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Measuring the Incidence and Prevalence of cardiovascular Diseases In NIgeria

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Abstract

Cardiovascular disease (CVD) is a major contributor to chronic diseases. High blood pressure and other modifiable cardiovascular risk factors are on the increase in Nigeria. The purposes of this study were to (a) explore associations among high blood pressure, social economic status, and health status awareness and (b) measure the incidence and prevalence of cardiovascular diseases in 3 states of Nigeria: Lagos, Ekiti, and Ondo. Participants (N = 368) were selected through stratification and randomization. Data were collected in person with the aid of validated questionnaire, which measured socioeconomic status as well as other variables in Lagos, Ado Ekiti, Ijesa-Isu, and Akure. Logistic regression and correlation analyses showed no significant difference in the regional incidence and prevalence of cardiovascular disease ($F(4, 362) = 1.23$, $p = 0.30$); and there was no significant relationship between the health status variable and the standard of living variable. Due to the fact that only 3 out of 36 states were sampled, this study is not generalizable and some other cardiovascular diseases modifiable risks factors that were not measured could have reacted differently in analysis. This study's results set precedence by promoting cardiovascular health. When disseminated, the results of this study will help advocate for a change process that curtails cost and decreases the general burden of CVDs in other, similar areas. Recommendations include measuring this incidence and prevalence of CVDs in all 36 states of Nigeria and exploring the interactions between culture, religion, health, and beliefs.

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Dedication

To my lovely mother whom I see as one of the greatest mothers that ever lived. Mother, I love you today and always. My mother lost her sight during the data collection phase of this study. May the Lord continue to comfort you about this detrimental loss that has changed your life in ways that were not expected. To my children, we have been through rough times. Only God knows why we suffered unnecessarily but He knows best and will not let it all be in vain, for we deserve better.

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Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

The Healthy People 2010 and 2020 initiatives are about improving the health of individuals and communities (U.S. Department of Health and Human Services [DHHS], 2015). This systemic approach to health used goals and objectives while considering the significant impact of health determinants. Because Nigeria is a developing country its health care system lags behind the standard health systems in the United States this approach constitutes a frame of reference. The Centers for Disease Control and Prevention (CDC) estimated that heart disease and stroke cost the United States $315 billion in 2005. In the year 2007, an estimated million people died of cardiovascular diseases in Nigeria. Behavioral, socioeconomic, and physical factors were found to have played significant roles in this mortality figure (Ameen, 2008). Lifestyle accounted for greater than 50% of all life-years lost prematurely to cardiovascular diseases (Shi, Ansari, McGuinness, Wasserman, & Johnson, 2013). This study measured lifestyle by way of using variables such as income, exercise, and use of drugs (alcohol and illicit drug use).

Background of Study

Cardiovascular diseases (CVDs), which are diseases of the myocardium and blood vessels, have been linked to lifestyle or habits: smoking, poor diet, physical inactivity, and excessive alcohol use (Shi et al., 2013). There are many forms of the disease: ischemic heart disease, stroke, hypertensive heart disease, rheumatic heart disease, aortic aneurysm, cardiomyopathy, atrial fibrillation, congenital heart disease,

endocarditis, peripheral artery disease, heart block (1st, 2nd, 3rd degree), and ventricular fibrillation (Braunwald, 2013).

Statement of the Problem

The prevention of CVD has the highest priority objectives globally by a wide margin. Public health action on CVD and treatment is needed to prevent additional decades of global burden and disparities in health and healthcare costs (Labarthe& Dunbar, 2012). In 2003, Bracht (2012) endorsed the idea of prevention. Prevention was also validated in studies done by Green and Ottoson (2009) and Adedoyin, Mbada, Awofolu, and Oyebami (2005). Despite these scientific alerts, epidemiological data on CVDs were not available in developing countries because of the lack of data and research in the area (Adedoyin et al.2005). Data that could globally support claims were not available. Adedoyin et al. conducted a study in Nigeria on clinical participants who were diagnosed with CVDs between 1997 and 2001 and reported that 35% of the participants had heart failure while 32% were reported suffering from high blood pressure.

These articles suggest the lack of data on CVDs in Nigeria, a fact that has been documented since 1997. Despite the significance of this information, the gap continued as there were no data on the estimated incidence and prevalence of CVDs in Nigeria as of 2013. The variables that augment chronic diseases include lifestyle, socioeconomic status (SES), heredity, race, ethnicity, and health services (Green &Ottoson, 2009). Cardiovascular diseases are major contributors to chronic disease in the western world (Green &Ottoson, 2009). Even though the incidence of hypertension and other modifiable CVD risk factors is said to be on the increase in Nigeria, these data have not

been quantified objectively to reflect the estimated states/national numbers of the incidence and prevalence of CVDs in Nigeria's population.

A qualitative study was conducted in Nigeria on health promotion programs for CVD (Odusola et al., 2015). While this study offered no data on the incidence and prevalence rates in Nigeria, it expressed a significant increase in the rate of CVDs clinically in the population under investigation. The investigators suggested that factors such as alcohol abuse, physical inactivity, tobacco use, elevated cholesterol, high blood pressure, and diabetes were major contributors to the significant increase in CVDs (Odusola et al. 2015). Despite all the cited literature, a gap remains, and the lack of incidence and prevalence rates of CVDs in Nigeria continued until 2014 when this study was conducted.

Purpose of the Study

The purpose of this study was to understand the associations among high blood pressure, social economic status, and health status awareness in three states of Nigeria: Lagos, Ekiti, and Ondo. This quantitative study measured the incidence and prevalence of cardiovascular diseases while simultaneously promoting the cardiovascular health of the participant's areas of physical residence. This was fulfilled by calculating incidence and prevalence of the diseases in three populations of Nigeria using already collected data in hospitals and local government agencies in 2013. In addition, this study was trying to estimate those who had the disease (individuals with the highest risks factor) and those who had the disease without knowledge (highest risk factors) in specific populations. The estimations were determined by measuring heart rhythm using electrocardiogram devices

(PQRST waves), normal blood pressure (measured as < 120mmhg systolic and < 80mmhg diastolic), and normal pulse rate (60-100 pulse per minute), as well as looking into body mass—normal and abnormal—index (BMI). This quantitative way of collecting data was appropriate for a population that did not have a nationally established database of cardiovascular diseases.

Research Questions

This study sought to answer two research questions:

1. Were there significant differences in the incidence and prevalence of cardiovascular diseases among four populations?

    1. Pedestrians
    2. Vehicular commuters
    3. Okada commuters (Tricycle)
    4. Bikers

This research question was tested using the following hypothesis:

*H*01: $\mu 1 = \mu 2 = \mu 3 = \mu 4$ (means of populations 1, 2, 3, & 4).

*H*a1: $\mu 1 \neq \mu 2 \neq \mu 3 \neq \mu 4$ (means of populations 1, 2, 3, & 4).

2a. Was there a correlation between standard of living and the cardiovascular health of the populations, as determined by the dissertation questionnaire? This research question was tested using the following hypotheses:

2b. Was there a monotonic relationship between any two of the predictor's variables?

Research hypothesis:

*H*a2: There is a monotonic relationship between the two variables.

*H*02: There is no monotonic relationship between the two variables.

Hypothesis

The purpose of this study was to learn what proportion of the population suffers cardiovascular diseases (highest risks participants) in three age brackets: 20-40, 41-60, and 61 and above. I hypothesized that there would be no significant difference in the incidence and prevalence of CVDs among four populations: pedestrians, vehicular commuters, Okada commuters, and bikers. The study also looked into the location of participants' residences to see whether their SES affected their cardiovascular health. These factors formed the basis for the research questions and hypothesis as shown below.

Significance of the Study

There was no precedence for this study in Nigeria. In fact, there are no public health records that could indicate the incidence and prevalence of CVDs in Nigeria, her states, and territories. This study might assist Nigerians in looking at diseases from pathological points of view and changing specific behaviors to augment health as they relate to cardiovascular diseases.

This study looked at the incidence and prevalence of CVDs in three states of Nigeria. The results could contribute to the current data on CVDs. The data collected could assist by increasing the consistency of what is known in this area of science. It also filled some of the gaps in literature that have been missing. According to Given, Given, Champion, Kozaccik, and DeVoss (2003), there had been difficulty in the full utility of

CVD applications when they were being developed if the number of individuals in the population that suffer CVDs was not known.

Information about morbidity and mortality as it relates to CVDs come out of research of this and could help with programs of systematic prevention of these diseases. The results from this study are intended to help policy makers and stakeholders in Africa, and specifically in Nigeria, in planning health programs and interventions that are preventive at all levels to combat these diseases. Scientific approach to public health planning is an ideal approach to global interventions and needed applications that apply to most individuals and communities. This will promote cardiovascular health in primary, secondary, and tertiary modes of prevention. The literature reviewed helped with explaining the gaps in CVD issues with respect to Africa and particularly Nigeria. The prevention strategies of any disease, including CVDs, warrant the need of an accurate assessment of the number of the incidence and prevalence of CVDs in Nigeria. This will stand as the need assessment for the potential initiation of any intervention. Hence, this type of study is potentially significant towards an evidenced-based approach of health program planning which may invariably improve the social well-being of the population as a whole. This study has implications for positive social change. The concept of positive change in the well-being of individuals and communities is an ideology that is endorsed globally, and this study subscribed to and met that standard.

Theoretical Base

Some of the theories that impacted this study positively were the trans-theoretical change model, the human ecology, and the social cognitive theory. The trans-theoretical

change model analyzes if individuals are actually ready for the change before introducing any intervention. This approach cuts down on potential waste of resources for this study. As a result, I aligned this model's view and utilized the approach while interviewing the potential participants. The human ecology model applied to the field of epidemiology and sees an important characteristic of epidemiology in its ecology perspectives. This view that people are not perceived just as individual organisms was endorsed by this study. This background allowed the investigator to look deeply into the risks that are associated with CVDs in the population that was investigated using the assigned variables in the rural and the urban cities. This approach augments the assessment of CVDs along the lines of socioeconomic status. The third theory that really affected this study is the social cognitive theory. This theory played a major role in the data collection phase of this study. It assisted with the teaching and learning/prevention strategy of the research. The health belief model was used since it embraces the ideology of not scaring people into health, but engaging them in the idea of rewarding the participants into some healthy behaviors while simultaneously rewarding them with self-regulatory behaviors. This worked well for this study.

The variables that boost the development of cardiovascular mortality can be explained using many theories, one of which is the social cognitive theory (Albrecht, Fitzpatrick, & Scrimshaw, 2005). Even though this theory cannot prove a causal link, it can help to explain the association between the variables. For example, social inequalities and poverty have been documented as deterrents to public health (Albrecht et al., 2005). Social cognitive theory operates under the belief that healthy functioning is a result of

various interactions among behaviors, physiology, cognition, and the environment. According to this belief, self-efficacy is an achievable goal. It is also a belief that in order to achieve this goal, individuals need to have positive feelings toward themselves, and having this feeling will motivate them toward a positive change (Novick, Morrow, & Mays, 2008).

Self-efficacy could be seen as an embodiment of the social cognitive theory according to Albrecht et al. (2005). It was another one of those theories that helped explain the environmental interaction with the participants' behaviors (Albrecht et al., 2005). The self-efficacy theory sees behavior, physiology, cognition, and the environment as interacting and influencing one another and posits that individuals need to be able to control their own behaviors as opposed to being passive recipients of the environmental stimuli (Bandura, 2001; DiClemente& Peterson, 1994). Efficacy cognition would change in response to changing environmental stimuli (Locke, Spirduso, & Silverman, 2007). Behaviors such as smoking, bad dietary habits, excessive alcohol intake, chewing tobacco, and extreme poverty are some of the environmental related behaviors that could negatively influence the cardiovascular health of a population. Some of these behaviors were found in the populations that this study investigated. Hence, self-efficacy in these participants was related to the behaviors that promoted cardiovascular diseases (Locke et al., 2007). Equally important is the human ecology theory.

The human ecology model in the field of epidemiology notes an important characteristic of epidemiology in its ecologic perspectives. This is a view where people are not perceived as just individual organisms, but also as members of communities that

exist in a social context. Hence, the world is seen as a complex ecosystem where disease pattern varies greatly from one country to the other (Jekel& Elmore, 2007). This view helped to explain how behaviors that were part of the participants' community influenced the health of its members.

Heart disease is one of the five leading causes of death in America today and according to Friis and Sellers (2014), heart diseases are ranked high globally and are responsible for more deaths than other chronic diseases. Heart diseases, however, have modifiable risk factors. This means there are behaviors that individuals and communities can engage in that might lower their risk for these diseases drastically. Odusola et al. (2015) suggested that the incidence of hypertension and other modifiable CVD risk factors are on the rise. Their study did not have the data on the incidence and prevalence rates but expressed the significant increase in the rate of CVDs clinically in the population that was under their investigation. Odusola et al. suggested that factors such as alcohol abuse, physical inactivity, tobacco use, elevated cholesterol, high blood pressure, and diabetes were major contributors to the significant increase of CVD. This increase in CVD sufferers was described as a potential public health disaster if it was left unchecked. It has also been suggested that the epidemiological transition that is resulting in the increase of cardiovascular diseases was driven in part by dietary factors, lack of physical exercise, smoking, alcohol consumption, and psychological issues (Tibazarwa et al., 2009).

Hendricks et al. (2011) see CVDs as the leading contributors to the burden of diseases in low- and middle-income countries. The researchers then suggested that

strategies to implement preventions are lacking and recommended a program that could be implemented to reverse the trend.

Epidemiological data on CVDs are not available in developing countries (Adedoyin et al., 2005). A study was conducted in Nigeria on 1,104 participants that were already diagnosed with CVD between 1997 and 2001. The study found that 35% of the cases had heart failures while 32% of them were reported to have suffered from high blood pressure (Adedoyin et al., 2005).

Nature of the Study

The prevention of cardiovascular diseases was an identified need based on the problem statements of this study. The identified statements were developed based on extensive literature that was relevant, updated over the years to support the need for this research. This support included analysis and summary in the literature of how these diseases are currently affecting the population under investigation.

Quantitative data collection was very appropriate for a population that never had an established way of collecting medical data history. This quantitative research used 2013 hospital records of patients diagnosed with cardiovascular disease along with the records of the newly diagnosed in the targeted populations. The following cardiovascular health parameters were measured via questionnaire: heart rhythm (normal sinus rhythm/PQRST waves) using electrocardiogram devices; normal blood pressure (less than 120 systolic and less than 80 diastolic); normal pulse rate (60-100); and BMI calculations of participants. This study looked into the effects of economic status by exploring (a) the pedestrian, (b) other members of the population bikers, (c) those with

automobiles, and(d) other associations. This exploration helped reveal other existing relationships that some of the variables shared in relation to cardiovascular diseases within the specific populations of the participants.

A total sample size of 368 was selected through stratification and randomization from Lagos, Ekiti, and Ondo states of Nigeria. They had to meet the following criteria: not pregnant, able to understand the study process, and able to sign and understand an informed consent.

