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Predictors of Knowledge of Stroke and Intent to Call 911 Among African Americans

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2015

Abstract

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MPH, University of Liverpool, UK, 2012

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Dissertation Submitted in Partial Fulfillment

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Abstract

Stroke is associated with significant health disparity and predominantly affects the elderly. Stroke outcome is significantly improved if an individual is able to get "clot-bursting" medication. A significant predictor of an on-time arrival to the emergency room for treatment in the event of a stroke is the ability to accurately recognize stroke signs and symptoms. The purpose of this study was to determine the factors (demographic, socioeconomic, and educational) that predict the knowledge of stroke signs/symptoms and intent to call 911 in the event of a stroke. The study was grounded in the social ecological theoretical model and analyzed archived data from 11,537 African Americans to answer the research questions. Multivariable analysis and chi-square analysis for trend were done to determine the predictors of knowledge of stroke signs and symptoms, intent to call 911, and their respective trends. Results show that respondents who were 18–39 years of age were less likely to have a low to no knowledge (OR = 0.46, CI = 0.27 – 0.80), while those who had a high school (OR = 1.95, CI = 1.28 – 2.96) or less than high school (OR = 2.83, CI = 2.03 – 3.96) level of education were more likely to have low to no knowledge of stroke signs and symptoms. Further, while males were less likely (OR = 0.65, CI = 0.64 – 0.66), respondents age 40–64 years (OR = 1.87, CI = 1.14 – 3.09), and those with moderate to adequate knowledge of stroke (OR = 1.39, CI = 1.18 – 1.65), were more likely to say they intend to call 911 in the event of a stroke. This study may lead to policies to improve stroke knowledge among the elderly. Targeted stroke education based on age, education, and socioeconomic status should be a component of such policy. Additionally, this study may lead to the provision of sidewalks and health education programs to improve risk factor control and could thus impact stroke incidence.

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Dedication

This project is dedicated to God, the giver and sustainer of all life, and also to all the respondents and their families who took part in this survey, and finally to the field nurses and support staff who made the collection of the data possible.

Acknowledgments

I will like to acknowledge my committee chair and member(s) for their hard work and patience in guiding this process and project. I also want to acknowledge my parents and family members, who have constantly encouraged me in the course of this study. I will like to acknowledge Ms. Shannon Dile, Ms. Shea Blackston, and Dr. Lynneice L. Bowen for their support and sacrifices as I worked on my studies and this project specifically. My acknowledgement also goes to Dr. Carolyn Jenkins and the Centers for Disease Control and Prevention's REACH program office for granting me the use of these data. Finally, I would like to thank my employer for the understanding shown me while I worked on my studies and this project.

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Chapter 1: Introduction to the Study

Introduction

Preventing stroke and its associated disability has been the focus of the American Heart Association's 2020 vision for health and cardiovascular disease in the United States (Go et al., 2013). The most widely used modality for preventing stroke-related disability is the administration of recombinant tissue plasminogen activator (rtPA) within the first 4.5 hours post stroke (Bryer et al., 2010). The prevention of stroke is highly reliant on risk factor prevention and modification by keeping individuals at a lower risk factor state or moving them from a high to a lower risk factor state (Ruland, Raman, Chaturvedi, Leurgans, & Gorelick, 2003; Sallar, Williams, Omishakin, & Lloyd, 2010). Achieving both goals has been shown to be associated with the level of knowledge of stroke signs, symptoms, and risk factors (Sallar et al., 2010; Williams & Noble, 2008). The level of knowledge of stroke signs, symptoms, and risk factors along with intent to call 911 in the event of a stroke is variable across different ethnic groups, educational level, and income level. These factors have been shown to be independently related to risk factor modification and even post stroke outcome. While there have been studies of the factors that predict the knowledge of stroke and intent to call 911 in other parts of the country (Stroebele et al., 2011), there is currently no statewide study of the determinants of stroke knowledge and intent to call 911 in South Carolina with a view to addressing possible barriers in order to improve knowledge and use of emergency service in the event of a stroke.

This chapter provides an overview of this study, the literature gap that this work was intended to address, and the purpose and intent of the study. Subsequent sections of

this chapter provide brief overviews of the background of the problem, followed by the problem statement and then the purpose of the study. A note on the research questions and hypotheses then follows to provide direction on the questions expected to be answered by this study and the hypotheses that were tested. Finally, the theoretical framework and for the study and the nature of the study, including the rationale for the selected methodology and study design, are provided.

Background

Stroke is a neurological disease of vascular origin. It is more prevalent in older individuals and is usually associated with certain risk factors classified as non-modifiable such as age, race, and sex, as well as with modifiable risk factors such as cigarette smoking, diabetes, hypertension, obesity, high cholesterol, and atherosclerotic occlusive disease. There are about 795,000 cases of stroke in the United States each year, two-thirds of which are repeat strokes (Centers for Disease Control and Prevention, 2007; Go et al., 2013). Among patients with stroke, there is an overrepresentation of African Americans and Hispanics, creating a health disparity in stroke incidence and prevalence of stroke-related disability between the White majority and other racial minorities (Go et al., 2013). Currently, the prevalence of stroke in childhood and adolescent age groups is generally low (Fullerton, Adams, Zhao, & Johnston, 2004) but is expected to rise as the incidence and prevalence of childhood and adolescent obesity rise (Rendall, Weden, Fernandes, & Vaynman, 2012; Singh, Kogan, Van Dyck, & Siahpush, 2008; Stamatakis, Zaninotto, Falaschetti, Mindell, & Head, 2010). In addition, increased prevalence of childhood and adolescent obesity is expected to lead to increased prevalence of childhood and adolescent hypertension through the relationship between blood pressure and body

size (Liker et al., 1988). This has been seen as a possible reason to encourage stroke knowledge, education, and action in the event of a stroke. The net effect of high prevalence of childhood obesity and hypertention is expected to be an increase in childhood strokes and stroke-related disability.

The epidemiology of stroke shows that there is a disproportionally high incidence, prevalence, morbidity, and mortality from stroke in about nine states in the southeast called the "stroke belt." The state of South Carolina has a significantly higher stroke incidence and mortality relative to the national average or any other state in the "stroke belt." As such, the state is referred to as the "buckle of the stroke belt" (Centers for Disease & Prevention, 2012; Centers for Disease Control and Prevention, 2006).

Knowledge of stroke symptoms and signs is suboptimal among ethnic minorities in South Carolina where this study was carried out. Only about 17% of the Hispanics surveyed were able to recognize all four symptoms of stroke. Although the majority of respondents stated that they would call 911 in the event of a stroke, only 23% who knew the four warning signs of stroke stated that they would call 911 in the event of a stroke (Ellis, Wolff, & Wyse, 2009; Sallar et al., 2010). In separate surveys among veterans and post stroke patients in South Carolina, age, race, and educational level were the independent determinants of knowledge of stroke signs and symptoms and intent to call 911. This study was conducted to evaluate the predictors of knowledge of stroke and intent to call 911 in the event of a stroke among residents of the state of South Carolina. In addition, this study will also evaluate the 10-year trend in the level of knowledge of stroke signs and symptoms and intent to call 911.

This study is important because of the role that knowledge of stroke signs and symptoms plays in early recognition of stroke, which itself plays a role in early arrival to the emergency room and access to life-saving treatment (Bohannon, Silverman, & Ahlquist, 2003). This study was designed to identify possible barriers to knowledge and intent to call 911, with a view to using the findings to develop targeted educational campaigns that could improve the level of knowledge of stroke signs/symptoms and intent to call 911 among South Carolinians.

Problem Statement

Among high-risk populations (Blacks and Hispanics) with a disproportionately high prevalence of stroke and stroke risk factors, the level of knowledge of stroke and intention to call or actually calling 911 in the event of a stroke are lower than would be expected. The same is true among Hispanics and Blacks in South Carolina ("buckle of the stroke"), with high prevalence and mortality from stroke (Ellis & Egede, 2008a, 2008b; Willey, Williams, & Boden-Albala, 2009). The incidence and mortality of stroke in the state of South Carolina are significantly higher than in other parts of the country (Centers for Disease Control and Prevention, 2006); despite this disparity, studies show that the level of knowledge of stroke signs, symptoms and risk factors in the state is among the lowest in the country (Centers for Disease & Prevention, 2004; Ellis & Egede, 2008a, 2008b; Ellis et al., 2009). There is a significantly higher proportion of racial minorities (28% African Americans) in the state compared to the average for the entire country (United States Census Bureau, 2012). Further, knowledge of stroke symptoms and signs is very low among ethnic minorities who usually have the highest risk and burden of stroke. Taken together, this indicates a need to determine the factors that

determine knowledge and intended action in the event of a stroke, with a view to addressing those factors in targeted health education campaigns. This study represents the first state-wide effort to examine this subject both in a cross-sectional and longitudinal manner, with the goal of using the data to inform health education and reduce stroke-related mortality and morbidity.

Research Purpose

This was a quantitative longitudinal cross-sectional study design using a secondary data analysis strategy. The source of data was a state-wide survey that was conducted annually from 2003-2012. The immediate purpose of this study was to determine the factors that predict knowledge of stroke risk factors, signs and symptoms, and intent to call 911 in the event of a stroke. It is hoped the information from this study will inform the design of targeted stroke health education campaigns that could result in a more robust knowledge and appropriate action in a population that has among the highest incidence and prevalence of stroke (Centers for Disease Control and Prevention, 2006). Studies show that the provision of health education campaigns can result in significant improvement in the level of knowledge of stroke and intent to call 911(Morgenstern et al., 2007; Mullen Conley et al., 2010; Williams, DeSorbo, Noble, & Gerin, 2012). There were three main independent variables in this study: knowledge of stroke signs and symptoms, knowledge of stroke risk factors, and intent to call 911. The major dependent variables were socio-demographic factors such as age, race, gender; economic factors such as educational level and income level; and knowledge of stroke risk factors, signs, and symptoms became independent variables, to determine if they predicted intent to call 911. Relevant covariates that were analyzed in the statistical analysis were past history of

stroke, past or current history of a medical condition that is a risk factor for stroke, and history of cigarette smoking. These covariates increase an individual's chances of a prior exposure to stroke education and might skew the data because of a possible overrepresentation of one racial group compared to another.

Research Questions

The overarching research question was the following: What are the independent predictors of knowledge of stroke signs and symptoms, risk factors, and intent to call 911 in the event of a stroke? The overarching hypothesis was that respondents with more favorable demographic and economic profiles would be more likely recognize the risk factors and signs and symptoms of stroke and would also be more likely to call 911 in the event of a stroke. The hypothesis was addressed using the following research questions:

RQ1: Is level of education a significant predictor of knowledge of stroke risk factors and signs and symptoms?

Null Hypothesis 1: Educational level is not an independent predictor of knowledge of stroke signs/symptoms and intent to call 911 after adjusting for age, family income level, household type, and gender of participants.

Alternative Hypothesis 1: Educational level is an independent predictor of knowledge of stroke signs/symptoms and intent to call 911 after adjusting for age, family income level, household type, and gender of participants.

RQ2: Is economic and demographic background a significant predictor of knowledge of stroke signs and symptoms?

Null Hypothesis 2: Income level is not an independent predictor of knowledge of stroke signs/symptoms and intent to call 911.

Alternative Hypothesis 2: Income level is an independent predictor of knowledge of stroke signs/symptoms and intent to call 911.

Null Hypothesis 3: Age and race are not independent predictors of knowledge of stroke signs/symptoms and intent to call 911.

Alternative Hypothesis 3: Age and race are independent predictors of knowledge of stroke signs/symptoms and intent to call 911.

RQ3: Is knowledge of stroke signs/symptoms and risk factors a significant predictor of intent to call 911?

Null Hypothesis 4: Knowledge of stroke signs/symptoms and risk factors is not an independent predictor of intent to call 911 after adjusting for age, income level, age, academic literacy level, and gender.

Alternative Hypothesis 4: Knowledge of stroke signs/symptoms and risk factors is an independent predictor of intent to call 911 after adjusting for age, income level, age, academic literacy level, and gender.

RQ4: What was the trend in knowledge of stroke signs/symptoms and risk factors and intent to call 911 from 2001-2012?

Null hypothesis: There was no significant change in the in the pattern of knowledge of stroke signs/symptoms and risk factors and intent to call 911 from 2001-2012.

Alternative hypothesis: There was a significant change in the level of knowledge of stroke signs/symptoms and risk factors and intent to call 911 from 2001-2012.

Theoretical/Conceptual Framework

The study was most appropriately rooted in the social ecological model as the theoretical framework. The theory was originally developed by Bronfenbrenner to understand how human behavior and development are closely related to and determined by their environment (Bronfenbrenner, 1997). This theoretical framework has been applied to public health education and prevention efforts to explain how the environment influences whether individuals seek health education or change their health behavior (Centers for Disease Control and Prevention, 2013c).

This theoretical framework was most appropriate for my work because it enabled the visualization of not only the factors that determine knowledge of stroke and appropriate action in the event of a stroke, but also at what level of the theoretical framework factors were operating. This theoretical framework helped to categorize the layer in which the factor(s) that determine knowledge and intent to call 911 are located and may help to guide the development of targeted intervention programs. For instance, health education might not be as useful an intervention if it were revealed that individuals of low, mid, or high SES with health insurance were more likely to say that they would call 911 in the event of a stroke. This would indicate that the barrier to calling 911 might be at the policy and organizational level. Addressing the policy level of the social ecological model by pushing policies that will provide for both health insurance coverage and cheap emergency medical services is more likely to be effective in combatting this barrier. Additionally, policies that encourage employers to provide health insurance such

as tax credits might be useful in this regard. In the context of public health, the theoretical framework indicates that contributors to health prevention and promotion such as knowledge and access to healthcare can be affected by the environment and interpersonal interactions. These factors are classified as individual (decisions), interpersonal (family and social support), community, organizational and, policy factors (Centers for Disease Control and Prevention, 2013a; Whittemore, Melkus, & Grey, 2004). Knowing the determinants of knowledge and intent to use 911 does not require the social ecological model, but identifying the best way to categorize and address these determinants requires a firm grounding in social ecological theory.

Nature of the Study

My dissertation used a quantitative methodology because the aim was to identify not only what factors might be barriers to knowledge and action, but also how much the independent variables modified or were related to the dependent variable. A quantitative positivist approach and methodology were thus most suitable for this study because they provided the opportunity to quantify the relationship between the dependent and independent variables and the direction of the relationship. The cross-sectional research design provided the opportunity to get a "snapshot" of the study population at a point in time, while the longitudinal component enabled me to determine the trend in knowledge and action in my study population (Creswell, 2009). The source of data was a state-wide cross-sectional survey done using both mailed questionnaires and telephone interviews (Bruce, Pope & Stanistreet, 2008). Sampling strategy was based on a random stratified cluster sampling strategy. Cases were weighted to ensure that the result of the analysis

was representative of the entire state of South Carolina (Frankfort-Nachmias & Nachmias, 2008c).

After cleaning my data and ensuring that variables had been appropriately coded, I proceeded to carry out a descriptive analysis to help me characterize the respondents. The next step in my analysis involved bivariate analysis using chi-square and *t* tests for significant associations between variables. Significantly related variables were explored using more advanced statistics. Results from the univariate and bivariate analysis are presented in tables. The next step in data analysis was to build logistic regression models to identify independent variables that would significantly predict knowledge of stroke signs/symptoms and intent to call 911 in the event of a stroke. While this study was limited by the fact that I used secondary data that it was impossible to confirm, the robust nature of the sampling and sample ensured that the results were robust against such bias.

Definition of Terms and Variables

The following terms are used in this study and are defined below:

Stroke: A rapidly developing focal or global neurological disorder of vascular origin, usually lasting more than 24 hours and leading to death, disability or, full recovery (Khaw, 1996; WHO MONICA Project Principal Investigators, 1988).

Knowledge of stroke: This was defined as knowing at least one symptom and sign and risk factor for stroke. The level of knowledge was measured by the combined number of symptoms and signs and risk factors named by the respondent.

Intent to call 911: This independent variable was derived from a categorical response to the question of what the respondent would do if he or she were having a stroke or witnessed someone having a stroke. Although respondents are given more than

two options of response, the only appropriate response was one in which the respondent said that he or she would call 911.

Educational level: Defined based on completion of a specific level. It is used as a surrogate for academic literacy.

Income level: Defined as annual income category for the respondent. Income category is defined based on the United States' Census definition. This is explained further in Chapter 3 when the coding of data is discussed.

Assumptions and Limitations

For the results and conclusions of this study to be valid, several assumptions were made at the level of sampling, data collection, and analysis. In surveys that involved telephone and mailed questionnaires like this one, it is impossible to go back and confirm the responses, and, as such, it is assumed that the response is from the intended respondent or target population (Frankfort-Nachmias & Nachmias, 2008d). In using a stratified random cluster sampling technique with weighting, it was assumed that the sample would be representative of the state of South Carolina. However, because participation in research is voluntary and evidence exists that individuals with lower socioeconomic and educational status are less likely to participate in research (Schneider, 2011), this study involved the assumption that responses from respondents who might not be representative of the population in terms of educational and socioeconomic status were representative of the entire population of the state.

This study also involved assumptions in the propositional statement that education, sociodemographic factors, and income are related to, and therefore predict the direction and magnitude of the independent variables. While I hoped that I would fail to

reject this hypothesis, there was the chance that this would not be the case. Statistically, it was assumed that the data generated would satisfy the basic requirements for the use of a particular statistical test. For instance, for a *t* test to be applied comparing the mean ages of respondents who intend to call 911 versus those who do not, there is an assumption of a normal distribution of the ages of respondents (Field, 2009). Finally, in this study, because I was comparing changes in the trends of the dependent variables, I assumed that the population structure was similar from year to year. While this assumption might be valid for the purpose of this study, this is rarely the case in real life because of migration and other changes in human behavior that could affect population structure.

Scope and Significance

This project was an examination of the factors that predict knowledge of stroke signs and symptoms and intent to call 911 among residents in the state of South Carolina. Stroke is currently the fourth leading cause of death in the United States and is a significant cause of health disparity, disability, and loss of productivity (Go et al., 2013; Ovbiagele et al., 2013). The health and economic impact of stroke in addition to the fact that it is to a large extent preventable through modification of habits and certain cultural practices inform efforts to apply multiple modalities for its prevention (Ovbiagele et al., 2013). Provision of adequate stroke education can be viewed as a moral imperative given the morbidity, mortality, and health disparity associated with stroke.

The success of a health education program depends to a great extent on the design and implementation of the program. It has been suggested that provision of culturally appropriate and relevant stroke education program is likely to be successful in improving knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke

(Mullen Conley et al., 2010; Williams & Noble, 2008). The National Institute for Neurological Disorders and Stroke (NINDS) made four recommendations for a successful stroke education campaign:

1. Program planning should start with a community needs assessment. Here, my community represents residents in the state of South Carolina, where the morbidity and mortality from stroke are highest. The large sample size and multi year nature of the data provided for a robust study that could provide a much-needed backdrop for a targeted health education program to improve knowledge of stroke and intent to call 911.
2. A variety of strategies can be applied to meet community needs and resources.
3. Educational principles and models should be used in planning effective programs.
4. The message must be simple: "Stroke is an emergency. Time is brain" (Daley et al., 1997).

This project addressed the first point in this list, and one could argue that this is the most important of all the points listed.

Implications for Social Change

The devastation of a stroke cuts across all segments of society and is expected to result in increased healthcare spending (Ovbiagele et al., 2013). As presented in prior sections, stroke leads to loss of productivity and economic output for society and the individual. Studies show that African Americans and Hispanics have the highest burden of stroke yet are the most likely to be socioeconomically disadvantaged (Go et al., 2013). Furthermore, compared to Whites, Blacks are less likely to return to work 1 year after a

stroke event (Busch, Coshall, Heuschmann, McKevitt, & Wolfe, 2009). There is thus a need to identify effective health education and preventive strategies. This study was designed to identify, using population-level data, the factors (economic, social, and demographic) that predict whether an individual is likely to be aware of stroke signs, symptoms, and risk factors and intent to call 911 in the event of a stroke.

If specific factor(s) are identified to independently predict either increased or decreased knowledge and/or intent to call 911 (surrogate for use or emergency services or appropriate action), such factors could be targeted in a health education campaign with a view to eliminating or promoting them, depending on the direction of their impact on the dependent variable. Thus, the potential social change implications of this study were as follows:

1. More targeted health education campaigns.
2. Better use of scarce health-education and health-promotion resources.
3. Reduction in stroke incidence and stroke-related disability.
4. Reduction in stroke-related decrease in economic productivity.
5. Reduction in other stroke-related comorbid health conditions such as post stroke depression/suicide, poststroke chronic pain syndrome, and repeated stroke.
6. Reduction in stroke-related health disparity.

Summary

This chapter provides an overview of the structure, context, and direction of this study. It provides an outline of the significant aspects of this study and gives the reader insight into how the study progressed, along with the guiding principles/theoretical

framework for the study. Prevention of stroke and its associated morbidity and mortality are related to knowledge of stroke signs and risk factors, which in turn affects use of emergency services in the event of a stroke. Available evidence, as discussed in sections of this chapter and subsequent chapters, indicates that age, educational level, and income are among factors that could predict knowledge and intent to call 911.

In the subsequent sections of this project, different aspect of this project are discussed, with some being an expansion of segments of this chapter. In Chapter 2, the literature review is covered, beginning with a brief introduction to the literature review. Next, the theoretical concept is discussed and expanded upon, followed by a review of the evidence from the literature on the dependent variables. Next, a general epidemiology of stroke is reviewed; a critique of the literature is then presented, followed by a review and discussion of the knowledge gap that this study set out to address. The chapter winds down with a summary of the literature review.

The next chapter is Chapter 3, and it presents a discussion of the research design and methodology. This study was a secondary data analysis, and as such did not entail the presentation of a detailed survey design, including validation. However, the study used a validated survey instrument from the Centers for Disease Control and Prevention (CDC). The research population and sampling strategy are then presented. Next, the methodology of data collection is discussed, followed by data handling and processing, plus coding as applicable. This is followed by the data analysis plan and strategy and a description of the assumptions underlying the choice of statistical tests. Finally, a description of the statistical tests chosen, the basis for choosing them, and the hypothesis tested by each test

is presented. Finally, the ethical procedures for obtaining institutional review board approval are discussed.

The result of the data analysis is presented in Chapter 4. This chapter presents a description of the participant characteristics and discussion of findings from the univariate and bivariate analysis. Finally, results of hypothesis tests such as analysis of variance and multivariate analysis such as multi variable logistic regression are presented. Finally, Chapter 5 presents an interpretation of the findings presented in Chapter 4. It expands on the study limitations; presents implications for social recommendations, action, and further research; and finally contains a summary/conclusion of the research findings.

Chapter 2: Literature Review

Introduction

This study was an examination of the determinants of knowledge of stroke signs/symptoms and the intent to call 911 following an acute stroke event among the adult population of the state of South Carolina. Further, it examined the trend in the level of knowledge and stroke signs and symptoms and intent to call 911 over the last 10 years. Another gap addressed by this study was the fact that for a health education intervention to be successful, a form of needs assessment or formative research (Siegel, 2007) is necessary. This study provided for this need for formative research, and the results can, in the long term, inform the design and execution of stroke education and prevention programs. Finally, I hoped to identify possible barriers to knowledge and intent to call 911, which could be the target of health education intervention. This study used a cross-sectional survey and was grounded in the social ecological theory of (Bronfenbrenner, 1976). The literature review is divided into sections, which are as follows: definition/description of stroke, pathophysiology of stroke, and risk factors for stroke; epidemiology of stroke, going from global to national to South Carolina, as applicable; review of studies of knowledge and intent to call 911 in other population samples; review of social ecological theory; and finally, review of the survey study design and the variables studied.

In brief, *stroke* is a neurological event of vascular origin lasting more than 24 hours and resulting in death, disability, or full recovery. The organ affected by stroke is the brain. A stroke results from a decrease in blood and nutrient supply to the brain. A stroke can also result from bleeding into the substance of the brain. Thus, there are two

possible broad etiological types of stroke (Kumar, Fausto, & Abbas, 2005). There are several risk factors associated with increased risk for stroke. These factors are often modifiable, with the result that the risk and incidence of stroke can be reduced (Longo et al., 2012). Emerging research shows that one of the determinants of a favorable outcome after a stroke is whether the patient gets thrombolytic agents such as recombinant tissue plasminogen activator (rtPA; Gonzalez et al., 2013; Kablau, Alonso, Hennerici, & Fatar, 2013; Thomalla et al., 2006). The administration of this drug is time dependent, and patients are expected to receive it within the first 3 hours of a stroke event (Thomalla et al., 2006). The major determinant of achieving this time goal is how soon the patient gets to a center with a neurologist's coverage after the stroke event. And that is determined by how soon 911 is called for an ambulance to convey the patient to such a center. In a recent study, it was shown that this, too, was affected by how aware the patient and/or the patient's caregivers were of stroke signs and symptoms (Malek, Adams, Debenham, Hyacinth, & Lackland, 2013). Recent findings suggest that this knowledge of the common and most important warning signs of stroke is low in the general population (Centers for Disease & Prevention, 2004).

The literature search was conducted for relevant peer-reviewed articles using a combination of key words and Boolean operators. The major databases searched were PubMed, Google Scholar, EMBASE, EBSCO, SciELO, and CINAHL/MEDLINE through the Walden University Library. Additionally, I consulted bibliographic lists in published articles and specialist journals on topics such as stroke, health disparity, and health promotion. Combinations of search terms included but were not limited to *knowledge + stroke + signs and symptoms, attitude + stroke*, *stroke + 911*, *stroke risk*

factors, *stroke + knowledge + mortality*, and *stroke + education + knowledge + risk factors*. Occasionally, Spanish and French articles were included after being translated to English with assistance from colleagues who are fluent speakers of those languages. Although effort was made to keep the articles reviewed within the last 10 years, older articles were reviewed where they were needed to properly discuss the subject.

