HEALTH DISPARITIES IN RURAL GEORGIA: A CASE STUDY OF LIBERTY, LONG AND McINTOSH COUNTIES

By

William A. Amponsah,
Whitney Fuller,
and
Godfrey Gibbison

Amponsah and Gibbison are faculty members and Fuller is a McNair Scholar, respectively, in the School of Economic Development, College of Business Administration, Georgia Southern University, Statesboro, GA 30460. Please send all correspondence to Dr. William A. Amponsah at waamponsah@georgiasouthern.edu or at (912) 478-5086.

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ABSTRACT

Health disparities can be defined as differences in the health status among distinct segments of the population including differences that occur by gender, race or ethnicity, education, income, disability, or living in various geographic localities. When populations are disproportionately unhealthy, they are likely to be unable to maintain steady employment, and are more likely to rely on government assistance and support from others. We conduct a case study of three rural counties; Liberty, Long, and McIntosh to explore what factors explain the incidence of health disparities manifested in high blood pressure and heart disease. We test the hypotheses that older individuals are more likely to experience illness at a higher rate than the rest of the population. Additionally, educated individuals are more efficient producers of healthy outcomes, and blacks face greater disparities in health outcomes.

Using survey data collected from the three counties, we apply logistic regression analysis and confirm the presence of health disparities among older individuals and black men with high blood pressure. Additionally, the presence of high cholesterol can exacerbate the incidence of chronic high blood and heart diseases, and educated women are less likely to have high blood pressure.

I. Introduction

For some time now, the nation has been concerned about disparities in access to health services. In the past year, since the inauguration of President Obama's administration, both houses of Congress have been discussing the need for health care reforms to provide insurance and access to health care for tens of millions of Americans who cannot afford to pay for health care. Eliminating or reducing health disparities is important, and to date there have been various intervention initiatives at the federal, state and local community levels. When the *Healthy People 2010* report was launched in January 2000, the U.S. Department of Health and Human Services (DHHS) committed the nation to an overarching goal to eliminate health disparities. To be sure, the report documents a comprehensive disease prevention and health promotion agenda (DHHS, 2000).

However, there is usually confusion on the definition of disparity that leads to the adoption of different strategies in eliminating it. The sources of confusion have to do with the meaning of health disparity, health inequality, and health inequity (Carter-Pokras and Baquet, 2002). Disagreements in the use of these definitions center on which term to use based on whether a judgment of what is avoidable and unfair is included, and how these judgments are made. Usually differing opinions stem from dictionary definitions as well as personal beliefs of what is avoidable and what is unfair. Additional confusion may arise from the different operational definitions adopted by various health organizations. The authors suggest that what should be agreed upon is that a disparity acts like a signpost, indicating that something is wrong. Consequently, if a disparity is identified and described, then the health care community, policy makers, and the public can become more aware of it. If a disparity is determined to be avoidable and unfair, then it must be considered inequity. According to the authors, the term health disparity is almost exclusively used in the United States, while the terms health inequity and health inequality are more commonly used outside of the United States. In this paper, we focus on the issue of health disparity and not health equity per se.

Health disparity is defined broadly in the *Healthy People 2010* report as differences in disease prevalence or treatment by sex, race or ethnicity, educational attainment, income, sexual orientation, or geographic location (U.S. Department of Health and Human Services, 2000). In 2002, the Institute of Medicine (IOM) issued a report that confirmed the existence of significant disparities in the quality of health care received based on the patient's socioeconomic status, access to health care, and use of health care services (Swift, 2002).

According to the DHHS (2004), health care disparities generally exist between rural and urban areas. The DHHS' 2004 National Healthcare Disparities Report documents that rural residents often face barriers to high quality care. Additionally, compared with their urban counterparts, residents of rural areas tend to die from heart disease, report poor health, and more often have chronic conditions such as diabetes. Furthermore, the Report indicates that despite the greater need for health care, rural residents have fewer visits to health care providers and are less likely to receive recommended preventive services. Rural minorities appear to be particularly disadvantaged, and differences in their health care are observed in the management of cardiovascular disease (CVD), cancer and diabetes. When populations are disproportionately unhealthy, they are more likely to be unable to maintain steady employment, and are more likely to rely on government assistance and support from others.

