
HEART DISEASE AND STROKE IN RURAL AMERICA: A LITERATURE REVIEW

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SCOPE OF PROBLEM

- Disease of the heart is the first ranking among the leading causes of death in 1999.²⁹
- Stroke is the third ranking leading cause of death in 1999.²⁹
- Heart diseases are the most frequently first-listed diagnoses for hospital discharges nationally.²⁶
- Heart failure and stroke is the most frequent diagnostic category among hospitalized rural elderly Medicare beneficiaries.²⁷
- Congestive heart failure, hypertension, and angina are “ambulatory-care-sensitive” conditions.²⁸
- Pacemaker insertion, coronary artery bypass surgery, and coronary angioplasty are “referral-sensitive” conditions.²⁸

GOALS AND OBJECTIVES

Approximately 61 million individuals in the United States are afflicted with some form of cardiovascular disease, which includes both heart disease and stroke and contributes to an estimated four of every 10 deaths in the United States.⁸ Compounding the problem is the staggering percentage of the population with high cholesterol, hypertension, and obesity—all risk factors for heart disease and stroke.³⁰ While there has been a 50 percent reduction in coronary heart disease and stroke in the past 30 years,³ mostly attributable to advances in therapy and technology, disparities among certain subgroups have become more exaggerated.⁴ Among these vulnerable subgroups include rural populations,^{5,6} particularly those in the South and Appalachian region.⁴

Given that heart disease and stroke are the first and third leading causes of death in the United States,¹ addressing this health concern is pivotal to

improving the nation’s health. Specifically, the goal of the Healthy People 2010 heart disease and stroke objective is to “improve cardiovascular health and quality of life through the prevention, detection, and treatment of risk factors; early identification and treatment of heart attacks and strokes; and prevention of recurrent cardiovascular events.”²

Heart disease and stroke are the first and third leading causes of death in the United States.¹

The Healthy People 2010² objectives addressed in this section are as follows:

- 12-1. Reduce coronary heart disease deaths.
- 12-3. Increase artery-opening therapy.
- 12-7. Reduce stroke deaths.
- 12-9. Reduce the proportion of adults with high blood pressure.
- 12-12. Increase blood pressure monitoring.
- 12-15. Increase blood cholesterol screening.

The following definitions are pertinent to the discussion of heart disease and stroke:

- *Cardiovascular disease (CVD)*, as defined in HP2010, “includes a variety of diseases of the heart and blood vessels, coronary heart disease (coronary artery disease, ischemic heart disease), stroke (brain attack), high blood pressure (hypertension), rheumatic heart disease, congestive heart failure, and peripheral artery disease.”²
- ◆ *Coronary heart disease (CHD)* occurs when there is a decreased flow of blood to the heart muscle, resulting in damage and/or death of the deoxygenated heart muscle.²

- ◆ *Acute myocardial infarction* (AMI, commonly called a “heart attack”) “occurs when a coronary artery becomes completely blocked, usually by a blood clot (thrombus), resulting in lack of blood flow to the heart muscle and therefore loss of needed oxygen.”²
- *Cerebrovascular disease* “affects the blood vessels supplying blood to the brain.”²
 - ◆ *Stroke* occurs when the brain does not receive an adequate supply of blood due to the rupture of blood vessels or the presence of blood clots.² There are two main types of strokes: ischemic (blockage) and hemorrhagic (bleeding). Ischemic strokes are the most common, and account for approximately 88 percent of all strokes.³¹
- *Antithrombotic therapy* utilizes intravenous medications that dissolve blood clots, possibly reducing damage to the heart and brain during an acute myocardial infarction or a stroke.³²
- *ACE inhibitors* are medications that enable the lowering of blood pressure by promoting the expansion of blood vessels (vasodilation).³³
- *Statins* are a family of medications proven effective in lowering serum cholesterol and blood lipid levels. Statins have been shown to reduce the long-term risk of AMIs and strokes.³⁴
- *Advanced Cardiac Life Support training* (ACLS training) heightens health care providers’ awareness of current developments in the treatment procedures of cardiopulmonary emergencies.³⁵
- *Coronary Artery Bypass Grafting* (CABG surgery) increases blood flow from the heart by bypassing the clogged portion of the coronary artery through a surgically implanted vein or artery taken from a different portion of the body.³⁶