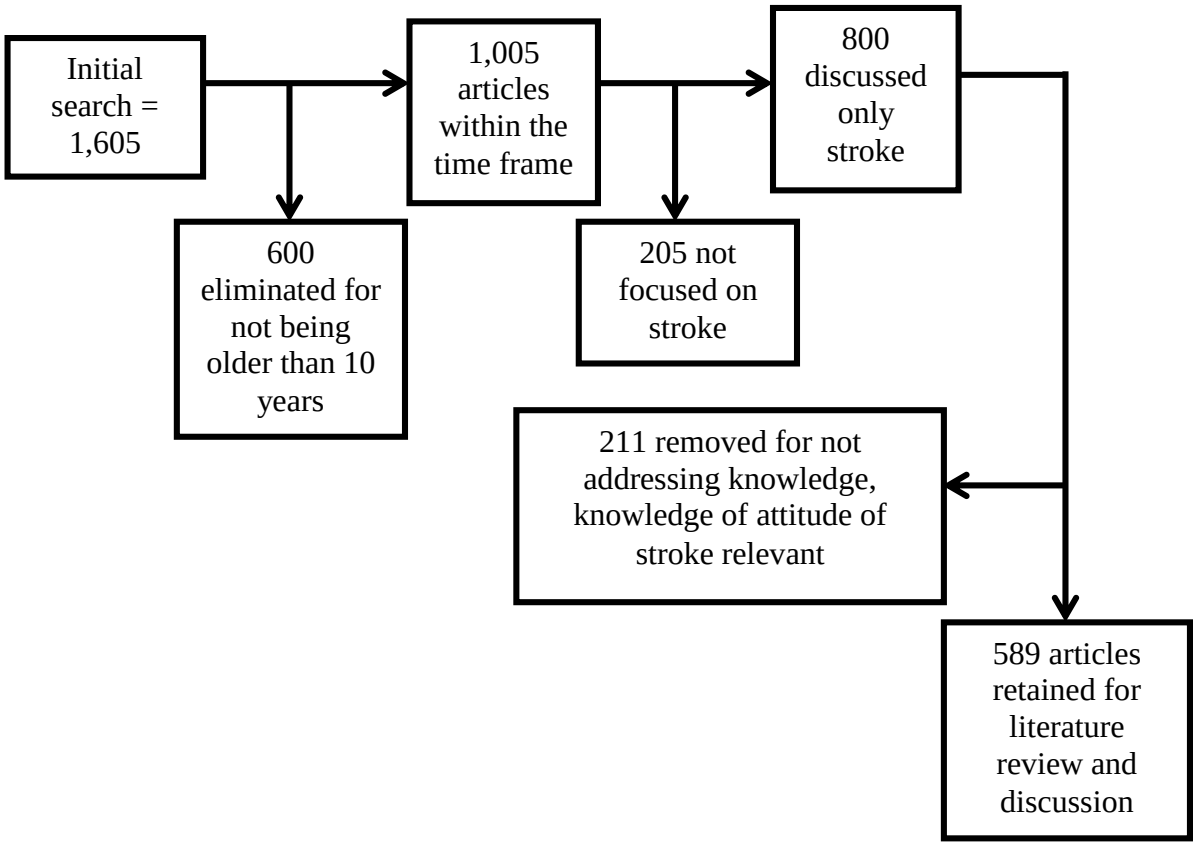

Figure 1. Literature review workflow.

Theoretical Foundation

Background of Theory

The best theoretical construct for this project was the social ecological model. This theory was originally developed by Bronfenbrenner to address the interrelationship

between various environmental and individual factors. Originally, this theory was developed to understand human development and thus behavior. Bronfenbrenner (1977) claimed that understanding human development,—and as in my case, human behaviors—requires understanding all the factors with which people interact. The main aspects of this theoretical model focus on the personal characteristics of individuals, which are divided into three types—demand, resource, and force characteristics (Bronfenbrenner & Morris, 1998)—as discussed below.

1. *Demand characteristics* refer to immediate stimuli that someone else perceives about the individual, such as age, gender, skin color, and physical appearance. These characteristics may influence initial interactions such as seeking health information (Black kids may be more likely to watch shows on BET, which might have less health education) because of the expectations formed immediately due to them.
2. *Resource characteristics* refer in part to mental and emotional resources such as past experiences, skills, and intelligence, as well as to social/material resources (access to good nutrition, housing, caring parents, and educational opportunities). These characteristics in my study determined things like the effect of a family history of stroke or heart disease on knowledge of and attitude toward stroke.
3. *Force characteristics* are those that have to do with differences of temperament, motivation, and persistence. According to Bronfenbrenner, two children may have equal resource characteristics, but their developmental trajectories will be quite different if one is motivated to succeed and persists

in tasks and the other is not motivated and does not persist. This last component accounts for the variation in knowledge and attitude that might be observed among similarly disadvantaged or advantaged respondents.

Relevance of the Model to Public Health

The social ecological model can be applied to various health promotion and prevention efforts (World Health Organization, 1948). It is intended to explore the interrelationship between the individual and the community, environment, and public policy (Centers for Disease Control and Prevention, 2011, 2013c). For instance, while the individual is responsible in this case for instituting a healthy lifestyle—which might involve exercising, taking insulin, quitting cigarette smoking, eating a healthy diet, being compliant with blood pressure medication, or going for annual medical checkups—the environment/interpersonal factors, organizational structure, community, and public policy influence the success of these health options.

Figure 2. A schematic representation of the social ecological model as applied to health promotion and prevention.

In some recent studies, respondents indicated that their source of stroke information was a family member or relative (Evci, Memis, Ergin, & Beser, 2007). This indicates an aspect of the role of interpersonal relationships in individual-level behavior that influences health behavior and health promotion. Other factors in the interpersonal level of the ecological model would include the role of relatives and friends in ensuring drug compliance and reinforcing positive healthy habits such as exercising together, attending health education programs, and community leaders either organizing or encouraging the organization of health education programs and health fairs (Moore, 2003).

The organizational level of influence on health promotion,—and in this case, stroke knowledge—includes stroke health education for post stroke patients and provision of stroke education to middle school children to, in turn, improve the use of 911 (Morgenstern et al., 2007; Mullen Conley et al., 2010). An additional level of organizational-level influence could involve stroke health fairs and programs such as the Medical University of South Carolina's "Stroke Out Stroke" Program. Others include the provision of a gymnasium at the workplace, provision of incentives for healthy lifestyles, and provision of discounted insurance for those with high health literacy and those who practice healthy lifestyles.

The roles of the community and policy makers are very important and interrelated with all the other components of the social ecological model. Community leaders and policy makers could help to develop and implement policies that promote healthy habits such as exercising (e.g., by the provision of sidewalks) and encouraging and incentivizing the location of healthy fresh vegetable- and fruit-selling grocery stores in the community to ensure the availability of healthier food choices (Centers for Disease Control and Prevention, 2013a, 2013c; Moore, 2003).

Literature Review Related to Key Variables and/or Concepts

Knowledge of Stroke Signs and Symptoms

Knowledge of stroke risk factors, signs, and symptoms has been described as the first strategy in the prevention of stroke, and the level of knowledge is affected by race, age, gender, and geographical distribution (Centers for Disease & Prevention, 2004). Overall, over the years from 1995 to 2005, there were improvements in the level of knowledge of stroke signs and symptoms (Go et al., 2013). Knowledge of stroke is

measured on the basis of knowledge of the organ affected, knowledge of risk factors for stroke, and knowledge of the symptoms and signs of stroke (Centers for Disease & Prevention, 2004). Correct knowledge of stroke involving the ability to name at least one stroke warning sign was reported to have increased by 20% from 48% in 1995 to 68% in 2000, but there was no improvement from 2000 to 2005, when it was still 68%. These results were based on telephone surveys from a biracial population in the greater Cincinnati/Northern Kentucky region, and also showed that knowledge of at least three correct warning signs was low but seemed to be on the increase over time from 5.4% in 1995 to 12% in 2000 and 15.7% in 2005. Knowledge of at least one risk factor for stroke increased from 59% in 1995 to 71% in 2000, but with no improvement over this figure in 2005 (Dawn Kleindorfer et al., 2009). Over the last 10 years, there have been several studies of the knowledge of stroke in varying populations, with different reported levels of knowledge. This section reviews some of these studies with a view to identifying the gap(s) and pointing out how my study helps to fill the gap(s).

Ellis, Wolf, and Wyse (2009) investigated stroke knowledge among low-literacy Latinos living in the South Carolina low country region. They hypothesized that Latinos with low literacy levels would exhibit low recognition of early warning signs of stroke and appropriate first action to call 911 to initiate treatment in the event of a stroke. The project was a pilot project that was a survey of a convenience sample of 60 Latinos who were enrolled and receiving instructions in English as a second language (ESL) in 2007. Level of literacy was defined using the Basic English Skill Test (BEST), which was administered initially as part of the enrollment process into the ESL program. The BEST Literacy is an English based tool used in the United States to measure the reading and

writing ability of adult English language learners. The scores derived from the BEST Literacy evaluation are used to classify students into seven levels English language proficiency: 0 = Beginning ESL (0–330), 1 = Low Beginning ESL (331–400), 2 = Low Beginning (401– 417), 3 = High Beginning (418–438), 4 = Low Intermediate (439–472), 5 = High Intermediate (473–506), 6 = Advanced (507–540).

Knowledge of stroke was measured using the heart attack and stroke module of the Behavioral Risk Factor Surveillance System (BRFSS) of the Centers for Disease Control and Prevention (CDC); a federated system led by the CDC for measuring health behavior and knowledge or risk factors. The results from this study indicate that while about 46% of participants in general were aware of at least one sign/symptom of stroke, only 16% of respondents were able to recognize all four warning signs of stroke. Comparison of "literacy" groups indicated that members of Group 1, which had the lowest level of "literacy" measured by the BEST test, were more likely to recognize three out of the four warning signs of stroke. There was no statistically significant difference between literacy groups in recognition of stroke warning signs, except in recognition of dizziness/trouble walking/loss of balance as a stroke warning sign, $p = 0.038$. Some of the challenges in this study were the fact that a convenience sample was chosen and, as a result, external validity was threatened. Furthermore, the authors did not provide any information on how the total sample size of 60 was chosen. Finally, level of English literacy is not in any way a true representation of health literacy, just as academic literacy is not a representation of level of health literacy (Sanders, Shaw, Guez, Baur, & Rudd, 2009; Sandiford, Cassel, Montenegro, & Sanchez, 1995; Schiavo, 2007).

In a population-based study that was done in Turkey, the investigators set out to investigate the level of knowledge of stroke among a representative sample of a segment of the Turkish population (Evci et al., 2007). The sample was drawn from the city of Aydin and respondents were > 40 years old and registered as patients at the health center. A weighted sample of 920 individuals was selected, and this sample was deemed to be representative of the Turkish adult population. Sampling was done using a cluster sampling technique, with the health centers acting as the cluster. Respondents were then randomly drawn from the clusters. Data collection was done using a validated interviewer-administered questionnaire, with a face-to-face interview done by trained students. The results indicated that a majority (64.5%) of respondents correctly identified the brain as the organ of affectation by a stroke event, while 28% and 18% identified vessel occlusion and bleeding into the brain as the etiology of stroke. Unlike in the study among Latinos (Ellis et al., 2009), about 80% of respondents knew at least one stroke warning sign, and 63.6% of respondents knew at least one risk factor for stroke, with stress being wrongly recognized as the top (34.9%) risk factor, albeit followed closely by hypertension (34.1%) and incorrectly followed distantly by diabetes mellitus (9.8%). This study's design was appropriate for a population-based study and is similar to the approach used by the CDC and a recently published study by the American Heart Association (AHA) among women in the United States (Ferris et al., 2005). A challenge to the study is the fact that a standardized questionnaire like the one used by the CDC for BRFSS was not employed. Multiple interviewers were used for data collection, but the investigators were silent on the roles that interrater/interviewer differences could have played in the results.

The final study I chose to review here was a nationwide study of the knowledge of stroke among the general population of Spain (Lundelin et al., 2012). The study sample was chosen from an existing study of the Spanish population on nutrition and cardiovascular risk factors in Spain (ENRICA). Sample selection was done using a multistage cluster random sampling technique. Interviews were conducted using telephone, and respondents were selected by random telephone dialing using the landline directory as the sampling frame. The response rate was 55% and was said to be among the highest in Europe for a study of this nature and design. Data analysis was done, taking account of the complex sampling strategy that was used in the design, with the weighting accounted for in the analysis such that the results could be extrapolated to the general population. About 65.2% of respondents demonstrated adequate knowledge of stroke symptoms as evidenced by being able to name four to six stroke symptoms. This was a well-designed study, and the approach to data collection and analysis have been applied by the CDC and AHA (Centers for Disease & Prevention, 2004, 2008; Ferris et al., 2005). The challenge I saw for this study from the article was the lack of description of the data collection instrument (questionnaire). Thus, it was impossible to determine whether the data collection instrument was validated before it was used for this study.

Intent to Call 911 Following a Stroke Event

Calling 911 is an important part of acute stroke care because of its relationship with time to arrival at the emergency department (ED) and administration of "clot – bursting" therapy like recombinant tissue plasminogen activator (rtPA) and Aspirin (Morgenstern, Steffen-Batey, Smith, & Moye, 2001). In a study among over one thousand participants from West Virginia, 90% of respondents reported that they will call

911 if they or someone nearby were having a stroke. On the other hand, only 2 – 3% of respondents were able to make the connection between specific stroke symptoms/signs and intent to calling 911 if they were to have or observe the symptom (Alkadry, Wilson, & Nicholson, 2005). This means that while the name "stroke" was familiar to respondents as an emergency event, the specific symptoms weren't.

In the study among the Spanish general public which utilized a multistage cluster random sampling technique to conduct a cross sectional survey. Analysis by complex analysis indicated that a total of 81.1% said that they would call 911 in the event of a stroke. Subgroup analysis revealed that, among men who were 18 – 44, 45 – 64, and ≥65 years old, about 85%, 78%, and 75% indicated that they will call 911 in the event of a stroke, and among women of the same age category, the numbers were 85%, 80%, and 70% who said that they will call 911 in the event of a stroke (Lundelin et al., 2012). In a similar study, the investigators utilized a cluster random sampling technique among the general population in a section of Turkey to investigate the knowledge of stroke and intent to call 911 in the event of a stroke (Evci et al., 2007). When asked what they would do first if they were to witness a stroke event, about 43.3% said that they would call the equivalence of 911. Finally, in a study among Hispanics to determine the level of knowledge of stroke symptoms, the investigators recorded a low (16.7%) level of recognition of all 4 stroke warning signs. Despite this, about 72% of respondents indicated that they will call 911 if they were to witness a stroke event. This wide level of difference in the proportion of individuals who said that they will call 911 in the event of stroke in developed countries versus a developing country like Turkey might be related to

the differences in the perceived availability of the emergency medical services in the respective environment.

Determinants of Knowledge of Stroke Signs/Symptoms and Intent to Call 911

Like most health behaviors, the level of knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke is determined by a number of factors. These factors might act independently or in concert, either lower or increase the level of positive stroke related health behaviors i.e., increased level of knowledge and intent to call for emergency medical service as the first option in the event of a stroke.

In a study among Latinos in the United States in which literacy level was measured using the BEST English and reading literacy test, individuals with the highest level of English literacy were less likely to recognize stroke warning signs and symptoms compared to the lower literacy groups, with the reported ability to recognize stroke symptoms rising as the level of literacy decreased in this sample. But the revers was the case with calling 911 as those with the highest level of English literacy, were more likely (85%) to state that they will call 911 in the event of a stroke, compared to the lower literacy (63%) or lowest literacy (71%) groups (Ellis et al., 2009). Although, this differences according to the authors was not statistically significant. When the author examine a population of individuals with a prior history of stroke from the general population (Ellis & Egede, 2008a) and then a population of over 36,000 veterans (Ellis & Egede, 2008b), they identified race to be playing an important role in determining the level of knowledge and intent to call 911 in the event of a stroke. For instance, among the veteran population, with Whites as reference, Hispanics (OR .34, 95% CI .22-.51) and

other ethnicity (includes Blacks and mixed races; OR .68, 95% CI .50-.92) were less likely to recognize all five stroke warning signs/symptoms. Hispanics (OR .37, 95% CI .24-.58) and other ethnicity (OR .68, 95% CI .48-.96) were less likely to recognize all five warning signs/symptoms and call 911 as the initial action. While among the population of stroke patients, Hispanic/other ethnicity (odds ratio [OR] 0.42 [0.25, 0.71]), age 50-64 (OR 0.64 [0.43, 0.97]), age 65+ (OR 0.36 [0.23, 0.55]), and >high school or higher level of education (OR 1.79 [1.22, 2.63]) were the independent predictors of recognition of all five signs of stroke and intent to call 911.

In two robust studies conducted outside the United States, It was shown that among the Turkish general population, older age (OR = 1.04, CI = 1.03–1.06), lower family income (OR = 1.43, CI = 1.02–2.01), ≤6 years level of education (OR = 3.64, CI = 2.63–5.03), and living alone (OR = 1.87, CI = 1.08–3.24) were the significant independent predictors of a lower level of knowledge of stroke signs and symptoms. Additionally, older age (OR = 1.01, CI = 1.00–1.02), lower family income (OR = 1.83, CI = 1.33–2.50), and ≤6 years of education (OR = 1.35, CI = 1.01–1.81) were significant predictors of a poor to no knowledge of the warning signs of stroke. Among the Spanish general population, the determinants or significant predictors of adequate knowledge or knowledge of stroke based on a multivariate model were age ≥65 years (OR = 0.20, CI = 0.15-0.26), female sex (OR = 1.59, CI = 1.36-1.86), high school (OR = 2.53, CI = 2.11-3.04) or college education (OR = 4.81, CI = 3.80-6.09), poor self-rated health status (OR = 0.63, CI = 0.53-0.74), obesity (OR = 0.78, CI = 0.66-0.92) or, having diabetes mellitus (OR = 0.75, CI = 0.58-0.96). While the independent, significant predictors of the intent to call 911 were having a high school (OR = 1.44, CI = 1.25-1.66) or college education (OR

= 1.65, CI = 1.40-1.93) and poor self-rated health status high school (OR = 2.53, CI = 2.11-3.04) or, college education (OR = 0.76, CI = 0.67-0.87). Additionally, in an adjusted model, knowledge of stroke symptoms significantly predicted intent to call 911 (OR = 1.06, CI = 1.03-1.09).

General Epidemiology of Stroke

The World Health Organization (WHO) defines stroke as a "rapidly developing focal or global neurological disorder of vascular origin usually lasting more than 24 hours and leads to death, disability or, full recovery. This definition thus includes sub-arachnoid and intra-cerebral hemorrhage, but excludes transient ischemic attacks (TIA) and other intracranial bleed (Asplund et al., 1995; Ingall, Asplund, Mähönen, & Bonita, 2000; WHO MONICA Project Principal Investigators, 1988). The prevalence of stroke is much higher among developed countries compared to developing countries, but the case fatality rate is lower in developed countries and much higher in developing countries (Khaw, 1996; WHO MONICA Project Principal Investigators, 1988).

Prevalence of Stroke

The global prevalence of stroke is not well known because of discrepancy in adjudication, reporting, and health care utilization in different nations (WHO MONICA Project Principal Investigators, 1988). In the United States, about 6.8 million people 20 years or older have had a stroke, with an overall population prevalence of 2.8%. There is a slight gender predilection in the prevalence of stroke, with men having a 2.7% prevalence compared with 2.6% for women. This almost equal rate is because the incidence among women catches up with that of men, after women reach menopause. According to data from the Behavior and Risk Factor Surveillance System (BRFSS) there

is also a difference in the prevalence of stroke by race. For instance, while the prevalence among non-Hispanic Whites is 2.4%, it is 3.9% among non-Hispanic Blacks, 1.5% among individuals of Asia/Pacific Islanders, 2.5% among Hispanic (of any race; Blacks or Whites), 5.9% of American Indians/Alaskan Natives, and 4.1% of other races or multiracial individuals (Centers for Disease & Prevention, 2012; Centers for Disease Control and Prevention, 2007). In the United States, the overall prevalence of stroke over the last 10 years hasn't changed, but the prevalence rate is higher among individuals living in the southeastern United States, those with lower educational level, older adults, and Blacks (Centers for Disease & Prevention, 2012).

Under certain conditions, the individual has a stroke, but no overt clinical signs. These individuals are only diagnosed based on magnetic resonance imaging (MRI) and presents with disabilities, often as a result of having multiple such “silent strokes” also referred to as silent cerebral infarcts (SCI). The prevalence of silent cerebral infarct in the United States is between 6-28% and varies by age, ethnicity sex, and risk factor profile (Das et al., 2008; Prabhakaran et al., 2008; Vermeer, Longstreth, & Koudstaal, 2007). An estimated 13 million Americans have had at least one episode of silent infarct (Bryan et al., 1997; Howard et al., 1998). Transient ischemic attacks (TIA) which is not considered a stroke by the WHO definition, is much more prevalent in the population. In a recent study, the prevalence of TIA was found to be 17.8% in the sample studied. Just as seen in stroke and SCIs, the prevalence of TIA is higher among males, Blacks, people of lower socioeconomic and educational level, and those living in the Southeastern United States (Howard et al., 2006).

In the state of South Carolina, also known as the "buckle of the stroke belt", the prevalence of stroke of stroke is significantly higher than the national average. Similarly, the prevalence of risk factors for stroke is significantly higher than what is reported for the rest of the country (Centers for Disease & Prevention, 2012; Centers for Disease Control and Prevention, 2006). Recently, it was projected that by the year 2030, about 4 million more Americans would have had a stroke, a 21.9% increase in the prevalence of stroke (Heidenreich et al., 2011).

Incidence of Stroke

According to a 2002 report from the WHO, there are about 15 million stroke events per year, and in Europe, the annual incidence of stroke is about 650,000 events/year (Brundtland, 2002; Guilbert, 2003). The annual national incidence of stroke is approximately 795,000 cases per year, with about 610,000 being new cases, while 185,000 are recurrent or repeat strokes. The distribution of stroke by types is such that 87% are ischemic and 13% are hemorrhagic. The 13% that are hemorrhagic is composed of 10% intra-cerebral hemorrhage, and 3% are sub-arachnoid hemorrhage. On the whole, there is a stroke event every 40 seconds in the United States and about 55,000 more women than men have a stroke each year (Kleindorfer et al., 2010).

In the Framingham Heart Study (FHS), it was shown that women have a higher lifetime risk of stroke than men. This study indicates that the lifetime risk of stroke for individuals ages 55 to77 years was 1:5 (20 – 25%) for women and 1:6 (14 – 17%) in men (Seshadri et al., 2006). It should be noted that women generally have a lower age adjusted incidence of stroke than men, but this pattern is reversed as women age. For instance, while women between the ages of 45 – 84 were shown by the FHS to have a lower stroke

risk than men, but those older than 84 years have elevated stroke risk compared to men (Petrea et al., 2009; Reeves et al., 2008). Other studies from various populations reported an excess risk of stroke compared to women and this excess risk persisted and was not reversed by age (Hollander et al., 2003; Lewsey et al., 2009; Rothwell et al., 2005; Sealy-Jefferson et al., 2012; Vega et al., 2009).

There is also a significant racial variation in the incidence of stroke. In the REason for Geographic And Racial Disparity in Stroke (REGARDS) study, after 4.4 years of follow up for 27,744 participants, the overall age adjusted and sex adjusted Black to White incidence rate ratio was 1.51, but for the younger (45 – 54 years) age group, it was 4.02 and for those older than 85 years, it 0.86 (Howard et al., 2011). This indicates that the high disparity in incident stroke in Blacks versus Whites is being driven by the much higher incidence in the younger age group. Over the years, it has been demonstrated from data in the FHS that the incidence of stroke has steadily been on the decrease from 7.6/1000 person-years in the 1950s to 5.3/1000 person-years and among men and from 6.2/1000 person-years to 5.1/1000 person-years by 2004. Additionally, over the same period of time, the life time for incident stroke among individuals who are 65 years or older has decreased from 19.5% to 14.5% for men and from 18.0% to 16.1% in women (Carandang, Seshadri, Beiser, & et al., 2006). Taking race into consideration, as was observed with prevalence, even though the incidence of stroke has been on the decrease for Whites, it has remained steady among Blacks; mostly because although the incidence of ischemic stroke among blacks dropped, there was an increase in the incidence of hemorrhagic stroke among blacks (Kleindorfer et al., 2010). The same racial and gender trend is observed among Mexican Americans as seen in blacks

compared to Whites, with the following; the cumulative incidence for ischemic stroke at younger ages (45–59 years of age: RR, 2.04; 95% CI, 1.55–2.69; 60–74 years of age: RR, 1.58; 95% CI, 1.31–1.91) is significantly higher, but not at older ages (≥75 years of age: RR, 1.12; 95% CI, 0.94–1.32) where although it is higher, it was not statistically significant. Other studies have shown that the incidence of stroke is higher among American Indians than non-Hispanic Whites, with an age and sex-adjusted incidence rate of 6.79/1000 person-years (Morgenstern et al., 2004; White et al., 2005; Zhang et al., 2008).

Transient Ischemic Attacks (TIA)

The prevalence of TIA is often higher than that of frank stroke. The relevance of TIA to the epidemiology of stroke is because it is often a prelude to the development of stroke itself. This makes recognizing its occurrence via the symptomatology very important because some individuals with a TIA might not have had an emergency room (ER) visit during the event. Recognizing the symptoms of stroke make recognition of TIA easy and stroke prevention goals achievable (Go et al., 2013). Nationally approximately 5 million or 2.3% of individuals have had a physician diagnosis or self-reported a TIA event. This number is thought to be underestimated because a vast majority might not have reported the event (Johnston et al., 2003). The prevalence of physician diagnosed TIA increases with age and varies by sex and ethnicity same as in overt stroke. Thus men, Blacks, and Mexican Americans have a higher prevalence rate of TIA than their women or non-Hispanic White age-matched counterparts (Cancelli et al., 2011; Johnston et al., 2003; Kleindorfer et al., 2005; Morgenstern et al., 2004).

The relevance of TIA is seen in the fact that about 15% of all strokes are preceded by a TIA event. Thus TIA confers a significant short term risk of stroke and hospitalization for cerebrovascular disease (CVD) or CVD related death. For instance, in a study, approximately 11% of patients hospitalized for TIA experienced a stroke within 90 days of their TIA event. Further analysis show that the 11% was made up of about 5% who had a stroke within the first 2 days of their TIA event. Thus a TIA that lasted more than 10 minutes is among other things a predictor of a future stroke event (Hankey, 1996; S. Johnston, Gress, Browner, & Sidney, 2000). In summary, a past history of TIA is associated with 19% 10-year risk of stroke and a 43% combined 10-year risk of stroke, myocardial infarction (MI), or vascular death; at a rate of 4% combined risk per year. Meta-Analysis of patients with a prior history of TIA indicate that the 2 days risk of stroke is between 3-10%, while the 90 days risk is between 9-17% (Clark, Murphy & Rothwell, 2003; Giles & Rothwell, 2007; Wu et al., 2007).