Nonetheless, often the term health disparity is used to reflect racial or ethnic differences in health. In that sense, the diversity of the health workforce, effectiveness of care, language accessibility and cultural competency of health providers and appropriate health promotion information are some of the influences on health disparities.

From the foregoing, social and economic constraints are expected to significantly contribute to health disparities. The key constraints include employment status, and educational levels which influence income, poverty and other economic conditions. Most likely the lack of monetary income limits the ability to engage in certain healthy behaviors that can reduce the risk of developing diseases. Thus, typically health disparities are associated with the poor who tend to manifest higher propensities than the norm in rates of unemployment, high school drop-outs, etc., and are unable to obtain access to quality health care. These factors also influence safety and other concerns such as adequacy of housing, environmental conditions (especially air and water quality), crime rates, mental health (including depression), diet, physical activity, and drug and alcohol use. In sum, these factors influence access to preventive health care, healthy lifestyles, wellness resources, and experience with the health care system (Georgia Health Disparities Report, 2008).

Unhealthy behaviors, such as lack of exercise and poor diet, are known risk factors in developing health problems such as cardiovascular disease, diabetes, high blood pressure, and high cholesterol. These risk factors are often associated with developing a number of other diseases that are leading causes of premature death among Georgia's population, especially among the poor in rural areas.

A report by the United Health Foundation (2006) ranked the state of Georgia 40th in health status in the U.S., with 33% of blacks (African-Americans) living in poverty and experiencing 44% more premature deaths than whites. The Georgia Health Disparities Report (2008) concludes that Georgia's minorities in general suffer significantly worse health outcomes than whites. The Report awarded the grade of "F" to 16 of the 159 counties in Georgia on scores for minority care. Nevertheless, Georgia faces endemic structural problems in dealing with healthcare, in that 118 of the state's 159 counties are rural, and they face shortages of doctors, nurses, therapists and nutritionists.

For example, in the State of Georgia, CVD is the leading cause of death. Cardiovascular disease includes all diseases of the heart and blood vessels, including heart disease, stroke, and hypertensive disease. Death and disability from CVD are related to a number of risk factors such as lack of regular exercise, poor diet, high blood pressure, high cholesterol, and diabetes (American Heart Association, Southeast Affiliate, 2005). These risk factors are associated with developing a number of other diseases that are leading causes of premature death among Georgia's population, especially the poor in rural counties.

According to the Georgia Department of Community Health (2009), CVD (mainly heart disease) accounted for about one-third of deaths in Georgia, with 21,389 CVD deaths in 2007. In 2006 Georgia's CVD death rate was 9% higher than the national rate and 1.4 times higher for men than women in 2007. CVD death rates were 1.3 times higher for blacks than whites in 2007. Of the total CVD deaths in Georgia, heart disease accounted for 16,074 or 24% of all deaths, with hypertensive heart disease accounting for 1,181 of the deaths. The cost of CVD in Georgia in 2007 was estimated at $11.2 billion, which includes direct health care costs and lost productivity from morbidity and mortality. It is important to note that CVD deaths are usually exacerbated by modifiable risk factors such as smoking, lack of physical activity, poor eating habits, obesity, high blood pressure, high cholesterol, and diabetes.

In this paper, we conduct a case study of health disparities in three counties in Georgia; namely Liberty, Long, and McIntosh. Our main objective is to explore the incidence of health disparities among the residents of rural Long and McIntosh counties as against the slightly more peri-urban Liberty County. The first section provides a summary of previous research that sought to explain the interactions between factors that explain health disparities. The second section provides a brief overview of each of the three counties. This is followed by the section describing the data and methodology used in the study and the results of the study. The final section provides concluding comments and policy recommendations.

II. Previous Research Explaining Health Disparities

Differences in health status across racial and ethnic groups in the United States, particularly between black and white Americans, have been the subject of numerous public health and social science research. Many such studies apply a variety of health measures to delineate the relatively worse health status of black men and women compared with that of whites for a number of chronic diseases such as high blood pressure, CVD, stroke and diabetes. Some studies, such as Manton *et al*. (1987), have shown the health of black men and women to be worse than that of whites. Dressler *et al*. (2005), also confirm that black Americans suffer in nearly every measure of health in relation to white Americans.

