


# Rural America's Hospitals are Not Prepared to Protect Older Adults From a Surge in COVID-19 Cases

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## Abstract

Rural communities with predominantly older adult populations could be especially vulnerable to poor outcomes from COVID-19 due to lacking intensive care unit (ICU) capacity. Our objective is to describe the scope of the problem by summarizing population totals of older adults in rural America and their community's ICU bed availability. We performed a review of peer-reviewed literature, in addition to hand searching non-peer-reviewed and governmental/non-governmental agency reports, using the Kaiser Health News data report to assess the number of ICU beds in 10 predominantly rural states with the highest older adult populations. We found that while 19% of the U.S. population lives in rural counties, these counties contain only 1% of the ICU beds in the United States. Counties particularly at risk for inadequate ICU capacity include Crittenden, Arkansas; Cass, Minnesota; and Sagadahoc, Maine. Solutions include building new delivery systems, reopening previously closed rural hospitals, and calling on local businesses to create medical supplies. In summary, the 10 million older adults in rural communities in the United States may face challenges with obtaining critical care treatment due to the increased need of ICU beds during the COVID-19 pandemic.

## Keywords

older adults, COVID-19, rural populations, intensive care unit availability

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## Introduction

COVID-19 disproportionately harms older adults (aged 65 and older); in the United States, 31% of COVID-19 cases, 45% of hospitalizations, 53% of intensive care unit (ICU) admissions, and 80% of deaths were among adults aged  $\geq 65$  years old (Centers for Disease Control and Prevention COVID-19 Response Team, 2020). Older adults (OAs) with severe illness due to COVID-19 rely on noninvasive ventilation, invasive ventilation, circulatory support, and close monitoring and treatment of multiorgan failure when they are critically ill. This critical care is delivered by specialized physicians, nurses, and respiratory therapists and relies on equipment that is only available in intensive care units. Therefore, the number of ICU beds a community has available is an important quality metric for COVID-19 readiness.

Although major hot spots for COVID-19 are U.S. urban areas, rural areas have also had outbreaks and may lack capacity to care for patients with serious illness. Rural communities have disproportionately been affected by hospital closures due to insufficient funding, and their citizens are more likely to have unmet health and social needs. Rural citizens have higher rates of chronic illness,

disability, and limited access to health care and supportive services due to insufficient public transit, geographic isolation, and relative scarcity of resources (Skoufalos et al., 2017). Because one out of four OAs ages  $\geq 65$  years lives in a rural setting, experts anticipate that rural communities will have higher case fatality rates if solutions are not developed to improve access to critical care resources, such as ICU beds.

Our objective was to quantify the number of ICU beds available in rural health care facilities with a predominantly geriatric population. We also aimed to summarize policy changes and solutions that could address the expected shortfall of critical care capacity so that rural communities could ensure that those requiring intensive care have access to this important resource.

