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Review Article

U.S. Rural Hospital Care Quality and the Effects of Hospital Closures on the Health Status of Rural Vulnerable Populations: An Integrative Literature Review

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Introduction. Hospital and emergency department closures are emblematic of America's changing healthcare delivery system, which often places rural vulnerable communities at further risk for poor health outcomes. Employing the Vulnerable Populations Conceptual Model (VPCM), we aimed to synthesize the existing research addressing care quality in these facilities and the impacts of their closures on affected communities and health status. *Materials and Methods*. We conducted a modified integrative literature review (outlined by Whittemore and Knafl), comparing and contrasting articles via an organizational matrix. We identified articles through three databases and ancestral searches. We included English-written, peer-reviewed articles published from 2010 forward. We excluded international and nonresearch articles that focused on the closure of specific departments (other than emergency departments). Our final sample included 26 primary research studies (24 quantitative and two qualitative). We scored the articles according to their scientific rigor and data relevance, then deductively coded them according to the VPCM constructs. *Results*. We identified two overarching themes from the literature: (1) association of rural hospital care and patient health outcomes and (2) access to hospital care-effects of closures and openings on rural vulnerable populations. Subthemes reflected access to care and other resources, relative risks associated with time-sensitive health events, and health outcomes. *Discussion and Conclusion*. We found that rural hospitals provide access to essential health services and emergency care in these vulnerable, underserved communities. Their loss may increase adverse outcomes in affected communities and the overall health system. However, our review was limited by the retrospective, nonexperimental nature of most included articles, and more data quantifying these effects and the impact of confounding factors are needed. Multidisciplinary stakeholders must jointly address declining access to hospital and emergency care by sustainably addressing social determinants of health, quality assurance, innovative healthcare delivery systems, and rural hospital funding.

1. Introduction

America's healthcare delivery system is quickly shifting in ways that disproportionately place rural vulnerable populations at additional risk for poor health outcomes. Driven by multiple factors, rural hospital and emergency department closures illustrate dramatic shifts in healthcare conveyance. Presumably, cascading impacts of rural hospital closures ensue, but little research into the effects of this change on health outcomes and social determinants exists. Framed by the Vulnerable Populations Conceptual Model (VPCM) [1], this review synthesizes the existing research about hospitals and emergency departments in rural vulnerable communities and the effects of their closure on patients.

Since 2010, approximately 140 rural hospitals have closed across the United States (since 2005, the number of rural closures has exceeded 180) [2]. Defining closures is somewhat inconsistent in the literature, as some hospitals convert to providing other healthcare services (e.g., emergency services, skilled nursing care, primary care, and behavioral health services) while others cease operations

entirely. According to the Cecil G. Sheps Center for Health Services Research at the University of North Carolina (a recognized authority on U.S. hospital closures) [2], since 2005, 98 rural hospitals have closed entirely, and 83 have converted to other services. Other researchers may define hospitals and closures somewhat differently, making comparisons across studies of closures challenging and complex.

Before 2010, the nation experienced net increases in the number of hospitals. In the 1940s, Congress passed the Hospital Survey and Construction Act of 1946 (i.e., the Hill-Burton Act), intending to bring the ratio of hospital beds per 1000 civilian population from 3.2 to 4.5 [3]. By 1980, communities has met this goal [4]. Growth continued for a time with a net gain in the number of Medicare-participating hospitals, with openings outpacing closures by 116 from 2000 to 2010 [5]. During that era, the few hospital closures that occurred had negligible effects on health outcomes [6].

However, recent hospital closures and declining numbers of inpatient beds reduced the 2019 bed-to-population ratio from pre-Hill Burton levels to 2.4 per 1000 nationwide [7]. As the geographic density of hospital services continues to decline, particularly in the South, where 65% of the nation's 2020 rural hospital closures occurred [8], travel times to emergency and other needed hospital services have increased substantially [9]. The South was home to more hospitals (920 urban, 899 rural) in 2012–2013 than any other geographic region of the U.S., accounting for more than 38% of the nation's 4,722 short-term acute care hospitals [10]. These numbers possibly account for the significant number of Southern hospital closures, as those with redundant services could not compete for increasingly limited financial resources, providers, and patients [11].

Rural hospitals are closing for multiple reasons, but the primary factor is financial instability and shortfalls. According to Miller in 2020 [12], rural hospitals receive only 5% of U.S. hospital spending despite making up approximately 36% of all short-term, general hospitals in the nation. These financial deficits often result from the uncompensated care burden, exacerbated by insurance underpayment, and in states that have elected not to expand Medicaid per the Patient Protection and Affordable Care Act [13]. The result is a rural hospital system on the brink of collapse, with over 40% at high or immediate risk of closure in 2020 [12]. Other factors contributing to declining rural hospital numbers and bed-to-population ratios include shifts from inpatient care to outpatient services, consolidated delivery arrangements, and changing rural sociodemographic and economic characteristics [4, 11].

Still, as more hospitals close, travel times increase cumulatively. For example, since 2013, one-third of hospital closures occurred 20 or more miles from the nearest hospital [14], an increase from earlier years. In addition, the U.S. Government Accountability Office [9] reported that the median distance to general inpatient services for affected communities increased by 20.5 miles from 2012 to 2018 (even more for specialist services). While consolidated and centralized healthcare systems may increase efficiency and service offerings within a region, they do little to overcome distance-related barriers to care for emergent, time-sensitive conditions [15].

Medicare has several special designations for rural hospitals (including sole community hospitals, Medicare-dependent hospitals, rural referral centers, and prospective payment system (PPS) hospitals). However, most are Critical Access Hospitals (CAHs), which the Centers for Medicare and Medicaid Services (CMS) designed to reduce the financial vulnerability of rural hospitals [16, 17]. To qualify as a CAH, the facility must be in a rural area or one treated as rural, have 25 or fewer inpatient beds, have an average length of stay (LOS) per patient of 96 or fewer hours, and be 35 or more miles from the nearest hospital. CAHs differ from other rural hospitals in that CMS reimburses them on a cost basis and provides opportunities for federal grants and other benefits, such as flexible staffing and the provision of swing bed services [17]. CAHs comprised 53.5% of rural hospitals in 2015 [10], but by 2019, they accounted for two-thirds of the nation's rural hospitals [17].

Thus, this review of rural hospital quality and loss of services included studies of CAHs, which are vital in meeting the needs of people living in underserved, rural, and vulnerable regions and understanding the impact of hospital closures [2, 17]. For closure statistics, the Cecil G. Sheps Center defines rural hospitals as nonfederal, short-term, general acute care hospitals operated as a CAH or those located in nonmetropolitan counties or rural-urban commuting areas type 4 or higher [8]. However, we recognize that definitions of "rural" vary widely, and that no consensus exists as to what constitutes rurality, as reflected in the U.S. Department of Agriculture's Data for Rural Analysis website [18]. Consequently, inconsistent definitions would possibly limit the generalizability of disparately defined studies within literature reviews. However, given that most rural hospitals are CAHs and are consistently defined by eligibility criteria, studies involving CAHs are possibly more comparable and generalizable.

