THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF BIOBEHAVIORAL HEALTH

HEART ATTACK AND STROKE DISPARITIES AMONG RURAL WOMEN IN THE UNITED STATES

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SPRING 2013

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Biobehavioral Health
with honors in Biobehavioral Health

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ABSTRACT

Background: Compared to non-rural areas, past literature states that rural women have an elevated risk for heart attack and stroke. Numerous factors contribute to these inequalities throughout the United States. **Methods:** The 2008 Behavioral Risk Factor Surveillance System (BRFSS) is a national database that was used to analyze heart attack and stroke among women (n=257,079). The data was separated by women living in rural (n=84,648) and non-rural (n=172,431) metropolitan areas. Self-reported demographic, behavioral, and healthcare access variables were tested to explain any cardiovascular disease disparities. **Results:** As predicted, rural women had a greater risk for heart attack and stroke compared to non-rural women. Socioeconomic factors significantly mediated heart attack and stroke in rural women. **Discussion:** While socioeconomic factors strongly relate to cardiovascular events, variables outside of this model might further explain the risk for heart attack and stroke among rural women. **Key words:** Rural Women, Stroke, Heart Attack, Cardiovascular Disease

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ACKNOWLEDGEMENTS

It is my pleasure to thank all of the people who helped me complete this project. I am grateful for Dr. Ahern's guidance and patience throughout my thesis. It was his epidemiology course that drove me to pick the nature of my topic. Second, I would like to express gratitude to Dr. Gyekis, a faculty member in the Department of Biobehavioral Health, for teaching me Statistical Product and Service Solutions (SPSS) and igniting passion into my project. I am also thankful for the assistance of Marc Dingman, a graduate student in the Department of Biobehavioral Health, in helping me download the 2008 Behavioral Risk Factor Surveillance Survey (BRFSS). It would not have been possible to collect my data without your aid. Thanks also to Dr. Francis, the Honors Advisor in the Department of Biobehavioral Health, for providing critical comments on my paper and acting as my advisor. In addition, I appreciate Lisa Davis, Director of the Penn State Center for Rural Health, taking time to advise me on rural women's health before beginning my thesis. Finally, I would like to thank the Centers for Disease Control and Prevention (CDC) for collecting and allowing free access to the BRFSS.

INTRODUCTION

Cardiovascular disease (CVD) mortality in the United States has declined dramatically over the past five decades. Nevertheless, CVD is still the leading cause of death in the United States. The United States spent over $430 billion on CVD in 2007 (Rosamond et al., 2007). Considerable effort is being made to further reduce cardiovascular mortality. Healthy People 2020 and the Affordable Care Act of 2012 both incorporate initiatives aimed to improve heart disease. The Affordable Care Act specifically targets underserved populations. Despite the decline, heart disease still claims the lives of over 500,000 women every year (Folta et al., 2009) and accounted for 54% of mortality of women in 2007 (Mosca et al., 2011). Previous literature identifies unique risk factors for women's cardiovascular health, such as challenges balancing family needs and personal health (Folta, et al., 2009). Women living in rural America appear to bear an even greater burden of CVD. Compared to women living in urban areas, women living in rural areas had a 34% increased risk for heart disease and a 43% increased risk for stroke (Zuniga, Anderson, & Alexander, 2010). In order to allocate scarce healthcare resources appropriately, it will be important to identify important risk factors that predict CVD among rural women. The following provides an overview of cardiovascular health predictors.

Demographic Predictors

The widespread, diverse populations throughout the United States influence the prevalence of heart attack and stroke. For instance, age and gender significantly affect CVD in our country. Women report lower rates of heart disease compared to men until they reach menopause. The rise in total cholesterol and lipoproteins after menopause causes cardiovascular disease rates to surge in middle-aged women (Folta et al., 2009). Although the prevalence and

incidence of stroke is higher in men than women, there is considerable evidence that shows greater mortality rates in women following their first stroke (Appelros, Stegmayr, & Terent, 2009). The reasons for increased post-stroke mortality among women are unclear. The lack of definitive evidence on risk factors for women, and especially rural women, may be--in part--due to the fact that women were often not included in research on cardiovascular health. For example, whereas the Framingham Study has issued recommendations for men over sixty years, the first large scale study on women's health, The Women's Health Study, only began in the 1990s (Folta et al., 2009). Although this study investigates women's health, there is still a dearth of research that specifically focuses on the health of rural women.

In addition to differences in cardiovascular disease rates according to urban-rural status, it is known that stroke and heart attack rates vary by region. The United States Census Bureau classifies the country into the following regions: Northeast, South, Midwest, and West. According to Martin et al. (2005), there are important regional differences in risk factors for cardiovascular disease. For example, average physical activity is greater for people living in the West compared to the South; regional differences are greater for people living in rural areas. This is significant because physical activity prevents many forms of CVD. The South also experiences significant stroke disparities. The increased stroke rates in the South were thought to be caused by the confluence of racial and socioeconomic factors. According to some recent studies, the higher stroke rates in the South may be due to dietary factors and a higher prevalence of obesity (Cushman et al., 2008). The higher prevalence of obesity among Southern rural African American women is thought to play a role in the six-year lower life expectancy of African American women compared to Caucasian women (Appel, Harrell, & Deng, 2002).

Obesity may be a factor in other regional differences. The Appalachia area of the United States is also known to have a high rate of cardiovascular disease and reduced life expectancy. One study found that rural Appalachia women experience the country's highest obesity rates

(O'Brien & Talbot, 2011). Racial inequalities in Appalachia align with those in the South, and socioeconomic status accounts for many of these disparities. It will be important to consider unique environments throughout the United States when examining women's risks for heart attack and stroke in rural areas.

While regional differences in obesity rates may explain some urban-rural differences in women's health, there is also substantial literature that implicates socioeconomic status as a strong indicator of poor health and increased rates of CVD. One in six rural residents lived below the poverty line in 2009, a significantly higher rate than other metropolitan areas (Ennen & Beamon, 2012). These poverty-stricken rural communities are concentrated in the South. In addition, it is estimated that female-headed households are 45% more likely to live in poverty (2010 Census & American Community Survey, 2012). One study observed a 23% increased risk of non-fatal myocardial infarction in women who were impoverished as children (Gliksman et al., 1995). This association suggests that interventions aimed at young, poor women may greatly reduce the incidence of cardiovascular disease for future generations.

Education on cardiovascular disease will improve awareness of behaviors that may promote cardiovascular health. For example, most women perceive breast cancer as a greater risk than CVD (Mosca, Mochari-Greenberger, Dolor, Newby, & Robb, 2010). However, women employed in high-stress occupations report increased rates of non-fatal myocardial infarctions. There is also ample evidence that stress and high blood pressure are significantly associated with job insecurity (Slopen, Glynn, Buring, Lewis, Williams, & Albert, 2012). The relationship of these mediators and rural status may help explain the variablity of cardiovascular disease among rural women in the United States.

Along with the previous mentioned demographic factors, several studies found an association between marital status and cardiovascular disease. Research suggests married people

have the lowest risk for heart disease, followed by separated and widowed persons (Ennen & Beamon, 2012).

Behavioral Predictors

In addition to demographic variables, lifestyle choices mediate the incidence and prevalence of cardiovascular disease. The CDC recommends 150 minutes of moderate exercise or seventy-five minutes of vigorous exercise per week (United States Department of Health and Human Services [HHS], 2008). Large portions of the population in America fail to meet these guidelines. In one rural Midwestern community, only 52% of Caucasian women engaged in the suggested amount of physical activity (Eyler, 2003). It is not surprising that over half of young adults in the United States are overweight or obese (O'Neil et al., 2012). The CDC classifies obesity as a major risk factor for CVD. With this, approximatly 65% of rural African American women in two Virginia counties were obese (Herman, Hughes, & Garrison, 2002). Poor exercise habits and weight management can further lead to diabetes. Diabetes significantly increases heart disease. It is estimated that 65% of diabetics die from complications associated with heart disease (Liburd, Jack, Williams, & Tucker, 2005).