In order to promote a better understanding of the study process, Siegel and Lotenberg (2007) suggest developing strong communication strategies. Thus, at-risk behaviors and pertinent issues are better positioned in the minds of targeted audiences, making interventions more effective. Rapport was established with participants while explaining the study process prior to having them sign the consents. These engagements allowed the participants to understand the diseases and how they are catalytic and destructive toward living a healthy life. The idea that these diseases could cause premature death and their ability to cause permanent disability was explained to each participant.

I engaged the local leaders in the rural area and explained how empirical behavior research could promote the development of appropriate cardiovascular health programs. These populations are sometimes skeptical of ideas that are foreign to them. Engaging the leaders in screening for CVDs allowed me to conduct the investigation while simultaneously making the elders more comfortable with the goal, idea, and process of the study. Because of the lack of education of some of the participants, communicating

this project with the local leaders was essential. The participants were selected using random assignments (the national census and national registration data were not accessible due to election preparations). Hospital data and outpatient clinic data were collected and used for some of the calculations. Cardiovascular health was taught by explaining to the participants the associated risks and factors that are responsible for causing these diseases. Data were collected for the study using the parameters described above. IBM SPSS software (Version 22.0) was used for the data analysis, which included regression and correlation.

Definition of Terms

Alpha (α): (a) the maximum probability of a Type I error allowed in a statistical test. The level of $\alpha = 0.05$ is frequently used in most tests. (b) The level of internal consistency in an alpha reliability analysis is measured using α. The α is a conservative estimate of the test-retest correlation between a scale and a hypothetical parallel version (Elliot & Woodward, 2007).

Alternative (research) hypothesis (Ha): the hypothesis that the researcher is trying to support. For the alternative hypothesis, Ha might be $\mu a > \mu n$, where μ is the mean number.

Arterial pulse: determined by counting the pulsation per minute in the radial artery area at the wrist. Normal rate is 60 to 100 beats per minute in adults ("Arterial," n.d.).

Blood pressure measurements: determined by means of the cuff sphygmomanometer. This device has been calibrated in the past for the quantitative

measurement of arterial pressure in humans. The values obtained were taken to reflect the arterial blood pressure (Avolio, Butlin, & Walsh, 2010).

Chi square ($\chi 2$): a statistical test that determines the probability that two nominal variables, given the sample data, is "independent," (i.e., whether knowing one variable will help "predict" the other). The formula is where k is the number of "cells" (i.e., different combinations of the two variables), and Oi and E.I. are the observed and expected number of cases in the respective cells (Elliot & Woodward, 2007).

Coding: the process of translating research data (such as questionnaire responses) into consistent numerical codes for input into the computer system.

Confidence interval: In context of the mean of a variable, the interval is estimated with a given certainty (e.g., 95%) to contain the true mean.

Correlation: a measure of how well two variables predict each other. Correlation can take either the form of the Pearson product-moment correlation, which assumes interval data, or Spearman rank-order correlation, which assumes only ordinal data (Elliot & Woodward, 2007).

Cross tabulation: a table showing the relationship between two variables.

Dependent variable: This represents the characteristic of a participant that is of interest to the researcher. This is not possessed to an equal degree/same way by all participants and serves as the target to the researcher’s data collection efforts (Huck, 2012).

Electrocardiogram/EKG/ECG: The heart usually undergoes processes called depolarization and repolarization. During these processes, the heart generates electrical

currents and these produce the electrical tracing called an electrocardiogram using a monitoring device (Klabunde, 2012).

Incidence rate: the measure of a new number of cardiovascular disease occurrences within a particular time in the targeted population (Murray et al., 2002).

Independent variable: the variable used to predict a dependent variable (Huck, 2012). See dependent variable.

Indicator variable: a binary variable used to designate whether a case falls into a category or not. Usually, "1" denotes that the subject has the characteristic and "0" denotes that it does not.

Levels of measurement: Variables can be divided into four categories or levels of measurement. At the lowest level are nominal scales where the numbers are arbitrary. In ordinal (or monotonic) scaling, the measure increases or decreases with the number (IBM, 2013).

Missing data: This condition arises when data are not available or not applicable on one or more variables for one or more cases.

Normal sinus rhythm: Heart rhythm is normally controlled by sinus node at a rate of 60-100 beats/min; each P wave normally will be followed by QRS waves. Each QRS is preceded by a P wave. They are generated and driven by the spontaneous firing of pacemakers' cells of the sinoatrial node that is located in the posterior wall of the right atrium (Klabunde, 2012).

Normal systolic measurement: will be < 120mm Hg and diastolic will be < 80mm Hg (American Heart Association, 2015).

Null hypothesis (H0): the hypothesis where no statistical relationship or difference exists between two variables in the population. Hypothesis would be μ a = μ n.

Okada: three-wheeled motorcycle; cheaper than average vehicle in terms of cost, and could easily transport about two passengers. An Okada gets around easier in traffic congestion than average vehicles.

Population: the total groups (summed together), and the summation became the number that was used. If there would be generalization of study findings, this population's results are then used.

Predictor variable: the dependent variable.

Prevalence rate: the measure of cardiovascular diseases within the targeted populations over a period of a year (Murray et al., 2002).

Random sampling: a sample selected in a manner such that each element has the same probability of being picked from the population.

Regression analysis: a statistical procedure that attempts to predict a dependent variable from one or more independent variables. Regression requires interval or ratio data, although, in practice, it is mostly used with ordinal data (IBM, 2013).

Significance: the probability that some statistical phenomenon would happen by chance in a sample of a given size if no difference or relationship actually existed in the population and is called the significance of the study.

Statistical data: the compilation of objective information collected by using the observation principles of statistics (IBM, 2013).

Type I error: the error of incorrectly rejecting the null hypothesis (Ho) when it is in fact true; the probability of committing a type I error is denoted by the letter α in most study results. Type I error is not the result of an inappropriate application of a statistical procedure. Rather, this error occurs because of selection of a test that led to a false positive a certain percentage of the time. One can adjust the probability of false positives to one's liking, but doing so involves a trade-off against the probability of failing to accept the alternative hypothesis when it is in fact true (Elliot & Woodward, 2007).

Type II error: happens when the user incorrectly rejects or fails to reject the null hypothesis (Ho) when the alternative hypothesis (Ha) is in fact true. Type II error is not the result of an improperly applied statistical procedure. Rather, it is the result of the finite sensitivity of the test (Elliot & Woodward, 2007).

Variable name: a name used by the computer to identify a variable (Huck, 2012).

Assumptions

This study was subject to the following two assumptions:

1.The participants' responses to questions were true.

2.The variables were assumed to fit or deviate from the fixed typologies used for classifying CVDs.

Limitations

The fact that the sample size was not drawn from a national sample database was an impediment.

Scope and Delimitations

The selected population was a narrow segment of Nigeria's population. Nigeria has 36 states. The study participants were drawn out of three of the states. This was mainly because of the unrest in the country. The scope of this study did not include the measurements of some other variables. Variables such as blood cholesterol values, high blood glucose levels, and lipid and triglyceride measurements were not part of this study. The noninvasive measurements of the ankle arm index as a marker of peripheral arterial diseases was also not a measure in this research. These variables could have brought in other dimensions of reasoning into the study.

The instrument of data collection was called the dissertation questionnaire. The questionnaire was pretested even though it was not a requirement because of the nature of the study. In analyzing the data, the software that was used provided some buffering against potential biases. SPSS version 22.0 was used. The dissertation's questionnaire that was used for data collection in this study was designed by me. The reliability of the questionnaire could only be established after reproducing the study using similar instruments.

Summary and Transition

This quantitative study looked into the incidence and prevalence of cardiovascular diseases as well as the unique interactions noted among the variables in three different populations of Nigeria. The study was a result of the gaps noted in the extensive literature that was reviewed and a potential attempt in filling some of this gap. This was accomplished by selecting a total number of 368 participants through stratification and

randomization from three states of Nigeria. Participants had enough notification to decide if they wanted to be participants. Informed consents were obtained prior to the initiation of the study. The study used a prepared dissertation questionnaire for data collection and used theoretical concepts to guide the study phases. This study has no precedent and the literature review demonstrated the need for this study. The collected data were analyzed using the multivariable, analytic tools of SPSS (Version 22.0).

In order to answer the first research question, the participants were divided along their commuting preferences pedestrian, vehicular, okada (tricycle), and bikers for the purpose of answering the research questions. The results indicated that all the means of the groups were almost equal at alpha 0.05. $p = 0.30 > 0.05$ for the groups 1, 2, 3, 4. Hence, there were no noted differences among the group. This result was also validated by the ratios of the mean square being very close to 1.00, and the value of the $f(4,362) = 1.23$, $p = 0.30$. This directly answered the research, as there were no significant differences noted among the group. This was also validated by the ratios of the mean square being close to 1.00 and the value of *f* ratio. The group means were 2.25, 2.19, 2.13, 2.18, and 2.19. As a result, one can infer that there were no major differences among the means. Hence, the conclusion with this type of evidence was that there were no major differences among the group.

For the second research question (a & b), the research question answer for the monotonic relationship between any two of the predictor's variable:

The probabilities associated with predicted and actual outcome was summed up. This was done using the deviance -2LL statistics. Result showed blood pressure and ECG

had significant main effects on predicting cardiovascular diseases (8.0, 4.7). This analysis was done with the health outcome variable being dependent and blood pressure and ECG being the independent and predictor variables. The result showed that these variables were strong enough to be assigned with tasks and responsibilities that they performed for this study and its reported results.

The second part of the question was looking for the relationship between the health status variable and the annual income of the participants. The results showed that there was no significant relationship between the health status variable and the annual income of the participants. The Spearman's rho correlation coefficient was -0.08 of both variables. The matrix of this relationship for annual income of the participants/groups sig. (2-tailed) at 0.12, sample size was 367 (one incomplete for this analysis), 95% confidence interval that ranged from -0.18 to 0.03. This showed there was no significant relationship between the two variables, and the null was retained.

The incidence of a disease is a measure of risks. However, in some cities the data were not available to account for the duration of the diseases (this information was needed for the calculation). Also, some participants were not aware of having the highest risks factors for the diseases. Hence, point prevalence was calculated for those locations.

For the city of Akure in Ondo state of Nigeria, with the average population of 3,440,000, the disease reported for the 6 months was only 3,325 for ones that made it to the hospital. This gives a yield of 48 per 100,000 of the population. However, for the point prevalence the number was 577 per 1,000 of the population.

For the city of Lagos in Lagos state Nigeria, the point prevalence was 483 per 1,000 of the population. This was with an estimated population at the same point in time.

For the city of Ado Ekiti in Ekiti state of Nigeria, the incidence rate was 19,769 per 100,000 for 6 months among the age groups of interest. The point prevalence was 443 per 1,000 of the population. For the village of Ijesa-IsuEkiti in Ekiti state of Nigeria, the incidence rate was 21,590 per 100,000 of the population. The prevalence was 393 per 1,000 of the population.

Chapter2: Literature Review

Introduction

This is a quantitative study that looked into the incidence and prevalence of cardiovascular diseases as well as the unique interactions noted among the variables in three different populations of Nigeria. This study was a result of the gaps noted in the extensive literature that was reviewed and a potential attempt in filling some of this gap. Epidemiological theory stipulates that the ability to predict the impact of any intervention is critically dependent on the synthesis of all available/existing evidence. Using this information to estimate and follow affected populations or high-risk groups and individuals is important (Parry & Judge, 2005). Social and individual contributions to the development of CVDs have been well documented and the use of existing evidence assisted with teaching the participants preventive measures and the importance of weight and blood pressure controls on these diseases. This epidemiological principle guided the study. The existing evidence that showed the gap in the literature and associated theories that helped this study are discussed below in relation to the research questions.

The research questions were to see if there were significant differences in the incidence and prevalence of cardiovascular diseases in populations 1 (Pedestrians), 2 (Vehicular commuters), 3 (Okada commuters), and 4 (Bikers). It also tried to see if there was there a correlation between standard of living and cardiovascular health of the populations as determined by the dissertation questionnaire. In the process, the study looked at the variables to determine if there was a monotonic relationship between any two of the predictor's variables.

In an attempt to show the gaps in the literature as related specifically to this research and Nigeria, some studies stood out. These studies showed extensive lag in the data and research needed in the area of cardiovascular diseases.

One study by Ojikutu (2009) examined the prevalence of CVDs in Lagos State of Nigeria. This study was based on Nigeria records obtained from four local government areas of the state. Ojikutu's study found CVDs were on the increase and showed an increase in proportional mortality ratios in ages 60-70 and in the deceased workers of the private sector.

Langenberg, Shipley, Batty, and Marmot (2005) used a longitudinal study and reported an inverse association between adult height and coronary heart disease. These investigators believed that atherosclerosis and cardiovascular risk start earlier in life. This information was valuable towards the prevention of CVDs because of the potential impact of primary prevention teaching before the disease starts (Langenberg et al., 2005).

Equally important was the plausible causality chain that has been known to occur because of income inequalities and chronic diseases. Langenberg et al. (2005) showed the evidence that supported this claim in their study and successfully linked community socioeconomic inequalities to chronic health issues.

Theoretical constructs are essential tools for framing interventions. One construct that has been used successfully is the health belief model (Given et al., 2003). The health belief model can be used in developing interventions to help individuals in targeted populations. According to this theory, most behaviors are dependent on individuals' perceptions of susceptibility, severity, the benefits of taking action, and the cues to taking

action (Given et al., 2003). Since screening for chronic diseases is considered a measure of prevention of diseases, this theory helped explain why people may not seek preventive measures for themselves or family members. This theory stipulated that before seeking preventive measures people must generally believe that the disease of focus is serious, that it could put them at risk for unexpected death, and that screening them for the disease could save their lives (Jekel& Elmore, 2007). The health belief model helped guide this investigation in these regards.

This project sought to estimate the incidence and prevalence of CVDs in three populations in Nigeria. According to Anekoson (2013), Nigeria has an estimated population of about 148 million people. These numbers represent about 25% of Sub-Saharan Africa's population. This country, Nigeria, is bordered by the Gulf of Guinea, Cameroon, Benin, Niger, and Chad. Nigeria has more than 200 ethnic groups with three major tribes: Ibo (East), the Hausa (North), and the Yoruba (West). Agriculture is the dominant economic activity in terms of employment and linkages with the rest of the economy. Approximately 75% of Nigeria's land is arable, of which about 40% is cultivated (Anekoson, 2013).

Anekoson (2013) also found that the poverty index in Nigeria was high, and life expectancy, child mortalities, immunization coverage, contraceptive prevalence, access to improved drinking water, tuberculosis treatment success, hospital beds per population, among other issues were less if compared to the small state of Rwanda. Anekoson stated that these variables in Rwanda were better when compared with Nigeria. This comparison was even worse knowing that Nigeria and Rwanda have huge differences in

human and natural resources (favoring Nigeria); but despite that fact, Rwanda was determined to be better (Anekoson, 2013).

