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Strategies for Cardiovascular Disease Prevention in Rural Southern African American Communities

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1. Introduction

Cardiovascular disease (CVD) is a commonly recognized umbrella term encompassing conditions, disease or disorders of the heart and/or blood vessels that may result in impairment of optimal cardiovascular functioning. CVD is the leading cause of morbidity and mortality in the United States, as well as in both developed and developing nations. Although the risk for CVD in the United States may vary according to and fluctuate within certain demographic, educational, behavioral and socio-economic characteristics, disparities in CVD prevention and treatment continue to ensue, particularly within minority populations. This gap in CVD disparity is further increased in regard to African American women living in rural southern communities. Demographic, socioeconomic and neighborhood characteristics are suggested to converge within rural African American communities to additively influence CVD risk.

Efforts to prevent CVD have often involved the use of diet and nutrition, nutrition education, physical activity modifications and behavioral-based strategies. The higher rate of disparities in CVD prevalence, mortality, preventive and treatment services in rural regions warrants an aggressive approach in addressing this issue to improve public health. The use of prevention strategies, exploiting specific aspects of the above mentioned strategies may prove useful in mitigating CVD risk disparities among African Americans living in rural southern communities. This chapter will investigate CVD risk, prevention and treatment, with an emphasis on African Americans living in rural southern communities. Additionally, several strategies employing an integrative multi-disciplinary approach to preventing CVD in rural southern African American communities will be provided.

2. Definitions and classification of CVD

CVD is an umbrella term encompassing conditions such as: high blood pressure (HBP); coronary heart disease, including myocardial infarction and angina pectoris; heart failure, stroke and congenital cardiovascular defects (Lloyd-Jones et al., 2009). Classifications of CVD include, but are not limited to: atherosclerosis, cardiomyopathy, cerebrovascular disease (stroke), congenital heart disease, coronary heart disease, hypertension, heart failure, and transient ischemic attack. Ideally to achieve and maintain cardiovascular health several

anthropometrical (e.g. body mass index), behavioral (e.g. physical activity), dietary (e.g. healthy diet score) and clinical (e.g. total cholesterol, blood pressure and fasting plasma glucose) objectives should be met (Lloyd-Jones et al., 2010).

2.1 CVD prevalence in the United States

Cardiovascular disease (CVD) has been recognized as a public health problem for nearly a century in the United States, whereas in previous years contagious diseases such as typhoid disease, smallpox, diphtheria, rheumatic fever and tuberculosis posed a particular threat to public health (Griswold, 1927). Over one-third of adults living in the United States over the age of 20 years have high blood pressure, one of the most common types of CVD (Roger et al., 2011). Among these individuals the highest prevalence of hypertension is observed among African Americans- particularly those living in the rural South (Danaei et al., 2010). Further, these individuals also exhibit greater disparities in smoking, elevated blood glucose and adiposity. It is predicted that nearly half of individuals living in the United States will exhibit some form of CVD by 2030 (Heidenreich et al., 2011). The financial burden associated with the costs of CVD treatment, morbidity and mortality are projected to reach over \$800 billion during this time.

An estimated 1 in 3 American adults are predicted to possess one or more forms of CVD, the most common of which is hypertension or high blood pressure (HBP) (Lloyd-Jones et al., 2009). Although the prevalence of heart disease is slightly less in African Americans compared to Whites (10.2% vs. 11.4%), a significantly greater number of African Americans have high blood pressure (31.7% in African Americans vs. 22.2% in Whites). Individuals living in the southern region of the United States referred to as the “stroke belt” have the highest rates of high blood pressure (Hajjar & Kotchen, 2002). Further, high blood pressure increases the risk for cerebrovascular disease or stroke, which is the third leading cause of death among Americans (Lloyd-Jones et al., 2010). Although stroke-related deaths have declined in recent years, individuals living in the southeastern region of the United States exhibit the highest rates of stroke and related hospitalizations.

2.2 CVD prevalence in rural southern African American communities

As mentioned previously, individuals living in the stroke belt, a cluster of communities in Arkansas, Louisiana, Mississippi, Alabama, Georgia, South Carolina, North Carolina, Virginia, Tennessee, Kentucky and Indiana, exhibit stroke death rates higher than the national average. In comparison to other regions of the United States, CVD prevalence is elevated among individuals living in rural southern communities, particularly African American women (Taylor et al., 2002). The highest rates of CVD mortality are often observed among those who are poor and live in rural regions (Cooper et al., 2000).

2.3.1 Demographic and socioeconomic characteristics of rural communities

Rural communities are generally composed of individuals who are older, have lower educational attainment and lower socioeconomic status (Johnson, 2006). Persistent sluggish economies and lower income brackets have contributed to the continual presence of poverty across generations observed in rural America (Brown & Warner, 1991). Although a vast majority of non-Hispanic Whites occupy rural communities, rural communities in the southeastern United States are heavily populated by African Americans.

Although younger residents (21 to 35 years of age) of rural communities demonstrate greater knowledge regarding the general relationship between diet and CVD risk, these individuals were also found to express less immediate concern in developing adverse health outcomes (Pace et al., 2008). Nevertheless with knowledge of the relationship between a specific dietary component (i.e. fat) and CVD risk, came dietary behaviors that may reduce the risks associated with CVD (i.e. consumption of low-fat dairy products). Among 18 to 26 year old African Americans living in rural communities, females and greater educational attainment were associated with greater CVD risk knowledge (Winham & Jones, 2011). Although rural African American women may perceive themselves at risk for hypertension, barriers such as income, lack of insurance, medical expenses, neighborhood environment and family support/characteristics may inhibit them from actively seeking CVD prevention and/or treatment measures (Ford et al., 2009).

