Differences and Similarities in Rural Residents' Health and Cardiac Risk Factors

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Abstract

Purpose: The current U.S. population exceeds three hundred million with approximately 20% living in non-urban rural areas. A higher percentage of rural residents have diagnosed heart disease and report poorer health compared to non-rural residents; however, it is not known whether risk factor modification for heart disease and health status differ based on degree of rurality. The purposes of this study were: 1) to compare differences in health status and cardiac risk factors between cardiac patients living in large and small/isolated rural areas, and 2) to compare the health status of rural cardiac patients with a national sample.

Method: A secondary analysis using data from three separate studies was completed using a comparative descriptive design. The Cardiac Rehabilitation participant sample (n=191) included individuals 3 to 12 months post-cardiac event. The Arizona Heart Institute and Foundation Heart Test measured risk factors and the eight subscales of the Short-Form, Medical Outcomes study measured health status.

Findings: No significant differences in health status were found; all participants rated their health moderately high. However, individuals in large rural areas reported significantly better general health than those in the normative sample. No differences in smoking, blood pressure, diabetes, or overweight/obese BMI were found between the two rural groups. Differences in exercise, and anger were present between the two groups. Significant differences were identified in waist circumference between the genders placing women at higher risk for heart disease.

Conclusions: Identifying health status and cardiovascular risk factors of rural individuals informs interventions to be tested for rural residents.

***Keywords*:** Cardiac risk factors, Rural, Cardiac rehabilitation

Differences and Similarities in Rural Residents' Health and Cardiac Risk Factors

The current United States (US) population exceeds three hundred million with approximately 20% living in rural, non-urban areas ("American Fact", n.d.). A higher percentage of rural residents have diagnosed heart disease and report poorer health compared to non-rural residents (Jones & Goza, 2008). Though a higher percentage of rural residents have heart disease, they have lower hospitalization rates due in part to distances to health care facilities (Harris, Aboueissa, & Hartley, 2008). Rural residents with heart disease encounter challenges accessing specialized cardiac care from primary care providers or cardiac rehabilitation (CR) programs. However, residents of small rural and frontier/isolated areas may have less opportunity to develop healthy lifestyles and have less access to programs, such as CR, to assist them with lifestyle changes after a cardiac event than those living in larger rural, suburban and urban areas. The specific objective for this research was to examine the differences and similarities in self-reported health status and secondary prevention of cardiac risk factors between cardiac patients living in larger rural areas and those living in smaller/isolated rural

areas; and further, to compare the health status of cardiac patients living in both types of rural areas with a national normative sample of cardiac patients. The normative sample classifies rural as non-urban, which is consistent with the terms used to refer to rural (non-urban) and urban individuals in prior literature. A beginning knowledge of specific differences in health status and secondary prevention efforts of cardiac patients may assist nurses and other health care professionals to inform health care policy in rural America.

Overview

Rural has been defined in various ways; one method is to classify non-urban areas using the Rural Urban Commuting Codes (RUCA) designation (WWAMI Rural Health Research Center, n.d.). RUCA designations take into account geographic location based on access to metropolitan or micropolitan statistical areas where it is likely health care services, e.g., hospitals, CR programs, and physicians, will be available. Using the RUCA codes, rural-designated areas can be combined to form rural categories, such as large or small rural and isolated areas. Disparities in preventive health care exist between rural and urban individuals, including, routine physical exams (83.8% vs. 86%, respectively), screening tests including pap smears (84.3% vs. 86.6%), mammograms (77.9% vs. 82.2%) and colorectal screening (46.3% vs. 49.2%), with individuals living in isolated areas having even lower percentages than their counterparts in large rural areas (South Carolina Rural Health Research Center, n.d.).

Coronary heart disease (CHD) consistently accounts for more deaths in the US than other diseases and is the primary cause of death (Lloyd-Jones et al., 2009). Mortality rates attributed to CHD differ among individuals residing in rural and urban areas. Estimates show one of three individuals has at least one type of cardiovascular disease (Lloyd-Jones et al., 2009). Men living in rural, non-metropolitan counties (Eberhardt et al., 2001) have an ischemic heart disease

mortality rates of 20%, which exceeds metropolitan county rates by 12%. According to the American Heart Association (Lloyd-Jones et al., 2009) the estimated direct and indirect costs of CVD in the U.S. is $475.3 billion. Costs directly linked to health care delivery, hospital care, medications and provider visits are direct costs which may or may not be covered by health insurance; indirect costs, lost wages due to illness or death are not covered. When comparing individuals in urban and any type of rural area, differences exist in their insurance status with the greatest number of uninsured individuals living in isolated areas (Lenardson, Ziller, Coburn & Anderson, 2009). Regardless of rural-urban designation, characteristics of the uninsured include low income, fair to poor health, and low educational attainment. However, uninsured rural residents earn significantly lower family incomes; 1) 50% of urban residents compared to 59% of rural residents earn incomes at 200% of the federal poverty level ($p < .05$), 2) 28% of urban residents compared to 31% of rural residents have no family members employed full time, ($p <.05$), and 3) 31% of urban residents compared to 36% of rural residents earn less than $10 per hour ($p <.05$) (Lenardson et al., 2009). Furthermore, individuals who live in rural areas are less likely to receive recommended cardiac treatment such as fibrinolytic or percutaneous coronary interventions (PCI), compared to individuals living in urban areas (Baldwin et al., 2004).