The literature reviewed contributed significantly to the current data and increased the consistencies in what is known in the area of cardiovascular diseases/science in Africa. Even though there have been difficulties in the full utility of the research applications when developing interventions (Given et al., 2003), global types of intervention and applications that will apply to most individuals and communities will make interventions more effective. Interventions are better when the entire information is specific to the targeted population. The model, Healthy People 2010 (DHHS, 2015), in America (designed for America with the significant portions of the goals met) will still be a good initiative for Nigeria in 2020. The infrastructure, the skills, and the communities were better prepared for health changes in America in 2010. This was why the public health 2010 initiative passed in America, and the system was able to move to goals for 2020. In Africa, and in Nigeria to be specific, where the system is still in its infancy, it will take more time to attain the goals of such initiatives. However, it was a good tool to steer this research. It took more effort and persistence to move this study forward in Nigeria.

The trans-theoretical model enacts changes in steps. This model analyzes if individuals are actually ready for the change before introducing any intervention (Given et al., 2003). The approach cuts down on potential waste of resources. Imposition of change on communities or individuals when they are not ready would be a waste. Hence,

the model assisted with helping to move the communities forward along the phases of this research process.

Gonin, Kadrofske, Schmaltz, Bastyr, and Vinik (2014) did a study on Q-T intervals and used prolongation of this interval as a diagnostic tool for the assessment of cardiac autonomic neuropathy in diabetes mellitus. This was used to evaluate alteration in cardiac sympathetic innervations by measuring the Q-T intervals. This study showed the importance of the electrocardiogram as a tool for measuring cardiovascular health (Gonin et al., 2014).

According to Martisa, Acharyab, Mandanac, Raya, and Chakrabortya (2012), using the P, QRS, T waves indicating the electrical activity of the heart, ECG is a good way of observing the electrical activities of the heart. These researchers used the principal components of a segmented ECG in their study and concluded that ECG could provide 98.11% levels of accuracy. These literatures cited were very relevant to this writer's study as they set precedence for the precision of some of the variables that were used for measuring cardiovascular and the incidence and prevalence of cardiovascular diseases in Nigeria.

Another risk factor for CVDs is obesity. Many individuals were observed to be obese and showed abnormal BMI results during the data collection phase of this study. The continuous increase in obesity has been projected as a global trend (Popkin, Adair, & Wen Ng, 2012). This trend is the result of global nutritional transition which is a phenomenon that has been attributed to obesity in developing countries. It is possible to have underweight, stunting, and micronutrient deficient individuals side by side with

increasing rates of obesity. This is what the global nutritional transition phenomenon is about (Popkin et al., 2012). This concept was said to be a result of poverty alleviation and food programs that showed these unforeseen consequences and is more apparent in environments where activities have changed from very active to sedentary type of lifestyles. There was an apparent shift in how humans eat and drink, notably in the past half-century in Africa. This shift happened to produce a situation of energy imbalances. Some of the communities became overweight and started experiencing obesity in populations that were previously very active. The activities they previously engaged in included pastoral livestock rearing, farming, and the provision of their nutrition (Popkin et al., 2012). Now, most have white-collar jobs and farming is only being done in the rural areas. This explained the shift from being very skinny and gaunt looking to varieties of body types.

Healthy interventions inform, elicit, facilitate, and maintain positive health practices (change) in large numbers of people (Novick et al., 2008). Individual factors have been known to contribute to the development of cardiovascular diseases (Lewis, Heitkemper, & Dirksen, 2000). As a result, factors such as smoking, drinking, physical inactivity, and poor dietary habits are behavioral in nature and fall into this modifiable factor category. Modifiable factors are variables that negatively affect the health of the heart but could be modified in ways that would not be hurting the heart. Health status that reflects elevated serum lipids, hypertension, diabetes mellitus, and stress are great contributors to development of these diseases (Lewis et al., 2000). Identifying and educating individuals and communities about these modifiable factors is the key to

preventing and maintaining these diseases at all levels of prevention. It was acknowledged that 85% of individuals in this study never had a serum level test drawn/done, and about 60% of them have never been tested for diabetes.

Based on this analysis, one can assume that there was a potential relationship between lower socioeconomic status, individual behavior, and cardiovascular diseases. There have not been many cardiovascular health-related studies done in Nigeria. This gap existed because of multifaceted issues, some of which were lack of knowledge, inadequate distribution of resources, lack of a well-organized health care system, and poverty, and corruption. These variables and more are impinging on any progress that could have been made in the healthcare sectors. Currently in Nigeria, time and resources are devoted to the treatment of elevated blood pressure. While this is good, hypertension is just one of the causes of cardiovascular diseases. Prevention of CVDs at all levels is the ideal goal. This was one of the reasons why the targeted populations in this study found the study beneficial. Presently, there are no databases for health history, primary physician care, health care coverage, and emergency health assistance for cardiovascular care in the populations.

Since there are currently no community or population interventions for cardiovascular health at all levels of prevention in Nigeria and there are few programs for high blood pressure treatments, knowing the estimate of those that suffer from this disease becomes very important. Measures that will prevent these diseases at the community level are better and more economical in that they will consider and be specific to the targeted populations. There are many ways to reach the targeted

communities. One way is through community organizing. Knowing the incidence and prevalence of CVD, targeting the specific populations, and reaching the populations through community organizing are attempts to bring change to the populations. Mobilization of the communities entails the use of educational programs along with interventions that will prevent CVDs at all levels. Community mobilization programs that have been used for cardiovascular disease prevention include training community members on heart attack warnings, performing CPR (cardiopulmonary resuscitation), along with what to do in cardiac emergencies (Green &Ottoson, 2009). All these promotional activities were the result of research. Hence, this writer's study has added to the body of knowledge for these populations.

Implementing health changes using community organizing and health programs continues to be a success (Green &Ottoson, 2009). Change can occur at several levels using the trans-theoretical change model for the change to be successful. The process includes individuals (the affluent and the poor); organizations (advocacy, consultation, professional networks, training of agency leaders and personnel); and government at local, state, and national levels. For the communities in this writer's study, the ecological perspective was used because it suggested multi-sectorial collaboration with the use of analytic and programmatic tools that integrate community programs. This approach incorporates all the elements of a community that are vital to its success. It involves building a coalition of mutual interest of all participants and using this interest to plan and implement programs (Green &Ottoson, 2009). The approach will promote healthy cities and healthy communities. This view was strongly endorsed by the 2010 Healthy

People initiatives (DHHS, 2015). This is an initiative that is still appropriate for Africa (Nigeria) due to the huge disparity in the level of development in the health care sectors here in the United States when compared to Nigeria.

The targeted segments of Nigerian population for this study were selected by way of exhaustiveness (measurability, reachability, and with substance) to prevent subject attrition and allow quantitative measurements (Siegel & Lotenberg, 2007). According to the CDC (2008), all people, and especially those at greater risk of health disparities, can achieve their optimal lifespan with the best possible quality of health in every stage of life. I shared this view and ideology since they favored the goals of cardiovascular diseases and prevention globally. Hence, cardiovascular disease prevention would be achieved through health promotion, prevention of disease, injury, disability, and general preparedness for new health threats (CDC, 2008).

The prevention of CVDs has the highest priority globally by a wide margin in terms of community-wide objectives (Bracht, 2012; Green &Ottoson, 2009). Some cardiovascular heart diseases belong to the category of diseases that could improve when the risks are targeted; this would improve community and population health significantly. The variables that augment chronic diseases include lifestyle, SES, heredity, race, ethnicity, and health services (Green &Ottoson, 2009). The investigator's area of interest is the adult population and cardiovascular health. Cardiovascular diseases have been a major contributor to chronic diseases in the adult population. A health promotion program that is evidence-based and one that promotes current and known knowledge of research findings has been utilized for public health social marketing programs in an

ongoing fashion. Marketing public health research helps disseminate the information to targeted audiences. The results of this investigation can assist these populations in terms of CVD prevention.

The literature reviewed showed the gaps that exist in the areas of what is scientifically known with regard to cardiovascular diseases in Nigeria. The report pointed out the lack of data needed in getting objective answers to research in Nigeria. Most of the studies cited how CVDs are taking up a significant portion of the resources that were geared towards health. These studies also noted that program and interventions that are evidenced based are ones that have produced results that actually decrease the burden of the diseases. Two studies stressed how CVDs are on the increase in Nigeria and again expressed their concerns on the absence of needed data. In conclusion, there are identified gaps in the knowledge of what is known about cardiovascular diseases in Nigeria. One way of trying to fill this gap is to measure the incidence and prevalence of cardiovascular diseases. This is how this study fits into what the area of research needs as it applies to Nigeria. This study is a quantitative research that used quantitative methods in describing, comparing the variables, and analyzing the results. The research questions were developed based on the extensive literature that was current and relevant. I was an outside observer of the data and used all possible means to minimize biases. The instrument used for data collection was pre-tested on 15 participants to see if the participants would be able to understand the questions asked of them, whether they were well written, clear, and inclusive enough to answer the research questions. The results showed that the instrument provided needed information and allowed me to move

forward in the research process. The reliability of this will be tested with repeated uses. With this background, this study proceeded to specifics of the research design.

Chapter 3: Research Method

Introduction

This quantitative study looked into the incidence and prevalence of cardiovascular diseases as well as the unique interactions noted among the variables in three different populations of Nigeria. This study was a result of the gaps noted in the extensive literature that was reviewed and a potential attempt in filling some of this gap. This study was set to measure the incidence and prevalence of cardiovascular diseases. It also tried to understand the association of high blood pressure, socioeconomic status, and health status awareness among participants. In the process, the study measured specific variables and simultaneously discovered relationships between these variables by measuring the strength of the relationship. This study also looked into which variables were of good quality and ones that would get the job done accurately. In order to do this, hypotheses were formed and research question were stated based on the identified gaps in literature.

Research Design and Approach

This study was quantitative and the methodology was utilized in getting answers for the research questions. According to Shaw, Huebner, Armin, Orzech, and Vivian (2009), cultural, languages, and socioeconomic status are major contributors to health literacy. Even though health literacy is a broad concept, it is viewed as the ability or inability to act on medical therapeutic instructions (Alberts et al., 2005). It is also a popular assumption that middle class populations have better health-seeking behaviors and health literacy than the lower economic class. Since this concept has claimed to be

pivotal and isolated as major factors in chronic disease screening, it then became a concept that this investigator incorporated into the process of screening for CVDs in conjunction with economic status. For instance, vehicular ownership in most of the populations under investigation was deemed as an indicator of economic status. Hence, anyone who commutes with his or her own vehicle was portrayed as belonging to the middle economic status or higher. Using this as a model for data collection augmented the process of data collection and validated the popular assumption that pedestrians are taking to belong to a lower economic group.

The study looked into the prevalence of cardiovascular diseases in pedestrians, commuters with automobiles, commuters with Okada, and bikers. It also explored any association among the measured variables.

Study Design/Methodology

The population was divided into groups of similar individuals and called strata. This was based on ages. Participants were adults ages 20-40, 41-60, and 61 and above. Logistic model of exposure tool of analysis was used for the sampling. This used the total population and the demographics to come up with the proportion that was needed in each stratum (three in total: 0.33, 0.33, 0.34). Random sampling was then done to choose the participants. Not all the individuals that showed up for this study became participants. The total number of selected participants was 368.

One of the objectives of this study was to calculate the incidence and prevalence. In order to calculate the prevalence one needs the incidence number and the duration of the disease in a steady-state situation (i.e., immigration = outmigration). When one

cannot get the needed data for this calculation, one can then resort to point prevalence. For this study, I could not specifically say how long some of the participants who showed high risks for the diseases have been carriers. Additionally, I could not tell if those who confirmed that they were diagnosed were surviving longer due to lack of data. In calculating point prevalence for this study, I calculated it for 6 months. For this calculation, hospital records from the selected populations (where available) were used. The prevalence estimated results included the undiagnosed for these participants and this study.

The incidence rate for this study was the number of new occurrences of CVDs over a period of 3 months as measured by electrocardiogram readings, arterial pulse measurements, and blood pressure. Equally important to the calculations were the CVD risk factors: chest pain, heart-Ds-Hx, abnormal pressure, activity in miles, abnormal ECG waves, smoking and history, and health status.

The following process was applied to the data for the study and selected from the records of discharged patients that were reviewed. In this study, 360 participants were stratified into three age groups: 20-40, 41-60, 61 and above. Random samples were then selected from each stratum to form the study sample.

According to Horton (2010), when stratified sampling is done properly the smallest sample size will be sufficient to conduct the study. This reason, along with the higher cost of a larger sample, influenced the sample size of 368. Cardiovascular health risk factors were measured with EKG P, QRS, S, T waves, normal blood pressure,

normal pulse rates, and BMI. This quantitative method of data collection was appropriate for a population that had never had a national data pool for cardiovascular diseases.

The research location included rural communities in Nigeria. This inclusive approach promoted cardiovascular health in the populations. The study utilized social marketing as a tool to promote the screening of health in the community. This approach has been used successfully (Green &Ottoson, 2009). According to Siegel and Lotenberg (2007), developing strong communication strategies that describe at-risk behaviors and pertinent issues in ways that position it in the minds of the target audience will make interventions more effective. The student investigator happened to understand the values and beliefs of the targeted populations. However, needs change from time to time and along generations. Therefore, the student investigator engaged the local leaders in showing how empirical behavior research results can potentially develop appropriate cardiovascular health programs. Because of the lack of education in some members of the community, communicating this project with its leaders then became essential. The student investigator discussed the social determinant of health using the general model of social determinants (Schulz, Krieger, &Galea, 2002) and the significance of the project in terms of the health of the population.

Study Population

The study populations were from cities and a remote village in the southern part of Nigeria (unable to sample Northern part due to disturbances). The samples were 368 in number (please see Appendix A for the formula used for calculating the needed sample size for estimating a proportion and Appendix B for Correlations Figure 1). These did not

include the 15 samples of convenience that were pretested using the dissertation questionnaire.

The study population was divided into relevant strata according to ages. A random sample was selected from each stratum. This approach reduced the potential sampling error from the targeted population (Gregg, 2008). The participants were adults ages 20-40, 41-60, and 61 and above, and the sample was representative of the population.

Targeted Population and Demographics

Lagos, in Lagos state, was one of the sampled states and cities. The United Nations estimated the population of Lagos as 11.2 million in 2011 (World Population Review, 2015). Lagos is one of the most populous cities in the world. The population of the Lagos urban area according to the Lagos state government is 17.5 million, a number disputed by the Nigerian government and judged unreliable by the National Population Commission of Nigeria. However, Lagos was reported in 2014 to have a metropolitan population of 21 million, making Lagos the largest metropolitan area in Africa. The National Population Census of Nigeria 2006 (as cited in World Population Review, 2015) stated that the population figure of Lagos state given by the Lagos state government is 17,553,924. Lagos was estimated to be one of the fastest-growing cities in the world and was one of the areas under investigation for this study. Lagos is a highly heterogeneous state that houses 250 to 400 ethnic Nigerian groups (Lagos Urban Research Group, 2009). The ethnic groups' composition from the whole country was represented in the state. The same could be said of all the main religion affiliates represented in the country

(ZaccheusOnumbaDibiaezue Memorial, 2014). Another city that was part of this study was Ado Ekiti.

