

The Relationship Between Rural Setting and Health: Factors that Influence Individuals With or at Risk of CVD

A Summary of the Literature

Introduction

The sixty million Americans living in rural areas face significant health disparities due to a number of unique challenges associated with where they live.¹ Risk factors including poor diet and comparatively low rates of physical activity among individuals in rural communities are associated with a number of negative health effects, including cardiovascular outcomes.^{2,3}

Unfortunately, rural residents often have limited access to healthcare services to address cardiovascular and other health concerns. A scarcity of primary and specialty care providers, long travel distances to services, and unreliable transportation together create an environment in which individuals often do not receive the care necessary to maintain optimal health.^{4,5,6,7} Economic burdens like lack of insurance among rural residents, large upfront costs for care, and higher rates of unemployment make health care more difficult to afford.^{8,9} In addition, research suggests there may be reluctance among rural residents to seek health care due to concerns about stigma and confidentiality.¹⁰

Given this reality, it is unsurprising that rural populations also bear a disproportionate burden of disease and disease risk. Individuals in rural areas have high rates of obesity, cardiovascular disease (CVD), and stroke.^{11,12} They are also more likely to die from drug overdose than their urban counterparts.¹³

Nevertheless, there are promising initiatives that stakeholders are undertaking to confront poor health outcomes in rural communities. These include improving access to care via traditional providers^{14,15}; supporting the work of non-traditional providers^{16,17,18}; and promoting telehealth to bolster access to clinical services.^{19,20, 21}

Understanding the specific challenges facing rural communities is critical in guiding policy related to cardiovascular health.²² This review describes the current literature on rural health challenges and opportunities, focusing on cardiovascular risk due to obesity and other risk factors; diminished rural access to healthcare services; rural healthcare workforce shortages; telehealth and broadband internet; and the growing rural impact of the substance use disorder epidemic.

What are rural areas?

While there is no single definition of “rural” in the United States, the term generally describes areas with low or geographically diffuse populations. Different definitions have been used for eligibility for programs; implementation of laws; and research and data collection at the state and federal levels.²³

Cardiovascular Risk in Rural Areas: Obesity and Other Factors

Poor diet, lack of physical activity, obesity, and smoking are all risk factors associated with cardiovascular disease.²⁴ In general, rural areas of the United States have higher obesity rates,^{25,26} higher rates of smoking,²⁷ and lower rates of physical activity²⁸ than urban areas. For example, one study found that adolescents in Appalachia had obesity rates more than twice the national rate, putting them at high risk of cardiovascular disease.²⁹

Policy Guidance: Rural Health

As a result, rural populations face amplified health risks, including cardiovascular disease risk, compared to other communities. Examining social and physical infrastructure in rural communities can help determine the most effective ways to increase rural residents' access to healthy food and decrease sedentary and smoking behaviors.^{30,31}

Nutrition and Physical Activity in Rural Settings

Disparities in rural obesity rates are not individual failings but rather systemic issues. For example, research suggests individuals in low income rural communities have less access to healthy and fresh foods when compared to their urban counterparts.^{32,33,34} Access is hindered by higher costs particularly for healthy food,³⁵ as well as fewer places to buy food (i.e. rural "food deserts").^{36,37} Individuals experiencing food insecurity and/or living in a food desert face increased risk of obesity, cardiovascular disease, and other health concerns.³⁸

Lower rates of physical activity may also be affected by the environmental realities of living in rural communities.³⁹ Often, people living in rural settings lack walkable areas or access to fitness centers, sporting facilities, parks, and other areas where physical activity can occur.⁴⁰ For children, access to places that encourage physical activity is often limited to school settings.⁴¹ Again, such social determinants may explain findings like those of a 2017 study that reported that approximately 45 percent of rural Midwestern men are inactive during their leisure time, compared to 38 percent of urban men.^{42,43}

Relevant efforts to encourage healthier behaviors in rural communities include promotion of healthy diets; eradication of food deserts; construction of sidewalks, parks, playgrounds, and gyms; and investments in sports programs and other events to stimulate physical activity.^{44,45} As one study noted, any obesity intervention should directly engage local residents, including working with schools to encourage time set aside for physical activity, encouraging local campaigns that aim to increase physical activity, and working with leaders of faith-based organizations to encourage healthy lifestyles.⁴⁶