Additionally, some studies have focused on delineating how the socioeconomic status (SES) and racial differences explain health disparities. For example, Williams and Collins (1995) reviewed studies of SES and racial differences in health by tracing patterns of the social distribution of disease over time and described the evidence for both a widening SES differential in health status and an increasing racial gap in health between blacks and whites, due in part, to the worsening health status of the African American population. Adler and Rehkopf (2008) have also examined the current definitions and empirical research on health disparities, particularly the disparities associated with race/ethnicity and socioeconomic status. The authors reveal that although health is consistently worse for individuals with few resources and for blacks as compared with whites, the extent of health disparities varies by outcome, time, and geographic location within the U.S. Other studies have focused on the social and psychological factors influencing health disparities (Schnittker and McLeod, 2005), or simply the history and recent developments in health disparities (James, 2009).

Bound *et al*. (2003), by focusing on the association between race differences in health status and race differences in labor market outcomes show that blacks and Native Americans had worse labor market outcomes, worse health, and lower educational attainment than their white counterparts. Furthermore, race/ethnicity disparities in health could account for a significant part of the differences in employment rates, earnings, and individual and household incomes between blacks and Native Americans, on the one hand, and whites, on the other, particularly among men and women 45 to 64 years old. However, the observed race/ethnicity disparities in health among employed people were relatively small, suggesting that health disparities appeared to contribute little to disparities in weekly earnings among race/ethnicity groups. The authors also found that health disparities could account for a significant part of the higher participation rates among blacks and Native Americans in public assistance programs and especially Social Security, relative to whites' rates.

A number of studies have investigated the link between genes and the susceptibility to a number of chronic diseases such as high blood pressure, hypercholesterolemia, and diabetes that are perceived to be associated with the risk of developing heart disease (CVD) and stroke (Tabarrok, 1994; Macdonald, 2003; Macdonald *et al*., 2005). An earlier proposition by Grossman (1972) postulated that health could be viewed as a durable capital stock that produces an output of healthy time. The basis of Grossman's argument is that individuals inherit some initial biological stock of health capital that depreciate with age and could be improved by investing in healthy behavior. Therefore, older individuals are more likely to experience illness at a higher rate than the rest of the population. However, individuals can maximize their healthy outcomes subject to income and price constraints. To the extent that the individual is able to solve this constrained health optimization problem, they are able to determine their well-being maximizing stock of health capital which may be produced in combination with certain market inputs (such as medication), healthy behaviors (such as regular physical exercise), in tandem with the individual's endowed genetic inheritance. Additionally, educated individuals are more efficient producers of healthy outcomes.

Grossman also argues that poor individuals may pay less attention to healthy behaviors because of the high cost associated with healthcare.

Motivated by the additional finding by Macdonald *et al*. (2005) that the risk of developing many of the chronic diseases can be modified by participation in certain healthy behaviors (such as proper diet and regular physical exercise), Gibbison and Johnson (2007) evaluated the relationship between family genetic endowment and health-related behaviors. The authors found that poor genetic endowment tends to be associated with a lower probability of participating in cigarette smoking and in regular exercise.

This study contributes to the body of knowledge about health care disparities by analyzing survey data on three rural counties in the state of Georgia that faces structural problems with health care. The key questions are to discover whether disparities in health care occur in those communities, and what explains these disparities. We focus on two diseases that are leading cause of death in the state of Georgia.