Ado Ekiti is a city in southwestern Nigeria. The city has a population of 446,749 and it is the capital of Ekiti State of Nigeria (Ekiti State, 2015; Federal Republic of Nigeria, 2012). The participant pool for this study came out of this population. Ado Ekiti is a city in southwest Nigeria. The population in 2004 was stated as 446,749. The people of Ado Ekiti are mainly of the Ekiti sub-ethnic group of the Yoruba. Various commercial enterprises operate in Ado Ekiti. The city is the trade center and farming region where yams, cassava, grain, and tobacco are grown. Textile and cotton are grown and weaved as an agricultural product of the city (Encyclopedia Britannica, 2015). The population is mostly farmers. The city is surrounded by vegetation and dome shaped hills with undulating landscapes (Ekiti State, 2015).

Abeokuta is another city with a population of 593,100 (Mongabe, 2012). This city was targeted but sampling was not pooled because the suggestion by the authority to change my dissertation topic was rejected (the topic had been approved by the Institutional Review Board [IRB]). Akure was another state capital with a population of 495,000 (Federal Republic of Nigeria, 2012). It is one of the oldest cities in the country's southwest region. Sampling was pooled successfully from this city.

Ijesa-Isu is one rural village that was included in the sampling pool; however, there are no official data on the population.

Sampling

The sampling procedure for this epidemiological study was complicated, not only because it was one of stratification but also because of the country that was under investigation. Nigeria had no data for the demographic breakdown for this study's stratums. Reports were mostly on populations that were not of interest. For instance, the data for the demographic composition of ages 30-40, 41-50, 51-60 for the country were missing. However, data were available for the 15-64-year-olds and that constituted about 60% of the population (Nigeria People, 2012). The other issue was cost which played a big role in determining the final sample size (please see Appendix A).

The first step of the sampling process was done using the Power program V3.0. This software was used for estimating sample size for the exposure of cardiovascular diseases with three levels of proportions (30-40, 41-50, and 51-60). Sample size was determined in terms of the key estimates desired: target population, precision, desired level of confidence (Turner, 2003). The estimated sample size was 1,267 nationally (Little, Sharp, Khoury, Bradley, & Gwinn, 2005). The study design utilized stratified sampling. The 1,267 sample size would have been selected from all Nigeria populations; however, only 368 samples were drawn. Sampling was not drawn nationally. The participants were assigned into three strata along age lines. Since the percentage of adult men and women in the target populations varied demographically (Nigeria) by only 2% (Nigeria People, 2012), the proportions were set at 0.33, 0.33, and 0.34, respectively for each stratum (see Appendix A). However, due to a problem during data collection and the terrorist unrest in the country, it was found that the average age in Nigeria, as of 2014,

was 17 years. At the beginning of this research (which was when the general election was being prepared) it was uncovered that 17-year-olds made up a significant proportion of the population. As a result, the stratum ages were changed to become 20-40, 41-60, and 61 and above. The sample size was 422 for each stratum, of which 120 randomized samples were selected per stratum for data collection.

Stratification Process for Recruitment

The targeted population was divided into three stratums by age. Each stratum was homogeneous and heterogeneous between each stratum and along age lines. A random sample was selected among each stratum to reduce sampling error (Gregg, 2008). However, the study suffered unequal gender representation. There were not enough male participants.

Cost and war/terrorists concerns were considered. This caused the samples to be reduced to 120 for each stratum. This left the study with 360 participants. A total of 368 participants were recruited. The extra eight participants were added for potentially missing data/attrition. The samples were drawn from three cities, namely Ado Ekiti, Akure, Lagos, and one village (Ijesa-Isu). Study samples were then randomly selected from the stratum to make the pool of study participants.

Data Collection

Hospital records of discharged patients from these populations were part of the participant selection system as well as active recruitment from the street, walk-in, and from close-by neighborhoods. It is important to note that medical doctors have never seen some of the participants before.

Validity/Reliability

If the validity of a study determines whether the research truly measures that which it was intended to measure, or how truthful the research results are, then validity will not be a problem for this study. This was because the validity of this study looked into the construct: research questions and hypothesis. Equally important were the data collection and analysis processes for this study as these were completed as planned. The notion that the processes would be replicable and show that the study measured accurately what it set out to measure, were of paramount concern to the researcher during the data collection phase of this study. Extra precautions were taken throughout all the research phases to augment duplicability potential of this study. Hence, this study is open to the process of it being duplicated.

About reliability, whether the result was replicable, and secondly, concerning validity, whether the means of measurement were accurate and whether they were actually measuring what they were intended to measure, could also be comprehensive for this study by looking into the data gathering tools and details of its selection phase (Golafshani, 2003). The dissertation questionnaire (see Appendix C) was pretested before the data gathering process. Pretesting of the instrument allowed the assessment of how people responded to the questions. It also helped with determining whether the tool was well written, clear, and inclusive of what the student researcher was looking into. The information collected assisted this study and would assist with the future use of the questionnaire (Szklo& Nieto, 2014). It would be of particular interest if this instrument has a repeated use for this type of study.

Pretesting of the dissertation questionnaire augmented the study in many ways. It allowed for the ease of assessment in using the dissertation questionnaire and allowed for the estimation of each participant's interviewing time frame and scheduling.

A convenience sample of 15 was surveyed in one of the rural areas of Ekiti. As a result, I was able to see how consistent was the exposures/outcome variable of the population rates when the tool was used. This approach increased the reliability of the survey (Checkoway, Pearce, &Kriebel, 2004).

Chapter 4: Results

Data Analysis

The purpose of this study was to understand the associations among high blood pressure, social economic status, and health status awareness in three states of Nigeria: Lagos, Ekiti, and Ondo. This quantitative study measured the incidence and prevalence of cardiovascular diseases in Nigeria. Some of the variables that augment chronic diseases, such as CVDs include lifestyle, SES, heredity, race, ethnicity, and health services (Green &Ottoson, 2009). These factors were incorporated into the survey. It was this study's hypothesis that there would be no significant difference in the number of incidence and prevalence of CVDs in these four populations: pedestrians, vehicular commuters, Okada commuters, and bikers. Hence, in this study I sought to learn what proportion of the population, across three age groups, suffers from cardiovascular diseases (ages 20-40, 41-60, 61 and above) and whether where the participants lived and their SES affected their cardiovascular health. Due to the dichotomous nature of some of the analytic tools, the age variable was made dichotomous for ease of data analysis.

The study was set up to measure the incidence and prevalence of cardiovascular diseases in Nigeria and in the process to find answers to the research questions.

1. Were there significant differences in the incidence and prevalence of cardiovascular diseases in populations 1 (Pedestrians), 2 (Vehicular commuters), 3 (Okada commuters), and 4 (Bikers)?

Research hypothesis:

Ha1: $\mu 1 = \mu 2 = \mu 3 = \mu 4$ (Means of populations 1, 2, 3, & 4)

H01: $\mu 1 \neq \mu 2 \neq \mu 3 \neq \mu 4$ (Means of populations 1, 2, 3, & 4)

The research hence looked into the four populations for differences in the numbers of occurrences/highest risks for the diseases in populations 1 (Pedestrians), 2 (Vehicular commuters), 3 (Okada commuters), and 4 (Bikers) by using the population means of each of the groups. The study looked to see which of the variables had better descriptive and prescriptive potentials.

2. Was there a correlation between standard of living and cardiovascular health of the populations as determined by the dissertation questionnaire? This research question was tested using the following hypotheses:

Was there a monotonic relationship between any two of the predictor's variables?

Research hypothesis:

Ha2: There is a monotonic relationship between the two variables.

H02: There is no monotonic relationship between the two variables.

Data were collected in four different hospital locations and one community center. Prior to collection, posters were used to increase awareness of the study. The town crier was also used to promote awareness. (Please note that the outbreak of Ebola further hindered data collection. The index case in Nigeria was in one of the locations that granted ethical clearance for this study.)

Furthermore, terrorism and insurgence of Ebola restricted data collection in other areas of Nigeria. Abeokuta city was one of the original areas marked for data collection. However, the designated area that would allow for this comprehensive study was made

inaccessible. Their ethical review board was suggesting that I change the research questions and plans to augment their institutional agenda. This view and proposition were rejected because the study's plan, questions, and title went through a rigorous process before it was authorized by the IRB. Changing it in a nonscientific manner would have discredited and dimerized the process. Hence, this location was not part of the study. This study was well received by other institutions that already had groups of doctors and academicians designated as the research ethics committee of the various institutions. Some of the organizations' members were alumni of institutions in the United States and already had the ideas and experience of how the process works. After this writer applied to and was interviewed by the ethics committees of the four institutions/states, ethical clearance was granted to conduct the study. Copies of these certificates were e-mailed to Walden University's ethics committee. The above statement accounts for the inability of collecting data in one of the areas indicated in the proposal.

As indicated in the approved proposal for this study, copies of posters were posted prior to the commencement of the study. The recruitment got easier as awareness was increased. In following the IRB criteria for this study, participants were staff, patients, vendors, and patients' family members. Only one participant was an active cardiac patient. The individual was not part of the study. All other participants were individuals in outpatient areas of care and community centers. They were all ambulatory individuals and were screened using the dissertation questionnaire as outlined in chapter 3 of this dissertation.

Ethical Considerations

A total number of 368 participants were involved in this study. Participants were from Ijesa-Isu, Ado Ekiti, Akure, and Lagos cities. All participants resided in the southern belt of Nigeria. Data collection activities started in January and ended in June of 2014. Participants were from different areas of the country. For instance, Lagos, one of the areas under investigation, is a highly heterogeneous state that houses 250 to 400 ethnic Nigerian groups (Lagos Urban Research Group, 2009). The ethnic groups' composition from the whole country was represented in the state. The same could be said of all the main religion affiliates represented in the country (Zacchaeus Onmumba Diapause Memorial, 2014).

Consents were obtained prior to collecting data. After consents and confirmation that the participants had time to decide if they would like to take part in the study, the dissertation questionnaires were completed. The height, weight information, and blood pressure measurements were then entered into the data; the gathering of the electro cardiogram observations of the participants' hearts followed this event. The observed variables at the end of the exercise were height, weight, blood pressure, income, age, activity in miles, and EKG changes. The outcome variable was initially called participantillorwell (outcome variable or risks for CVDs). However, for the ease of reading and dissemination, this variable was renamed as health status. Other variables in the study were gender, chest pain, heart-Ds-Hx, BP-reading awareness, medication, commute-M, and smoking. All variables are shown in Table 1.

Table 1

Measured Variables

Scaled	Nominal
Height	Gender
Weight	Chest pain
Blood pressure	Heart-Ds-Hx
Income	BP-reading awareness
Age	Medication
Activity in miles	CommuteM
ECG	Smoking
Health Status	

The health status variable was determined by five categorical variables. High blood pressure (assigned with a score of 1 for this status), deviation from normal EKG parameters (assigned with a score of 1), abnormal BMI (assigned with a score of 1), participants that do not exercise/lack of (walks at least a mile a day and obese were assigned with a score of 1), and abnormal pulse measurements (assigned with a score of 1). All scores total five. A negative measure/scorecard of three of these variables indicated a positive sign for the disease under investigation. For instance, a participant with a blood pressure of 180/100, who weighed 190 lbs., with a height of 148cm, and had an EKG result that showed abnormal PQRST waves. The situation got more complex because the participant was not aware of the situation prior to this data collection. This was considered with a solid score of 4 and rated as one of the health status positive group.

A score of three or more out of five of these scaled variables was considered as strong inclination toward the outcome variable. A score of two to three put the participant's data in the health status negative. A participant with a score of 0 or 1 was determined to be negative of the outcome (this did not mean that the participant with a score of one does or does not suffer from heart disease, but this study did not have any of the measured indicators present in those individuals). However, this participant's data assisted with data analysis. Participants with scores of 3 and above showed highest risks for the diseases, while ones with 2, 1, and 0 were assigned health status negative. This explained the variables and the observations that were used for the research analysis.

The SPSS software version 22.0 was used for analysis. Variables were defined along the lines of scaled and nominal. Hence, the variables were arranged under these two observational modes.

Research Questions

1. Were there significant differences in the incidence and prevalence of cardiovascular diseases in populations 1 (Pedestrians), 2 (Vehicular commuters), 3 (Okada commuters), and 4 (Bikers)?

Research hypothesis:

Ha1: $\mu 1 = \mu 2 = \mu 3 = \mu 4$ (Means of populations 1, 2, 3, & 4)

H01: $\mu 1 \neq \mu 2 \neq \mu 3 \neq \mu 4$ (Means of populations 1, 2, 3, & 4)

2. Was there a correlation between standard of living and cardiovascular health of the populations as determined by the dissertation questionnaire? This research question was tested using the following hypotheses:

Was there a monotonic relationship between any two of the predictor's variables?

Research hypothesis:

Ha2: There is a monotonic relationship between the two variables.

H02: There is no monotonic relationship between the two variables.

The variables used for measurements are discussed below.

Created Variables for Analytic Purposes

The health status variable. This variable was the outcome variable and was determined by five categorical variables. High blood pressure (assigned with an operational score of 1 for this status), deviation from normal EKG parameters (assigned with a score of 1), abnormal BMI (assigned with a score of 1), do not exercise/lack of (walk at least a mile a day score of 1), and participants with abnormal pulse measurements (assigned with a score of 1). All scores total five. A score of 3 indicated a positive sign for the disease under investigation.

Health status positive variable. A score of 3 or more out of 5 was considered as a strong inclination toward the outcome variable, and this was assigned to health status positive variable.

Health status uncertain group. A score of 2 to 3 put the participant's data in the health status uncertain group.

Health status negative. Participants with a score of 0 and 1 were determined to be negative of the outcome variable and rated as health status negative.

Definition of other variables

- Height is the participant's height in centimeters/inches
- Weight is the participant's weight in kilograms/pounds
- Blood pressure is the blood pressure measured by blood pressure cuffs that were used in the institutions and calibrated by the department of health
- Income is annual income: a = < 18,000, b = > 18,000, c = < 50,000, d = > 50,000, e = < 100,000, f = > 100,000. Everything were in the local currency of Naira.
- Age is how many years the participants reported that they have existed since birth.
- Activity was measured in miles: assessed if they walked more or less than a mile daily.
- ECG/EKG: Looked into the deviations from normal PQRST wave results.
- Pulse rates, Norm 60-100.
- Gender: classification according to sex (male or female).
- Pain (yes or no)
- History of heart disease, yes or no (1, 2); Heart-Ds-Hx, yes or no (1, 2)
- Awareness of blood pressure measurement prior reading: yes, or no (1, 2)
- Taking medication for conditions, yes or no (1, 2)
- Commute M: Commuting method: 1-pedestrian, 2-vehicular, 3-bike, and 4-okada.
- Smoking: 1 - Current smoker, 2 - Ex-smoker, 3 - Spouse smokes, 4 - Chews tobacco.