The VPCM [1], developed by the nursing faculty at the University of California, Los Angeles, is a theory that describes the factors leading to the vulnerability of specific populations and predicts health outcomes as an offshoot of resource availability and altered relative risk [1, 19]. This circular, iterative model integrates socioeconomic (e.g., social determinants of health (SDOH)) and environmental resources (e.g., access to quality healthcare). Empirical health status metrics include mortality and morbidity. In contrast, relative risk measures include exposure to risk factors (e.g., smoking) and health behaviors, such as health services utilization (or lack thereof) and vaccination uptake. In the present context of hospital and emergency department closures, we examine the impacts of resource shifts on relative risks (e.g., timely utilization of health services) and health status indicators (i.e., resultant effects on health outcomes such as mortality).

The number of hospital closures and reduced access to emergency services for patients is well documented [2, 9, 20]. However, the impact of these closures on healthcare quality and outcomes is unclear and disparate. The primary aim of

this review is to synthesize the existing research about (1) hospitals' roles in providing high-quality healthcare resources in rural vulnerable communities and (2) the consequent impact of hospital and emergency department closures on relative risks for adverse outcomes and worsening health disparities compared with other populations. Given the VPCM's [1] proposed application to future research and public policy (see Figure 1), additional aims include informing upcoming studies of rural hospital closure effects at the state and county levels and informing impactful legislation and other policies to mitigate adverse outcomes.

2. Materials and Methods

Given the multidisciplinary nature of health services research, this literature review employed a modified integrative review method [21] and an organizational matrix [22] to facilitate the analysis. Integrative reviews broadly incorporate articles from diverse methodologies (experimental and nonexperimental designs) and various perspectives on a phenomenon (including theory development) [21]. We systematically searched for relevant primary source data from multiple sources, as described below. After screening the articles, the primary author organized the articles in a matrix [22]; each row contained a single article, and the columns comprised author/date, theoretical framework, research questions, methodology and sample characteristics, analysis and results, conclusions, limitations and strengths, score, and next steps for researchers to consider. The primary author reviewed the articles for this integrative review and deductively coded the data to identify common themes and gaps in the literature [21] using the VPCM framework [1]. Later, the second author reviewed the themes and proposed several changes. The two authors then resolved the coding differences through collegial discussion, comparing source materials.

2.1. Quality Scoring. Due to articles employing a wide range of empirical methods, this review used a simple data quality scoring system, as suggested by Whittemore and Knafl [21]. Accordingly, we assigned high or low scores for scientific rigor and data relevance. Given the nonrandomized, noninterventional style of the articles, we assigned a low score for rigor unless the authors explicitly overcame these and other limitations. For example, Gadzinski and colleagues [23] utilized an observational retrospective cohort method, so we assigned a low rigor score because of the study's multiple limitations, including the use of administrative data, the use of a somewhat limited and geographically asymmetrical subset of CAHs, and the use of charges instead of actual payments for their cost analysis. However, we assigned a high relevance score since these authors compared postsurgical mortality rates between CAHs and non-CAHs and explained why reduced payments to struggling rural hospitals could be more problematic than beneficial. Note that administrative data for use in health services research are gathered for billing and administrative purposes during patient encounters with the healthcare system and often do not fully reflect health outcomes or prognostic indicators [24]. These data are further limited by possible coding errors or selection bias [25].

Furthermore, we included articles about nonrural hospitals if the communities they served were vulnerable in other ways. However, we assigned a low relevance score to them. Articles were not omitted according to their scores, but those with low rigor or relevance contributed less to the final analysis.

2.2. Sampling. This review employed a structured, comprehensive, and transparent selective sampling of the literature [26], querying three databases—CINAHL, PubMed, and Scopus—in February and March 2020. The following search terms were used: TI ((hospital* OR (emergenc* AND department* OR room* or center* OR ward* OR facilit* OR service* OR ED OR ER))) AND TI ((closur* OR closing* OR shut* OR terminat* OR stop* OR "lack of access*" or "decreas* access")) AND AB ((county OR counties OR communit* OR region* OR rural)) AND AB ((death* OR mortalit* OR fatalit* OR morbidit* OR "loss of life")). Note that the last search terms listed align with the VPCM's health status metrics [1]. The initial literature search was limited to publication dates of 2010–2020 (to identify contemporary articles); however, many of the articles published in this timeframe (and included in the review) involved retrospective analyses of data dating back to the mid-1990s. Additional inclusion criteria were articles found in peer-reviewed journals and written in English. Ancestral sources identified from bibliographies [21] were also allowed. We assumed articles examining the closures of specific departments within hospitals (other than emergency departments) were beyond the scope of this review and excluded them from the analysis. However, the final dataset included studies examining the type of care and outcomes in existing facilities as they factor into resource availability and potentially affect health outcomes if their quality or accessibility shifts.

The final PRISMA search diagram (see Figure 2) reflects an initial yield of 164 articles. Twenty-three duplicates were removed. One hundred forty-one article titles and abstracts were then screened, 99 of which we removed for not fully meeting the inclusion criteria. Forty-two articles were further screened; 19 were removed, having met the exclusion criteria (international or nonresearch articles). In July 2021, we updated the dataset to include three additional articles identified from bibliographies and other sources. The final sample included two qualitative studies and 24 quantitative studies. Notably, one study [27] was available only as a conference abstract. Still, we included it, given its focus and implications for the research phenomenon.

3. Results

The authors stated theories and conceptual frameworks for three of the articles identified for this review [28–30]. These included Yamashita and Kunkel's [30] use of Andersen's classic behavioral model of healthcare, as well as Hsia and Shen's [28]

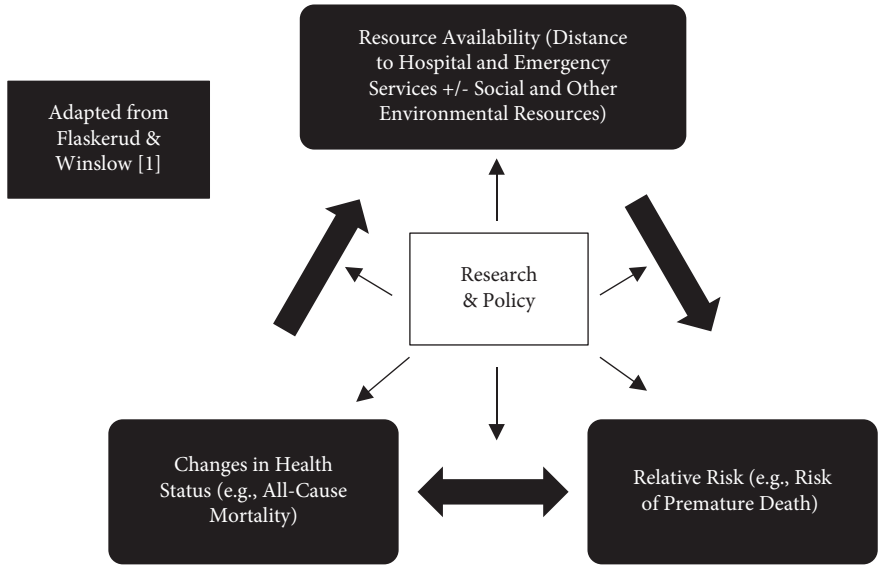

Figure 1: The VPCM [1], adapted for hospital and emergency department closures study.