Risk Factors for Stroke

Like the disease itself, the risk factor for stroke is not homogenously distributed throughout the population. Age, sex, and racial disparity also exist in the distribution of risk for stroke. The risk factors for stroke are broadly divided into modifiable and non-modifiable risk factors (Longo et al., 2012). The non-modifiable risk factors are;

a. Age
b. sex/gender
c. race and
d. certain genetic inheritance like mutation in the methylenetetrahydrofolate reductase (MHTFR) gene

e. family history of cardiovascular diseases

f. Past history of cardiovascular diseases

g. Past history of chronic kidney disease

The modifiable risk factors relate mostly to lifestyles and lifestyle related disease conditions, and they are;

h. Hypertension/High Blood Pressure

i. Diabetes mellitus

j. Atrial fibrillation

k. Abnormally high serum cholesterol

l. Cigarette smoking

m. Physical activity

n. Sedentary lifestyle

o. History of sleep apnea

Female specific risk factors have been identified, although many of them still remain inconclusive. Examples of such risk factors are;

p. Early menopause

q. Use of hormone replacement therapy

r. Pregnancy/post-pregnancy

s. Complicated pregnancy course (Fauci, 2008; Kumar et al., 2005)

What follows is a fairly detailed discussion of some of some of the most common and modifiable risk factors for stroke.

Hypertension. High blood pressure (HBP) is a significant risk factor for both ischemic and hemorrhagic stroke. For instance, about 77% of those who have a first

stroke, have a blood pressure of >140/90 mmHg. In addition, among diabetics, it was shown that lowering or keeping their blood pressure at less than 120/80 mmHg reduces their lifetime risk for stroke by half compared to those who are hypertensive (Cushman et al., 2010). Furthermore, a meta-analysis showed that individuals with elevated blood pressure shy of, but close to the defined values for hypertension (pre-hypertension), also have an increased risk for stroke. The risk is much higher among the elderly with prehypertension and those with prehypertension values closer to the defined values for hypertension (Lee et al., 2011). As observed in stroke and other risk factors highlighted prior, Blacks with or without diabetes have a higher prevalence of prehypertension. In a recent study, it was shown that although Blacks were more aware of their hypertension and more likely to be treated for it, they were less likely to achieve blood pressure control, putting them at much higher risk for stroke compared to non-Hispanic Whites (Glasser et al., 2011; Howard et al., 2006).

Diabetes mellitus. It is a significant risk factor for stroke partly because, it increases the risk for developing atherosclerotic occlusive disease. Diabetes mellitus increases the age specific incidence and incidence rates for stroke in all age groups. But there is also a racial disparity in the distribution of diabetes related stroke risk. The stroke risk for individuals with diabetes peaks at age 55 years for Blacks and 65 years for non-Hispanic Whites. Often, ischemic stroke patients with diabetes are younger than their non-diabetic counterpart, they are more likely to be Black and in addition have a history of other co-morbid conditions like hypertension, coronary heart disease and high cholesterol. Among patients with a history of TIA or a “non-serious stroke”, having an impaired fasting glucose or impaired glucose tolerance nearly doubles their risk for a

subsequent stroke, while with diabetes, their risk for a subsequent stroke triples (Kissela et al., 2005; Vermeer et al., 2006).

Lifestyle-related risk factors. The presence of a number of lifestyle related risk factors are associated with an increased risk for stroke. For instance individuals who describe themselves as current smokers in a recent study, where reported to have a 2 – 4 times increased risk for stroke compared to non-smokers or those who have quit smoking for more than 10 years (Goldstein et al., 2011; Shah & Cole, 2010). Cigarette smoking is a strong risk factor for ischemic stroke and subarachnoid hemorrhage sub-type of hemorrhagic stroke. The evidence for intracerebral hemorrhage is inconclusive. Discontinuation of cigarette smoking reduced the risk for stroke irrespective of age, sex, or racial groups. Indirect smoking (second hand smoking) has also been reported to be associated with an increased risk for developing stroke (Bhat et al., 2008; Lee & Forey, 2006; Oono, Mackay, & Pell, 2011).

Another important lifestyle related risk factor for stroke is sedentary lifestyle or physical inactivity. In a recent prospective study, compared with no physical activity, moderate to vigorous physical activity was associated with 35% reduction in risk of ischemic stroke. Furthermore, it was reported that while there was benefit from moderate to vigorous physical activity, light physical activity such as walking had no benefit in reducing ischemic stroke risk (Willey, Moon, et al., 2009; Willey, Xu, Boden-Albala, & et al., 2009). Individuals who engaged in physical activity while they were young adults, but discontinued in older age, did not experience any benefit from the prior history of physical activity. In addition, engaging in physical activity in the week(s) preceding the stroke was associated with significant reduction in risk, because it was shown that

physical activity tends to decreased significantly in the week preceding the stroke event (Grau et al., 2009; Krarup et al., 2007).

Other risk factors for stroke. Other risk factors associated with stroke have been described in selected populations. One such risk factor is atrial fibrillation (Afib), which is a strong risk factor for stroke. Independently, Afib increases the risk for stroke by 5 fold through-out all ages. The likelihood of having Afib increases with age and so does the risk of stroke in individuals with Afib. For instance, the percentage of strokes attributable to Afib is 1.5% at ages 50-59 years, and 23.5% by ages 80-89 years of age (Wang, Massaro, Levy, & et al., 2003; Wolf, Abbott, & Kannel, 1991). Afib is often clinically undetectable and asymptomatic, making it likely that the actual incidence of Afib related stroke is understated (Page, Wilkinson, Clair, McCarthy, & Pritchett, 1994; Strickberger et al., 2005; Tayal et al., 2008).

High cholesterol or dyslipidemia is another risk factor for stroke. Low concentration of high density lipoprotein cholesterol (HDL-c) was associated with a future risk of stroke, especially thromboembolic stroke (Curb et al., 2004). But this evidence is still inconclusive as some studies have failed to replicate this finding (Curb et al., 2004; Huxley et al., 2011). Similarly, associations between a family history of stroke and a future development of stroke have been reported. Also genetics factors have been implicated in the development of stroke. For instance, in the Framingham Heart Study, a history of stroke by age 65 years was associated with a 3 fold increase in the risk of stroke in offspring despite adjusting for known stroke risk factors. There seem to be an additive effect between presence of genetic risk factors and presence of classical stroke

risk factor (measured on the Framingham Risk Scale [FRS]). Individuals in the highest quintiles of the FRS with a family history of stroke in a parent by age 65 years had a 25% ischemic stroke rate compared to 7.5% for those without such a family history (Seshadri et al., 2010).

Finally some other risk factors for stroke includes but are not limited to; 1. Chronic kidney disease, which is associated with 1.77 adjusted hazard ratio for stroke. Further, patients with an eGFR of, 60ml/min/1.73m^2 body surface area are 43% more likely to have a stroke (Meng Lee et al., 2010; Manolio et al., 1996). Similarly, studies show that sleep apnea is an independent risk factor for stroke and is associated with a two-fold increased risk for stroke (Redline et al., 2010; Yaggi et al., 2005). Finally, some stroke risk factors are specific to women; for instance use of hormone replacement therapy, menopause and pregnancy associated thromboembolic diseases (Lloyd-Jones et al., 2009).

Stroke Mortality

Stroke is the fourth leading cause of death in developing countries and account for 10% of all deaths in industrialized countries. The average case fatality rate is about 30%, with a range of 15 – 50% and the Nordic countries having among the lowest case fatality rates (Feigin, Lawes, Bennett, Barker-Collo, & Parag, 2009; Khaw, 1996). There is a strong correlation between the mortality rate from stroke and prevalence and/or burden of risk factors according to the WHO MONICA project (Birgitta Stegmayr et al., 1997). While stroke is the 4th leading cause of death in the United, globally, it is the second leading cause of death. As mentioned before, while developing countries have a lower prevalence of risk factor (obesity, diabetes, hypertension and high cholesterol) burden

than developed countries, they have among the highest case fatality rate; probably due to poor acute stroke care (Feigin et al., 2009). Surprisingly, there is no clear gender relationship in stroke mortality unlike what has been observed in other vascular diseases like myocardial infarction (Lloyd-Jones et al., 2009).

In the United States, a stroke related death occurs every 4 minutes and account for 1 in every 19 deaths (Go et al., 2013; Heidenreich et al., 2011; Murphy, Xu, & Kochanek, 2013). From 1985 to 2005, the United States has experienced a decrease in incident stroke by 36.9% and mortality from stroke by an average of 22.9% (Centers for Disease & Prevention, 1999; Lackland et al., 2014). The decline in stroke death rates was much larger in men than women and similarly there was a larger decline among men who were 65 years or older compared to age-matched women (Lackland et al., 2014; Pilote et al., 2007). On the other hand, the trends in stroke mortality differ significantly by geographic regions. For instance, from 1999 to 2007, among individuals who are 45 years and older; the mortality rate for stroke among Black and White women and White men, declined by 2% annually in every census divisions, but among Black men, there was much less decline among those residing the East and West South Central divisions (Gillum, Kwagyan, & Obisesan, 2011). Over half of all stroke mortality occurs outside a hospital setting and more women than men die from stroke because they are often older. In fact, in 2009, women made up 60% of all cases of stroke deaths in the United States (Centers for Disease Control and Preventio/National Center for Health Statistics, 2012).

Similar to the incidence and prevalence of stroke and stroke risk factors, there is also an association between mortality rate from stroke and race/ethnicity. The age-standardized mortality rates for ischemic stroke, intra-cerebral and subarachnoid

hemorrhage were higher among Blacks than Whites in general. Similarly, the death rate from intra-cerebral hemorrhage is higher among Asians/Pacific Islanders than among Whites. Furthermore, the death rate from subarachnoid hemorrhage is higher among all minority populations in general, than among Whites. This racial difference in stroke mortality persists even among those between the ages of 25 – 45 years, with the age-adjusted mortality ratio in this group being higher among Blacks and American Indians/Alaskan Natives than Whites. Conversely, Hispanics have a lower mortality rate from ischemic stroke and subarachnoid hemorrhage than Whites (Ayala et al., 2001).

Finally, mortality from stroke is associated with age. For instance, the average age at death is 79.6 years, however males, Blacks, Hispanics, and other minorities have a younger age at mortality from stroke compared to either females or Whites (Centers for Disease & Prevention, 2005). In a recent CDC report, it was shown that mortality from stroke among Medicare beneficiaries increase with increasing age; with the rate being 9% among 65-74 year olds, 13.1% among 74-84 year olds, and 23% among those 85 years or older (Casper et al., 2008). Examination of geographical variation in stroke mortality shows that the Southeastern states have the highest rates. This area is known as the "stroke belt" and includes 8 states; North Carolina, South Carolina, Georgia, Tennessee, Mississippi, Alabama, Louisiana, and Arkansas. This geographic difference in mortality rate from stroke existed about 7 decades ago and has persisted until now (Figures 2a, b and, c). A region that includes parts of North Carolina, the whole of South Carolina and parts of Georgia is referred to as the "buckle of the stroke belt" because this region has an even higher mortality rate from stroke, than the rest of the stroke belt. For instance, while the overall mortality from stroke is approximately 20% higher in the stroke belt than the

rest of the country, it is 40% higher in the buckle of the stroke belt (Casper et al., 2008; Casper, Wing, Anda, Knowles, & Pollard, 1995; Howard et al., 1997; Howard et al., 1995; Lanska, 1993; Perry & Roccella, 1998).

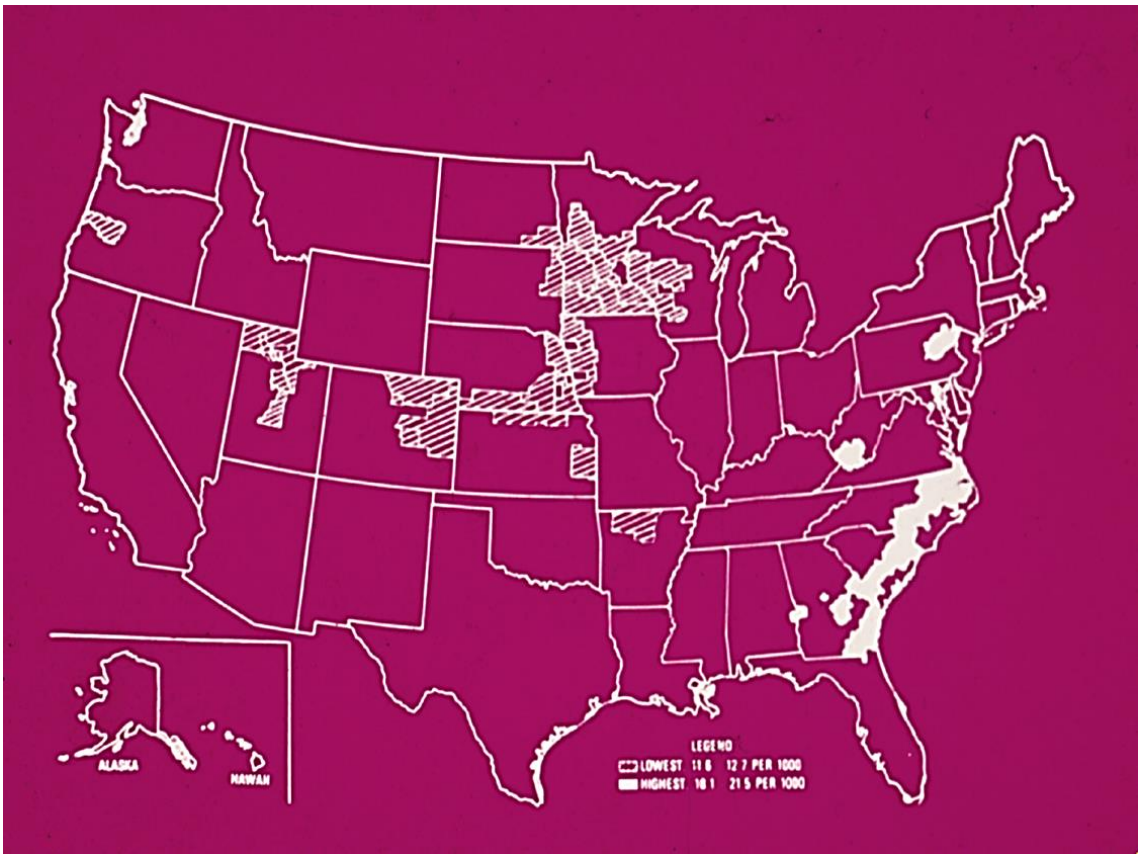

Figure 3. Mortality from stroke in the United States in the 1950s. The map indicates a much higher mortality rate in parts of the area now known as the "stroke belt." From "Heart Disease and Stroke Statistics—2013 Update: A Report From the American Heart Association," by A. S. Go et al., 2013, *Circulation, 127*(1), e6-e245. doi: 10.1161/CIR.0b013e31828124ad

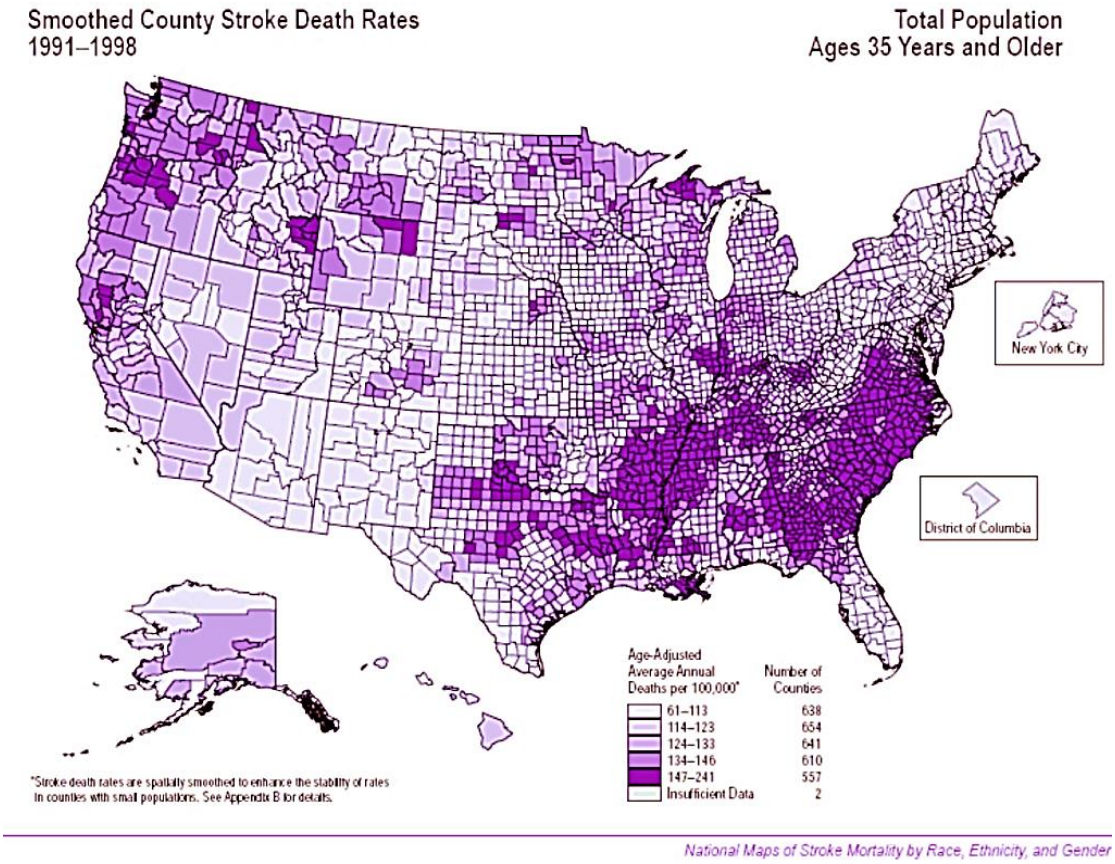

Figure 4. County-level resolution of stroke mortality in the United States. The map indicates that while the numbers of stroke deaths increased in every part of the country from the figures in the 1950s (possibly from better diagnosis), it still remained much higher in the stroke belt. From "Heart Disease and Stroke Statistics—2013 Update: A Report From the American Heart Association," by A. S. Go et al., 2013, *Circulation, 127*(1), e6-e245. doi: 10.1161/CIR.0b013e31828124ad

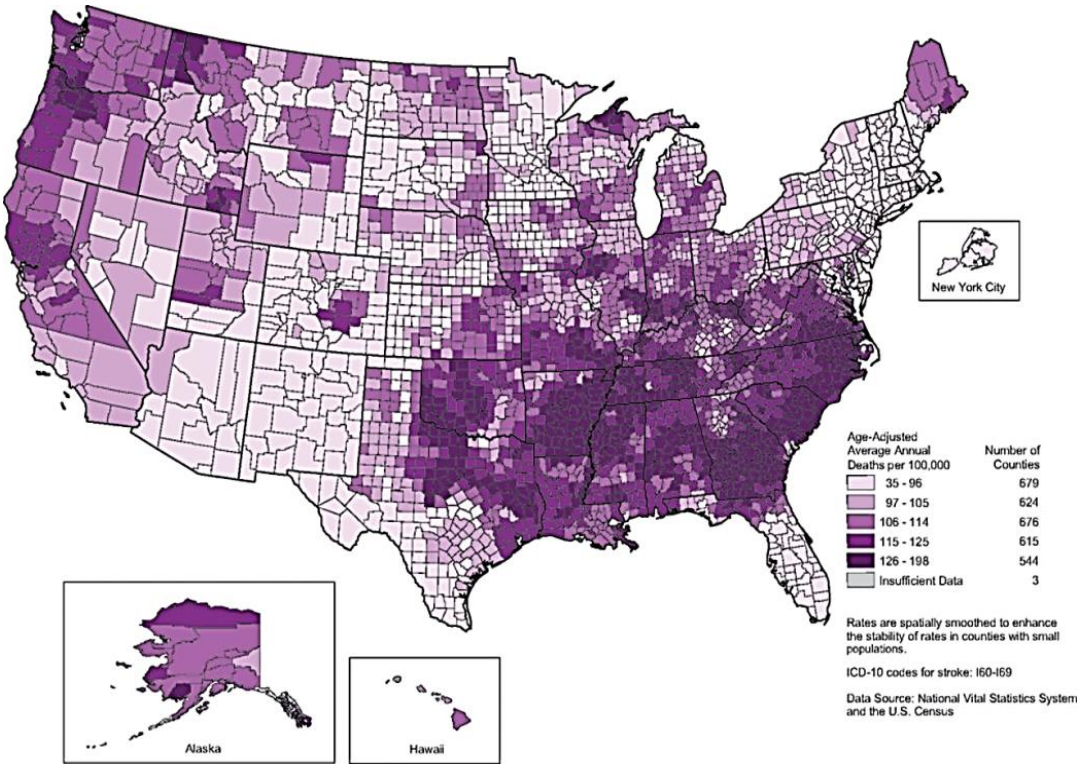

Figure 5. Stroke death rates, 2000 through 2006 for adults who were 35 years of age or older, by county. Rates are spatially smoothed to enhance the stability of rates in counties with small populations. The map still indicates a significant disparity in numbers of stroke deaths between the stroke belt and the rest of the country. *International Classification of Diseases, 10th Revision* codes for stroke: I60–I69. From "Heart Disease and Stroke Statistics—2013 Update: A Report from the American Heart Association," by A. S. Go et al., 2013, *Circulation, 127*(1), e6-e245. doi: 10.1161/CIR.0b013e31828124ad

Critique of Literature

In the last ten years which spans the time this study will be focusing on, there has been a number of studies of the level of knowledge and appropriate action in the event of a stroke. Some of these studies have also identified socio-demographic and economic factors that are associated with these variables (Centers for Disease & Prevention, 2004; Ellis et al., 2009; Evci et al., 2007; Ferris et al., 2005; Kleindorfer et al., 2009; Lundelin et al., 2012). In the study by Ellis et al (2009), they examined "Stroke knowledge among

low literacy Latinos living in the South Carolina Low Country." They reported that only about 17% of respondents knew all 4 warning signs of stroke, with only about 23% of those who knew all 4 warning signs, indicating that they would call 911 if they witnessed a stroke event. The study also showed that educational literacy level measured as English literacy was predictive of both knowledge and intent to call 911. The limitations of this study are highlighted by the small sample size (60), which limits the external validity of the findings and conclusions. Secondly, this study defined literacy based on English literacy skills. This narrow definition of literacy, increases the threat to external validity in this study because; First, the result of the analysis indicating that those with higher English literacy were more aware, might have been because those with lower English literacy level did not comprehend the questions as much as the others. This assertion is based on the fact that the authors did not state that questions were translated in the event of poor English comprehension by a participant. This study utilized a cross sectional survey methodology, which is the most widely used methodology for this type of study and have proved to be a very appropriate methodology (Frankfort-Nachmias & Nachmias, 2008d).

In a similar article, Evci et al (2007), performed a population level study to investigate both knowledge and intent to call emergency medical services in the event of a stroke. In carrying out this study, they conducted home interviews and used interviewer administered questionnaires to survey residents in a region of Turkey. This study surveyed a sample of 920 adults and reported that 80% of respondents were able to name at least one stroke symptom. Further, knowledge of stroke symptoms was predicted by age, income, social support, and educational level. The methodology and sampling

strategy for this study was very appropriate. By utilizing a weighted random cluster sampling strategy, the investigators ensured that a sample of 920 individuals was representative of the population of 217,588 potential respondents. This strategy is similar to the strategy used for my study and is also most widely used approach (Centers for Disease & Prevention, 2004; Hickey, Holly, McGee, Conroy, & Shelley, 2012). This approach to survey study design and sampling ensures a very robust sample and analysis that is robust to bias. It also ensures that the internal and external validity of the final result and conclusions of the study is minimally threatened.

Knowledge Gap

As stated in prior sections, stroke is a devastating health condition and a significant cause of health disparity. Knowledge of stroke plays a significant role in both prevention and reduction in morbidity and mortality, because it affects both intent to call for emergency medical services and time to arrival at the emergency room for administration of "clot busting" drugs and other supportive measures. While there has been a number of studies from several parts of the country and the globe on the factors that predict knowledge of stroke signs, symptoms and risk factors along with intent to call 911, there is yet to be a comprehensive state wide study of the predictors of knowledge and appropriate action (intent to call or calling 911) in the event of a stroke in the state of South Carolina. This study will be filling this gap by providing this information and also show the trend in this health behavior over a 10 year (2003-2012) period. The uniqueness and importance of filling this knowledge gap is especially important because South Carolina is at the epicenter of the stroke belt. As mentioned before, the stroke belt is a region in the country with the highest incidence and mortality

from stroke. Secondly, this study will provide information that could if acted upon aid in the design of health educational intervention(s) that would improve the overall stroke picture in the state.

Summary of Literature and Conclusions

Cardiovascular and other chronic diseases like diabetes and hypertension are now the top causes of death, morbidity and mortality (Birgitta Stegmayr et al., 1997; Khaw, 1996). Current literature shows a strong relationship between knowledge of signs, symptoms and risk factors for stroke and intent to call 911 in the event of a stroke (Centers for Disease & Prevention, 2004; Ellis & Egede, 2008a). The importance of such knowledge is imperative because of the role that early usage/calling of 911 plays in the initial acute phase of stroke treatment and prevention of stroke related mortality and disability (Go et al., 2013; Lisabeth, Brown, & Morgenstern, 2006). Further evidence shows that level of knowledge about stroke seems to be lower among high risk populations like those living in the stroke belt and racial minority groups (Centers for Disease & Prevention, 2004; Travis et al., 2003; Willey, Williams, et al., 2009).

Studies have examined the level of knowledge of stroke signs, symptoms and risk factors and intent to call 911 in various populations. There has been a small study among a limited number of Hispanics in the stroke belt (Ellis & Egede, 2008a), but there is currently no statewide study of the determinants of level of knowledge of stroke risk factors, signs and symptoms, and intent to call 911. Studies show that several factors including race/ethnicity, educational level, income, age, and sex are associated with the

level of knowledge of stroke risk factors, signs and symptoms, and intent to call 911 in the event of a stroke.