This study measured the incidence and prevalence of CVDs and tried to see if there were significant differences in the number of incidence and prevalence rate of cardiovascular diseases in populations 1 (Pedestrians), 2 (Vehicular commuters), 3 (Okada commuters), and 4 (Bicycle bikers). Hence, this study investigated the question

of what proportion (if any) of the populations suffered cardiovascular diseases (ages 30-40 years, 41-50 years, 51-60 years) and investigated if the location of participants' residences and their economic status affected their cardiovascular health.

The variables were: The Pedestrians (1), Vehicular commuters (2), Okada commuters (3) and, Bicycle bikers (4) populations were explored, and that helped with comparing and analyzing the level of occurrences of CVDs in each population.

Research Question One

1. Were there significant differences in the incidence and prevalence of cardiovascular diseases in populations 1 (Pedestrians), 2 (Vehicular commuters), 3 (Okada commuters), and 4 (Bikers)?

Research hypothesis:

H01: $\mu 1 = \mu 2 = \mu 3 = \mu 4$ (Means of populations 1, 2, 3, & 4)

Ha1: $\mu 1 \neq \mu 2 \neq \mu 3 \neq \mu 4$ (Means of populations 1, 2, 3, & 4)

Modes of transportation observations are nominal. This observation was cross-tabbed with the health status categorical variable using SPSS version 22.

Table 2

Case Processing Summary

	Cases					
	N	Valid		Missing	*N*	Total
Mode of transportation/ Health Status (or risk factors for CVD)	358	97.5%	9	2.5%	367	100%

Table 2, above, shows 358 cases after eliminating the number of participants determined to not be qualified for showing any signs of the diseases. This was very important since the focus was to estimate the number of participants that suffered from the disease.

The Pedestrian--The count in the pedestrian population was 49. A show of 49.17% was in the health status uncertain group, and 20% of them were in the health status positive category and were determined to have the associated risk factors for the diseases.

Vehicular population--This population had 33.8% that were within the health status uncertain group and had 33.5% in the health status positive category.

Public transportation population--These participants identified themselves as using public transportation most of the time as their means of getting to work back and forth. This population had 24.8% showing for the health status uncertain group and 22.1% of this population belonged to the health status positive group.

Okada population--This population rides the motorcycle vehicles on a daily basis and paid to ride them as modes of commercial transportation on a daily basis. The count from this population was 61. This population had about 21.9% of its population in the health status uncertain group and 21.5% in the health status positive group.

Bikers--There were not too many participants in this group. There were only five participants. This group could have been eliminated from the study but it was good for the analysis. The group had 1.8% in the health status uncertain group. The rest of the

group was the health status positive group. These were the poorest of the groups in terms of economic status.

The cross tabulation was done of the variables mode of transportation and health status (or risk factors for CVD). This procedure tabulated the different combinations of values that occurred for these two variables. It helped explain what happened between these two variables (an independent and dependent variables). Since, these interactions were best being described as logical possibilities. The possibilities were better explained with the logical regression. However, in the cross-tabulation table (see Table 3) the results were controlled for any spurious relationship.

Table 3

Mode of Transportation Health Status Cross Tabulation

Mode of Transportation		Health Status Uncertain	Health Status Positive	Total
Pedestrian	Count	49	26	75
	% within Health Status	17.6%	32.5%	20.9%
Vehicular	Count	94	26	120
	% within Health Status	33.8%	32.5%	33.5%
Public Bus/Train	Count	69	10	79
	% within Health Status	24.8%	12.5%	22.1%
Bicycle	Count	5	2	7
	% within Health Status	1.8%	2.5%	2.0%
	% of Total	1.4%	0.6%	2.0%
Okada	Count	61	16	77
	% within Health Status	21.9%	20.0%	21.5%
	% of Total	17.0%	4.5%	21.5%
Total	Count	278	80	358

A statistical expression for this research that predicted the behavior of the dependent variable based on the knowledge of one or more of the observed was constructed. The goodness of fit test was done. This looked into the observed counts using the contingency table that was run using the SPSS software (Version 22.0). The result produced a contingency table that fitted the expected count into the developed model. As a result of this model, one could easily read the values as displayed in Table 2.

The categories in the variable mode of transportation were five, namely: Pedestrian, Vehicular, Public bus/train, Bicycle, and Okada.

The pedestrian count was 75. Out of this, 49 were within the variable disease health status uncertain, and the count was 26 for the health status positive category. This gave the sum of 75. The health uncertain; was about 17.6% and the health status positive group was 32.5%. Hence, about 32.5% of the pedestrian population sampled for this study was within the category of health status positive while; 17.6% could be stated to be in the health status uncertain category.

Looking at the vehicular category, 33.8% were in the health status uncertain group, whereas 32.5% participants were in the yes, while 33.5% were health status positive group.

In the public Bus/Train category, 69 or 33.8% of the participants were in the health status uncertain category, while 12.5% of them fell into the health status positive category.

The bicycle rider population was the smallest of all the sampled populations and showed the total count of seven, five of which were in the health status uncertain group

and 24.8% in the health status positive category; this group had 12.5% of them in the category of the mode of transportation.

The Okada population showed a count of 77, out of which 21.9% belonged to the health status uncertain while 20% were in the health status positive group.

In the analysis that followed using regression, the dependent variable health status (or risk factors for CVD) was a quantitative dependent, predictor variable. This was the summed variable, and that made this variable continuous and numeric.

The incident rate of CVDs as discussed earlier involved the count of incident cases over a defined period in the population under investigation. This was revealed by the two-by-two tables below (Gregg, 2008). The operational definition of CVDs, according to this study, were the deviations from the norms of the predictors' variables, namely blood pressure, BMI, EKG, Pulse and the other variables used with assistance of the dissertation questionnaire. The incidence of the disease as discussed earlier allowed for the estimation of the risk that was necessary for assessing causal relationships.

Prevalence on the other hand measured the frequency of CVDs (the existing outcome) at a point or during a given period of the study. Since more than 85% of the participants were not aware of their blood pressure measurements, their pulses, and greater than 50% have not seen a doctor in 3 years, it can be said for these populations that the only statistical prevalence that could be calculated was the point prevalence. Hence, these statistics were done as reflected in Table 4 below.

Table 4

Parameters for Measuring Incidence and Prevalence

Measure		Expresses	Types of Events
Incidence	Frequency of Event	Newly Developed CVD	
Prevalence	Frequency of the existing CVD	Point Prevalence of CVD at the point when the study was conducted in June 2014	

The incidence of CVDs indicators was better represented by the number of events occurring in the participants' populations over a specified period of time (denominator). Incidence was based on person/time units of the at-risk participants. This study was set out to measure the incidence and prevalence of cardiovascular diseases in the populations that were involved in this study. This was done as described below. The incidence rate was obtained for the geographical locations represented in the tables below by using the average estimate for the time period at the time the study was conducted. The population was assumed to be relatively stable and as a result, the incidence rate followed the formula below:

incidence rate = number of events/average population. measure for the prevalence

Point prevalence was the frequencies of CVD in the participants' population at the time when the study was conducted in 2014 (Szklo& Nieto, 2014).

Results showed that in Akure Ondo State, Nigeria, from January 2014 to June 2014, there were 3,325 cases of heart disease among the adult population. This amounts to 48 per 100,000 of this population per year. Hence, the incidence rate for this location

was 48 per 100,000 of this population. However, the point prevalence was 57% or 570 per 1000 in June 2014 (see Table 5).

Table 5

Estimated Incidence and Prevalence Results for Investigated Population in Akure Ondo

Measure	Numerator (x)	Denominator (Y)
Incidence Rate Akure	No. of new cases of a specific disease reported during a given period. = 3325/0.5 = 1662 x 100 000/3440000= 48 among the age groups of interest	Average Population during time interval 3440000
Point Prevalence Akure	No. of current cases, new and old, of CVD at a given point in time: Number of person ill/Total number in the group at a point. = 45/79 x1000 = 0.569 or 57% and or 577 per 1000 of the population.	Estimated Population at the same point in time 79

The same estimation was done for Ado Ekiti. The result is displayed in Table 6.

Table 6

Estimated Incidence and Prevalence Results for Investigated Population in Ado Ekiti

Measure	Numerator (291)	Denominator (736)
Incidence Rate Ado	No. of new cases of a specific disease reported during a given period. = 291/736/2 x 100000 = 19,769 per 100,000 for six months among the age groups of interest	Average Population during time interval 736
Point Prevalence Ado	No. of current cases, new and old, of CVD at a given point in time: Number of person ill/Total number in the group at a point. = 39/88 x1000 = 0.44 or 44% and or 443 per 1000 of the population.	Estimated Population at the same point in time 88

The next results were for Lagos State. The same process was used for the estimation of those indexes for Lagos (see Table 7).

Table 7

Estimated Incidence and Prevalence Results for Investigated Population in Lagos

Measure	Numerator (x)	Denominator (Y)
Point Prevalence Lagos	No. of current cases, new and old, of CVD at a given point in time: Number of person ill/Total number in the group at a point. = 56/116 x1000 = 0.48or 48% and or 483 per 1000 of the population.	Estimated Population at the same point in time 116

Next is Ijesa-Isu. This was the rural and remote village from the capital Abuja (see Table 8).

Table 8

Estimated Incidence and Prevalence Results for Investigated Population in Ijesa-Isu

Measure	Numerator (x)	Denominator (Y)
Incidence Ijesa-Isu	38/88/2 x 100000 = 21,590 adults per 100,000 every six months.	
Point Prevalence Ijesa-Isu	No. of current cases, new and old, of CVD at a given point in time: Number of person ill/Total number in the group at a point. = 22/56 x 1000 = 0.39 or 39% and or 393 per 1000 of the population.	Estimated Population at the same point in time 56

More analytic tools were deployed to answer the research questions. One such tool was the statistic logistic regression.

Logistic Regression

The logistic regression analytic tool is a good tool for binary outcome variables such as diseases due to its robust alternative. This tool was used to assess how strong or weak some of the variables were in making predictive or descriptive assumptions for this study. In an attempt to do this, a model was developed.

This model assumed that the relationship between the given value of a variable *x* and the probability of the outcome follows a logistic function. Since the outcome of the model is constrained to values with 0 to 1 ranges, the variables of CVD (health status uncertain, health status positive) were coded with a dichotomous outcome. The frequency of the outcome was the number of individuals with the outcome (the numerator) divided by the number of individuals at risk for the outcome (the denominator). The absolute measure of the outcome was (health status variable) CVD in calculating the incidence and the prevalence. The incidence of CVD in these populations is the frequency of any new disease-related event among the participants (Szklo& Nieto, 2014).

The data entered for this analysis showed only 2.5% of the participants were disease free. There were 87 males, or 23.7% of the population. There were 280 females, or 76.3% of the population. The dependent variable was health status (or highest risk factors for CVD). There was one missing data. This was eliminated for the analysis. For this to work, a model fitting information was generated as reflected in Table 9 below.

It was equally important to note that there were 366 processed cases with one missing value. About 2.5% of processed cases showed participants that were health status positive of the cardiovascular risk factors, and 97.5% of them were rated as health status uncertain. This category consisted of 43.7% of the entire study participants. They had normal EKG while 56.3% (206) showed abnormal EKG results. Regarding blood pressure, 50.3 marginal percentages of the participants had normal blood pressure. However, 49.7% showed abnormal blood pressure results. Regarding BMI, 32% had normal BMI, whereas 68% showed abnormal BMI. The model was fitted and the result displayed in Table 9.

Table 9

Model Fitting Model Information

Model	AIC	BIC	-2Log Likelihood[1]	Chi Square	*df*	Sig.
Intercept Only	34.16	38.07	32.16			
Final	27.02	46.55	17.02	15.14	4	0.00*

[1] -2Log Likelihood tells us how we can predict CVD using the Health Status variable. Estimation terminated at 17.02 because parameter estimate changed less than .001. AIC is a measure of fit which penalizes the model; however, there is no model of comparison here.

* Indicates the significance with $p < .01$ and a well fitted model.

The log likelihood value was 32.16. This was a measure of the model with no independent variables, but only with a constant/intercept. The final log likelihood was 17.03. A measure of that was computed after all the independent variables had been entered into the model. Hence, the difference between the two was the model chi square value 15 = 32.16-17.03 = 15.13 that was tested for a statistical significance of 0.004. This led to a conclusion that there was significant relationship between the dependent variable and the independent variables in this model. In order to reduce the possibility of errors, a series of procedures called goodness of fit were performed as shown in Table 10 and discussed.

Table 10

Pearson and Deviance Goodness of Fit

Measure	Chi Square	*df*	Sig.
Pearson	5.728	11	.891
Deviance	5.842	11	.884

Threats to Validity

Part of minimizing the threats to validity includes stratification and testing to see if the model fits the data. The goodness of fit results are depicted in Table 10. Chi-square for Pearson and the Deviance statistics results were with the significance levels of 0.90 and 0.88, respectively. Values larger than 0.10 are typically considered poor, and values smaller than 0.10 are usually accepted (Yen, Wu, & Cheng, 2010). This demonstration of

fitness was further enhanced by the Cox and Snell, and Nagelkerke values of 0.04, 0.19. This showed at least 19% of variation in the dependent variable was explained by the variables that are included in the model, and McFadden of 0.17. All these showed a goodness of fit for the analysis that was performed. It also boosted the power of the predictive values of the independent variables as shown in Table 11.

Table 11

Cox and Snell, Nagelkerke, and McFadden Goodness of Fit

Measure	Value
Cox and Snell	0.04
Nagelkerke	0.19
McFadden	0.17

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model was formed by omitting an effect from the final model. This reduced model was equivalent to the final model because omitting the effect did not increase the degrees of freedom (see Table 12).

Table 12

Model Fitting Likelihood Ratio Tests

	AIC of Reduced Model	BIC of Reduced Model	-2 Log Likelihood of Reduced Model	Chi Square	*df*	Sig
Intercept	27.02	46.55	17.02	0.00	0	
ECG	32.12	47.74	24.12	8.00	1	0.01*
BMI	25.78	41.40	17.78	0.75	1	0.38
Gender	26.13	41.75	18.13	1.10	1	0.29
Blood Pressure	29.69	45.31	21.69	4.67	1	0.03*

* This result showed that EKG and blood pressure had significant main effect on predicting cardiovascular diseases.

The likelihood ratio test was a significance test that compared models based on the maximum likelihood method (MLE). This approach used the regression model and performed the tasks using the computer and SPSS software. This result showed that EKG had a significant main effect on predicting cardiovascular diseases with X_2 (1) = 8.00, p = 0.01.

BMI = X2 (1) = 0.75, p = 0.38. Blood pressure measurement variable with X2 (1) = 4.67, $p = 0.03$, and Gender was X_2 (1) = 1.10 p = 0.29.

Research Question 2

2. Was there a correlation between standard of living and cardiovascular health of the populations as determined by the dissertation questionnaire? This research question was tested using the following hypotheses:

Was there a monotonic relationship between any two of the predictor's variables?

Research hypothesis:

Ha2: There is a monotonic relationship between the two variables.

H02: There is no monotonic relationship between the two variables.