2.3.2 Rural African American neighborhood/community resources

In comparison to urban communities, rural communities have limited access to fruits and vegetables (Hosler et al., 2008). Research indicates that neighborhood characteristics influence the affordability of fresh fruit and vegetables, with African American rural residents paying more for these items (Dunn et al., 2011). Perceptions regarding self-efficacy, the neighborhood (i.e. community) and home (i.e. consumer) nutrition environment and family support among rural Georgia residents indicate positive associations between these variables and healthy dietary behaviors (Hermstad et al., 2010). Components of the neighborhood nutrition environment include food accessibility as influenced by the number, type and location of grocery/convenience stores and restaurants. Conversely, the home nutrition environment includes the presence, cost and quality of healthy food items in the neighborhood, which influence consumer nutrition behaviors such as shopping at supermarkets versus convenience stores and dining out at a sit-down versus a fast-food establishment. The home nutrition environment and consumer nutrition behavior were positively associated with dietary behaviors that facilitate dietary fat intake among rural women.

Senior citizens living in rural communities are at risk for inadequate fruit and vegetable intake as well. Older women reported consuming more servings of fruit and vegetables, although both men and women reported consuming comparable servings of fruit and vegetables in rural Texas (Sharkey et al., 2010). Likewise, fruit and vegetable consumption among these individuals was influenced by supermarket location, produce variety and produce quality. Consequently, the diet quality of rural residents is compromised. Data collected on the diet quality of older adults living in the rural southern United States revealed that less than 2% met the dietary guidelines (Savoca et al., 2009). Although overall diet quality was inadequate, dietary intakes of dark green and orange vegetables were sufficient. In comparison to American Indians and in some instances non-Hispanic whites, rural African Americans reported consuming greater quantities of total and whole fruit, grains and meat.

Sanderson et al (2003) found that nearly two-thirds of African American women living in rural Greene, Lowndes and Wilcox counties of Alabama were either “insufficiently inactive” (46%) or “inactive” (15%). Contributing to their current level of physical activity or inactivity were participation in regular religious services, observing others engaging in physical activity (i.e. exercise), interacting with others engaging in physical activity and more positive feelings and perceptions regarding participation in physical activity. In addition, an

immense sense of community related to neighborhood characteristics such as quality, safety and neighbor support contributed to more personal positive feelings and perceptions regarding physical activity. Rural women who viewed their neighborhood as safe and observed the presence of sidewalks were more likely to engage in regular physical activity (Wilcox et al., 2003). Glover et al (2011) found rural South Carolina female children to be significantly more likely to engage in physical activity than their male counterparts. Among these children less than half (42%) indicated that they consume fewer than the recommended daily servings of fruit and vegetables.

2.4 Racial/ethnic disparities in CVD

Racial and socioeconomic distinctions between CVD risk among women living in the rural southern region of the United States have been noted by researchers (Appel et al., 2002). Women with lower education levels exhibited the greatest risk for CVD, as augmented by inadequate physical activity, smoking, elevated cholesterol levels and a family history of CVD. In comparison to White women, African American women living in rural communities had significantly lower education and income levels. Among these women the prevalence of hypertension and diabetes was greater among African American women. Although deaths from CVD have declined in individuals living in rural regions, those in the southern and Appalachian regions of the United States are still at an amplified risk for premature death from CVD (Pearson and Lewis, 1998; Barnett & Halverson, 2000; Barnett et al., 2000). National rates of death in the United States from heart disease were the second highest in southern rural counties; among men the highest percentage of deaths related to CVD were observed in these counties (Eberhardt et al., 2001).

Disparities in access to medical treatment facilities in rural areas are believed to contribute to the increased risk of premature death from CVD among rural residents. In comparison to urban communities, rural communities are more likely to have inadequate access to and quality of health care services (Reschovsky & Staiti, 2005). Minorities (i.e. African Americans and Hispanic Americans) living in rural regions have disproportionately limited access to health care compared to their White counterparts (Mueller et al., 1999). African American women living in rural areas are particularly vulnerable (Cort et al., 2001). Significant disparities in access to facilities that provide treatment for acute cases of CVD (i.e. stroke) have been observed when comparing urban to rural communities, with significantly fewer rural communities having access to acute care facilities (Khan et al., 2011).

Disparities in stroke prevalence have also been observed with African Americans being more likely to report having a stroke, compared to other ethnic groups; African Americans were also more likely to report being hypertensive (McGruder et al., 2004; Lloyd-Jones, 2009). Among these individuals, black non-Hispanic females with less than a high school education, living above or equal to the poverty line with an annual income <\$20,000 and unemployed were more likely to have a stroke. Racial/ethnic disparities in CVD risk in regard to the presence of other co-morbidities such as diabetes, insulin resistance and hypertension have also been observed (Brown, 2006).

Zuniga et al (2003) suggest that disparities in CVD among rural Americans may be augmented due to certain behavioral characteristics and attitudes. Lower educational attainment, socioeconomic status and standards of living among individuals in rural communities may contribute to behaviors that increase CVD risk; poor dietary patterns,

smoking, physical inactivity and the failure to manage other co-morbidities such as hypertension and diabetes contribute to this increased risk (Cooper et al., 2000).

2.5 Classical and novel assessments of CVD risk

CVD clinical risk assessment has customarily been assessed based on an individual’s lipid profile. Generally, the risk for CVD is amplified due to the risk for and presence of other co-morbidities. In addition to the more common physiological manifestations of CVD risk, novel assessments of CVD include the presence of more recently recognized proteins and cytokines that influence CVD risk. It has been suggested that acute phase proteins such as C - reactive protein (CRP), fibrinogen, homocysteine and lipoprotein (a) may be useful as novel assessment parameters of CVD risk (Hackman & Anand, 2003).

