Hospital Length of Stay and Healthcare Costs Among African American Women Due to Obesity and Diabetic Conditions in United States

By

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ABSTRACT

Obesity has reached near epidemic proportions in the United States. Rising obesity and its associated comorbidities result in deleterious effects on health status[4-6] and a significant increase in health burdens [7, 8]. Excess cost attributable to overweight and obesity was reported to be approximately $92.6 billion dollars, comprising between 6 – 10% of the total health care expenditure of the US [9, 10]. Obese individuals had 36% higher annual health care costs than non-obese individuals [11].

Type 2 Diabetes (T2DM) has the common characteristic of obesity or being overweight. In addition, the researchers found that while two out of every 1,000 normal weight people had been diagnosed with diabetes, some 18 out of 1,000 obese people had the disease and there was a 41% increase in the incidence of diagnosed diabetes during that time. Researchers confirmed that the more fat tissue a person has the less sensitive that person becomes to insulin. Therefore a greater amount of insulin is required to maintain the body's regulation of blood glucose levels. Fat cells release a protein that leads to the development of T2DM [17].

Obesity prevalence of the pre-diabetic and diabetic conditions is more common in certain subgroups of the population. For African Americans, the prevalence of obesity is high, particularly African American women. The risks of morbidity and mortality associated with diabetes poses serious problems African American women as they affected by obesity related comorbidities disproportionately [14].

Although prevalence rates of obesity and diabetes have reached epidemic proportions in the African American population, the relationship between obesity and hospital health care use, cost and length of stay has received limited attention and failed

to provide consistent results. Even though obesity is one of the biggest drivers of preventable chronic diseases and healthcare cost in the United States, obesity rates continue to grow. Taking account of culture and social economic factors, this study serves as a model for future studies on hospital length of stay and health care cost in high risk populations of primary diseases with comorbidities. The study provides a baseline for obese African American women with T2DM. The study design is a retrospective, correlation, quantitative analysis on lengths of hospital stay and cost among adult African American women categorized according to their weight status with T2DM. This study will be driven by the following four research questions and associated statistical hypotheses:

Research Question 1 (RQ1). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital length of stay (LOS) among African American females?

Research Question 2 (RQ2). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital costs among African American females?

Research Question 3 (RQ3). How co-morbidities and life factors are related to individual health factors of interest (obesity and diabetes) among African American females?

Research Question 4 (RQ4). How primary diagnoses are related to individual health factors of interest (obesity and diabetes) for African American females?

The aim of the study is to estimate the hospital length of stay and associated cost, related to obesity in African American women with T2DM. This cost of illness study would suggest that hospital costs could potentially be saved if obesity would be eliminated [49]. Primary prevention by health promotion campaigns and secondary by mental and dietary treatment can significantly decrease hospital costs obesity inflicts on society [50].

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CHAPTER 1 INTRODUCTION

1.1 Statement of the Problem

Literature review revealed that of approaches proven efficacious in clinical trials for improving diabetes and obesity outcomes are often not fully realized because therapies are not efficaciously implemented in high risk communities. It has been established that lifestyle interventions, with modest (5-7%) weight loss, can prevent or delay development of type 2 diabetes in individuals at high risk for the disorder. Although prevalence rates of obesity and diabetes have reached epidemic proportions in the United States, more notably in the African American population, the relationship between obesity and hospital health care use has received very little attention. An even smaller body of literature has focused on use of hospital care resources and hospital length of stay among obese African American with diabetes; and the research that is available failed to provide consistent results. Obesity is one of the biggest drivers of preventable chronic diseases and healthcare cost in the United States, however obesity rates continue to grow. Taking account of culture and social economic factors, this study will serve as a model for future studies on hospital length of stay and health care cost in high risk populations of primary diseases with comorbidities. The study will provide a baseline for one high risk population, obese African American women with diabetes. By means of a retrospective, correlation, quantitative analysis, baseline data will be provided on lengths of hospital stay and cost among adult African American women individuals categorized according to their weight status with type 2 diabetes.

1.2 Background

Obesity is the second leading cause of preventable death in the United States and the most prevalent, fatal, chronic, relapsing disorder of the 21st century. Obesity is a disease that affects over one-third of the adult American population or approximately 72 million Americans [1]. The number of obese persons to exceed seventy-two million [2]. Obesity rates have not decreased in the last 30 years and obesity prevalence has more than doubled in that time span, from approximately 15% to current 34% [3].

Rising obesity and its associated comorbidities result in deleterious effects on health status[4-6] and a significant increase in health burdens [7, 8]. Excess cost attributable to overweight and obesity was reported to be approximately $92.6 billion dollars, comprising between 6 – 10% of the total health care expenditure of the US [9, 10]. Obese individuals had 36% higher annual health care costs than non-obese individuals [11]. Figures 1 and 2 demonstrate the prevalence of obesity in Adults and in Non-Hispanic blacks.

Figure 1: Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2013

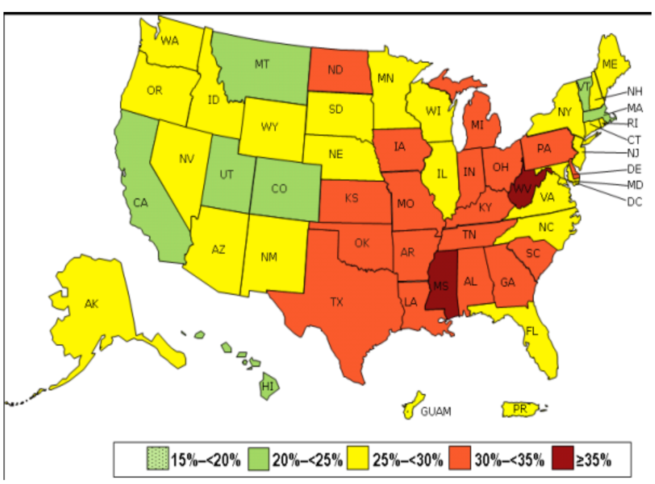
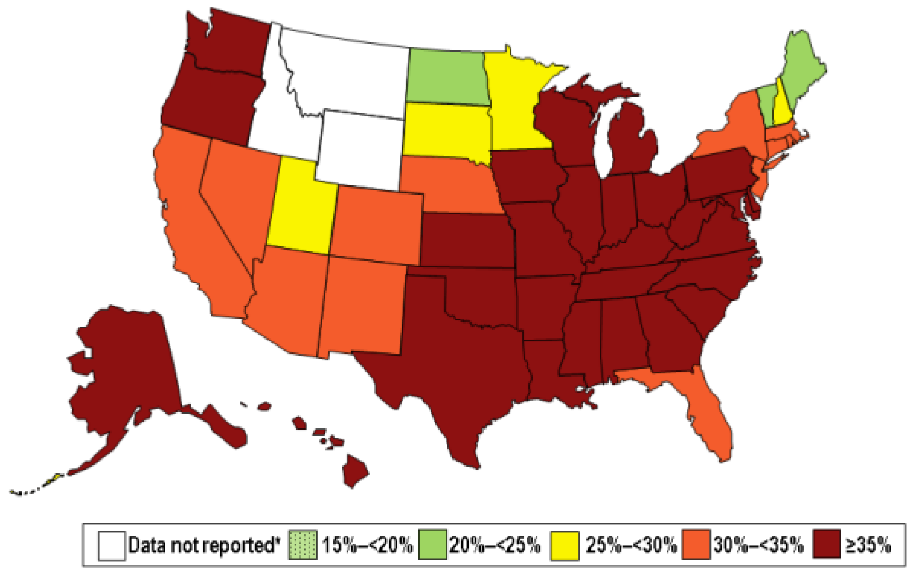


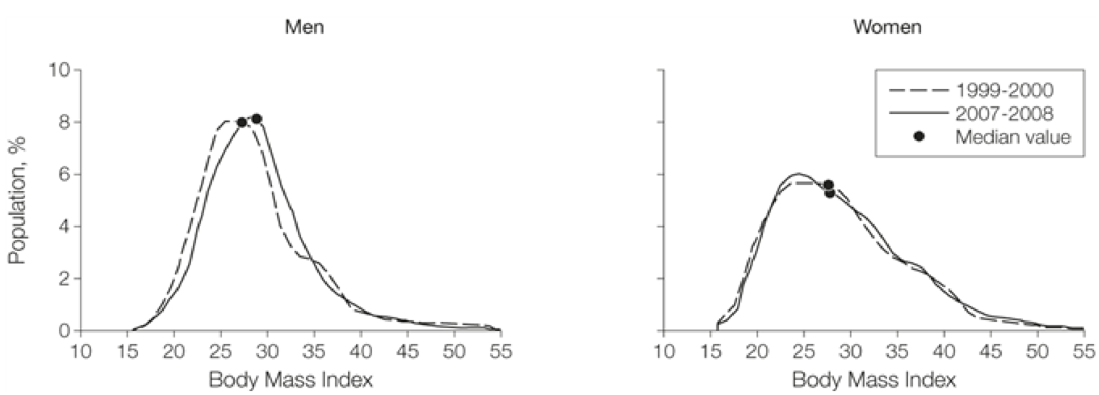
Figure 2: Prevalence of Self-Reported Obesity Among Non-Hispanic Black Adults by State, BRFSS, 2011-2013



1.2.1 Obesity Prevalence in United States- Women Greatly Affected

Studies show that in 2007-2008 women in the United States had an obesity prevalence rate of 35.5% while the rate for men was 32.2% [12].

Figure 3: Smoothed Frequency Distribution of BMI for Men and Woman 1999-2000 and 2007-2008 [12]

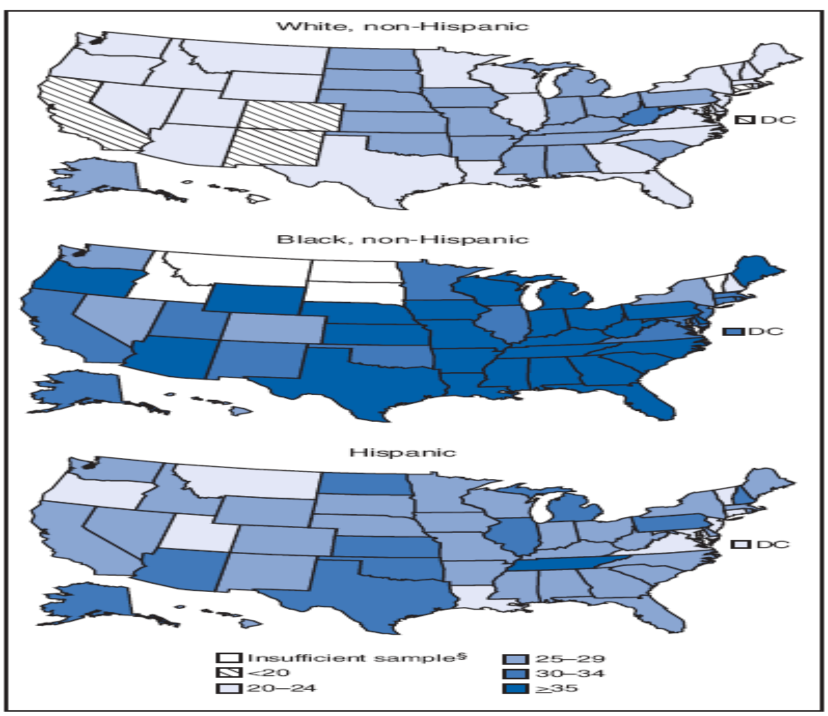


By the year 2020, it is projected that 43.3% of women in the United States population compared to 40.2% of men will be obese [13]. Furthermore, at higher obesity levels BMI >35 estimates show that women in the United States will be greatly affected. However for all ethnicity of women, the rate of obesity is highest in women and African American women are they affected by obesity related comorbidities disproportionately [14].

Non-Hispanic blacks (35.7%) had 51% greater prevalence of obesity, when compared with non-Hispanic whites (23.7%). This pattern was consistent across most U.S. [15].