III. Overview of the Three Counties

In this section, we provide some demographic and economic data about the three counties analyzed in the study[1]. The U.S. Census Bureau uses the figure of 50,000 people per county to classify a rural county. The state of Georgia defines rural counties as 35,000 people or less. For the purpose of this study, we treat both Long and McIntosh counties as rural while Liberty County is peri-urban. Long County had a population of 11,452 residents in 2008, with the unemployment rate of 6.7% in 2009 when compared to the U.S. average of 8.5%. Per capita personal income in 2007 was $20,874 and the

[1] All data were collected from STATSIndiana – USA Counties IN Profile. For example, data for Liberty County is found at http://www.stats.indiana.edu/uspr/a/usprofiles/13/us_over_sub_pr13179.html. To find data for Long County and McIntosh County, respectively insert pr_13183.html and pr13191.html at the end of the url provided. All data were accessed on January 11, 2010.

poverty rate was 21.2%. According to the 2000 U.S. Census, 74.3% of the adults of 25 plus years had high school diploma or more, with 5.8% having a bachelor's degree or more. McIntosh County had a population of 11,455 residents in 2008, with the unemployment rate of 9.2% in 2009. Per capita personal income in 2007 was $24,224 and the poverty rate was 18.3%. According to the 2000 U.S. Census, 71.2% of the adults of 25 plus years had high school diploma or more, with 11.1% having a bachelor's degree or more. Liberty County is part of the Hinesville-Fort Stewart military base metropolitan area. Liberty County had a population of 58,491 residents in 2008, with the unemployment rate of 8.6% in 2009. Per capita personal income in 2007 was $25,342 and the poverty rate was 17.7%. According to the 2000 U.S. Census, 86.8% of the adults of 25 plus years had high school diploma or more, with 14.5% having a bachelor's degree or more.

IV. Data and Methodology

Data used in this study were collected in 2008 by the Bureau of Business Research and Economic Development (BBRED) of Georgia Southern University. The targeted population included residents of rural southern Georgia with potential access to medical services and health insurance. The survey was designed as a stratified multistage sample; in which two rural counties, Long and McIntosh, were compared to Liberty County. The three counties were selected because of the substantial military presence in Liberty County (the other two are neighboring counties), which would ensure many civilians access to medical care, employment and insurance coverage. The survey was conducted by telephone using systematic sampling with a random start. A member of the household, at least 18 years of age, was requested by the interviewer to provide responses to questions on a survey questionnaire. A total of 600 respondents participated, but only 400 fully completed responses are used for the study (see Table 1 for descriptive statistics of the sample population).

The main focus of this study is to investigate the extent to which certain factors influence disease prevalence in order to determine subsequent health disparities. The two dependent variables used in this study are chronic heart disease and high blood pressure. As indicated already, they are two of the most prevalent cause of death in Georgia. However, based on the survey responses received, high blood pressure was the most frequently diagnosed medical condition from among respondents (see Table 1). The survey respondents were asked if they were ever told by a doctor that they had heart disease, which requires an answer of yes or no. Variables were created for heart disease diagnosis (yes = 1 and no = 0). A similar variable was created for the other dependent variable, high blood pressure diagnosis. The same coding was used, where a response of "yes"= 1 and "no"= 0. The survey questionnaire also contained questions about diagnosed diseases such as high cholesterol. However, although cholesterol tends to manifest itself in individuals with both heart disease and high blood pressure, it is not clear whether either heart disease or high blood pressure cause high cholesterol. Therefore, we chose to include high cholesterol as an independent variable.

The survey questionnaire also contained standard questions about the respondent's income, health insurance, marital status, age, race, gender, education level, and county of residence. These questions comprise the independent variables. Binary variables were created for those variables that required "yes" and "no" answers. Separate cross tabulations for each dependent variable with each of the selected independent variables were implemented using the Chi-square test. The likelihood ratio was used to determine significance of the relationship between the dependent and independent variables. Those independent variables that had the strongest relationship with the dependent variable, according to the Chi-square test, were chosen to be used in a simple logistic multivariate-regression model (please see Tables 2 through 6).

Education was stratified into two binary responses; one for those whose highest education attainment is high school completion and another for those who have completed college education, respectively. For marital status, we have a single variable; married versus not married. Age is a continuous variable measured in years. Household income of more than $45,000 is coded equal to 1, and income of $45,000 or less equals 0. For the gender variable, male was coded as 1 and female as 0, and for the race variable black was coded 1 and other races as 0. Location in the two rural counties of Long and McIntosh were, respectively, coded as binary variables where residence in either one was 1 as against 0 in Liberty County. The major weakness of this data is the sample size. Many surveys had incomplete responses and were omitted from the analysis. The study is, therefore, based on the 400 useful completed surveys.