Health Status

Individual health status varies based on geographic location. Few studies were found which examined the health status of individuals with coronary disease who live in rural areas. In a study that compared frontier and urban individuals with chronic heart failure, minimal differences were found between the two groups in terms of depression, quality of life, New York Heart Association classification and socio-demographic information (Wagnild, Rowland, Dimmler, & Peters, 2004). In both groups, participants had on average of 2.5 to 2.65 chronic conditions.

Although it was suggested that frontier participants reported more depression (M = 10.01, SD = 6.7) than urban participants (M = 8.26, SD = 6.5) and may be an important clinical finding, it is not statistically significance.

Using the Minnesota Living with Heart Failure Questionnaire, frontier participants reported more symptoms then their urban counterparts (Wagnild et al., 2004) ($t = 2.0$, $p<0.05$). Rural-living residents, compared to urban residents, have limited connections with a family health care provider, have more financial restrictions and less opportunities to engage in a heart healthy lifestyle, such as buying fresh produce, exercise equipment, or gym memberships, with additional barriers to keeping fit, including less time, and fewer alternatives to exercise (King, Thomlinson, Sanguins, & LeBlanc, 2006).

Risk Factors

The main modifiable risk factors for CHD include tobacco use, physical inactivity, obesity, elevated blood pressure, and lipid levels (Balady, et al., 2007). The majority of studies which investigated cardiovascular risk factors among rural residents examined rural versus urban comparisons. Differences in risk factors were found between urban and any type of rural area with rural residents more likely to smoke, be obese, and be physically inactive than their urban counterparts (Jones & Goza, 2008; Eberhardt et al., 2001). A comparison of rural Appalachia and national data revealed higher scores for cardiac risk factors, hypertension, body mass index (BMI), and tobacco use, among rural residents (Schwartz et al., 2009). However, in comparing all types of rural and urban medically underserved areas (MUAs), urban residents in MUAs had significantly higher percentages of individuals who either smoked or were diabetic (Homko et al., 2008).

Few studies were found that examined secondary prevention of cardiac risk factors in rural populations. Using a pretest-posttest design, individuals living in rural areas who participated in a CR program demonstrated improvement with cardiac risk factors, including weight, activity levels, quality of life, cholesterol levels, and dietary fat intake (Aounm & Rosenberg, 2004). Prior studies have found disparities in access to health care services such as CR programs between rural and urban individuals with rural persons being more disadvantaged (Gavic, 2005). Nebraska ranks first in the country in the number of CR programs per population; with approximately 90 CR programs scattered throughout the state, many of which are in small rural communities (Curnier, Savage, & Ades, 2005). This finding suggests that regardless of where they live individuals living in Nebraska, even though they may be 30 to 60 miles away, have access to a CR program. However, it is not known if Nebraska cardiac patients who live in small rural/isolated areas have poorer health and are less successful in cardiac risk reduction after a cardiac event compared to those who live in large rural areas with easier access to CR services.

To reduce cardiovascular disease risks in rural populations, researchers and practitioners need to know more about secondary prevention issues that cardiac patients face in managing their disease. Individuals living in small/isolated rural areas may have less opportunity to engage in physical activity, dietary choices, and access to health care. These factors may contribute to their health status and their increase risks over those living in larger rural, and non-rural areas. However, because so few studies have been reported comparing individuals who have experienced a cardiac event and are living in small rural and isolated areas, more comparison studies with these groups are needed. Large versus small rural/isolated environments offer unique challenges, encompassing health care access, travel distances and population density, that must be considered when planning interventions focused on secondary prevention; more research

is needed that includes individuals living in different rural environments. This study addresses whether differences in health status and risk factors exist between cardiac patients living in large rural versus small rural/isolated areas.

Method

A secondary analysis using data from three separate studies was completed using a comparative descriptive design. The three studies were combined to form a CR participant sample (n = 191), referred to as the CR participant data sample. The subjects for all three studies which were used in the CR data sample were recruited using non-probability sampling methods from three separate Midwestern health care systems in rural *Nebraska* communities. The entire CR participant data sample (n = 191) included individuals 3 to 12 months post-cardiac event who lived in a rural area. Rural categories were defined using the Rural Urban Commuting Codes (RUCA) designation (WWAMI Rural Health Research Center, n.d.). Postal zip codes were used to assign each study participant to the corresponding RUCA classification. Consistent with RUCA categorization B, which designates 2 rural groups, participants were placed in one of the two rural groups, large rural core or small rural/isolated.