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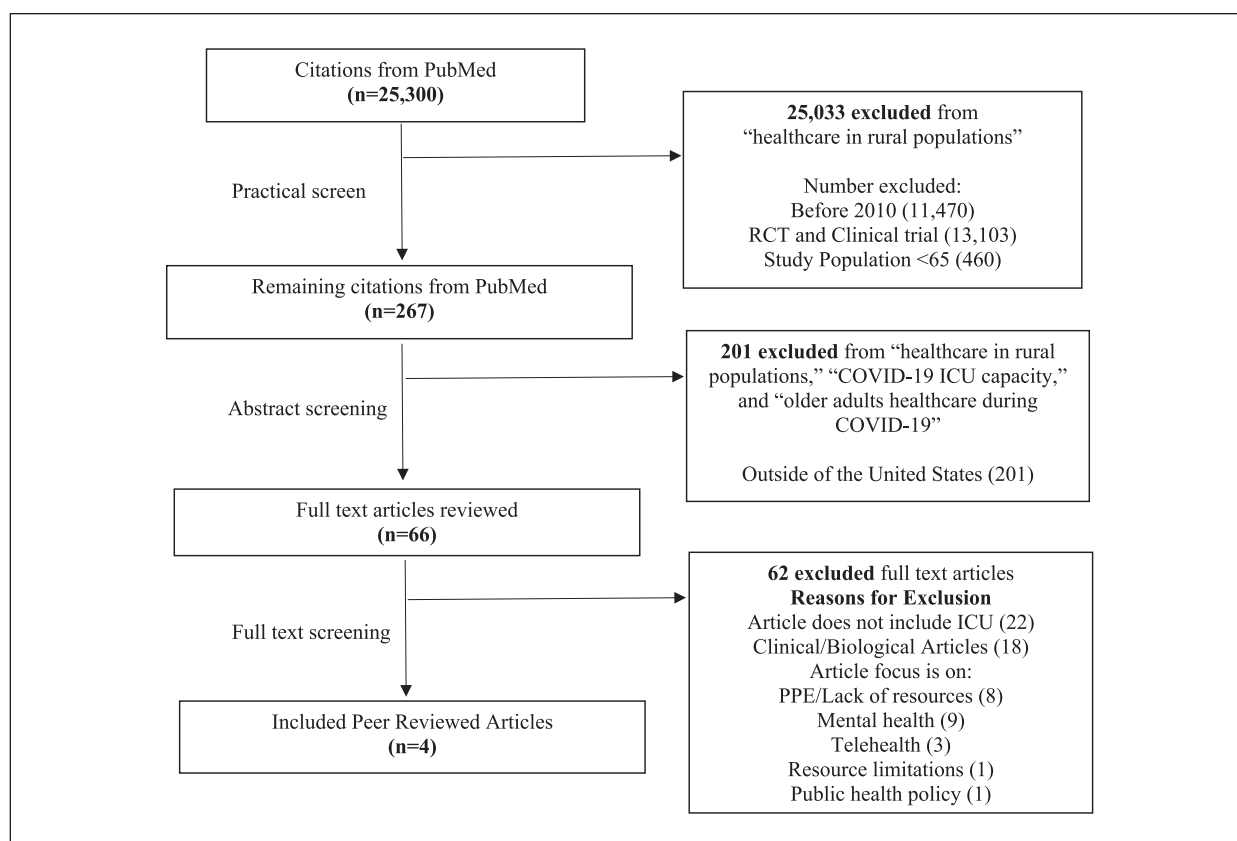
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**Figure 1.** Flow diagram of peer-reviewed article selection process.

Note. ICU = intensive care unit.

## Method

We narratively reviewed peer-reviewed literature using the following key terms: healthcare in rural populations, COVID-19 ICU capacity, and OA healthcare during COVID-19. We searched PubMed to find academic articles relevant to our topic. When searching for COVID-19 ICU capacity and OA health care during COVID-19, less than 100 results were obtained due to the rarity of articles on this topic. Therefore, we were able to begin abstract screening right away as seen in Figure 1. For health care in rural populations, we applied various filters before being able to begin abstract screening as seen in Figure 1. After practical and abstract screening, 66 peer-reviewed articles remained, of which, four were included after full-text evaluation. In addition, 18 non-peer-reviewed and governmental/non-governmental agency reports were included after a hand search on Google of recent interviews and news articles. Given the novelty of the COVID-19 outbreak, we also included non-peer-reviewed literature including newspaper and magazine articles. These sources have been shown to play a complementary role to academic journal articles during an epidemic by extracting findings of high importance or interest and translating them for general viewing expeditiously. Their accuracy and completeness vary, but are often comparable with academic journal articles. Due to