We estimated separate equations for heart disease diagnosis and high blood pressure diagnosis. As previously explained, both are treated as binary variables. We used the standard simple logistic regression model to estimate coefficients explaining diagnosis of the two chronic diseases:

$$\text{Prob } (D = 1) = F\ (\beta_i x_i),$$

$$\text{Prob } (D = 0) = 1 - F\ (\beta_i x_i),$$

where the probability of disease (D) being diagnosed is a function of $\beta_i x_i$. D = 1 if an individual has been diagnosed with a certain medical condition, β is a vector of coefficients to be estimated and x_i is a vector of independent variables based on individual *i*'s responses to the survey questionnaire. The probability model is expressed as a regression of the form:

$$E[y] = 0\,[1- F(\beta_i x_i)] + 1[F(\beta_i x_i)]$$

$$= F(\beta_i x_i)$$

Assuming logistic disturbances, the density function is of the form:

$$\text{Prob}(D=1) = \frac{e^{\beta i x i}}{1 + e^{\beta i x i}}$$

The inverse function of the logistic model is particularly easy to obtain (let Prob = P) as:

$$\ln [P/(1-P)] = \beta_i x_i$$

Therefore, the model represents the diagnosis of disease as follows:

$$\ln [P/1-P] = \beta_0 + \beta_1 \text{Age} + \beta_2 \text{Race} + \beta_3 \text{Gender} + \beta_4 \text{Education} + \beta_5 \text{Household Income} + \beta_6 \text{High Cholesterol} + \beta_7 \text{Married} + \beta_8 \text{Long} + \beta_9 \text{McIntosh} \quad (1)$$

V. Results

The descriptive statistics are presented in Table 1. About 39% of the respondents have high blood pressure, 35% have high cholesterol, and 9% have heart disease. The mean age of respondents is 50 years, although respondents ranged from 19 years to 94 years old. About 67% of the respondents are married, 26% are black, 37% of the households are earning $45,000 or more, 22% have graduated from college (although 89% had completed high school), and 31% are males.

We first provide the logistic regression results for high blood pressure for the combination of men and women (see Table 2). In doing so, we code the gender variable as binary (where male = 1 and female = 0). We also provide separate regression results for men (Table 3) and for women (Table 4). Individuals diagnosed with high cholesterol are positively associated with being diagnosed with high blood pressure (see Table 2). The result is statistically significant and has a relatively large odds–ratio (OR = 4.924). This result is consistent with both men (Table 3) and women (Table 4). There are important differences in the results obtained for educated women as compared to educated men. Women who have graduated from college have a negative but significantly association with being diagnosed with high blood pressure (Tables 2 and 4). However, for men, higher education is likely associated with high blood pressure, although the result is not significant.

The results also show in Table 3 that there are differential effects on being black male and female and having high blood pressure. Being a black male is positively and significantly associated with being diagnosed with high blood pressure, with large odds (OR = 4.496), although the result is not significant for black females (Table 4) nor necessarily for all blacks (Table 2). Additionally, older men are significantly more likely to be diagnosed with high blood pressure (OR = 1.079), but not older women. Married men are more likely but not significantly to be diagnosed with high blood pressure. On the other hand, married women (Table 4) are less likely but not significantly to be diagnosed with high blood pressure. Invariably, living in the rural county of McIntosh is significantly more likely to cause high blood pressure (OR = 2.573). Additionally, being a male resident in both Long and McIntosh counties significantly more likely results in being diagnosed with high blood pressure. Interestingly, higher income is negatively but not significantly associated with high blood pressure diagnosis.

In addition to reporting regression results for heart disease for all males and females (Table 5), we also provide separate results for males (Table 6) and females (Table 7). Again, high cholesterol diagnosis is likely to significantly lead to diagnosis of heart diseases, especially more likely with males (OR = 17.527) but not significantly with females. Nonetheless, older age significantly and positively leads to the diagnosis of heart disease for all, both males and females. This is a very important finding in providing health management intervention for older adults in heart disease.