The scatter plot (see Appendix B, Figure 3) shows that groups are not evenly distributed. However, the question regarding the normality was not at stake. The variables were that of independent and were randomly assigned. The scatter diagram also shows the spread of the variables.

In order to see if there were significant differences in the number of incidence and prevalence of cardiovascular diseases in the population groups, a one-way analysis of variance was done. This assisted with explanation of either accepting or rejecting the null hypothesis. It was revealed in the descriptive statistics that the groups display almost the same means and variances. This is a show of normal distribution. Hence, a one-way analysis of variance (ANOVA) is an appropriate tool of analysis for a scale and nominal observations. ANOVA statistics start by randomizing the cases within the variables. As a result, the hypothesis that there would be no significant difference in the number of CVD as measured by the dissertation questionnaire was able to be tested.

The CVD was observed by the health status variable (the outcome variable) measured by the highest risk factors for cardiovascular diseases. Hence, it is appropriate to test this hypothesis using a one-way analysis of variance. Prior to the testing, the descriptive statistic was analyzed (see Table 13).

Table 13

Stratified Sampling and the Confidence Interval

Sampling Method	Stratified	
Number of samples		1000
Confidence interval level		95.0%
Confidence interval type	Percentile	
Strata variables	Participant age	

Table14 shows descriptive statistics: the means, variances, and standard errors of the groups. This information was needed when comparing the means of the group and when determining if there were significant differences between the groups. The table shows the result of the descriptive analysis of the samples. The samples means are shown in the table. About five cases were eliminated because one group showed fewer than two cases.

The Pedestrian mean was 2.28, with 0.55 standard deviation, and accounted for 21.5% of the population. The Vehicular population mean was 2.19, with 0.45 standard deviation, and accounted for 33.5% of the population. The Public bus/train population mean was 2.13, with 0.33 standard deviation, and accounted for 21.5% of the population. The Bicycle group mean was 2.28 and was the least of the group. It had only seven cases at barely 1.9% of the population with a standard deviation of 0.49. The last was the

Table 14

Descriptive Statistics

				95% Confidence Interval		
	Bias	Std. Error		Lower	Upper	
Pedestrian	N	79	0	7	65	93
	Mean	2.25	-0.00	0.06	2.16	2.4
	Std. Deviation	0.55	-0.00	0.04	0.48	0.62
Vehicular	N	123	0	9	106	141
	Mean	2.19	0.00	0.04	2.11	2.26
	Std. Deviation	0.45	-0.00	0.03	0.38	0.51
Public Bus/Train	N	79	0	8	63	94
	Mean	2.13	0.00	0.04	2.06	2.20
	Std. Deviation	0.33	-0.00	0.04	0.24	0.40
Bicycle	N	7	0	3	2	13
	Mean	2.28	0.00	0.19	2.00	2.71
	Std. Deviation	0.49	-0.08	0.18	0.00	0.58
Okada	N	79	0	8	63	94
	Mean	2.18	0.00	0.05	2.08	2.28
	Std. Deviation	0.45	-0.00	0.04	0.36	0.52
Total	N	367	0	0	367	367
	Mean	2.19	0.00	0.03	2.15	2.24

Okada population with a population mean of 2.18. This was also about 21% of the population and had a standard deviation of 0.45.

There were insignificant variations between the groups' population means and variances as demonstrated by the descriptive statistics, the dispersion, the data, the scatter, and box plots. With this result, it became wise to use the harmonic mean. This is used very often when there are questions with distribution and high or low scores validity (Yen et al., 2010). The harmonic mean minimizes the bias that might have been introduced through having unequal sample sizes (IBM, 2013).

This mean would be used in evaluating the relationship between the means and the variances. The standard deviations as stated above augmented the theory or credence to the assumption of equal variances. This assumption was tested using the Levene's test for homogeneity which tests to see if the variances in different groups were equal.

Table 15 shows the standard deviation of the health status variable. The statistic test ANOVA was used to test if the mean weights for the dependent variable health status (CVDs) highest risks factors and the independent variable mode of transportation differed significantly from each other. One-way ANOVA was used because the comparison variables groups were formed by considering whether the groups' means were equal. A statistical comparison of the two-sample means was done.

Table 15

Health Status (or risk factors for CVD) Variable

Std. Deviation	-0.00 0.45	0.02	0.42	0.49

The outcome of the two means is shown in Table 16. Calculated values in Table 16 led to the rejection of the acceptance of the null hypothesis.

Table 16

One-Way ANOVA: Health Status/Mode of Transportation

	Sum of Square	*df*	Mean Square	*F*	Sig.
Between group	1.01	4	0.25	1.23	0.30
Within groups	74.25	362	0.20		
Total	75.26	366	362		

ANOVA tested the data to see if the means of weights for the two variables differ significantly from each other at $\alpha = 0.05$. The *f* ratio was calculated as the mean square between, divided by the mean square within, as shown in the table. The *f* was 1.23 with its associated *p* value of 0.30. The result showed that all the means were almost/equal at alpha 0.05. *F* statistics as $0.30 > 0.05$. Hence, there were no noted differences between the groups. So, $F(4, 362) = 1.23$, $p = 0.30$. This answered one of the research questions. There were no significant differences noted among the groups. Hence, the null hypothesis was not rejected.

The one-way analysis of variance results showed the health status variable (or risk factors for CVD) and the mode of transportation variables between groups and within groups' results. The between group sum of squares was 1.0. This was the usual value (Huck, 2012). The group sum of square was 74.25. The between groups *df*value was 4

and the within value *df*was 362. These two sums added together made the total number of cases analyzed. The mean square for the between groups was 0.25 and it was 0.20 for the within group.

The second portion of the research question was looking to see if there was a correlation between standard of living and cardiovascular health of the populations as determined by the dissertation questionnaire. One variable used for this analysis was ordinal while the other was scaled. When these two types of variable are collected, then this form of analysis can be performed (IBM, 2013). In determining the variable for this study, one of the tools used was the dissertation questionnaire. Two particular populations were isolated, the first being the annual income of participants, and the other was the health status variable. The variables of analysis, hence, were ordinal and scaled.

Since normality could not be assumed with these two variables, and they meet the criteria for the Spearman rho statistics, a decision was made to use it for analysis. The statistics Spearman rho was a good fit for this analysis. Table 17 shows the results of this analysis. The idea was to detect the strength of the relationship within the two variables and see if the relationship would be one of decreasing or increasing between the two variables of participants' income and health status.

Variables health status (or risk factors for CVD) and annual income were plotted on the scatter plot depicted in Figure 2 (see Appendix B). It showed the dispersion of the data and an obvious indication that there was no relationship between the two variables.

Table 17

Spearman's rho Correlation: Health Status (or risk factor for CVD/Annual Income)

Spearman rho			Participants Ill-well	Annual Income
Correlation Coefficient			1.00	-0.08
Sig. 2-Tailed			-	0.12
N			367	367
Boot Strap		Bias	0.00	0.06
	Standard Error	Standard Error	0.00	0.00
	Lower	BCA 95%		-0.18
	Upper			0.03

Note. Unless otherwise noted, bootstrap results are based on 1000 stratified bootstrap samples.

In order to answer the question if there was correlation between standard of living and cardiovascular health of the populations as determined by the dissertation questionnaire, Spearman's rho correlation statistical process was conducted on Health Status (or risk factors for CVD)/Annual Income. The result is shown in Table 17 which displays a matrix giving the correlation coefficients between the variables -0.08. This was with a two-tailed significance of 0.12. All this was calculated from a sample size of 367

using a BCA of 95% confidence interval ranging from -0.18 to 0.03. The fact that the confidence interval crossed zero and that the significance was greater than 0.05 reflects that there was no significant relationship between health status (or risk factors for CVD) and the annual income variables. Because of this finding, the hypothesis was not supported. There was no increasing or decreasing function between the two variables.

This study performed the analysis of the collected in this chapter using SPSS version 22.0 In making this analysis and an attempt at answering the research questions this study used analytic inferential tools. A bivariate analytic tool was used in finding the correlation between two variables. Logistic regression was used to predict and test the predictiveness potentials of variables such as blood abnormal blood pressure, abnormal EKG waves, abnormal BMI, and gender. The developed model has the potential of being used to predict the probability of getting CVD's for a given participant based on the observations of whether or not the event occurs for that person. Hence, the observed and the predicted values were used in checking for the fitness for the model. This log likelihood showed the fitness of the model.

So the conclusion was that predictor variables blood pressure and EKG as defined by this study will make significant contributions (if used) to the prediction of the outcome variable (CVD's). This chapter also measured the estimated values of the incidence and prevalence of cardiovascular diseases in three states of Nigeria. In analyzing this data, the noted issue that could have made the process more efficient was lack of data The issue of lack of data and the gap it posed to the process of analysis was well discussed in this research. Basic calculations of the numerators and the denominators were impacted by

this fact. Because of the noted gap, it was difficult to ascertain a steady state situation in which the incidence of the diseases was not changing in certain locations. Also, I could not specifically indicate how long some people have been careers of the risks factors. Again, this resulted in some incomplete data and the calculation of point prevalence for the disease instead of the normal prevalence calculations. In all, the tools that were used in analyzing this data were tested and confirmations indicated that they were appropriate and were built to test what they were assigned to analyze for this research.

Chapter 5: Discussion, Conclusions, andRecommendations

Study Overview

The purpose of this study was to understand the associations among high blood pressure, social economic status, and health status awareness in three states of Nigeria: Lagos, Ekiti, and Ondo. This quantitative study, which assessed the incidence and prevalence of CVDs in Nigeria and, used some of the variables that affect CVDs development. The variables were used as indices of measurements. The study was cleared by the IRB at Walden University and the United States, and by affiliated hospitals in Nigeria, in 2014 (see Appendix D). The study population consisted of adults, 20 years of age and over. The sample was representative of the population. A total sample of 368 participants was selected through stratification and randomization from Lagos, Ondo, and Ekiti states of the federation. The populations for answering the research questions were classified as (a)pedestrians, (b) vehicular commuters, (c) Okada commuters, and (d) bikers.

"Health status" was the outcome variable. It was determined by the sum of five categories: high blood pressure (for this status it was assigned an operational score of 1), an EKG that deviated from normal parameters (assigned with a score of 1), an abnormal BMI (assigned with a score of 1), lack of exercise (walk less than one mile a day) and obesity (assigned a score of 1), and abnormal pulse measurements (assigned a score of 1). For example, high blood pressure, abnormal EKG, abnormal BMI, lack of exercise, and abnormal pulse were each scored 1; thus, if all categories were met, a participant's assessment sum score would be 5. A score of 5 meant all indicators were present in the

participant and a score of 1 means only one of the measured parameters was present; the lower an individual scored, the healthier the individual was. A score of 3 indicated a positive sign for the disease under investigation, meaning a predictor of high risk for cardiovascular disease. For instance, there was a participant with a blood pressure of 180/100 mmHg, weight of 190 lbs., height of 148 cm, and EKG results that showed abnormal PQRST waves. The situation became more complex because the participant was not aware of these conditions prior to data collection. This assessment was considered a solid score of 4 and rated as one of the health status groups. The lower an individual participant scored on the scale of five the better. A score of zero was optimum and signaled being in good health.

IBM's SPSS software, version 22.0, was used for analysis. Variables were defined along the lines of scaled and categorical.

Pedestrian Population

The pedestrian population in this study was 49. The study found that 49.17% of the pedestrians were in the health status uncertain group (participants who scored 2–3 out of 5). Furthermore, 20% of the pedestrians were determined to have the associated risk factors for the diseases.

Vehicular Population

The count in the vehicular population was 120. Of this number,33.8% were within the health status uncertain group (participants who scored 2–3 out of 5) and 33.5% were at the highest risk for the diseases.

Public Transportation Population

The 79 participants in the public transportation population identified themselves as using public transportation most of the time as their means of getting back and forth to work. This population had 24.8% in the health status uncertain group and 22.1% at high risk for the diseases.

Okada Population/Bikers Population

This population rode the motorcycle vehicle daily. The count from this population was 61 individuals. This population had 21.9% of its individuals in the Okada population health status uncertain group and 21.5% at high risk for the diseases.

Bicycle Population

The bicycle riders were the smallest group. The group had only seven participants. This group could have been eliminated from the study because there were only five individuals. However, it is important to include them in the discussion in order to show accountability of all groups in the study. The group had 1.8% in the health status uncertain group. The rest belonged to the disease free group.

Research Questions and Findings

The primary research questions this study sought to investigate, and their resulting findings, are described below.

1. Were there significant differences in the incidence and prevalence of cardiovascular diseases in populations 1(Pedestrians), 2 (Vehicular commuters), 3 (Okada commuters), and 4 (Bikers)?

H01: $\mu 1 = \mu 2 = \mu 3 = \mu 4$ (Means of populations 1, 2, 3, & 4).

Ha1: $\mu 1 \neq \mu 2 \neq \mu 3 \neq \mu 4$ (Means of populations 1, 2, 3, & 4).

Findings--A total sample size of 368 participants was selected through stratification and randomization from Lagos, Ekiti, and Ondo states of Nigeria. The populations, for the purpose of answering the research question, were classified as 1 (Pedestrians), 2 (Vehicular commuters), 3 (Okada commuters), and 4 (Bikers). Results indicated that all the means were almost/equal at alpha 0.05. $p = 0.30 > 0.05$ for the groups 1, 2, 3, and 4. Hence, there were no noted differences between the groups. So, $F(4, 362) = 1.23$, $p = 0.30$. This directly answered the research question, as there were no significant differences noted among the groups. This was validated by the ratios of the mean square being close to 1.00, and the value of *F* ratio being 1.23. The groups' means were 2.25, 2.19, 2.13, 2.18, and 2.19. As a result, one can infer that there were no major differences among the means. Hence, the conclusion with this type of evidence was that there were no major differences among the groups.

2. Was there a correlation between standard of living and cardiovascular health of the populations as determined by the dissertation questionnaire?

This research question was tested using the following hypotheses:

Ha2: There is a monotonic relationship between the two variables.

H02: There is no monotonic relationship between the two variables.

Findings--There was no significant relationship between the health status variable and the annual income variable among the participants. The Spearman's rho correlational coefficient was -0.08 of both variables (health status and income). The matrix of this relationship for annual income of the participants/groups sig. (2-tailed) at 0.12, sample

size of 367, 95% confidence interval that ranged from -0.18 to 0.03. This showed that there was no significant relationship between the two variables, and because of this finding the alternate hypothesis was not supported; hence, null was retained, not rejected.

The cross tabulation results of these variables also showed only 2.5% of the participants scored very low and belonged to the health status negative. They had 87 males which accounted for 23.7% of the population. Females accounted for 76.3% of the population. The dependent variable was health status (or risk factors for CVD) and was determined by a sum of five categories: EKG, blood pressure, BMI, pulses, daily walking distance in miles.

The income variable was measured as annual income A: < = 18,000; B: 18,000-49,999; C: 50,000-99,999; and D: 100,000 and above. Everything was in the local currency of Naira. When analyses of both variables were conducted using correlational study, the results showed that the income of the participants and the participants assessed risk factors for CVDs (health status variable) showed no correlational relationship. This meant the income levels for this population may not be associated with CVDs.