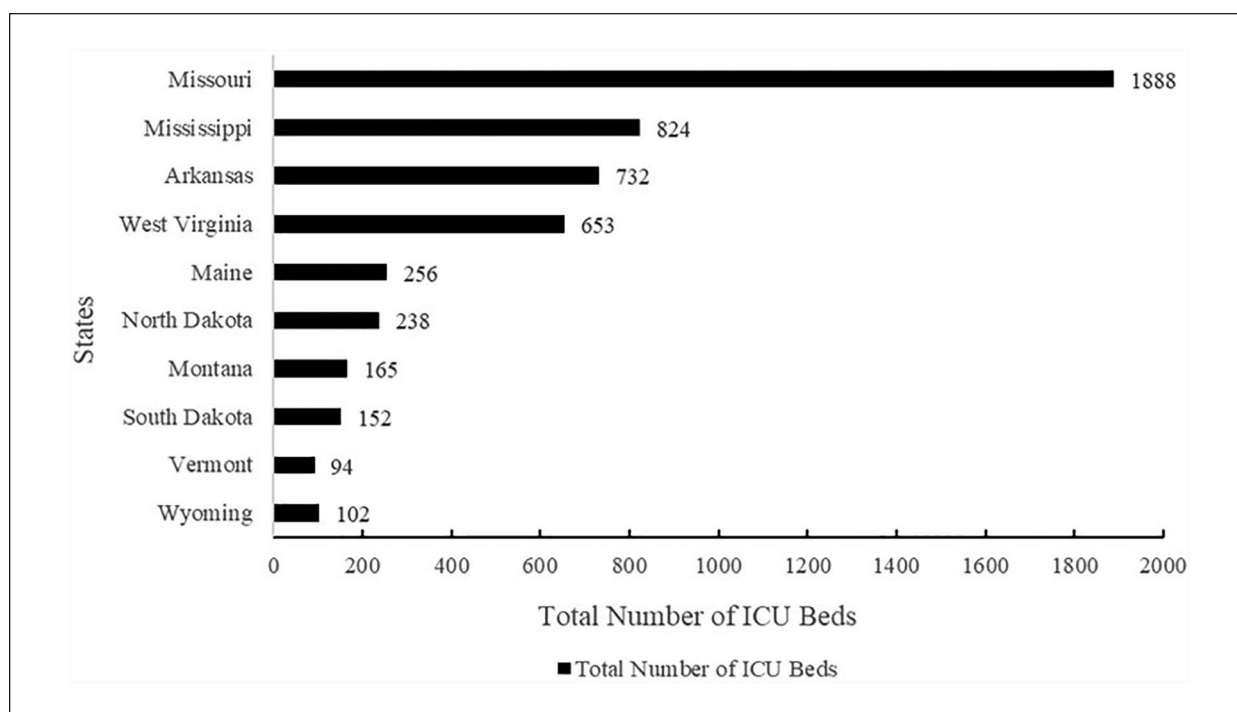
the specificity and urgency of the pandemic, the general public and academic communities have been relying on governmental and non-governmental agency reports to obtain their data. We included these reports due to their relevancy and speed in which they are updated in real time. Table 1 summarizes all included references.

To summarize the number of counties without ICU availability in 10 predominantly rural states, we used the Kaiser Health News report (KHNR, Schulte et al., 2020). We used the American Community Survey Report by the U.S. Census Bureau to determine the top 10 states with the greatest population of adults 60 years old and older to determine the counties most likely to be affected by COVID-19 (Smith & Trevelyn, 2019). We used data from The Department of Health Resources and Services Administration's report on the list of rural counties in the United States to identify all rural counties within the top 10 states with the highest proportion of OAs (U.S. Census Bureau, 2018). We only included Section 1 from this report which lists non-metro counties by state where the entirety of the county is considered rural. Section 2 was not included as it lists Census Tracts in Metropolitan counties identified as rural, which due to their proximity to cities may experience less access to care challenges. In addition, the KHNR only included county-wide data. By cross-referencing the tables with county names provided by the KHNR, we were able to