Smoking and alcohol use are typically associated with CVD. Studies on smoking prevalence suggest that rural women are more likely to smoke and drink alcohol than their non-rural counterparts, possibly contributing to urban-rural differences in heart attack and stroke rates. Women who smoke elevate their risk for cardiovascular disease six times as compared to non-smokers (Weiss, 2009). It is interesting that rural Pennsylvanians have a 3% higher rate of smokers than persons living in urban areas (Forrest, Hannam, & Leeds, 2011). Along with smoking, rural women in Pennsylvania are known to binge drink more than women living in urban areas. Nationally, urban women binge drink at a rate of 8%, while rural women partake in this behavior at a rate of 11% (Forrest & Lin, 2010). Alcohol affects cardiovascular disease risk

in a distinct way. Moderate alcohol consumption it thought to be a protective factor to one's health, whereas excessive alcohol use is strongly associated with with negative health outcomes.

Emotional well-being is another predictor of CVD. There is limited literature on rural women and life satisfaction. Previous research indicates that life satisfaction in the United States' population relates to his or her ability to remain employed following a stroke (Niemi, Kotila, & Waltimo, 1988). The income and employment patterns of women living in rural areas might relate to life satisfaction differences, and subsequently to cardiovascular health.

Healthcare Access Predictors

The majority of CVD costs in the United States stem from a lack of preventative services. The mandated insurance component of the the Affordable Care Act is expected to encourage a proactive approach to preventive health and this should accrue to cardiovascular health. Until the law goes into full effect in 2014, a large percentage of the United States' population will lack adequate health insurance coverage and will continue to stuggle to attain adequate healthcare. It is known that persons living in rural areas are often undeserved with respect to having access to healthcare services. This is especially true for access to health promotion programs and screening services (Hagema, Pullen, Walker, & Boeckner, 2010). According to one study, only 54% of women in the United States recognize heart attack symptoms. This might originate from the meager 48% of physicians ever discussing cardiovascular disease with their patients (Mosca, Mochari-Greenberger, Dolor, Newby, & Robb, 2010). This may be especially problematic in rural areas because of the lower physican to patient ratio. In one study, the largest metropolitan area averaged ninty-one internalist physicians per 100,000 people, while the smallest town reported a ratio of thirty-eight (Hart, Salsberg, Phillips, & Lishner, 2002). There is also likely a delay in receiving emergency care for rural residents. Healthcare access disparties in these areas may lead to higher morbidity and mortality outcomes. A few studies indicate that rural women

are particularly vulnerable to transportation, diagnosis, and healthcare provider inequalities (Taylor, Hughes, & Garrison, 2002).

Research Questions

This study will focus on identifying predictors of cardiovascular disease among rural women. More specifically, the study will focus on predictors of heart attack and stroke among rural women using data from the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a population-based survey conducted nationally by the Centers for Disease Control and Prevention (CDC). The CDC has been using the BRFSS to track the nation's health status and behavioral risks since the 1980s. The BRFSS database is useful for characterizing predictors of health status because it includes extensive assessment of potential predictors of health including demographic and behavioral risk factors, and measures of access to and use of healthcare resources. This study will use self-reports of having a heart attack or stroke. It is hypothesized that rural women will have a greater risk for heart attack and stroke compared to non-rural women and that there will be differences in risk factors.

METHODS

Source of Data

The BRFSS is an ongoing population-based telephone survey of adults in the United States. The CDC conducts the survey and data are available for public use. The survey includes questions to assess demographic, behavioral, and healthcare access variables, as well as self-reports of cardiovascular events. The BRFSS is a telephone survey and interviews one randomly selected adult per household. While the survey is conducted nationally, it is not fully representative of the adult population of the United States. The survey does not, for example, include persons who do not have a telephone. Military personnel, institutionalized persons in nursing homes, and incarcerated individuals are also excluded. It is likely that homeless people and some other groups who are routinely away from a telephone might be systematically underrepresented in the survey. While not fully representative, the BRFSS is thought to be one of the best databases available to characterize the health status of the United States' population and to identify predictors of health status. This study used the 2008 BRFSS survey. Only data from the fifty states were used and only data from the subset of 257,079 women in the survey were extracted for analyses (Centers for Disease Control and Prevention [CDC], 2008).

Descriptive and Analytical Statistics

Descriptive statistics were run to characterize the demographic, behavioral, and healthcare variables; these were done using un-weighted data. Univariate and multivariate logistic regressions were used to identify the independent contribution of selected predictors for self-reported heart attacks and strokes. Age and urban-rural metropolitan status were always included as covariates when assessing predictors. Odds ratios and confidence intervals were reported for

each predictor. All analyses were conducted using Statistical Product and Service Solutions (SPSS) software.

Dependent Variables

Self-reports of women experiencing a stroke or heart attack were the two variables selected for analyses. The BRFSS interviewer asked respondents the answer to the questions: "Have you ever been told you had a heart attack, also called a myocardial infarction," and "Have you ever been told you had a stroke (CDC, 2008)?" The possible responses were "no," "yes," "don't know," and refused. For this study, women answering "don't know" or who refused to answer were excluded from analyses.

Demographic Covariates

The BRFSS provides information related to rural and non-rural status. The metropolitan code variable consisted of: 1) city, 2) center city, 3) other metropolitan code, 4) suburban, and 5) rural areas. For this study, all persons with a rural code were labeled as rural and all other persons reporting city, center city, and suburban areas were aggregated into a single category called non-rural. Persons with the "other metropolitan" code were omitted from the analysis. In the logistic regression analyses, the non-rural category was the reference group.

Marital status, life satisfaction, employment, education level, race, and income were included as demographic predictors. Marital status consisted of the following groups: married, divorced, widowed, separated, and never married. All other categories were specified as missing data. Life satisfaction was assessed by the question: "How satisfied are you with your life (CDC, 2008)?" The answers to this variable were a scale of four categories from never to always. Employment status was defined as: 1) employed, 2) self-employed, 3) out of work for less than one year, 4) out of work for more than one year, 5) homemaker, 6) student, 7) retired, and 8)

unable able to work. Students and individuals who refused to answer were excluded from the data. The education level ranged from no education to college and more. The race variable included: 1) white, 2) black, 3) multiracial, 4) Hispanic, 5) other, 6) don't know, and 7) refused. Income was classified into groups from less than $15,000 to over $50,000.

In addition, states were merged into Northeast, Midwest, South, and West categories defined by the United States Census Bureau. The Virgin Islands, Guam, Puerto Rico, and the District of Columbia were omitted from analyses.

Behavioral Covariates

Several measures relating to lifestyle and behavior were extracted from the BRFSS files for this study. The measure of exercise behavior was based on the respondents answer to the question of whether he or she was engaged in any form of physical activity in the last month. Response categories were: "yes," "no," "don't know," or refused to answer. For the analyses in this study, "don't know" and refused to answer were coded as missing data. The body mass index on the BRFSS file is computed from the respondent's report of height and weight and converted into one of three categorical measures: 1) "not overweight or obese," 2) "overweight," and 3) "obese." A measure of having diabetes was included in this study based on the BRFSS designation of the respondents having either: 1) "no diabetes," 2) "pre-diabetes," 3) "gestational diabetes," and 4) "diabetes." Heavy alcohol consumption was included in this study based on the respondent's report of drinking more than two drinks per day. Smoking status was included in this study using the BRFSS categories of: 1) "never a smoker," 2) "former smoker," 3) "someday smoker," and 4) "every day smoker." The BRFSS measure of life satisfaction was used based on the respondents' answers to the question: "How often do you get the social and emotional support you need (CDC, 2008)?" The BRFSS categories were: 1) "always," 2) "usually," 3) sometimes,"

and 4) “rarely.”

Healthcare Access Covariate

A measure of access to healthcare was assessed through the respondent’s report of having health insurance. In the BRFSS survey, the interviewer asks: “Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare (CDC, 2008)?” The possible responses were “yes,” “no,” “don’t know,” and refused to answer. In this study, the responses of “don’t know” and refused to answer were coded as missing data.