IDENTIFIED BY PEOPLE LIVING IN RURAL AREAS AS A HIGH PRIORITY HEALTH ISSUE FOR THEM

According to the Rural Healthy People 2010 survey, heart disease and stroke ranked second across the four groups of state and local respondents in the

frequency of priority nominations received. This focus area was nominated by an average of 41 percent of the respondents.⁷ Respondents from rural hospitals and rural health centers and clinics were more likely than respondents from local public health offices or state health organizations to rate this topic area as a high priority. State agency respondents were least likely to rate heart disease and stroke as a priority. The differences in nomination rates were statistically significant. The Midwest and South regions were more likely than the Northeast or West to nominate heart disease and stroke as a rural priority area. The difference across the regions was statistically significant.³⁷

PREVALENCE AND DISPARITIES IN RURAL AREAS

Heart disease and stroke are respectively the first and third leading causes of death in the United States¹ and cost the United States almost \$298 billion annually.⁸ In 1999, cardiovascular disease contributed to one out of every 2.5 deaths, (958,775 individuals).³⁰ Stroke affects more than 600,000 individuals every year. The associated cost for treatment and rehabilitative services for stroke victims in the United States is an estimated \$41 billion annually.³⁸

Although heart disease is sometimes considered a disease mostly affecting men, half of all cardiovascular disease deaths occur in women.⁸ Women are almost twice as likely to die from heart disease than to die from cancer.³⁹ According to the Center for Disease Control and Prevention’s National Health and Nutrition Examination Survey (NHANES) III (1988-94), during early adulthood, men have higher rates of cardiovascular disease than women, but this difference lessens during later years—equaling each other at the ages of 65-74 and surpassing men at the age of 75 years.³⁰ The highest rates of heart disease deaths among women occur in Northeastern large urban areas followed by the South’s most rural counties.⁹ For men, the highest heart disease-related deaths occur in the South’s most rural counties.⁹ For women and men, the lowest death rates from heart disease occur in the West.⁹

As noted earlier, the incidence of heart disease and stroke has declined significantly over the past three decades;³ however, the decline has not been uniform across all subgroups.

According to 1995 data, the death rate for African-American males from cardiovascular disease is 42 percent higher than white males, and the rate for African-

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American females is 65 percent higher than white females.² Other vulnerable populations to heart disease and stroke include older African Americans,² Hispanic Americans,³ individuals of lower socioeconomic status,¹¹ and as noted in the preceding, rural populations,^{5, 6} particularly those in the South and Appalachian region.^{4, 12} This trend, as summarized by Wing,¹¹ suggests that coronary heart disease has shifted from a disease of the privileged to one of the disadvantaged.

According to self-reported data in the 1996 National Health Interview Survey, heart disease was 1.34 times more prevalent in non-metropolitan statistical areas (non-MSAs) (98.8 per 1,000 individuals) when compared to metropolitan statistical areas (72.6 per 1,000 individuals). Cerebrovascular disease was reportedly 1.45 times higher in non-MSAs than in MSAs (15.1 per 1,000 individuals and 10.4 per 1,000 individuals, respectively). Hypertension was also higher in rural than urban areas (101.3 per 1,000 individuals in MSAs and 128.8 per 1,000 individuals in non-MSAs).¹³ Ischemic heart disease, which contributed to over 60 percent of heart disease mortalities in 1998,⁴⁰ is nationally higher in rural counties among men 20 years of age and older.⁹

True prevalence data for heart disease and stroke in rural versus urban areas are not readily available. However, differences in mortality data often reflect disparities between rural and urban areas. From

1985–1995, declines in mortality rates for premature coronary heart disease in African Americans and whites were found to be slower in the rural South than their counterparts in other geographic areas. For African-American women and men, the slowest rates of annual decline were in the rural South, with rates of 1.6 percent and 0.7 percent, respectively. The fastest areas for decline of coronary heart disease mortality among African Americans were in less metropolitan areas (counties with fewer than one million people) outside the South, which had declines measuring 3.3 percent for African-American women and 3.9 percent for African-American men.¹²

IMPACT OF THE CONDITION ON MORTALITY

Cardiovascular disease remains the leading cause of death in the United States. In 1999, there were 725,192 heart disease deaths and 167,366 stroke deaths. The age-adjusted death rate for heart disease was 265.9 deaths per 100,000, and for stroke was 61.4 deaths per 100,000.¹⁴

In recent years there have been numerous medical advances both in therapy and in technology of CVD. Improvements in medicine and Medicare coverage of expensive procedures have contributed to decreased mortality overall. From 1986 to 1998, mortality following an

AMI admission declined by one-third—from 24 percent to 16 percent.⁴¹ Nonetheless, disparities of benefits in medical advances in rural areas when compared to

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urban areas sometimes result in increased mortality.