Figure 4 above is a map showing state-specific percentages of U.S. adults categorized as obese, by black/white race or Hispanic ethnicity, based on data from 2006-2008 Behavioral Risk Factor Surveillance System surveys.[15]

Figure 4: Behavioral Risk Factor Surveillance System surveys, United States, 2006—2008. [15]



In most states, non-Hispanic blacks had the greatest prevalence of obesity, followed by Hispanics, and non-Hispanic whites.

At least three reasons may account for the racial and ethnic differences in obesity. First, racial and ethnic groups differ in behaviors that contribute to weight gain; second explanation may be differences in individual attitudes and cultural norms related to body weight; third explanation may be differences in access to affordable, healthful foods and safe locations to be physically active and this limited access may negatively impact diet and physical activity levels [16].

1.2.2 Obesity Correlation with Diabetes – Most Prevalent in Non-Hispanic Blacks

Many experts believe there is no coincidence that the rise in obesity among Americans correlates with a staggering increase in diabetes, which has reached epidemic proportions. Research from a clinical study of 31,000 Americans over a six year period conducted by the Centers of Disease Control showed that people with Type 2 Diabetes (T2DM) have the common characteristic of obesity or being overweight. In addition, the researchers found that while two out of every 1,000 normal weight people had been diagnosed with diabetes, some 18 out of 1,000 obese people had the disease and there was a 41% increase in the incidence of diagnosed diabetes during that time. Researchers confirmed that the more fat tissue a person has the less sensitive that person becomes to insulin. Therefore a greater amount of insulin is required to maintain the body's regulation of blood glucose levels. Fat cells release a protein that leads to the development of T2DM [17]. Obesity prevalence of the pre-diabetic and diabetic conditions is more common in certain subgroups of the population. The American Diabetes Association found that after adjusting for population age differences, 2007-2009 national survey data for people diagnosed with diabetes, aged 20 years or older include a prevalence of 12.6% for non-Hispanic blacks.

The AHRQ-funded literature review of 290 articles revealed that improving the lipid profile of African Americans with diabetes could help to lower their risk of diabetes-related cardiovascular disease and T2DM. Both obesity and diabetes have the highest prevalence and greatest disparities in treatment are in non-Hispanic blacks and Hispanics populations[18].

1.2.3 Obesity Association with Hospital Costs

Because overweight and obesity are associated with many comorbidities, increasing levels of overweight and obesity may impact hospital use. Obesity is associated with health problems, such as diabetes and cardiovascular disease and one consequence of the emerging obesity epidemic may be increased hospital use and length of stay [19]. Studies, largely from outside the United States, suggest that increased hospital use and high healthcare cost are associated with overweight and obesity [19-22]. However those studies results may not be applicable due to due to differences in the American diet. Therefore research is needed in the United States on the association of obesity, hospital admissions and length of stay in African American women.

Table 1 lists the top ten most common comorbidities for hospitalization in the U.S, among patients with diabetes in 2008. Obesity which ranks number six attributes to 1,2M or 15.8% of hospital stays in patients in diabetes and 1,5M or 4.9% of hospital stays for patients without diabetes [23].

Table 1

Rank	Comorbidity	Number of hospital stays among patients w/ diabetes	Number of hospital stays for patients w/o diabetes
1	Hypertension	5,316,881 (68.8%)	9,709,282 (30.2%)
2	Fluid and electrolyte disorders	1,912,018 (24.7%)	4,644,232 (14.4%)
3	Chronic pulmonary disease	1,606,352 (20.8%)	4,064,227 (12.6%)
4	Deficiency anemia	1,586,034 (20.5%)	3,477,918 (10.8%)
5	Renal failure	1,417,301 (18.3%)	1,606,505 (5.8%)
6	Obesity	1,218,623 (15.8%)	1,571,851 (4.9%)
7	Congestive heart failure	986,192 (12.8%)	1,522,888 (4.7%)
8	Hypothyroidism	919,041 (11.9%)	2,245,515 (7.0%)
9	Depression	813,417 (10.5%)	2,223,302 (6.9%)
10	Peripheral vascular disorders	704,136 (9.1%)	1,005,318 (3.1%)
Based on all-listed diagnoses Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2008 [23].			

Table 2 represents the Top ten most common principal reasons for hospitalization among patients with diabetes in 2008 with the number of hospital stays [23].

Table 2

Rank	Principal diagnosis	Number of hospital stays among patients with diabetes*
1	Diabetes	519,522 (6.7%)
2	Congestive heart failure (non-hypertensive)	424,147 (5.5%)
3	Coronary atherosclerosis (hardening of the arteries)	346,054 (4.5%)
4	Pneumonia	290,709 (3.8%)
5	Septicemia	224,842 (2.9%)
6	Acute myocardial infarction (heart attack)	220,760 (2.9%)
7	Chronic obstructive pulmonary disease and bronchiectasis	219,743 (2.8%)
8	Nonspecific chest pain	212,706 (2.8%)
9	Cardiac dysrhythmias	196,293 (2.5%)
10	Complication of device, implant, or graft	194,516 (2.5%)
Based on all-listed diagnoses and records with diabetes as a secondary diagnosis. AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2008 [23]		

According to the estimates from a statistical brief based upon data from the HCUP Nationwide Inpatient Sample (NIS) for 2009; principal diagnoses for hospital stays with a secondary diagnosis of obesity in 2009 were as follows:

1. Osteoarthritis
2. Congestive heart failure; non-hypertensive
3. Coronary atherosclerosis and other heart disease
4. Nonspecific chest pain
5. Skin and subcutaneous tissue infections
6. Cardiac dysrhythmias
7. Pneumonia (except that caused by tuberculosis or sexually transmitted disease)
8. Chronic obstructive pulmonary disease and bronchiectasis
9. Mood disorders
10. Acute myocardial infarction [24]

A comparison with obesity related primary diagnosis presented dichotomous variables of comorbidities to use in a correlational analysis for determination of diabetes and obesity correlation with hospital length of stay and cost.

1.3 Goals and Objectives

The aim of this research is to study the effects of obesity and diabetes on hospital resources for African American women between the ages of 21 and 55. The research questions will prepare United States health care provider data to develop preventive programs appropriate for the high prevalence and severity of obesity and diabetes among the adult African American women population. This research will provide a model for conducting obesity outcome research involving other racial/ethnic minorities and socio-economically disadvantaged groups. The purpose of this retrospective, correlational, quantitative study is to examine obesity and diabetes associations with United States hospital use and healthcare costs for African American women. The study will explore the relationship between co-morbidities of interest (obesity and diabetes) and hospital resources (length of stay and costs). The study will also examine other factors, such as other co-morbidities, as well as primary diagnoses related to obesity and diabetes, among African American females. These other factors will be considered in the study for control purposes to eliminate potentially lingering confounding variables.

1.4 Significance of the Problem

1.4.1 Obesity Strain on Healthcare System

The increase in obesity will continue to strain the healthcare system and its intensification is increased by the addition of millions of cases of diabetes)[25]. With the large amount of obesity related consequences, obesity presents a significant financial burden for society. Data shows that the annual healthcare costs associated with obesity may have been as high as 147 billion dollars in 2008 and accounting for more than 8% of the total Medicare expenditures and 11% of the Medicaid expenditures [26]. According to Wexler (2007), obese people account for 37% of the United States' population, but obesity-related diseases and health problems account for 61% of healthcare costs in the United States every year [27]. The costs exceed $147 billion per year causing a strain on the healthcare system. As obesity rates grow, costs associated with obesity will become too large for federal healthcare systems to continue to cover. Reduction in obesity rates in the United States is necessary to save billions of dollars that could be spent on other government programs [28]. To further emphasize this problem, in 1990, not one State in the United States possessed an obesity rate over 14%. In 2000, just ten years later, twenty three states had an obesity rate between 20 and 24%, and the other 27 states had a lower obesity rate previously. However in 2010, 36 states had an obesity rate of at least 25%, and 12 states had an obesity rate of 30% or higher [29]. This dramatic rise in obesity continue to cause many problems for the economy and healthcare system [30]. To put this in perspective for costs, obesity has made large contribution to the growth in healthcare costs. In 1990, the federal government spent about $107.9 billion on Medicare, representing about 8.8% of total expenditures; and $43.3 billion on Medicaid representing about 3.5% of expenditures. However by 2000, those numbers doubled. In 2010, $517.5 billion were spent on Medicare (18.9% of expenditures) and $265.4 billion on Medicaid (9.7% of expenditures) [31]. By 2010, the federal government was spending almost $800 billion on Medicare and Medicaid (28.6% of expenditures). With these statistics, it is ironic that neither Medicare nor Medicaid directly covers the condition of obesity, but the health problems related to or caused by obesity are covered.

Obesity can lead to T2DM, chronic heart disease, hypertension, and many other diseases that are covered by Medicaid and Medicare. As obesity has increased, so has the incidence of these diseases, thereby increasing the cost of healthcare [31]. If obesity rates do not go down, medical costs will become too large for government programs to cover. Increasing healthcare costs aren’t the only problems the obesity rate is causing. Research demonstrates that it is vital for the government to help save financial health of the healthcare system by bringing down obesity rates. Money should be spent on programs that both encourage and educate people on health lifestyle. In fact, a reduction in obesity rates by only 5%, the government could save an estimated $611.7 billion on healthcare costs over the next twenty years [32]. The dramatic increase in the rate and consequences of obesity has sparked increased efforts from various sectors to decrease the burden associated with the condition. Saving money on the healthcare system as a result of obesity rate reduction would help our economy and benefit the entire country for generations to come.

1.4.2 Obesity Burden on Hospitals

The substantial prevalence of overweight and obese patients may pose a threat to future hospital services. To further address the burden of overweight and obesity in hospitals, research in needed to provide data about consequences of obesity on length of stay, use of hospital resources and overall hospital cost.

During the past decades it has been reported an increasing prevalence of overweight body mass index (BMI) of (BMI $\geq$ 25 kg/m2) and obesity (BMI $\geq$30 kg/m2) worldwide [33, 34]. T2DM, cardiovascular diseases and cancer are by far the leading cause of mortality in the world, and they are all associated with overweight and obesity [35]. The risks for these diseases are increased in adults with excess abdominal fat and high BMI [36]. The associated socio-economic costs are extremely high and also likely to increase [37]. In clinics and public hospitals in the United States, studies of overweight and obesity among adult outpatients has shown prevalence rates around 80% [38, 39]. Some research provides a correlation between obesity and the length of stay in hospital of patients treated for different causes [40]. Furthermore, among 75% of hospitalized patients research by Huang, et al. found that one or more obesity-related condition(s) existed [38].

Obesity is a contributing factor to numerous of medical problems effecting cost of hospital services. According to The American Heart Association, obesity is one of several modifiable independent risk factors for cardiovascular disease [41]. Overweight individuals are also at higher risk for a long list of other diseases, including high blood pressure, high cholesterol, T2DM, stroke, gallbladder disease, arthritis, sleep disturbances and problems breathing, and certain types of cancers [42].

To further complicate matters for hospital resources, obese patients may delay seeking medical care for a number of reasons, including self-consciousness about their weight, fear of negative comments from physicians and staff, or past negative experiences with hospitals or staff [43]. When patients delay seeking appropriate preventive care, they are more likely to end up in the emergency department or be admitted to the hospital and, consequently, under the care of a hospital staff [42].

Besides burden on health care staff, hospital resources such as furniture, equipment, medical supplies, designed to accommodate the average-size adult will have to be modified to accommodate obese patients. Upon arrival at a hospital, even transferring the patient from the ambulance stretcher to a hospital bed could require devices designed to aid in lifting and moving patients are not rated for use with the obese patient. There must be sufficient staff on hand to facilitate transfer of the patient, and the staff must be well educated in lifting and moving techniques safe for staff and patient. In a Novation survey of VHA member hospitals released in December 2004, 28% of respondents reported an increase in workplace injuries, primarily back injuries related to lifting obese patients. The National Council of Compensation estimates the average cost per healthcare worker injury to be $8,400. This increase in worker's compensation claims would have a financial impact on hospitals [42].