The concept of the social ecological model, originally a human development theory, indicates that an individual's level of knowledge of stroke risk factors, signs and symptoms, and intent to call 911 in the event of a stroke is determined by multiple factors. These could be classified as interpersonal like learning from relative or health care providers, organizational like educational classes, community level factors like community participation in health fairs and family, and policy level like increasing funding for educational programs and policy to support healthy dietary and lifestyle choices (Bronfenbrenner, 1997; Centers for Disease Control and Prevention, 2013a, 2013c; Moore, 2003).

In conclusion, stroke is a devastating health condition responsible for substantial health care cost and health disparity. Knowledge of stroke signs and symptoms, risk factors, and intent to call 911 in the event of a stroke are factors that are determined by socio-demographic factors. This project seeks to identify the differential effect of these factors on knowledge of stroke and intent to call 911 in the event of a stroke, with a view to using the information in developing targeted health education campaigns. This literature review provides ample evidence of the impact of stroke to the society and the role that education and accessibility to emergency medical services plays in reducing stroke related death and disability. Further, it will also determine the trend in the level of knowledge and intent to call 911 over the period from 2003 to 2012 (10 years in total) in the state of South Carolina. The next section of this work is chapter three where the methodology, data source, participants, data collection approach, and approach to data

analysis was discussed. This is followed by Chapter four where the results of the data analysis were presented. Finally followed by Chapter five, where the results are interpreted, the findings are discussed, recommendations are presented, and the possible implications for social change implication stated in addition to a discussion of the limitations of the study.

Chapter 3: Research Method

Introduction

Knowledge of stroke and intent to call 911 in the event of a stroke is a very important part of the AHA's strategy for reducing the associated death and disability from stroke. One of the determinants of a successful health education campaign is the formative research carried out before it is executed (Schiavo, 2007). *Formative research*, in summary, refers to pre intervention research that is carried out to understand and identify the area(s) of need that the health education or intervention is to target. It is also referred to as a *needs assessment* (Schiavo, 2007; Siegel, 2007). The purpose of this study was to determine the predictors of knowledge of stroke and intent to call 911 in the event of a stroke with a view to designing health education campaigns that will target factors that negatively impact knowledge and intent to call 911. This study could thus be considered formative research or a health education needs assessment. Additionally, this project was designed to determine longitudinal changes in both the level of knowledge and intent to call 911 among the population of the state of South Carolina.

Purpose of the Study

The purpose of this repeated cross-sectional study was to determine the factors that predict knowledge of stroke signs and symptoms and intent to call 911 among residents of South Carolina. In addition, this study used longitudinal modeling to determine the trend in knowledge of stroke risk factors, signs and symptoms, and intent to call 911 in the event of a stroke. And was expected to provide actionable information that could provide a backdrop for designing a targeted stroke education campaign that would mitigate the negative predictors. The longitudinal analysis could provide evidence

for or against the success of multiple stroke education campaigns that have been implemented in the state, in addition to enabling the identification of the level of social ecological framework on which future stroke educational campaigns should be focused.

Research Design and Approach

This study used a repeated cross-sectional survey design to access the potential predictors and 10-year trend in the potential predictor of the knowledge of stroke risk factors, signs and symptoms, and intent to call 911. While the cross-sectional approach helps to provide a "snapshot" of the potential determinants of knowledge and appropriate action in the event of a stroke (Frankfort-Nachmias & Nachmias, 2008b, 2008d), the multiyear repeated component provided the ability to determine whether the same factors remained significant determinants from year to year and how the dependent variables had changed over the years. This approach also enables health educators to focus on the factors that have not changed positively over the years, while de-emphasizing or at least keeping steady those that have significantly improved. In this design, there was single time point collection of the same data, over several years (ten years and a total of eight surveys).

As mentioned in the introduction and literature review sections, several factors have been proposed in much smaller studies and in different populations, to be associated with knowledge and intent to call 911 in the event of a stroke. The dependent variables are the following:

- Knowledge of stroke risk factors,
- Knowledge of stroke signs and symptoms, and
- Intent to call 911.

A combination of individual (age, education, sex, race, and socioeconomic status) and non-individual (example income) level factors were the independent variables and were tested for any significant association in terms of predicting knowledge and intent to call 911 in the event of a stroke. The cross-sectional survey design is the most popular and commonly used design for this type of study. As there is no intervention needed, an experimental or quasi-experimental design is unnecessary (Campbell & Stanley, 1963).

Population

In 1999, the Centers for Disease Control and Prevention (CDC) launched the Racial and Ethnic Approaches to Community Health (REACH 2010) demonstration program. This was later renamed *Racial and Ethnic Approaches to Community Health across the U.S.* or *REACH U.S. Program* with the determination to collect data beyond the year 2010. REACH in general was a multiyear, community-based program targeting the following health priority areas: cardiovascular disease, diabetes, breast and cervical cancer, asthma, adult/older adult immunizations, infant mortality, and hepatitis B. REACH focused on the following racial/ethnic minority populations: African Americans, American Indians/Alaska Natives, Hispanics/Latinos, Asian Americans, and Native Hawaiian/Pacific Islanders.

The CDC contracted with National Opinion Research Center (NORC) at the University of Chicago to conduct the REACH Risk Factor Survey in 21 communities, which was later expanded to 28 communities.

The goal of this population-based survey was to identify eligible households and interview approximately 900 adult residents in each community. The Medical University of South Carolina (MUSC) was one of the sites for the REACH population

survey and was thus the source of these data. The study population from MUSC and for this project was selected from residents of the state of South Carolina and composed of African American adults residing in Charleston and Georgetown Counties (Figure 6). The survey was conducted exclusively among English-speaking residents residing in both Counties. There was no indicated reason for limiting this survey exclusively to African Americans; it is possible that the disproportionately high incidence and prevalence of the diseases of focus among African Americans might in part be responsible.

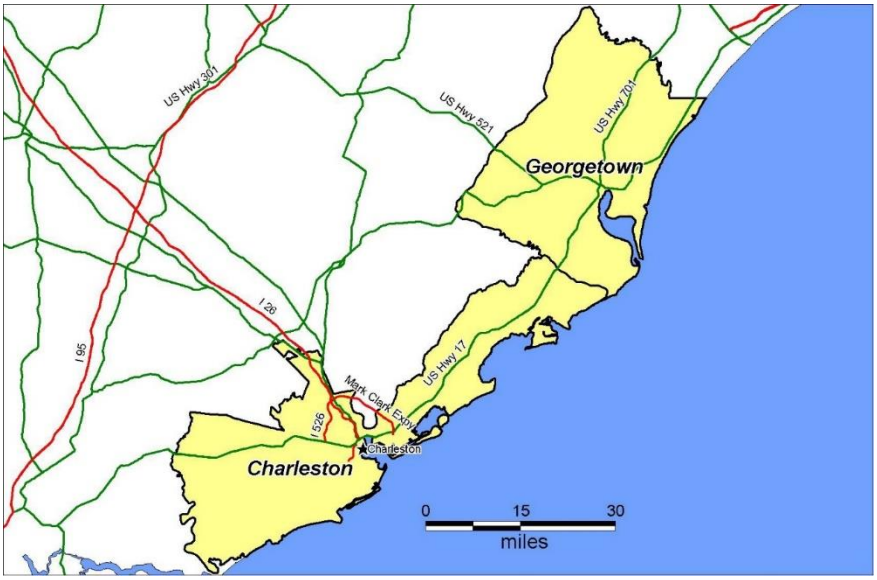

Figure 6. A portion of the map of the state of South Carolina showing Charleston and Georgetown counties. Respondents for the REACH survey were selected from this region. Both counties have a slightly higher proportion of African Americans than the rest of the state, while South Carolina as a whole has slightly more African Americans than many parts of the country (United States Census Bureau, 2012). Additionally, the proportions of African Americans in Charleston and Georgetown counties are 29.4% and 33.3%, respectively. Thus, the total sampling frame combining both counties was 129,730, about 10% of the total African American population in the state. With the sample weighted, the sample selected from this frame was representative of the entire African American population of the state of South Carolina.

Sampling and Sampling Procedures

Since REACH was commissioned to start in 1999, the original sample selection strategy was based on random-digit dialing and mailed questionnaires. But as more and more individuals, especially African Americans, started adopting the use of cell phones as the only available phone in the home, by 2007, the sample selection strategy shifted to what is referred to as *address-based sampling*. This was to ensure that the up to 40% of American homes that might not be reachable by traditional random-digit dialing as used in most surveys targeting landlines could be reached by this survey. Further, as mentioned earlier, minority populations have embraced cell phones at a higher rate than the majority, increasing the risk for coverage bias in REACH communities. The actual sampling strategy was based on a stratified random cluster sampling technique. The address-based sampling strategy is described briefly below.

Address-Based Sampling Design

In order to reduce the potential coverage bias of traditional random-digit dialing, an address-based sampling method was used in the REACH U.S. Risk Factor Survey (which was started in 2007). The basis of the address-based sampling frame is the U.S. Postal Service (USPS) delivery sequence file (DSF) as provided by the vendor, Valassis. The DSF contains nearly all addresses in the United States that receive mails. Using geographic information systems (GIS) technology, an address frame that matched the targeted geographies of the REACH program was constructed. This enabled the creation of a sampling frame that included even individuals without home/landline phones.

After selecting a sample of addresses, the addresses were matched to telephone numbers through a vendor, Marketing Systems Group. Advance letters describing the survey were sent to sampled households with known telephone numbers. The survey was conducted by telephone for those addresses with known telephone numbers. For those addresses without matched telephone numbers, the survey was conducted by mailing self-administered questionnaires. The self-administered questionnaire packets were also mailed to those addresses that were unsuccessfully contacted by telephone. To increase the efficiency of the survey, under the address-based sampling design, the addresses that were more likely to be households of the survey target race/ethnicity were oversampled—note that this was not applicable in South Carolina and thus in this study, because all participants were African Americans. These addresses were identified by aggregating data from different sources, such as residential directory listings, administrative data, and consumer transactions. After households were selected, they were then screened to ascertain eligibility and obtain consent to participate.

Household Screening

The household screening was conducted with any household member 18 years or older to ascertain the age and racial/ethnic eligibility of each household member. The screening interview took approximately 2 minutes to administer. Up to two adults were selected for the next step household member interview. For the survey by mailing, all household members who completed the mail survey and met the racial/ethnic eligibility requirements were included in the member interview.

Household Member Interview

If the household screening interview resulted in the selection of one or more household members for the survey, the interviewer attempts to immediately interview the selected household members. If a respondent was not available to complete the interview, the interviewer attempts to set up an appointment for another time. The REACH U.S. household member interview was modeled closely after the CDC's Behavioral Risk Factor Surveillance System (BRFSS) interview. A copy of the questionnaire (mail version) is available in Appendix B, and it takes approximately 17 minutes to complete.

Sample Size Estimates

Estimation of sample size for this study was based on a similar study among Hispanics residing in Charleston. In this study, Ellis et al., (2009) indicated that 89% of respondents recognized at least one sign/symptom of stroke. Using this figure, my estimated sample size based on this formula,

$$N = \frac{Z^2 \times P\,(1-P)}{E^2} = 150$$

Where N = sample size; Z is 95% confidence interval, which is 1.96; P is the prevalence, or in this case, the level of knowledge about stroke (89%); and E is the allowable error or alpha, which is 0.05 or 5% (Bruce, Pope, & Stanistreet, 2008). This sample size estimate was an essential part of the process to ensure that the secondary data being analyzed were powered enough to answer the research questions.

Despite this estimated sample size, it should be noted that the average number of interviewees per year from the REACH U.S. survey was approximately 800 per

sample year which is over 8000 in total.. This indicates that the data sample from the REACH U.S. survey was large enough for this project and well powered to test the research hypotheses and answer the research question.

Sampling Weights

As mentioned earlier, sampling was done by stratified random cluster sampling technique based on census tracts and using a method similar to that employed by the CDC's BRFSS (Centers for Disease Control and Prevention, 2013b). Each sampled address received a base weight that reflected the probability of selection. The base weight was further weighted by the number of eligible members and the number of selected members at the sampled address. The sample member weights were further adjusted by age-gender population sizes of the community so that the member sample represented the community in terms of age-gender composition. Finally, extremely large member weights, if any, were trimmed, and the sample member weights were scaled down so that they sum to the sample size.

The REACH 2010 and REACH U.S. data are publicly available data requiring no formal application and/or approval for access and/or use of the data. The South Carolina component was conducted by Medical University of South Carolina (MUSC) and in accordance with the CDC data use policy, these data were released to be used for this study without any condition. The South Carolina component of REACH was supervised and conducted by Dr. Caroline Jenkins of the School of Nursing at MUSC. Dr. Jenkins is a colleague and mentor and based on this relationship granted me access to a copy of these data to be analyzed for the purpose of my dissertation and then subsequently published.

Instrumentation and Operationalization of Constructs

The questionnaires for the both REACH 2010 and REACH U.S. surveys were designed, validated, and subjected to continuous revalidation by the CDC (Larson, Schlundt, Patel, Beard, & Hargreaves, 2008). These surveys were designed with the same format and setup and similar questions as the BRFSS (Centers for Disease Control and Prevention, 2013b). For this study, only the questions in the areas focusing on socio-demographic variables, income, education, knowledge of stroke risk factors, signs and symptoms, and intent to call 911 were used. As analysis of archival data was done for my study (i.e., this study did not collect any original or primary data), there was no need for permission to use the questionnaire. The BRFSS, which shares significant similarity with the REACH questionnaire, has been tested for validity and reliability and has been shown to be very to moderately reliable (Nelson, Holtzman, Bolen, Stanwyck, & Mack, 2001; Yore et al., 2007). Furthermore, the effect of nonresponse bias on this instrument has been shown to be minimal and only becomes noticeable when the response rate falls below 32% (Schneider, Clark, Rakowski, & Lapane, 2012). Such a low response rate was not observed in any of the surveys that were part of this study (2001 – 2012). The REACH survey questionnaire has also been validated among African Americans by the CDC and shown to be a valid instrument for accessing self-reported health status among African Americans (Larson et al., 2008).

Operationalization

This study analyzed archived data and, as such, the operationalization of the variables was done during the questionnaire design and validation. For the purpose of this study, certain variables were redefined as follows:

1. Knowledge of stroke signs and symptoms was defined as the ability to recognize stroke signs/symptoms. The level of knowledge was determined by the number of correct signs/symptoms recognized. A point was subtracted for every incorrect response. Correctly recognizing 2 or more of the signs and symptoms was considered a moderate to high or adequate level of knowledge.
2. Intent to call 911 was defined as a response from a respondent in which he or she stated that the first action he or she would take in the event of a stroke or recognized symptoms of a stroke event, was to call 911. The other options were calling a relative, sleeping it off, or driving to the hospital by oneself. Calling 911 first was the expected response, and all others were grouped together as incorrect or inappropriate action.
3. Income level was determined based on the reported annual household income as stipulated by the U.S. Census Bureau.
4. Educational level was defined based on the level of academic achievement by grade level of education.
5. Age and race were defined based on the respondent's self-reporting of these variables. For the purpose of this survey, participants were 18 years or older.

Data Analysis Plan

Analysis of any data, whether primarily generated by the investigator or part of an archived dataset, as was the case with my study, requires that the investigating team or the lead investigator develops and write out a detailed data analysis plan. The analysis plan, apart from guiding the analysis process, also ensures that in the event that the investigator is not available for directing the analysis, such a plan will provide the

directives needed to carry out a robust and accurate data analysis. As stated previously, the data source for my project was the REACH 2010 and REACH U.S. survey.

Data Cleaning and Recoding

As stated prior, the data is weighted and as such analysis was done using a complex analysis module which will take the weighting into account. The first step in the analysis was to write the complex analysis module plan using the complex analysis module of SPSS version 20. This was done by using the primary sampling unit (PSU), stratum, and weighting variables to write the algorithm that was needed for the analysis of a complex sample. In the next step of the analysis plan, a strategy for addressing missing values was devised. One of the methods suggested, which involved recoding and labelling as missing was adopted to ensure that the analysis does not include these missing values. Recoding of missing values was necessary as the data for the REACH US/REACH 2010 database was not clean. Additionally, responses like "I don't know" were also designated as missing to ensure a more robust analysis and results which excludes such responses from the various analysis and statistical models.

The dependent variables were knowledge of signs and symptoms of stroke and intent to call 911. The response to knowledge of stroke signs and symptoms were each collected as a variable. To obtain overall stroke knowledge, these variables was given a score of 1 for a yes response and 0 for a no response. This number was added to generate an overall stroke knowledge score, with the highest number corresponding to a high level of knowledge and vice versa. Some variables like body mass index (BMI) were reported without decimal point. To obtain the actual BMI value, the reported value was multiplied by 0.1. Other variables were similarly manipulated to make them ready for analysis; for

instance, age, was regrouped to give 3 major groups; young (18-49) middle age (50-69), and elderly (70 and over). Further, educational level was recoded into less than high school (1), high school (2), some college (3) and college or higher (4). Similarly, employment status was recoded into employed (1), unemployed (2), student (3) and retired (4). Income was recoded into < $25,000 (1), $25,000 to <$50,000 (2), $50,000 to <$75,000 (3) and ≥$75,000 (4).

Data Analysis

Part of the data analysis was writing the analysis algorithm mentioned in the previous section. This algorithm was used every time an analysis was to be done as it ensures that the sample weights were taken into account in the analysis. The next step in the data analysis was to describe the respondents using descriptive statistics expressed in frequencies and proportions to show the distribution of respondents. Frequencies and proportions were used, because continuous variables like age and BMI were grouped into categories, from which frequencies and proportions (percentages) could be easily derived. The result of the analyses were expressed in tables.

The next step in the data analysis utilized a bivariate chi-square analysis with a Fisher exact test to investigate the distribution of the respondents by level of knowledge of symptoms and signs of stroke or intent to call 911, based on variables such as socio-demographic factors, income level, and risk factor status like previous heart attack or stroke. A chi-square for trend test was employed to determine whether there is significant year to year change in trend of the level of knowledge and intent to call 911 in the population over the survey period.

To properly answer the research questions, a multiple logistic regression model was built and ran using block enter method, to determine the factors/variables that predict knowledge and intent to call 911. This analysis will proceed thus;

RQ1: Is educational level a significant predictor of knowledge of stroke risk factors, signs and symptoms?

Null Hypothesis 1: Educational level is not an independent predictor of knowledge of stroke signs/symptoms and intent to call 911 after adjusting for age, family income level, household type, class, and gender of participants.

Alternative Hypothesis 1: Educational level is an independent predictor of knowledge of stroke signs/symptoms and intent to call 911 after adjusting for age, family income level, household type, class, and gender of participants.

To answer this research question and test the hypothesis, two separate models were designed. The first had overall knowledge of stroke as the dependent variable, with educational level (academic literacy) as the predictor. Analysis was adjusted for income level, age, past history of stroke, BMI, past history of heart attack, and race. A p-value of less than 0.05 or an odds ratio not including unity were considered statistically significant. The second model was essentially the same as the first, except that this time the dependent variable was intent to call 911, but with all other parameters kept the same. This analysis was done for each year for each dependent variable to see if the relationship of the predictors with the dependent variable changed in magnitude and/or direction.

RQ2: Is income level and demographic background (age and sex) a significant predictor of knowledge of stroke signs and symptoms?

Null Hypothesis 2: Income level is not an independent predictor of knowledge of stroke signs/symptoms and intent to call 911.

Alternative Hypothesis 2: Income level is an independent predictor of knowledge of stroke signs/symptoms and intent to call 911.

Null Hypothesis 3: Age and sex are not independent predictor of knowledge of stroke signs/symptoms and intent to call 911.

Alternative Hypothesis 3: Age and sex are independent predictors of knowledge of stroke signs/symptoms and intent to call 911.

To address this question, the same model as mentioned before with similar parameters was built and ran. This time the focus of the analysis was first age and sex as predictosr and then income level (surrogate for economic background). The dependent variables are still the same.

RQ3: Is knowledge of stroke signs/symptoms and risk factors a significant predictor of intent to call 911?

Null Hypothesis 4: Knowledge of stroke signs/symptoms and risk factors is not an independent predictor of intent to call 911 after adjusting for age, income level, age, academic literacy level, and gender.

Alternative Hypothesis 4: Knowledge of stroke signs/symptoms and risk factors is an independent predictor of intent to call 911 after adjusting for age, income level, age, academic literacy level, and gender.

Using the same model as before, the relationship of level of knowledge of stroke signs and symptoms to intent to call 911 was investigated, with intent to call 911 as the dependent variable. The models included all the other factors tested in RQ1 as covariate,

with knowledge of stroke as the main independent variable test. Each covariate based on the review of literature has been shown to influence disparity in knowledge of stroke. Especially important as covariates for intent to call 911 are past history of stroke and/or past history of a heart attack. This is because, as part of the discharge process after either of this event, an extensive one-on-one education about the signs and symptoms of stroke/heart attack and what to do in the event of one is done.

RQ4: What is the trend in knowledge of stroke signs/symptoms,risk factors and intent to call 911 from 2001 – 2012?

Null hypothesis: There has been no significant change in the in the pattern of knowledge of stroke signs/symptoms and risk factors and intent to call 911 from 2001-2012.

Alternative hypothesis: There has been a significant change in the level of knowledge of stroke signs/symptoms and risk factors and intent to call 911 from 2001-2012.

To answer this question, a Chi-square test for trend was done to determine if level of knowledge and/or intent to call 911 has changed from year to year over the period of the survey.

For all tests, a p-value of less than 0.05 or a confidence interval (CI) that does not include 1 or unity will be considered statistically significant. A Bonferroni test was used to correct for multiple comparisons while an R^2 with an asymptotic level of significance of <0.05 will indicate that the model is adequate. The natural log of the β-weights from the logistic regression represents odds ratio with CI. If the OR is less than one and the upper limit of the CI is less than 1, the variable tested results in a lower

likelihood for the dependent or predicted variable. But if the OR is greater than 1 and the lower limit of the OR is greater than one, then factor tested increases the likelihood for the occurrence of the dependent or predicted variable.

Threats to Validity

In survey research designs like this one, several factors could constitute threats to validity. While it is hard at this point to address the validity related to the instrument, because of the fact that I am using archival data, they are still worth mentioning. Construct validity which reflect how well the instrument is measuring the intended measure, could be a potential threat to validity (Frankfort-Nachmias & Nachmias, 2008a). For instance, the annual household income refers to the total amount of money coming into a specific household address. But it is possible for one household address to have more than one family, in which case the annual household income becomes the combined income of the families. If the family that filled the questionnaire thought the question refers to only their household, then the actual annual household income will be underreported and this will be an example of an error due to construct validity. This situation threatens both external and internal validity. This could easily be addressed if the survey were conducted entirely by phone.

Another threat to validity was the fact that both phones and email questionnaires were used. While the rationale for doing this was sound, and the respondents were comparable, the respondents to the mailed questionnaires do not have the ability to clarify a question before responding to it. This affects construct validity which can itself affect internal and external validity.

The use of weighting is an attempt to address external validity, by choosing a sample that is representative of the entire African American population of South Carolina. This is especially important since participation in research is voluntary and it has been shown that the less educated and economically disadvantaged seldom participate in research as volunteers. The other approach taken to address threats to validity of statistical conclusion was the use of address-based sampling rather than the traditional random digit dialing sampling strategy. This ensures that the segment of the population without land-lines was also captured in the survey.

Ethical Considerations

Although this project is utilizing publically available archival data, the process of data collection involved a process that took into consideration best practice in treatment of human research subjects. The decision to participate in the survey was entirely voluntary and participants first provided informed consent over the phone or signed one and returned with the questionnaire. Prior to mailing questionnaires or making phone calls, households were contacted to find out if they were interested in participating, at which time, their questions about the survey were answered. Further, because the intent was to make the data publically available, it was anonymized from the start and any information that could allow identification if respondents were removed from the data set.

Notwithstanding, the data is currently stored on a password protected computer to which only the investigator has access. The compact discs are stored in a drawer with lock and key. Finally approval to carry out this study will be obtained from the institutional review board at Walden University. Since the data is already publically

available, there is no need to obtain authorization to use it from the CDC. Because the data collected also include other aspects of health, it was not destroyed after this study as there is intention to mine it for publication on other aspect of health and wellness.

Summary

In this chapter a longitudinal cross-sectional study design with a stratified random cluster sampling technique was used to investigate the predictor of knowledge of stroke signs/symptoms and intent to call 911 in the event of a stroke. This chapter described the population, sampling strategy, data handling and analysis and concluded with a description of the threats to validity and ethical approaches. The next chapter (chapter 4) will present the results of the data analysis described here, specifically the time frame for data being used here, report baseline description of samples and results of hypothesis testing. In chapter 5, results will be discussed along with their implication for public health practice and stroke prevention. The chapter concludes with a section on social change implication of the results, the limitations of the study and finally a series of conclusions.

Chapter 4: Results

Introduction

Increasing knowledge about stroke signs and symptoms and encouraging individuals to call 911 are among the strategies that are currently recommended as a means of reducing the effects of the aftermath of a stroke event. This is because recognizing stroke signs and symptoms and as a result calling 911 increase the number of individuals who will potentially meet the criteria for getting the life-saving "clot bursting" drug – tissue thromboplastin activator (tPA) in order to reduce stroke-associated disability and death (Go et al., 2013; Morgenstern et al., 2002). With a study showing an improvement from 14% to 52% in the proportion of tPA-eligible stroke patients because of early use of 911 (Morgenstern et al., 2002), I proposed to investigate and identify the factors that could predict knowledge of stroke signs and symptoms and intent to call 911 in the event of stroke among African Americans in South Carolina, which is a population with a higher than the national prevalence for stroke.

Age, educational level, family income level, and gender were hypothesized to be predictors of the levels of knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke. Further, in addition to the aforementioned predictors, level of knowledge of stroke signs and symptoms was hypothesized to be a predictor of intent to call 911 in the event of a stroke. The final hypothesis was that the level of knowledge of stroke signs and symptoms and intent to call 911 would improve from year to year from 2001–2012. In this chapter, the results of the analysis geared toward testing these hypotheses are presented.