IMPACT OF THE CONDITION ON MORBIDITY

Heart disease and stroke are leading causes of disability, annually costing the United States an estimated \$19 billion and \$5.6 billion, respectively.¹⁵ Compared to population norms, quality of life domains represented by physical function, role physical, role emotional, vitality, social functioning, bodily pain, mental health, and general health are lower for people living with coronary heart disease and stroke as compared to population norms.^{42, 43}

In 1999, the most common diagnosis for individuals 65 years of age and older was heart disease—comprising 23 percent (4.5 million) of total inpatient discharges, with an average stay of 4.7 days.²⁶ In recent years, more people have received cardiac procedures. From 1986 to 1998, angioplasty increased from 1.3 to 8.4 individuals per 1,000, and CABGs increased from 2.7 to 4.8 individuals per 1,000.⁴¹

CONTRIBUTOR TO MANY OTHER HEALTH PROBLEMS

With heart disease and stroke, there is increased likelihood of recurrence and other macrovascular complications.¹⁶ There are a significant number (1 in 40) of AMI patients who suffer from an ischemic stroke within six months of discharge.¹⁶ Individuals over 65, females, blacks, those with frailties, and those with prior medical history of stroke are at increased risk of stroke occurrence after an AMI.¹⁶

Depression is significantly associated with both heart disease¹⁷ and stroke.^{18, 19} Some studies suggest a causal relationship between depression and AMI and stroke,¹⁹ while others report the evidence of depression after other debilitating events⁴⁴ and intensive medical treatments, such as CABG surgery.⁴⁵ Morris¹⁸ reported in a 10-year follow-up study that individuals diagnosed with depression after suffering a stroke had a mortality rate three times higher than those not diagnosed with depression. In an analysis of several studies, Glassman¹⁷ found a strong association between depression and heightened occurrence of and mortality from cardiovascular disease.

BARRIERS

Rural populations have certain behaviors and attitudes that contribute to their heightened risks of coronary heart disease and stroke. Rate of lifestyle change, individuals' perception of heart disease risk, and attitudes of health care providers may heighten the disparity in heart disease and stroke incidence in rural versus urban areas.

Pearson⁵ proposes that rural areas do not adopt changes in behaviors as rapidly as do urban areas. Historically, rural areas have not adopted behaviors such as smoking, high-fat diets, and sedentary lifestyles as readily as urban areas. Similarly, once these coronary heart disease and stroke risk factors are adopted in the rural areas, they are reversed at a slower rate than urban areas. In one study of ischemic heart disease patients in rural West Virginia, 27 percent continued smoking after diagnosis.⁴⁶ This delay in lifestyle changes partially explains the initial lower rate of coronary heart disease in rural areas compared to urban areas, and the gradual evolution to higher rates of coronary heart disease in rural areas.⁵

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Another possible contributor to the higher rates of coronary heart disease in rural areas is that of socioeconomic status. Lower standards of living and social and economic restrictions, rampant in some rural areas, lead to higher prevalence of coronary heart disease risk factors, such as cigarette smoking, poor dietary habits, and sedentary lifestyles.⁴⁷

Perception of risk may also play a role in the rural/urban disparity for heart disease. Some rural inhabitants do not perceive themselves at risk for heart disease and stroke, and their behaviors are modeled by these misperceptions. Older rural

women reportedly have a decreased perception of heart disease and are less likely to participate in primary prevention efforts, such as screening procedures. This lower perceived risk is exacerbated by the decreased availability of screenings in rural areas.²⁰

Attitudes of health care providers toward patients in rural settings can determine the quality of medical care. In a scenario-survey sent to a random selection of family physicians, heart patients with reduced access to services were not as likely to be referred to a cardiologist or to receive a left ventricular function test—two heart failure guidelines. Physicians' treatment methods were affected by the patient's environment.⁴⁸

Beyond social and behavioral barriers, rural residents are faced with access challenges and service gaps in seeking treatment and prevention services. The unique challenges faced by rural residents include the prolonged distance to provision of comprehensive post-discharge care of heart failure²¹ and limited access to personnel, screening services (e.g., cholesterol checks), and treatment services for heart disease and stroke. When screening does occur, dietary assessments and other needed follow-up measures are often unavailable.⁴⁹ Furthermore, organizations disseminating heart disease and stroke prevention strategies may have only limited activities in rural areas.⁵