Conventional risk factors for CVD risk assessment include biological (e.g. genetic predisposition, physiological (e.g. inflammatory disorders, hypertension, hyperlipidemia, diabetes), behavioral (e.g. cigarette smoking, physical inactivity) (Khot et al., 2003), dietary (e.g. inadequate fiber and antioxidant nutrients, high fat composition) and demographic (e.g. age, race, sex, education, income) (Figure 1). Indirect CVD risk may be assessed based on the presence of other co-morbidities as certain disease states increase the risk for developing CVD. For example, persistent elevations in blood glucose as seen in diabetes mellitus may increase the risk for hypertension. As indicated earlier in regard to racial/ethnic disparities in CVD risk, hypertension typically afflicts African Americans earlier in life and with greater severity.

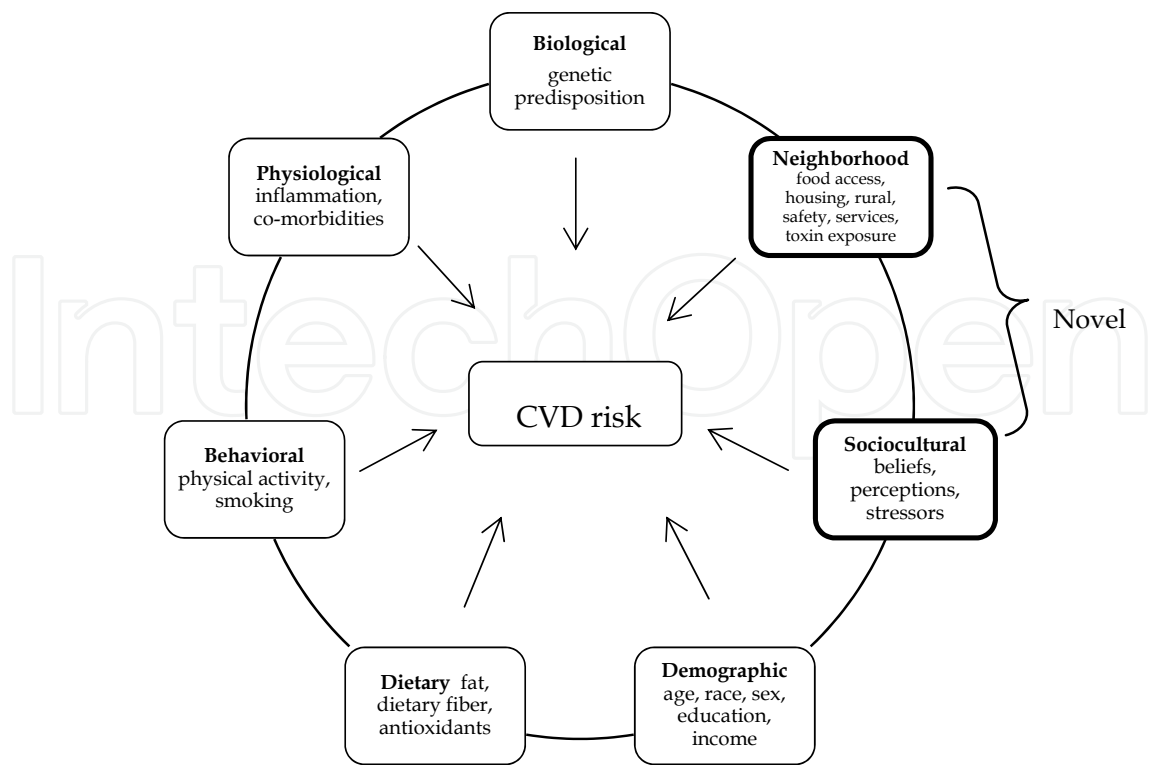


Fig. 1. Conventional and novel influencers of CVD risk.

The assessment of CVD risk in African Americans is elusive in that generational non-genetic trajectories not commonly observed among other subgroups ensue in the African American population. Because African Americans typically exhibit lipid profiles within the “normal” range, an assessment of CVD risk (or other co-morbidities) based solely on lipid profile may not be sufficient to determine the level of true risk (Sumner et al., 2005a). While African Americans may display normal triglyceride levels even in the presence of insulin resistance, these individuals may have increased lipoprotein activity, which serves to attenuate increases in postprandial triglyceride levels (Sumner et al., 2005b). Although triglyceride levels may be used as a clinical diagnostic tool for insulin resistance, the demonstration of normal triglyceride levels among African Americans with insulin resistance (Sumner & Cowie, 2008), suggest that the identification of this disorder, as well as CVD, based solely on these variables may be insufficient. The integration of several specific biomarkers for disease risk as well as socioeconomic and demographic characteristics that influence disease risk may prove useful in the assessment of CVD risk among African Americans.

Research findings suggest that socioeconomic characteristics may influence and/or mediate the manifestation of certain physiological processes, which may increase the risk of adverse cardiovascular outcomes (Muennig et al., 2007; Aiello & Kaplan, 2009). Further, chronic socioeconomic conditions may transcend generations and result in persistent inflammatory and immunologic responses that increase CVD risk. Lower socioeconomic characteristics during childhood have been associated with CVD in adulthood (Galobardes et al., 2006). Lower socioeconomic status has been found to be positively associated with inflammatory biomarkers such as fibrinogen and C - reactive protein (Wilson et al., 1993; Tabassum et al., 2008). Predictors of socioeconomic status and certain biomarkers related to CVD risk include employment/occupational status, educational attainment and income (Yarnell et al., 2005; Muennig et al., 2007; Ranjit et al., 2007; Rosvall et al., 2007). Of the predictors of socioeconomic status (i.e. education, income and occupation), education was significantly associated with decreased blood pressure, decreased total cholesterol and increased high-density lipoprotein cholesterol (HDL-C) (Winkleby et al., 1992). Albert et al (2006) found education and income to function as novel assessments of CVD risk, with education and income being inversely associated with CVD risk.