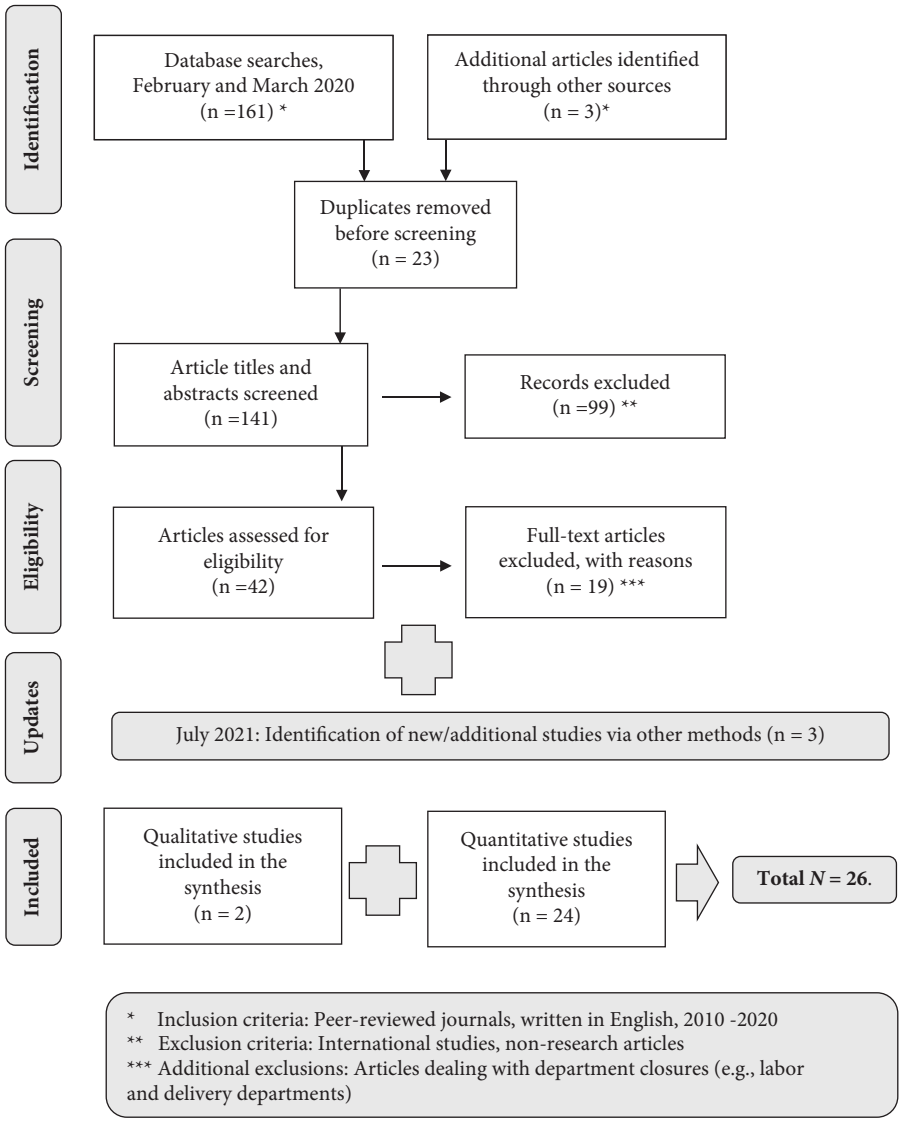

Figure 2: Search strategy (PRISMA) flowchart.

and Shen and Hsia's [29] use of study data to inform their development of conceptual frameworks to understand the effects of emergency department closures on patient care at bystander hospitals (the nearest available facility offering similar services) and the effects of delayed care. However, an implicit recognition of underserved and vulnerable populations was noted throughout the remaining 23 studies. In total, 17 studies examined the effects of access to care or the effects of hospital and emergency department closures or openings [6, 27–42]. Nine articles reported the comparative effects of health outcomes in hospitals and emergency departments based on facility type (e.g., rural vs. non-rural, CAHs vs. non-CAHs) [23, 43–50]. See Table 1 for a summary of papers, including quality scores. Because most CAHs exist in rural areas, we classified them as rural for this analysis.

Twenty-three quantitative studies employed retrospective designs, often using large datasets and incorporating large sample sizes [6, 23, 27–35, 39–50]. On the lower end, one study comprised 1,438 survey respondents [36], while another assessed age-adjusted heart disease mortality in 88 counties (although these counties represented more than 11 million residents) [30]. On the upper end, one study assessed hospital closure effects on 32,485,906 Medicare beneficiaries in 2,847 hospital service areas [6], while another involved 66,585,996 weighted patient years for 11,581 beneficiaries [44]. As expected, the two qualitative studies had smaller sample sizes, one with 16 key informants and 44 focus group participants [37] and the other with 37 focus group participants [38]. One quantitative study [41] utilized prospective optimization modeling and retrospective analyses. Alternatively, another quantitative study involved a descriptive survey of patients affected by hospital and emergency room closures [36]. Ten studies employed geographic information systems, zip codes, and census data to compute drive times or other spatial effects on outcomes [28–34, 39–41]. The two studies by Romero et al. [36, 37] were reported separately as part of a more extensive mixed-methods study, so we analyzed the quantitative and qualitative manuscripts separately. Individual quantitative and qualitative articles were weighted equally in this analysis.

As the review proceeded, commonalities reflecting the concepts of the VPCM were noted across the studies' dependent variables (DVs), independent variables (IVs), and covariates (CVs). Most of the IVs reflected resource availability or relative risk [6, 23, 28–35, 39–41, 45–50], while the DVs reflected health status in terms of mortality and morbidity [6, 23, 27–30, 33–35, 39, 43–46, 48–50], LOS [6, 23, 43], readmission rates [6, 28, 45, 46, 50], overall cost [6, 23, 45], and other adverse events. However, one study [42] assessed the impact of changing hospital resources on the availability of other resources, namely, physician supply. Mortality rate metrics were either disease- or procedure-specific deaths or all-cause mortality. CVs most often reflected relative risk metrics (i.e., demographics, diagnoses, or SDOH) [6, 23, 29, 30, 33–35, 39, 42, 43, 46–50]. Timelines for retrospective reviews of hospital and emergency department closures most often included data from the late 1990s to 2016 [6, 27–31, 33–38, 42]. Two studies from the updated sample examined more recent data [40, 41].