First, descriptive statistics presenting the characteristics of the population are presented. These descriptive characteristics are presented in categories as socio-demographic characteristics, health behavior and health characteristics, and risk factor profile and risk factor management approach for respondents. This section concludes with a descriptive presentation of respondents' knowledge of stroke signs and symptoms, knowledge of cardiovascular signs and symptoms, and distribution based on cardiovascular risk profile and knowledge of prevention of cardiovascular risk. The next section presents a univariate analysis of the association of knowledge of stroke signs and symptoms and the descriptive characteristics of the respondents. This section presents the univariate predictors of level of knowledge of stroke signs and symptoms. In the next section, results from a multivariate analysis based on the research hypotheses and questions are presented. All results are presented along with the respective tables. Finally, a summary of the results and transition to the next chapter are presented. In general, in each table, results with a *p*-value of < 0.05 are presented in bold font.

Descriptive Characteristics of Respondents

A total of 11,537 unweighted respondents were included in the analysis, which comprised a total of 9 separate years of surveys with an average of at least 800 respondents per year; however, this number varies based on the variable examined.

Socio-Demographic Characteristics of Respondents

The total number of respondents varied based on the number of responses received for each question and thus variable. This number is presented in the tables for each variable or response. The proportions and percentages are based on the total number of respondents and responses for each variable being considered. Table 1 shows that 77%

of respondents were contacted by and had their surveys done over the phone, and the majority (84.9%) were 64 years or younger. About 58% of respondents were female; 97.9% said that they were born in the United States, while 43.9% and 37.9% had a college or higher and high school educational level, respectively. Slightly over half (52.3%) of respondents were employed, 54.0% had household incomes of less than $25,000, and about 70% of respondents had health insurance coverage. A little over 23% of respondents said that they could not afford a doctor even when they needed one, and 98.3% said that they worried about having enough money to buy healthy foods. This was reflected in over 80% of respondents having a household income of less than $50,000. About two-thirds of respondents were either overweight or obese, with approximately 40% reporting that they were obese. This is about the same as the national pattern from the NHANES survey (Ogden, Carroll, Kit, & Flegal, 2014). Finally, while 62.7% of respondents stated that they had never smoked cigarettes, approximately 21% stated that they were current smokers who smoked daily or on some days in the week.

Table 1

Socio-Demographic Variables and Survey Characteristics

Variable	Weighted count	Un-weighted count	Percent (%)	C I of percent (%)
Mode in which questionnaire was administered				
In person	49.3	40	0.5	0.1 – 4.8
By telephone	7564.2	7568	77.9	63.9 – 87.5
By mail	2100.4	2106	21.6	11.4 – 37.1
Age category (years)				
18 – 39	1703.6	838	40.5	40.0 – 41.0
40 – 64	1869.8	2249	44.4	44.3 – 44.6
65 and older	634.9	1121	15.1	14.8 – 15.4
Sex				
Male	4051.4	2973	41.7	38.8 – 44.6
Female	5662.3	6740	58.3	55.4 – 61.2
Born in the United States				
Yes	4110.5	4130	97.9	97.2 – 98.4
No	87.8	65	2.1	1.6 – 2.8
Educational level				
Never attended school or only kindergarten	15.5	14	0.2	0.1 – 0.3
Did not complete high school (grades 1-11)	1752.6	1814	18.1	16.9 – 19.4
Completed high school (12^{th} grade or GED)	3661.2	3496	37.9	36.6 – 39.1
Some college/complete college/graduate school	424.7	4337	43.9	42.2 – 45.6
Occupational status				
Employed	5012.0	4317	52.3	50.5 – 53.6
Unemployed	1355.7	1241	14.1	13.1 – 15.1
Student	513.5	329	5.3	4.5 – 6.3
Retired/Unable to work	2720.9	3306	28.3	26.5 – 30.0
Household income level				
Less than $25,000	4828.8	4850	54.0	52.4 – 55.6
$25,000 to < $50,000	2733.6	2658	30.6	29.4 – 31.8
$50,000 to < $75,000	773.8	832	8.7	7.9 – 9.5
$75,000 or more	600.5	604	6.7	5.8 – 7.7
Has health insurance coverage				
Yes	2910.7	3190	70.1	68.2 - 72.0
No	1239.6	967	29.9	28.0 – 31.8
Need but can't afford a doctor?				
Yes	2246.9	2134	23.3	21.2 – 25.5
No	7410.0	7512	76.7	74.5 – 78.8
Worried about funds to pay for healthy foods				
Always/Usually/Sometimes	4101.5	4109	98.3	97.2 – 99.0
Rarely/Never/Not applicable	69.4	50	1.7	1.0 – 2.8
Body Mass Index Category (kg/m^2)				
Normal weight	2606.7	2378	27.7	26.9 – 28.6
Overweight	3126.8	3109	33.3	32.2 – 34.4
Obese	3661.1	3853	39.0	37.9 – 40.0
Cigarette smoking				
Current smoker (everyday)	1298.6	1139	13.5	12.6 – 14.5
Current smoker (some days)	688.4	586	7.2	6.5 – 7.9
Former smoker	1601.3	1789	16.6	15.7 – 17.7
Never smoked	6039.4	6098	62.7	61.9 – 63.5

Health Behavior and Health Characteristics of Respondents

As presented in Table 2, about 80% of respondents said that they perceived their health to be either good, very good, or excellent in the last 30 days prior to the survey, and approximately 17% said that they had had more than 7 days of poor physical and/or mental health in the last 30 days. About 77% of respondents said that they had had a medical checkup in within the last 12 months. Among diabetic respondents, 77% said that they checked their blood sugar level regularly, approximately 43% said that they had had an HbA1c test done, 28.3% had had their feet checked, and 54.9% had had their eyes checked at least once in the last 12 months. Among all respondents, 72.2% said that they engaged in 10 minutes or more of moderate physical activity, among whom 49.2% said that they engaged in 10 minutes of physical activity more than 3 times a week. Approximately 73% said that they were eating more fruits and vegetables. A total of 78.3% of respondents said that they had had their cholesterol checked in the last 12 months, among whom 67.2% said that they had been eating a less high fat or cholesterol diet. Only 25.9% of respondents stated that they ate five or more servings of fruits and vegetables per day.

Table 2

Participant Distribution by Health Behavior and Health Characteristics

Variable	Weighted count (*N*)	Unweighted count (*N*)	Percent (%)	C I of percent (%)
Self-described general health status				
Excellent	1642.8	1376	17.0	15.4 – 18.7
Very good	2453.1	2346	25.3	23.9 – 26.8
Good	3645.2	3800	37.7	35.9 – 39.4
Fair	1493.9	1650	15.4	14.5 – 16.4
Poor	443.4	494	4.6	4.0 – 5.3
Number of days of poor physical health in 30 days				
None	6033.4	5790	62.5	61.2 – 63.7
One week or less	2012.0	2068	20.8	19.7 – 22.0
More than one week	1608.3	1770	16.7	15.4 – 18.0
Number of days of poor mental health in 30 days				
None	6289.0	6325	65.0	62.4 – 67.6
One week or less	1792.2	1761	18.5	17.1 – 20.1
More than one week	1592.1	1572	16.5	15.2 – 17.8
Time since last routine checkup				
12 months or less ago	7486.7	7831	77.3	75.6 – 78.9
Over 12 months ago	2196.9	1844	22.7	21.1 – 24.4
Diabetic: You check your blood sugar level regularly				
Yes	2359.4	2740	77.1	73.3 – 80.5
No	701.1	648	22.9	19.5 – 26.7
Diabetic: You had HbA1C test in the last 12 months				
Yes	601.3	774	42.7	37.7 – 47.8
No	806.2	972	57.3	52.2 – 62.3
Diabetic: You had feet checked in the last 12 months				
Yes				
No	473.2	653	28.3	24.3 – 32.7
	1198.9	1412	71.7	67.3 – 75.7
Diabetic: You had eye exam in the last 12 months				
Yes	922.2	1075	54.9	49.6 – 60.0
No	758.8	1001	45.1	40.0 – 50.4
Engage in moderate activity for at least 10 minutes				
Yes	6947.2	6891	72.2	71.1 – 73.3
No	2676.4	2712	27.8	26.7 – 28.9
Frequency of moderate activities per week				
3 times or less	3467.2	3496	50.8	47.8 – 53.7
Greater than 3 times	3362.4	3278	49.2	46.3 – 52.2
More physically active				
Yes	3875.9	3854	71.1	69.0 – 73.1
No	1577.6	1598	28.9	26.9 – 31.0
Eating more fruits and vegetables				
Yes	3989.7	4072	73.2	71.6 – 74.7
No	1463.7	1386	26.8	25.3 – 28.4
Job activity is mostly				
Sitting or standing	1023.7	957	52.1	50.9 – 53.3
Walking	565.3	504	28.8	26.4 – 31.3
Heavy labor/physically demanding	374.7	270	19.1	17.3 – 21.0

(*table continues*)

Variable	Weighted count (*N*)	Unweighted count (*N*)	Percent (%)	C I of percent (%)
Physical activity in the past month besides job				
Yes	2615.4	2579	64.4	63.5 – 65.4
No	1443.0	1475	35.6	34.6 – 36.5
Have had cholesterol checked				
Yes	7467.9	7949	78.3	75.4 – 80.9
No	2071.3	1592	21.7	19.1 – 24.6
Eating less high-fat diet or high-cholesterol foods				
Yes	3612.7	3733	67.2	64.7 – 69.6
No	1767.3	1642	32.8	30.4 – 35.3
Fruits and vegetable servings consumed per day				
Adequate (5+ servings)	2508.0	2583	25.9	24.0 – 27.8
Inadequate (< 5 servings)	7193.9	7122	74.1	72.2 – 76.0

Respondent's Risk Factor Profile and Management

Approximately 21% of respondents were at risk from smoking, 72.3% were at risk from overweight or obesity. The prevalence of self-reported diabetes diagnosis was 18%, which is twice the current prevalence among the African American population in the United States (Hardman et al., 2011). Among diabetics, 65.3% reported that they've taken a course to help them manage their diabetes. The prevalence of hypertension was 44.4%, 82.6% of whom were aware that regularly taking anti-hypertensive medications can help to control high blood pressure (HBP). Respondents who had hypertension stated that they were making lifestyle modifications such as; either changing eating habits (82.7%), reducing salt intake (83.4%), reducing alcohol intake (36.3%), and/or exercising (75.7%) to help control their high blood pressure. About 37% of respondents said that they have high cholesterol, 82.4% of whom said that they have been prescribed medication for high cholesterol. About 74% said they have been advised to reduce their blood cholesterol level. Among the general respondents, 40.1% said that they have received some form of advised to eat less fat or cholesterol containing foods. Other healthy habits that respondents reported being advised to adopt includes to protect from

and manage high cholesterol includes; exercising more (54.5%), eating more fruits and vegetables (55.2%) and being referred to a dietician or nutritionist or nurse for dietary counselling (Table 3).

Respondent's History and Knowledge of Stroke and Cardiovascular Disease, and Intent to Call 911

The history and knowledge of cardiovascular diseases and stroke among respondents was variable. Table 4 shows that 3.5% said that they have been diagnosed with a heart attack, 3.1% said that have been diagnosed with angina and 3.8% said that they have been diagnosed with a stroke. Approximately 86% and 77% of respondents stated that they are taking aspirin to prevent either heart attack or stroke respectively. The number making up this proportion was significantly more than the number that respondent in the affirmative to being diagnosed with heart attack, angina or stroke.

On knowledge of cardiovascular disease symptoms, 38.8% correctly recognized discomfort in the jaw, neck or back as a symptom of heart attack. Further, 49.2% and 87.3% correctly identified weakness, lightheadedness or fainting and chest pain or discomfort as symptoms of heart attack. About 31% incorrectly identified trouble seeing in one or both eyes as a symptom of heart attack. Finally 74.7% and 79% respectively correctly identified arm or shoulder discomfort and shortness of breath respectively as symptoms of heart attack. Overall, 82.1% of respondents had a moderate to adequate (were able to correctly identify 2 or more signs and symptoms) knowledge of heart attack.

Table 3

Participant Distribution by Risk Factor Profile and Their Management

Variable	Weighted count	Unweighted count	Percent (%)	C I of percent (%)
Smoking risk category				
Not at risk	7640.7	7887	79.4	78.3 – 80.4
At risk	1987.0	1725	20.6	19.6 – 21.7
Body mass index risk category				
Not at risk	2606.7	2378	27.7	26.9 – 28.6
At risk	6787.9	6962	72.3	71.4 – 73.1
Been diagnosed with diabetes				
Yes	1731.4	2136	18.0	16.0 – 20.2
No	7881.1	7463	82.0	79.8 – 84.0
Taken a course to help self-manage my diabetes				
Yes				
No	510.3	674	65.3	59.2 – 70.9
	271.3	363	34.7	29.1 – 40.8
Diagnosed with high blood pressure (HBP)				
Yes	4289.7	5020	44.4	41.7 – 47.2
No	5371.0	4638	55.6	52.8 – 58.3
Aware of antihypertensives and regularly taking medication				
Yes	3421.1	4191	82.6	80.2 – 84.7
No	721.2	682	17.4	15.3 – 19.8
Changing eating habit to lower or control HBP				
Yes				
No	1619.2	2056	87.2	86.1 – 88.2
	238.0	267	12.8	11.8 – 13.9
Reducing salt intake to help control or lower HBP				
Yes	1556.6	1978	83.4	81.1 – 85.4
No	103.9	109	5.6	4.8 – 6.5
Do not use salt	206.8	254	11.1	8.9 – 13.8
Reducing alcohol to lower or control HBP				
Yes				
No	674.8	737	36.3	33.3 – 39.5
Do not drink alcohol	116.6	124	6.3	4.4 – 8.2
	1066.5	1464	57.4	52.6 – 62.1
Exercising to help lower or control HPB				
Yes	1402.2	1729	75.7	72.6 – 78.5
No	450.8	585	24.3	21.5 – 27.4
Have high blood cholesterol level				
Yes	2751.2	3264	37.1	34.4 – 40.0
No	4656.8	4615	62.9	60.0 – 65.6
Prescribed medication to lower blood cholesterol				
Yes				
No	933.1	1048	82.4	78.8 – 85.5
	199.3	229	17.6	14.5 – 21.2
Advised to reduce blood cholesterol or fat level				
Yes				
No	1135.0	1280	73.9	71.1 – 76.5
	400.4	424	26.1	23.5 – 28.9
Advised to eat less high fat or cholesterol diet				
Yes	2190.3	2359	40.1	37.1 – 43.2
No	3271.6	3099	59.9	56.8 – 62.9

Variable	Weighted count	Unweighted count	Percent (%)	C I of percent (%)
				(*table continues*)
Advised to exercise more				
Yes	2994.6	3215	54.5	50.6 – 58.4
No	2497.1	2275	45.5	41.6 – 49.4
Advised to eat more fruits and vegetables				
Yes	3028.5	3152	55.2	53.3 – 57.1
No	2455.9	2331	44.8	42.9 – 46.7
Have been referred to a dietician, nutritionist or nurse				
Yes	515.6	541	45.5	39.0 – 52.2
No	617.8	736	54.5	47.8 – 61.0

On the other hand, 82.2% of respondents correctly identified sudden confusion or trouble speaking as a symptom or sign of stroke. Further, 89.7% recognized numbness or weakness of the face, arm and leg especially on one side as a symptom or sign of stroke, but only 53.5% correctly recognized sudden trouble seeing in one eye as a symptom of stroke. **A surprising 42.5% of respondent incorrectly identified chest pain and discomfort as a sign or symptom of stroke.** Finally 77.6% and 54.6% of respondents correctly identified trouble walking, dizziness or loss of balance and severe headaches respectively as symptoms of stroke. Overall, 86.1% of respondents had moderate to adequate knowledge (were able to correctly identify 2 or more signs and symptoms) of stroke signs and symptoms. Furthermore, 88.6% of respondents stated that they will dial 911 if they were to witness someone having a stroke or heart attack. Only 20.9% of respondents stated that they have heard of a cardiovascular disease prevention program being carried out or available in their area.

Table 4

Distribution of Respondents by History of Cardiovascular Disease, Prevention, Awareness of Signs/Symptoms, Intent to Call 911, and Prevention Programs

Variable	Weighted count	Unweighted count	Percent (%)	C I of percent (%)
Doctor diagnosed heart attack or myocardial infarction				
Yes	337.3	400	3.5	3.1 – 3.9
No	9247.3	9161	96.5	96.1 – 96.9
Doctor diagnosed angina or coronary heart disease				
Yes	296.1	353	3.1	2.7 – 3.5
No	9227.1	9131	96.9	96.5 – 97.3
Doctor diagnosed stroke				
Yes	367.1	413	3.8	95.6 – 96.6
No	9211.4	9141	96.2	3.4 – 4.4
Taking aspirin to reduce chance of heart attack				
Yes	1056.4	1184	86.1	83.0 – 88.6
No	171.0	200	13.9	11.4 – 17.0
Taking aspirin to reduce chance of stroke				
Yes	912.6	1027	77.3	72.6 – 81.5
No	267.7	296	22.7	18.5 – 27.4
Heart attack is pain or discomfort in the jaw, neck, or back				
Yes	3772.9	3856	38.8	36.7 – 41.0
No	5939.3	5857	61.2	59.0 – 63.3
Heart attack is feeling weak, lightheaded, and faint				
Yes	4778.4	4617	49.2	47.2 – 51.2
No	4935.6	5097	50.8	48.8 – 52.8
Heart attack is chest pain or discomfort				
Yes	8484.4	8397	87.3	86.4 – 88.2
No	1229.6	1317	12.7	11.8 – 13.6
Heart attack is sudden trouble seeing in one or both eyes				
Yes	*3036.6*	*2867*	*31.3*	*29.8 - 32.8*
No	*6676.3*	*6846*	*68.7*	*67.2 – 70.2*
Heart attack is pain and discomfort in the arms or shoulder				
Yes	7258.1	7379	74.7	72.7 – 76.6
No	2455.1	2334	25.3	27.3 – 23.4
Heart attack is shortness of breath				
Yes	7676.0	7640	79.0	78.0 – 80.0
No	2036.0	2071	21.0	20.0 – 22.0
Level of knowledge of signs and symptoms of heart attack				
Moderate to adequate knowledge (2 or greater)	7969.0	7904	82.1	80.2 – 83.8
None to low knowledge (1 or less or)	1740.1	1805	17.9	16.2 – 19.8
Stroke is sudden confusion or trouble speaking				
Yes	7985.9	7997	82.2	80.5 – 83.8
No	1726.5	1715	17.8	16.2 – 19.5
Stroke is sudden numbness or weakness of the face, arm or leg, especially on one side				
Yes	8711.6	8671	89.7	88.8 – 90.5
No	1000.8	1041	10.3	9.5 – 11.2

(*table continues*)

Variable	Weighted count	Unweighted count	Percent (%)	C I of percent (%)
Stroke is sudden trouble seeing in one or both eyes				
Yes	5198.5	5127	53.5	51.3 – 55.7
No	4514.7	4586	46.5	44.3 – 48.7
Stroke is sudden chest pain or discomfort				
Yes	4130.6	3927	42.5	41.4 – 43.7
No	5582.7	5786	57.5	56.3 – 58.6
Stroke is sudden trouble walking, dizziness, or loss of balance	7535.0	7462	77.6	75.7 – 79.4
Yes	2177.7	2250	22.4	20.6 – 24.3
No				
Stroke is severe headache without known cause				
Yes	5306.4	5435	54.6	52.8 – 56.4
No	4406.4	4277	45.4	43.6 – 47.2
Level of knowledge of signs and symptoms of stroke				
Moderate to adequate knowledge (2 or greater)	8359.6	8301	86.1	84.9 – 87.2
None to low knowledge (1 or less)	1351.9	1409	13.9	12.8 – 15.1
What would you do if you or someone were having a heart attack or stroke				
Call 911 (correct response)	8582.8	8637	88.6	87.4 – 89.7
Do anything else (call relative, taxi, etc.; incorrect response)	1104	1044	11.4	10.3 – 12.6
Ever heard of area prevention and education program				
Yes	828.1	901	20.9	17.9 – 24.3
No	3127.8	3036	79.1	75.7 – 82.1

Univariate Analysis of Predictor of Knowledge and Knowledge of Stroke Signs and Symptoms and Intent to Call 911

Univariate logistics regression analysis is presented in this section. The organization of results is similar to the previous section, with respondent's socio-demographic characteristic coming first and history and knowledge of cardiovascular disease symptoms coming last. The sections below only presents the results that show statistically significant univariate association. The rest of the results are presented in tables in each subsection. In each section, odds ratios (OR) and 95% confidence intervals (CI) are presented in bracket.

Socio-Demographic Characteristics of Respondents

Based on mode of questionnaire administration, compared with respondents who received and returned their survey by mail, those respondents who had in-person administration of their questionnaire (less than 1%) were significantly less likely (OR = 0.41, 0.37 – 0.48) to have moderate to adequate knowledge of stroke signs and symptoms. Respondents ages 18 – 39 (OR = 2.57, CI = 2.17 – 3.06) and 40 – 64 (OR = 2.31, CI = 1.44 – 3.71) years, were significantly more likely to have moderate to adequate stroke knowledge compare with those who were 65 years or older. On the other hand, compared to respondents with college or higher level of education, those who never attended school (OR = 17.12, CI = 3.12 – 93.97), had between 1st and 11th grade education (OR = 4.87, CI = 4.08 – 5.80), or completed high school (OR = 2.56, CI = 2.16 – 3.09) were significantly more likely to have a low to no knowledge (only correctly knew 1 or none) of the signs and symptoms of stroke. Respondents who were employed (OR = 2.56, CI = 2.29 – 2.86), unemployed (OR = 1.70, CI = 1.31 – 2.20), and students (OR = 2.27, CI = 1.38 – 3.75) were more likely to have moderate to adequate knowledge of stroke signs and symptoms compared with those respondents who said they were retire or unable to work. Respondents with annual household income of <$25,000 (OR = 3.46, CI = 2.18 – 5.76) and $25,000 to <$50,000 (OR = 2.28, CI = 1.32 – 3.94) were significantly more likely to have low to no knowledge of stroke signs and symptoms compared with respondents who reported an annual household income of $75,000 or more for a family of 4. Finally, respondent whose self-reported height and weight put them in the normal BMI category were significantly less likely (OR = 0.81, CI = 0.67 – 0.99) to have low to no knowledge of stroke signs and symptoms (table 5).

Table 5

Univariate Relationship Between Level of Knowledge of Stroke Signs and Symptoms and Basic Demographic Characteristics of Respondents

Variable	Odds ratio	Confidence interval
Mode in which questionnaire was administered		
In person	**0.41**	**0.37 - 0.48**
By telephone	1.10	0.86 – 1.39
Age category (years)		
18 – 39	**2.57**	**2.17 - 3.06**
40 – 64	**2.31**	**1.44 – 3.71**
Sex	1.15	0.89 – 1.49
Born in the United States	0.90	0.32 – 2.55
Educational level		
Never attended school or only kindergarten	**17.12**	**3.12 - 93.97**
Did not complete high school (Grades 1-11)	**4.87**	**4.08 – 5.80**
Completed high school (12th grade or GED)	**2.56**	**2.16 – 3.09**
Occupational status		
Employed	**2.56**	**2.29 - 2.86**
Unemployed	**1.70**	**1.31 – 2.20**
Student	**2.27**	**1.38 – 3.75**
Household income level		
Less than $25,000	**3.46**	**2.18 - 5.76**
$25,000 to < $50,000	**2.28**	**1.32 – 3.94**
$50,000 to < $75,000	1.02	0.44 – 2.38
Has health insurance coverage	0.82	0.59 – 1.14
Need but can't afford a doctor?	1.17	0.87 – 1.57
Worried about funds to pay for healthy foods	0.67	0.13 – 3.53
Body mass index category (kg/m^2)		
Normal weight	**0.81**	**0.67 – 0.99**
Overweight	0.93	0.69 – 1.25
Cigarette smoking		
Current smoker (every day)	0.90	0.76 - 1.08
Current smoker (some days)	0.69	0.47 – 1.01
Former smoker	1.04	0.84 – 1.29

Health Behavior and Health Characteristics of Respondents

Table 6 showed that compared with respondents who reported their health status as poor, those who reported their health status as either excellent (OR = 2.00, CI = 1.25 – 3.21), very good (OR = 2.52, CI = 1.91 – 3.32), good (OR = 1.81, CI = 1.11 – 2.95), or fair (OR = 1.59, CI = 1.12 – 2.26), were significantly more likely to have moderate to

adequate knowledge of stroke signs and symptoms. Similarly, compared to those who reported having over one week of poor physical health within the last 30 days prior, respondent who reported having zero days (OR = 1.23, CI = 1.03 – 1.45) or ≤7 days (OR = 1.50, CI = 1.21 – 1.86) of physical health were more likely to have moderate to adequate knowledge of stroke signs and symptoms. On the other hand respondents who had their HbA1c test in the last 12 months were less likely (OR = 0.49, CI = 0.37 – 0.65) to have a low or no knowledge of stroke signs and symptoms. Also, respondents who had a feet (OR = 1.61, CI = 1.07 – 2.43) or an eye (OR = 1.57, CI = 1.13 – 2.17) exam within the last 12 months were more likely to have moderate to adequate knowledge of stroke signs and symptoms. Finally, respondents who reported being physically active beside job related activity (OR = 0.63, CI = 0.48 – 0.83), have had their cholesterol checked (OR = 0.72, CI = 0.54 – 0.96), or were watching their diet against high fat or cholesterol (OR = 0.57, CI = 0.44 – 0.73) were less likely to have low or no knowledge of stroke signs and symptoms.