Procedures in the treatment of heart disease and stroke are also more limited in rural areas than in urban areas. Availability of technology is a main factor for geographic differences in testing patients for stroke diagnosis.⁵⁰ Some physicians in rural areas are averse to treating stroke patients with anticoagulant therapy because of limited experience in administration and monitoring of the drug and fear of drug complications, such as excessive bleeding and/or fatal bleeding.³⁸ A study of Medicare patients in one state yielded an antithrombotic therapy utilization rate 1.7 times greater in urban hospitals than in rural hospitals and demonstrated that patients who were prescribed antithrombotic therapy were less likely to suffer adverse outcomes.²²

The relationship between volume and outcome has been the subject of numerous studies. According to a meta-analysis study, the relationship between AMI outcome/stroke outcome and volume is somewhat controversial.⁵¹ Thiemann⁵² reported that high mortality rates of elderly patients after an AMI are not related to a deficiency in the number of procedures provided at the hospital (i.e., angioplasty, bypass surgery, etc.) or specialty of the attending physician, but are related to a low volume of patients. Another study reports higher mortality rates after angioplasty for AMI patients in rural hospitals than for urban hospitals. However, the post-CABG mortality rates were similar for urban and rural hospitals.⁵³

Variations in training may also exist. Disparities in level and frequency of ACLS training may exist when comparing rural and urban health care facilities. Standards of care for cardiac arrest patients are established in ACLS training.⁵⁴ Dane,⁵⁵ in a study of a tertiary care center, reported that patients requiring resuscitation efforts were almost four times more likely to survive to discharge if attended by an ACLS-trained nurse than if attended by a non-ACLS-trained nurse.

Quality of care relating to heart and stroke treatment has been studied in rural versus urban hospitals. One study found that six quality indicators (QIs) for AMI inpatient care were not as likely to be followed in rural hospitals as in urban hospitals, resulting in a lower quality of care in the rural hospitals. There was a dramatic difference in the level of adherence to the quality indicator of administering of aspirin during a hospital stay to ideal candidates—87.8 percent in urban hospitals, 83.9 percent in semirural hospitals, and 75 percent in rural hospitals.²³ Reduced accessibility to continuing medical education may contribute to the differences in care.⁵

Baker,²⁴ however, reported that the differences in rural versus urban hospitals did not result from different levels of quality but from access to technology or specialists. Although it is controversial whether outcome success correlates to the number of specialists in an area, one study conducted in the Appalachian region found that nonmetropolitan

counties had a cardiovascular physician-to-patient ratio less than one-third of that found in metropolitan counties.⁶

Finally, it is often the case that rural areas do not offer as many heart and stroke services as do urban areas. In particular, there may be limited access to cardiac rehabilitation services, such as dietitians, exercise physiologists, and social workers.⁶ While availability of services and distance traveled impact treatment-seeking behavior, another critical factor is patient intent. In one study⁵⁶ of rural patients who had experienced a cardiac event, only 28.3 percent attended a cardio rehabilitation program, and of that percent, only 17 percent actually completed the program. In measuring a number of variables, including rurality and distance traveled, it was determined that the most significant factor in attending cardiac rehab was patient intent. A key component of intent was whether or not the physician recommended the program.

KNOWN CAUSES OF THE CONDITION OR PROBLEM SO EFFECTIVE INTERVENTIONS OR SOLUTIONS CAN BE IDENTIFIED

Heart disease and stroke are related to a varied and complex set of risk factors. Factors such as age, gender, locality, race and ethnicity, and heredity are considered non-modifiable risk factors. However, there are modifiable risk factors such as smoking, high cholesterol, hypertension, physical inactivity, obesity, diabetes, and stress.⁵ The risk of coronary heart disease can be predicted using blood pressure, cholesterol, and LDL-C categories in algorithms developed by the Framingham Study.⁵⁷ The 1988-1994 NHANES III performed by the Centers for Disease Control and Prevention found that in the United States, approximately 102.3 million individuals have “borderline high risk” cholesterol levels of 200-239 mg/dL, and 41.3 million individuals have “high risk” blood cholesterol levels of ≥ 240 mg/dL; 20 percent of Americans suffer from

high blood pressure; and over 108 million Americans age 20 years and older are “overweight” (have a body mass index ≥ 25.0).³⁰

The American Heart Association and the American College of Cardiologists have endorsed the following risk reduction strategies for persons with existing CVD, which are shown with their corresponding reduction in cardiovascular events and mortality:⁵⁸

Strategy	CV Event Reduction (%)	Mortality Reduction (%)
Smoking cessation	-	43
Lower serum lipids	42	30
Exercise	25	20
Aspirin	30	15
Anticoagulants	53	10
ACE inhibitors	25	20
Beta-blockers	26	27
Blood pressure reduction	21	12

Source: Smith, 1997⁵⁸

As seen above, lifestyle changes can dramatically reduce the occurrence of premature heart disease and stroke. For example, smoking is a modifiable risk factor and accounts for approximately 20 percent of all cardiovascular disease deaths;³⁰ however, smoking cessation results in a significant reduction in mortality related to heart disease.