After reviewing the purpose and findings of the included studies, we identified two overarching themes from the data: (1) association of rural hospital care and patient health outcomes and (2) access to hospital care-effects of closures and openings on rural vulnerable populations. Subthemes framed according to the VPCM constructs follow below.

3.1. Theme 1: Association of Rural Hospital Care and Patient Health Outcomes. We found that many articles focused on rural hospitals' health outcomes. Most articles revealed favorable effects, but several noted unfavorable outcomes. If these institutions provide high-quality (or acceptable-quality) care, commensurate with the VCPM [1], the loss of these facilities would adversely affect the health outcomes of the people they serve. This effect may be magnified since many rural communities lie in remote areas with "backup" facilities an unacceptable distance away.

3.1.1. Favorable Outcomes. Much of the data regarding the quality of rural hospitals and CAHs are favorable. Ibrahim and associates [45, 46] and Gadzinski and colleagues [23] found that CAHs performed better or comparably compared with non-CAHs in postsurgical inpatient mortality rates, serious complications, and LOS. Furthermore, Natafgi et al. [47] found no significant difference between CAHs and comparably sized PPS non-CAHs in four states (Colorado, North Carolina, Vermont, and Wisconsin) on surgical patient safety indicators. The findings were not without caveats. These researchers found higher rates of reoperation and readmissions and higher costs for specific procedures at CAHs [23, 45, 46]. The authors concluded that CAHs provide quality surgical care to underserved patients in remote and rural locations but that these facilities may benefit from additional resources for postoperative care [23, 45–47].

In addition, patients stabilized at CAHs before their transfers to Level I trauma centers tended to fare better than those transferred directly to Level I trauma centers [43]. Thus, the researchers concluded that CAHs fill gaps in rural coverage and may reduce unnecessary transfers to Level I trauma centers for less severe injuries and illnesses, potentially accruing significant savings to the healthcare system.

3.1.2. Unfavorable Outcomes. On the other hand, Joynt et al. [49] and Joynt et al. [48] studied quality indicators of large numbers of CAHs and non-CAHs for acute myocardial infarction, congestive heart failure, and pneumonia. Across all three diagnoses, 30-day mortality was significantly greater in CAHs than non-CAHs. However, the absolute differences were relatively small (1.8% in Joynt et al. [48]), with the authors concluding that CAHs serve the vital purpose of providing access to care for rural and underserved communities. However, quality enhancements are needed [48, 49].

Similarly, in 2006, Lichtman et al. [50] found that the 30-day risk-stratified mortality rate was significantly higher for ischemic stroke patients at CAHs. However, the 30-day risk-stratified readmission rate was lower in CAHs vs. non-

Table 1: Summary of studies.

Author/year	Focus	Geographic area	Study design/sample	Quality score: rigor/relevance (high or low)
Comparisons of care provided				
Gadzinkski et al. (2013)	Differences in utilization and outcome measures between CAHs and non-CAHs for patients undergoing the eight most performed CAH surgical procedures between CAHs and non-CAHs	The U.S.	Retrospective cohort study (2005 to 2009) $n = 1282$ CAHs and 3612 non-CAHs, representing 6,587,713 surgical admissions	Low/high
Ibrahim et al. (2016)	Differences in surgical outcomes and costs for patients treated in CAHs vs. non-CAHs	The U.S.	Cross-sectional retrospective review $N = 1,631,904$ MCR beneficiary admissions; CAHs $n = 828$, non-CAHs $n = 3676$	Low/high
Ibrahim et al. (2018)	Differences in mortality, serious complications, reoperation, and readmission for patients undergoing emergency colectomies performed at CAHs and non-CAHs between 2009 and 2012?	The U.S.	Cross-sectional retrospective correlational study $n = 219,170$ patients who underwent urgent or emergent colectomies	Low/high
Johnston et al. (2019)	Rural, micropolitan, and metropolitan access to primary care, specialists, and hospital beds	The U.S.	Retrospective time-series design, using CMS fee-for-service data $n = 66,585,996$ weighted patient-years in the final sample. 9.6% rural, 17.6% micropolitan, 72.8% metropolitan. This sample represented 11,581 unique beneficiaries	Low/high
Joynt et al. (2011)	Comparison of the quality of care at CAHs vs. non-CAHs for three common diagnoses (AMI, CHF, and pneumonia). Identify what contributes to differences in the quality of care between the two types of hospitals	The U.S.	Retrospective observational study using Hospital Quality Alliance data (2008 to 2009) $n = 4738$ hospitals (1268 CAH; 3470 non-CAH) and 2,351,701 index admissions for AMI, CHF, & pneumonia	Low/high
Joynt et al. (2013)	Comparison of 30-day mortality for AMI, CHF, and pneumonia in CAHs vs. non-CAHs and rural CAHs vs. rural non-CAHs (from 2002–2010). Identification of the resources those are associated with improvement.	The U.S.	Retrospective observational study using data from MCR FFS patients CAH hospitals ($n = 860$ in 2002 and 1264 in 2010). Non-CAH ($n = 3108$ in 2002 and 3255 in 2010). AMI: $n = 1,902,586$ admissions; CHF: $n = 4$, 488,269 admissions; pneumonia: $n = 3,891,074$	Low/high
Lichtman et al. (2012)	Differences in 30-day mortality and 30-day readmission rates (both risk-standardized for ischemic stroke patients) at CAHs vs. non-CHAs in 2006	The U.S.	Retrospective review of MCR data (2006) $n = 4546$ hospitals (1165 CAHs and 3381 non-CAHs) and 310,381 ischemic stroke discharges (10,267 from CAHs; 300,144 from non-CAHs)	Low/high
Natafgi et al. (2017)	Surgical patient safety outcomes in CAHs in comparison to comparably sized PPS rural hospitals in a four-state analysis	Colorado, North Carolina, Vermont, and Wisconsin (<8% of CAHs in the U.S.)	Retrospective review of HC-UPSID and AHA annual survey data $n = 35,674$ discharges (14,296 from 100 CAHs and 21,378 from 36 small PPS hospitals)	Low/high

Table 1: Continued.