Table 6

Univariate Association of Level of Knowledge of Stroke Signs and Symptoms and Participant's Health Behavior and Health Characteristics

Variable	Odds ratio	Confidence interval
Self-described general health status		
Excellent	**2.00**	**1.25 – 3.21**
Very good	**2.52**	**1.91 – 3.32**
Good	**1.81**	**1.11 – 2.95**
Fair	**1.59**	**1.12 – 2.26**
Number of days of poor physical health in 30 days		
None	**1.23**	**1.03 – 1.45**
One week or less	**1.50**	**1.21 – 1.86**
Number of days of poor mental health in 30 days		
None	1.23	0.97 – 1.56
One week or less	1.28	0.82 – 2.01
Time since last routine checkup	1.00	0.76 – 1.32
Diabetic: You check your blood sugar level regularly	0.80	0.13 – 4.91
Diabetic: You had HbA1C test in the last 12 months	**0.49**	**0.37 – 0.65**
Diabetic: You had feet checked in the last 12 months	**1.61**	**1.07 – 2.43**
Diabetic: You had eye exam in the last 12 months	**1.57**	**1.13 – 2.17**
Engage in moderate activity for at least 10 minutes	**0.49**	**0.43 – 0.55**
Frequency of moderate activities per week	0.90	0.70 – 1.15
More physically active	0.91	0.65 – 1.27
Eating more fruits and vegetables	0.85	0.69 – 1.03
Job activity is mostly		
Sitting or standing	0.93	0.32 – 2.70
Walking	1.23	0.27 – 5.53
Physical activity in the past month besides job	**0.63**	**0.48 – 0.83**
Have had blood cholesterol level checked	**0.72**	**0.54 – 0.96**
Eating fewer high fat diet or high cholesterol foods	**0.57**	**0.44 – 0.73**
Fruits and vegetable servings consumed per day	0.91	0.76 – 1.09

Respondent's Risk Factor Profile and Management

In Table 7, having low to no knowledge of stroke signs and symptoms was also found to be associated with a diagnosis of diabetes mellitus (OR = 1.28, CI = 1.08 – 1.51), taking a course on how to self-manage diabetes (OR = 0.47, CI = 0.39 – 0.56), and being diagnosed with HBP (OR = 1.13, CI = 1.00 – 1.28). Similarly, having low to no knowledge of stroke signs and symptoms was less likely among respondents who have been advised to eat less fatty or high cholesterol foods (OR = 0.63, CI = 0.50 – 0.79).

Table 7

Univariate Association Between Knowledge of Stroke Signs and Symptoms and Participant Risk Factor Profile and Management

Variable	Odds ratio	Confidence interval
Smoking risk category	0.81	0.65 – 1.01
Body Mass Index risk category	1.19	0.97 – 1.47
Been diagnosed with diabetes	**1.28**	**1.08 – 1.51**
Taken a course to help self-manage my diabetes	**0.47**	**0.39 – 0.56**
Diagnosed with high blood pressure (HBP)	**1.13**	**1.00 – 1.28**
Aware of anti-hypertensives and regularly taking medication	1.06	0.75 – 1.50
Changing eating habit to lower or control HBP	0.86	0.47 – 1.57
Reducing salt intake to help control or lower HBP		
Yes	0.74	0.43 – 1.27
No	0.67	0.20 – 2.29
Reducing alcohol to lower or control HBP		
Yes	1.01	0.79 – 1.27
No	0.81	0.24 – 2.76
Exercising to help lower or control HPB	1.01	0.87 – 1.32
Have high blood cholesterol level	1.01	0.90 – 1.14
Prescribed medication to lower blood cholesterol	1.01	0.60 – 1.68
Advised to reduce blood cholesterol or fat level	1.73	0.76 – 3.94
Advised to eat fewer high fat or cholesterol diet	**0.63**	**0.50 – 0.79**
Advised to exercise more	0.85	0.72 – 1.03
Advised to eat more fruits and vegetables	1.07	0.81 – 1.42
Have been referred to a dietician, nutritionist or nurse	0.74	0.41 – 1.36

Respondent's History, Knowledge and Knowledge of Stroke and Cardiovascular Disease and Intent to Call 911

Table 8 shows that respondents who reported a prior history of myocardial infarction (OR = 1.41, CI = 1.01 – 1.97) were more likely to have moderate to adequate knowledge of stroke. On the other hand respondents who reported taking aspirin to reduce their chance of heart attack (OR = 0.43, CI = 0.32 – 0.58) or stroke (OR = 0.40, CI = 0.23 – 0.70); those who correctly identified discomfort in the jaw, neck, or back (OR = 6.70, CI = 5.29 – 8.49); weakness, lightheadedness or fainting (OR = 7.70, CI = 5.95 – 9.97), and chest pain or discomfort (OR = 16.81, CI = 13.68 – 20.66) as symptoms of heart attack were more likely to have moderate to adequate knowledge of stroke signs and symptoms. Respondents who incorrectly identified trouble seeing in one or both eyes as a symptom of heart attack were significantly more likely (OR = 7.88, CI = 5.35 – 11.63) to have low to no knowledge of stroke signs and symptoms. Furthermore, respondents who correctly identified arm or shoulder discomfort (OR = 10.24, CI = 8.79 – 11.94) and shortness of breath (OR = 11.81, CI = 9.35 – 13.36) as symptoms of heart attack were also more likely to have moderate to adequate knowledge of stroke signs and symptoms. Overall, respondents with moderate to adequate (were able to correctly identify 2 or more signs and symptoms) knowledge of symptoms and signs of heart attack were significantly more likely (OR = 24.16, CI = 19.74 – 29.56) to be knowledgeable of the symptoms and signs of stroke. Finally, respondents who said they will call 911 in the event of a stroke or heart attack were also more likely (OR = 1.65, CI = 1.34 – 1.94) to have moderate to adequate knowledge of stroke signs and symptoms.

Table 8

Relationship of Knowledge of Stroke Signs/Symptoms and Respondent's History and Knowledge of Cardiovascular Disease Signs/Symptoms, Prevention, and Intent to Call 911

Variable	Odds ratio	Confidence interval
Doctor diagnosed heart attack or myocardial infarction	**1.41**	**1.01 – 1.97**
Doctor diagnosed angina or coronary heart disease	0.85	0.62 – 1.16
Doctor diagnosed stroke	1.32	0.80 – 1.61
Taking aspirin to reduce chance of heart attack	**0.43**	**0.32 – 0.58**
Taking aspirin to reduce chance of stroke	**0.40**	**0.23 – 0.70**
Heart is pain or discomfort in the jaw, neck or back	**6.70**	**5.29 – 8.49**
Heart attack is feeling weak, light headed and faint	**7.70**	**5.95 – 9.97**
Heart attack is chest pain or discomfort	**16.81**	**13.68 -20.66**
Heart attack is sudden trouble seeing in one or both eyes	***7.88***	***5.35 – 11.63***
Heart attack is pain and discomfort in the arms or shoulder	**10.24**	**8.79 – 11.94**
Heart attack is shortness of breath	**11.18**	**9.35 – 13.36**
Level of Knowledge of signs and symptoms of heart attack	**24.16**	**19.74 – 29.56**
What would you do if you or someone were having a heart attack or stroke	**1.65**	**1.34 – 1.94**
Ever heard of area prevention and education program	0.76	0.54 – 1.09

Multivariate Analysis to Identify Determinants of Knowledge of Stroke Signs/ Symptoms and Intent to Call 911 and Trends in Knowledge and Intent to Call 911

The overall aim of this project was to identify through targeted analysis the predictors of knowledge of stroke signs and symptoms and intent to call 911. The results of multivariate analysis of some of the factors tested to determine if they were independent predictors of level knowledge of the symptoms and signs of stroke and intent to call 911, in addition to determining the trend in knowledge and intent to call 911. *As stated in the methods sections, level of knowledge of stroke signs and symptoms were derived from adding the responses to individuals symptoms questions (correct response =*

1 and incorrect response = 0). Correctly identifying 1 or no symptom was classified as low or no knowledge, while correctly identifying 2 or more symptoms was classified as moderate or adequate knowledge of stroke signs and symptoms. The findings are all presented in Tables 9 (which covers knowledge of stroke and hypothesized predictors) and 10 (which cover intent to call 911 and hypothesized predictors).

RQ1: Is educational level a significant predictor of knowledge of stroke risk factors, signs and symptoms and intent to call 911?

The analysis showed that educational level was a significant independent predictor of level of knowledge of signs and symptoms of stroke. Compared to those with college level or higher education, respondents who did not complete high school (OR = 2.83, CI = 2.03 – 3.96) and those who completed high school (OR = 1.95, CI = 1.28 – 2.96) were more likely to have a low to no knowledge of stroke signs and symptoms. As such the null hypothesis was rejected in favor of the alternative hypothesis. On the other hand, educational level was not a significant predictor of intent to call 911 and as such the null hypothesis was not rejected.

RQ2: Is economic and demographic background a significant predictor of knowledge of stroke signs and symptoms?

Null Hypothesis 2: Income level is not an independent predictor of knowledge of stroke signs/symptoms and intent to call 911.

Multivariate analysis revealed that while respondents with an annual household income of <$25,000 (OR = 3.76, CI = 0.64 – 22.05), $25,000 to <$50,000 (OR = 2.14, CI = 0.34 – 13.29), or $50,000 to <$75,000 (OR = 1.18, CI = 0.12 – 11.65) were more likely to have low to no knowledge of stroke signs and symptoms, this was not statistically

significant. Thus the null hypothesis was not rejected. Similarly, respondent's household income level was also not a significant predictor of intent to call 911 in the event of a stroke or heart attack.

Null Hypothesis 3: Age and sex are not independent predictor of knowledge of stroke signs/symptoms and intent to call 911.

Alternative Hypothesis 3: Age and sex are independent predictors of knowledge of stroke signs/symptoms and intent to call 911.

With reference to age, compared to respondents who were 65 years or older, respondents between the ages of 18 – 39 years (OR = 0.46, CI = 0.27 – 0.80) were significantly less likely to have low to no knowledge of stroke signs and symptoms, on the other although respondents ages 40 – 64 years (OR = 0.53, CI = 0.27 – 1.02) were less likely to have low to no knowledge of stroke signs and symptoms, it was not statistically significant. On the hand, respondents ages 40 – 64 years were more likely to say that they will call 911 in the event of a stroke or heart attack (OR = 1.87, CI = 1.14 – 3.09). On the other hand, respondents' sex was not a significant independent predictor of level of knowledge of stroke signs and symptoms, because although males were more likely to have low to no knowledge of stroke signs and symptoms, it was not statistically significant. With regards to intent to call 911 in the vent of a stroke or heart attack, male respondents were significantly less likely (OR = 0.65, CI = 0.64 – 0.66) than females to say that they will call 911 in the event of a stroke or heart attack.

RQ3: Is knowledge of stroke signs/symptoms and risk factors a significant predictor of intent to call 911?

Alternative Hypothesis 4: Knowledge of stroke signs/symptoms and risk factors is an independent predictor of intent to call 911 after adjusting for age, income level, age, academic literacy level, and gender.

A multivariate logistic regression analysis indicated that level of knowledge of stroke signs and symptoms was a significant predictor of intent to call 911. Having a moderate to adequate knowledge of stroke signs and symptoms was associated with a higher likelihood (OR = 1.39, CI = 1.18 – 1.65) of intent to call 911 in the event of a stroke.

Table 9

Multivariate Analysis to Identify Independent Predictors of Level of Knowledge of Stroke Signs and Symptoms

Variable	Odds ratio	Confidence interval
Educational level		
Some College/College graduate/Graduate school	1.00 [ref]	
High school graduate (12th grade or GED)	**1.95**	**1.28 - 2.96**
Did not complete high school	**2.83**	**2.03 – 3.96**
Never attended school or only attended kindergarten	---	---
Annual household income		
$75, 000 or more	1.00 [ref]	
$50, 000 to less than $75, 000	1.18	0.12 – 11.65
$25, 000 to less than $50, 000	2.14	0.34 – 13.29
Less than $25, 000	3.76	0.64 – 22.05
Age category		
65 years and older	1.00 [ref]	
40 – 64 years	0.53	0.27 – 1.02
18 – 39 years	**0.46**	**0.27 – 0.80**
Sex		
Female	1.00 [ref]	
Male	1.08	0.68 – 1.72

Table 10

Multivariate Regression Analysis to Determine the Independent Predictors of Intent to Call 911 in the Event of a Stroke

Variable	Odds ratio	Confidence interval
Educational level		
Some College/College graduate/Graduate school	1.00 [ref]	
High school graduate (12th grade or GED)	1.16	0.69 – 1.98
Did not complete high school	1.03	0.80 – 1.33
Never attended school or only attended kindergarten	---	---
Annual household income		
$75, 000 or more	1.00 [ref]	
$50, 000 to less than $75, 000	0.98	0.63 – 1.54
$25, 000 to less than $50, 000	0.59	0.23 – 1.51
Less than $25, 000	0.63	0.26 – 1.49
Age category		
65 years and older	1.00 [ref]	
40 – 64 years	**1.87**	**1.14 – 3.09**
18 – 39 years	1.41	0.69 – 2.90
Sex		
Female	1.00 [ref]	
Male	**0.65**	**0.64 – 0.66**
Categorical level of knowledge of stroke		
Low level or no knowledge	1.00 [ref]	
Moderate to adequate knowledge	**1.39**	**1.18 – 1.65**

RQ4: Is there any change in trend for knowledge of stroke signs/symptoms and risk factors and intent to call 911 from 2001-2012?

Alternative Hypothesis 5: There has been a significant change in the level of knowledge of stroke signs/symptoms and risk factors and intent to call 911 from 2001-2012.

Figures 7 and 8 shows that the analysis for change in trend of knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke indicates that there was a significant upward trend in the level of knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke. Chi-square for trend indicates that overall, there has been significant upward trend in improvement for knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke or heart attack, p for trend <0.001.

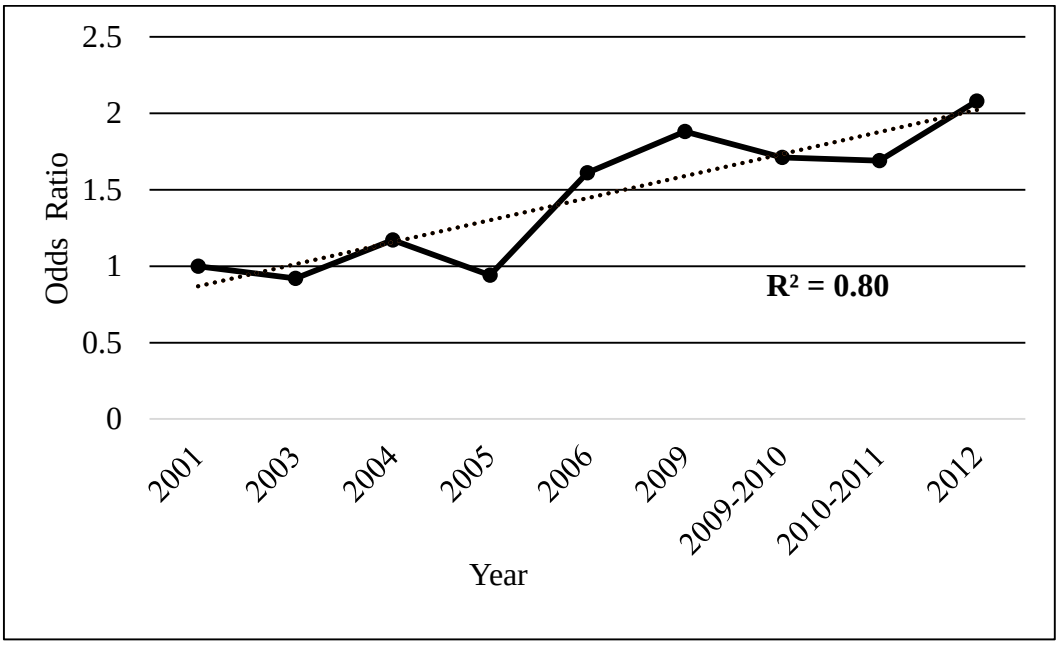

Figure 7. Changes in level of knowledge of stroke signs and symptoms from year to year (2001 to 2012).

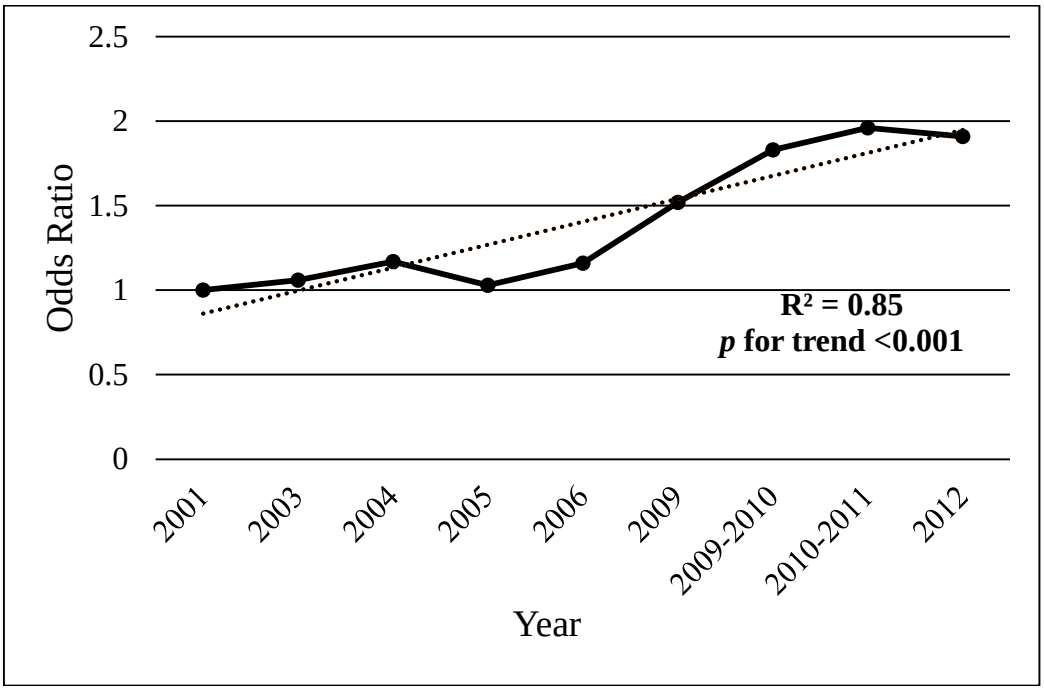

Figure 8. Year-to-year changes in trends of intent to call 911 in the event of a heart attack or stroke from 2001–2012.

Table 11 is a summary of the year to year proportion of respondents who had moderate to adequate knowledge of the signs and symptoms of stroke and also responded that they will call 911 in the event of a stroke or heart attack. Except for the year 2005 where there was a decline in the proportion of respondents with moderate to adequate knowledge of the signs and symptoms of stroke and intend to call 911 in the event of a stroke or heart attack, there was a steady year-to-year increase in the proportion of adequate knowledge of stroke signs and symptoms and intent to call 911 from 2001 to 2012.

Table 11

Proportion of Respondents by Year With Moderate to Adequate Knowledge of Stroke and/or Intent to Call 911 in the Event of a Stroke

Year (*n*)	Knowledge of signs and symptoms (%)		Action in the event of a stroke (%)	
	Moderate to adequate	Low to none	Call 911	Do something else
2001 (921)	82.2	17.8	84.9	15.1
2003 (901)	82.3	17.7	85.8	14.2
2004 (1850)	84.8	15.2	87.4	12.6
2005 (927)	81.0	19.0	86.0	14.0
2006 (903)	88.0	12.0	88.0	12
2009 (908)	90.3	9.7	89.6	10.4
2009-2010 (1268)	88.7	11.3	91.5	8.5
2010-2011 (1031)	88.8	11.2	92.3	7.7
2012 (1001)	88.5	11.5	91.6	8.4

Summary

The sections presented the findings from the analysis of the data. Results showed that respondent's, socio-demographic, economic and lifestyle factors were associated with their knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke. In addition, respondent's lifestyle and cardiovascular disease history in addition to knowledge of cardiovascular disease signs and symptoms significantly predicted their level of knowledge of stroke signs and symptoms. In the multivariate model, respondent's age and educational level were the significant independent predictors of knowledge of stroke signs and symptoms. Similarly, age, sex and knowledge of stroke signs and symptoms were significant independent predictors of intent to call 911 in the event of a heart attack or stroke. Finally, there was a significant upward trend in the level of knowledge of stroke signs and symptoms and intent to call 911 in the event of a heart attack or stroke.

The next chapter presents discussion of the results presented in this chapter. It starts off with an introduction, then interpretation of the findings in the context of this work and also prior and/or similar work. Next is a presentation of the limitations and challenges encountered in the course of this study. Finally recommendations and implications for positive social change in addition to conclusion(s) are presented.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

Summary of Purpose of the Study

This project was conceived with the aim of determining predictors of knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke. This study involved the use of archived data collected as part of REACH 2010 and subsequent REACH U.S. survey among African Americans on the southeastern coast of South Carolina. It was a longitudinal cross-sectional study design, as it incorporated nine sets of data collected over a period of 11 years from the same geographical area. The study sample was weighted on multiple parameters to ensure that the sample was closely representative of the African American population of the state.

Prevention of stroke and stroke-associated disability and mortality is reliant on risk factor modification and use of the "clot-bursting" drug (tissue plasminogen activator or tPA). One of the goals of an educational campaign is to improve knowledge of stroke risk factors, symptoms, and signs of stroke in order to improve their modification in addition to increasing the number of patients who are potentially eligible to be treated with tPA. Only patients who make it to the emergency room within 3 hours post stroke are eligible to receive tPA (Go et al., 2013; Malek et al., 2013). In this study, the overall aim was to identify predictors of knowledge of stroke signs and symptoms; therefore, I sought to identify potential areas for targeting stroke education to maximize effectiveness. Second, there were assertions that level of knowledge does not improve intention to call 911 (Mikulik et al., 2011; Skolarus et al., 2013). Thus, apart from identifying general predictors of knowledge of stroke signs and symptoms, this study also

sought to test the hypothesis that level of knowledge of stroke signs and symptoms is a predictor of intent to call 911 in the event of a heart attack or stroke, with a view to recommending that health education target improvement in knowledge of stroke signs and symptoms. Further, the study had a secondary goal of determining whether knowledge of other cardiovascular disease (coronary heart disease) symptoms would be associated with knowledge of stroke signs and symptoms.

Summary of Key Study Findings

The results from this study reveal that a majority of respondents were female, employment level was significantly below national levels, and slightly over half of those who reported their household income level, were below the poverty level of < $25,000 annual household income for a family of four. The proportion of smokers closely mirrored that reported for the general population (Jacobs et al., 2014), although it was slightly lower in this population at 20.7%. Respondents with diabetes and high cholesterol exhibited a positive attitude toward managing their diseases. The proportion of obese or overweight individuals in this sample was similar to the general population at about 70%, with current estimates indicating that two-thirds of the American population are overweight or obese (Ogden et al., 2014). A worrisome finding was that a number of respondents did not appropriately recognize some of the subtle signs and symptoms of stroke and heart attack. For instance, 31% thought trouble seeing in one or both eyes was a symptom of heart attack, while, on the other hand, 42.5% thought chest pain or discomfort was a symptom of stroke. While the response in both cases is to call 911, inaccurately recognizing a subtle sign might affect the urgency with which help is sought. In a univariate analysis, multiple factors including education, household income level,

age of respondents, and employment status were among the predictors of knowledge of signs and symptoms of stroke. Other factors that predicted level of knowledge of stroke signs and symptoms were obesity risk factors, respondent's management of diabetes, HPB status, and dietary habits. Finally, in both univariate and multivariate analysis, knowledge of stroke signs and symptoms was predicted by the respondent's knowledge of other cardiovascular disease. Further, knowledge of symptoms and signs of stroke and other cardiovascular diseases was a significant independent predictor of intent to call 911 in the event of a stroke or heart attack.

Interpretation of Findings

Relation of Findings to Current Knowledge and Literature

This study is the first of its scale (sample size wise) to be conducted among the nonmilitary African American population in the state of South Carolina. The findings of this study are in agreement with a number of similar studies but stand in contrast to those of other studies that have examined the same or similar questions in different populations and geographical regions of the United States. The level of knowledge of stroke signs and symptoms in this study was 86.1%, which was similar to the level of knowledge of signs and symptoms of heart attack (82.1%) and also similar to the proportion of respondents (88.6%) who said that they would call 911 in the event of a stroke or heart attack. Among respondents in this study, over the approximately 11-year period in which data for this study was collected, moderate to adequate knowledge of stroke in this population ranged from 81.0% to 90.3%. The knowledge level between 2001 and 2005 was 81.0% to 84.8%, which was significantly higher than was reported from a study in another region of the country. In that study, correct knowledge of at least one sign or symptom of stroke

rose from 48% in 1997 to 68% in 2000 and stayed the same between 2000 and 2005 (Kleindorfer et al., 2009), a period similar to that referenced earlier. Furthermore, except in 2005, there was a steady year-to-year increase in the proportion of respondents with moderate to adequate knowledge of signs and symptoms of stroke (Table 11). This runs contrary to the prior published longitudinal cross-sectional study that reported no increase in level of knowledge from 2000 to 2005 (Kleindorfer et al., 2009).

In this current study, the level of education for respondents was one of the predictors of level of knowledge of stroke signs and symptoms, with respondents who reported having a college level of education being the least likely to have low to no knowledge of stroke signs and symptoms. This findings support those of two separate studies carried out among the South Carolina Hispanic and veterans populations. In that study, it was reported that Hispanic respondents with high English literacy skills and veterans with a high school or higher level of education were significantly more likely to accurately recognize two or more signs and symptoms of stroke (Ellis & Egede, 2008a, 2008b; Ellis et al., 2009). In a study among the Spanish general public, about 62.5% of respondents were able to correctly name four or more signs and symptoms of stroke (Lundelin et al., 2012). This number is similar to that observed from further secondary analysis within this study and is thus supported by it.

In this study, overall, about 88% of respondents stated that they would call 911 in the event of a stroke or heart attack. This number's average over the years ranged from a low of approximately 85% in 2001 to a high of 92% in the 2010–2011 survey. Again, a steady rise in intent to call 911 in this population is a positive development, as intent to call 911 seems to rise with the level of knowledge of stroke signs and symptoms. In a

similar study conducted among patients with a prior history of stroke, the proportion of respondents who would call 911 was over 80% overall, ranging from 81.35% among non-Hispanic Blacks to 84.4% among Hispanics (Ellis & Egede, 2008a). This finding is in contrast with findings from other studies that documented no improvement in the intent to call 911.

With regard to socioeconomic factors being a predictor of stroke knowledge and intent to call 911, this study did not find an independent association. This finding is not totally surprising, as educational level is an element of socioeconomic factors and a partial determinant of income level. Adjusting for this in a multivariable model is likely to affect the fitness of the model. In addition, in a recently published study, 90% of respondents said that they would call 911 in the event of a stroke (Alkadry et al., 2005). Their findings were supported by this study, which found that an average of 88% of respondents would call 911 in the event of a stroke. Finally, it was noted that intent to call 911 was highest among the younger age group (18–39) and lowest among the older age group (65 and above). This supports findings from a recently published study conducted in Spain (Ludelin et al., 2012). The study authors reported that while a total of 81.1% of their respondents said that they would call 911 in the event of a stroke, the subgroup analysis indicated that the proportions were 85%, 80%, and 70% among female respondents ages 18–44, 45–64, and 65 and older, respectively, and about 85%, 78% and 75% among male respondents of similar age distribution (Lundelin et al., 2012).