The first data source (n = 64) included in the CR participant sample were patients who had been hospitalized 6-12 months earlier with coronary artery bypass graft (CABG) surgery or myocardial infarction (MI). A letter explaining the study, consent forms, questionnaires, and a return envelope were sent to 112 potential subjects, who were identified by cardiac case managers. Sixty-six returned the questionnaires for a response rate of 59%, 2 patients were not included due to significant amounts of missing data (Yates et al., 2007).

The second data source (n=64) included in the CR participant sample were patients who had recently completed a rural based CR program. All participants who completed the CR

program and met study criteria were invited to participate in a randomized clinical trial involving booster sessions to maintain the positive gains they had made in CR. The patients' baseline scores were used in the current analysis. Of the 74 eligible, 9 declined due to scheduling problems or lack of interest (88%). Of the 65 who were initially enrolled, 1 person withdrew (2% attrition rate) (Yates, Anderson, Hertzog, Ott, & Williams, 2005).

The third data source (n = 62) included in the CR participant sample were patients who participated in a clinical trial testing two methods of delivering CR: a traditional outpatient program vs. a home-based program. Approximately 100 patients were approached to participate, 74 initially enrolled (74%), 13 persons withdrew (18%) during the course of the study (Yates, Price-Fowlkes, & Agrawal, 2003).

Measures

All study instruments in the three studies which contributed to the CR participant data sample were completed via mail surveys. Cardiac risk factors were measured by using selected items from the Arizona Heart Institute and Foundation Heart Test for Men and Women (Dietrich, 1981). Participants were asked about: 1) blood pressure,<140/90 vs. $\geq$ 140/90; 2) whether or not they engaged in a regular exercise program; 3) recent cholesterol level, < 200 mg/dL vs. $\geq$ 200 mg/dL; 4) amount of fat in diet, low fat vs. moderate/high fat; 5) how often they were easily angered and frustrated, rarely vs. some/most of the time; 6) whether or not they were trying to lose weight; 7) whether or not they smoked; and 8) whether or not they had diabetes. The Arizona Heart Institute questions have face validity and the literature supports the relevance of measuring these variables as outcomes of risk reduction for cardiovascular patients.

For those who exercised regularly, participants were asked what activities they did, how many times per week, and for how many minutes per session. Weekly activity expenditure (kcals

/ week) was calculated as the product of the duration and frequency of the primary activity (hrs / week), weighted by an estimate of the metabolic equivalent (MET) of that activity (Ainsworth et al., 2000) and multiplied by body weight (kg). The recommended weekly activity expenditure is 1000 – 1500 kcals/week, with a minimal goal of 150 minutes moderate to intensive exercise per week (American Heart Association, 2003; "ACSM issues new," 2011).

Participants were also asked to self-report their height and weight and waist circumference (in inches) by measuring their waist at the umbilicus. BMI was calculated using the standard formula from self-report of height and weight (Centers for Disease Control, 2010). Normal BMI is < 25.0 kg/m^2. Overweight is defined as a BMI of 25.0 to 29.9 kg/m^2 and obesity as a BMI > 30.0 kg/m^2. Women with a waist measurement greater than 35 inches or men with a waist measurement greater than 40 inches may have a higher CHD disease risk American Association of Cardiovascular and Pulmonary Rehabilitation [AACVPR] 2003).

Health status was measured by the eight subscales of the Short Form-36 (SF-36) from the Medical Outcomes Study (Ware, Snow, Kosinski, & Gandek, 1993). The eight categories of the survey includes: physical functioning, role-physical, role-emotional, social, bodily pain, vitality, mental health, and general health. Scores on all eight subscales can range from 0 – 100 with 100 denoting the person's ability to perform normal activities i.e. social, physical, etc. without interference due to health problems. Estimates of internal consistency reliability (Cronbach's alpha) of these subscales ranged from 0.78 for general health to .93 for physical functioning (Ware et al., 1993). The SF-36 also has established validity evidence (McHorney, Ware, & Raczek, 1993). In the current study, all Cronbach alpha internal consistency reliabilities of the 8 subscales were > 0.70.

All three of the studies which contributed to the CR participant data sample were approved by an Institutional Review Board (IRB) at the university and the clinical sites where the studies were conducted. Informed consent was obtained from each participant in the three separate studies. The CR participant data sample received exempt status from the University IRB where the original three studies were conducted.