The results also show (Table 6) that married men are significantly less likely to have heart disease; although that result is not significant when we add women. Additionally, living in McIntosh County increases the preponderance of having heart disease for all males and females (OR = 3.095), although for males there is a very high and significant likelihood of being diagnosed with heart disease in both rural counties with odd-ratios of 12.568 and 13.397, respectively, for Long and McIntosh counties. However, being black does not significantly show much disparity of being diagnosed with heart disease.

VI. Concluding Comments

This paper conducts a case analysis of health disparities in three counties of Georgia, two that are rural and one peri-urban. The key findings are as follows. First, there is substantial evidence of chronic diseases such as high blood pressure and high cholesterol in the counties, although the incidence of heart disease in the sample population is below the state average in Georgia. Second, in general high cholesterol increases the probability of individuals being diagnosed with both high blood pressure (for all genders) and heart disease (for males). Furthermore, older individuals (both males and females) are more significantly likely to have heart diseases, whereas the incidence of high blood pressure is more likely among older males. In the sample population, black males were found to have a significantly higher diagnosis of high blood pressure but not for heart disease. Additionally, females with higher education are less likely than males to have high blood pressure. Lastly, living in McIntosh County reveals a significant likelihood of having both high blood pressure and heart disease. For males, living in both Long and McIntosh counties increases the likelihood of contracting both high blood pressure and heart disease.

Therefore, a wide range of health disparities were found to exist based on gender, race, age, marriage status and rural location in the sample population. Although many of the reviewed literature tended to decry health disparities among blacks, including the Health Disparities Report 2008 of Georgia, for the sample population, health disparity was significantly found among black males with high blood pressure. Generally, disparity in health among rural residents was confirmed by the study, especially for males. Nonetheless, married men were less likely to exhibit disparity in heart disease.

The results gleaned from this paper are important, in that they should provide health care managers and policy makers with critical information in responsibly designing health planning and the use of health care resources in rural Georgia. They should also add to the existing body of knowledge in encouraging healthy behavior and garnering improved health outcomes. For example, a very important finding in this study is that high cholesterol can exacerbate the incidence of chronic high blood and heart diseases. Therefore, it may be important to encourage healthy interventions, including lifestyle modifications that mitigate the incidence of high cholesterol. Another important finding is that health disparities exist among the older citizens of the rural counties, and may require greater attention from policy makers and health care providers. Yet another interesting finding is that college educated women in the counties have less incidence of high blood pressure at least than the men. Further studies must reveal what is motivating such an outcome.

Lastly, although the percentage of blacks in the sample population (26%) nearly mirrors the percentage of blacks in the state of Georgia (about 30%), there was no overwhelming confirmation of health disparity among all blacks, with the exception of black males with high blood pressure. This does not necessarily mean that gaps in health status between blacks or for that matter the larger minority or ethnic communities and whites do not exist. Therefore, interpretation of our conclusions must be done with caution. If anything, it points to the need for intensified collaborative efforts by the Georgia communities, health policy makers, health care advocates, health systems practitioners and researchers in undertaking community based analyses such as the one we have done, to draw inferences against existing anecdotal and stereotypical conclusions that are highly maintained within the communities.

References

Adlar, N.E. and D.H. Rehkopf (2008), U.S. Disparities in Health: Descriptions, Causes, and Mechanisms." *Annual Review of Public Health*, 29: 235-252.

Bound, J., T. Waidmann, M. Schoenbaum, and J.B. Bingenheimer (2003), "The Labor Market Consequences of Race Differences in Health." *The Milbank Quarterly*, 81(3): 441-473, 2003.

Carter-Pokras O. and C. Baquet (2002), "What is a Health Disparity?" *Public Health Report*, 117:426-434.

Dressler, W.W., K.S. Oths, and C.C. Gravlee. (2005), "Race and Ethnicity in Public Health Research: Models to Explain Health Disparities." *Annual Review of Anthropology*, 34: 231-235.

Georgia Department of Community Health (2008), *Georgia Health Disparities Report 2008: A County-Level Look at Health Outcomes for Minorities in Georgia*. Office of Health Improvement and the Minority Health Advisory Council. Atlanta, GA.