RESULTS

Table 1 displays the number and percentage of sampled women respondents for the demographic factors according to rural status. There were 84,648 (32.9%) rural and 172,431 (67.1%) non-rural women in the total sample.

Table 1 shows that a greater portion of the sample were from the older age categories. Rural women also had a slightly higher percentage of sixty-five and older respondents (33.5%) than non-rural women (30.3%). The dataset was categorized into Northeast, Midwest, South, and West regions of the country defined by the Census Bureau. Table 1shows that there were a greater amount of participants residing in the South for both rural (34.1%) and non-rural (30.8%) women. A greater percentage of rural women were married (55.8%) than non-rural women (51.4%) in the sample. Rural and non-rural women had similar characteristics across all employment categories. There was a high percentage (34.4%) of non-rural participants who indicated a college degree or more, while rural respondents had a greater portion (35.0%) in the high school or GED category. More women living in rural areas were white (84.6%) compared to non-rural areas (75.7%). Finally, there were differences of household income categories between the two groups of women. Non-rural women in the sample indicated a higher percentage in the $50,000 or over household income category (43.4%) compared to rural women (32.3%).

Table 1. Descriptive Statistics on Rural and Non-Rural Women in the United States by Demographic Factors

Variable	Cases			
	Rural		Non-Rural	
	N	%	n	%
Age				
18-24	2421	2.9	5359	3.1
25-34	7599	9.1	17411	10.2
35-44	10892	13.0	26849	15.8
45-54	16549	19.7	34687	20.4
55-64	18342	21.9	34507	20.2
65 and Over	28138	33.5	51598	30.3
Region				
Northeast	10129	12.0	41191	25.0
Midwest	24058	28.4	32789	19.9
South	28896	34.1	50711	30.8
West	21565	25.5	40120	24.3
Marital Status				
Married	46302	55.8	86188	51.4
Divorced	11575	14.0	26521	15.8
Widowed	16678	20.1	29965	17.9
Separated	1723	2.1	4352	2.6
Never Married	6655	8.0	20558	12.3
Employment				
Employed	34041	40.9	73980	43.9
Self-Employed	5928	7.1	10627	6.3
Out of Work More than One Year	1393	1.7	3342	2.0
Out of Work Less than One Year	1546	1.9	3996	2.4
Homemaker	10675	12.8	21427	12.7
Retired	23112	27.8	44137	26.2
Unable to Work	6537	7.9	11040	6.6
Education Level				
College and/or More	21291	25.2	59160	34.4
Some College	24058	28.5	47120	27.4
High School or GED	29574	35.0	49345	28.7
Some High School	6391	7.6	10345	6.0
Elementary	3058	3.6	5471	3.2
No Education	98	0.1	378	0.2
Race				
White	70965	84.6	129312	75.7
Black	4595	5.5	17949	10.5
Multiracial	1547	1.8	2529	1.5

Hispanic	3577	4.3	14738	8.6
Other Race	3187	3.8	6215	3.6
Income				
Greater than $50,000	23193	32.3	63650	43.4
$35,000 to $50,000	11728	16.3	21504	14.7
$25,000 to $35,000	10420	14.5	17422	11.9
$15,000 to $25,000	15447	21.5	26225	17.9
Less than $15,000	11110	15.5	17959	12.2

Descriptive information related to behavioral factors is found in Table 2. Exactly 71.4% of non-rural women in the sample indicated that they exercised in the past month, while 68.8% of rural women engaged in this activity. Rural women reported more obesity (29.1%) than non-rural respondents (26.2%). Non-rural women were more likely to describe a normal body mass index (42.6%) compared to rural participants (39.1%). The four diabetes categories presented similar percentages between the rural and non-rural participants. There were also similar proportions between the two groups for heavy alcohol consumption. Descriptive information on smoking status indicates that a greater portion of rural women smoke every day (13.3%) than their non-rural counterparts (11.2%). Rural and non-rural women in the sample presented almost identical percentages among the life satisfaction categories.

Table 2. Descriptive Statistics on Rural and Non-Rural Women in the United States by Behavioral Factors

Variable	Cases			
	Rural		Non-Rural	
	N	%	n	%
Exercise (Within the Past Month)				
Yes	58186	68.8	122985	71.4
No	26349	31.2	49269	28.6
Body Mass Index				
Not Overweight or Obese	31102	39.1	68760	42.6
Overweight	25240	31.7	50281	31.2
Obese	23177	29.1	42355	26.2
Diabetes				

No	72533	85.8	149156	86.6
Pre-Diabetes	1187	1.4	2211	1.3
Gestational	1135	1.3	2531	1.5
Yes	9725	11.5	18401	10.7
Heavy Alcohol Consumption (More than 1-2 Drinks Per Day)				
No	80016	96.4	160068	95.5
Yes	2976	3.6	7597	4.5
Smoking Status				
Never a Smoker	48630	57.7	100601	58.6
Former Smoker	20863	24.7	44909	26.2
Someday Smoker	3611	4.3	7013	4.1
Every day Smoker	11240	13.3	19213	11.2
Satisfied with Life				
Always	37320	45.3	76148	45.8
Usually	40770	49.5	80691	48.6
Sometimes	3360	4.1	7440	4.5
Rarely	872	1.1	1855	1.1

Table 3 provides descriptive statistics for healthcare coverage. Non-rural participants had more healthcare coverage (91.0%) than rural women (88.1%).

Table 3. Descriptive Statistics on Rural and Non-Rural Women in the United States by Healthcare Access

Variable	Cases			
	Rural		Non-Rural	
	N	%	n	%
Any Healthcare Coverage				
No	10077	11.9	15458	9.0
Yes	74394	88.1	156642	91.0

As a preliminary step in the examination of predictors of cardiovascular health among women living in rural areas, it was necessary to examine predictors of living in rural as opposed to non-rural areas. Binary and multivariate logistic regressions were used to examine demographic variables and rural living for the sample of women in this study. Metropolitan status (rural vs. non-rural) was the dependent variable and the reference group was women living in

non-rural areas. The univariate model analyzed each predictor variable separately, while the multivariate model included all demographic variables. It should be noted that because the sample size for these analyses is very large, even small differences between the groups were statistically significant.

Table 4 presents the results obtained from both the univariate and multivariate analyses predicting metropolitan status. Rural status of women was associated with several demographic characteristics. Rural women were more likely to be older compared to women living in urban areas. This is especially true for women who were sixty-five and over, with an OR of 1.277 (*P* = <.001, 95% CI = 1.275-1.279). In addition, women residing in the West appeared less likely to live in a rural area. The remaining regions have the following OR values: 2.305 (*P* = <.001, 95% CI = 2.302-2.308) in the South, 2.730 (*P* = <.001, 95% CI = 2.726-2.734) in the Midwest, and 1.197 (*P* = <.001, 95% CI = 1.195-1.199) in the Northeast. The only positive association within the marital status categories was widowed. Rural women had a 1.078 OR (*P* = <.001, 95% CI = 1.076-1.080) for losing a partner. The majority of the employment variable groups presented OR values lower than the non-rural reference group. As seen in Table 4, rural women were much more likely to be unable to work as compared to non-rural women (OR = 1.495, *P* = <.001, 95% CI = 1.492-1.498). The education level variable used college and/or more as the reference group. All other categories were positively associated with rural living, except for the group with no education. The logistic regression analyses indicated that having no education was more likely to be the case for rural women (OR = .810, *P* = <.001, 95% CI = .800-.810). Compared to women living in non-rural areas, rural women are more likely to be white. Minorities are underrepresented in rural female populations. Hispanic women were least likely (OR = .296, *P* = <.001, 95% CI = .295-.296) to reside in rural areas. Finally, for women living in rural areas, having a lower income was much more likely than their urban peers; $25,000 to $35,000 (OR = 1.759, *P* = <.001, 95% CI = 1.756-1.761).