**Table I.** Summary of All Included Articles and References ( $N = 22$ ).

Peer-reviewed journal articles (PubMed)		
Reference	Sample and setting	Methodology
Brower et al. (2000)	861 Patients with Acute Lung Injury (10 U.S. university centers of the Acute Respiratory Distress Syndrome Network of the National Heart, Lung, and Blood Institute)	Research Study (multicenter, randomized trial)
MacDowell et al. (2010)	Survey conducted of 1031 rural hospital CEOs identified by regional/state Area Health Education Center (A nationwide U.S. survey; analyses from 335 respondents (34.4%) representative of rural hospital CEOs in the United States are presented)	Research Study (a multi-step, nationwide U.S. survey)
Skoufalos et al. (2017)	Proceedings of the 2017 Connectivity Summit on Rural Aging	Conference proceeding
Valley et al. (2015)	Medicare beneficiaries (aged > 64 years) admitted to 2988 acute care hospitals in the United States with pneumonia from 2010 to 2012	Research Study (retrospective cohort study)
Non-peer-reviewed articles (hand search on Google for webpages and interviews)		
Reference	Setting	Method
Advisory Board (2020)	New York City	News Article
Baptist Health (2020)	Baptist Health-Heber Springs (Arkansas)	News Article
Carey (2020)	Rural Hospitals in the United States	News Article
Elehwany (2020)	United States	News Article
Goldman (2020)	New York City	News Article
Harris & Sellers (2020)	New York City	News Article
Klein & Hostetter (2020)	Rural Hospital outside of Minneapolis	Interview
Mansoor (2020)	New York State	News Article with Interview
Ramsey & Burke (2020)	New York City	News Article
Sepkowitz (2020)	Rural United States	Interview
Velasquez & Smith (2020)	New York City	News Article
Wight (2020)	Rural Maine	News Article
Government and non-government agency reports (hand search on Google)		
Reference	Setting	Methodology
Centers for Disease Control and Prevention (CDC, 2020)	COVID-19 Severe Case Patients within the United States (49 states, the District of Columbia, and three U.S. territories from February 12 to March 16)	Health Protection Agency (National Report)
Halpern et al. (2020)	ICU Capacity Statistics (2018 proprietary data set from the American Hospital Association of most nonfederal hospitals in the United States)	National Report
U.S. Census Bureau (2018)	List of Rural Counties in the United States (Updated Census 2010)	U.S. Census Bureau Report
Schulte et al. (2020)	Older Americans living in counties with no ICU beds (Kaiser Health News identified the number of ICU beds each hospital reported in its most recent financial cost report, filed annually to the Centers for Medicare & Medicaid Services; included beds reported in the categories of intensive care unit, surgical intensive care unit, coronary care unit and burn intensive care unit; Veterans hospitals were not included)	National Report
Smith & Trevelyn (2019)	The older adult population in the Rural United States (2012–2016 American Community Survey data)	U.S. Census Bureau Report
CDC (2020)	Older adults in the United States	Health Protection Agency (National Report)

Note. COVID = coronavirus disease; ICU = intensive care unit.



**Figure 2.** Estimated total number of ICU beds in predominantly rural states with the largest proportion of OA citizens. Note. ICU = intensive care unit; OA = older adults.

sum the total number of rural counties reporting no ICU beds in each state.

## Results

In Figure 2, we show the top 10 states with the highest proportion of older adults that contain rural counties. Of these states, Wyoming and Vermont have the least ICU beds with approximately 100 ICU beds each. Missouri, which has 10 times as many citizens at approximately 6 million people, has the most (1,888) ICU beds.

Figure 3 shows the number of thousands of OAs 60 years old and older who reside in counties with no ICU beds. Vermont, South Dakota, North Dakota, and Montana each have over 50,000 OAs residing in a county without ICU beds. Arkansas and Mississippi have about 200,000 residents ages 60 years and older residing in a county without ICU beds, and Missouri has close to 350,000 OAs in a county without ICU beds.

Figure 4 demonstrates that most counties in these states without ICU beds are considered rural. Wyoming has 23 total counties and 12 of those counties do not have any ICU beds. Of those 12 counties, all 12 are considered rural by the Department of Health Resources and Services Administration (U.S. Census Bureau, 2018). Montana has 43 counties without an ICU bed, and of those, 42 are considered rural.