Gibbison, A. Godfrey, C. Douglas Johnson (2007), "Family History of Chronic Disease and Participation in Healthy Behaviours." *Health Economics, Policy and Law*, 2: 297-315.

Grossman, M. (1972), "On the Concept of Health Capital and the Demand for Health." *Journal of Political Economy*, 80(2): 223-255.

James, S.A. (2009), "Epidemiologic Research on Health Disparities: Some Thoughts on History and Current Developments." *Epidemiologic Reviews*, 31(1): 1-6.

Macdonald, A. (2003), "Genetics and Insurance: What Have We Learned So Far? *Scandinavian Actuarial Journal*, 4: 324-348.

Macdonald, A. H.R. Waters, and C.T. Wekwete (2005), "A Model for Coronary Heart Disease and Stroke with Applications to Critical Illness Insurance Underwriting I: The Model." *North American Actuarial Journal*, 9(1): 13-40.

Manton, K., C. Patrick, and K. Johnson (1987), "Health Differentials between Blacks and Whites: Recent Trends in Morbidity and Mortality." *The Milbank Quarterly*, 65 (suppl. 1): 129-199.

Schnittker, J. and J.D. McLeod (2005), "The Social Psychology of Health Disparities." *Annual Review of Sociology*, 31: 75-103.

Swift, E.K. (2002), *Guidance for the National Health Care Disparities Report*.

Washington, DC: National Academies Press, 1-9.

Tabarrok, A. (1994), "Genetic Testing: An Economic and Contract Analysis." *Journal of Health Economics*, 13: 75-91.

United Health Foundation. "America's Health Rankings: A Call to Action for People & Their Communities" 2006 ed. http://www.unitedhealthfoundation.org/ahr2006/2006ahr.pdf (accessed 24 June 2008).

U.S. Department of Health and Human Services (2000), *Healthy People 2010: Understanding and Improving Health*. 2nd edition, Washington, DC: U.S. Government Printing Office, 23-28.

____________________ (2004) "Healthcare Disparities in Rural Areas: Selected Findings from the 2004 National Healthcare Disparities Report." Agency for Healthcare Research and Quality.

Williams, D.R. and C.C. Collins (1995), "U.S. Socioeconomic and Racial Differences in Health: Patterns and Explanations." *Annual Review of Sociology*, 21: 349-386.

Table 1. Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum	Cases
All observations in current sample					N
Age	50.130	17.4044	19.00	94.00	400
High Cholesterol	0.350	0.4776	0.00	1.00	400
Long	0.187	0.3908	0.00	1.00	400
Married	0.667	0.4717	0.00	1.00	400
McIntosh	0.187	0.3908	0.00	1.00	400
Race (Black = 1)	0.257	0.4378	0.00	1.00	400
Income	0.370	0.4834	0.00	1.00	400
College Education	0.220	0.4148	0.00	1.00	400
High school Education	0.895	0.3069	0.00	1.00	400
High Blood Pressure	0.392	0.4889	0.00	1.00	400
Gender	0.309	0.4627	0.00	1.00	400
Heart Disease	0.093	0.2900	0.00	1.00	400

Table 2. Logistic Regression Results for High Blood Pressure: Combined men and women

Variable	β	Standard Error	t	P-value	Odds-Ratio
Constant	-1.213	0.263	4.613	0.000	
Age	0.001	0.001	1.381	0.167	1.001
Education	-0.565	0.301	1.875	0.061	0.568
High Cholesterol	1.594	0.236	6.765	0.000	4.924
Married	-0.182	0.254	0.718	0.4725	0.833
Black	0.351	0.268	1.307	0.191	1.420
Income	-0.039	0.261	0.148	0.882	0.962
Gender	-0.008	0.027	0.291	0.771	0.992
Long	0.464	0.302	1.537	0.124	1.590
McIntosh	0.945	0.299	3.162	0.002	2.52
Chi-Squared	78.535				
Log-likelihood	228.674				
McFadden R^2	0.146				
P-value	0.628				
N	400				