Author/year	Focus	Geographic area	Study design/sample	Quality score: rigor/relevance (high or low)
Windorski et al. (2019)	Differences in ICU LOS, ventilator requirements and duration, hospital LOS, and mortality for trauma patients treated initially in a CAH ED vs. those initially transferred to a level 1 trauma center	The U.S.	Retrospective correlational study using chart review data (2009–2014) $n = 1478$ patients; 73.3% transferred from CAH, 26.7% transported directly to level 1 trauma center	Low/high
Analyses of hospital closures and openings				
Anderson et al. (2019)	How the expansion of trauma care centers in N.M. has translated into improved access to trauma care services at the population level and the characteristics of those with access to care	New Mexico	Retrospective cross-sectional analysis using spatial data at the census block level, 2007–2017 $n = 2{,}082{,}669$ general population	High/low
Burkey et al. (2017)	How hospital closures based upon optimization models differ from actual closures (2001–2015); whether short-term optimization models are stable over time; how recommended closures affect service equity/equality; and whether recommended closures disproportionately impact rural communities	North Carolina, South Carolina, Virginia, and Tennessee	GIS-informed optimization modeling design using AHA and Census Bureau Data $N = 4$ states	High/high
Busingye et al. (2011)	The changes in spatial and temporal disparities in access to emergency cardiac and stroke care that occurred in Middle Tennessee from 1999 to 2010	Middle Tennessee	Retrospective network analysis and two-way comparison design $n = 30$ counties, 250 census tracts, and 1.2 million people	High/high
Countouris et al. (2014)	The impact of a community hospital closure on older adults in a suburb of Pittsburgh	Pittsburgh, PA	Qualitative focus group study (2010–2012) using a community-engaged research process $n = 37$ participants	High/low
Crandall et al. (2016)	The effect of the closure of L.A.'s MLK trauma center on the distribution of admissions to nearby trauma centers and the impact of the closure on mortality rates in these centers and within L.A. County	Los Angeles, CA	Retrospective observational study involving nonpublic patient-level data from the state of California, 1999–2009 $N = 37{,}131$ trauma patients	Low/low
Germack et al. (2019)	The relationship between rural hospital closures and the supply of physicians following a closure	The U.S.	Retrospective design, assessing rural U.S. hospitals that experienced at least one closure, 1997–2016 $n = 1541$ rural counties over 20 years; equated to 30,820 county-years	Low/high
He et al. (2017)	The effect of time to definitive care on patient outcomes after the closure of trauma centers	Uncertain	Chart review; pre- and postevent design, 2008–2009 and 2011–2013 $n = 27{,}843$ patients	Low (not enough information–conference abstract)/ low
Hsia & Shen (2011)	The populations most affected by the rising rate of hospital trauma center closures (2001–2007)	The U.S.	Retrospective correlational design $n = 31{,}475$ zip codes covering 283 million people	Low/high

Table 1: Continued.

Author/year	Focus	Geographic area	Study design/sample	Quality score: rigor/relevance (high or low)
Hsia & Shen (2019)	Patient outcomes (in AMI patients) at bystander hospitals (high and nonhigh occupancy) when a nearby E.D. opens or closes	The U.S.	Retrospective time-series probability and fixed effects design $n = 1{,}143{,}745$ patients across 3720 hospitals (1209 of which were high occupancy)	High/high
Joynt et al. (2015)	Characteristics of hospitals that closed between 2003 and 2011, the effect of closures on mortality and readmission rates, and whether outcomes varied by the acuity of medical condition or rurality	The U.S.	Retrospective correlational design, using MCR data, 2003–2011 $n = 32{,}485{,}906$ MCR beneficiaries, 195 hospital closures, and 2847 hospital service areas (184 w/ closures)	High/high
Liu et al. (2014)	How California E.D. closures (from 1999-2010) affected inpatient mortality rates at nearby hospitals	California	Retrospective analysis, using C.A. Office of Statewide Health Planning and Development's Hospital Annual Utilization data from 1999-2010 $n = 16{,}246{,}892$ admissions to CA hospitals via ED	High/high
McCarthy et al. (2021)	The impact of rural hospital closures (2010–2019) on the proportion of the population that can reach a hospital or E.D. by road within 15, 30, 45, and 60 minutes	The U.S.	Retrospective GIS-informed isochrone design, using U.S. Census Bureau population data (2010) and Provider of Services (hospital location) CMS data (2010–2019) $n = 9$ Census Bureau divisions, 48 contiguous states, and the populations therein	High/high
Rhudy et al. (2016)	Effects of delayed interventional cardiology access and social factors associated w/excess ACS, NSTEMI, or STEMI mortality	Maine	Retrospective population-based secondary analysis of census and CMS claims data overlaid on a GIS-derived base map for 2013 $n = 3126$ ACS cases meeting inclusion criteria (2247 NSTEMI; 879 STEMI)	Low/high
Romero et al. (2012)	The impact of the 2010 closure of St. Vincent's Catholic Medical in Lower Manhattan on patients, community, and healthcare providers	New York, NY	Community-based participatory qualitative approach, using key informants and focus groups $n = 16$ key informants and six focus groups (44 group participants)	High/low
Romero et al. (2012)	The impact of the 2010 closure of St. Vincent's Catholic Medical in Lower Manhattan on patients, community, and healthcare providers	New York, NY	Descriptive survey study with both closed and open-ended questions $n = 1438$ respondents (local service providers and residents)	Low/low
Shen & Hsia (2012)	Effects of increased drive times to the nearest E.D. on mortality rates, the health profile of the patients, and long-lasting outcomes of patients experiencing AMI	The U.S.	Retrospective observational difference-in-differences design, using American Hospital Association and MedPAR data, 1996–2005 $n = 1.49$ million patient-year observations	High/high
Yamashita & Kunkel (2010)	The relationship between age-adjusted heart disease mortality and distance to a hospital, adjusted for social factors such as poverty, education, and insurance coverage	Ohio	Retrospective spatial analysis, using U.S. Census Bureau and Ohio Department of Health data for the year 2000 $n = 88$ Ohio Counties (representing >11 million residents in 2000)	High/high

CAHs. Low-volume non-CAHs had similar 30-day risk-stratified mortality rates to CAHs, pointing to low patient volume, reduced CAH resources, and patient characteristics not accounted for in this study, possibly affecting the findings.

3.2. Theme 2: Access to Hospital Care—Effects of Closures and Openings on Rural Vulnerable Populations. As theorized by the VPCM [1], resource availability differences influence health outcomes. Accordingly, the second theme derived from the data comprises the differences in health status between areas with full access to hospital and emergency care and those without access to needed services. According to Johnston and colleagues [44], variances in hospital beds per 1,000 people in the hospital service area were associated with significant differences in mortality rates. Access to care factors accounted for 89% of the probability of preventable hospitalization and 32% of mortality differences between urban and rural residents.