In the multivariate logistic regression model, each OR represents the independent predictive association of each predictor while controlling for all other predictors in the model. Examination of Table 4 shows that on average, as expected, in the multivariate model the magnitude of the odds values for each predictor is lower than the corresponding value in the univariate model. Again, however, because the samples sizes were very large each of the predictors was still significantly associated with predicting rural status.

Table 4. The Association between Demographic Factors and Rural Living for Women in the United States

Variables	Univariate Model				Multivariate Model			
	OR	*P*	95% CI		OR	*P*	95% CI	
			Lower	Upper			Lower	Upper
Age								
18-24*	1.000				1.000			
25-34	0.986	<.001	0.985	0.988	0.933	<.001	0.930	0.935
35-44	0.931	<.001	0.929	0.933	0.872	<.001	0.870	0.875
45-54	1.075	<.001	1.074	1.077	0.897	<.001	0.894	0.899
55-64	1.200	<.001	1.198	1.202	0.912	<.001	0.910	0.915
65 and Over	1.277	<.001	1.275	1.279	0.783	<.001	0.780	0.785
Region								
West*	1.000				1.000			
South	2.305	<.001	2.302	2.308	2.118	<.001	2.115	2.122
Midwest	2.730	<.001	2.726	2.734	2.219	<.001	2.215	2.223
Northeast	1.197	<.001	1.195	1.199	1.125	<.001	1.123	1.128
Marital Status								
Married*	1.000				1.000			
Divorced	0.878	<.001	0.877	0.880	0.634	<.001	.633	.635
Widowed	1.078	<.001	1.076	1.080	0.709	<.001	.707	.710
Separated	0.746	<.001	0.743	0.748	0.657	<.001	.655	.660
Never Married	0.711	<.001	0.710	0.712	0.548	<.001	.547	.549
Employment								
Employed*	1.000				1.000			
Self-Employed	1.067	<.001	1.065	1.070	1.048	<.001	1.046	1.050
Out of Work More than One Year	0.945	<.001	0.942	0.948	0.784	<.001	0.781	0.787
Out of Work Less than One Year	0.947	<.001	0.944	0.949	0.827	<.001	0.824	0.830
Homemaker	0.997	<.001	0.996	0.998	0.826	<.001	0.825	0.828
Retired	1.223	<.001	1.222	1.225	0.894	<.001	0.892	0.896

Unable to Work	1.495	<.001	1.492	1.498	1.011	<.001	1.008	1.013
Education Level								
College and/or More*	1.000				1.000			
Some College	1.464	<.001	1.462	1.466	1.279	<.001	1.277	1.281
High School or GED	1.921	<.001	1.919	1.924	1.544	<.001	1.542	1.547
Some High School	1.937	<.001	1.933	1.940	1.703	<.001	1.698	1.707
Elementary	1.319	<.001	1.316	1.322	1.703	<.001	1.697	1.709
No Education	0.810	<.001	0.800	0.820	.972	0.002	.953	.990
Race								
White*	1.000				1.000			
Black	0.476	<.001	0.475	0.477	.381	<.001	.380	.382
Multiracial	0.768	<.001	0.765	0.771	.754	<.001	.751	.758
Hispanic	0.296	<.001	0.295	0.296	.252	<.001	.252	.253
Other Race	0.462	<.001	0.460	0.463	.509	<.001	.507	.510
Income								
Greater than $50,000*	1.000				1.000			
$35,000 to $50,000	1.645	<.001	1.642	1.647	1.741	<.001	1.738	1.743
$25,000 to $35,000	1.759	<.001	1.756	1.761	2.085	<.001	2.081	2.089
$15,000 to $25,000	1.696	<.001	1.694	1.699	2.235	<.001	2.231	2.239
Less than $15,000	1.593	<.001	1.590	1.596	2.705	<.001	2.699	2.711

*Reference group

Table 5 displays univariate and multivariate logistic regression results for the examination of behavioral factors predicting rural living for women. In the univariate model, rural women in the sample were not as likely to engage in physical activity (OR = 1.172, *P* = <.001, 95% CI = 1.171-1.173). There was also a higher risk for obesity in this group, with an OR of 1.364 (*P* = <.001, 95% CI = 1.362-1.365). Furthermore, the univariate model indicated that on average women in rural areas were less likely to engage in heavy alcohol consumption (OR = .751, *P* = <.001, 95% CI = .749-.753). Other noteworthy results in Table 5 show that women living in rural areas were more likely to engage in every day smoking (OR = 1.515, *P* = <.001, 95% CI = 1.513-1.517) and that life satisfaction was not strongly associated with rural or non-rural residence. As was found for demographic factors, the strength of most associations for the

behavioral predictors changed only modestly when all predictors were included in the model and all measures remained statistically significant predictors of living in rural areas.

Table 5. The Association between Behavioral Factors and Rural Living for Women in the United States

Variables	Univariate Model				Multivariate Model			
	OR	*P*	95% CI		OR	*P*	95% CI	
			Lower	Upper			Lower	Upper
Exercise								
Yes*	1.000				1.000			
No	1.172	<.001	1.171	1.173	1.105	<.001	1.104	1.106
Body Mass Index								
Not Overweight or Obese*	1.000				1.000			
Overweight	1.162	<.001	1.161	1.163	1.151	<.001	1.150	1.153
Obese	1.364	<.001	1.362	1.365	1.326	<.001	1.325	1.328
Diabetes								
No*	1.000				1.000			
Pre-Diabetes	1.093	<.001	1.088	1.097	1.025	<.001	1.020	1.030
Gestational	0.806	<.001	0.803	0.809	0.814	<.001	0.811	0.817
Yes	1.144	<.001	1.142	1.145	1.034	<.001	1.032	1.036
Heavy Alcohol Consumption(More than 1-2 Drinks Per Day)								
No*	1.000				1.000			
Yes	0.751	<.001	0.749	0.753	0.715	<.001	0.713	0.717
Smoking Status								
Never a Smoker*	1.000				1.000			
Former Smoker	1.064	<.001	1.063	1.065	1.049	<.001	1.048	1.050
Someday Smoker	1.197	<.001	1.194	1.200	1.229	<.001	1.227	1.232
Every day Smoker	1.515	<.001	1.513	1.517	1.543	<.001	1.540	1.545
Satisfied with Life								
Always*	1.000				1.000			
Usually	1.047	<.001	1.046	1.048	0.983	<.001	0.982	0.984
Sometimes	1.028	<.001	1.025	1.030	0.875	<.001	0.873	0.877
Rarely	1.063	<.001	1.058	1.068	0.875	<.001	0.870	0.879

*Reference group

Table 6 displays a logistic regression examining healthcare access and rural living. Rural women have a higher risk (OR = 1.225, *P* = <.001, 95% CI = 1.224-1.227) of being without any type of healthcare coverage.

Table 6. The Association between Healthcare Access and Rural Living for Women in the United States

Variables	Univariate Model			
	Odds Ratio	p-value	95% CI	
			Lower	Upper
Without Healthcare Coverage				
No*	1.000			
Yes	1.225	<.001	1.224	1.227

*Reference group

Having found predictors of living in rural areas, the next step in this research is to examine predictors for risk of heart attack and stroke among the women living in rural areas. Table 7 and 8 provides results of these analyses. Table 7 presents the results for predicting stroke risk. Logistic regression was used to examine the association of each predictor in combination with the effect of rural status and age. For example, after adjusting for age, women living in rural areas of the United States had a significantly increased risk for stroke (OR = 1.208, *P* < .001, 95% CI = .1.208-1.208). After adjusting for both age and region, there was a reduced effect of rural status (OR = 1.165, *P* < .001, 95% CI = .1.162-1.168). Each of the adjustments changed the impact of rural status on stroke. After including all predictors, the effect of rural status remained significant (OR = 1.093, P < .001, 95% CI = 1.090-1.097); this indicates that after controlling for all other covariates, women living in rural areas had approximately 10% increased risk of having a stroke as compared to women living in non-rural areas.