Once the patient is situated, the medical personnel have the additional challenge to accurately assess the patient. Even basic vital signs can be difficult to obtain due to several layers of fat between the arteries and skin surface. Because of difficulty with assessment in obese patients, physicians perform more invasive, thus costly procedures than may be necessary [42].

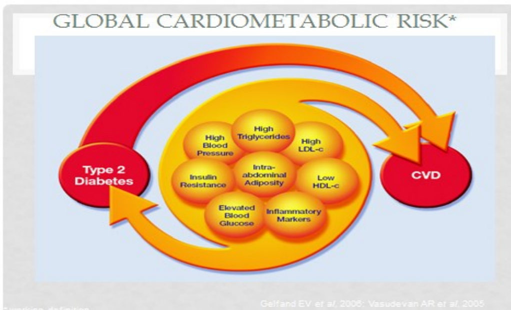
1.4.3 Need for Research in African American Women

Obesity in the United States is disproportionately high in African American women than whites even before and after taking into account differences in BMI. Data suggest that the inverse association of a healthy diet with diabetes is stronger for minorities than for whites [44].

The risk of diabetes is significantly related to obesity. In the Third National Health and Nutrition Examination Survey, the prevalence rates of diabetes for non-Hispanic blacks were 1.6 times the rate for non-Hispanic whites [45]. Studies have demonstrated greater visceral adipose tissue in whites than in blacks despite the greater amount of total body fat in black women than in white women however, black obese women demonstrate a higher degree of insulin resistance than white obese women despite less visceral fat [46, 47].

Diabetes is of equal public health concern for all ethnic groups in the United States; however there is a need for research specifically in the black population. The prevalence of obesity is high among African Americans but particularly high in African American women. Over the past 30 years, the prevalence of diabetes in African Americans has more than tripled and research recognizes variability in clinical manifestations of the disease in black populations, such as insulin-resistant, noninsulindependent diabetes mellitus (NIDDM) and insulin-sensitive NIDDM, which have different cardiovascular disease risk profiles [48].

Figure 5: Insulin resistance Associated with Type 2 Diabetes and Obesity and increase risk for cardiovascular diseases



African American women currently experience poorer health status are expected to grow as a proportion of the total U.S. population; therefore, the future health of America as a whole will be influenced substantially success on improving the health of African American women with obesity and diabetes. Eliminating racial and ethnic disparities in health will require enhanced efforts at preventing disease, promoting health and delivering appropriate care. This will necessitate improved collection and use of standardized data to correctly identify all high risk populations and monitor the effectiveness of health interventions as well as new knowledge about the determinants of disease, causes of health disparities, and effective interventions for prevention and treatment of African American women.

The risks of morbidity and mortality associated with diabetes poses serious problems for the African American community. It is vital to put at the forefront, initiating research studies, developing strategies for use in practice and providing education to the public about the potentially deadly consequences of obesity, its correlation to diabetes and hospital costs in African American women. Research on how obesity affects African American women utilization trends in hospital admissions and length of stay is warranted to gain insight into the experiences that may influence use of preventative health care to improve health outcomes. The study may help health professionals tailor their interactions with overweight and obese African American women who are in need of obesity sensitive care. The knowledge gained from this study may provide the information needed to develop interventions aimed at promoting timely use of preventative healthcare with an ultimate goal of reducing mortality from diabetic conditions in a high risk population. Concerted efforts to reduce health disparities could thus have immense economic and social value.

1.4.4 Relevance to Biomedical Informatics

The study demonstrates relevance to the field of biomedical informatics, specifically studying patient outcomes and health care delivery. The study will provide data on correlation of variables of interest on hospital resources impact on quality, costs and outcomes and will provide direction for future research. On a broader application, the study will assist policy-makers in making informed decisions about future health policy and budgets for healthcare expenditures for high risk populations

1.5 Hypotheses and Research Questions

The aim of the study is to estimate the hospital length of stay and associated cost, related to obesity in African American women with T2DM. This cost of illness study would suggest that hospital costs could potentially be saved if obesity would be eliminated [49]. Primary prevention by health promotion campaigns and secondary by mental and dietary treatment can significantly decrease hospital costs obesity inflicts on society [50]. This study will be driven by the following four research questions and associated statistical hypotheses:

Research Question 1 (RQ1). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital length of stay (LOS) among African American females?

Null Hypothesis 1 (H01). There is not a statistically significant relationship between either of the individual health factors of interest (obesity and diabetes) and hospital LOS among African American females.

Alternative Hypothesis 1 (HA1). There is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital LOS among African American females.

Research Question 2 (RQ2). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital costs among African American females?

Null Hypothesis 2 (H02). There is not a statistically significant relationship between either of the individual health factors of interest (obesity and diabetes) and hospital costs among African American females.

Alternative Hypothesis 2 (HA2). There is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital costs among African American females.

Research Question 3 (RQ3). How co-morbidities and life factors are related to individual health factors of interest (obesity and diabetes) among African American females?

Null Hypothesis 3 (H03). There is not a statistically significant correlation between both co-morbidities and life factors, and either of the individual health factors of interest (obesity and diabetes).

Alternative Hypothesis 3 (HA3). There is a statistically significant correlation between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes).

Research Question 4 (RQ4). How primary diagnoses are related to individual health factors of interest (obesity and diabetes) for African American females?

Null Hypothesis 4 (H03). There is not a statistically significant correlation between diagnoses and either of the individual health factors of interest (obesity and diabetes).

Alternative Hypothesis 4 (HA3). There is a statistically significant correlation between diagnoses and at least one of the individual health factors of interest (obesity and diabetes).

1.6 Overview of Obesity Related Diabetes

With T2DM diabetes, the body either resists the effects of insulin which is a hormone that regulates the movement of sugar into your cells or doesn't produce enough insulin to maintain a normal glucose level. Therefore, T2DM diabetes occurs because the body doesn’t use the hormone insulin properly. Insulin helps the body absorb glucose and use it for energy. If the body doesn’t make enough insulin or doesn’t use insulin properly, the person will have a condition called insulin resistance. Insulin resistance requires the body to produce higher levels of insulin. Over time, the body cannot keep up with the demand for extra insulin and T2DM develops. Too much glucose, also called sugar, develops in the blood damaging your body over time; causing heart attacks, strokes, kidney disease, blindness, dental disease, amputations, and other serious health problems. Increased risks for diabetes include being aged 45 or older, overweight, physical inactive, have high blood pressure or high cholesterol and African American, Alaska Native, American Indian, Asian American, Hispanic/Latino, or Pacific Islander American ethnicity [51]. Both obesity and race are risk factors for diabetes. According to the Center for Disease Control, Americans dietary habits are causing a diabetes epidemic. Some staggering statistic with obesity related diabetes is that in 1999, diabetes affected 16 million representing 6% of Americans and during the same period, the obesity rate climbed from 12% to almost 20%. Every three seconds, someone is diagnosed with diabetes.

Although both diabetes and obesity risk factors are often associated with race, age, and family history, it's becoming more and more clear that the conveniences of modern life also contribute to the development of both diseases. For example, sedentary lifestyles (reduced physical activity) and the popularity of high fat, high energy diets and convenient foods are known to lead to obesity. The link between diabetes and obesity has been proven. Of the people diagnosed with T2DM diabetes, about 80 to 90% are also diagnosed as obese [52]. Understanding what causes the disease will hopefully allow us to prevent diabetes in the future.

Being overweight places extra stress on your body in a variety of ways, including your body's ability to maintain proper blood glucose levels causing your body to become resistant to insulin. It appears to reduce the chances that you will develop diabetes would be to maintain a healthy weight and increase your physical activity. According to the

Obesity Society, if you are overweight, even a small weight loss (5 to 10%) can prevent diabetes or prolong the chance that you will develop the disease [52]. To aid in weight loss, a high fiber, low carbohydrate diet and 20 to 30 minutes of moderate activity per day are recommended.

As the ultimate cost of obesity is a drastically reduced quality of life and a shorter life span, in addition to these health consequences, obesity places an enormous burden on the health care system and the economy as a whole. Decreasing the occurrence of being overweight and obesity remains an important intervention to reduce the burden of diabetes.

CHAPTER 2 LITERATURE REVIEW

2.1 Literature Search and Search Strings

Literature search consisted of review of many peer reviewed articles published on Type 2 diabetes and obesity. Reviewed were articles and information published on organization websites and relevant books. Electronic search strategies were utilized to identify relevant peer-reviewed articles, reviews and meta-analysis. Searched was MEDLINE (1990-2014) for English articles for titles and abstracts. Hand searches were also conducted (e.g. reference list of relevant articles) and Google searches. The total number of title/abstracts screened were 706, consisting of citations identified by electronic database search as n=632 and citations identified by hand searches as n =74. These yield potentially relevant 319 articles identified and a detailed review of 211 articles. Following search strings were used to extract articles from various databases: Search terms included:

"Obesity" or "African American" or "Black" and "Type 2 Diabetes" or "Type II Diabetes" or "Diabetes";

"Obesity" and "African American" or "Black" and "Type 2 Diabetes" or "Type II Diabetes" or "Diabetes;"

"Obesity" and "Chronic Diseases";

"Obesity" and "Diabetes" and "Outcomes";

"Obesity" and "African American and Type 2 Diabetes" or "Diabetes" and "Hospital Costs" or "Hospital Length of Stay";

"Obesity" and "African American" or "Black" and "Type 2 Diabetes" or "Diabetes" and "Hospital Admission" or "Primary Diagnosis".

2.2 Epidemiology of Diabetes

A growing epidemic of diabetes in the United States coupled with an increasing prevalence of diabetes risk factors will only exacerbate the problem of diabetes. Therefore, population-based researches that study variable diabetes risk factors such as obesity are needed to reduce the burden of diabetes. In addition, people with diabetes have a higher rate for complications that significantly affect the morbidity and mortality associated with diabetes thereby contributing to the increasing medical costs related to diabetes. Adoption of appropriate diet and exercise behaviors and adherence to medication regimens could result in tighter glycemic control that, along with controlled blood pressure and blood lipids, will greatly reduce the burden of diabetes complications in the United States [53].

Diabetes and its complications are a major cause of morbidity and mortality in the United States and contribute substantially to health care costs. Although already seen is an epidemic of diabetes in the United States over the past two decades, the United States can expect a continued rise in the incidence of diabetes as the population gets older resulting in continued increase in adult obesity rates, and an increase in the population of minority groups that are at high risk for diabetes. In addition, rising childhood obesity rates and the increasing diagnosis of Type 2 diabetes (formerly "adult-onset" diabetes) among children and young adults have become an increasingly serious health crisis, which will result an increased number of people having and managing diabetes for most of their lives [53].

Although 90 – 95% of the diabetes burden in the United States is due to Type 2 Diabetes Mellitus, (T2DM), understanding of the different types of diabetes and their impact on health is warranted. Research on the epidemiology of diabetes in the United States provides background on the complications associated with diabetes [53]. In particular, the National Health and Nutrition Examination Surveys (NHANES) is the only nationally representative survey that have taken blood samples in addition to survey questions and therefore, can estimate both diagnosed and undiagnosed diabetes [54]. Based on prevalence estimates from NHANES for 2005, the total prevalence of diabetes (both diagnosed and undiagnosed) was estimated at 20.8 million or 7.0% of the US population. Of these, 14.6 million were diagnosed and 6.2 million representing almost 30% of all diabetes cases were undiagnosed [53].

2.3 Risk Factors

Although the pathogenesis of diabetes is complex, a number of factors that increase the risk for the disease have been identified in research. Risk factors for diabetes include family history, race, and certain viral infections during childhood. Risk factors for T2DM are more diverse; some are modifiable, and others are not. Non-modifiable risk factors for T2DM include age, race or ethnicity, family history (genetic predisposition), history of gestational diabetes, and low birth weight. Diabetes incidence and prevalence increases with age. In 2005, the Centers for Disease Control and Prevention reported that the prevalence of diabetes among people aged 20 years or older was 20.6 million (9.6% of the people in that age group), and the prevalence of diabetes increased with age (10.3 million people aged 60 years or older, or 20.9% of those in that age group, had diabetes) [55].