Data Analysis

The CR participant sample data was used to compare differences between the two groups (large vs. small/isolated rural), t-tests were used for continuous variables and chi-square statistics for categorical data. Data were examined for outliers and violations of normality using SPSS v.19. All of the variables demonstrated low univariate skew and kurtosis. T-tests were used to examine whether there were differences between the two CR participant sample data rural groups and the MI normative group in the subscales of the SF36. The level of significance designated for all analyses was alpha ≤ 0.05.

Results

The CR participant data sample was 97% Caucasian and 77% male, with ages ranging from 40 to 86 years (see Table 1).

The majority of participants in both rural groups were married, well educated (> 80% completing high school), and had incomes greater than $20,000 a year. No differences were found between persons living in large rural and small/isolated areas in age, race, marital status, education, and income. In contrast, individuals from the large rural areas (M = 7 miles) lived significantly closer to the CR site than those living in small rural/isolated areas (M = 17.2 miles). Fewer men lived in small rural/isolated areas (78%) compared to large rural areas (61%) and

more patients in the small rural/isolated areas had Coronary Artery Bypass Graft (CABG) surgery (79%) compared to large rural areas (62%).

Table 1

Socio-demographic and illness comparisons between large vs. small rural/isolated areas

Variable	*Large Rural (N = 99) Mean (SD)*	*Small Rural (N = 80) Mean (SD)*	*Test statistic t-test df = 177*
Age	64 (10.4)	65.9 (8.9)	2.32
Miles from home to CRP [a]	7 (9.7)	17.2 (17.3)	5.08*
	%	%	Chi Square (df = 1)
Men	78%	61%	5.80*
Married	82%	86%	.58
HS diploma or higher	81%	83%	.18
Income >$20,000	61%	50%	2.63
Cardiac event			
CABG surgery [b]	62%	79%	6.18*
Medical intervention [c]	38%	21%	

[a] CRP = Cardiac Rehabilitation Program, [b] CABG surgery = coronary artery bypass graft surgery
[c] Medical intervention = status post myocardial infarction or percutaneous coronary intervention
*p < .05

Of the 93 counties in Nebraska, 85 (91.3%) are considered rural, with 32 (37.6%) of the rural counties designated as frontier areas, which loosely correlates with the RUCA isolated category. The participants lived in 27 different rural counties, representing 29% of the state's counties. Even with the majority (74%) of the rural counties in the state having a hospital and CR program, many of the participants lived 2-5 counties away and traveled approximately 50 - 250 miles one way from the CR site.

Health status measured by the SF-36, showed no significant differences between participants living in large rural vs. the small rural/isolated areas (see Table 2). Participants in both rural areas rated their levels of functioning moderately high. The only significant difference found in health status revealed individuals living in large rural areas reported significantly better

general health than individuals experiencing an MI who were included in the normative sample ($F = 2.81$, $df = 200$, $p < .006$).

Table 2

Comparisons between large rural, small rural/isolated areas and SF-36 normative data

SF 36 Subscale	***Large Rural (n = 95)***		***Small Rural/Isolated (n = 78)***		***SF-36 Norms[a] (n = 107)***	
	Mean	***SD***	***Mean***	***SD***	***Mean***	***SD***
Physical Function	69.15	25.69	70.0	25.13	69.68	26.12
Role Physical	54.21	42.31	56.41	42.14	51.41	39.35
Role Emotional	72.98	38.98	71.36	37.11	73.49	38.01
Social	79.73	25.53	79.96	24.78	84.65	21.23
Pain	74.11	24.55	70.93	21.95	72.75	25.25
Mental	76.33	16.80	77.69	15.12	76.33	16.80
Vitality	59.47	21.35	56.41	20.49	57.68	18.97
General Health	66.77[b]	19.02	63.35	19.31	59.17[b]	19.34

[a] Normative data were from patients diagnosed with MI[27]
[b] Significant differences between groups at $p < .05$

Cardiac risk factors, measured by the Arizona Heart Institute Questionnaire, showed mostly non-significant differences (see Table 3).

The majority of individuals were overweight or obese by BMI (74% in large rural group and 69% in small rural group) with no differences found between participants in the two groups. The majority of individuals in both groups were trying to lose weight using a combination of exercise and diet with the majority reporting a low-fat diet. While not significant the results demonstrate a trend toward more individuals living in the large rural areas to have a serum cholesterol level < 200 mg/dL (71%) compared small rural/isolated participants (55%, $p = .056$). Compared to individuals living in small rural/isolated areas, those in large rural areas were significantly more likely to be engaged in a regular exercise program and to be more easily angered in their daily lives. No differences were found between the groups in smoking status, few were smokers, blood pressure status, most had normal BP < 140/90, or presence of diabetes (approximately 39%).