3. Global perspective of CVD

Cardiovascular disease (CVD) is caused by disorders associated with the heart and blood vessels, which include heart attack (coronary heart disease), stroke, hypertension, peripheral artery disease, rheumatic heart disease, congenital heart disease, and heart failure (WHO, 2011). According to the World Health Organization (WHO) report, 17.3 million people died from CVD in 2008. Of those deaths, 7.3 million resulted from coronary heart disease and 6.2 million from stroke. Low and middle income regions are disproportionately affected with over 80% of the deaths occurring in these locations. It is projected by 2030 that approximately 23.6 million people will die from CVD, which will remain the leading cause of death (WHO, 2011). Despite the declines in CVD over the past few decades, it still remains the leading cause of death in the United States.

In 1992, more than 816,000 Americans died from some form of CVD, compared to 631,636 in 2006. In this same year heart disease was the major cause of death among various ethnic groups as well as for the general population. African Americans had the highest death rates

compared to Asian and Pacific Islanders, Native Americans or Alaskan natives and Hispanics. In general heart disease was highest in Mississippi, a Black Belt state characterized by a population density of African Americans (CDC, 2010). It was estimated that in 2010 heart disease would cost the United States 316.4 billion dollars. This cost includes: healthcare services, medications, and lost productivity (CDC, 2010). Many Black Belt states exhibit higher prevalence of CVD, hypertension or high blood pressure (HBP) and obesity that exceed the national average (Table 1). It is estimated that 9 out of ten individuals with heart disease have at least one risk factor. Modifiable risk factors high blood pressure, high cholesterol, diabetes, smoking, overweight and obesity, poor diet, physical inactivity and alcohol use, are associated with lifestyle behaviors (Fakiri et al., 2006). Awareness of modifiable risk factors can lead to positive improvement in the health of individuals.

3.1 Stroke, hypertension and obesity

African Americans are disproportionately affected by CVD, and are more likely to have two or more risk factors (Gillum, 2001). Furthermore research studies have shown that African-American children have an increased relative stroke risk of 2.12 compared to Whites (Fullerton 2003). Also death rates for stroke was 48.1 for White males compared with 73.9 for African-American males; the disparities followed similar trends for White females, with a rate of 47.4 compared to 64.9 for African-American females per 100,000 (Fullerton, 2003). In general African Americans have been shown to be at risk 70% more than whites for stroke hospitalization (Kennedy, 2002). The severity, disability and mortality from stroke for African Americans are greater compared to Whites.

African Americans develop hypertension at an earlier age than Whites and Mexican Americans (CDC, 2010; Ong et al., 2007). Among African Americans more females (44.1%) than males (42.2%) tend to develop hypertension. The percent affected by hypertension is higher for African-Americans males and females 42.2% and 44.1% compared to the general population 31.8 and 30.3, respectively. The prevalence of hypertension in African Americans in the United States is among the highest in the world (Hertz, 2005). Hypertension is a major risk factor for heart disease, stroke, congested heart failure and kidney failure (CDC, 2010). Within the African American community, rates of hypertension vary substantially. Those with the highest rates are more likely to be middle aged or older, less educated, overweight or obese, physically inactive, and have diabetes mellitus (Collins, 2002).

In the past four decades the prevalence of obesity among U. S. adults increased from 13 to 32%. Presently, 66% of adults are overweight or obese; 16% of children and adolescents are obese and 34% are overweight. Overweight adolescents have a 70% chance of becoming overweight or obese adults and this number increases to 80% if one or both parents are obese (Kaufman, 20007). It is projected that by 2015, 75% of adults will be overweight and 41% will be obese (Wang and Beydoun, 2007). According to the Centers for Disease Control and Prevention none of the states in the United States of America met the Healthy People 2010 's goal to reduce obesity prevalence to 15%. Furthermore, the number of states with an obesity prevalence of 30% or more increased to 12 states in 2010 (CDC, 2011). In general the states where African Americans are present in the highest concentrations, They tend to have higher rates of obesity. Additionally, higher rates of obesity are found among groups with low educational and income levels, racial and ethnic minorities, rural and high poverty

areas. Obesity is a risk factor for CVD and other chronic diseases and disproportionately affects African Americans of all ages (Odgen et al., 2006). The rate of obesity is higher in rural areas, due in part to poor nutrition, physical inactivity, and low educational levels (Jackson, Doescher, Jerant & Hart, 2005). In Table 1 below, the prevalence of CVD is illustrated in the Black Belt States.

	CVD ¹ (%)	HBP (%)	Obesity (%)
Alabama	4.0	34.0	32.2
Arkansas	5.2	32.5	30.1
Georgia	3.8	31.7	29.6
Florida	4.1	28.3	25.6
Louisiana	5.0	34.3	31.0
Mississippi	3.9	36.2	34.0
North Carolina	4.2	30.4	27.8
South Carolina	4.1	31.0	31.5
Tennessee	4.0	30.6	30.8
National	4.5	29.7	33.8

Table 1. CVD, HBP and obesity prevalence¹ in adults across the Black Belt States.