The closure of hospitals and emergency departments disproportionately affects low-income and minority populations. Vulnerable populations, particularly impoverished and African American communities, were 32% more likely to face increased drive times of more than 30 minutes than more affluent communities [31]. Communities with medium and high uninsured rates experienced an increased likelihood (69% and 55%, respectively) of facing 30-minute-plus increased drive times compared to communities with low uninsured rates. Rural communities were at a higher risk of experiencing increased drive times than urban areas. Emergency department closures affected only 11% of the population from 1996 to 2005, but affected communities were more likely to be rural [29]. In addition, decreased access to hospital care increased the vulnerability of rural populations (with extant income and education deficiencies) to medical and social disparities [44] compared to urban populations and further decreased access to other needed care, especially physician services [42].

In nonrural areas, vulnerable populations may also suffer from the loss of hospital and emergency services. Romero et al. [37] conducted a qualitative study that asked participants how the closure of St. Vincent's Catholic Medical in Lower Manhattan (an urban inner-city vulnerable community) affected patients, the community, and healthcare providers. The researchers learned that the closure had a magnified effect on vulnerable patients, particularly those unable to travel to the nearest hospital facility. Countouris et al. [38] found that older adults in a Pittsburgh suburb experienced feelings of abandonment, fear, frustration, and isolation, encountered transportation challenges, and lacked knowledge and literacy about obtaining healthcare after their nearby community hospital closure.

3.2.1. Human Capital and Vulnerable Populations. Human capital and other SDOHs associated with vulnerability also appear to factor into these adverse outcomes. For instance, Yamashita and Kunkel [30] found that a significant relationship between distance and heart disease mortality did not hold after controlling for rurality, poverty, African American status, uninsured rates, and lack of access to a private vehicle. Similarly, Rhudy et al. [33] found that certain SDOH associated with rural disparities (age, education, income, and insurance status) had a more significant impact on acute coronary syndrome-related mortality than the distance from the interventional cardiac care facility.

3.2.2. Relative Risk Associated with Time-Sensitive Events. The VPCM theorists suggest that resource availability affects relative risk in terms of exposure to risk factors and health behaviors, and these factors ultimately influence health status and outcomes [1]. Travel time (i.e., timely accessibility) to hospital and emergency care may be a surrogate for the relative risk associated with inadequate care utilization for treatment of time-sensitive conditions.

Researchers are becoming increasingly interested in the effects of travel time adjustments on geographic access to care and, in some instances, health outcomes [30, 31, 33, 39–41]. Burkey et al.'s optimization models [41] indicated that up to one-third of Tennessee, Virginia, and Carolina (North and South) hospitals could close (to reduce potential service redundancy) without adversely affecting travel times. However, travel times were expected to increase dramatically beyond the one-third closure threshold. McCarthy's team [40] found through their isochrone examination of hospital closures nationwide (2010–2019) that most affected residents did not lose services within a 60-minute drive (note that isochrone studies map areas accessible from points within a certain time threshold). The study did not account for the hospitals lost since 2019 or the loss of specific services (e.g., obstetrics) at the remaining hospitals.

Other research confirmed that rural communities are at high risk of experiencing increased travel times [31] due to hospital closures. Undue travel time (greater than 30 minutes) increased 180-day, 1-year, and 3-year mortality rates by up to eight percentage points [29]. Moreover, travel times exceeding 30 minutes translated into significant long-term adverse effects on acute myocardial infarction patients who consequently received treatment at nearby high-occupancy bystander (the next closest) emergency departments [28].

Busingye et al. [39] found that the communities furthest away (greater than 90 minutes) from cardiac and stroke units had higher mortality risks than those within shorter travel distances. While Rhudy et al. [33] found no significant increases in acute coronary syndrome-related mortality for driving times over 60 minutes after adjusting for age, it is important to note that their analysis did not include patients who died before reaching an interventional cardiac facility, only those who experienced in-hospital mortality.

3.2.3. Missing the Benefits of Expanded Access. Of interest, recent hospital openings often did not benefit vulnerable populations [28, 32, 39]. For instance, a concerted effort to expand trauma center access in New Mexico successfully achieved a 20.8% increase in access to trauma care from 2007

to 2017 [32]. However, most of the improved access occurred in suburban communities. Access improvements were less likely to reach rural communities and American Indian reservations. In addition, Busingye et al. [39] found that while Middle Tennessee geographic access to specialized cardiac and stroke care within 30 minutes increased from 1999 to 2010, rural areas and those in socioeconomically disadvantaged neighborhoods were less likely to see improved access to care and more likely to have no access to stroke care within 90 minutes of travel. Conversely, cardiac patients exposed to decreased travel times of less than 30 minutes resulting from emergency department openings (more likely in urban and suburban areas [39]) were more likely to receive timely percutaneous coronary intervention and better 30-day mortality rates [28].

3.3. Health Outcomes. Declining resources and subsequent increases in relative risk could potentially worsen health outcomes, according to the VPCM [1]. While closures result in increased volume at the remaining facilities that may improve outcomes (by increasing providers' experience in treating certain conditions [50]), there may also be adverse effects due to changes in volume and patient mix. For instance, drive time increases of 30-plus minutes among high-occupancy bystander emergency departments accounted for a significant increase in one-year mortality rates and 30-day readmission rates for patients with acute myocardial infarction [28]. Also, Crandall et al. [34] noted that upon the closure of Los Angeles' Martin Luther King Jr. Trauma Center (which served vulnerable inner-city patients), admissions increased in three of four nearby trauma centers. Payer mix shifted significantly in these facilities, and while overall mortality did not increase, a significant number of deaths attributable to gunshot wounds did. Romero et al. [37] also found that patient participants were negatively affected by long waits and overcrowding at bystander hospitals and emergency departments when nearby hospitals closed.

4. Discussion

Our purpose in conducting this integrative literature review was to synthesize the existing research about care quality in rural hospitals and emergency departments and the effects of their closures. We found that much of the literature addressed the quality of care delivered in these facilities and the closures' effects on vulnerable patients and communities. Accordingly, we discuss the implications for access to care, SDOH, health disparities, and policy with a vulnerability focus.

4.1. Impact of Hospital Closures on Rural Vulnerable Populations' Health Disparities. Vulnerable populations are those social groups with elevated susceptibility to harm, neglect, or poor health outcomes [1, 51], a definition fitting many modern rural populations. Kilbourne and colleagues [52] incorporate a similar definition of vulnerable groups in their health services research framework, emphasizing the resultant gaps in health status or healthcare quality. Not all rural residents are vulnerable. Still, from the population-based perspective that we took in this analysis, the current hospital closure trend and subsequent shifts in access to care (confirmed in these articles) threaten rural vulnerable peoples who experience higher levels of chronic disease and premature death [53], lower socioeconomic status, and poor access to other essential health services such as primary care [42, 54]. Urban communities that suffer similar socioeconomic and environmental challenges may be similarly vulnerable (thus, we also evaluated and scored the few resulting articles that assessed urban vulnerable community hospital closures). However, given that alternative resources and supports may be out of reach and unattainable [12], the isolation of rurality often magnifies the effects of poverty and vulnerability.