African Americans are more likely to develop diabetes than whites [56]. Native Americans rates of diagnosed diabetes range from 5 to 50% in different tribes and population groups. Little difference exists by sex. Genetic factors also play a role, but non-genetic or lifestyle risk factors (such as diet and physical activity) appear to be the primary culprits [57].

Modifiable or lifestyle risk factors include increased body mass index (BMI), physical inactivity, poor nutrition, hypertension, smoking, and alcohol use, among others [56]. Increased BMI is consistently shown to be one of the strongest risk factors for development of diabetes [58]. A distribution of body fat, [57] and specifically an increased waist-to-hip ratio, were found to increase risk for diabetes [59].   In fact an age-standardized prevalence for T2DM was higher among minority populations, including non-Hispanic blacks,

Figure 6: Age- adjusted % of people 20 years if age diagnosed with T2DM by race/ethnicity

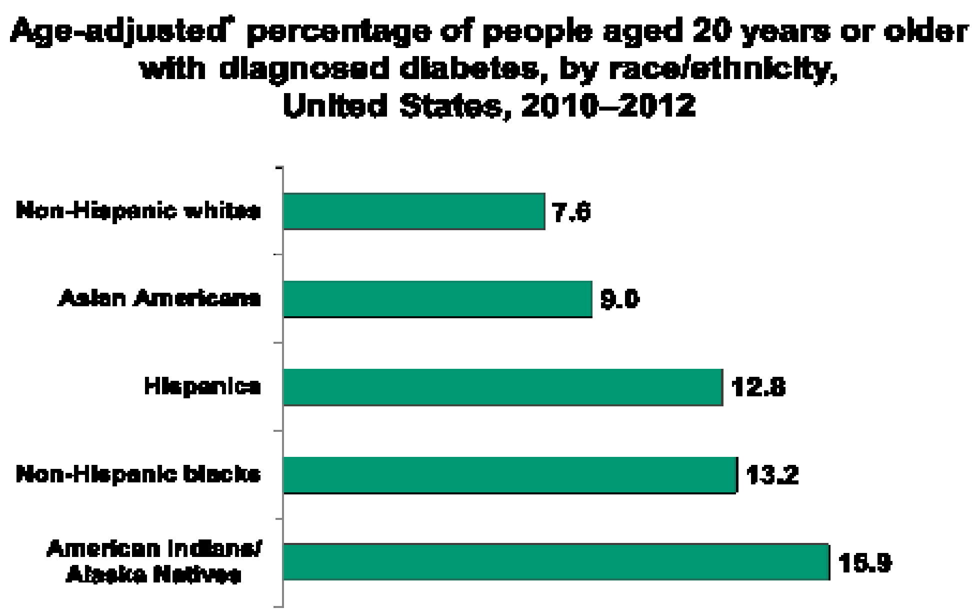
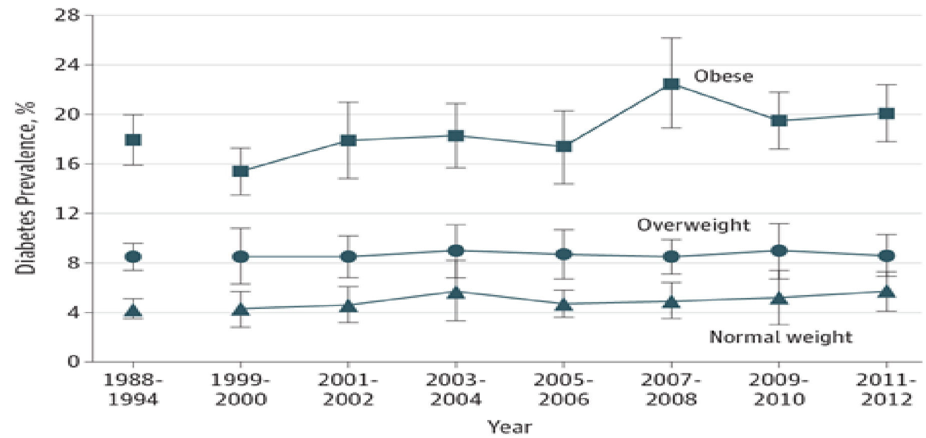


Figure 7: Prevalence per 100 of Adults aged 20 years or older by BMI category



No. of participants								
Obese	2324	727	732	815	820	1137	1302	1075
Overweight	2942	724	878	784	694	949	1009	852
Normal weight	3025	645	699	624	604	726	762	785

Consistent findings from various studies show that lower levels of physical activity increase a person's risk for diabetes. A recent review of ten prospective cohort studies investigating moderate-intensity physical activity and diabetes provides evidence that people who achieve recommended levels of even moderate activity are about 30% less likely to develop diabetes than their inactive counterparts [60].

2.3.1 Obesity as Primary Risk Factor for T2DM

Results from studies indicate that there is a relationship between obesity and the increased risk of diabetes mellitus. In fact, weight loss of just 5 to10% of pretreatment body weight has been associated with significant improvements in T2DM [61]. The Diabetes Prevention Program Research Group conducted a large, randomized clinical trial involving adults in the United States who were at high risk for the development of T2DM. The study was designed to determine if lifestyle intervention or treatment with an anti-hyperglycemic agent prevented or delayed the onset of diabetes. Women comprised 68% of the sample and 45% were members of minority groups. The participants who made lifestyle changes through diet and exercise reduced their risk of getting T2DM by 58% [62].

The increased health risks due to obesity can be minimized and frequently eliminated through interventions aimed at decreasing obesity. When assessing a client for obesity the nurse should be aware of the importance of obtaining a BMI and measuring the client's waist, and waist to hip ratio as indictors for obesity. There is evidence to infer that the risks of mortality and morbidity associated with obesity can be decreased with weight loss. An expert panel has concluded that weight losses of 5 to 15% of initial weight are a successful outcome [61]. In the Diabetes Prevention Program a 7 kg weight loss combined with 150 minutes a week of physical activity decreased the incidence of developing T2DM by 58% in overweight individuals with impaired glucose [62].

2.3.2 Indicators of Obesity

A widely used method to measure overweight and obesity is the body mass index (BMI). The BMI provides a relative measure of weight adjusted for height. Obesity is defined as a condition characterized by excess body fat, which normally accounts for approximately 25% of weight in females and 18% of weight in males [63]. The BMI indicator for overweight is defined as a BMI of 25.0 to 29.9 kg/m, while the indicator for obesity is a BMI greater than or equal to 30kg/m [63]. Another method currently being used to determine the distribution of body fat is waist circumference measurements. The presence of excess fat in the abdomen is an independent predictor of risk factors and mortality. Waist circumferences of 35 inches or greater in women have been associated with increased health risks. A more recent indicator is the waist to hip ratio to determine health related risk. Waist-to-hip ratio is the ratio of a person's waist circumference to hip circumference, mathematically calculated as the waist circumference divided by the hip circumference. A waist hip ratio greater than 0.8 in women has been associated with increased health risks [64].

According to NIH Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults, all adults (aged 18 years or older) who have a BMI of 25 or more are considered at risk for premature death and disability as a consequence of overweight and obesity These health risks increase as the severity of an individual's weight increases. This research confirms that obesity gradually increases the risks of diseases such as diabetes, heart disease, stroke and cancer [65].

2.4 African American Women and Obesity

Women of racial and ethnic minorities are affected disproportionately by obesity. Among African Americans, the proportion of women who are obese is 80% higher than the proportion of men who are obese. African American women are more likely than men to become obese and research revealed 66% of the African American women with a BMI of 24 to 25 when they were in their early twenties were obese by the ages of 35 to 37 years, whereas 47% of Hispanic and 42% of white women became obese [66].

When compared to non-Hispanic white women, 69% of African American women are overweight or obese. The prevalence of obesity increases up to age 60 after which there is a decline [67].

Data obtained from the National Health and Nutrition Examination Survey (NHANES) II have shown that the prevalence of obesity among African American women is twice that of European American women [68]. The tendency to become obese appears to occur gradually with a higher prevalence among African American women.

Using data from the National Longitudinal Survey of Youth, researchers examined early adult weight development in 9,179 African American, Hispanic, and white persons born between 1957 and 1964. Participants were followed for eight years and self-reported their weight and height 12 times from ages 17 to 24 years until ages 35 to 37 years. Overall, 28% of women and 26% of men were obese using BMI measurements [66].

2.4.1 African American Women, Obesity and Diabetes

Obesity which has risen to epidemic proportions in the United States is contributing to an emerging epidemic T2DM. African-American women are disproportionately affected by both conditions. Then association of obesity with increasing risk of diabetes has been documented in black women, Krishnan, et al. studied the effect of fat distribution and abdominal obesity, association of BMI, with risk of T2DM. During an eight year follow-up of 49,766 women from the Black Women's Health Study, diabetes occurred in 2,472 cases of diabetes. The research indicated that BMI is a strong predictor of T2DM in black women. Overall, the most overweight women (BMI $\geq$45) had 23 times the risk of developing diabetes as women who were not overweight. In addition, waist circumference and waist-to-hip ratio were independently associated with risk of diabetes, indicating that abdominal obesity is also relevant to the development of diabetes. The study found that central obesity, as well as overall obesity, was a strong risk factor for diabetes in African-American women [19].

Research on obesity indicates it is strong risk factor for T2DM in black women in the U.S. Even black women who are moderately overweight (BMI 25 to 29 kg/m^2) have an increased risk of diabetes relative to women who are slim, and the trend of increasing risk continues to the highest levels of obesity. Abdominal obesity is also independently associated with an increased risk of T2DM in black women. Data indicated that assuming causality, the vast majority of diabetes cases could be prevented if women were able to avoid being overweight or obese [19]. National trend data have shown that the prevalence of obesity and diabetes have been increasing rapidly [69]. Since obesity is a condition that can be modified through lifestyle factors, intervention programs designed to reduce obesity are clearly needed to decrease the high incidence of diabetes in African-American women.

Research yielded epidemiological studies which indicated that the risk of diabetes increases with increasing BMI and weight gain [20-22, 45, 57, 70-73]. The Nurses' Health Study, studied were women with a stable weight, risk increased with increasing weight gain to a relative risk of 12.3 for a gain of ≥20 kg [70] and risk continues to increase for even greater weight gain among black women. National Health and Nutrition Examination Survey III data indicate that the prevalence of undiagnosed diabetes among African-American women ranged from 1.7% in those 20 to 39 years of age to 8.5% in those 60 to 74 years of age [45].

There is limited research on the precise relationship between BMI and other important measures of disease and health service use, such as hospitalization. Moreover, while there is considerable evidence supporting the link between obesity and total hospital use, the evidence on the risk of outcomes in people who are overweight and obese is less clear. Further, there is little on the relationship between incremental changes in BMI and risk of being hospitalized, and how this might vary according to factors such as age, preexisting disease and other personal characteristics and on the differential risks for hospitalizations for specific diagnoses [74-79].

2.5 Mortality from Obesity and Diabetes

Obesity and diabetes are major causes of and mortality in the United States. It is estimated that 300,000 adults die from causes related to obesity each year [69]. The prevalence of obesity and risk for diabetes is high among African Americans, particularly African American women. The risks of mortality associated with diabetes poses serious problems for the African American community. In 2002, diabetes was the sixth leading cause of death with 73,249 death certificates listing diabetes as the underlying cause of death and an additional 224,092 death certificates listing diabetes as a contributing cause of death. Diabetes is likely to be underreported as a cause of death due to the many complications associated with diabetes that ultimately cause death. People with diabetes are more susceptible to many other illnesses. Once they acquire these illnesses, they often have worse prognoses. For example, they are more likely to die with pneumonia or influenza than people who do not have diabetes. Studies have found that about 35% to 40% of decedents with diabetes had it listed anywhere on the death certificate and about 10% to 15% had it listed as the underlying cause of death. Overall, the risk of death among people with diabetes is almost twice that of people of similar age who do not have diabetes [55]. Duration of diabetes also is an important determinant of mortality; younger age-of-onset groups (<45 years of age) have an increased risk of premature death. From death certificate data, it appears that age-adjusted death rates for African Americans and

Hispanic Americans are similar to the rates of whites [48, 80]. An increased mortality rate in North American Native Americans with T2DM also is apparent.