3.2 Rural communities defined

Because there are different characterizations of rural areas, there is no single preferred definition that suits all policy requirements. The US Census Bureau defines an urbanized area asan area that includes a central city and the surrounding densely settled territory that together have a population of 50,000 or more and a population density generally exceeding 1,000 people per square mile. The Office of Management Bureau designates areas as metro; Economic Research Service/United States Department of Agriculture (USDA) uses rural-urban continuum codes to distinguish metro counties by size and non-metro counties by their degree of urbanization or proximity to urban areas. USDA uses codes zero to three as metro; four to nine as non-metro. An urban population with a designation of four has 20,000 inhabitants or more adjacent to a metro area and a code of nine signifies completely rural or urban with a population of fewer than 2,500 not adjacent to a metro area (USDA National Agricultural Library, 2008).

3.2.1 Rural African American communities

For the purpose of this text rural areas/communities are smaller towns or cities with low population density; where most of the land is devoted to agriculture. This definition better describes the communities inhabited by a vast majority of African Americans. The Black Belt region is characterized by rural socioeconomic decline, inadequate programs, acute problem of poverty, poor health, substandard housing and underemployment. This region includes the southern most states with a high percentage of African Americans/Blacks (Webster & Bowman, 2008; Wimberly & Morris 1997). A large segment (54.8%) of the African American

¹ Coronary Heart Disease Prevalence

population resides in this region compared to 17.5%, 18.8%, 8.7% in the northeast, Midwest, and West, respectively (US Census Bureau 2000). For example, in the state of Alabama there are 17 Black Belt counties which include Barbour, Bullock, Butler, Choctaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Montgomery, Perry, Pike, Russell, Sumter, and Wilcox (Figure 1). The total population in this region is close to 600,000 or about 13 percent of the 4.5 million in the State. The percent of poverty ranges from 26.8% to 40% within the Black belt counties (Federal Statistics, 2004). The per capita income for the State of Alabama is estimated at \$33,945, but is much lower in selected Black Belt counties with median incomes ranging from \$24,969 to \$30,370. Furthermore, median incomes for non-Black Belt counties in Alabama ranged from \$41,770 to \$64,371. When compared with other Alabama counties, Black Belt counties in Alabama have disproportionate greater rates of heart disease, cancer, hypertension and diabetes. CVD mortality rates are higher in Black Belt counties compared to non-Black Belt counties in Alabama (Table 1). Similar trends exist in the Delta region. In general CVD mortality rates are higher, the rate in Alabama is 235, Mississippi is 267.6 and South Carolina is 306 (from 2004 report) compared to the national average of 190 per 100,000.



Fig. 2. Alabama black belt counties.

Black Belt States	Income
Alabama	33,945
Arkansas	33,150
Georgia	35,490
Florida	39,272
Louisiana	38,446
Mississippi	31,186
North Carolina	35,638
South Carolina	33,163
Tennessee	35,307
Virginia	44,762
National	40,584

Table 2. Per capita personal income (2010) of households in the Black Belt States.

County	Health Ranking*	Median Income	High School Graduation Rate	CVD Mortality Rate**
Black Belt				
Macon	61	27,011	57.6	373
Bullock	67	24,969	65.9	323
Barbour	31	30,370	53.5	295
Lowndes	62	28,530	48.3	400
Non-Black Belt				
Lee	2	41,770	69.2	178
Shelby	1	64,371	76.2	145
Jefferson	29	43,279	60.8	265
Alabama				235
National	-	50,221	84.6	191

*County Health Ranking 1= best performance and 67 = worst performance.
**CVD mortality rate per 100,000 Taken from "Selected Indicators of Health Status in Alabama", AL Rural Health Association and Alabama Department of Public Health, 2007

Table 3. Comparison of Four Targeted Black Belt Counties and Non Black Belt Counties in Alabama on Selected Health Measures

Americans living in rural areas are disadvantaged as it relates to healthcare. These rural residents have to travel long distances to reach a healthcare facility, have less access to specialized care and are less likely to receive preventive care (Larson and Fleishman, 2003). Data showed that rates were higher (176.3) among rural African Americans admitted for uncontrolled diabetes without complications compared to metropolitan Whites and Blacks - 13.8 vs. 76.7, respectively (AHRQ, 2005). In general pre-mature mortality is greater among rural residents than among urban/metropolitan or suburban. The age-adjusted death rate among individuals aged 1-24 who lived in rural counties was 31% higher than those living

in urban counties and 65% higher than individuals living in suburban counties. Similar trends exist for more mature adults living in rural counties when compared to their urban counterparts. Death rates from CVD and cancer are higher in rural areas within certain regions. The mortality rate from heart disease was highest in the South (Eberhardt et al., 2001); furthermore, it was 25% higher than the rate among Southern suburban residents. The gap becomes wider for African American women where a 10-fold difference was observed; and the highest rates were among residents who lived in rural areas in the Mississippi Delta region (Taylor, Hughes & Garrison, 2002). Stroke is also higher among rural African Americans (Gillum, 1997). In Mississippi 80% or more of the counties have no physicians who specialize in CVD. Furthermore there is a lack of medical care resources for coronary care unit beds and cardiac rehabilitation units as well as limited access for intervention and treatment. Additionally, an analysis of services to Medicare beneficiaries revealed that the level of cardiology services for rural Medicare recipients was 40% lower than the urban beneficiaries as a result of the lower number of doctor service per beneficiary (15%) (Taylor, 2002). Furthermore, there is an increasing body of research that supports the presence of physical bias on race/ethnicity, economic status and in some cases gender (Fincher et al., 2004).