Table 3

Comparisons between participants in large vs. small rural areas in cardiac risk factors

Risk factor	**Large Rural Areas (N = 99) %**	**Small Rural/ Isolated Areas (N = 80) %**	**Test statistic Chi-square df = 1**
Body mass index (kg/m^2)			
Normal weight	26%	30%	
Overweight	49%	42%	0.82
Obese	25%	27%	
Trying to lose weight	67%	70%	0.09
Eat low-fat diet	77%	82%	0.70
Serum cholesterol < 200 mg/dL	71%	55%	3.64†
Frequency of anger and frustration (some or most of the time)	56%	37%	5.95*
Still smoking	10%	6%	0.88
Normal blood pressure (<140/90)	93%	89%	0.49
Has diabetes	39%	38%	0.02
Regular exercise program	82%	68%	5.06*
	M (SD)	M (SD)	t-statistic (df)
Exercise			
# times/week	5.1 (1.7)	4.7 (2)	1.26 (df = 137)
Minutes/session	30.8 (10.1)	40.2 (40)	- 2.02 (df = 131)*
Kcals/week	771 (474)	844 (611)	5.31 (df = 115) *
Body mass index	27.7 (4.6)	27.4 (4.6)	0.327 (df = 170)
Waist circumference			
Men (>40inches)	38.5 (3.9)	38.5 (4.0)	-0.08 (df = 118)
Women (>35 inches)	35.4 (6.4)	36.6 (5.4)	-0.71 (df = 46)

*p < .05
†p = .056

Exercise which was measured using self-report, showed significantly more persons living in large rural areas engaged in a regular exercise program (82%) compared to those living in small rural/isolated areas (68%). However, persons living in small rural/isolated areas who were exercising did significantly more minutes/week and expended more kcals/week than those in large rural areas (see Table 3). The majority of individuals in both groups reported their aerobic exercise of choice as walking (92%), followed by bicycling (3%), and running/jogging (2%). Finally, no differences were found between groups in waist circumference. However,

significantly more women (52%) than men (25%) had a waist circumference that placed them in a higher risk category ($\chi^2 = 11.42$, df = 1, p = .001) for heart disease.

Discussion

The comparison of individuals by geographic location is unique; few studies examining cardiac risk factors and health status were found examining similarities and differences between individuals living in large rural vs. small/isolated rural areas. One of the reasons for examining these two groups is because individuals with reduced access to health care often have less access to care, poorer health, and more health problems. Examining individual risk factors by geographic location allows a closer look at community level factors which contributes to the overall health of the population. Differences were found for residents in their rating of general health status and in risk factors based on where they live. The main difference found in socio-demographic characteristics of the sample was that individuals living in small/isolated rural areas had farther to drive to access CR programs than those living in large rural areas. Prior investigators have reported similar findings between large and small/isolated rural areas for mileage and travel time required to access cardiac and other types of health care in rural areas (Chan, Hart, & Goodman, 2005). Few differences in risk factors were identified between the two rural groups. The majority of individuals in both groups were overweight or obese, ate a low-fat diet, were non-smokers, had normal blood pressure, and engaged in a regular exercise program. Differences that were found indicated that individuals living in large rural areas were more likely to engage in a regular exercise program compared to individuals living in small rural/isolated areas. In contrast, when individuals living in small/isolated rural areas did exercise, their exercise program was significantly greater in intensity than those living in large rural areas. However, on average, neither group was meeting the recommended level of 1000 to 1500 kcals of energy expenditure per week in physical activity ("ACSM issues new," 2011). Although the data in the

current study are limited by self-report, other investigators (Ayabe et al., 2004; Savage, Brochu, Scott, & Ades, 2000; Schairer, Keteyian, Ehrman, Brawner, & Berkebilem, 2003; Schairer et al., 1998) have demonstrated that CR participants do not consistently meet targeted kcals/week for physical activity.

Another difference in risk factors show that individuals living in large rural areas reported more anger and frustration in their daily lives than those in small/isolated rural areas. The differences in risk factors may be linked with problems associated with where they live. In this study, the large rural areas consisted of two communities of about 25,000 populations that face a common set of challenges such as traffic congestion, outdated roads, and shortages of affordable housing. These issues may serve as sources of frustration for individuals living in large rural areas. Similarly, those individuals living in small/isolated rural areas need to spend more time driving to access everyday necessities i.e. groceries, health care, etc. and thus have less time for an exercise program. The finding in the current study that more persons in small rural/isolated areas had surgery (79%) compared to those in large areas (62%) may be because of access issues. Persons living in small rural areas have farther to drive for care, or may delay longer in seeking care and, thus, were unable to get to the hospital soon enough for medical treatment of their cardiac event. However, Baldwin et al. (2004) found that individuals who live in rural areas are less likely to receive recommended cardiac treatments, such as fibrinolytic or percutaneous coronary intervention (PCI) procedures, compared with persons who live in urban areas. In contrast, a rural study conducted in a state that is considered predominantly frontier, found individuals seek health care based on their interpretation of symptom severity and delay health care based on the ability to adapt their life styles to the symptoms (Buehler, Malone, & Majerus-Wegerhoff, 2006). Future research is needed that reaches beyond individual reasons and

examines community level factors within rural environments that delay individuals in accessing care.