Discussion

Health and diseases are dynamic variables and are intertwined with variables that are biological, psychological, behavioral, and social factors. These interactions and associations occur throughout the stages of human development. Interdisciplinary efforts to bring about change that will reflect the findings of this study are needed in the population that was investigated. Psychosocial factors do influence health directly by using biological influence and behavioral mechanism (McLoughlin&Geooff, 2005). This

study's focus was more on the behavioral and social aspect of these influences. The interactions of the social economic status and CVDs are well documented. However, for this specific population under investigation, the interaction was no different from the individuals in higher income brackets to the ones in the lower income range when it comes to cardiovascular health. Most of the participants held to the belief that God will prevent this type of disease from happening to him or her. While this study did not aim to refute the claim, it did intend to promote health using the wealth of resources that filled the gap of what was known about these diseases while contributing to decrease the unknown.

This study measured physical inactivity (how many miles walked daily), past and present history of smoking, and participants' history of smoking. These variables were also measured by Shi et al. (2013). Even though lifestyle as a variable is known to account for greater than 50% of all life lost prematurely (Shi et al., 2013), lifestyle as a variable was not accurately measured by this study. This study did not set out to measure this concept. The economic status based on income was measured. However, this did not show major variability in its relationship with the outcome variable for this study and in the populations, that were investigated.

In the entire measured population, only nine individuals could be rated as totally free from the outcome variable based on income variable alone. The other participants were either in the health status uncertain group or in the health status positive ones. When viewed from wealth as determined by the mode of transportation, the total research sample was 398, out of which 120 individuals belonged to the vehicular ownership

group. In this group, 94 of them fitted well into the health status negative group (negative of the outcome), while about 26 of them were determined to be either uncertain because of their borderline scores or positive for outcome variable. The pedestrian count was 75. In this group, 17.6% of them were determined not to have the outcome variable.

The bicycle population resided in the very rural areas. They were represented by seven individuals. Five of these participants were in the health status negative group and two of them were not. There was no significant relationship between the health status variable and the annual income variable among the participants. Ameen's (2008) study described how low economic status played a significant role in determining health, and stated that this variable played a significant role in the mortality rate. This study agrees however, that studies that consider broadening the concept of health and the knowledge of them as they apply to each culture in Nigeria might measure lifestyles effectively. For instance, if one does not know that an EKG might assist in diagnosing a cardiovascular health problem, or if one is not aware that chest pain could be treated temporarily by seeing a medical doctor (and this assumption was not necessarily confined to the lower income group), then they will not understand the reasons for seeking help for such conditions. Also, there are local alcohol consumptions (kainkain, palmy, emu funfun) that are not measured in bottles or cans. To measure the abuse of these will require local tools. Measures and parameters/indices of health status measurements for this population might require some variations. For this study, it was not possible to link variables such as dietary habits and excessive use of alcohol because they were not measured.

Odusola et al. (2015) expressed significant increases in the rate of CVDs clinically in the population of patients under their care. Odusola et al. looked into the population of Nigerians that were health seekers and were under their care (seeing medical doctors). However, this study looked into the population of health seekers and ones that would not seek medical help due to lack of knowledge and lack of awareness among the issues that were affecting their concept of health. The gap remains for the estimated number of the incidence and prevalence of cardiovascular diseases in the entire population.

Change theories have always assisted in explaining why individuals decide to change or how individuals or communities move through the phases of change (Green &Ottoson, 2009). One of these theories is the trans-theoretical model. This model helped the researcher in explaining how the participants moved through the stages of change. Again, this started from when they heard about the study and were not sure if they wanted to be participants (pre-contemplation phase) of the study. Even though this model applies in stages, the researcher believes that the theory applied to the change was observed in these populations and wonders if individuals and communities could move faster along these stages when the individuals become aware and knowledgeable of critical health situations. The individuals worked through the information they received and decided to be participants (the contemplation phase). They were informed, signed the consents, and were ready for the study (Lach, Everard, Highstein, &Brownson, 2004). They completed the study.

The participants that showed no deviation from the study's means (ones with good results) were informed of their low cardiovascular risk factors. They were also informed of how to continue to maintain good cardiovascular health. This involved discussing risk factors for the diseases. The participants with negative health factors as measured by some of the variables in this study (abnormal blood pressure, an abnormal EKG: PQRST intervals, abnormal pulses, and abnormal BMI) were informed of the results. Health teaching was done and due to education and health status awareness, they worked the information through their cognitive and affective processes. The decision time was short. Some accepted to be admitted for treatment after other tests and physicians' assessments supported the initial screening. Some participants waited longer at outpatient clinics, while some made appointments (depending on severity) to return the following day. The study saw that these participants were engaged in their health. Participants were paying for their registration fees/admission fees/reporting to the emergency unit. These activities tied together all the theories that were used in the data gathering and analysis of this study.

Even though some of the stages were interwoven (and some of the theories showed overlaps), one clearly saw how change happened in some of these populations and participants, even though few still resisted the change. Participants' actions were sustained in attempts to self-control their health (self-efficacy). Some participants demonstrated a heightened awareness and the knowledge of health risks by seeking treatments as a show of important preconditions for self-directed change (social cognitive theory). This self-directed change is of interest because Africans' inabilities to see

medical doctors have been attributed to many factors. Some of these factors are seeing natural disease occurrences/pathophysiology of a disease and attributing the progression of the disease to supernatural implications. Another documented observation was referring to infection as germ. This situation was viewed by some Ghanaians (Africans) as the good (without germs) and the bad (with germs). This unscientific rationalization gets more serious when tests such as X-rays and blood work were not conclusive enough to make a diagnosis. This type of situation, according to Mensah (2013), increases Ghanaians' state of doubt and mistrust. Hence, people seek alternative traditional orthodox therapies. This type of orientation is what makes people think of diseases as the result of sins and witchcraft (Onyinah, 2002), a phenomenon that is plaguing Africa and has caused so many premature deaths and separation of families. This phenomenon manifested, as some participants believed praying alone would alleviate their symptoms, while some felt their problems could have supernatural causes. These areas were not explored in depth since they were not the goals and objective of this study. Besides, there was no way to objectively measure this problem and it could not be easily solved or measured with any of the variables that were under observation for this study. Hence, the issue was reserved for future studies.

The burden of disease analysis index uses the incidence and prevalence of disease data in the calculation of this index (Mensah, 2013). Nigeria as a country needs to contribute to this index and to support this global drive of chronic disease prevention at all levels of prevention. This conclusion was reached because there was no literature available that revealed Nigeria's contribution to the index.

Even though the epidemic of CVD began in the developed countries in the 20th century, it was not until lately that the developing countries started to show the beginning of a similar epidemic. In order to understand these problems in developing countries, data collection in the areas of the population, incidence, prevalence, and the case fatality rates would be needed. Hence, studies like this would assist with the control and needed treatment of the diseases.

It was estimated that greater than 80% of all CVD mortality happens in the developing countries. Greater than 75% of all CVD may be prevented with changes in life style. A coordinated set of actions, at the individual and community/public levels, aimed at the primary, secondary, and tertiary levels that will minimize or eliminate the impact of the disease are desired. It has been established that the basis of disease prevention is rooted in cardiovascular epidemiology. Following the guidelines put forward for prevention by this area of science would assist at all levels of prevention (Perk et al., 2012).

The prevention measures of CVDs are always ongoing throughout the lifespan of the individual. These measures start from the conception of the fetus and must be sustained until the death of the individual. Population strategy of prevention according to this source should be geared toward decreasing the incidence at the population's level through lifestyle and environmental changes that are targeted at the population at large (Perk et al., 2012).

According to the CDC (2011), age adjusted rates for coronary diseases have declined steadily in the United States since the 1960s. Factors that contributed to this

decline were many. One of them was the greater control of the associated risk factors. Another reason was the advance in technology and the resulting improvements in the ways the diseases were treated. All these resulted in declining incidence rates of the diseases and might reduce the prevalence of the disease in the long run. Currently, the improved treatment will increase prevalence of the people living with the disease; hence, the mortality rate will be lowered (CDC, 2011).

In the United States, based on self-reported study, it was found that a substantial difference in the prevalence of CVD existed by age, sex, race/ethnicity, education, and state of residence (CDC, 2011). Berry et al. (2012) also noted that there has been a steady decline in cardiovascular event rates in the general population in the United States. This was attributed to the general decline in the risk factors as opposed to the treatment effects alone. The overall decline in coronary heart diseases between the years 1980-2000 was about 44.3%. This in part was due to population changes, in levels of serum total cholesterol, and the decrease in systolic blood pressure (20.1%). The use of statin and anti-hypertensive treatments accounted for a 4.9% and 7.0% decrease, respectively (Berry et al., 2012).

During the course of the data collection in Nigeria, it was easier to calculate the incidence of the diseases in Akure due to the fact the state specialty hospital uses the Apache II system disease classification to organize the data of all patients (outpatient and inpatient). The institution was open to having the logs used for the purpose of data collection. This approach augmented the data collection process and cut down significantly on the time-consuming process for the researcher.

This study, like most epidemiological studies in developed countries like the United States, was based on limited populations. In most cases, samples were of convenience due to favorable historical, financial, or geographical circumstances (Sauver et al., 2012). This study was unable to recruit equal numbers of female and male participants for the study. The samples might be representative but they were not from the entire population of Nigeria. Studies that consider these options will contribute more to what is needed in this population while simultaneously filling the identified gap in the literature.

Significance to Theory

Many theories and models augmented the process of data collection as well as the analysis phases of this study, and this discussion will help in understanding the results. The theories as introduced in the literature review section of this paper and now revisited in the discussion phase demonstrated how these theories guided the study. Human ecology approach allowed this study to investigate risks for CVDs in rural areas and urban cities of Nigeria. It also allowed for assessing CVDs along the socioeconomic lines, as well as seeing how these diseases affect individuals using the human ecology approach. After all, the human ecology field in epidemiology sees an important characteristic of epidemiology in its ecologic perspectives (Jekel& Elmore, 2007). This view perceived people as not just individual organisms, but also as members of communities that exist in a social context. Hence, the world as described earlier was seen as a complex ecosystem where disease patterns vary greatly from one country to the other (Jekel& Elmore, 2007). The pattern of CVDs in the United States is very different from

the one observed in Nigeria. The reason being that urbanization was found to have augmented the burden of the diseases on the participants that were living in cities as opposed to those living in rural areas (and those living in developed countries more than those living in developing countries) even after risks were identified. Some participants in this study verbalized difficulties in following up with doctors after their risk factors were identified. These participants stated reasons such as lack of resources to return to the cities for prevention/treatments, interventions, and follow-ups. They resided in areas where there were no cardiovascular emergency treatment centers. Some might have to travel to the city in order to obtain an ECG if they suffer heart attacks due to an apparent lack of institutions that were well equipped to handle cardiovascular emergencies. This was one of the instances where it was beneficial to reside in the cities. Urbanization was found to provide better access to the treatment of CVDs and emergencies in these participants' populations. The idea that there was value in the structural constraints on health became useful in Nigeria. It showed that in Nigeria, the rural areas were communities that could greatly benefit from aggressive cardiovascular prevention programs at the primary and secondary levels with facilities that could provide this service. The lack of infrastructures like hospitals and first responders' services that would benefit individuals with cardiac emergencies had been documented in the past by another investigator (DelCasino, 2009).

This study revealed how behaviors that were part of the community could influence the health of its members. For instance, participants had the tendency to follow the direction of the researcher when they saw other members responding in positive ways

(smiling and nodding appropriately to suggestions). Speaking the local language fluently helped the investigator and the participants, for they were able to understand given directions and responded appropriately to given tasks.

According to Bandura (2001), self-efficacy is defined as one's confidence in the ability to develop strategies and complete the tasks necessary to be healthy or successful in health seeking endeavors. This study did not measure self-efficacy. Despite that, this theory helped shape the study. Individual participants' beliefs about their capabilities in making their health better could assist in the change process. Hence, self-efficacy might have been related to the behaviors that promoted CVDs (Locke et al., 2007). The social cognitive theory played a major role with this study and assisted in teaching and learning prevention strategies of the research. The health belief model is a part of the social cognitive school of thought. The health belief model embraces the ideology of not scaring people into health, but engaging in the idea of rewarding the participants into some healthy behaviors while simultaneously rewarding them with self-regulatory behaviors (Bandura, 2001). The participants in this study lacked the knowledge and health awareness of how lifestyles and habits could negatively create impairments in their health and well-being. However, when they were told of how changes in their lifestyle and habits could positively influence their health, this might have influenced their decision-making. This personal dimension augmented the idea of change to the participants and led to the actual change process. These behaviors were promoted to the participants during the course of the study. Self-efficacy affects thought patterns that could assist or hinder the individual. Participants with high self-efficacy within the study felt that they

had the ability to improve their health. The majority of these participants refused the part of thought hindrance and took the part of the thought process that assisted their decision-making. As a result, the researcher helped these identified participants to be successful by guiding them to the point where they felt that a change was needed. This was achieved, as proposed by the theory, as the participants went through the change levels effectively. The change started when the participants showed up to be part of the study. Afterward, they continued their health-seeking behaviors by choosing to see their primary health provider for health care and follow-up care. The pattern that was observed in these participants was encouraging. Cultural implication and the significance of how this change evolved are discussed next.

Cultural Implication

Culturally in Nigeria, some physicians have problems with communicating tests or grave clinical presentation results to patients and family. Sippel, Marckmann, Atangana, and Strech (2015) raised the issue of influence of society, culture, religion, and superstition. The idea of tradition imprisonment was also discussed, a phenomenon whereby an individual's old conviction plays a central role as to how they perceive health. Some of the participants of this study perceived their cardiovascular health problems to be the result of their sins to God. They felt the only way to cure was to pray to God for forgiveness. This view was projected in Gabon community. Gabon is another African country where individuals viewed HIV infections as the result of what they have done wrong (Sippel et al., 2015). Even though this study was able to lead some of the individuals who held this belief to seek medical care, some still refused help. It is the

proportion of the population that will not get medical help despite poor objective health outcome, prognosis, and diagnosis that will warrant further research study.

Social Change

Social change is a broad umbrella concept and covers a wide range. However, when the concept is applied to this study and its findings, one has to see how to increase the self-awareness of this disease at the individual and community levels and how to promote getting treatments for those that need prevention at the secondary and tertiary levels. Most importantly, one has to get the stakeholders involved. It will be a positive change when individuals can think of diseases in terms of the path to the disease development (pathophysiology) and not attribute them to supernatural powers/witch crafts. Women are being killed and stoned to death in Nigeria because they were viewed as witches. They are perceived to have caused the emergent cardiac arrest of their neighbor, husband, or stepchild. This study can be one of the catalysts that initiate the process of the change when its results reach the stakeholders, which will be in the dissemination phase. The results will be shared with the local and federal government. It will also be communicated to the local hospitals and community centers where this study was conducted. This will be a sign of social change. However, the real change will happen when the government and stakeholders decide to do something about the results of this study and others like it.