Table 8 shows analogous results for predicting heart attack risk among women living in rural areas. As seen for stroke risk, living in a rural area was significantly associated with increased risk for heart attacks (OR = 1.213, *P* < .001, 95% CI = 1.210-1.216). The impact of living in rural areas varies after controlling for other categories of predictors, but it remains significant after controlling for all categories of predictors (OR = 1.115, *P* < .001, 95% CI = 1.111-1.118).

As seen in Tables 7 and 8, the effect of stroke and heart attack on rural women in the United States was mediated by socioeconomic factors. Figure 1 and Figure 2 further illustrate this phenomenon. Examination of Figure 1 shows that education level (OR = 1.129, *P* = <.001, 95% CI = 1.126-1.132), employment (OR = 1.145, *P* = <.001, 95% CI = 1.142-1.148), and income (OR = 1.097, *P* = <.001, 95% CI = 1.094-1.100) all reduced the association of rural status on stroke risk. Examination of Figure 2 shows analogous results for heart attack risk. The increased risk of heart attack in this population was similarly explained by education level (OR = 1.123, *P* = <.001, 95% CI = 1.121-1.126), employment status (OR = 1.157, *P* = <.001, 95% CI = 1.154-1.160), and income (OR = 1.129, *P* = <.001, 95% CI = 1.126-1.132). Race appeared to enhance the positive association for stroke (OR = 1.269, *P* = <.001, 95% CI = 1.266-1.273) and heart attack (OR = 1.301, *P* = <.001, 95% CI = 1.298-1.304). Region, marital status, exercise, body mass index, diabetes, heavy alcohol consumption, smoking status, life satisfaction, and healthcare access were also examined with heart attack and stroke. After adjusting for all of these variables, the risk for stroke (OR = 1.093, *P* = <.001, 95% CI = 1.090-1.097) and heart attack (OR = 1.115, *P* = <.001, 95% CI = 1.111-1.118) remained similar to adding the socioeconomic factors alone.

Table 7. Predictors of Risk of Stroke Among Rural and Non-Rural Women (Age is included in all models: reference group = non-rural women)

Variables	OR	P	95% CI	
			Lower	Upper
Predictor Class:				
Rural Status	1.208	<.001	1.208	1.208
Adjusted for:				
Demographic				
Region	1.165	<.001	1.162	1.168
Marital Status	1.248	<.001	1.244	1.251
Employment	1.145	<.001	1.142	1.148
Education Level	1.129	<.001	1.126	1.132
Race	1.269	<.001	1.266	1.273
Income	1.097	<.001	1.094	1.100
Behavioral				
Exercise	1.176	<.001	1.173	1.179
Body Mass Index	1.198	<.001	1.195	1.201
Diabetes	1.209	<.001	1.206	1.212
Heavy Alcohol Consumption (More than 1-2 Drinks Per Day)	1.195	<.001	1.192	1.198
Smoking Status	1.191	<.001	1.188	1.194
Satisfied with Life	1.195	<.001	1.192	1.198
Health Care Access				
Without Healthcare Coverage	1.207	<.001	1.204	1.211
All Variables	1.093	<.001	1.090	1.097

Figure 1. The Association between Rurality and Stroke: Adjusted for Socioeconomic Factors

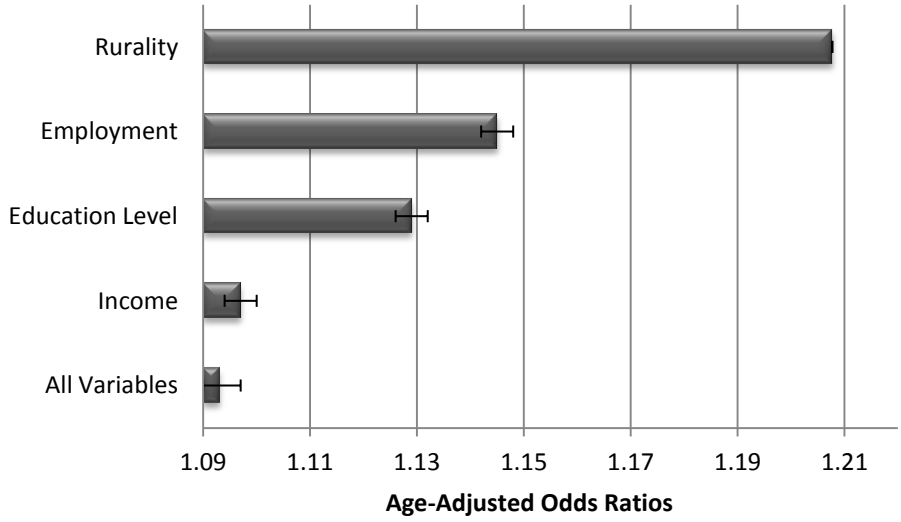
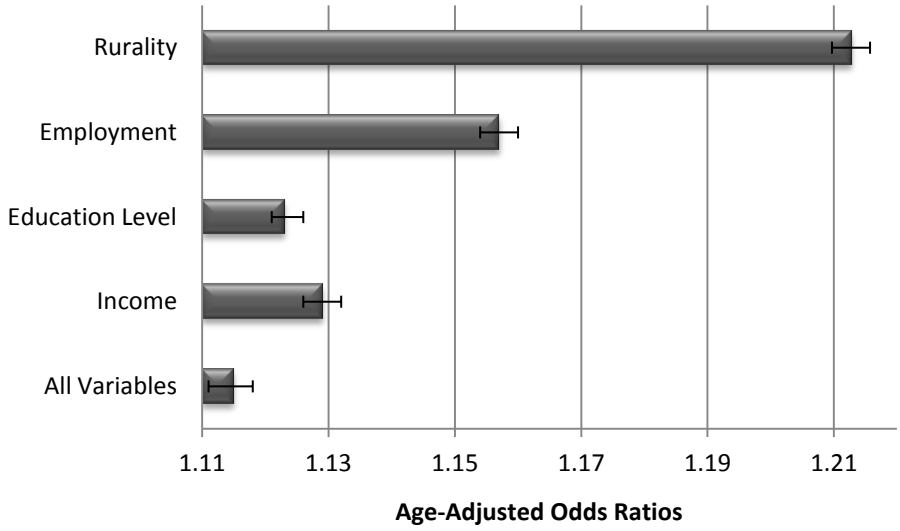


Table 8. Predictors of Risk of Heart Attack Among Rural and Non-Rural Women (Age is included in all models: reference group = non-rural women)

Variables	OR	P	95% CI	
			Lower	Upper
Predictor Class				
Rural Status	1.213	<.001	1.210	1.216
Adjusted for:				
Demographic				
Region	1.175	<.001	1.172	1.178
Marital Status	1.256	<.001	1.253	1.259
Employment	1.157	<.001	1.154	1.160
Education Level	1.123	<.001	1.121	1.126
Race	1.301	<.001	1.298	1.304
Income	1.129	<.001	1.126	1.132
Behavioral				
Exercise	1.181	<.001	1.178	1.184
Body Mass Index	1.203	<.001	1.200	1.206
Diabetes	1.213	<.001	1.210	1.216
Heavy Alcohol Consumption (More than 1-2 Drinks Per Day)	1.203	<.001	1.200	1.206
Smoking Status	1.201	<.001	1.198	1.204
Satisfied with Life	1.209	<.001	1.206	1.212
Health Care Access				
Without Healthcare Coverage	1.212	<.001	1.209	1.215
All Variables	1.115	<.001	1.111	1.118

Figure 2. The Association between Rurality and Heart Attack: Adjusted for Socioeconomic Factors



DISCUSSION

The purpose of this study was to identify stroke and heart attack disparities throughout the United States. It was hypothesized that rural women would be at a higher risk for these cardiovascular events than non-rural women. In addition, possible mediator variables from the BRFSS dataset were looked into further.