Diabetes can affect many different organ systems in the body and, over time, can lead to serious complications. Complications from diabetes can be classified as microvascular or macrovascular. Microvascular complications include nervous system damage (neuropathy), renal system damage (nephropathy) and eye damage (retinopathy) [81]. Macrovascular complications include cardiovascular disease, stroke, and peripheral vascular disease. Peripheral vascular disease may lead to bruises or injuries that do not heal, gangrene, and, ultimately, amputation.

2.6 Obesity and Diabetes Burden on Health Care System

According to the American Diabetes Association, the estimated costs associated with diabetes in the United States in 2002 totaled $132 billion, with direct medical costs of $92 billion and indirect costs (disability, loss in work productivity and premature mortality) of $40 billion [82, 83]. Given no additional increase in the prevalence of diabetes in the United States, these expenditures would be expected to reach approximately $192 billion by 2020 [83]. Of the $92 billion in direct costs for 2002, $23 billion was due to health care events with a primary diagnosis of uncomplicated diabetes and an additional $25 billion was for treatment of diabetes-related cardiovascular disease[83, 84]. Approximately 40% of the total cost of diabetes in the United States is due directly to inpatient care for treatment of diabetes complications [85]. Several studies have estimated annual and cumulative economic costs of diabetes complications over time [86, 87]. These studies found that macrovascular disease accounted for as much as 85% of the costs of complications associated with diabetes and that these conditions are a significant determinant of costs at an earlier time during the course of the disease than microvascular complications[88]. It is important to note, however, that relatively mild microvascular complications can become more serious over time and contribute significantly to morbidity and related costs in later years.

In addition, a key factor in the development of diabetes complications is glycemic level. People with higher initial HbA_{1c} levels had higher cumulative costs than people with lower levels [86]. These economic estimates suggest that improving glycemic control and other known risk factors for diabetes, particularly those for cardiovascular disease among people with diabetes, will significantly affect long-term costs [86, 87]. Although the evidence is strong that HbA_{1c} control and reduction can reduce a patient's risk for microvascular complications, the evidence is not so strong that glycemic control greatly reduces a person's risk for cardiovascular complications. Clearly, a combined effort to control blood glucose, blood pressure, and blood lipids will have the greatest effect on reducing a person's risk for diabetes-related complications and will prove to have a favorable impact on the economic costs associated with diabetes on the effects of exercise in managing these risk factors in people with diabetes mellitus [88-91].

2.6.1 Obesity and Hospital Length of Stay

Zizza, Herring, Stevens, & Popkin, 2004 conducted a longitudinal study to demonstrate a time trend in associations between weight status and length of stay. Examined where lengths of hospital stay among individuals categorized according to weight status. It was found individuals with body mass indexes (BMIs) of 35 kg/m^2 or above, those with BMIs of 30 to 34 kg/m^2, and those with BMIs of 25 to 29 kg/m^2 had crude length-of-stay rates greater than those of normal-weight individuals and association between BMI and length of stay varied over time. The study concluded that obese individuals experience longer hospital stays than normal weight individuals [10]. The analytic approaches used in this study support establishing weight status as a causal factor in the association were examined. This study is novel in that previous research examining the association between weight status and lengths of hospital stay has been based on cross-sectional designs; however, cross-sectional studies cannot provide evidence regarding the temporal sequence of an association. The longitudinal investigation enable measured individuals' hospital use patterns subsequent to measurement of their weight. Using the NHLBI criteria, the study demonstrated that as respondents' adiposity levels (measured via BMI groupings) increased from the normal range, so did their number of inpatient hospital days. Obesity on hospitalization was accessed in Blacks and Whites, however further research is needed to determine whether relationships exist among other racial/ethnic groups and gender.

2.6.2 Obesity and Hospital Admissions

There were 8,085 hospital admissions for obesity complications in 2008-2009, a rise of 60% over the past year, according to figures released by The NHS Information Centre. The organization's chief executive Tim Siraughan said: "The large increase in admissions for obesity reflects the growing impact that obesity has on the health of our nation as well as the demands it is placing on limited NHS resources. However, it also reflects the fact that overweight people are resorting to treatments such as bariatric surgery to tackle their health problems"[93].

According to Zizza, et al., data from the First National Health and Nutrition Examination Survey Epidemiologic Follow-up Survey to estimate length-of-stay differences demonstrated that individuals with body mass indexes (BMIs) of 35 kg/m^2 or above, those with BMIs of 30 to 34 kg/m^2, and those with BMIs of 25 to 29 kg/m^2 had crude length-of-stay rates greater than those of normal-weight individuals. Association between BMI and length of stay varied over time. The study concluded that obese individuals experience longer hospital stays than normal-weight individuals. [10]

Although prevalence rates of obesity have reached epidemic proportions in the United States, the relationship between obesity and health care use has received very little attention [94, 95]. An even smaller body of literature has focused on use of hospital care among obese individuals. Obesity has been strongly associated with a range of health problems; however, studies that have examined the association between obesity and hospitalization have failed to provide consistent results. Some of these studies have revealed elevated risks of hospitalization associated with obesity, [79, 96] others have shown no association [82, 97, 98] or even a decreased risk, [98, 99] and still others have shown a gender-specific [100] or age-specific [98] relationship. In most of these studies, data on weight and hospital use were collected concurrently, and in some, information regarding weight was actually collected after information regarding hospitalizations [97-99].

In addressing factors that are part of the causal pathway between obesity and hospitalization, prospective studies have included assessments of data on health conditions [98, 101]. Statistical control of such health conditions such as T2DM constitutes an over adjustment [92]; studies including health conditions in their analyses have shown no effect of obesity, leading to the erroneous inference that obesity is not an important risk factor for hospitalization [98, 101].

Obesity is the cause of other chronic diseases, psychological problems; obesity shortens the lifespan and puts strain on health systems [93]. To estimate the length of stay and associated hospital costs for obesity related illnesses a cost of illness study was set up. All discharges from all acute hospitals in the Republic of Ireland from 1997 to 2004 with a principal or secondary diagnostic code for obesity for all children from 6 to 18 years of age and for adults were collected [49]. A discharge frequency was calculated by dividing obesity related discharges by the total number of diagnoses (principal and secondary) for each year. The hospital costs related to obesity was calculated based on the total number of days care. Results included the discharge frequency of obesity related conditions increased from 1.14 in 1997 to 1.49 in 2004 for adults. The relative length of stay (number of days in care for obesity related conditions per 1000 days of hospital care given) increased from 3.68 in 1997 to 6.74 in 2004 for adults [49].

It should be noted in research that the fact that obesity is coded and the person is hospitalized, implies a severe case of obesity. The code for obesity was most often entered as secondary diagnosis which suggests that the estimates made in research are very conservative. A secondary diagnosis is often may be coded and treatment will usually be for a related condition rather than obesity. Secondly, the dependency of the analysis on consultants to report obesity, especially to include it as secondary code, will lead to underreporting. In light of the continuing rise in obesity-related health procedures, questions are being asked about whether the NHS is adopting the right approach to reducing obesity levels. In other words, as the number of hospital admissions, procedures and prescriptions related to obesity are rising insistently, prompting many to question whether the NHS is adopting the right approach to reducing the nation's increasing obesity [102].

In an article published in BMC Medicine, Reeves and colleagues describe the relationship between BMI, determined at baseline (1996 to 2001) in the Million Women Study (age 50 to 64 years) and hospital admission rates over a 9.2 year follow-up period [103]. The main finding was, that among these women in England, around one in eight hospital admissions was attributable to overweight or obesity, translating to around 420,000 extra hospital admissions, and two million extra days spent in hospital, annually. The authors examined 25 types of indications for admission and of these, significant increases in the risk of admission with increasing BMI were observed for 19. Almost two-thirds (62% of first time admission) were for diabetes, ischemic heart disease, stroke, joint replacements, gallbladder disease or cancer. The study revealed the first admissions in the overweight and obese women were due mainly to venous thromboembolism, diverticular disease, diaphragmatic hernia, cataracts or carpal tunnel syndrome. These observations stretch the usual radar beyond common conditions causally associated with BMI, such as diabetes, thereby giving a fuller reflection of the impacts of excess body weight [104].

Several studies have assessed the likely impact of projected rates of overweight and obesity on use of healthcare services in the United States [105, 106] but most have been based on published estimates of attributable risk for the incidence of a relatively small number of conditions known to be strongly associated with BMI, such as T2DM, ischemic heart disease, stroke and certain cancers. One report estimated that obesity accounted for up to 2.8% of healthcare expenditure globally but concluded that this was likely to be an underestimate. Although some studies have looked directly at the relationship between BMI and hospital admission rates[107] [6, 78, 108-113] relatively few have considered duration of stay [75, 107, 109] and most have had insufficient power to assess reliably the relationship between BMI and less common causes of hospitalization. Researcher describe and quantify the relationship between BMI and overall rates of hospitalization, and durations of hospital stay, using routinely collected hospital admission records of middle-aged women risk of hospitalization separately for the twenty five most common categories of admission in this group of women [104].

Studies of the impact of overweight and obesity on the use of healthcare services vary considerably in terms of the methods used and those aimed at assessing the economic impact have tended to consider only those health conditions widely recognized as being strongly associated with adiposity [105, 106].

There are several essential differences between this study and prior research. First, this study focuses on African American women population who was found to have high prevalence in both obesity and diabetes. No other study focuses on African American women in both disease states. Secondly, studying the correlation of the two diseases and comorbidities on length of stay and hospital cost. There are studies on primary diagnosis for hospital admission for these diseases but not much data on hospital cost and even less on length of stay, especially in the U.S. Third, studying the age as a continuous variable to see the change in hospital stay and cost for each one year increase in age. Finally, the study will look at socioeconomic variables of African American women to study its correlations with length of stay and hospital cost. This will serve as a model to research other ethnic groups.

CHAPTER 3 METHODOLOGY

3.1 Research Overview

Obesity is the second leading cause of preventable death in the United States and the most prevalent, fatal, chronic, relapsing disorder of the 21st century. African American females prove to be affected disproportionally by obesity. According to many experts, this prevalence of obesity is correlated with a staggering increase in diabetes. Studies suggest that increased hospital use and high healthcare cost are associated with obesity and; therefore, diabetes, but there is little research on this correlation for United States inpatient populations, despite the necessity of this research, given the prevalence of the disorder. The main goal of this study is to contribute to the understanding of the role of various risk factors on African American adult female obese patients with T2DM has on hospital length of stay. This would help in predicting Length of Stay and associated hospital cost through modification of identified factors. The purpose of this retrospective, correlational, quantitative study is to examine obesity and diabetes associations with United States hospital use and healthcare costs for adult African American women.

Chapter 3 will present an overview of the methodology used for this study. This overview will include the following: study design, population, sampling method, sample size, instrumentation, and data analysis methods.

3.2 Research Design

This study will follow a retrospective, quantitative, correlational design. A quantitative correlational design seeks to examine potential relationships between variables [114-118]. Further insight into why this design selection is appropriate for this study can be seen by examining the three parts of the design separately (retrospective, quantitative, and correlational).

This data will be retrospective due to the use of archival data for analysis. In retrospective studies, the outcome of interest has already occurred at the time the study is initiated. For this study, the data is archival, and the outcome of interest occurred in 2008, 2009, or 2010. Retrospective studies allow the researcher to estimate the effect of an exposure on an outcome and obtain measures of association, both of which are objectives of this study.

Quantitative research attempts to identify relationships between variables using trends, meanings, and suggested characteristics ([116, 119-121]. Using a quantitative design for this study will allow the researcher to explore the relationship between individual health factors of interest (obesity and diabetes) and the effects on hospitals (hospital LOS and healthcare costs).

Correlational studies should be used when independent variable variation has occurred without researcher control. In this study, the researcher is not able to control any of the independent variables; the variation within the independent variables occurred prior to data collection. All data is retrospective and; therefore, the researcher is unable to introduce any type of intervention, only examine the relationships between variables. The basic purpose of a correlational study is to determine the relationship between variables, but not the cause of this relationship. According to Triola (1998), coming to the conclusion that the results of a correlational study imply causality must be avoided [122].