Rural Tobacco Use

Meanwhile, smoking disproportionately impacts rural communities.^{47,48,49,50} Data from 2007 suggested that differences in smoking rates between rural and urban populations could be explained at least in part by differences in demographic and psychosocial factors: people in rural areas are generally older, have less education and lower income, and more likely to have jobs that are outdoors, all of which are risk factors for increased smoking rates. By 2014, however, further data demonstrated that demographic and psychosocial factors were unable to explain the entirety of the increasing divergence of smoking rates between rural and urban populations.⁵¹ Researchers speculate that differences in penetration of regulatory policy and tobacco control in insolated rural areas may be a factor driving these more recent differences.⁵²

Smoking status is one factor contributing to higher rates of CVD, especially among women and African Americans in rural areas.^{53,54,55,56} In light of this finding, research has identified a need to expand access to care, implement interventions that motivate all individuals to reduce high risk behaviors, and ensure that proper regulatory and tobacco control policies are being followed in rural areas.^{57,58,59, 60}

Access to Care in Rural Areas

Individuals in rural communities often experience limited access to healthcare services.⁶¹ The biggest barriers to accessing care are structural issues which include environmental factors such as transportation, healthcare infrastructure, and climate.

Poor or non-existent public transportation presents a challenge for many individuals living in rural areas.⁶² In general, many rural residents must travel considerable distances to obtain health services.⁶³ Studies have identified delayed or disrupted care due to long distances and extended travel times across a range of care types including pharmacy,^{64, 65} radiology (including mammography), cancer,^{66, 67, 68, 69} obstetrics,^{70,71} lactation consultancy,⁷² dentistry,⁷³ abortion,⁷⁴ acute care surgery,⁷⁵ mental health,⁷⁶ and rehabilitation and disability-related services.⁷⁷ For example:

- The median travel times for preventive breast screening were 4- to 8-times longer for rural women than for urban women; these longer times may be associated with lower utilization of breast cancer treatment services.⁷⁸
- Homeless female veterans traveled an average of 107 miles to access Veteran Administration Medical Centers (VAMCs) for specialty care.⁷⁹
- A dearth of cancer treatment settings in the Deep South, requiring long travel times, has led to increased cancer prevalence and mortality rates compared to the rest of the country.⁸⁰
- Compared to their urban counterparts, Medicare beneficiaries in rural areas traveled farther to see ophthalmologists, resulting in a lower than expected rate of cataract surgery.⁸¹

Recent closures of rural hospitals have exacerbated concerns about access to care, especially for economically marginalized rural populations who are disproportionately affected by the loss of health services.^{82,83} In rural communities not adjacent to urban areas, loss of hospital-based obstetrics services was found to be associated with increases in out-of-hospital, preterm births and births in hospitals without obstetric units in the following year.⁸⁴

Hospital closures do not always eliminate health services in a rural community. In one 2015 study, roughly half of rural hospitals that closed during the study period converted to alternative service delivery models, such as emergency or urgent care centers, outpatient centers, or skilled nursing facilities.⁸⁵ Nevertheless, such services can only partially fill the void left by closed hospitals in rural communities.⁸⁶

In rural settings, weather and climate can compound access barriers. For example, in a Wisconsin study, women were less likely to undergo mammography screening during winter months, especially women who had to travel further than 30 miles (48.3 km) to the nearest mammogram facility.⁸⁷

Rural American Indians and Alaskan Natives

One rural population particularly affected by limited access to care are American Indian/Alaskan Natives (AI/AN), who suffer from some of the highest rates of health and mental health-related disabilities. Although these populations may be served by the VA's services for rural populations⁸⁸ or by the Indian Health Service (IHS), frail and older AI/AN populations living on reservations or in rural Alaska often cannot access these centers and may require home-based care, telehealth services or other models of care.^{89,90}

Evidence on Rural Access to Cardiovascular Care / Stroke Services

Evidence indicates that the factors limiting access to rural health care services in general are relevant to cardiovascular patients. For example, rural residents typically must travel long distances to access interventional cardiology (IC) services, a factor associated with increased unadjusted coronary mortality.^{91,92} Similarly, for children with congenital heart defects, one study documented an average distance of over 50 miles from the nearest congenital heart center (CHCs) that specialize in pediatric heart surgery.⁹³ More troubling, 15.3 percent of these children had to travel over 100 miles away from home to access a CHC.⁹⁴