3.3 CVD interventions

The Department of Health and Human Service in 1990 established the *Healthy 2000* National Health Promotion and disease Prevention objectives, a strategy for improving the health of Americans. In 2000, the 2010 objectives were launched, as “a comprehensive nationwide promotion and disease prevention agenda. There were 467 objectives designed to serve as a frame work for improving the health of all people in the United States. In December of 2010 the *Healthy People 2020* was delivered which continues to build and expand goals and objectives established two decades earlier (CDC, 2011). The objectives relating to reducing health disparities in African Americans was partially met; for example diabetes prevalence, diabetes-related deaths and lower extremity amputations. However, fetal alcohol syndrome increases and the gap widened (CDC, 2002). Disparities among African Americans generally continue in all aspects of their lives. The Healthy People indicated that community-based intervention is an important method for achieving health objectives. Community-based partnerships have effectively changed health related issues such as establishing requirements for smoke free schools and labeling of heart healthy foods (Brownson, 1996). Large community based interventions have addressed both individual and community wide changes with emphasis on CVD prevention. These large interventions include: the North Karelia project, Finland, Stanford Five-City Project, and Pawtucket Heart health Program. The projects in the US reported favorable results except for the Minnesota Heart Study, where significant progress in reduction of risk factors were not realized. Unfortunately none of these large scale cardiovascular studies were focused on African Americans or rural populations (Brownson et al., 1996).

Interventions targeting African Americans are sparse, however smaller intervention projects focused on the rural African American population have demonstrated promising results. Significant reductions in body weight, total cholesterol, diastolic and systolic blood pressure among African Americans who participated in a Nutrition Education Program in rural Alabama were observed (Qian et al., 2005). Increased folate intake among rural African-American men at risk for CVD was also reported after 12 weeks of nutrition education.

Furthermore, fruits and vegetable consumption increased among rural and inner city participants (O'Loughlin, 1999; Brownson et al., 1996; Joshu et al., 2003; Resnicow et al., 2004). In the Bootheel Heart Project, an intervention focused on improving lifestyle factors related to CVD among at-risk African Americans, noted improvements for each of the five risk factors associated with CVD (i.e. leisure physical activity, smoking status, consumption of five fruits and vegetables daily, weight status and cholesterol levels). The Bootheel project was a physical activity intervention that focused on African Americans at risk for CVD as a result of physical inactivity and other lifestyle factors.

Increasing physical activity in the rural African American population is a major factor in partially addressing CVD health disparities issues. For physical activity intervention strategies to be effective, barriers and limitations must be identified and addressed. The most often cited reason for physical inactivity is the lack of facilities. In the rural areas, there are no designated walking trails or sidewalks. Safety is sometimes cited (Carter, 2009 unpublished data). Eyler et al (2003) reported positive outcome in physical activity levels among African American women involved in a cardiovascular Health Network project. In one study although an increased use of the walking trail was reported a significant change in walking rates was not evident (Brownson et al., 2004) A Faith-based Institution engaged in physical activity programs has seen a 54% increase in churches implementing such programs. Physical activity is an important factor for CVD prevention (Wilcox et al., 2006). It will require creative approaches to engage rural African Americans in physical activity and other life changing habits that are sustainable to achieve desired goals in CVD disparity reduction

3.4 CVD prevention among African Americans

The reasons for disparities observed among the African American population are complex and often interrelated. They are associated with low socioeconomic status, inequalities in work, income, education, limited access to health care and overall standard of living. African Americans living in the South and specifically the Black Belt/ Lower Mississippi Delta region have the highest CVD rates in the nation. Much effort has focused on pharmacologic management of CVD, although these treatments have proven benefit, they are costly and may have side effects and may require additional medical intervention. As noted earlier there are many rural areas without physicians; and access to cardiac physicians is a limitation for this segment of the population.

CVD prevention programs for African Americans especially in the rural areas should be established upon the community-based participatory research model. Community-based participatory model is a constructive research paradigm use to promote active community involvement that shapes the research and intervention strategies as well as implementation of the study. It is an interactive process, incorporating, research, reflection, and dynamic action involving individuals from all levels (community leaders, participants). There are several facts that drive the need for culturally sensitive prevention strategies that are region and community specific. The approach should elucidate information on nutritional and physical activity behaviors, group support, self efficacy, socialization patterns, willingness to participate in long term lifestyle modification etc. A holistic approach is warranted which will include changes at the systems levels, to include policy changes as it related to federal appropriation and implementation of these policies. It is important to increase awareness and engage African Americans in culture specific activities, broaden their perceptions and bring light to the disparities and action that will reduce these anomalies.

4. Disease prevention strategies for rural African Americans

African Americans living in rural America would benefit most from disease prevention program strategies within their communities since in comparison to other ethnic groups they are disproportionately affected by CVD, particularly hypertension, when compared to their White counterparts. They are also a group with less access to overall health care. Rural communities in Black Belt states (AL, FL, GA, LA, NC, SC, MS, TN and AR) throughout the US generally have higher rates of CVD per 100,000, often exceeding the national rate. These statistics obviously show the need for intervention within these communities.

Place of geographical residence has also been implicated as a factor in determining health status. In an evaluation among rural, urban and suburban residence, individuals living in the most urban and most rural areas were the most disadvantaged relative to health measures (Eberhardt & Pamuk, 2004). In a study conducted by Mainous III et al (2004) in Charleston, South Carolina, a Black Belt state, on race, rural residence and control of hypertension, the results strongly suggested that among patients with diagnosed hypertension, 11% of rural Whites, 13% of urban Whites, 20% of urban African Americans, and 23% of rural African Americans had diastolic blood pressures greater than 90 mmHg ($P < 0.01$).