3.3 Research Questions and Associated Hypothesis

This study will be driven by the following four research questions and associated statistical hypotheses:

Research Question 1 (RQ1). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital length of stay (LOS) among African American females?

Null Hypothesis 1 (H01). There is not a statistically significant relationship between either of the individual health factors of interest (obesity and diabetes) and hospital LOS among African American females.

Alternative Hypothesis 1 (HA1). There is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital LOS among African American females.

Research Question 2 (RQ2). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital costs among African American females?

Null Hypothesis 2 (H02). There is not a statistically significant relationship between either of the individual health factors of interest (obesity and diabetes) and hospital costs among African American females.

Alternative Hypothesis 2 (HA2). There is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital costs among African American females.

Research Question 3 (RQ3). How are co-morbidities and life factors related to individual health factors of interest (obesity and diabetes) among African American females?

Null Hypothesis 3 (H03). There is not a statistically significant correlation between both co-morbidities and life factors, and either of the individual health factors of interest (obesity and diabetes).

Alternative Hypothesis 3 (HA3). There is a statistically significant correlation between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes).

Research Question 4 (RQ4). How are primary diagnoses related to individual health factors of interest (obesity and diabetes) for African American females?

Null Hypothesis 4 (H03). There is not a statistically significant correlation between diagnoses and either of the individual health factors of interest (obesity and diabetes).

Alternative Hypothesis 4 (HA3). There is a statistically significant correlation between diagnoses and at least one of the individual health factors of interest (obesity and diabetes).

3.4 Population and Sample Criteria

The focus of this study will be N=803,163 African American, female inpatients between the ages of 21 and 55 in the United States from 2008 to 2010. For this study, Healthcare Cost and Utilization Project (HCUP) data will be used. The HCUP data contains The Nationwide Inpatient Sample (NIS). The NIS contains data on more than seven million hospital stays each year. The NIS is sampled from the State Inpatient Database (SID), which contains all inpatient data that are currently contributed to HCUP.

3.4.1 Power Analysis.

Power analysis for multiple regression was performed using G*Power 3.1.9.2 using a two-tailed test, a small effect size of .02, an alpha of .05, a power of .80, and while testing for two predictors, with an estimated total number of predictors set at 40. The total number of predictors was estimated to be high since this study will be adding control variables to the model based on correlations being greater than or equal to .30; with the high number of possible predictors to be added as control, the total number of predictors was estimated to account for the possibility of a large number of potential control variables with correlations above or at .30. The results of the power analysis indicated that in order to power the multiple regression with the ability to detect small effects, a sample of size N=485 is necessary.

Power analysis was also performed for correlational analysis using G*Power 3.1.9.2 using a two-tailed test, a small effect size of .10, an alpha of .05, a power of .80, and a correlation for the null hypothesis of 0. The results indicated that in order to power this Pearson's r correlational analysis, a sample of size N=782 is necessary. For some of the variables in this study, Spearman's rank order correlations will be used due to the use of ordinal variables. The sample size required for Pearson's r correlations will be used in tandem with the asymptotic relative efficiency (ARE) in order to calculate the required sample size for Spearman's rank order correlation [123]. According to Prajapati, Dunne, and Armstrong (2010), the ARE for the comparison of Pearson's r to Spearman's ρ is .91. The required sample size can then be calculated by dividing the calculated sample size for Pearson's r (*N*=782) by the ARE (.91), which gives a required sample of *N*=840 [123].

The required sample size chosen will be the largest of the three power analyses, *N*=840.

3.4.2 Instrumentation

For this study, no measurement instruments or tools will be used since this data will be taken from the NIS dataset provided through HCUP. This data is collected using discharge records from participating states. The discharge documentation was originally submitted to the state from hospitals, which are required by law or for hospital reimbursement reasons. According to Al-Halal, Kezouh, and Abenhaim (2013), there is no study regarding validity of the HCUP-NIS database. [124] Even with this being true HCUP-NIS is a trusted database which has been used in a large number of studies, such as studies by Bao and Sturm (2011), Ritchie, Maynard, and Chapko (1999), and Rutledge (1997) just to list a few [125].

According to Al-Halal, Kezouh, and Abenheim (2013), the HCUP-NIS is considered to be the largest all-payer inpatient database that is publicly available. The NIS is sampled from the State Inpatient Databases (SID), which is another HCUP database that contains all inpatient data that is currently contributed to HCUP[126]. According to Carlton (2009), quality control of this database is conducted by an independent contractor and through automated quality control checks [127]. Carlton (2009) goes on to explain that this is done by verifying the data against standardized norms and when data conflicts are present, some data are set to special missing values so the data can be investigated for data anomalies. The internal consistency of data is then completed by comparing values of similar data elements[127]. Carlton (2009) then goes on to cite the Agency for Healthcare Research and Quality to explain that “when conflicts occur, data are managed by established protocols; e.g., a hysterectomy procedure code should only appear with a sex of female [127].

NIS depends on the hospitals to ensure accuracy, completeness, and consistency of the data. Validity and reliability of the data from the hospitals to HCUP is out of the researcher’s realm of control. Despite this lack of control, due to the federal protocols and its use in a large number of studies, the NIS proves to be well documented and reviewed prior to use by the researcher for this study.

3.5 Measures

Due to the large number of variables potentially being used in the study, the operationalization of variables, as well as the location of the original data can be found in Appendix A.

3.6 Data Collection Procedures

NIS Core and Severity datasets for 2008 to 2010 will be used for analysis in this study. These datasets will be obtained from the HCUP Central Distributor. Prior to use of the data, the researcher will take the online HCUP Data Use Agreement Training Course, as well as sign the Data Use Agreement for Nationwide Databases. Variables to be used from each database can be found in the table in Appendix A. After all documentation has been submitted and the databases have been paid for, databases are then shipped to the recipient.

Below are the steps to obtaining the NIS database provided in the NIS Application Kit (2014) provided on the HCUP website:

1. Print or type all responses. An electronic copy is available on request.

2. Complete Part I: Organization and/or Individual Requesting Use of the HCUP NIS (page 2).

3. Complete Part II: Selection of HCUP NIS (page 3).

4. Determine the Total Payment Due and Select Payment Method (Part III, page 5).

5. Read and sign the Indemnification Clause (Part IV, page 7).

6. Complete the online HCUP Data Use Agreement Training Tool and provide your Certification Code (Part V, page 8).

7. Read and sign the Data Use Agreement for Nationwide Databases (10–13).

8. Submit the completed application (pages 2–14):

HCUP Central Distributor
Social & Scientific Systems, Inc.
8757 Georgia Avenue, 12th Floor
Silver Spring, MD 20910
Telephone: (866) 556-4287 (toll free)
Fax: (866) 792-5313 (toll free)
E-mail: HCUPDistributor@AHRQ.gov

3.7 Data Analysis

All statistical analysis will be performed using Stata v12. All inferential tests will be two-sided and will utilize a 95% significance level. Prior to hypothesis testing, descriptive statistics will be included to examine measures of central tendency (mean, median, standard deviation, and range) for all continuous variables in the study. Frequencies and percentages will be included for all categorical variables. The list of these variables which includes the scale of each variable can be found in Appendix A. All inferential tests will be performed using survey data analysis which will take into account the variable DISCWT from the NIS Core database. This variable is a weight variable which is used to make the sample more representative of national estimates. According to Heeringa, West, and Berglund (2010), weighting of survey data is required in order to "map the sample back to an unbiased representation of the population.[128]

Hypothesis testing for RQ3 and RQ4 will be performed using Spearman's rank order correlational analysis. A correlation table will be created containing all variables. Correlations between all life factors, co-morbidities, primary diagnoses, and individual health factors of interest (obesity and diabetes) will be used for hypothesis testing of RQ3 and RQ4. This correlation table will also be used to choose control variables to be used in hypothesis testing for RQ1 and RQ2. Any potential control variable with an absolute correlation at or above .30 with LOS will be included in hypothesis testing for RQ1. Any potential control variable with an absolute correlation at or above .30 with hospital costs will be included in hypothesis testing for RQ2. Prior to correlational analysis, the assumption of a monotonic relationship between compared variables will be tested using scatterplots of the variable combinations.

Two separate multiple regressions will be used to address RQ1 and RQ2. Prior to hypothesis testing, the assumptions (absence of outliers, normality, linearity, and homoscedasticity) will be checked for both models. Multiple regression is robust from deviations from normality as long as the homoscedasticity assumption is met [129, 130]. Visual inspection of a histogram and Normal Q-Q plots will be performed on the dependent variable of the study to check for deviations from normality. If the normality assumption is severely violated (mean and 5% trimmed mean vary greatly, and the mean and median vary greatly), then logarithmic or other transformation of the dependent variable will be considered to meet the normality assumption. According to Tabachnick and Fidell (2007), transformation of variables can often cause more trouble than not transforming [130]. Therefore if the homoscedasticity assumption is met, then the raw, untransformed dependent variable values of the dependent variable in question (either LOS or hospital costs) will be used for analysis. Homoscedasticity will be checked using the plot of residuals with the regression analysis. Multicollinearity will be checked using the correlation table created for hypothesis testing of RQ3 and RQ4, as well as the selection of control variables. If multicollinearity is detected (defined as a correlation of .90 or greater according to Tabachnick and Fidell; 2007) between any pair of independent variables, then it will be determined if omission of one of the variables is necessary, or if retention of both variables is more appropriate [130].

One of the two multiple regressions will be used to address RQ1. This multiple regression will use LOS as the dependent variable in analysis, and the following as independent variables: (a) obesity, (b) diabetes, and (c) variables with a correlation of .30 or greater with LOS to be used as control variables.

The other multiple regression will be used to address RQ2. This multiple regression will use hospital costs as the dependent variable in analysis, and the following as independent variables: (a) obesity, (b) diabetes, and (c) variables with a correlation of .30 or greater with hospital costs to be used as control variables.

3.8 Ethical Considerations

Ethical considerations for the use of this data are assured by the required HCUP Data Use Agreement (DUA) training. The DUA has specific requirements which must be followed by the researcher in order to preserve patient rights. The DUA emphasizes the importance of data protection and makes this an individual responsibility of the researcher. The DUA focuses on protection of individual identities. All data elements which can be used to directly identify an individual have been previously removed. Hospital names will not be reported, and any tabulated data in a cell size of ten or less cannot legally be reported.

The HCUP-DUA training is done online, and can be found at http://www.hcup-us.ahrq.gov/tech_assist/dua.jsp. The course takes approximately 15 minutes to complete.

3.9 Summary

Chapter 3 defines the methodology process to be used for this retrospective, quantitative, correlational study. African American female inpatients between the ages of 21 and 55 make up the population of this study. Data will be taken from HCUP databases, namely, the Core and Severity databases for the years 2008, 2009, and 2010.

Hypothesis testing will be done using two multiple regressions for survey data to analyze the relationship between the independent variables and the dependent variables, the details of which can be found in Appendix A. Chapter 4 will explore and report the preliminary findings of this study.

CHAPTER 4 PRELIMINARY RESULTS

In this chapter, preliminary results of measures of central tendency and frequencies, and percentages descriptive statistical analyses performed by the method described in chapter 3 are reviewed and discussed. Descriptive statistics for each possible variable were done separately; frequencies percentages for all categorical variables, and measures of central tendency for all continuous variables and counts.

4.1 Measures of Central Tendency for Continuous Variables and Counts

For measures of central tendency for continuous variables: LOS, COST, AGE, NumProc and NumChronic, mean, min and max with variances were calculated. Variables with high skewness on dependent variables would require a transformation of data to do a regression analysis. Skewness is noted to be high on Length of Stay (LOS) and Cost variables where 99% of data is not within three standard deviations. For LOS min max range 0 to 362, however high skewness of 10.886. Cost variable yield a min value of 106 to a maximum of 1.4 M, averaging a cost of 25K and skewness of 9.842, thus indicating outliners. LOS and Cost variables will need to be cleaned to remove outliners.