Table 3. Logistic Regression Results for High blood Pressure: Men

Variable	β	Standard Error	t	P-value	Odds-Ratio
Constant	-6.720	1.405	4.783	0.000	
Age	0.076	0.195	3.907	0.0001	1.079
Education	0.435	0.605	0.720	0.472	1.545
High Cholesterol	1.757	0.550	3.195	0.001	5.798
Married	0.676	0.623	1.084	0.278	1.965
Black	1.503	0.670	2.245	0.025	4.496
Income	-0.285	0.548	0.520	0.603	0.752
Long	2.102	0.820	2.563	0.010	8.185
McIntosh	1.853	0.682	2.719	0.006	6.380
Chi-Squared	64.098				
Log-likelihood	52.822				
McFadden R^2	0.378				
P-value	0.003				
N	125				

Table 4. Logistic Regression Results for High Blood Pressure: Women

Variable	β	Standard Error	t	P-value	Odds-Ratio
Constant	-0.673	0.296	2.270	0.023	
Age	0.001	0.001	0.981	0.326	1.001
Education	-1.304	0.409	3.188	0.001	0.271
High Cholesterol	1.396	0.284	4.919	0.000	4.039
Married	-0.416	0.294	1.413	0.158	0.659
Black	0.308	0.324	0.950	0.342	1.361
Income	-0.066	0.325	0.204	0.839	0.935
Long	0.082	0.355	0.231	0.818	1.085
McIntosh	0.469	0.376	1.247	0.212	1.599
Chi-Squared	52.535				
Log-likelihood	158.507				
McFadden R^2	0.142				
P-value	0.284				
N	277				

Table 5. Logistics Results for Heart Disease: Combined Males and Females

Variable	**β**	Standard Error	t	P-value	Odds-Ratio
Constant	-6.407	1.089	5.883	0.000	
Age	0.056	0.014	3.952	0.0001	1.058
Education	-0.342	0.536	0.637	0.524	0.711
High Cholesterol	0.911	0.390	2.333	0.0196	2.486
Married	-0.023	0.423	0.054	0.957	0.977
Black	-1.528	0.494	0.522	0.602	0.773
Income	-0.389	0.469	0.830	0.407	0.678
Gender	0.575	0.410	1.400	0.162	0.776
Long	0.775	0.496	1.563	0.118	2.170
McIntosh	1.130	0.437	2.584	0.010	3.095
Chi-Squared	51.159				
Log-likelihood	97.734				
McFadden R^2	0.207				
P-value	0.794				
N	400				

Table 6. Logistic Regressions Results for Heart Disease: Men

Variables	β	Standard Error	t	P-value	Odds-Ratio
Constant	-9.924	3.278	3.027	0.002	
Age	0.107	0.046	2.326	0.020	1.112
Education	-1.515	1.083	1.398	0.162	0.219
High Cholesterol	2.864	1.019	2.811	0.005	17.527
Married	-2.785	1.135	2.455	0.014	0.062
Income	0.735	1.060	0.694	0.488	2.086
Black	0.523	1.060	0.495	0.621	1.688
Long	2.531	1.193	2.122	0.034	12.568
McIntosh	2.595	1.023	2.537	0.011	13.397
Chi-Squared	43.870				
Log-likelihood	21.899				
McFadden R^2	0.50				
P-value	0.998				
N	125				

Table 7. Logistics Results for Heart Disease: Women

Variable	β	Standard Error	t	P-value	Odds-Ratio
Constant	-6.310	1.276	4.944	0.000	
Age	0.056	0.016	3.446	0.001	1.058
Education	-0.254	0.702	0.362	0.717	0.766
High Cholesterol	0.166	0.472	0.352	0.725	1.181
Married	0.856	0.547	1.564	0.118	2.353
Income	-0.542	0.596	0.909	0.363	0.582
Black	-0.242	0.624	0.388	0.698	0.785
Long	0.542	0.590	0.918	0.358	1.710
McIntosh	0.797	0.549	1.453	0.146	2.219
Chi-Squared	25.924				
Log-likelihood	66.292				
McFadden R^2	0.164				
P-value	0.093				
N	277				