In terms of stroke care, greater travel distances limit access to treatment for the estimated 60 percent of all stroke patients who rely on Emergency Medical Services (EMS) for transportation to care.^{95,96,97} In rural areas, access may be more limited. As discussed further below, in some instances, EMS may be the only form of life-saving care available to an individual living in a rural area. For example, in 13 rural counties in West Virginia, fewer hospitals and longer transport time and distances result in many patients being received well outside of the time period in which treatment known as tPA (tissue plasminogen activator) can be administered.⁹⁸

Rural Healthcare Workforce Challenges

Rural areas need a larger, more diverse, more effective, and more satisfied healthcare workforce.^{99,100,101,102,103} According to the Rural Health Association, there are only 39.8 primary care physicians for every 100,000 rural Americans, compared to 53.3 for every 100,000 urban Americans.¹⁰⁴ Disparities in the specialist workforce are even more pronounced, with 30 specialists per 100,000 residents in rural areas compared to 263 in urban areas.¹⁰⁵

Currently, workforce shortages burden many rural health clinics and hospitals with unmanageable workloads. These workforce shortages are driven by struggles to recruit new hires which are, in part, driven by low reimbursement for services provided in rural areas, poor patient outcomes, and a lack of desire among providers to work in rural communities.^{106,107,108,109,110,111}

Cardiovascular Workforce Challenges

Poor access to and maldistribution of cardiologists and other CVD experts is particularly pronounced in rural communities.¹¹² Compared to the healthcare workforce as a whole, the growth of specialists practicing cardiology has increased more modestly; some rural areas have seen little to no growth in cardiology workforce.¹¹³ For example, over a 12 year period between 1995 and 2007, Hospital Referral Regions in the western part of the country had a decreasing cardiologist to patient ratio.¹¹⁴

Moreover, research demonstrates that 80 percent of new cardiologists choose to practice in regions already enjoying a high supply of physicians,¹¹⁵ exacerbating the rural workforce shortage.^{116,117} As a result, primary care physicians often provide emergency or urgent medical care, including cardiovascular care, to their patients who are unable or unwilling to travel.¹¹⁸

Potential Solutions to Rural Health Workforce Challenges

Innovative models of care may help address both workforce shortages and quality of care issues. Approaches include using non-traditional providers like emergency medical service providers and community health workers, and applying targeted gap-filling approaches such as visiting provider clinics, better primary care testing, and rural medical education models.

Emergency Service Providers

There is some evidence to suggest that emergency service providers may help fill gaps within the rural healthcare system. Currently, it is estimated that at least a third of community paramedicine programs operate in rural areas.¹¹⁹ Paramedicine is an expanded model in which emergency medical service (EMS) providers fill gaps in care by providing immunizations, care coordination, and post-hospital discharge care, such as monitoring medication adherence.¹²⁰ A 2016 study identified 31 rural community paramedicine programs, in which specially-trained providers helped increase access to medical care by targeting populations such as high emergency care users and providing care beyond emergency services.¹²¹

Meanwhile, EMS-based care coordination, in which paramedics screen and refer patients for services and items such as transportation, food, and insurance, appears to be a promising model for helping residents who may depend on EMS as their only source of clinical and social support.¹²² New technologies may also assist EMS providers in extending their reach. One study used mathematical models to estimate that emergency responders could send automated external defibrillators (AEDs) via drones to treat cardiac events faster than current in-person responders.¹²³

While some paramedicine programs in rural communities are funded by various levels of government, most are self-funded or receive grants, with only some reimbursement by insurance plans.¹²⁴ Unstable funding poses a challenge; for example, programs in Vail, Colorado and Scott County, Minnesota, ceased operations temporarily while state legislators debated funding, highlighting the dependence on state resources for operation.¹²⁵

Community Health Workers

Community health workers (CHWs) can also increase access to care in rural areas. CHWs provide direct, culturally-tailored care to targeted populations.^{126,127,128,129} CHWs have been shown to help increase cancer screening rates; improve community knowledge about risk factors; integrate care coordination; expand access to basic primary care in underserved areas, including prenatal care; and provide effective chronic disease care – often at cost-savings.^{130,131,132,133,134,135,136}