4.2 Frequencies Percentages for Categorical and Ordinal Variables

For measures of frequencies percentages, categorical and ordinal variables: Diabetes, Obesity, Primary Diagnosis, Primary Pay, Severity, and Comorbidities: Arthritis, CHF, Chronic Lung, Depression, Hypertension, Hypothyroidism, Liver, Electrolyte, Perivasc and Renal Failure; frequency, percent, valid percent and cumulative percent were calculated.

Interestingly, 683K patients are diabetic and 691K obesity, however the number of patients with both diabetes and obesity is 35,455 or 4.4% of the population. For primary diagnosis we see low counts for DiabRetino and Pneumonia; 11 or <0% and 973 or .1%, respectively. The researcher is considering removing DiabRetino and Pneumonia as primary diagnosis and replacing with another stronger primary diagnosis. Of the co-morbidities, Chronic Lung, Hypertension and Electrolyte in-balance stand out these patients, with 13.1%, 14% and 32.2 percentages respectively. Frequency and percentage of Severity variable demonstrated that the majority of patients had minor to moderate loss of function or 79.5% of patients.

In looking at percent of primary payers, it appears that income and age may be correlated with the type of payers. Medicare and Medicaid make up 53.5% of the primary pay while private insurance make up 33.7%, and as expected self-pay has the least percentage as a payer, or 8.5%. It will be interesting to see how primary payers correlate with length of stay.

4.3 Further Work

The preliminary analysis revealed more the research will need to be developed and improved for the dissertation. At minimum, the research must performer an aggregation of groups to remove records, outliers and clean up the data. After performing a correlational analysis, those results will determine which control variables will be included in the multiple regressions. If correlations are found to be strong to RQ3 *How are co-morbidities and life factors related to individual health factors of interest (obesity and diabetes) among African American females?* and RQ4 *How are primary diagnoses related to individual health factors of interest (obesity and diabetes)* *for African American females?* the independent variable will be a control variable for the multiple regression. However variables LOS, Cost, Diabetes, Obesity will be in the model with RQ1 and RQ2 as the dependent variable is LOS for RQ1 and for RQ2 the dependent variable is Cost.

There will be two separate multiple regressions for each RQ1: *Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital length of stay (LOS) among African American females?* And RQ2 "*Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital costs among African American females?* In addition, preliminary research revealed a need to divide hospitals by region. Therefore a census region of the hospital where each individual received treatment in will be used as a control for the location within the United States. The four categories for census region will be (a) west, (b) Midwest, (c) south, and (d) northeast. Descriptive Analysis tables for central tendency for continuous variables and counts and frequency percentages for categorical and ordinal variables details can be found in Appendix B.

Finally, preliminary analysis further highlighted limitations of the study. First the study using a correlation design from three years combined timespan with no intervention to any group and control group, therefore the researcher is not able to determine the cause and effect and not able to generalize outside of the data set. The study does not include genetic profiles of patients which may play an important role in the etiology and progression of T2DM according to literature. Second, a retrospective dataset lends to increase in lurking variables and as there are many primary diagnoses, a limitation is made by researcher choice of variables. Third, the study is limited to a specific age and race. Finally, the NIS data is only for US Community Hospitals and does not include Private Hospitals.

CHAPTER 5 RESULTS

5.1 Sample and model specifications

A total of N = 758,874 records were retained for analysis. Appendix A contains a listing of the names, descriptions, and levels of measurement for the variables of this study. SPSS v22 was used to compute the descriptive measures of the variables and to check the assumptions related to normality. All inferential tests were performed using Stata v12. The inferential tests were two-sided and a 95% significance level was set for determining statistical significance. Stata v12 was chosen for the inferential tests because the software offers a procedure for performing survey data analysis "svy" which takes into account the variable DISCWT from the NIS Core database. The DISCWT variable is a weight variable which is used to adjust the sample in order to adjust the distribution of the sample to be more representative of national estimates. The "svyset" command was used to define the primary sampling unit as the individual, the DISCWT variable as the weighting variable, and Region as the stratification variable (four regions in total). Multiple regression analyses were used to address research questions 1 and 2. Correlational analyses were used to address research questions 3 and 4.

5.2 Descriptive Statistics

***Table 3**: Measures of Central Tendency for Continuous Variables of Study, for the Sample and the Population*

Variable	***M***	***SD***	***Mdn***	**Range**
LOS				
Sample	4.15	5.64	3.00	0 - 333
Population	4.15	5.66	3.00	0 - 333
Cost				
Sample	25,502.19	41,426.80	15,010.00	106 - 1,469,196
Population	25,665.26	41,772.48	15,075.00	106 - 1,469,196
Age				
Sample	37.21	10.54	37.00	21 - 55
Population	37.23	10.54	37.00	21 - 55
NumProc				
Sample	1.54	1.72	1.00	0 - 31
Population	1.54	1.72	1.00	0 - 31
NumChronic				
Sample	2.85	2.74	2.00	0 - 22
Population	2.85	2.74	2.00	0 - 22

Note. Sample *N* = 758,874; Population *N* = 3,794,690; *M* = Mean; *SD* = Standard Deviation; *Mdn* = Median.

Table 3 presents the measures of central tendency (mean, median, standard deviation, and range) for sample and the weighted population data, for the continuous variables in the study. As expected, the measures are similar between the sample of data and the weighted population findings. The patients in the weighted population ranged in age from 21 to 55 years (*M* = 37.23 years, *SD* = 10.54 years). The patient length of stay (LOS) ranged in value from 0 to 333 days (*M* = 4.15 days, *SD* = 5.66 days). The patients had approximately 2 procedures on average, and presented with approximately 3 chronic conditions on average. The total charges (Cost) ranged from $106 to over 1 million dollars (*M* = 25,665.26, *SD* = $41,772.48).

Table 4: *Measures of Central Tendency (mean, median, standard deviation, and range) for sample and the weighted population data, for the continuous variables*

Variable	***M***	***SD***	***Mdn***	**Range**
LOS				
Sample	4.52	6.99	3.00	0 - 248
Population	4.53	7.01	3.00	0 - 311
Cost				
Sample	30,708.52	49,500.68	17,932.00	142 - 1,469,196
Population	31,091.34	50,285.21	18,082.00	142 - 1,469,196
Age				
Sample	37.89	10.32	38.00	21 - 55
Population	37.89	10.32	38.00	21 - 55
NumProc				
Sample	1.51	1.70	1.00	0 - 25
Population	1.51	1.70	1.00	0 - 25
NumChronic				
Sample	2.67	2.43	2.00	0 - 18
Population	2.67	2.42	2.00	0 - 18

Note. Sample *N* = 155,026; Population *N* = 800,980; *M* = Mean; *SD* = Standard Deviation; *Mdn* = Median.

Table 4 presents the measures of central tendency (mean, median, standard deviation, and range) for sample and the weighted population data, for the continuous variables in the study, for the Northeast region. The weighted population of patients in the Northeast ranged in age from 21 to 55 years (*M* = 37.89 years, *SD* = 10.32 years). The patient length of stay (LOS) ranged in value from 0 to 311 days (*M* = 4.53 days, *SD* = 7.01 days). The patients had approximately 2 procedures on average, and presented with approximately 3 chronic conditions on average. The total charges (Cost) ranged from $142 to over 1 million dollars (*M* = $31,091.34, *SD* = $50.285.21).

Table 5: *Measures of Central Tendency for Continuous Variables of Study, for the Sample and the Population, for the South Region*

Variable	***M***	***SD***	***Mdn***	**Range**
LOS				
Sample	4.04	5.16	3.00	0 - 333
Population	4.03	5.17	3.00	0 - 333
Cost				
Sample	22,437.26	35,558.83	13,431.50	106 - 1,454,410
Population	22,584.35	35,814.81	13,498.00	106 - 1,454,410
Age				
Sample	36.77	10.55	36.00	21 - 55
Population	36.78	10.55	36.00	21 - 55
NumProc				
Sample	1.55	1.68	1.00	0 - 31
Population	1.55	1.68	1.00	0 - 31
NumChronic				
Sample	2.80	2.76	2.00	0 - 22
Population	2.80	2.76	2.00	0 - 22

Note. Sample *N* = 428,936; Population *N* = 2,121,483; *M* = Mean; *SD* = Standard Deviation; *Mdn* = Median.

Table 5 presents the measures of central tendency (mean, median, standard deviation, and range) for sample and the weighted population data, for the continuous variables in the study, for the South region. The weighted population of patients in the South ranged in age from 21 to 55 years (*M* = 36.78 years, *SD* = 10.55 years). The patient length of stay (LOS) ranged in value from 0 to 333 days (*M* = 4.03 days, *SD* = 5.17 days). The patients had approximately 2 procedures on average, and presented with approximately 3 chronic conditions on average. The total charges (Cost) ranged from $106 to over 1 million dollars (*M* = $22,584.35, *SD* = $35,814.81).

Table 6: *Measures of Central Tendency for Continuous Variables of Study, for the Sample and the Population, for the Midwest Region*

Variable	***M***	***SD***	***Mdn***	**Range**
LOS				
Sample	4.04	4.76	3.00	0 - 275
Population	4.03	4.73	3.00	0 - 275
Cost				
Sample	23,332.63	37,220.83	14,414.50	116 - 1,438,090
Population	23,212.67	36,959.22	14,362.00	116 - 1,438,090
Age				
Sample	37.75	10.65	38.00	21 - 55
Population	37.77	10.65	38.00	21 - 55
NumProc				
Sample	1.53	1.87	1.00	0 - 30
Population	1.53	1.86	1.00	0 - 30
NumChronic				
Sample	3.22	2.96	3.00	0 - 22
Population	3.22	2.96	3.00	0 - 22

Note. Sample *N* = 113,734; Population *N* = 577,301; *M* = Mean; *SD* = Standard Deviation; *Mdn* = Median.

Table 6 presents the measures of central tendency (mean, median, standard deviation, and range) for sample and the weighted population data, for the continuous variables in the study, for the Midwest region. The weighted population of patients in the Midwest ranged in age from 21 to 55 years (*M* = 37.77 years, *SD* = 10.65 years). The patient length of stay (LOS) ranged in value from 0 to 275 days (*M* = 4.03 days, *SD* = 4.73 days). The patients had approximately 2 procedures on average, and presented with approximately 3 chronic conditions on average. The total charges (Cost) ranged from $116 to over 1 million dollars (*M* = $23,212.67, *SD* = $36,959.22).

***Table** 7: Measures of Central Tendency for Continuous Variables of Study, for the Sample and the Population, for the West Region*

Variable	***M***	***SD***	***Mdn***	**Range**
LOS				
Sample	4.21	6.46	3.00	0 - 260
Population	4.23	6.50	3.00	0 - 260
Cost				
Sample	37,831.69	57,818.33	22,941.50	135 - 1,457,016
Population	37,891.38	58,086.51	22,941.00	135 - 1,457,016
Age				
Sample	37.54	10.67	37.00	21 - 55
Population	37.56	10.67	37.00	21 - 55
NumProc				
Sample	1.56	1.76	1.00	0 - 25
Population	1.55	1.76	1.00	0 - 25
NumChronic				
Sample	2.97	2.86	2.00	0 - 22
Population	2.96	2.85	2.00	0 - 22

Note. Sample *N* = 61,178; Population *N* = 294,925; *M* = Mean; *SD* = Standard Deviation; *Mdn* = Median.

Table 7 presents the measures of central tendency (mean, median, standard deviation, and range) for sample and the weighted population data, for the continuous variables in the study, for the West region. The weighted population of patients in the West ranged in age from 21 to 55 years (*M* = 37.56 years, *SD* = 10.67 years). The patient length of stay (LOS) ranged in value from 0 to 260 days (*M* = 4.23 days, *SD* = 6.50 days). The patients had approximately 2 procedures on average, and presented with approximately 3 chronic conditions on average. The total charges (Cost) ranged from $135 to over 1 million dollars (*M* = $37,891.38, *SD* = $58,086.51).