In this study, a significantly higher proportion of women than men had a waist circumference placing them at increased risk for heart disease. Body fat that accumulates around the stomach area poses a greater health risk than fat stored in the lower half of the body ("Waist Circumference Health," n.d.). Other researchers have found that overweight or obesity was a problem for 67% to 73% of women living in rural areas (Chikani, Reding Gunderson, & McCarty, 2004; Feresu, Zhang, Puumala, Ullrich, & Anderson, 2008). Weight-reduction strategies may need to take a more prominent role in CR programs to assist individuals with weight loss while they are actively enrolled in CR.

No differences were found between individuals living in large vs. small/isolated rural areas in their ratings of health. SF-36 scores indicated moderately high levels of physical and psychological functioning. Mean scores were slightly higher on the mental subscales, ranging from 71.4 to 80, compared to the physical subscales, ranging from 54.2 to 74.1. Other investigators also found that SF-36 subscale scores ranged from 70 to 86 three months post CABG surgery (Zimmerman et al., 2007). Similarly, SF-36 subscale scores ranged from 47 to 80 six weeks post-PCI (Barnason, Zimmerman, Brey, Catlin, & Nieveen, 2006). The only significant difference found in health status was that individuals living in large rural areas reported significantly better general health than individuals experiencing an MI who were included in the normative sample. The majority of the patients in the current study had CABG surgery, perhaps they view their heart condition as "fixed" after surgery, while patients who are medically treated, PCI or MI patients, do not consider themselves fixed.

The results of the study need to take into account limitations; 1) merging of three separate studies, 2) using existing data for secondary analysis, 3) using self-report instruments, and 4) the rural environmental context. The lack of clinician generated objective data such as blood pressure and lipid profiles are additional limitations. Future studies could benefit from broadening the environmental context of the study by measuring county level data in addition to individual data, therefore an analysis would include participants place of residence, health status and county resources. The generalizability of the findings is limited to primarily Caucasian men and women who reside in rural areas similar to those in this study.

Practice and Policy Implications

Based on the findings in this study, it appears that two of the main individual risk factors that continue to need modification for individuals in this rural population are lack of physical activity and being overweight or obese. Thus, it is important to note that reducing or eliminating risk factors should remain on the agenda for healthcare providers. According to the National Institutes of Health (NIH), obesity is now considered an epidemic (Lucey, 2008). The proportion of Nebraska adults who are overweight or obese has increased by 33% and 75% respectively since 1992; and is higher in Nebraska than the nation (Nebraska Health & Human Services System, 2003), as well as higher in rural areas of Nebraska than urban areas (Wang, Mueller, & Liyan, 2008). It is also important to keep in mind that many of the modifiable risk factors, such as overweight/obesity, sedentary lifestyle, smoking, hypercholestermia, elevated blood pressure, and diabetes are interrelated (Balady et al., 2007). Having programs which focus on multiple risk factors should assist in decreasing all of the modifiable cardiovascular risk factors.

The ability to identify information about the health status and cardiovascular risk factors of individuals in rural areas provides health care providers and program planners with data that can

assist them in developing health care resources for residents in large rural, small rural and isolated areas. While interventions aimed at improving the health status of individuals has included rural residents, understanding the health status of rural residents will assist in developing interventions that take into account the characteristics of the rural community. Government, private for profit and non-profit health care systems in rural communities need to pool their resources to assess community level risk factors, such as access to health care, food and physical activity opportunities which may make rural residents vulnerable for developing CV disease. After the assessments are complete the group should then focus their energies on developing community level programs and initiatives aimed at individuals to improve their health status and modify their CV risk factors.

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References

American College of Sports Medicine. (2011). ACSM issues new recommendations on quantity and quality of exercise. Retrieved from http://www.acsm.org/about-acsm/media-room/news-releases/2011/08/01/acsm-issues-new-recommendations-on-quantity-and-quality-of-exercise

Ainsworth, B. E., Haskell, W. L., Whitt, M. C., Irwin, M. L., Swartz, A. M., Strath, S. J., … Leon, A. S. (2000). Compendium of physical activities: An update of activity codes and met intensities. *Medicine and Science in Sports Exercise, 32*, S498-S504. [MEDLINE]

American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR). (2004). *Guidelines for Cardiac Rehabilitation and Secondary Prevention Programs.* 4th ed. Champaign, IL: Human Kinetics.