Rural populations have higher mortality rates than their urban counterparts, particularly in the Southeastern United States [55, 56]. However, Gong et al. [56] concluded from their state-level analysis that if rural residents had a similar socioeconomic status and the same access to healthcare that urban populations do, the rural residents would have lived longer. Consequently, decreases in care access (confirmed by several study authors [31, 40] in this review) may ultimately exacerbate health inequities and poor outcomes [28, 29] in rural vulnerable communities [15, 57]. Hospital closures may trigger a downward spiral of detrimental effects related to worsening economies and SDOH, as counties lose an average of 300 jobs and see a decline of $1,400 (in 2018 dollars) in per capita income when their only hospital closes [20]. Considering SDOH's role in health outcomes [30, 33], further socioeconomic degradation in response to hospital closures will likely advance health disparities.

As noted above, the closure of hospitals and emergency departments disproportionately affects low-income and minority populations [29, 31]. For example, over six years (2012 to 2018), the median distance to emergency services increased by 20.9 miles and to drug and alcohol addiction services by 39.1 miles for rural residents living in closed hospital service areas [9]. In addition, decreased access to care increases the vulnerability of rural populations to medical and social disparities (compared with urban populations) associated with lower incomes and lower educational attainment [44]. It also leads to personal and community senses of loss and hopelessness [38, 58].

Rural hospital closures have lesser-known consequences. Decreased competition among the remaining hospitals means lower quality of care and higher prices [59]. Hence, hospital closures may result in growing health disparities for rural patients (compared with urban patients) through this indirect but significant pathway. However, if patients steer to hospitals with sufficient volume, the quality of care may improve for specific procedures [50], so long as patient volume and drive time are not excessive [28].

4.2. Part of a More Extensive Network. Rural hospitals are part of a more extensive care network; thus, their status affects others in the healthcare system. For instance, patient

stabilization at CAHs contributed to reduced mortality and LOS at Level 1 trauma centers [43], while potentially reducing unnecessary transfers to higher levels of care and associated costs. Bed-to-population ratios (whose declines influence the broader system's ratios) affect patient outcomes in those with complex chronic illnesses [44], while rural hospitals affect system-wide competition, quality, and costs [59]. Notably, hospital closures (rural and urban) may affect patient experiences and outcomes at bystander hospitals [28, 37].

4.3. Policy Interventions. Correcting the health and healthcare inequities seen among rural populations, including the closure of rural hospitals, involves elucidating underlying causes through research and addressing the causes through public and organizational policy interventions that address systemic barriers from which disparities arise. We use the four domains of the VPCM Model to organize a discussion of select policy interventions.

4.3.1. SDOH. The socioeconomic status of patients and communities, often disparate in rural and vulnerable communities, influences health [53]. The 2019 U.S. poverty rate was 15.3% in rural areas, compared to 11.9% in urban areas of the country [60]. Similarly, in 2019, 13.6% of the nation's rural residents had not completed high school compared with 11.7% of urban dwellers. These differences contribute to health inequities and disparities. According to the Healthy People 2030 initiative [61], policymakers should take action to improve the upstream elements (apart from healthcare delivery) that indirectly impact health by enhancing housing, transportation, education, work environments, air quality, nutritional food accessibility, and physical activity opportunities. These enhancements are requisite to reduce disparities in rural vulnerable communities.

Improved health equity depends on building income and wealth among rural and other vulnerable populations. Measurement of the contribution of health determinants to health outcomes included in the County Health Ranking Model shows that social and economic factors have the greatest impact on health outcomes, 40% when compared to 30% for health behaviors, 20% for clinical care, and 10% for the physical environment [62]. There is a linear relationship between income and health. Greater income equates to better health. The relationship between economic status and health is bidirectional [63, 64]. In addition to the linear relationship between health and wealth, there is a relationship between health and income inequality. The more significant the gap between the lowest and the highest wage earners, the poorer the health outcomes among vulnerable people, and the greater the difference in outcomes when compared to advantaged people. The unhealthiest countries have the greatest income inequality [64, 65]. Note that there is a difference between wealth and income. Wealth refers to "the monetary value of all possessions or assets" ([66], p. 2), while income is a measure of earnings during a specified time period. As such, income is a limited reflection of a person's economic resources when compared to wealth, but measuring income is easier [63, 67].

Economic policy is health policy [68]. Economic development in rural areas is necessary to reduce health and healthcare disparities and advance health equity. Economic development alone is not sufficient. Equity in rural areas requires addressing systemic and institutional policies in education, housing, banking, and justice systems that are unjust and create economic and other barriers. The Aspen Institute's Thrive Rural Framework [69] aims to dismantle discrimination based on "place (size or location of the community), race (racial, immigrant, or cultural identity), and class (wealth or income)" (p. 3) to achieve equitable rural prosperity (including health, economic development, environmental stewardship, and civic engagement). The Aspen Institute Framework aligns well with the Robert Wood Johnson Foundation Culture of Health Model [70]. The critical difference is focus. The Aspen Institute Framework is centered on rural prosperity to which health contributes, whereas the RWJF Model is focused explicitly on health and the social drivers of health. Both are needed, and the distinctions matter when soliciting support and developing improvement strategies.

Federal and other governmental policies could be used to address income and wealth inequality in several ways. Strategies to consider are cash and income support for individuals experiencing poverty, minimum wage increases, tax code changes, and support for social programs [71].

4.3.2. Quality Assurance. Researchers who found that CAHs fell short of non-CAHs in several studies point to the need for quality improvement programs to better serve patients in rural and underserved communities [48–50]. These may be enacted at the federal, state, and local levels. Furthermore, state hospital associations [54] and the Bipartisan Policy Center Rural Health Task Force [57] propose alternative delivery models (including telehealth) to bolster quality in these communities.

Reimbursement is frequently used to change hospitals' policies, processes, and practices to improve the quality of care. CMS promotes improved patient outcomes and manages the cost of care through value-oriented and value-based reimbursement strategies. Because of the unique circumstances encountered by CAHs, many do not participate in CMS Prospective Payment Systems and, therefore, are not compelled to participate in CMS-mandated quality improvement programs. As CMS continues the shift to value-based payment, it is expected that CAHs will be required to report quality data and be reimbursed based on quality metrics [72].

4.3.3. Innovative Healthcare Delivery Systems. Alternative delivery models can potentially improve care quality and better meet the needs of 21st-century rural vulnerable populations. Telehealth holds promise for bridging access gaps by bringing patients and providers closer together through technology [73]. Provider visits are a cornerstone of telehealth. Still, the technology also links patients to essential monitoring for chronic health conditions to improve patient safety and quality of life while reducing hospitalizations [74].