This needed healthcare change is very important because Nigeria continues to be one of the African countries that need to do more in order to improve the well-being of its citizens in terms of health and welfare. The health system is presently in chaos. Some

hospitals in Nigeria were on strike and not taking patients when this study was in progress.

The World Health Organization (2015) just released a report on Nigeria and some other countries. According to this report, 80% of the deaths from chronic diseases will be in the middle and lower income countries. This is clearly so because of the demonstrated lack of knowledge of chronic diseases. This study showed there is a general lack of knowledge about CVDs across all levels of social economic status in the population pooled for the study.

Limitations and Future Recommendations

One of the study limitations was the fact that the samples were drawn from three states out of 36 states that make the country. Conducting this study in the whole country with samples that will be drawn from the entire population is ideal and it is strongly recommended for future studies. This study's future recommendation will cover the gap, researchers, government, consumers, and the agents of research dissemination. This study, being the first that measured the incidence and prevalence of cardiovascular diseases in Nigeria, started the process of scientifically measuring the number of the population that were affected by this disease, whether or not they were aware. However, this study fell short of making the study pool from all the 36 states of the federation. The states that were involved in the participants' pool were only three. While the numbers and findings in this study filled some of the gaps in what was known, there remains a significant unknown that can only be filled with future studies. That includes samples from all the states of Nigeria. This means more research is needed. Since this study was

conducted, there has been significant development in some parts of the country. There have been terrorism and other elements that destabilize nations. Conducting research in the general population on cardiovascular health, and checking to see if these other factors are influences of cardiovascular health will be strongly recommended for future research.

Health research means nothing if the results cannot be translated into health practices. The government, agents of research dissemination, and researchers have to make a collaborative effort in order to make research results trickle down to the consumers and public at large in a timely fashion.

Conclusion

When a community is in good health, it is classified as a status. This status has been noted to improve the level of human capital in the population. When human capital goes up, it affects the economic growth of individuals and communities in return (Trading Economics, 2016). The idea that health and human capital are fuels for economic growth ((Zivin & Neidell, 2013) . The result of this study, when officially disseminated, communicated, and acted upon by the stakeholders, could have the kinds of effects that trigger needed change. The change will in return improves the health and well-being of individuals and communities (with regards to cardiovascular diseases) where this study was conducted. It has been estimated that Nigeria lost more than $14 million to chronic diseases in 2005 and this value has been estimated at three to seven times greater for the year 2015 (World Health Organization, 2015). This is interesting because Nigeria's gross domestic product for 2014 was only $568.51 billion (Trading Economics, 2016), and Nigeria does not have health insurance coverage for almost 80%

of its population. Cardiovascular diseases are chronic illnesses and prevention is one of the ways to bring healthcare cost down.

Health and diseases are dynamic variables that are intertwined with variables that are biological, psychological, behavioral, and social factors. These interactions and associations occur throughout the stages of human development. Interdisciplinary efforts to bring about change that will reflect the findings of this study are needed in the population that was investigated. Psychosocial factors do influence health directly by using biological influence and behavioral mechanism (McLoughlin&Geooff, 2005). This study's focus was more on the behavioral and social aspect of these influences. The interactions of the social economic status and CVDs are well documented. However, for this specific population under investigation, the interaction was no different from the individuals in higher income brackets to the ones in the lower income range when it comes to cardiovascular health. Most of the participants held to the belief that God will prevent this type of disease from happening to him or her. While this study did not aim to refute the claim, it did intend to promote health using the wealth of resources that filled the gap of what was known about these diseases while contributing to decrease the unknown.

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Further studies are needed to explore the phenomenon that was discussed earlier as this is important to the prevention of diseases at all levels. The study also needs to be conducted across the entire country with 100% representation of all communities to promote generalizability of results. The idea that diseases were the result of dietary intake, genetics, lifestyle, and the environment as opposed to being caused by witchcraft and punishment for human sins needs to be promoted and communicated at all levels of health planning and intervention in Nigeria.

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Appendix A: Study Design Formula

Study design: the formula for calculating the needed sample size for estimating a proportion

Logistic model for exposure: OR(x) = exp (beta x)

E1: Cardiovascular diseases

Two-sided test Alpha-level: 0.050000

Probability of disease at baseline: 0.300000

Probability distribution

Score	30.000	41.000	51.000
	0.3300	0.3300	0.3400

ORs under H_ 1 (alternative)

Score	30.000	41.000	51.000
	1.000	1.237	1.500

ORs under H_0 (null) Score 30.000 41.000 51.000

Appendix B: Figures

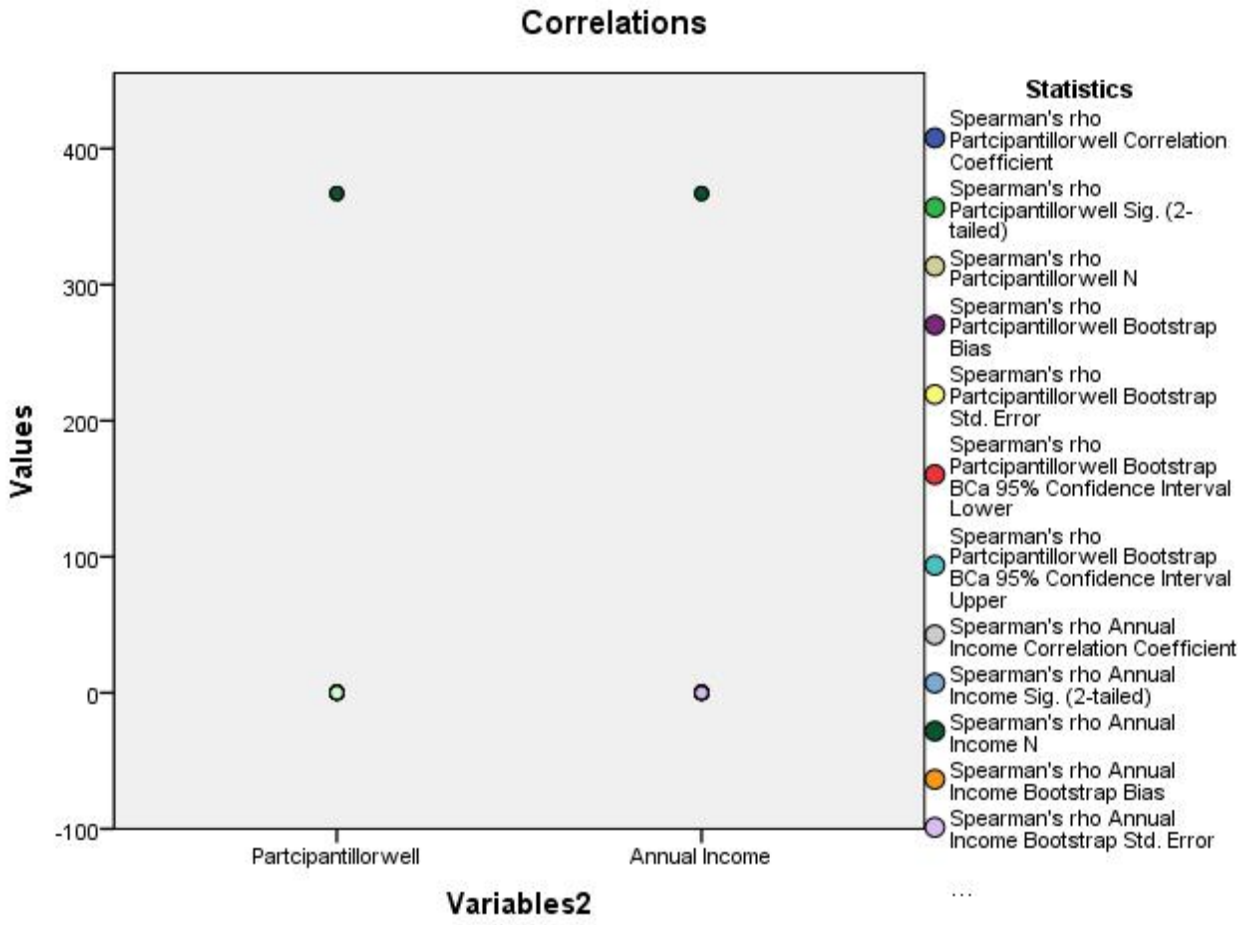

Figure 1. Correlations.

A quantile - quantile plot was used to display the degree to which the quantiles of reference in the distribution is known. The data fit the reference distribution, because the points will lie in a tight random scatter around the reference line. There is small outlier in the plot. But the overall pattern indicated normality. Please see below a normal Q-Q plot of the observed.

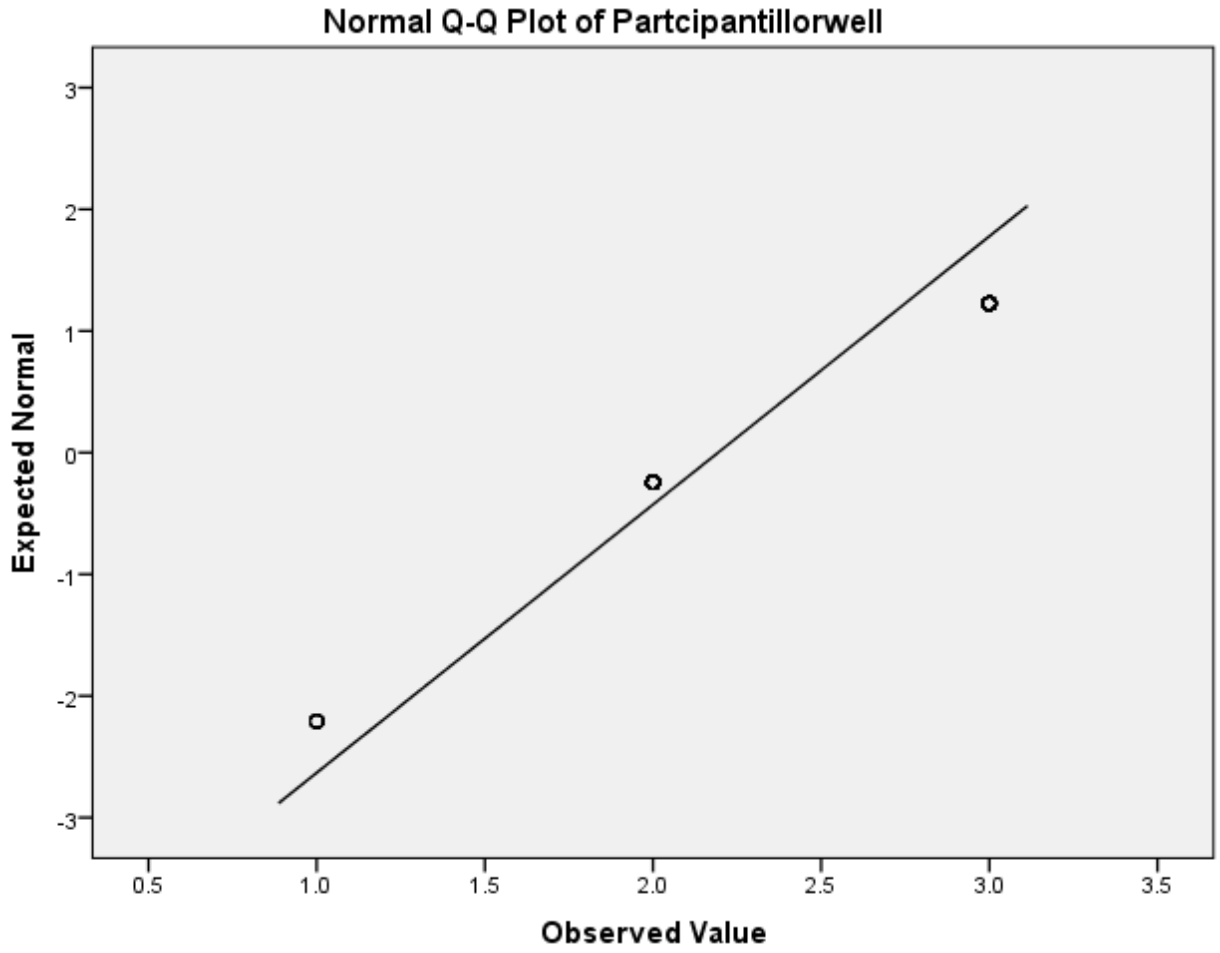

Figure 2.Quantile-quantile plot.

T up y e owever, the question regarding y ri e w re that of s l lso showed the spread of the variables.

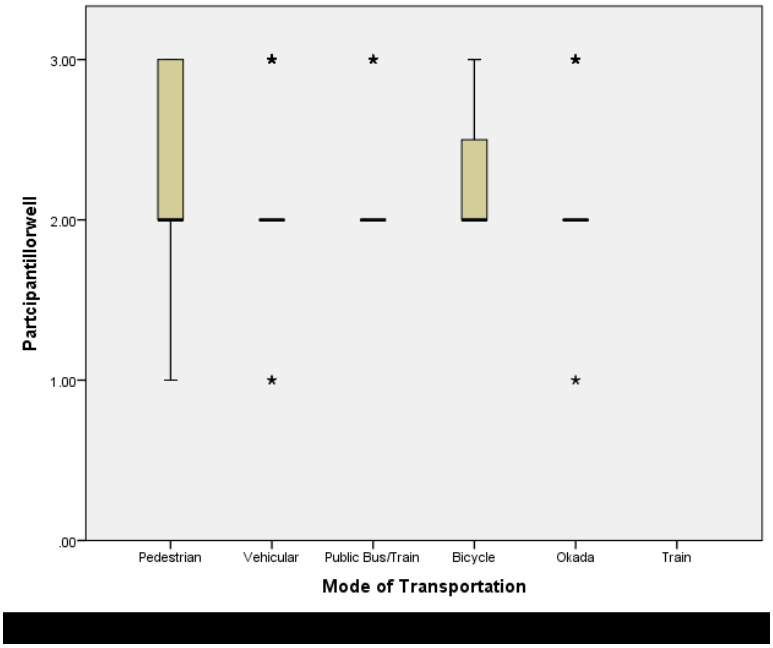

Figure 3. Scatter diagram.

Appendix C: Questionnaire

Please check the appropriate boxes.

Gender	(a) Male	(b) Female
How tall are you?	Ft. Inches	
What is your weight?	In Kilograms	
Do you currently smoke?	Yes	No
Have you ever smoked?	Yes	No
Have ever been diagnosed with any heart related conditions/High blood pressure/Abnormal EKG Readings/Abnormal Pulse?	Yes	No
Do you take medications for the above?	Yes	No
Have you ever suffered chest pain?	Yes	No
What is your annual income?	<18,000. (Minimum wage) >18000. <100,000. >100,000.	
How do you commute to work by	Bike Vehicular mode As pedestrian	
. Do you own a motor vehicle	Yes	No
. How many miles do you walk daily	< 1mile	> 1mile

*Interpreter available for those who cannot read English
* Questions based on cardiovascular risk factors
Cardiovascular diseases measured as abnormal EKG readings, abnormal arterial pulse readings, and abnormal blood pressure measurements