Our main hypothesis of a higher associated risk for stroke and heart attack among rural women was supported through logistic regressions done in SPSS. As seen in Table 7 and Table 8, there was a connection between socioeconomic factors and these cardiovascular diseases; this phenomenon is emphasized in Figure 1 and Figure 2. The risk for heart attack and stroke was not reduced any further than with the socioeconomic variables alone.

As mentioned, there were variables in the 2008 BRFSS that were not associated with heart attack or stroke. For example, obesity generally increases the risk for cardiovascular disease. It was reported that rural areas in America are more impoverished and obese than non-rural areas (Patterson, Moore, Probst, & Shingogle, 2004). Specifically, rural residents were 15% more obese than their urban counterparts. Our findings align with this study. Table 5 indicates that rural women in the sample were associated with obesity (OR = 1.364, *P* = <.001, 95% CI = 1.362-1.365). As seen in Table 7 and Table 8, the risk of heart attack and stroke among rural women did not decrease after controlling for body mass index. Liburd, Jack, Williams, and Tucker (2005) found that approximately 65% of diabetics die from heart disease complications. Diabetes was associated with rural women; however, it was not related to stroke or heart attack. With this, physical activity typically acts as a preventative measure for cardiovascular disease. We found that rural women were less likely to exercise than non-rural women (OR = 1.172, *P* = <.001, 95% CI = 1.171-1.173); exercise did not mediate stroke or heart attack. An article in the *American*

Journal of Preventative Medicine states that more studies on physical activity are needed for this population (Appel, Harrell, & Deng, 2002).

Region and race did not affect stroke or heart attack in this sample, contradicting past literature. These results are found in Table 7 and Table 8. Furthermore, rural living variations were identified between regions. The Midwest was highly correlated with rural areas (OR = 2.730, *P* = <.001, 95% CI = 2.726-2.734), followed by the South (OR = 2.305, *P* = <.001, 95% CI = 2.302-2.208) and the Northeast (OR = 1.197, *P* = <.001, 95% CI = 1.195-1.199). Appel, Harrell, and Deng (2002) discuss inequalities facing rural African American women residing in Southwest, United States. These researchers suggest high heart attack and stroke rates to be rooted in modeling, history, and society. According to this article, approximately half of all United States citizens in poverty reside in the South. This study also found that rural African American women have lower adjusted salaries, higher obesity, and more female-headed households compared to whites living in the same metropolitan area. Appel, Harrel, and Deng (2002) propose that race distribution between regions plays a role in disparities. Hispanics had a strong negative association with rural residency (OR = .296, *P* = <.001, 95% CI = .295-.296). With this, a *Circulation* article states that Hispanics have a lower risk for stroke compared to other races (Cooper et al., 2000). Despite our findings, racial and ethnic differences across the United States appear to influence CVD to some extent.

Marital status and life satisfaction were also not correlated with these cardiovascular events. Table 4 indicates that rural women were more likely to be married than divorced, widowed, separated, or never married. Ennen and Beamon (2012) found that married people have a lower risk for heart disease; this does not completely align with our results.

Alcohol consumption and smoking did not mediate CVD, despite their associations with rural women. These CVD results are seen in Table 7 and Table 8. Rural women were more likely to smoke everday (OR = 1.515, *P* = <.001, 95% CI = 1.513-1.517) and less likely to binge drink

(OR = .751, *P* = <.001, 95% CI = .749-.753) compared to non-rural women in the univariate model. Weiss (2009) found that a woman's risk for CVD is six times higher when they smoke. In addition, Forest and Lin (2010) found that rural women binge drink more than urban women in some areas of the United States. These previous findings differ from the results in our CVD models.

According to *Rural Health Care Providers in the United States*, low household incomes seen in rural areas of the United States prevent many specialty physicians from practicing there (Hart, Salsberg, Phillips, & Lishner, 2002). Providers who may greatly improve heart attack or stroke outcomes for rural women are generally unavailable; however, this does not appear to be these women's major disparity. Our findings show that rural women are associated with a lack of any healthcare coverage (OR = 1.225, *P* = < .001, 95% CI = 1.224-1.227); this includes those who receive Medicaid and Medicare benefits. As mentioned, the majority of stroke and heart attack costs stem from poor preventative care. Healthy People 2020 objectives specifically aim to decrease coronary artery and stroke related deaths through preventative measures (HHS, 2011). The Affordable Care Act may indirectly improve CVD prevention through increased healthcare coverage. Although, healthcare coverage was not correlated with stroke (OR = 1.207, *P* = <.001, 95% CI = 1.204-1.211) or heart attack (1.212, *P* = <.001, 95% CI = 1.209-1.215); Table 7 and Table 8 display this information.

Finally, socioeconomic factors significantly mediated heart attack and stroke among rural women. Table 4 displays associations rural women have with education, income, and employment. The univariate model indicates that these women are more likely to be retired (OR = 1.223, *P* = <.001, 95% CI = 1.222-1.225) or unable to work (OR = 1.495, *P* = <.001, 95% CI = 1.492-1.498) than non-rural women. Income was a unique variable among rural women. Its positive correlation strengthened after controlling for all variables in the multivariate model. The results found in this study may relate to the higher rates of poverty in rural areas (Ennen &

Beamon, 2012). As already stated, the risk of heart attack or stroke among rural women does not decline any further when controlling for socioeconomic status alone; these odds ratios are emphasized in Figure 1 and Figure 2. Diez-Roux, Link, and Northridge (2000) similarly found an association between low income and CVD using the BRFSS. The researchers concluded that income did not directly affect heart disease and stroke. Rather, unique characteristics encompassed by low income populations raise their risk. Body mass index, hypertension, and sedentary behavior were related to rural living and CVD in this study. The remaining risk for heart attack (OR = 1.115, *P* = <.001, 95% CI = 1.111-1.118) and stroke (OR = 1.093, P = <.001, 95% CI = 1.090-1.097) after controlling for all variables at once indicates that there are mediators excluded from our analysis. There is a lack of literature on socioeconomic factors influencing CVD among rural women; however, research indicates that women in the South are disproportionately affected by these cardiovascular events and poverty. Specifically, individuals living in the South region of the United States constitute half of all Americans living in poverty (Appel, Harrel, & Deng, 2002). It may be advantageous to direct present and future healthcare reform efforts toward this population.

Conclusion

This study used the BRFSS to examine possible relationships between CVD and rural women. Age and metropolitan status were held constant in the stroke and heart attack models as each variable was examined separately. Rural women were associated with a higher risk of stroke and heart attack compared to non-rural women. In addition, this phenomenon was partially mediated by socioeconomic factors. These patterns are generally unnoticed by society. Future research might delve deeper into other factors that influence stroke and heart attack. The United States spent $470 billion on CVD in 2007 (Rosamond et al., 2007). These costs will not be reduced if inequalities continue to be overlooked in America.

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APPENDIX

The following are selective variables/questions from the *Behavioral Risk Factor Surveillance System 2008 Codebook* (CDC, 2008):

State FIPS Code

Section: 0.1 Record Identification
Column: 1-2

Type: Num
SAS Variable Name: _STATE

Prologue:
Description: State FIPS Code

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Alabama	6,489	1.57	1.52
2	Alaska	2,664	0.64	0.21
4	Arizona	6,165	1.49	2.04
5	Arkansas	5,695	1.37	0.93
6	California	11,598	2.80	11.93
8	Colorado	11,762	2.84	1.58
9	Connecticut	6,155	1.48	1.16
10	Delaware	4,026	0.97	0.29
11	District of Columbia	4,243	1.02	0.20
12	Florida	10,874	2.62	6.22
13	Georgia	5,716	1.38	3.08
15	Hawaii	6,446	1.56	0.43
16	Idaho	5,111	1.23	0.47
17	Illinois	5,163	1.25	4.16
18	Indiana	4,900	1.18	2.03
19	Iowa	6,012	1.45	0.99
20	Kansas	8,628	2.08	0.89
21	Kentucky	8,091	1.95	1.40
22	Louisiana	6,182	1.49	1.42
23	Maine	6,788	1.64	0.45
24	Maryland	9,481	2.29	1.85
25	Massachusetts	20,581	4.97	2.15
26	Michigan	9,453	2.28	3.29
27	Minnesota	4,287	1.03	1.70
28	Mississippi	7,949	1.92	0.93
29	Missouri	5,158	1.24	1.93
30	Montana	6,846	1.65	0.32
31	Nebraska	16,255	3.92	0.57
32	Nevada	4,771	1.15	0.84
33	New Hampshire	6,892	1.66	0.44
34	New Jersey	11,740	2.83	2.87