In this study, the independent determinants of adequate knowledge of stroke signs and symptoms were educational level and younger age, while the independent determinants of intent to call 911 were age, sex, and knowledge of stroke signs and

symptoms. These findings support those from multiple studies that indicated that respondents who were aware of stroke signs and symptoms were more likely to call 911 in the event of a stroke (Miller, King, Miller, & Kleindorfer, 2007; Mullen Conley et al., 2010; Skolarus et al., 2013; O. Williams et al., 2012; Olajide Williams & Noble, 2008). But the findings were in contrast to those of studies that have reported that increasing knowledge of stroke symptoms through stroke education did not result in any appreciable improvement in the level of intent to call 911.

Interpretation of Findings in Relation to Conceptual Framework

The theoretical framework for this study was the social ecological theory. It captures how different layers of environmental and personal interaction affects individuals, their health and health decisions (Centers for Disease Control and Prevention, 2011, 2013c). The findings from this study showed that components of individual level factors (age and sex) as described by the social ecological theory were determinants of level of knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke. Furthermore, societal level factors such as educational achievement was shown to be an independent predictor of level of knowledge of stroke signs and symptoms in this study. In univariate models, policy level factors such as annual household income and knowledge/awareness of an available health communication program were associated with knowledge level. Other individual level factors like obesity, attitude towards disease and experiential factors like a past history of diabetes, stroke, or heart attack were all univariate determinants of knowledge of stroke signs and symptoms. Finally, knowledge of signs and symptoms of stroke was an independent predictor of intent to call 911. Having an adequate knowledge of stroke

could occupy different layers of the theoretical framework. For instance if the hospital where a patient was treated has a policy of providing stroke education, it become an organizational factor influencing knowledge. On the other hand, if the local or national health authority develops and implements a policy that mandates stroke education post stroke or at a particular age, that becomes a public policy factor or level of interaction. Finally, as is usually occurs with most patients and their relatives, doing research and increasing ones level of knowledge of stroke is an individual or personal level factor. This study was not designed to determine at what level of the theoretical framework the interactions were taking place. But some of the factors considered and presented here fall in one or more category of level of interaction in the social ecological theoretical model (figure 2).

Limitation of the Study

While this study utilized a large sample size and as such is robust to most errors and biases related to inadequate sample size, it has a few of limitations that are worth summarizing here. One limitation is with regards to the data itself; which showed mild difference in the structure and content of the general arrangement of the questionnaire and the questions. But this did not affect the questions that were applicable to the core of this study. Further, the suggested options for response like “yes” or “no” were alternated from questions to questions and it is not clear how this might have affected the flow of responses from question to question. While it is unclear how this might have actually affected responses, it was in itself a good way to ensure that respondents were putting

thoughts into their responses and pay attention to the questions and their subsequent responses.

This study exclusively focused on African Americans which is the population of interest. While this is not traditionally a limitation in itself, it means that conclusions from this study can only be generalized to African Americans and might not be applicable to other racial/ethnic groups. Finally, while the data was treated longitudinally, this study was repeated cross-sectional longitudinal study. This is because there is a good probability that a respondent was surveyed multiple times which creates an aging effect on responses. Thus, while some respondents were being surveyed once in each new survey, the response of others might be affected by the fact that they have had the same survey multiple times. The design of the survey in addition to the fact that the questionnaire has been validated through similar repeated cross-sectional studies in the BRFSS national surveys, the validity of the findings of this study is not considered to be significantly impacted.

Recommendations

This study has produced some important finding that could be the basis for a number of public health related and further research recommendations. These recommendations touch on all the levels and layers of interaction depicted in by the social ecological theory. As noted in the univariate analysis, respondents who were actively engaged in managing their health and risk factor profiles were more likely to be knowledgeable of stroke signs and symptoms. Thus suggesting that having patients

actively involved in managing their cardiovascular health will be a useful way to improve knowledge of stroke signs and symptoms.

Taking advantage of every opportunity to provide cardiovascular and specifically stroke education should be a goal of every medical encounters. In this study, it was noted that individuals with a prior history of heart attack, angina, and other coronary heart disease symptoms were more likely to accurately recognize the signs and symptoms of stroke. This points to the necessity, of providing comprehensive stroke and stroke related education in the event of a hospital visit for other cardiovascular disease. Further, only about 21% of respondents stated that they were aware of an area health education program. This means that publicity around health education programs need to be improved.

It was also observed that lower educational status and older ages were associated with lower knowledge level and intent to call 911 in the event of a stroke. Both observations are troublesome because of two facts. Those with low educational status are less likely to have health insurance, more likely to be of low socioeconomic status, and more likely to develop stroke. Since this group have a lower level of knowledge of stroke signs and symptoms, it is recommended that stroke educational programs be geared towards this group in order to improve preventions and reduce stroke associated disability and death.

Implications for Positive Social Change

This study set out to determine the independent predictors of the level of knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke among African Americans in the state of South Carolina. The results of this study shows

that socioeconomic factors, educational level and age of respondents in addition to provision of health education are among the factors that could potentially affect adequate knowledge of stroke signs and symptoms and intent to call 911. Some social change implication of these findings are; (1) to increase the knowledge of stroke signs and symptoms among the elderly (65 years and older) who are more at risk for stroke, but according the findings of this study, were also more likely to have low to no knowledge of stroke. Further, a policy that encourages the teaching of stroke education in high schools and as part of formal teaching could help to improve knowledge in children and adolescents and increased the use of 911 in the event of a stroke in the elderly for instance (Morgenstern et al., 2007; Mullen Conley et al., 2010; Williams, DeSorbo, Noble, Shaffer, & Gerin, 2012; Williams & Noble, 2008). This is particularly important in light of the changing demographic of the US population and the fact that more children are being raised by their grandparents (Hank & Buber, 2009; Hayslip & Kaminski, 2005).

More health education programs such as diabetes and cardiovascular health management programs will need to be designed and implemented in the community. Furthermore, over 70% of respondents stated that they worry about having enough money to afford healthy foods. Policies that leads to the elimination of food deserts (area with shortage or unaffordable healthy foods) will be a good approach to improve cardiovascular and specifically stroke risk management. Provision of sidewalks and public or low cost gym membership are other aspect of social change that this study have highlighted with it results. This is because in a univariate model, knowledge of signs and

symptoms of stroke was highest among individuals who were either overweight or obese and these have a higher risk for stroke.

Conclusions

This study utilized archived dataset from the REACH 2010 and REACH U.S. survey to carry out a repeated cross-sectional study/secondary data analysis. With the aid of a set of hypothesis and research questions, this study sought to identify the factors that independently predicted knowledge of stroke signs and symptoms and intent to call 911 in the event of a stroke.

The study identified several factors that in a univariate model, independently predicted the knowledge of stroke signs and symptoms. In a multivariate model, educational level and age of respondents were the independent predictors of knowledge of stroke, while age, sex, and respondent's level of knowledge of stroke signs and symptoms were among the independent predictors of intent to call 911. Finally in a longitudinal analysis, the chi-square for trend showed a significant increase in the year-to-year level of knowledge of stroke signs and symptoms and intent to call 911. Thus in the overall conclusion socioeconomic factors, cardiovascular risk factors and history of cardiovascular diseases were among the predictors of level of knowledge of stroke signs and symptoms; and contrary to conclusions from other studies, knowledge of stroke signs and symptoms was a significant predictor of intent to call 911. This means more effort should be devoted to addressing impediments to improving knowledge of stroke signs and symptoms among African Americans in particular and the general population at

large. This will be a particularly cost effective and useful strategy for preventing stroke and its associated morbidity and mortality.

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Appendix A: Letter of Approval From Walden University Institutional Review Board

Gmail by Google

Hyacinth Hyacinth <hyacinth.hyacinth@waldenu.edu>

IRB Materials Approved - Hyacinth Hyacinth

IRB <IRB@waldenu.edu> Wed, Aug 27, 2014 at 4:17 PM
To: Hyacinth Hyacinth <hyacinth.hyacinth@waldenu.edu>
Cc: James Rohrer <james.rohrer@waldenu.edu>

Dear Mr. Hyacinth,

This email is to notify you that the Institutional Review Board (IRB) confirms that your doctoral capstone entitled, "Predictors of awareness of stroke risk factors, signs and symptoms and intent to call 911 among African Americans in South Carolina," meets Walden University's ethical standards. Since this project will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. Your IRB approval number is 08-27-14-0160571.

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the documents that have been submitted to IRB@waldenu.edu as of this date. This includes maintaining your current status with the university and the oversight relationship is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to the project staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 10 business days of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB materials, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the IRB section of the Walden web site:

http://researchcenter.waldenu.edu/Application-and-General-Materials.htm

You are expected to keep detailed records of your capstone activities for the same period of time you retain the original data. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKImdiQ_3d_3d

Sincerely,

Libby Munson

Research Ethics Support Specialist

Office of Research Ethics and Compliance

Email: irb@waldenu.edu

Fax: 626-605-0472

Phone: 612-312-1283

Office address for Walden University:

100 Washington Avenue South

Suite 900

Minneapolis, MN 55401

Appendix B: Letter of Support for Use of Data From Representative of Data Source

Gmail by Google

Hyacinth Hyacinth <hyacinth.hyacinth@waldenu.edu>

IRB Review

Jenkins, Carolyn <jenkinsc@musc.edu> Sat, Aug 23, 2014 at 11:35 AM
To: Hyacinth Hyacinth <hyacinth.hyacinth@waldenu.edu>, IRB <IRB@waldenu.edu>, James Rohrer <james.rohrer@waldenu.edu>
Cc: "Tucker, Pattie (CDC/CCHP/NCCDPHP)" <PJT1@cdc.gov>

On behalf of the REACH Charleston and Georgetown Diabetes Coalition, for which I serve as PI, I am releasing the REACH Survey data files to Hyacinth Hyacinth for his dissertation and then with approval by the Coalition, he may submit for subsequent publication in scientific publications. Please contact me if you have further questions or if you need additional information.

I am also copying Dr. Pattie Tucker at CDC so if the IRB has additional questions about data ownership, you may also contact her.

Regards,
Carolyn

Carolyn Jenkins, DrPH, APRN-BC-ADM, RD, LD, FAAN
Professor and Ann Darlington Edwards Endowed Chair
Director, Center for Community Health Partnerships and
Co-Director, SCTR Community Engagement Core and
PI for REACH Charleston and Georgetown Diabetes Coalition
Medical University of South Carolina
Phone: 843-792-4625
Cell: 843-697-9089
E-Mail: jenkinsc@musc.edu

From: Hyacinth Hyacinth <hyacinth.hyacinth@waldenu.edu>
Date: Friday, August 22, 2014 at 6:25 PM
To: Microsoft Office User <jenkinsc@musc.edu>, IRB <IRB@waldenu.edu>, James Rohrer <james.rohrer@waldenu.edu>
Subject: Fwd: IRB Review
[Quoted text hidden]

Appendix C: REACH 2010 Questionnaire

REACH 2010
Risk Factor Survey

Household Member Interview Questionnaire
2006

REINTRO

[IF SCREENER RESPONDENT IS SAMPLED FOR DETAILED INTERVIEW AND NO BREAK OCCURS BETWEEN SCREENER AND DETAILED INTERVIEW, SKIP TO CONSENT1.]

Hello, my name is [INTERVIEWER NAME]. I'm calling on behalf of the Centers for Disease Control and Prevention. We're conducting a study of [TARGET RACE] regarding health issues in your area.

19 CONSENT

Taking part is up to you. You don't have to answer any question you don't want to, and you can end the interview at any time. The interview takes a short time and any information you give me will be confidential. There are no risks or benefits to you for participating. In order to evaluate my performance, my supervisor may record and listen as I ask the questions. I'd like to continue now unless you have any questions.

1. CONTINUE WITH INTERVIEW

IF RESPONDENT REFUSES TO CONTINUE, EXIT THE INTERVIEW AND CODE THE CASE AS A REFUSAL. USERCODE E.RF

20 CDCPNUM

NOTE: CDCPNUM has been deleted.

22 GENHLTH

1. Would you say that in general your health is:

(PLEASE READ ALL)

1. Excellent
2. Very good
3. Good
4. Fair or
5. Poor

9. REF 7. DK

23 PHYSHLTH

2. Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?

(INTERVIEWER: **ENTER "0" FOR NONE**. RANGE 0-30, 77, 99)

NUMBER OF DAYS |___|___|

99. REF 77. DK

3.

24 MENTHLTH

Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?

(INTERVIEWER: **ENTER "0" FOR NONE**. RANGE 0-30, 77, 99)

NUMBER OF DAYS |___|___| [IF 2 and 3 = "0" GO TO 5]

99. REF 77. DK

25 POORHLTH

4. During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?

(INTERVIEWER: **ENTER "0" FOR NONE**. RANGE 0-30, 77, 99)

NUMBER OF DAYS |___|___|

99. REF 77. DK

26 MEDCOST

5. Was there a time during the last 12 months when you needed to see a doctor, but could not because of the cost?

1, YES

2. NO

9. REF 7. DK

27 CHECKUP

6. About how long has it been since you last visited a doctor for a routine checkup?

(READ ONLY IF NECESSARY. INTERVIEWER: "A routine checkup is a general physical exam, not an exam for a specific injury, illness, or condition.")

1. Within the past year (anytime less than 12 months ago)
2. Within the past 2 years (1 year but less than 2 years ago)
3. Within the past 5 years (2 years but less than 5 years ago)
4. 5 or more years ago
5. Never

9. REF 7. DK

28 DIABETES

7. Have you ever been told by a doctor that you have diabetes?

(READ IF NECESSARY: Diabetes is a disease in which blood glucose levels are above normal. The pancreas does not make enough insulin or does not use it properly to enable the body to use glucose for energy. This causes sugar to build up in your blood, which can lead to further health complications.)

IF RESPONDENT SAYS PRE-DIABETES OR BORDERLINE DIABETES, USE RESPONSE CHOICE 3.

1. YES [GO TO 7a]
2. NO [GO TO 7b]
3. NO, PRE-DIABETES OR BORDERLINE DIABETES [GO TO 7b]
9. REF 7.DK [BOTH GO TO 7b]

168 ONLPREG

7a. INTERVIEWER: IF FEMALE, ASK

Was this only when you were pregnant?

1. YES ° GO TO 8
2. NO ° GO TO 8
3. MALE ° GO TO 8

9. REF 7. DK [BOTH GO TO 8]

DIABWORR

7b. IF COMMUNITY = 26, ASK. ELSE, SKIP TO 10a.

How worried are you about developing diabetes in the next 10 years? Would you say you are very worried, somewhat worried, slightly worried, or not at all worried?

1. VERY WORRIED [GO TO 10a]
2. SOMEWHAT WORRIED [GO TO 10a]
3. SLIGHTLY WORRIED [GO TO 10a]
4. NOT AT ALL WORRIED [GO TO 10a]
9. REF 7.DK [BOTH GO TO 10a]

177 CHKHEMO1

8. A test for hemoglobin "A one C" measures the average level of blood sugar over the past three months. Have you ever had an "A one C" test?

1. YES ° GO TO 8a 2. NO ° GO TO 9

29 CHKHEMO2

8a. About how many times in the past 12 months has a doctor, nurse, or other health professional checked you for hemoglobin "A one C"?

INTERVIEWER:ENTER "00" FOR NONE. RANGE 0-77, 99.
ENTER "76" FOR "76 OR MORE"

NUMBER OF TIMES |___|___| IF NUMBER > 5, SKIP TO 8b. ELSE, SKIP TO 9.

99. REF 77. DK [BOTH GO TO 9]

CONFHEMO

8b. Just to confirm that I entered it correctly, I have [NUMBER FROM CHKHEMO2] times. Is that correct?

1. YES [SKIP TO 9]
2. NO [SKIP BACK TO 8a]

30 FEETCHK

9. About how many times in the past 12 months has a health professional checked your feet for any sores or irritations?

INTERVIEWER: ENTER "00" FOR NONE. RANGE 0-77, 99.

ENTER "76" FOR "76 OR MORE"

NUMBER OF TIMES |___|___| IF NUMBER > 24, SKIP TO 9a. ELSE, SKIP TO 10.

99.REF 77.DK [BOTH GO TO 10]

CONFFEET

9a. Just to confirm that I entered it correctly, I have [NUMBER FROM FEETCHK] times. Is that correct?

1. YES [SKIP TO 10]
2. NO [SKIP BACK TO 9]

31 EYEEXAM

10. When was the last time you had an eye exam in which your pupils were dilated? This would have made you temporarily sensitive to bright light.

READ ONLY IF NECESSARY

1. Within the past month (anytime less than 1 month ago)
2. Within the past year (1 month but less than 12 months ago)
3. Within the past 2 years (1 year but less than 2 years ago)
4. 2 or more years ago
5. Never

9. REF 7. DK

INSURE

10a. IF COMMUNITY = 26, ASK. ELSE, SKIP TO 11.

Do you have any kind of health care coverage, including health insurance, pre-paid plans such as HMOs, or government plans such as Medicare/Medicaid?

1. YES [GO TO 11]
2. NO [GO TO 11]

9. REF 7. DK [BOTH GO TO 11]

32 PREAM1

The next few questions are about exercise, recreation, or physical activities other than your regular job duties.

33 WALKTEN

11. In a usual week, do you walk for at least 10 minutes at a time for recreation, exercise, to get to and from places, or for any other reason?

1. YES 2. NO ° GO TO 14

9. REF 7. DK [BOTH GO TO 14]

12.

34WALKDAYS

How many days per week do you walk for at least 10 minutes at a time?

DAYS PER WEEK: |___|___| RANGE 01-07, 77, 99.

99. REF 77. DK

35 WALKHRS

13. On days when you walk for at least 10 minutes at a time, how much total time do you spend walking?

HOURS |___|___| RANGE 0-10, 77, 99 MINUTES |___|___|___|___| RANGE 0-600, 7777, 9999
IF TIME > 2 HOURS OR > 120 MINUTES, SKIP TO 13a. ELSE, SKIP TO 14.

9999. REF 7777. DK [BOTH GO TO 14]

13a. Just to confirm that I entered it correctly, I have [NUMBER/PERIOD FROM WALKHRS]. Is that correct? CONFWALK

1. YES [SKIP TO 14]
2. NO [SKIP BACK TO 13]

42 PREAM2

There are three categories of physical activity - light, moderate and vigorous. I will be asking you about your moderate and vigorous activities, even if you have included them in your previous answers. With moderate activities you have some increases in breathing and heart rate. With vigorous activity you have large increases in breathing and heart rate.

43 MODEXER

14. Now thinking about the physical activities that you do when you are not working, please tell me, In a usual week, do you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate?

1. YES 2. NO ° GO TO 17

9. REF 7. DK [BOTH GO TO 17]

44 MODEXDAY

15. How many days per week do you do moderate activities?

DAYS PER WEEK |___|___| RANGE 1-7, 77, 99
99. REF 77. DK

45 MODEXHRS

16. On days when you do moderate activities for at least 10 minutes at a time, how much total time do you spend doing these activities?

HOURS _|___|___| RANGE 0-10, 77, 99 MINUTES |___|___|___| RANGE 0-600, 7777, 9999
IF TIME > 2 HOURS OR > 120 MINUTES, SKIP TO 16a. ELSE, SKIP TO 17.

9999. REF 7777. DK [BOTH GO TO 17]

16a. Just to confirm that I entered it correctly, I have [NUMBER/PERIOD FROM MODEXHRS]. Is that correct? CONFMOD

1. YES [SKIP TO 17]
2. NO [SKIP BACK TO 16]

50 VIGEXER

17. In a usual week, do you do vigorous activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?

1. YES 2. NO ° GO TO 20

9. REF 7. DK [BOTH GO TO 20]

18. 51 VIGEXDAY
How many days per week do you do these vigorous activities?
DAYS PER WEEK |___|___| RANGE 1-7, 77, 99
99. REF 77. DK

19. 52 VIGEXHRS
On days when you do vigorous activities for at least 10 minutes at a time, how much total time do you spend doing these activities?
HOURS |___|___| RANGE 0-10, 77, 99 MINUTES |___|___|___| RANGE 0-600, 7777, 9999
IF TIME > 2 HOURS OR > 120 MINUTES, SKIP TO 19a. ELSE, SKIP TO 20.
9999. REF 7777. DK [BOTH GO TO 20]

19a. Just to confirm that I entered it correctly, I have [NUMBER/PERIOD FROM VIGEXHRS]. Is that correct? CONFVIG

1. YES [SKIP TO 20]
2. NO [SKIP BACK TO 19]

20. 58 SMOKE100
Have you smoked at least 100 cigarettes in your entire life?
INTERVIEWER: 5 PACKS = 100 CIGARETTES
1. YES 2. NO ° GO TO 24a
9. REF 7. DK

21. 59 SMOKEDAY
Do you now smoke cigarettes everyday, some days, or not at all?
1. EVERYDAY
2. SOME DAYS ° GO TO 23
3. NOT AT ALL ° GO TO 24a
9. REF 7. DK

22. 62 SMOKENUM
On the average, about how many cigarettes a day do you now smoke?
INTERVIEWER: 1 PACK = 20 CIGARETTES
ENTER "76" FOR "76 OR MORE". RANGE 1-77, 99
NUMBER OF CIGARETTES |___|___| ° GO TO 24a
99. REF 77. DK

23. 63 SMOKNM30
On the average, when you smoked during the past 30 days, about how many cigarettes did you smoke a day?
INTERVIEWER: 1 PACK = 20 CIGARETTES
ENTER "76" FOR "76 OR MORE". RANGE 1-77, 99
NUMBER OF CIGARETTES |___|___|
99. REF 77. DK

64 PREAFRT

These next questions are about the foods you usually eat or drink. Please tell me how often you eat or drink each one, for example, twice a week, three times a month, and so forth. Remember, I am only interested in the foods you eat. Include all foods you eat, both at home and away from home.

65 FRUITJUI

24a. How often do you drink fruit juices such as orange, grapefruit, or tomato?

READ ONLY IF NECESSARY: "Please respond in terms of times per day, per week, per month or per year."

INTERVIEWER: ENTER "555" FOR "NEVER" ° GO TO 25a

NUMBER OF TIMES: |___|___|___| RANGE 1-365, 555, 777, 999

999.REF 777. DK [BOTH GO TO 25a]

66 FRUITJU2

24b. FRUIT JUICE MODE

1. PER DAY
2. PER WEEK
3. PER MONTH
4. PER YEAR

REF DK

SKIP TO 24c IF NUMBER/PERIOD > 3 TIMES PER DAY OR
> 21 TIMES PER WEEK OR
> 90 TIMES PER MONTH OR
> 1095 TIMES PER YEAR OR

ELSE, SKIP TO 25a.

CONFJUI

24c. Just to confirm that I entered it correctly, I have [NUMBER/PERIOD]. Is that correct?

1. YES [SKIP TO 25a]
2. NO [SKIP BACK TO 24a]

67 FRUIT

25a. Not counting juice, how often do you eat fruit?

READ ONLY IF NECESSARY: "Please respond in terms of times per day, per week, per month or per year."

INTERVIEWER: ENTER "555" FOR "NEVER" ○ GO TO 26a

NUMBER OF TIMES: |___|___|___| RANGE 1-365, 555, 777, 999

999.REF 777. DK [BOTH GO TO 26a]

68 FRUIT2

25b FRUIT MODE

1. PER DAY
2. PER WEEK
3. PER MONTH
4. PER YEAR

REF DK

SKIP TO 25c IF NUMBER/PERIOD > 3 TIMES PER DAY OR
> 21 TIMES PER WEEK OR
> 90 TIMES PER MONTH OR
> 1095 TIMES PER YEAR OR

ELSE, SKIP TO 26a.

CONFFRUI

25c. Just to confirm that I entered it correctly, I have [NUMBER/PERIOD]. Is that correct?

1. YES [SKIP TO 26a]
2. NO [SKIP BACK TO 25a]

69 GREENSAL

26a. How often do you eat green salad?

READ ONLY IF NECESSARY: "Please respond in terms of times per day, per week, per month or per year."

INTERVIEWER: ENTER "555" FOR "NEVER" ○ GO TO 27a

NUMBER OF TIMES: |___|___|___| RANGE 1-365, 555, 777, 999

999.REF 777. DK [BOTH GO TO 27a]

70 GREENSA2

26b GREEN SALAD MODE

1. PER DAY
2. PER WEEK
3. PER MONTH
4. PER YEAR

REF DK

SKIP TO 26c IF NUMBER/PERIOD > 2 TIMES PER DAY OR
> 14 TIMES PER WEEK OR
> 60 TIMES PER MONTH OR
> 730 TIMES PER YEAR OR

ELSE, SKIP TO 27a.

CONFGREE

26c. Just to confirm that I entered it correctly, I have [NUMBER/PERIOD]. Is that correct?

1. YES [SKIP TO 27a]
2. NO [SKIP BACK TO 26a]

71 POTATOES

27a. How often do you eat potatoes not including French fries, fried potatoes, or potato chips?
READ ONLY IF NECESSARY: "Please respond in terms of times per day, per week, per month or per year."

Interviewer: ENTER "555" FOR "NEVER" ◦ GO TO 28a

NUMBER OF TIMES: |___|___|___| RANGE 1-365, 555, 777, 999

999.REF 777. DK [BOTH GO TO 28a]

72 POTATO2

27b. POTATOES MODE:
1. PER DAY
2. PER WEEK
3. PER MONTH
4. PER YEAR

REF DK

SKIP TO 27c IF NUMBER/PERIOD > 1 TIMES PER DAY OR
> 7 TIMES PER WEEK OR
> 30 TIMES PER MONTH OR
> 365 TIMES PER YEAR OR

ELSE, SKIP TO 28a.

CONFTATO

27c. Just to confirm that I entered it correctly, I have [NUMBER/PERIOD]. Is that correct?

1. YES [SKIP TO 28a]
2. NO [SKIP BACK TO 27a]

73 CARROTS

28a. How often do you eat carrots?
READ ONLY IF NECESSARY: "Please respond in terms of times per day, per week, per month or per year."