Pearson⁵ suggests that rurality is directly linked to higher rates of cardiovascular disease. When compared to urban areas, rural areas reportedly have lower education levels, which have been shown to directly correlate to increased rates of cardiovascular disease and risk factors such as smoking and obesity.⁵

PROPOSED SOLUTIONS OR INTERVENTIONS THAT ARE FEASIBLE IN RURAL COMMUNITIES

Modifiable risk factors can be influenced through evidence-based preventive measures. Primary

prevention strategies are those that aim to prevent the onset of heart disease and stroke, such as assessing the presence of risk factors and targeting modifiable risk factors. According to an American Heart Association scientific statement, risk factor assessments should begin as early as 20 years of age.²⁵

Secondary prevention strategies are those that increase the likelihood of early diagnosis, such as through screening efforts and warning-sign information dissemination, and those that address the treatment of the disease. Access to diagnostic tests and procedures and treatment modalities is paramount the quality and quantity of life of persons affected by these conditions (see Access section). Evidence-based standardized treatment protocols improve the functioning, well-being, and survival of heart disease patients. Additional gains in reducing heart disease and stroke death rates and the burden of disease can be realized by implementing evidence-based primary and secondary preventive measures:

- Encourage consumption of “heart healthy” foods.
- Assess risk factors.²⁵
- Decrease the level of modifiable risk factors, such as smoking, sedentary lifestyle, and over-consumption of foods.
- Increase blood pressure and cholesterol screening and follow-up (i.e., dietary counseling, stress management, etc.).⁵⁹
- Increase dissemination of information on warning signs and prevention.⁵

Tertiary prevention strategies are those that aggressively treat heart disease and stroke, endeavoring to decrease their severity and occurrence of complications, such as through antithrombotic therapy. Tertiary prevention addresses both the habilitation of heart disease and stroke patients and their rehabilitation efforts following diagnosis and include:

- heightened medication management,

- increased utilization of telemedicine technology and stroke teams,
- increased utilization of antithrombotic therapy,
- stricter adherence to quality indicators in the treatment of AMI,²³ and
- implementation and frequent utilization of ACLS training. (Camp⁶⁰ shows that ACLS-trained rural hospital personnel can have similar outcomes to ACLS-trained major teaching hospital personnel.)

Disease management may also serve as a method to address heart disease and stroke. The key aims of this approach are to “inform physicians, educate patients, increase monitoring, and facilitate compliance. Improved outcomes include decreased hospitalization and emergency room visits, and improved quality of life.”⁶¹ Nonetheless, additional research is needed to assess the effectiveness of disease management programs in rural areas.

Finally, “Telestroke”—telemedicine utilization for stroke treatments—and the formation of stroke teams are modern concepts developed in the pursuit of heightened quality in after-stroke care.⁶²

Levine⁶² suggests that stroke teams—health professionals specifically trained in stroke care—should be available to remote communities through telemedicine. Quality care is provided through a physician at the local site and through the expertise of the remote site’s stroke team.⁶² Studies gauging the effectiveness of “telestroke” technology are ongoing; “telestroke” may prove a viable option in after-stroke treatment for patients in rural areas.

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COMMUNITY MODELS KNOWN TO WORK

See the Models for Practice section in Volume 1 for a catalog of models.

SUMMARY AND CONCLUSIONS

Heart disease and stroke are the leading causes of morbidity and mortality. Rates of reduction are varied, and certain populations are particularly vulnerable, including rural populations. Several risk factors for heart disease and stroke are more predominant in rural areas; however, access to services and preventive measures, such as screening, are not as readily available. Many risk factors are modifiable, and a decrease in these risk factors will directly correlate to a decrease in the incidence of heart disease and stroke.

Regardless of the volume/outcome relationship in heart disease and stroke, as findings have been somewhat inconclusive, there are disparities in treatment style and adherence to quality indicators. Best modes of practice can be followed in both rural and urban areas. Heart disease and stroke will continue to be priority health issues in rural areas as long as access to quality care and prevention efforts are not addressed and modifiable risk factors are not effectively changed.

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