In addition to risks for disparities in health, living in rural communities creates other disadvantages such as availability and accessibility to healthier food selections. Food availability and accessibility factors were evaluated in two contrasting cities in Tuskegee, AL (located in Macon County, a Black Belt County) and Auburn, AL. Thirty retail outlets were evaluated for the availability of selected foods in Macon County. More healthy food selections such as frozen, low-sodium or dark-green, yellow vegetables, low-fat milk or yogurt, low-sodium and low-fat cheese were often unavailable in convenience stores; none of the supermarkets in the same location stocked low-sodium vegetables (Bovell-Benjamin et al., 2008). Similar findings on availability and accessibility were found in a South Los Angeles restaurant relative to African Americans having healthy food options, both in food selections and in food preparation. Restaurants in economically disadvantaged poorer rural communities heavily promoted unhealthy food options to residents compared to residents living in more affluent areas (Lewis et al., 2005).

4.1 Diet and nutrition prevention strategies

Many disease prevention strategies for cardiovascular exist with varied results. The main stream intervention strategies emphasize the importance of nutrition education using several social theories to enhance the change process. Diet has also been implicated as a tool to reduce or prevent selected types of CVD. Consumption of diets rich in fruits and vegetables, containing significant amounts of antioxidants, high dietary fiber, low saturated and trans fat and a balance in other essential nutrients are recommended to reduce the risk for CVD. Sweet potato greens and purslane, two novel foods, and several traditional foods included in the African-American diet such as butter beans, purple hull peas, muscadine grapes, collards, butter peas, figs, okra, mustard greens, green onions, rutabagas, and eggplant are examples of foods that contain significant levels of antioxidants (Huang et al., 2007a, 2007b, 2008, 2009). In an article by Johnson and Pace (2010), the nutritional characteristics of sweetpotato (*Ipomoea batatas*) leaves were reviewed in terms of health promotion and disease prevention. The supply an abundance of vitamins, minerals, antioxidants, dietary fiber and essential fatty acids.

Additionally, the bioactive compounds contained in this vegetable occupy a role in promoting health by improving immune function, suppressing cancer cell growth and reducing oxidative stress and free radical damage, which are associated with the development of cardiovascular and other chronic diseases. Currently sweet potato leaves are consumed in Asian and African countries; limited consumption occurs in the United States. Additionally, the article examined the nutritional characteristics and bioactive compounds within sweet potato leaves that contribute to health promotion and disease prevention. Dawkins et al (2010) found that purslane (*Portulaca oleracea*) contained relatively high amounts of omega-3 fatty acids, protein and dietary fiber and low amounts of total fat. High dietary fiber and low dietary fat are synergistic in the reduction and prevention of cardiovascular disease. However, for all of these foods, their health benefits are not well known nor have their nutrient value been emphasized as excellent foods for consumption to prevent diseases in the African American community.

4.2 Other CVD prevention strategies

After one year of participation in one of three church-based intervention strategies, a standard behavioural group intervention, the standard intervention supplemented with spiritual strategies, or self-help strategies, 529 African American women from 16 different churches who participated in the intervention exhibited significant improvements in body weight, waist circumference, systolic blood pressure, total dietary fat and sodium intake. The self help group did not show improvement. The improvements in the intervention group suggest that they reduced their CVD risk profiles one year after the initiation of the program. Further suggested from this research is that church-based programs can significantly benefit the cardiovascular health of African American women (Yanek et al., 2001)

4.2.1 Rural CVD prevention strategies

Nutrition, Health and Physical Activity Fairs (NHPAFs) are often used to provide information to the community to create awareness, education, and action to reduce CVD risk factors in individuals attending the fair. The NHPAFs, hosted in Macon County, AL in 2008, 2009, 2010 and 2011 were community nutrition outreach activities with residents from other neighboring counties participating. Other counties included: Bullock, Montgomery, Chambers, and Lee. These nutrition fairs were sponsored by the Department of Food and Nutritional Sciences, Tuskegee University, Tuskegee, AL.

At the NHPAFs, participants most unique experience allowed them to have onsite nutrition assessments, clinical evaluations measurements of blood pressure, glucose and cholesterol, percent body fat, waist and hip circumference, hydration level, weight, vision, hearing, as well as foot health and care and breast self-examination. Consultation with nutritionists, physicians, nurse practitioners and diabetic educators were also available for interpretation of clinical measurements. Additionally, participants were exposed to gardening and herb displays, NUTRIFOODs (sweet potato leaves, purslane, butter beans, purple hull peas, muscadine grapes, collards, butter peas, figs, okra, mustard greens, green onions, rutabagas, and eggplant) tasting.

Data collected at these fairs showed that individuals with scores higher than 10 (determined from a 25-question instrument where lower scores are better) were good candidates for nutrition counseling. The mean score was 18 among those 14 to 80 years old. Other outcome measures showed significant positive associations ($P < 0.05$) between weight and blood glucose,

and body mass index (BMI) and systolic blood pressure; BMI was positively and significantly ($P < 0.01$) associated with blood glucose, diastolic blood pressure, and percent body fat. High nutrition scores correlated with increased risk for chronic disease (NHPAF, 2007).

Often in small rural communities with limited health resources, nutrition and health fairs can be used to assess the health status of residents. Twenty-two men, 45 women and six children participated in a one-day health fair sponsored by a school of nursing, University of Alabama. The results indicated that participants need assistance with health promotion in several areas: weight loss/obesity, blood sugar control, lowering cholesterol levels, vision and hearing follow-up, etc. (Lyons et al., 2001).