Telehealth strategies may also bring providers closer, opening the door for expert provider-to-provider consultations. However, all telehealth requires connectivity, and policymakers must ensure that broadband internet services are available and affordable [73, 74].

Home-based care is an evolving concept that includes familiar delivery models, such as traditional home healthcare and newer models. Home-based care initially focused on nonmedical assistance for activities of daily living, short-term nursing care, and rehabilitation following a hospital or other facility stay [75]. Home-based care has evolved to include hospital-type care and urgent care. The newer models could be used to address challenges associated with rural hospital closures. One promising delivery innovation is the hospital-at-home model [76]. Although not a new concept (Johns Hopkins trademarked a home hospital program in 2002), some health systems are revisiting this option for delivering acute hospital care for appropriate patients, especially in the age of telehealth [77]. Another variant, urgent care at home, is being offered by independent in-home medical companies [78].

Not all patient conditions are suitable for home hospital or urgent care. Still, the model has succeeded with patients requiring pneumonia, dehydration, heart failure, and COPD exacerbation treatments. One challenge in making this program viable in the U.S. is reimbursement. Traditional Medicare does not pay for acute fee-for-service patient care outside of hospital settings [77]. However, the COVID-19 pandemic is changing this scenario, as the hospital-at-home scheme has started to change what Medicare qualifies as allowable locations for acute treatment delivery [76, 77]. Some Medicare Advantage plans do cover home-based hospital and urgent care [75].

Intended to reduce the need for hospital and emergency care, integrated community health centers that deliver patient-centered primary, behavioral, dental, substance use disorder, and, sometimes, urgent care are more than a half-century old but are gaining traction [79]. Most often found in rural communities, HRSA's Health Center Program centers care for more than triple the number of patients now than in 2000. These community health centers may be federally qualified health centers (FQHCs) if they receive federal funding, but the essential requirements are community and patient governance, healthcare services at reduced rates in underserved communities, and meeting clinical quality measures [79, 80].

4.3.4. Hospital Funding. Rural hospitals close for multiple reasons, but the primary reason is underfunding [9, 13, 20, 58, 59, 81]. Financial shortfalls result from numerous factors, including low-income populations [11], a more significant number of individuals who are uninsured or lack employer-based insurance coverage [82], lower patient volumes [59, 81], aging populations [11], outdated payment and delivery systems, and health technologies, which are expensive and reduce the need for lucrative inpatient services [20]. Furthermore, some community hospitals suffer from a bypass effect, occurring when patients (presumably with more resources) leave the community to seek care at hospitals outside of their communities [20]. These factors culminate in hospitals' inability to survive, and closures ultimately reduce both potential and realized access to care [83] if not followed by measures to mitigate the losses [13, 54].

The Bipartisan Policy Center [84] concluded that a systems approach is needed to address the financial and other problems CAHs face. Four points are emphasized to enhance the viability of CAHs, including: (1) not every community needs a CAH; in some communities, a small inpatient center or rural emergency center may be more appropriate; (2) funding should align with community characteristics, including low inpatient volumes; (3) workforce adjustments, including use of nurse practitioners and physician assistants operating to the top of their license, in-home providers, case managers, and decreased reliance on solo primary care physicians are needed; and (4) telehealth should be expanded.

Supporting CAHs includes addressing uncompensated care and the availability of healthcare coverage. Medicaid Expansion addresses both uncompensated care and access to healthcare coverage [85, 86]. In addition, Medicaid Expansion improves the financial performance of hospitals [13, 87]. Decreasing the practice of bypassing rural community hospitals in favor of larger regional hospitals is also essential and can be conceivably addressed by collaborations between CAHs and other rural hospitals and regional health centers.

5. Future Research

Many studies in this integrative review did not employ causal inference designs or ascertain the varying effects of hospital closures on different types of rural communities (e.g., those with varying economic status). While this integrative review required an aggregate, population perspective, future studies quantifying the effects of socioeconomic stratification through quantile regression could aid researchers in discerning which subpopulations are at the greatest risk of poor outcomes when hospital and emergency care resources disappear. Furthermore, most studies were observational (see Table 1), and many did not examine the impact of confounding factors, such as SDOH, health behaviors, space, and time. Consequently, future research should explore causal relationships between hospital closures and poor health outcomes through difference-in-difference or modern group matching methods [88] while accounting for confounding factors. Furthermore, using Rural-Urban Commuting Codes (RUCC) in future research would be a good way to determine rurality to improve the generalizability of studies and when determining future policy.

6. Conclusion

Rural hospitals provide vital access to care in rural and underserved communities. Nevertheless, hospital closures are more likely to affect rural communities with enduring

disparate health outcomes. As hospitals close, travel times increase cumulatively, reduce access to care, and, in turn, increase the risks associated with time-sensitive health events. Ultimately, the loss of rural hospitals may also increase mortality and morbidity in vulnerable communities and the overall health system through interrelated effects on bystander hospitals, the availability of healthcare providers, individual and community socioeconomic status, and community well-being. Consequently, policymakers should work to improve SDOH, ensure the quality of care at the remaining hospitals, promote alternative healthcare delivery systems, and enhance funding for care delivery. Future research should better establish the causal relationships behind declining access to care and health disparities and ascertain hospital closures' health outcomes effects on communities of varying socioeconomic status.

Data Availability

The data supporting this integrative literature review are from previously reported studies and datasets, which have been cited at relevant places in the text.

Additional Points

Key Messages. (1) Hospital closures are more likely to affect rural communities with extant health disparities despite facilities providing vital access to essential services to these often-underserved communities. (2) Ultimately, the loss of hospital and emergency care in rural vulnerable communities may increase mortality and morbidity in affected populations and the overall health system through the interrelated effects on the remaining hospitals, healthcare provider availability, community well-being, and social determinants of health. (3) This review article illustrates the need for policymakers to ensure care quality at the remaining hospitals, promote alternative healthcare delivery in affected communities through sustainable funding and other supports, and improve the social determinants of health.

Disclosure

The content is solely the responsibility of the authors. It does not necessarily represent the official views of the Sigma Theta Tau International Honor Society of Nursing or the University of Tennessee, Knoxville.

Conflicts of Interest

The authors declare that there are no conflicts of interest. The co-authors were faculty members of the corresponding author's dissertation committee.

Authors' Contributions

The primary (corresponding) author was involved in the conception, design, data retrieval, analysis, interpretation, manuscript drafting, critical revision of intellectual content, and final approval of this submission. The second author was involved in the submission's design, data interpretation, critical appraisal and revision of intellectual content, and final manuscript approval. In addition, the third author contributed to the manuscript's conception and discussion section, critically appraised the intellectual content, and revised and approved the final manuscript. The three authors agree to be accountable for all aspects of this work and ensure that questions related to the accuracy and integrity of the work are investigated and resolved.

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