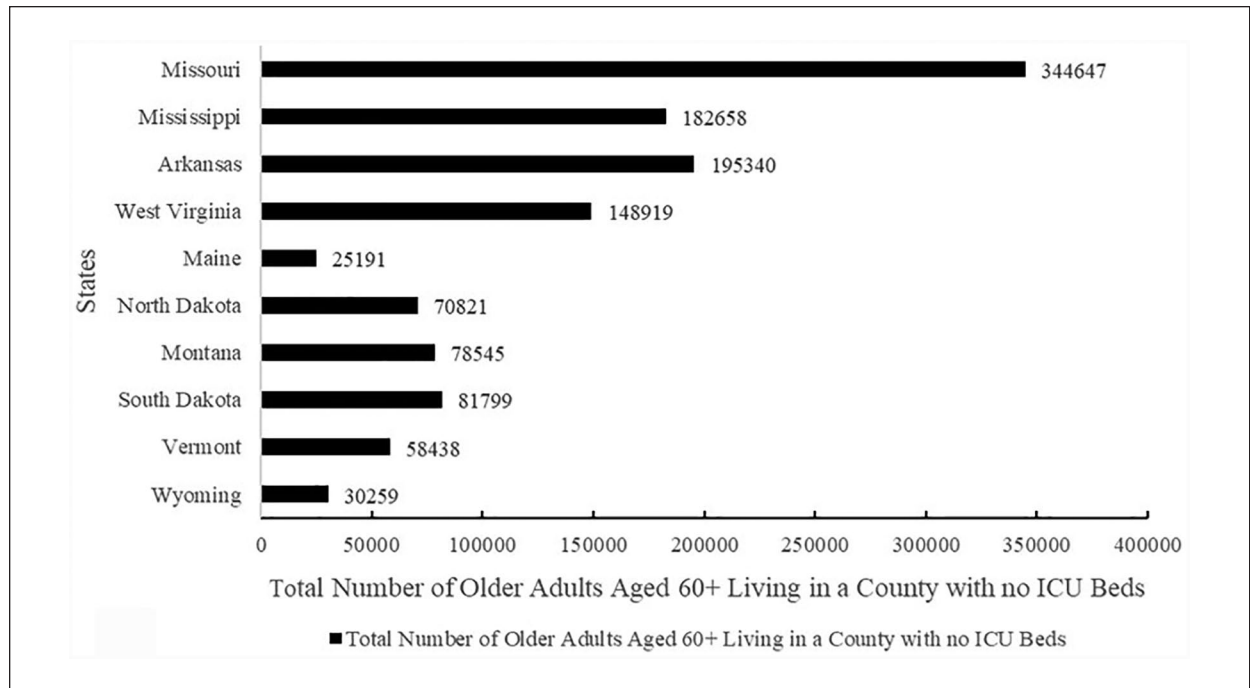
*Authors' analysis of data is sourced from the KHNR, which reports the number of ICU beds each hospital reported in its most recent financial cost report, filed annually to the Centers for Medicare & Medicaid*

*Services. This report included the total of ICU beds per county matched with county population figures for adults aged 60+ years from the Census Bureau's American Community Survey. This report does not include any ICU beds Veterans' Affairs Hospitals because they do not file cost reports.*

## Discussion

We found that many rural counties in the United States lack ICU beds, especially Missouri, Arkansas, Mississippi, and West Virginia. Stakeholders should prepare to scale up support for these counties to ensure that OAs living in these states have access to necessary critical care if a COVID-19 outbreak occurs in their community. The lack of ICU beds also reflects a lack of staff trained in delivering the intensity of care that seriously ill patients with COVID-19 need to survive the pandemic. Regular beds can be retrofitted into ICU beds, but staff credentialing and acquisition typically takes months.