State FIPS Code

Section: 0.1 Record Identification
Column: 1-2

Type: Num
SAS Variable Name: _STATE

Prologue:
Description: State FIPS Code

Value	Value Label	Frequency	Percentage	Weighted Percentage
35	New Mexico	6,227	1.50	0.63
36	New York	7,915	1.91	6.37
37	North Carolina	15,835	3.82	2.96
38	North Dakota	5,035	1.21	0.21
39	Ohio	12,962	3.13	3.76
40	Oklahoma	7,812	1.88	1.17
41	Oregon	4,796	1.16	1.25
42	Pennsylvania	13,172	3.18	4.16
44	Rhode Island	4,786	1.15	0.36
45	South Carolina	10,202	2.46	1.44
46	South Dakota	6,981	1.68	0.25
47	Tennessee	5,024	1.21	2.01
48	Texas	10,716	2.59	7.49
49	Utah	5,330	1.29	0.79
50	Vermont	6,751	1.63	0.21
51	Virginia	5,310	1.28	2.55
53	Washington	22,532	5.44	2.14
54	West Virginia	4,168	1.01	0.62
55	Wisconsin	7,075	1.71	1.84
56	Wyoming	7,999	1.93	0.17
66	Guam	796	0.19	0.05
72	Puerto Rico	4,475	1.08	1.22
78	Virgin Islands	2,489	0.60	0.03

Have any health care coverage

Section: 3.1 Health Care Access
Column: 80

Type: Num
SAS Variable Name: HLTHPLAN

Prologue:
Description: Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Yes	370,296	89.33	84.48
2	No	43,246	10.43	15.13
7	Don’t know/Not Sure	594	0.14	0.30
9	Refused	373	0.09	0.10

Exercise in Past 30 Days

Section: 5.1 Exercise
Type: Num
Column: 86
SAS Variable Name: EXERANY2

Prologue:

Description: During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Yes	299,159	72.17	74.38
2	No	114,844	27.71	25.53
7	Don’t know/Not Sure	367	0.09	0.07
9	Refused	139	0.03	0.03

Ever Told by Doctor You Have Diabetes

Section: 6.1 Diabetes
Type: Num
Column: 87
SAS Variable Name: DIABETE2

Prologue:

Description: Have you ever been told by a doctor that you have diabetes (If "Yes" and respondent is female, ask "Was this only when you were pregnant?". If Respondent says pre-diabetes or borderline diabetes, use response code 4.)

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Yes	47,402	11.44	8.77
2	Yes, but female told only during pregnancy	3,700	0.89	1.03
3	No	357,514	86.25	89.06
4	No, pre-diabetes or borderline diabetes	5,454	1.32	1.02
7	Don’t know/Not Sure	255	0.06	0.04
9	Refused	182	0.04	0.07
BLANK	Not asked or Missing	2		

Ever Diagnosed with Heart Attack

Section:	8.1 Cardiovascular Disease Prevalence	**Type:**	Num
Column:	91	**SAS Variable Name:**	CVDINFR4

Prologue: Has a doctor, nurse, or other health professional ever told you that you had any of the following? For each, tell me "Yes", "No", or you're "Not sure":

Description: (Ever told) you had a heart attack, also called a myocardial infarction?

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Yes	25,042	6.04	4.27
2	No	387,349	93.45	95.41
7	Don't know/Not sure	2,029	0.49	0.31
9	Refused	88	0.02	0.01
BLANK	Not asked or Missing	1		

Ever Diagnosed with a Stroke

Section:	8.3 Cardiovascular Disease Prevalence	**Type:**	Num
Column:	93	**SAS Variable Name:**	CVDSTRK3

Prologue: Has a doctor, nurse, or other health professional ever told you that you had any of the following? For each, tell me "Yes", "No", or you're "Not sure":]

Description: (Ever told) you had a stroke.

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Yes	16,453	3.97	2.67
2	No	396,949	95.76	97.15
7	Don't know/Not sure	1,031	0.25	0.17
9	Refused	75	0.02	0.01
BLANK	Not asked or Missing	1		

Frequency of Days Now Smoking

Section: 11.2 Tobacco Use
Column: 99
Type: Num
SAS Variable Name: SMOKDAY2

Prologue:
Description: Do you now smoke cigarettes every day, some days, or not at all?

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Every day	52,102	27.07	30.97
2	Some days	17,754	9.23	12.03
3	Not at all—Go to Section 12.01 AGE	122,461	63.63	56.93
7	Don´t Know/Not Sure—Go to Section 12.01 AGE	59	0.03	0.04
9	Refused—Go to Section 12.01 AGE	72	0.04	0.03
BLANK	Not asked or Missing	222,061		
	Notes: Section 11.01, SMOKE100, is coded 2, 7, 9, or Missing			

Reported Age in Years

Section: 12.1 Demographics
Column: 101-102
Type: Num
SAS Variable Name: AGE

Prologue:
Description: What is your age?

Value	Value Label	Frequency	Percentage	Weighted Percentage
7	Don’t know/Not sure	280	0.07	0.04
9	Refused	3,373	0.81	0.54
18 – 24	Age 18 - 24	14,050	3.39	12.36
	Notes: _ _ Code age in years			
25 – 34	Age 25 – 34	39,374	9.50	18.22
35 – 44	Age 35 – 44	61,903	14.93	18.93
45 – 54	Age 45 – 54	84,268	20.33	18.88
55 – 64	Age 55 – 64	87,834	21.19	14.22
65 – 99	Age 65 or older	123,427	29.78	16.81

Marital Status

Section: 12.6 Demographics
Type: Num
Column: 112
SAS Variable Name: MARITAL

Prologue:
Description: Are you: (marital status)

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Married	231,145	55.79	59.89
2	Divorced	57,902	13.97	8.74
3	Widowed	56,767	13.70	6.24
4	Separated	8,745	2.11	2.07
5	Never married	49,212	11.88	18.83
6	A member of an unmarried couple	9,065	2.19	3.95
9	Refused	1,508	0.36	0.28
BLANK	Not asked or Missing	165		

Education Level

Section: 12.8 Demographics
Type: Num
Column: 115
SAS Variable Name: EDUCA

Prologue:
Description: What is the highest grade or year of school you completed?

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Never attended school or only kindergarten	793	0.19	0.24
2	Grades 1 through 8 (Elementary)	13,925	3.36	3.96
3	Grades 9 through 11 (Some high school)	26,457	6.39	7.27
4	Grade 12 or GED (High school graduate)	124,922	30.16	28.67
5	College 1 year to 3 years (Some college or technical school)	109,406	26.41	26.34
6	College 4 years or more (College graduate)	137,725	33.25	33.15
9	Refused	1,026	0.25	0.37
BLANK	Not asked or Missing	255		

Employment Status

Section: 12.9 Demographics
Column: 116

Type: Num
SAS Variable Name: EMPLOY

Prologue:
Description: Are you currently: (employment status)

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Employed for wages	182,805	44.13	51.12
2	Self-employed	36,571	8.83	8.60
3	Out of work for more than 1 year	7,456	1.80	2.20
4	Out of work for less than 1 year	9,722	2.35	3.74
5	A homemaker	32,800	7.92	8.10
6	A student	6,678	1.61	4.76
7	Retired	109,951	26.55	15.76
8	Unable to work	26,934	6.50	5.20
9	Refused	1,282	0.31	0.51
BLANK	Not asked or Missing	310		

Income Level

Section: 12.10 Demographics
Type: Num
Column: 117-118
SAS Variable Name: INCOME2

Prologue:

Description: Is your annual household income from all sources: (If respondent refuses at any income level, code "Refused.")