American Fact Finder. (n.d.). Retrieved from http://factfinder2.census.gov/legacy/aff_sunset.html

American Heart Association. (n.d.). Getting healthy. Retrieved from http://www.heart.org/HEARTORG/GettingHealthy/GettingHealthy_UCM_001078_SubHomePage.jsp

Aounm, S., & Rosenberg, M. (2004). Are rural people getting heartsmart? *The Australian Journal of Rural Health, 12*(2), 81-88. [MEDLINE]

Ayabe, M., Brubaker, P. H., Dobrosielski, D., Miller, H. S., Ishi, K., Yahiro, T., … Tanaka, H. (2004). Physical activity patterns of cardiac rehabilitation program participants. *Journal of Cardiopulmonary Rehabilitation, 24*(2):80-6. [MEDLINE]

Balady, G. J., Williams, M. A., Ades, P. A., Bittner, V., Comoss, P., Foody, J. M., … Southard, D. (2007). Core components of cardiac rehabilitation/secondary prevention programs: 2007 update. *Journal of Cardiopulmonary Rehabilitation, 27*(3), 121-129. [MEDLINE]

Baldwin, L. M., MacLehose, R. F., Hart, L. G., Beaver, S. K., Every, N., & Chan, L. (2004). Quality of care for acute myocardial infarction in rural and urban U. S. hospitals. *Journal of Rural Health, 20*(2), 99-108. [MEDLINE]

Barnason, S. A., Zimmerman, L. M., Brey, B., Catlin, S., & Nieveen, J. L. (2006). Patterns of recovery following percutaneous coronary intervention: A pilot study. *Applied Nursing Research, 19*(1), 31-37. [MEDLINE]

Buehler, J. A., Malone, M., & Majerus-Wegerhoff, J. M. (2006). Patterns of responses to symptoms in rural residents: The symptom-action-time-line process. In H. J. Lee, & C. A. Winters (Eds.), *Rural nursing: Concepts, theory, and practice* (2nd ed. pp. 129-137). New York: Springer.

Center for Disease Control. (2010). *Overweight and obesity*. Retrieved from http://www.cdc.gov/obesity/

Chan, L., Hart, L. G., & Goodman, D. C., & WWAMI rural Health Research Center (2005). *Geographic access to health care for rural Medicare beneficiaries. Working Paper #97*. Seattle, WA: WWAMI rural Health Research Center.

Chikani, V., Reding, D., Gunderson, P., & McCarty, C. A. (2004). Wisconsin rural women's health study psychological factors and blood cholesterol level: Difference between normal and overweight rural women. *Clinical Medicine & Research, 2*(1), 47-53. [MEDLINE]

Curnier, D., Savage, P., & Ades, P. (2005). Geographic distribution of cardiac rehabilitation programs in the United States. *Journal of Cardiopulmonary Rehabilitation, 25*(2), 80-84. [MEDLINE]

Dietrich, E. (1981). *The Arizona Heart Institute's heart test*. New York: Bantam Books.

Eberhardt, M. S., Ingram D. D., Makuc, D. M., Pamuk, E. R., Freid, V. M, Harper, S. B., …. Xia, H. (2001). *Urban and rural health chartbook*: *Health United States, 2001*.

Hyattesville, Maryland: National Center for Health Statistics Economic Research Service.

Feresu, S. A., Zhang, W., Puumala, S. E., Ullrich, F., & Anderson, J. R. (2008). The frequency and distribution of cardiovascular disease risk factors among Nebraska women enrolled in the Wisewoman screening program. *Journal of Women's Health, 17*(4), 607-617. [MEDLINE]

Gavic, A. (2005). Addressing the problem of cardiac rehabilitation program distribution. *Journal of Cardiopulmonary Rehabilitation*, *25*(2), 80-84. [MEDLINE]

Harris, D. E., Aboueissa, A., & Hartley, D. (2008). Myocardial infarction and heart failure hospitalization rates in Maine, USA-variability along the urban-rural continuum. *Rural and Remote Health*, *8*, 980. [MEDLINE]

Homko, C., Santamore, W., Zamora, L., Shirk, G., Gaughan, J., Cross, R. … Bove, A. A. (2008). Cardiovascular disease knowledge and risk perception among underserved individuals at increased risk of cardiovascular disease. *Journal of Cardiovascular Nursing*, *23*(4), 332-337. [MEDLINE]

Jones, A., & Goza F. F. (2008). Suburban and urban differences in the self-diagnosis of coronary heart disease in the United States. *Journal of Biosocial Science*, *40*(6), 895-909. [MEDLINE]

King, K. M., Thomlinson, E., Sanguins, J., & LeBlanc, P. (2006). Men and women managing coronary artery disease risk: Urban-rural contrasts. *Social Science and Medicine*, *62*(5), 1091-1102. [MEDLINE]

Lenardson, J., Ziller, E., Coburn, A. & Anderson, N. (2009). Health insurance profile indicates need to expand coverage in rural areas - Research & Policy brief. Portland, ME: University of Southern Maine, Muskie School of Public Service, and Maine Rural Health Research Center.