Experts such as Infectious disease specialist and CNN medical correspondent, Dr. Kent Sepkowitz, have expressed concerns that the health care systems in rural America are not adequate to respond to a surge in COVID-19 cases (Sepkowitz, 2020). They have highlighted that outbreaks in rural counties in Arkansas have occurred and these communities lack the critical care infrastructure to respond appropriately. For instance, in rural Cleburne county where a church gathering resulted in a COVID-19 outbreak, the closest medical care is a



**Figure 3.** Estimated number of older adults living in counties with no ICU beds.  
 Note. ICU = intensive care unit.

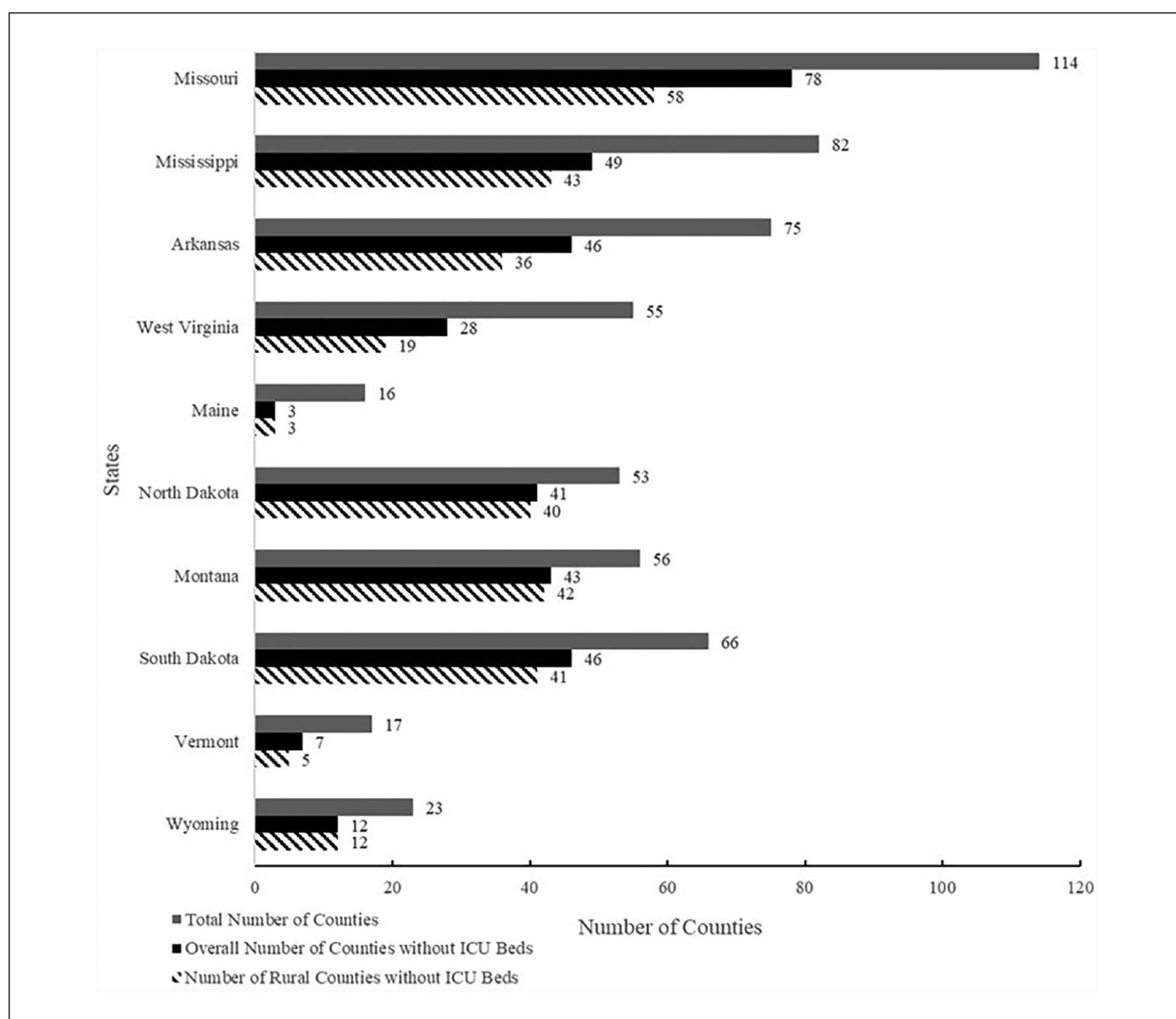
25-bed hospital with no ICU capacity or specialists (Baptist Health, 2020). Prior to the pandemic, these rural hospitals were able to transfer critically ill patients to nearby urban hospitals, but transfers are only accepted when there is capacity for patients. Urban hospitals may lack this capacity if they also face an outbreak and therefore critically ill rural patients will not receive the care they need.