INTERVIEWER: ENTER "555" FOR "NEVER" ◦ GO TO 29a

NUMBER OF TIMES:_ |___|___|___| RANGE 1-365, 555, 777, 999

999.REF 777. DK [BOTH GO TO 29a]

74 CARROT2

28b CARROTS MODE:
1. PER DAY
2. PER WEEK
3. PER MONTH
4. PER YEAR

REF DK

SKIP TO 28c IF NUMBER/PERIOD > 1 TIMES PER DAY OR
> 7 TIMES PER WEEK OR
> 30 TIMES PER MONTH OR
> 365 TIMES PER YEAR OR

ELSE, SKIP TO 29a.

CONFCARR

28c. Just to confirm that I entered it correctly, I have [NUMBER/PERIOD]. Is that correct?

1. YES [SKIP TO 29a]
2. NO [SKIP BACK TO 28a]

75 VEGETABL

29a. Not counting carrots, potatoes, or salad, how many servings of vegetables do you usually eat?

EXAMPLE: A SERVING OF VEGETABLES AT BOTH LUNCH AND DINNER WOULD BE TWO SERVINGS.

READ ONLY IF NECESSARY: "Please respond in terms of times per day, per week, per month or per year."

INTERVIEWER: ENTER "555" FOR "NEVER" º GO TO 30

NUMBER OF TIMES: |___|___|___| RANGE 1-365, 555, 777, 999

999.REF 777. DK [BOTH GO TO 30]

76 VEGETAB2

29b VEGETABLES MODE:
1. PER DAY
2. PER WEEK
3. PER MONTH
4. PER YEAR

REF DK

SKIP TO 29c IF NUMBER/PERIOD > 2 TIMES PER DAY OR
> 14 TIMES PER WEEK OR
> 60 TIMES PER MONTH OR
> 730 TIMES PER YEAR OR
ELSE, SKIP TO 30.

CONFVEGE

29c. Just to confirm that I entered it correctly, I have [NUMBER/PERIOD]. Is that correct?

1. YES [SKIP TO 30]
2. NO [SKIP BACK TO 29a]

77 BPHIGH2

30. Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?

1. YES 2. NO º GO TO 32

9. REF 7. DK [BOTH GO TO 32]

78 BPMEDICN

31. Are you currently taking medicine for your high blood p ressure?

1. YES 2. NO

9. REF 7. DK

79 PREAM3

These next questions are about blood cholesterol, which is a fatty substance found in the blood.

80 BLOODCHO

32. Have you ever had your blood cholesterol checked?

1. YES 2. NO º GO TO 36a

9. REF 7. DK [BOTH GO TO 36a]

81 TOLDHI

33. Have you ever been told by a doctor or other health professional that your blood cholesterol is high?

1. YES 2. NO º GO TO 36a

9. REF 7. DK [BOTH GO TO 36a]

82 CHOLREDU

34. Are you now under the advice of a doctor to reduce your blood cholesterol or blood fat level?

1. YES 2. NO ° GO TO 36a

9. REF 7. DK [BOTH GO TO 36a]

83 CHMEDICN

35. Did the doctor...

35a. **. .** .prescribe medication to lower your blood cholesterol?

YES NO

9. REF 7. DK

83 CHMEDICN

35b. (Did the doctor...)

. . .provide you a low fat or low cholesterol diet?

1. YES 2. NO

9. REF 7. DK

83 CHMEDICN

35c. (Did the doctor...)

. . .refer you to a dietitian, nutritionist, or nurse to help you reduce the fat or cholesterol in your diet?

1. YES 2. NO

9. REF 7. DK

88 CVDFATRK

36. To lower your risk of developing heart disease or stroke, has a doctor advised you to...

36a. . . .eat fewer high fat or high cholesterol foods?

(READ IF NECESSARY: Heart disease is any disorder that affects the heart's ability to function normally.

A stroke is an interruption of the blood supply to any part of the brain.)

1. YES 2. NO

9. REF 7. DK

88 CVDEXRSK

36b. *(To lower your risk of developing heart disease or stroke, has a doctor advised you to...)*

. . .exercise more?

YES NO

9. REF 7. DK

88 DOCFRUVG

36c. *(To lower your risk of developing heart disease or stroke, has a doctor advised you to..*

. . .eat more fruits and vegetables?

1. YES 2. NO

9. REF 7. DK

91 CVDFAT02

37. To lower your risk of developing heart disease or stroke, are you ...

37a. **. .** .eating fewer high fat or high cholesterol foods?

1. YES 2. NO

9. REF 7. DK

91 CVDEXR02

37b. *(To lower your risk of developing heart disease or stroke, are you ...)*
. . .more physically active?

1. YES 2. NO

9. REF 7. DK

91 CVDFVG01

37c. *(To lower your risk of developing heart disease or stroke, are you ...)*
. . .eating more fruits and vegetables?

1. YES 2. NO

9. REF 7. DK

94 CVDINFAR

38. Has a doctor ever told you that you had any of the following. . .

38a. **. .** .heart attack or myocardial infarction?

(READ IF NECESSARY: A heart attack or myocardial infarction occurs when an area of heart muscle dies or is permanently damaged because of an inadequate supply of oxygen to that area.)

1. YES 2. NO

9. REF 7. DK

94 CVDCORHD

38b. *(Has a doctor ever told you that you had any of the following. ..?)*
. . .angina or coronary heart disease?

(READ IF NECESSARY: Angina is a specific type of chest discomfort caused by inadequate blood flow through the blood vessels (coronary vessels) of the heart

94 CVDSTROK

38c. *(Has a doctor ever told you that you had any of the following. . ?)*
. . .stroke?

1. YES 2. NO

9. REF 7. DK

97 AGE_

38d. Interviewer: IF R IS THE SAME PERSON WHO ANSWERED THE SCREENER QUESTIONS, THEN SAY:
I know we collected some of this information earlier, but I just need to confirm this information here.

IF 35 <= AGE <= 120, THEN SKIP TO Q39. ELSE, IF 18 <= AGE <= 34, SKIP TO Q42a.
IF AGE = 777, 999, BUT AGE WAS GIVEN IN THE SCREENER, USE SCREENER AGE TO DETERMINE SKIP. IF AGE = 777, 999 AND AGE IS ALSO MISSING IN THE SCREENER, SKIP TO Q42a.

98 CVDASPRN

39. Do you take aspirin daily or every other day?

1. YES ºGO TO 41a 2. NO

9. REF 7. DK

99 ASPUNSAF

40. Do you have a health problem or condition that makes taking aspirin unsafe for you?

1. YES º GO TO 40a 2. NO º GO TO 42

9. REF 7. DK [BOTH GO TO 42a]

169 STOMCON

40a. Is this a stomach condition?

Interviewer: CODE UPSET STOMACH AS YES

1. YES º GO TO Q42a 2. NO º GO TO Q42

9. REF 7. DK

100 WHYASPAN

41a. Why do you take aspirin?. . .To relieve pain

1. YES 2. NO

9. REF 7. DK

100 WHYASPAN

41 b. (*Why do you take aspirin?)*

. . .To reduce the chance of a heart attack

1. YES 2. NO

9. REF 7. DK

100 WHYASPAN

41 c. (*Why do you take aspirin*?) . . .To reduce the chance of a stroke

1. YES 2. NO

9. REF 7. DK

103 PREAM4

Now I would like to ask you about your knowledge of the signs and symptoms of a heart attack and stroke.

106 HASYMP1

42. Which of the following do you think is a symptom of a heart attack. For each, tell me yes, no, or you're not sure.

42a. Do you think pain or discomfort in the jaw, neck, or back are symptoms of a heart attack?

1. YES
2. NO
3. NOT SURE 9. REF

106 HASYMP2

42b. Do you think feeling weak, lightheaded or faint are symptoms of a heart attack?

1. YES
2. NO
3. NOT SURE 9. REF

108 HASYMP3

42c. *(Do you think)* chest pain or discomfort *(are symptoms of a heart attack?)*

1. YES
2. NO
3. NOT SURE

9. REF

108 HASYMP4

42d. *(Do you think)* sudden trouble seeing in one or both eyes *(is a symptom of a heart attack?)*

1. YES
2. NO
3. NOT SURE

9. REF

110 HASYMP5

42e. *(Do you think)* pain or discomfort in the arms or shoulder *(are symptoms of a heart attack?)*

1. YES
2. NO
3. NOT SURE

9. REF

110 HASYMP6

42f. *(Do you think)* shortness of breath *(is a symptom of a heart attack?)*

1. YES
2. NO
3. NOT SURE

9. REF

112 STRSYMP1

43. Which of the following do you think is a symptom of a stroke? For each, tell me yes, no, or you're not sure.

43a. Do you think sudden confusion or trouble speaking are symptoms of a stroke?

1. YES
2. NO
3. NOT SURE

9. REF

112 STRSYMP2

43b. Do you think sudden numbness or weakness of face, arm, or leg, especially on one side are symptoms of a stroke?

1. YES
2. NO
3. NOT SURE

9. REF

114 STRSYMP3

43c. *(Do you think)* sudden trouble seeing in one or both eyes *(is a symptom of a stroke?)*

1. YES
2. NO
3. NOT SURE

9. REF

114 STRSYMP4

43d. *(Do you think)* sudden chest pain or discomfort *(are symptoms of a stroke?)*
1. YES
2. NO
3. NOT SURE
9. REF

116 STRSYMP5

43e. *(Do you think)* sudden trouble walking, dizziness, or loss of balance *(are symptoms of a stroke?)*
1. YES
2. NO
3. NOT SURE
9. REF

116 STRSYMP6

43f. *(Do you think)* severe headache without known cause *(is a symptom of a stroke?)*
1. YES
2. NO
3. NOT SURE
9. REF

118 FIRSTAID

44. If you thought someone was having a heart attack or a stroke, what is the first thing you would do:

PLEASE READ ALL

1. Take them to the hospital
2. Tell them to call their doctor
3. Call 911
4. Call their spouse or a family member, or
5. Do something else

9. REF 7. DK

HEPATITIS1

CATI: IF COMMNUMB NOT IN (11,17,19,20), SKIP TO QUESTION 45.

INTERVIEWER: THE FOLLOWING 4 QUESTIONS ARE RELATED TO HEPATITIS B AND HEPATITIS B VACCINE. IF THE RESPONDENT'S ANSWERS REFER TO 'HEPATITIS," CODE THE ANSWERS AS FOR "HEPATITIS B."

44A. The next few questions are about hepatitis B.

Have you ever had a blood test for hepatitis B?
1. YES
2. NO
7. DON'T KNOW/NOT SURE
9. REFUSED

44B. HEPATITIS2

Have you ever been told by a doctor, nurse, or other health professional that you have hepatitis B? Please choose one of the following answers: Yes, I have hepatitis B; Yes, I had hepatitis B but I do not have the infection now, or No, I have never had hepatitis B.

1. Yes, I have hepatitis B
2. Yes, I had hepatitis B but I do not have the infection now
3. No, I have never had hepatitis B
7. DON'T KNOW/NOT SURE
9. REFUSED

44C. HEPATITIS3

Has a doctor, nurse or other health professional ever discussed hepatitis B with you?

1. YES
2. NO
7. DON'T KNOW/NOT SURE
9. REFUSED

44D. HEPATITIS4

Are people who have hepatitis B at risk for liver cancer? Would you say yes or no?

1. YES
2. NO
7. DON'T KNOW/NOT SURE
9. REFUSED

44E. HEPATITIS5

Have you ever received the hepatitis B vaccine? This vaccine is given in three separate doses and has been available in the United States since 1991. It is recommended for people who may be exposed to the hepatitis B virus, such as health care workers or people whose households include someone with hepatitis B.

1. YES
2. NO
7. DON'T KNOW/NOT SURE
9. REFUSED

45. 119 FLUSHOT

During the past 12 months, have you had a flu shot?

1. YES 2. NO

9. REF 7. DK

46. 120 PNEUMVAC

Have you ever had a pneumonia vaccination?

1. YES 2. NO

9. REF 7. DK

47.

121 SEX

INDICATE GENDER OF RESPONDENT
ASK ONLY IF NECESSARY: "Just to confirm, are you male or female?"
1. MALE ◦ GO TO 52a 2. FEMALE 9. REF [GO TO 52a]

READ QUESTIONS 48 THROUGH 52 FOR FEMALES ONLY.

122 PREAM5

Now I have some questions about other health services you may have received.

123 HADMAM

48. A mammogram is an x-ray of each breast to look for breast cancer. Have you ever had a mammogram?
1. YES 2. NO ◦ GO TO 50
9. REF 7. DK [BOTH GO TO 50]

124 HOWLONG

49. How long has it been since you had your last mammogram?
READ ONLY IF NECESSARY

1. Within the past year (anytime less than 12 months ago)
2. Within the past 2 years (1 year but less than 2 years ago)
3. Within the past 3 years (2 years but less than 3 years ago)
4. Within the past 5 years (3 years but less than 5 years ago)
5. 5 or more years ago

9. REF 7. DK

125 HADPAP

50. A Pap smear is a test for cancer of the cervix. Have you ever had a Pap smear?
1. YES 2. NO ⁰ GO TO 52 9. REF 7. DK [BOTH GO TO 52]

126 LASTPAP

51. How long has it been since you had your last Pap smear?
READ ONLY IF NECESSARY

1. Within the past year (anytime less than 12 months ago)
2. Within the past 2 years (1 year but less than 2 years ago)
3. Within the past 3 years (2 years but less than 3 years ago)
4. Within the past 5 years (3 years but less than 5 years ago)
5. 5 or more years ago

9. REF 7. DK

127 HADHYST

52. Have you had a hysterectomy?
1. YES 2. NO

9. REF 7. DK

REACH

52a. IF COMMUNITY IN (02, 05, 07, 15, 10,16), SKIP TO 53. ELSE, IF COMMUNITY = 09, SKIP TO 52b. ELSE, ASK 52a.

Finally, I have just a few more questions about you and your household. Have you ever heard of a program in your area called [PROGRAM NAME]?

1. YES

LAWRENCE

52b. IF COMMUNITY = 09, ASK 52b. ELSE, SKIP TO 53.

Is your doctor located at the Greater Lawrence Family Health Center?
1. YES 2. NO

9. REF 7. DK

130 EDUCA

53. What is the highest grade or year of school you completed?
READ LIST ONLY IF NECESSARY

1. Never attended school or only attended kindergarten
2. Grades 1 through 8 (Elementary)
3. Grades 9 through 11 (Some high school)
4. Grade 12 or GED (High school graduate)
5. College 1 year to 3 years (Some college or technical school)
6. College 4 years or more (College graduate)

9. REF

54.	131 EMPLOY Are you currently. . .? PLEASE READ ALL 1. Employed for wages 2. Self-employed 3. Out of work for more than 1 year 4. Out of work for less than 1 year 5. Homemaker 6. Student 7. Retired, or 8. Unable to work 77. DK 99. REF
59.	148 HISPANIC Are you Hispanic or Latino? 1. YES 2. NO 9. REF 7. DK
60.	150 ORACE What one or more of the following would you say is your race? PLEASE READ ALL MARK ALL THAT APPLY 1. White 2. Black or African American 3. Asian 4. Native Hawaiian or Other Pacific Islander 5. American Indian or Alaska Native, or 6. Some other race ° GO TO 60b **60b.** OTHER SPECIFY_____ 151 ORACEOTH 9. REF 7. DK
	IF RESPONDENT IS NOT ELIGIBLE BASED ON RESPONSES TO HISPANIC AND ORACE, SKIP TO CLOSE AND TERMINATE INTERVIEW. USERCODE 70. **IF ONE RACE SELECTED IN 60, SKIP TO 62.** **IF MORE THAN ONE RACE SELECTED IN 60, GO TO 61.**

61.	152 RACE2 Which one of these groups would you say best represents your race? READ IF NECESSARY 1. White 2. Black or African American 3. Asian 4. Native Hawaiian or Other Pacific Islander 5. American Indian or Alaska Native 6. Other ° GO TO 61b 9. REF 7. DK 153 RACE2OTH **61b.** OTHER, SPECIFY_____ 9. REF 7. DK
62.	ASIA [ASK THIS ITEM ONLY IN COMMUNITIES TARGETING ASIANS—COMMNUMB IN SAMPLE FILE = 11, 17, 19, 20. IF ORACE NE 3, SKIP TO 62a] To what Asian group do you belong? READ RESPONSES IF NECESSARY. 01. Asian Indian 02. Cambodian 03. Chinese 04. Filipino 05. Japanese 06. Korean 07. Laotian 08. Thai 09. Vietnamese 10. Other Asian 77. DON'T KNOW 99. REFUSED **IF COMMNUMB=11 AND ASIA NE 2, THEN SKIP TO CLOSE AND TERMINATE INTERVIEW. USERCODE 70.** **ELSE IF COMMNUMB=19 AND ASIA NE 9, SKIP TO CLOSE AND TERMINATE INTERVIEW. USERCODE 70.**
62a.	PACISL **[ASK THIS ITEM ONLY IN COMMUNITIES TARGETING NATIVE HAWAIIAN/PACIFIC ISLANDERS— COMMNUMB IN SAMPLE FILE = 17, 20. IF RACE NE 4, SKIP TO 70]** To what Native Hawaiian / Pacific Islander group do you belong? READ RESPONSES IF NECESSARY. 1. Chamorro 2. Samoan 3. Tongan

	4. Other Pacific Islander 7. DON'T KNOW 9. REFUSED **IF COMMNUMB=20 AND ASIA NOT IN (2,7,8,9) AND PACISL NOT IN (1,2,3), SKIP TO CLOSE AND TERMINATE INTERVIEW. USERCODE 70.**
70.	OKBELONG **[ASK THIS ITEM IN COMMUNITY 16 ONLY. OTHERWISE, SKIP TO 62b.]** To which tribe do you primarily belong? READ RESPONSES IF NECESSARY. 1) Cherokee 2) Choctaw 3) Chickasaw 4) Creek 5) Seminole 6) Comanche 7) Kiowa 8) Osage 9) Cheyenne/Arapaho 10) Absentee Shawnee 11) Other 77) DON'T KNOW 99) REFUSED **[CATI: IF OKBELONG=11, SKIP TO OKBEOTH. ELSE, SKIP TO OKENROL]**
71.	OKBEOTH What is the name of that tribe? _____
72.	OKENROL In which tribe, if any, are you primarily enrolled? READ RESPONSES IF NECESSARY. 1) Cherokee 2) Choctaw 3) Chickasaw 4) Creek 5) Seminole 6) Comanche 7) Kiowa 8) Osage 9) Cheyenne/Arapaho 10) Absentee Shawnee 11) Other

	12) None 77) DON'T KNOW 99) REFUSED **[CATI: IF OKENROL=11, SKIP TO OKENROT. ELSE, SKIP TO 62b.]**
73.	OKENROT What is the name of that tribe? _____

62b.	MARSTAT Are you…? PLEASE READ: 1 Married 2 Divorced 3 Widowed 4 Separated 5 Never married, or 6 A member of an unmarried couple 9 REFUSED

132 INCOMEA

55. Is your annual household income from all sources. . .

55a. . . . Less than $25,000?

1.YES ° GO TO 55b 2.NO ° GO TO 55e 9. REF 7. DK [BOTH GO TO 56]

133 INCOMEB

55b. . . . Less than $20,000?

1. YES ° GO TO 55c 2. NO ° GO TO 56 9. REF 7. DK [BOTH GO TO 56]

134 INCOMEC

55c. . . .Less than $15,000?

1. YES ° GO TO 55d 2. NO ° GO TO 56 9. REF 7. DK [BOTH GO TO 56]

135 INCOMED

55d. . . .Less than $10,000?

1. YES ° GO TO 56 9. REF 7. DK [BOTH GO TO 56]
2. NO ° GO TO 56

136 INCOMEE

55e. . . . Less than $35,000?

1. YES ° GO TO 56 9. REF 7. DK [BOTH GO TO 56]
2. NO ° GO TO 55f

55f. . . . Less than $50,000? 137 INCOMEF

1. YES ○ GO TO 56
2. NO ○ GO TO 55g

9. REF 7. DK [BOTH GO TO 56]

55g. . . . Less than $75,000? 138 INCOMEG

1. YES ○ GO TO 56
2. NO ○ GO TO 56

9. REF 7. DK [BOTH GO TO 56]

IF FIRST ADULT INTERVIEW HAS ALREADY BEEN COMPLETED, AND SECOND ADULT IS BEING INTERVIEWED, SKIP TO QUESTION 56.

140 WEIGHT

56. About how much do you weigh without shoes?
Interviewer: ROUND FRACTIONS UP
|___|___|___| WEIGHT IN POUNDS. RANGE 1-500, 777, 999

999. REF
777. DK

142 HTF, HTI

57. About how tall are you without shoes?
Interviewer: ROUND FRACTIONS DOWN
a. FEET |___|___| RANGE 0-8, 77, 99 **b.** INCHES |___|___| RANGE 0-72, 77, 99

99. REF 77. DK 99. REF 77. DK

BIRTHPLACE

57A. CATI: IF COMMNUMB NOT IN (11,17,19,20), SKIP TO QUESTION 58.

In what country were you born?

1. UNITED STATES (SKIP TO Q58)
2. CAMBODIA
3. CHINA
4. HONG KONG
5. KOREA
6. LAOS
7. MAINLAND CHINA
8. PHILIPPINES
9. SAMOA
10. TAIWAN
11. THAILAND
12. TONGA
13. VIETNAM
77. DON'T KNOW
99. REFUSED
Q57A2. OTHER, SPECIFY _____

YEARS _US

57B. For how many years have you lived in the United States?

____ YEARS (SKIP TO Q58)

777. DON'T KNOW/NOT SURE
999. REFUSED

YEAR_MOVED

57C. In what year did you move to the United States?

ENTER YEAR _____

7777. DON'T KNOW
9999. REFUSED

58. IF FIRST ADULT INTERVIEW HAS ALREADY BEEN COMPLETED, AND SECOND ADULT IS BEING INTERVIEWED, SKIP TO CLOSING STATEMENT.

145 COUNTIES

What county do you live in?

County:_____

***Will have a list for each site

99999. REF
77777. DK

94 ADDNUM

63. Other than [(XXX) XXX-XXXX], is there another telephone number used in this household? Please do not include cellular phones in your answer.

1. YES ➔ GO TO NUMPHONS
2. NO ➔ GO TO WO_SERVICE

9. REF 7. DK [GO TO WO_SERVICE]

64. 95 NUMPHONS

How many other telephone lines are there in the household?

1 additional line	➔	GO TO BIZPH1
2 additional lines	➔	GO TO NBUZPHN
3 additional lines	➔	GO TO NBUZPHN
4 or more additional lines	➔	GO TO NBUZPHN

9. REF 7. DK [GO TO WO_SERVICE]

65. 96 BIZPH1

Is that line used for business purposes only?

1. YES ➔ GO TO WO_SERVICE
2. NO ➔ GO TO WO_SERVICE

9. REF 7. DK [GO TO WO_SERVICE]

97 NBUZPHN

66. How many of these lines are used for business purposes only?

___|___ GO TO WO_SERVICE. RANGE 0-4, 77, 99
INTERVIEWER: ENTER "4" FOR "4 OR MORE".

99. REF 77. DK [GO TO WO_SERVICE]

67. WO_SERVICE

During the past 12 months, has your household been without telephone service for 1 week or more? Please do not include cellular phones in your answer.

(1) YES	
(2) NO	[SKIP TO CLOSE]
(7) DON'T KNOW	[SKIP TO CLOSE]
(9) REFUSED	[SKIP TO CLOSE]

68.
C11Q21_A

For how long was your household without telephone service in the past 12 months?

(ENTER THE DAYS, WEEKS, OR MONTHS THEN CONTINUE TO THE NEXT SCREEN TO ENTER TIME PERIOD.)

ENTER NUMBER __ __ __

(777) DON'T KNOW [SKIP TO CLOSE]
(999) REFUSED [SKIP TO CLOSE]

[CATI: IF DAYS ARE THE CHOSEN TIME PERIOD, RANGE IS 01-365;
IF WEEKS ARE THE CHOSEN TIME PERIOD, RANGE IS 01-52;
IF MONTHS ARE THE CHOSEN TIME PERIOD, RANGE IS 01-12]

69.
C11Q2

ENTER PERIOD
[CATI: ONE NUMERIC-CHARACTER FIELD]

(1) DAYS
(2) WEEK(S)
(3) MONTH(S)
(7) DON'T KNOW
(9) REFUSED

70.
C11Q21_CNF

Just to confirm that I entered it correctly, I have **[NUMBER/PERIOD].** Is that correct?

(1) YES
(2) NO **[SKIP BACK TO C11Q21_A]**

IF 2 ADULTS WERE SAMPLED FOR THE DETAILED INTERVIEW, AND ONLY ONE ADULT HAS BEEN INTERVIEWED, FOLLOW THESE PROCEDURES:

1) **TO INTERVIEW SECOND ADULT, SKIP BACK TO INVITE_B AFTER ADMINISTERING QUESTION C11Q21_CNF**

2) **SKIP THE FOLLOWING QUESTIONS FOR THE SECOND ADULT: 55-55g, 58, 63-70**

CLOSING STATEMENT:
Those are all the questions I have. I'd like to thank you on behalf of the Centers for Disease Control and Prevention for the time and effort you've spent answering these questions. If you have any questions about this survey, you may call my supervisor toll-free at 1-800-320-5658. If you have questions about your rights as a survey participant, you may call the Chair of the Abt Associates Institutional Review Board at 617-492-7100. Thanks again.

Appendix D: List of Abbreviations

NINDS	National Institute for Neurological Disorders and Stroke
WHO	World Health Organization
MONICA	MONItoring of trends and determinants in CArdiovascular disease
CDC	Centers for Disease Control and Prevention
rtPA	Recombinant tissue plasminogen activator
ESL	English as a second language
BEST	Basic English Skill Test
AHA	American Heart Association
BRFSS	Behavior and Risk Factor Surveillance System
REACH	Racial and Ethnic Approach to Community Health
ED	Emergency department
TIA	Transient ischemic attack
MRI	Magnetic resonance imaging
SCI	Silent cerebral infarct
FHS	Framingham Heart Study
REGARDS	REason for Geographic and Racial Disparity in Stroke
ER	Emergency room
CVD	Cardiovascular disease
AF	Atrial fibrillation
HDLc	High-density lipoprotein cholesterol
DSF	Delivery sequence file
GIS	Geographic information system

MUSC	Medical University of South Carolina
BMI	Body mass index
RQ	Research question
OR	Odds ration
CI	Confidence interval
HbA1C	Hemoglobin A One C
HBP	High blood pressure