Lloyd-Jones, D., Adams, R., Carnethon, M., DeSimone, G., Ferguson, B., Flegal, K., … Hong, Y. (2009). Heart disease and stroke statistics-2009 update: A report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation, 119*, e21-e181. [MEDLINE]

Lucey, P. A. (2008). Call to arms: Time to fight an epidemic. *Nursing Economics, 26*(3), 202-205. [MEDLINE]

McHorney, C. A., Ware, J. E., & Raczek, A. E. (1993). The MOS 36 item short form health survey (SF 36) II: Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Medical Care,31*(3), 247-263. [MEDLINE]

Nebraska Health & Human Services System. (2003). *Nebraska behavioral risk factor survey report 1999-2000*. Nebraska Health & Human Services System, Data Management Section. Retrieved from http://nlc1.nlc.state.ne.us/epubs/H8350/B001-199900.pdf

Savage, P. D., Brochu, M., Scott, P., & Ades, P. A. (2000). Low caloric expenditure in cardiac rehabilitation. *American Heart Journal, 140*(3), 524-533. [MEDLINE]

Schairer, J. R., Keteyian, S. J., Ehrman, J. K., Brawner, C. A., Berkebilem, N. D. (2003). Leisure time physical activity of patients in maintenance cardiac rehabilitation. *Journal of Cardiopulmonary Rehabilitation, 23*(4), 260-265. [MEDLINE]

Schairer, J. R., Kostelnik, T., Proffitt, S. M., Faitel, K. I., Windeler, S., Rickman, L. B., … Keteyian, S. J. (1998). Caloric expenditure during cardiac rehabilitation. *Journal of Cardiopulmonary Rehabilitation, 18*(4), 290-294. [MEDLINE]

Schwartz, F., Ruhil, A., Denham, S., Shubrook, J., Simpson, C., & Boyd, S. (2009). High self-reported prevalence of diabetes mellitus, heart disease, and stroke in 11 counties in rural Appalachian Ohio. *Journal of Rural Health, 25*(2), 226-337. [MEDLINE]

South Carolina Rural Health Research Center. Rural residents lag in preventive services use; lag increases with service complexity. Retrieved from http://rhr.sph.sc.edu/News/Final%20-%20Preventive%20Services%20Policy%20Brief.pdf

Wagnild, G., Rowland, J., Dimmler, L., & Peters, D. (2004). Differences between frontier and urban elders with chronic heart failure. *Progress in Cardiovascular Nursing, 19*(1), 12-18. [MEDLINE]

Waist Circumference Health Risk Factor. Waist Circumference and Health. Retrieved from http://www.weight-loss-i.com/waist-circumference.htm

Wang, H., Mueller, K., & Liyan, X. (2008). *Health and health-related behaviors in Nebraska: Overall trends, progress toward health people 2010 goals, and rural-urban comparisons.* Obama, NE: Nebraska Center for Rural Health Research Information Project, University of Nebraska Medical Center

Ware, J., Snow, K. K., Kosinski, M., & Gandek, B. (1993). *SF 36® Health Survey Manual and Interpretation Guide*. Boston, MA: New England Medical Center, The Health Institute.

WWAMI Rural Health Research Center. *RUCA Data.* Retrieved from http://depts.washington.edu/uwruca/ruca-data.php

Yates, B. C., Heeren, B., Keller, S., Agrawal, S., Stoner, J., & Ott, C. (2007). Comparing two methods of rehabilitation for risk factor modification after a cardiac event. *Rehabilitation Nursing*, *32*(1), 5-22. [MEDLINE]

Yates, B. C., Anderson, T., Hertzog, M, Ott, C., & Williams, J. (2005). Effectiveness of follow-up booster sessions in improving physical status after cardiac rehabilitation: Health, behavioral, and clinical outcomes. *Applied Nursing Research*, *18*(1), 59-62. [MEDLINE]

Yates, B. C, Price-Fowlkes, T., & Agrawal, S. (2003). Barriers and facilitators of self reported physical activity in cardiac patients. *Research in Nursing and Health*, *26*, 459-469. [MEDLINE]

Zimmerman, L., Barnason, S., Schulz, P., Nieveen, J., Miller, C., Hertzog, M, Rasmussen, D., Tu, C. (2007). The effects of a symptom management intervention on symptom evaluation, physical functioning, and physical activity for women after Coronary Artery Bypass surgery. *Journal of Cardiovascular Nursing*, *22*, 493-500. [MEDLINE]