Many specialists in rural counties are expressing similar fears about limited ICU accessibility for their patients. The Society of Critical Care Medicine reported on resource availability stating that of the 2,704 U.S. hospitals with ICU services, only 9% (244) are in rural areas (defined as a population < 10,000). In addition, 2% of acute care hospital beds and 1% of ICU beds are in rural areas (Halpern et al., 2020). Sixty-five percent of U.S. rural counties lack health professionals, because physicians favor working in urban areas (MacDowell et al., 2010). A U.S. survey conducted by 1,031 rural hospital CEOs reported that physician specialists are lacking in rural settings (MacDowell et al., 2010); 75.4% of the rural CEOs reported physician shortages and 70.3% stated their hospitals have shortages of two or more primary care (PC) specialties (MacDowell et al., 2010). Other health care professionals are also in short supply in these rural hospitals. For instance, 73% lack registered nurses (RNs), 61.2% lack physical therapists, and 51% lack pharmacists (MacDowell et al., 2010). Therefore, many rural counties lack essential health care personnel and ICU beds.

OAs who live closer to hospitals with ICU beds and are admitted to ICUs have improved outcomes. An

analysis of Medicare beneficiaries which estimated the relationship between ICU admissions and outcomes for elderly patients with pneumonia found that discretionary admissions of patients, which were dependent only on distance, were associated with improved survival, as compared with those who stayed in general wards (Valley et al., 2015). They also found that older patients living closer to a hospital with ICU capacity were more likely to be admitted to the ICU than those living farther away (36% for patients living closer as compared with 23% for patients living farther) (Valley et al., 2015). Although empirical research is lacking that ICU care improves survival in OAs with COVID-19 patients, we know that expert lung-protective ventilator management for acute respiratory distress syndrome (ARDS)—the central lung pathology in patients critically ill with COVID-19—increases survival (Brower et al., 2000).

Urban areas such as New York City (NYC) have been heavily impacted by COVID-19 and are demonstrating how to expand ICU capacity. As of March 26, 2020, an additional 40,000 ICU beds were required to treat all that needed critical care, according to Governor Andrew Cuomo (Velasquez & Smith, 2020). Since then, NYC has more than doubled their ICU capacity with the aid of USNS Comfort Navy Ship and the conversion of Jacob K. Javits Convention Center, a trade-show hall, into a temporary hospital (Ramsey & Burke, 2020). As of May 16, there is no longer a need for the 40,000 ICU beds because NYC passed their peak case count, but it remains unclear whether reopening will cause an uptick in cases and ICU bed needs. However, capacity remains challenging. To reopen safely, government officials estimate



**Figure 4.** Estimated number of counties in predominantly rural states without ICU beds.

Note. ICU = intensive care unit.

that 30% of hospital and ICU beds need to be reserved for COVID-19 cases, but currently only 27% of hospital beds are open and 26% of ICU beds are available (Goldman, 2020). According to Dr. John Puskas, Chair of Cardiovascular Surgery at Mount Sinai, his cardiovascular care facility consisting of 26 ICU beds was repurposed for non-cardiac COVID-19 patients (Harris & Sellers, 2020). In addition, field hospitals have been set up in open areas in Central Park to expand the capacity to care for COVID-19 patients. Rural hospitals may be able to retrofit existing rooms to meet the infection control parameters and critical care needs of COVID-19 patients, and have the space for field hospitals, but funding, operational planning, and staff and specialists to run these alternative sites are paramount. Other hospitals in parts of the country outside of urban hotspots, especially rural areas that were already struggling with ICU capacity prior to this pandemic, can learn from NYC's experience in ramping up their capacity. Increasing ICU capacity is not a small undertaking; from the difficulties seen in

NYC, it is evident how challenging, complex, and time-consuming the process truly is. Legislators and hospitals in rural America must continue to have conversations about increasing hospital bed, ICU, and testing capacity.