As evidence grows to support increased CHW utilization, health departments have begun to build inter-sectoral coalitions to target care in both high- and low-risk rural populations, with promising results.^{137,138} For example, a CHW-led prenatal mobile health campaign in rural Nebraska was well-received by the participants, cost-effective, and showed promising results in improving patient communication and self-care during pregnancy.¹³⁹

CHWs may also be critical in addressing CVD. Studies have shown that CHWs can help underserved patients reduce their risk of developing CVD by influencing lifestyle and behavioral changes including adherence to healthier diets.^{140,141} Additional evaluations of programs specifically targeting cardiovascular health and stroke have demonstrated that CHW-led efforts can be adapted to multiple settings and populations to improve heart health and stroke recovery outcomes in rural areas.^{142,143,144}

CHW programs, however, face a number of barriers to implementation, including the need for more stable funding.^{145,146,147} Additional challenges include coverage and reimbursement by payers and incorporation into a wider array of provider networks.^{148,149}

Targeted Gap-Filling Approaches

Targeted strategies to specifically address shortages of cardiologists and other providers in rural areas have also shown promise. For example, cardiologists in Iowa have expanded access to office-based cardiology care through visiting consultant clinics in which cardiologists, usually from urban areas, make regular visits to rural healthcare settings.¹⁵⁰ Better screening tools for primary care providers can also alleviate the demand for specialists; for example, initial testing using precision medicine blood tests can preliminarily rule out obstructive coronary artery disease (CAD) in patients exhibiting symptoms and can help avoid unnecessary visits to specialists for advanced cardiac testing.¹⁵¹

For stroke care, implementation of best practices in treatment allows patients to be evaluated and receive treatment faster and more efficiently.¹⁵² For example, many states have implemented routing policies which ensure that stroke patients are transferred to primary stroke centers.¹⁵³ Alternatively, Critical Access Hospitals (CAHs), special rural hospitals that receive enhanced payment, and other rural facilities may take steps to become certified by The Joint Commission and the American Heart Association to provide advanced stroke care.¹⁵⁴

In communities that lack pharmacists, establishing centralized, remote clinical pharmacies may improve patient access to pharmacists who can help them understand and adhere to their medication and treatment plans.¹⁵⁵ Meanwhile, multiple studies suggest that introducing medical students to rural medicine and providing residency and rotation opportunities in rural areas can increase the likelihood of medical professionals entering rural practice.^{156,157,158}

While not comprehensive solutions to the CVD workforce shortage, this patchwork of options provides opportunities to increase access to care for rural populations.

Telehealth in Rural Communities

As discussed above, the challenges posed by distance and provider shortages are significant barriers to care for rural residents, affecting cardiovascular care and a broad range of other health services. In recent years, telehealth – the use of electronic communication and other telecommunications to link patients to clinical care – has emerged as one important tool to address these gaps. Research demonstrates that telehealth can be feasible and effective for improving access to care and health outcomes and decreasing costs in rural communities.^{159,160,161,162,163} Various rural populations have benefited from this technology, especially as smartphones and internet access proliferate.^{164,165,166,167}

Overall Utilization of Telehealth Services

The overall use of telehealth is increasing nationally, including in rural areas; but acceptance, reimbursement, and availability of telehealth services vary across different healthcare provider specialties, population demographics, and geographic regions.¹⁶⁸ Between 2004 and 2013, telehealth use among rural Medicare beneficiaries increased at an annual rate of 28 percent.¹⁶⁹ Legislation and funding at the federal level has promoted and incentivized telehealth use.¹⁷⁰ For example, the 2018 FAST Act lifted geographic restrictions on Medicare coverage for “telestroke” services for acute stroke (see further discussion of telestroke below). Meanwhile states have passed their own legislation, and states with telehealth parity laws – legislation that requires reimbursing some or all

Policy Guidance: Rural Health

telehealth services at the same rates as in-person care – have seen faster telehealth growth rates than those without.^{171,172,173,174}