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Less than $10,000 Notes: If "no," code 02	19,425	4.69	4.55
2	Less than $15,000 ($10,000 to less than $15,000) Notes: If "no," code 03; if "yes," ask 01	21,257	5.13	4.28
3	Less than $20,000 ($15,000 to less than $20,000) Notes: If "no," code 04; if "yes," ask 02	27,420	6.62	6.31
4	Less than $25,000 ($20,000 to less than $25,000) Notes: If "no," ask 05; if "yes," ask 03	34,935	8.44	7.54
5	Less than $35,000 ($25,000 to less than $35,000) Notes: If "no," ask 06	44,435	10.73	9.81
6	Less than $50,000 ($35,000 to less than $50,000) Notes: If "no," ask 07	56,219	13.58	12.68
7	Less than $75,000 ($50,000 to less than $75,000) Notes: If "no," code 08	60,718	14.66	14.82
8	$75,000 or more	96,426	23.29	27.77
77	Don’t know/Not sure	24,589	5.94	6.24
99	Refused	28,656	6.92	5.99
BLANK	Not asked or Missing	429		

Respondents Sex

Section: 12.20 Demographics
Type: Num
Column: 143
SAS Variable Name: SEX

Prologue:

Description: Indicate sex of respondent.

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Male—Go to Section 13.01 DRNKANY4	155,703	37.56	48.64
2	Female—If 11.01, AGE, is 45 or older go to Section 13.01 DRNKANY4	258,806	62.44	51.36

How often get emotional support needed

Section: 22.1 Emotional Support and Life Satisfaction
Type: Num
Column: 205
SAS Variable Name: EMTSUPRT

Prologue:
Description: How often do you get the social and emotional support you need?

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Always	199,756	49.43	49.19
2	Usually	117,706	29.13	28.99
3	Sometimes	45,563	11.27	11.48
4	Rarely	13,532	3.35	3.35
5	Never	19,387	4.80	4.65
7	Don’t know/Not sure	5,991	1.48	1.11
9	Refused	2,172	0.54	1.24
BLANK	Not asked or Missing	10,402		

Metropolitan Status Code

Weighting: 1.31 Record Identification
Type: Num
Column: 986
SAS Variable Name: MSCODE

Prologue:
Description: Metropolitan Status Code

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	In the center city of an MSA	126,360	31.07	37.52
2	Outside the center city of an MSA but inside the county containing the center city	88,096	21.66	28.51
3	Inside a suburban county of the MSA	52,652	12.94	14.74
4	In an MSA that has no center city	2,775	0.68	1.04
5	Not in an MSA	136,864	33.65	18.19
BLANK	GU, PR, VI	7,762		

Computed Five level race/ethnicity category.

CalculatedVariables: 12.7 Calculated Race Variables

Type: Num

Column: 1240

SAS Variable Name: _RACEGR2

Prologue:

Description: Five-level race/ethnicity category

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	White only, Non-Hispanic Notes: RACE2 = 1	325,936	78.65	67.46
2	Black only, Non-Hispanic Notes: RACE2 = 2	32,681	7.89	9.80
3	Other race only, Non-Hispanic Notes: RACE2 = 3 or 4 or 5 or 6	16,110	3.89	5.29
4	Multiracial, Non-Hispanic Notes: RACE2 = 7	6,696	1.62	1.52
5	Hispanic Notes: RACE2 = 8	28,742	6.94	15.15
9	Don’t know/Not sure/Refused Notes: RACE2 = 9	4,246	1.02	0.79
BLANK		98		

Computed body mass index categories

Calculated Variables: 12.18 Calculated Variables

Type: Num

Column: 1263

SAS Variable Name: _BMI4CAT

Prologue:

Description: Three-categories of Body Mass Index (BMI)

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	Neither overweight nor obese Notes: _BMI4 < 2500 (_BMI4 has 2 implied decimal places)	142,007	34.26	35.37
2	Overweight Notes: 2500 <= _BMI4 < 3000	144,892	34.96	34.73
3	Obese Notes: 3000 <= _BMI4 < 9999	108,933	26.28	25.53
9	Don’t know/Refused/Missing Notes: _BMI4 = 9999	18,677	4.51	4.38

Heavy Alcohol Consumption Calculated Variable

Calculated Variables: 13.5 Calculated Variables **Type:** Num

Column: 1280 **SAS Variable Name:** _RFDRHV3

Prologue:

Description: Heavy drinkers (adult men having more than two drinks per day and adult women having more than one drink per day)

Value	Value Label	Frequency	Percentage	Weighted Percentage
1	No Notes: SEX = 1 and _DRNKDY3 <= 2 or SEX = 2 and _DRNKDY3 <= 1 or ALCDAY4 = 888	383,308	92.47	91.75
2	Yes Notes: SEX = 1 and _DRNKDY3 > 2 or SEX = 2 and _DRNKDY3 > 1	19,270	4.65	4.99
9	Don’t know/Refused/Missing Notes: _DRNKDY3 = 900	11,931	2.88	3.26

ACADEMIC VITA

LINDSAY MARIE HOFFMAN

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EDUCATION

The Pennsylvania State University – University Park, PA
Schreyer Honors College
Bachelor of Science in Biobehavioral Health — Spring 2013
Thesis Title: *Heart Attack and Stroke Disparities among Rural Women in the United States*
Thesis Supervisor: Dr. Frank M. Ahern

HONORS

Dean's List — Summer 2009 – Present
The National Society of Collegiate Scholars (NSCS) — May 2010 – Present

FURTHER RESEARCH EXPERIENCE

Special Instructor-Initiated Independent Research Studies – University Park, PA
Honors Student — January 2012 – May 2012

- Gathered information concerning health insurance and the Affordable Care Act
- Introduced new insurance issues to the professor during weekly meetings

The Strengthening Families Program – University Park, PA
Research Assistant — September 2011 – December 2011

- Determined mindful parenting behavior through close observation of recorded video-taped discussions
- Provided observational ratings related to the effectiveness of the mindful parenting program to the coordinators

PROFESSIONAL DEVELOPMENT

American Academy of Physician Assistants (AAPA) — July 2012 – Present
Student Shadow at Dubois Regional Medical Center — March 2012 – May 2012
Student Shadow at Elk Regional Health Center — August 2011

ACTIVITIES AND COMMUNITY SERVICE

Penn State Hershey Cardiac Group Medical Mission Trip – Guayaquil, Ecuador
Student Volunteer — November 2012

- Assisted medical professionals with pediatric heart surgeries in the screening, operating, and recovery areas
- Provided emotional support to families with an individual undergoing a pediatric heart surgery

Penn State Pre-Physician Assistant Club – University Park, PA

Member January 2012 – December 2012

- Obtained a CPR/AED certification through the Mount Nittany Medical System
- Attended biweekly meetings to expand knowledge about health care

The Village at Penn State – State College, PA

Student Volunteer September 2011 – August 2012

- Communicated effectively with health impaired residents
- Teamed with staff to provide medical care and activities for residents

Society for Distinguished Alumni Mentoring Program

Scholar Protégé July 2011 – Present

- Communicated regularly with a former Penn State faculty who graduated from the University Scholars Program
- Interacted with other Scholar Alumni Mentors during special events

WORK EXPERIENCE

The Arc of Centre County – State College, PA

Residential Program Worker May 2012 – Present

- Assisted individuals with intellectual disabilities who have medical needs
- Maximized skills and empowered individuals with intellectual disabilities in their residences

Penn State Office of Undergraduate Admissions – University Park, PA

Summer Tour Guide May 2012 – August 2012

- Presented the key areas of The Pennsylvania State University to prospective students and their families

Morgan Academic Support Center for Student Athletes – University Park, PA

Tutor March 2012 – August 2012

- Facilitated and taught optimal study habits and skills
- Organized and prepared for appointments on a weekly basis