### Increasing ICU Capacity in Rural Hospitals

Several rural hospitals have responded to concerns of a COVID-19 surge by enhancing their critical care capacity and their examples could guide other counties. New Ulm Medical Center (NUMC), a rural hospital outside of Minnesota, is building new delivery systems to accommodate up to 4 times their usual patient volume (Klein & Hostetter, 2020). Dr. Toby Freier described how their 25-bed critical access hospital partnered with another local critical access hospital through a one-hospital, two-campus model which allows for NUMC to take on higher-complexity cases due to their larger resource inventory (Klein & Hostetter, 2020).

Other solutions include reopening previously closed rural hospitals, calling on local businesses to create medical supplies, and creatively sourcing medical personnel. These shut-down hospitals are often already equipped with the proper gas lines and other needed fixtures and could be a more efficient way to create space (Carey, 2020). However, many require substantial repairs that may limit their ability to be quickly utilized. When considering the lack of medical resources including personal protective equipment (PPE), state's auto supply stores have started making face shields, and hospital staff are stitching face masks and hospital gowns (Wight, 2020). At least 52,000 health professionals, including retired physicians and nurse practitioners, and medical students have volunteered to assist staffing hospitals inundated with COVID-19 patients to temporarily fix workforce shortage in these areas (Mansoor, 2020).

Funding rural hospitals will be crucial to help them expand their capacity to care for more patients. Congress passed the CARES Act giving US\$100 billion in grants to hospitals across the United States, as well as to other Medicare and Medicaid suppliers, to cover unreimbursed health care related expenses or lost revenue due to COVID-19 (Elehwany, 2020). In addition, the Health Resources and Services Administration received US\$275 million in funding which will support rural hospitals, critical access hospitals, and telehealth services (Elehwany, 2020). Grants will be provided toward hospital payments, telehealth efforts, and support for health care providers (Elehwany, 2020). In addition, rural providers will have access to a US\$562 million small business emergency relief fund, which aims to reduce medical practice closures (Elehwany, 2020).

Although the findings of this review highlight the need for hospitals and health care systems to prepare for changes in delivery of care in rural communities, should a surge occur, it is important to acknowledge some limitations in our methodologies. First, given the urgency and novelty of the topic, a scoping review better met our objectives. A more comprehensive systematic review should be done when more information on the topic is available. The information surrounding the pandemic is rapidly changing, so it is possible that some elements were not included in this paper. Data regarding ICU bed capacity throughout the United States, specifically in rural counties, can vary day-to-day for reasons including lags in reporting. Therefore, findings are contemporaneous and there is value in updating them when more is known. Despite these limitations, we provide valuable insights into the challenges rural dwelling OAs would face given a lack of available ICU beds should a COVID-19 surge occur in rural counties.

## Conclusion

Rural communities lack ICU beds that are essential to care for critically ill patients with COVID-19. Although these communities can transport critically ill patients to

surrounding urban hospitals, if these hospitals reach maximum ICU capacity, rural patients may be the first to be denied ICU admission. Because rural communities have a disproportionate number of OAs who are high-risk for severe complications due to COVID-19, case fatality rates could be particularly high if outbreaks occur in these communities. Stakeholders in rural communities should make every effort to slow potential infection rates, build alliances with neighboring communities to share health resources, and scale up beds and staffing. Accessibility to ICU units and resources for OAs residing in rural communities needs to become a top priority as public discourse continues about how to better the United States' response to unexpected outbreaks and pandemics.

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