Changes in policy have been accompanied by increases in federal funding to support telehealth services and the infrastructure necessary to support them. Health Resources and Services Administration (HRSA) grants have funded efforts to increase telehealth services in Federally Qualified Health Centers (FQHCs), which serve approximately 1 in 5 rural residents.¹⁷⁵ As a result of these policy changes and investments, the telehealth industry is growing at an annual rate of 70 percent and is expected to be worth \$36.3 billion by 2020.^{176,177}

However, more than 34 million Americans, most of whom live in rural areas, lack adequate broadband internet access to support telehealth as well as electronic health records and imaging tools.¹⁷⁸ Efforts at the federal government to provide internet and by extension telehealth services exist. The American Broadband Initiative, an interagency effort, seeks to expand broadband infrastructure across the country, and has dedicated \$600 million for a new broadband pilot program in rural areas.¹⁷⁹

While most research on telehealth focuses on service provision, technology could also be used to address the rural workforce shortage gap by improving access to medical education in rural areas. One study found that administration of a tele-based objective structured clinical exam (OSCE) was economically feasible and acceptable for medical school students to demonstrate their clinical knowledge and ability to support patient needs remotely.¹⁸⁰

Costs Associated with Telehealth Implementation

Studies have identified overall cost savings associated with telehealth use in rural settings, with the savings often stemming from reduced need for travel and transfers. For example, one study documented that emergency telehealth services helped 85 rural hospitals across seven states avoid 1175 emergency department (ED) transfers, with an average savings of \$3823 per visit over a five-year period.¹⁸¹ Similarly, a telehealth program in rural Alaska is estimated to have saved \$8.5 million in travel costs alone for Medicaid patients in 2012.¹⁸² On the other hand, at least one study notes that although telehealth may cost roughly half as much as an office visit, the convenience may lead to increased healthcare utilization and therefore may not decrease total spending.¹⁸³

Overall, any assessment of the cost-effectiveness of telehealth would depend on the services offered and the alternatives available. For example, in one study, while telemedicine via real time video counseling showed some advantages over voice-only telephone smoking cessation counseling, it was significantly more expensive.¹⁸⁴ Meanwhile, another study found that telemedicine-based care for depression and pediatric emergency care was more cost-effective than transporting the patient to a specialty hospital.^{185,186}

Additional Barriers to Telehealth Implementation

Despite the potential benefits of telehealth, a lack of resources and lagging awareness may hinder the adoption of new technologies.¹⁸⁷ For example, though rural areas have limited access to primary and specialty care, recent research notes that 14.2 percent of rural health centers surveyed did not perceive a need for telehealth services, and that rural health centers not using telehealth reported a range of barriers, including cost, reimbursement, and technical issues.¹⁸⁸ Another study of a telehealth model to provide rehabilitation services to rural veterans found multiple benefits but also identified a number of implementation challenges reported by participating rural providers, including concerns related to training, equipment, service coverage, and occupational safety.¹⁸⁹

Policy Guidance: Rural Health

Patient-level factors can also operate as barriers to telehealth access. Despite the increased prevalence of cell phones across the country, only 38 percent of rural cell phone users reported owning a smartphone, a key tool for some telehealth applications.¹⁹⁰ The use of new technology may be especially challenging for older patients, who represent the fastest-growing rural population and are at heightened risk of cardiovascular and other diseases.^{191,192}

Telehealth for Cardiovascular Disease and Stroke Care

New telehealth services serving CVD and stroke care patients have successfully connected rural patients struggling with transportation to medical professionals.^{193,194} The use of telehealth for stroke patients has been a particular area of research and clinical interest, given the time sensitivity of stroke care. Currently, only one percent of the American rural population lives within 60 minutes of a primary stroke center.¹⁹⁵ Telestroke services for acute stroke can improve treatment by connecting registered nurses or other non-specialist practitioners to specialists who can remotely guide treatment for patients.^{196,197,198,199,200} Telestroke networks have been shown to be cost-effective and increase access to emergency treatment for acute stroke patients.²⁰¹

In addition to responding to crises, telehealth can be used to remotely monitor patients with, or at risk of, cardiovascular disease. Studies have found that remote monitoring for heart failure, diabetes, hypertension, and other CVD related conditions can improve patient outcomes.^{202,203,204,205,206}

