coronavirus threatens rural hospitals already at the financial brink. *NPR*. March 21, 2020. Accessed April 8, 2020. <https://www.npr.org/sections/health-shots/2020/03/21/819207625/coronavirus-threatens-rural-hospitals-already-at-the-financial-brink>
- 17 Bryen W, McNutt K. Until coronavirus surfaces, mandates are scarce in rural communities. *Enid News & Eagle*. March 23, 2020. Accessed March 25, 2020. https://www.enidnews.com/oklahoma/until-coronavirus-surfaces-mandates-are-scarce-in-rural-communities/article_c75394e4-6d21-11ea-bfdc-6716c7cefc0a.html
- 18 Price A. Coronavirus creeping into rural Texas. *Austin American-Statesman*. April 6, 2020. Accessed April 7, 2020. <http://statesman.tx.app.newsmemory.com/?publink=1211107bf>
- 19 Lim D. The next coronavirus hot spots are in states that aren't testing enough. *Politico*. March 31, 2020. Accessed April 1, 2020. <https://www.politico.com/news/2020/03/31/testing-coronavirus-blindspots-157993>
- 20 Waldorf B, Kim A. *The Index of Relative Rurality (IRR): US county data for 2000 and 2010*. Purdue University Research Repository; 2018. doi:10.4231/R7959FS8
- 21 Waldorf BS. A continuous multi-dimensional measure of rurality: moving beyond threshold measures. Paper presented at: Annual Meeting of the Association of Agricultural Economics; July 2006; Long Beach, CA. doi:10.22004/ag.econ.21383
- 22 Waldorf B, Kim A. Defining and measuring rurality in the US: from typologies to continuous indices. Paper presented at: Workshop on Rationalizing Rural Area Classifications; August 2015; Washington, DC. https://sites.nationalacademies.org/cs/groups/dbasssite/documents/webpage/dbasse_167036.pdf

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ABOUT

OSU Center for Rural Health at the Oklahoma State University Center for Health Sciences houses the Oklahoma State Office of Rural Health, Oklahoma Rural Health Policy and Research Center, OSU Area Health Education Center (AHEC), and OSU TeleHealth. The Center is actively participating in Oklahoma State University Tier One research that aims to solve rural Oklahoma's most pressing challenges through timely, impactful, community-participative and action-oriented research. The Center is a member of the Institute of Healthcare Improvement (IHI) Leadership Alliance, and is engaged in grant activities with the Health Resources and Service Administration (HRSA), the National Institute on Minority Health and Health Disparities (NIHMHD), and other health equity research efforts.

MISSION

OSU Center for Rural Health's mission is to enhance the quality of life for rural and underserved Oklahoma communities through the development of the medical and public health workforce, research, policy, and community engagement.

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