4.3 Effective social models and compliance tools for disease prevention in African Americans

The traditional social models, e.g. Social Cognitive Theory, Health Belief Model, and the Transtheoretical Model for Change etc. are commonly used to promote sustained behavioral change. Social Cognitive Theory variables (e.g. social support, self-efficacy, outcome expectations and self-regulation) are often used to reinforce desired behaviors. The question of whether all behavior is the same in African Americans compared to Whites living in rural or urban American communities remains unanswered. In a university-neighborhood health care center intervention to promote the Dietary Approaches to Stop Hypertension (DASH) diet study, 82 low-income African American adults with poorly controlled blood pressure participated (12 to 15 participants per group) in the study for eight weeks for one to two hours weekly. The intervention followed constructs of Social Cognitive Theory and featured dinners developed using the DASH diet plan. Following the dietary intervention, blood pressure was significantly decreased ($P < 0.05$) among participants who did not miss more than 2 of 8 sessions (Rankins et al., 2005).

Through the 12-week Tuskegee University Nutrition Outreach Program (TUNOP), the effects of a church-based nutrition education and lifestyle intervention, utilizing the Transtheoretical Model for Change, on blood lipid profile and risks for CVD in African Americans were investigated (Qian et al., 2007). Eighty-nine African Americans aged 35-75 years, 15 men and 74 women) at CVD risk participated in the program. Lipid profiles (triacylglycerols, low density lipoprotein cholesterol [LDL-C], high density lipoprotein cholesterol [HDL-C], and total cholesterol) and plasma high-sensitivity C-reactive protein (hs-CRP) concentrations were monitored before and after nutrition education intervention. Results showed a 3% reduction in body weight ($P < 0.01$); BMI (kg/m^2) was reduced by 3.2% ($P < 0.01$). Hip circumference was reduced from baseline by 1.22% ($P < 0.05$). Other reductions included an 8.8% reduction ($P < 0.05$) in triacylglycerols; a 5.1% increase was measured ($P < 0.01$) in HDL-C. The decreased hs-CRP level, a 68.5% reduction ($P < 0.05$) indicated that nutrition education did reduce the inflammatory processes within the human body, which might have a beneficial effect on disease reduction.

A meta analysis (386 articles) aimed at determining the effectiveness of health programs on healthy outcomes in faith-based organizations were evaluated at approximately 200 eligible institutions. Significant reduction ($P < 0.05$) in cholesterol and blood pressure levels and weight were measured. Therefore, such programs focused on primary prevention, general health maintenance and cardiovascular health (DeHaven et al., 2004) can bring about improvements in overall health and reduce the risk for CVD.

Lack of exercise also negatively impacts hypertension. Martin et al (2007) evaluated the characteristics of insufficiently active hypertensive African-American women using a social cognitive theory and the Transtheoretical Model to identify positive resources and areas of need to improve activity levels. According to the Transtheoretical Model stages of change, 88.52 % of the sample was in the contemplation state. Women reported moderate levels of confidence to overcome barriers, a moderate level of confidence to use self-motivation, and reported that barriers rarely interfered with their ability to be physically active. The researchers concluded that physical activity interventions should focus on developing social support networks and teaching a variety of behavior strategies important to the adoption of an active lifestyle. The same group of researchers in an effort to further determine the relationship of health behavior theories with self-efficacy among insufficiently active hypertensive African-American women identified correlates associated with self-efficacy which included: overcoming barriers to physical activity; making time for activity and sticking with physical activity. The results suggested that self-efficacy is behavior specific and each measure likely provides specific information (Martin et al., 2008).

4.4 Recommended integrative CVD prevention strategies

The obvious cardiovascular disparities existing between African Americans and Whites as well as African Americans living in rural versus urban areas, clearly suggest that an integrative strategy to reduce these racial and geographical disparities is needed. An integrated strategy (addressing the entire needs of the community) for African Americans living in rural communities must take into consideration programs that will address specific demographical, geographical, cultural, educational and socioeconomic characteristics in order to be effective in reducing high blood pressure, weight and other risk factors for CVD. Sustaining change must be a part of any program aimed at improving the lives of African Americans living in the rural South. Barriers to cardiovascular health faced by African Americans living in the rural South include: lack of food availability and accessibility, inadequate intake of fruits and vegetables and other foods, lack of knowledge about the good quality of foods already in their diet, physical inactivity and lack of the resources needed to access what is needed. These barriers must and should be overcome if we are ever to close the gap relative to health disparities. Prevention strategies should be tailored to be culturally and regionally specific to meet the needs of each community.

5. Conclusion

CVD is of public health concern particularly among African Americans living in rural communities in the southern region of the United States. African American women living in rural communities are at a particularly elevated risk for CVD. Risk for CVD increased by limited education, income and neighborhood resources, which act in concert to further widen the gap in health disparities. CVD prevention within these communities requires an integrative, culturally sensitive strategy that identifies, evaluates and optimizes demographic, environmental, food, and social factors that contribute to health promotion and disease prevention. Nutrition-based strategies should consider the context of the food environment and promote the increased consumption of more healthful foods already present in the diet. Behavior based strategies should consider the potential lack of sidewalks and other facilities that may hinder physical activity. Finally, social models and compliance

tools should consider the unique family and community environments, which may be passed down from one generation to the next and how this influences sustained behavior and ultimately cardiovascular health. Preventing CVD and ultimately mitigating CVD disparities in rural communities necessitates an integrative approach encompassing an open and honest dialogue between community residents and leaders, health care professionals and federal health agencies.

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Human behavior accounts for the majority of morbidity and premature mortality throughout the world. This book explores several areas of human behavior including physical activity, nutrition and food, addictive substances, gun violence, sexual transmitted diseases and more. Several cutting edge methods are also examined including empowering nurses, community based participatory research and nature therapy. Less well known public health topics including human trafficking, tuberculosis control in prisons and public health issues in the deaf community are also covered. The authors come from around the world to describe issues that are both of local and worldwide importance to protect and preserve the health of populations. This book demonstrates the scope and some of the solutions to addressing today's most pressing public health issues.

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