Telehealth could also potentially help expand access to services that help lower cardiovascular risk. For example, a 2017 study found that slow implementation of CMS's 2011 Medicare Obesity Benefit, which reimburses primary care providers for treating weight loss with intensive behavioral therapy, may be due to insufficient reimbursement of certain care-team members involved in the treatment, including behavioral psychologists and dietitians.²⁰⁷ The researchers recommended improved reimbursement of telehealth services to expand access to the obesity benefit for older adults in rural areas.²⁰⁸

Substance Use Disorder: A Growing Co-Morbidity

Drug overdose now represents the leading cause of accidental death in the US, with overdose death rates in rural areas surpassing those in urban ones in 2015.^{209,210} Various rural sub-groups are at particularly high risk of substance use disorder, including college students, disadvantaged and disengaged young Black men, and adolescents.^{211,212}

Use of various substances are associated with increased risk for CVD, including alcohol, tobacco, heroin, prescription stimulants, and methamphetamines.²¹³ Given the high rates of tobacco and alcohol use among rural individuals, rural individuals may be at risk for higher rates of CVD due to substance use.^{214,215,216,217}

Meanwhile, rural populations are less likely to be diagnosed and treated for substance use disorder or mental illness, a common co-morbid condition, despite changes in Medicaid, the Affordable Care Act (ACA), and state legislation focused on ensuring treatment of substance use and mental health services.²¹⁸ Nationally, over 88 percent of large rural counties lack a sufficient number of opioid treatment programs which provide medication assisted treatment (MAT), including methadone, buprenorphine, and naltrexone.²¹⁹ Even where services exist, the barriers to rural care discussed above can pose challenges for MAT. For example, in rural Vermont, one survey found that a lack of transportation, weather, and costs led a significant proportion of rural patients with SUD to miss a MAT visit.²²⁰

Opportunities to Improve Rural SUD Care

Various efforts have been successful in reducing the burden of substance use in rural communities. Several studies have suggested that Medicaid expansion and mental health parity rules have benefitted communities by increasing access to and coverage of care, though increased Medicaid reimbursement may be necessary to attract more mental health and/or substance use professionals to rural areas.^{221,222,223,224} Other findings include:

- At the community level, integrating behavioral health and social needs with primary care have improved health outcomes, while increasing universal screening for SUD has ensured that high-risk rural individuals are appropriately targeted for prevention interventions.^{225,226,227,228,229}
- Having at least one outpatient medical visit and having a high degree of trust in one's health care provider can reduce risky behavior.^{230,231} As opposed to EDs, outpatient medical centers provide rural drug users an opportunity to address underlying issues including co-morbid alcohol use, sleep deprivation, and mental health challenges.²³²
- Increasing access to Medication Assisted Treatment (MAT) such as buprenorphine or methadone in rural health centers can reduce the burden of opioids in rural areas.^{233,234,235,236}
- In efforts to prevent SUD, school-based programs have shown success in reducing substance use rates among youth.²³⁷ For example, the Positive Action program is a series of lesson plans and materials designed to promote proper hygiene, exercise, social skills, and self-improvement skills. In one study of implementation in a rural community, the Positive Action program improved self-esteem and decreased stressful school situations that are associated with elevated substance use risk.²³⁸
- The 2016 Comprehensive Addiction and Recovery Act (CARA) expanded buprenorphine prescribing authority for nurse practitioners.²³⁹ However, by the end of 2017, only 13.8 percent of rural counties had at least one NP that received a waiver to prescribe buprenorphine.²⁴⁰ This may be due in part to continued state practice limitations for NPs.²⁴¹
- Developing opportunities for rural practitioners to provide SUD treatment through telehealth has increased access to care. For example, the Project ECHO (Extension for Community Healthcare Outcomes) program in rural New Mexico contributed to a marked increase in buprenorphine-authorized practitioners over a 10-year span.²⁴²

The American Heart Association Position on Rural Health

The AHA's mission is to be a leader in ensuring that everyone has access to optimal healthcare, regardless of who they are or where they live. Rural residents often encounter barriers to healthcare that limit their ability to obtain the care they need. The health—including cardiovascular health—of rural communities across the United States remains hampered by a wide range of factors. Stakeholders can use the evidence provided in this review to understand many of the causes of these health disparities and support tangible action to improve the health of rural communities.

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