Table 8*: Frequencies and Percentages of Sample and Population Findings for Health Factors of Interest Variables*

	Sample		**Population**	
Variable	**Frequency**	**Percent**	**Frequency**	**Percent**
Diabetes				
Yes	113,364	14.9	113,342	14.9
No	645,510	85.1	645,532	85.1
Obesity				
Yes	105,282	13.9	105,082	13.9
No	653,592	86.1	653,792	86.2

Table 8 presents the frequencies and percentages of the health variables of interest for the sample and population. Approximately 15% of the patients in the weighted population presented with the individual health factor of diabetes. Almost 14% of the patients presented with the individual health factor of obesity.

Table 9: *Frequencies and Percentages of Sample and Population Findings for Health Factors of Interest Variables, According to Region (N = 758,874)*

	Sample		**Population**	
Variable/Strata	**Frequency**	**Percent**	**Frequency**	**Percent**
Diabetes				
Northeast	21,532	13.9	21,514	13.9
South	64,297	15.0	64,268	15.0
Midwest	18,394	16.2	18,459	16.2
West	9,141	14.9	9,135	14.9
Obesity				
Northeast	17,148	11.1	17,140	11.1
South	63,038	14.7	63,010	14.7
Midwest	16,133	14.2	16,220	14.3
West	8,963	14.7	8,903	14.6

Table 9 presents the frequencies and percentages of the health variables of interest for the sample and population, according to region. Patients with diabetes ranged from

13.9 % in the Northeast to 16.2% in the Midwest. Obesity was lower in the Northeast (11.1%) than in the other three regions (14% - 15%).

Table 10: *Frequencies and Percentages of Sample and Population Findings for Severity and Primary Diagnosis Variables*

	Sample		**Population**	
Variable	**Frequency**	**Percent**	**Frequency**	**Percent**
Severity				
No specification	192	<0.05	186	<0.05
Minor loss of fn.	303,756	40.0	303,746	40.0
Moderate loss of fn.	300,450	39.6	300,617	39.6
Major loss of fn.	130,498	17.2	130,354	17.2
Extreme loss of fn.	23,978	3.2	23,970	3.2
NHCHeart				
Yes	11,635	1.5	11,630	1.5
No	747,239	98.5	747,244	98.5
CorAthero				
Yes	4,137	0.5	4,091	0.5
No	754,737	99.5	754,783	99.5
Asthma				
Yes	16,362	2.2	16,475	2.2
No	742,512	97.8	742,399	97.8
AcuteMyo				
Yes	3,593	0.5	3,592	0.5
No	755,281	99.5	755,282	99.5
ChronPulm				
Yes	21,302	2.8	21,433	2.8
No	737,572	97.2	737,441	97.2
CardiacDys				
Yes	2,759	0.4	2,760	0.4
No	756,115	99.6	756,114	99.6
Gallbladder				
Yes	7,735	1.0	7,765	1.0
No	751,139	99.0	751,109	99.0
OtherDiagn				
Yes	611,479	80.6	611,373	80.6
No	147,395	19.4	147,501	19.4

Table 10 presents the frequencies and percentages of the severity and primary diagnosis variables for the sample and population. Almost 80% of the weighted population of patients had minor to moderate loss of function. Very small percentages of patients presented with specific primary diagnoses, with less than 5% of patients in the weighted population classified for each specific primary diagnosis type. However, the majority of patients (81%) were classified into the primary diagnosis group of "other diagnosis" (OtherDiagn).

Table 11: *Frequencies and Percentages of Sample and Population Findings for Severity and Primary Diagnosis Variables, According to Region*

	Sample		**Population**	
Variable/Strata	**Frequency**	**Percent**	**Frequency**	**Percent**
Severity - Northeast				
No specification	9	<0.05	9	<0.05
Minor loss of fn.	66,169	42.7	66,002	42.6
Moderate loss of fn.	61,925	39.9	61,958	40.0
Major loss of fn.	23,177	15.0	23,295	15.0
Extreme loss of fn.	3,746	2.4	3,762	2.4
Severity - South				
No specification	144	<0.05	141	<0.05
Minor loss of fn.	170,964	39.9	171,062	39.9
Moderate loss of fn.	167,635	39.1	167,621	39.1
Major loss of fn.	76,233	17.8	76,122	17.8
Extreme loss of fn.	1,396	3.3	13,989	3.3
Severity - Midwest				
No specification	33	<0.05	32	<0.05
Minor loss of fn.	42,335	37.2	42,337	37.2
Moderate loss of fn.	46,639	41.0	46,690	41.1
Major loss of fn.	20,553	18.1	20,520	18.0
Extreme loss of fn.	4,174	3.7	4,155	3.7
Severity - West				
No specification	6	<0.05	6	<0.05
Minor loss of fn.	24,288	39.7	24,245	39.6
Moderate loss of fn.	24,251	39.6	24,281	39.7
Major loss of fn.	10,535	17.2	10,541	17.2
Extreme loss of fn.	2,098	3.4	2,105	3.4
NHCHeart				
Northeast	1,827	1.2	1,835	1.2
South	7,015	1.6	7,009	1.6
Midwest	1,789	1.6	1,797	1.6
West	1,004	1.6	1,014	1.7

	Sample		Population	
Variable/Strata	**Frequency**	**Percent**	**Frequency**	**Percent**
CorAthero				
Northeast	725	0.5	721	0.5
South	2,497	0.6	2,463	0.6
Midwest	607	0.5	607	0.5
West	308	0.5	305	0.5
Asthma *				
Northeast	4,677	3.0	4,681	3.0
South	7,396	1.7	7,430	1.7
Midwest	2,927	2.6	2,944	2.6
West	1,362	2.2	1,349	2.2
AcuteMyo				
Northeast	582	0.4	585	0.4
South	2,173	0.5	2,168	0.5
Midwest	593	0.5	597	0.5
West	245	0.4	246	0.4
ChronPulm				
Northeast	5,623	3.6	5,622	3.6
South	9,980	2.3	10,028	2.3
Midwest	3,817	3.4	3,841	3.4
West	1,882	3.1	1,873	3.1
CardiacDys*				
Northeast	606	0.4	612	0.4
South	1,568	0.4	1,560	0.4
Midwest	385	0.3	386	0.3
West	200	0.3	199	0.3
Gallbladder				
Northeast	1,731	1.1	1,736	1.1
South	4,293	1.0	4,302	1.0
Midwest	1,085	1.0	1,092	1.0
West	626	1.0	631	1.0
OtherDiagn				
Northeast	125,670	81.1	125,673	81.1
South	346,733	80.8	346,733	80.8
Midwest	89,882	79.0	89,785	78.9
West	49,194	80.4	49,193	80.4

* Due to preliminary results, DiabRetino and Pneumonia as primary diagnosis were replaced with Asthma and Cardiac dysrhythmias

Table 11 presents the frequencies and percentages of the severity and primary diagnosis variables for the sample and population. Approximately 80% of the weighted population of patients in each of the four regions had minor to moderate loss of function. Very small percentages of patients presented with specific primary diagnoses, with less than 5% of patients in the weighted population of each region classified for each specific primary diagnosis type. However, approximately 80% of patients in each of the four regions were classified into the primary diagnosis group of “other diagnosis” (OtherDiagn).

Table 12*: Frequencies and Percentages of Sample and Population Findings for Comorbidity Variables*

	Sample		**Population**	
Variable	**Frequency**	**Percent**	**Frequency**	**Percent**
Arthritis				
Yes	20,776	2.7	20,805	2.7
No	738,098	97.3	738,069	2.7
CHF				
Yes	25,222	3.3	25,187	3.3
No	733,652	96.7	733,687	96.7
ChronLung				
Yes	98,392	13.0	98,780	13.0
No	660,482	87.0	660,094	87.0
Depression				
Yes	51,035	6.7	51,112	6.7
No	707,839	93.3	707,762	93.3
Hypertension				
Yes	244,942	32.3	245,093	32.3
No	513,932	67.7	513,781	67.7
Hyperthyroidism				
Yes	24,443	3.2	24,476	3.2
No	734,431	96.8	734,398	96.8
Liver				
Yes	12,472	1.6	12,470	1.6
No	746,402	98.4	746,404	98.4
Electrolyte				
Yes	107,053	14.1	106,730	14.1
No	651,821	85.9	652,144	85.9
PeriVasc				
Yes	9,009	1.2	8,982	1.2
No	749,865	98.8	749,892	98.8

RenalFailure				
Yes	46,195	6.1	46,138	6.1
No	712,679	93.9	712,736	93.9

Table 12 presents the frequencies and percentages of the comorbidity variables for the sample and population. Approximately 32% of the weighted population of patients had hypertension. Approximately 14% of the patients had an electrolyte disorder and 13% had chronic pulmonary disease. Almost 7% of the patients in the weighted population had depression.

Table 13*: Frequencies and Percentages of Sample and Population Findings for Comorbidity Variables, According to Region*

	Sample		**Population**	
Variable/Strata	**Frequency**	**Percent**	**Variable**	**Frequency**
Arthritis				
Northeast	3,871	2.5	3,880	2.5
South	11,670	2.7	11,726	2.7
Midwest	3,319	2.9	3,305	2.9
West	1,916	3.1	1,911	3.1
CHF				
Northeast	3,975	2.6	3,983	2.6
South	14,524	3.4	14,506	3.4
Midwest	4,649	4.1	4,666	4.1
West	2,074	3.4	2,062	3.4
ChronLung				
Northeast	23,961	15.5	23,988	15.5
South	46,199	10.8	46,185	10.8
Midwest	19,464	17.1	19,559	17.2
West	8,768	14.3	8,773	14.3
Depression				
Northeast	10,704	6.9	10,709	6.9
South	26,011	6.1	26,005	6.1
Midwest	9,816	8.6	9,851	8.7
West	4,504	7.4	4,487	7.3
Hypertension				
Northeast	46,867	30.2	46,915	30.3
South	139,798	32.6	139,870	32.6
Midwest	39,051	34.3	39,165	34.4

West	19,226	31.4	19,206	31.4
Hyperthyroidism				
Northeast	4,554	2.9	4,545	2.9
South	13,468	3.1	13,515	3.2
Midwest	4,201	3.7	4,196	3.7
West	2,220	3.6	2,232	3.7
Liver				
Northeast	2,800	1.8	2,780	1.8
South	6,303	1.5	6,301	1.5
Midwest	1,900	1.7	1,905	1.7
West	1,469	2.4	1,483	2.4
Electrolyte				
Northeast	16,468	10.6	16,429	10.6
South	64,020	14.9	63,976	14.9
Midwest	17,621	15.5	17,623	15.5
West	8,944	14.6	8,906	14.6
PeriVasc				
Northeast	1,336	0.9	1,327	0.9
South	5,404	1.3	5,401	1.3
Midwest	1,609	1.4	1,616	1.4
West	660	1.1	651	1.1
RenalFailure				
Northeast	7,584	4.9	7,601	4.9
South	27,388	6.4	27,380	6.4
Midwest	7,659	6.7	7,658	6.7
West	3,564	5.8	3,556	5.8

Table 13 presents the frequencies and percentages of the comorbidity variables for the sample and population, according to region. Approximately 30% to 35% of patients across the four regions had hypertension. The proportion of patients with electrolyte disorder was highest in the Midwest, lowest in the Northeast. Chronic pulmonary disease was also most prevalent in the Midwest, and patients in the South had the lowest frequency of chronic pulmonary disease. The proportion of patients with depression was also highest in the Midwest.

***Table 14**: Frequencies and Percentages of Sample and Population Findings for Life Factor Variables*

	Sample		**Population**	
Variable	**Frequency**	**Percent**	**Variable**	**Frequency**
SES				
0 to 25,000	366,753	48.3	367,399	48.4
25,001 to 30,000	169,318	22.3	168,875	22.3
30,001 to 35,000	132,580	17.5	132,244	17.4
35,001 and above	90,223	11.9	90,355	11.9
Medicare				
Yes	96,650	12.7	96,943	12.8
No	662,224	87.3	661,931	87.2
Medicaid				
Yes	309,301	40.8	309,177	40.7
No	449,573	59.2	449,697	59.3
PrivInsurance				
Yes	257,240	33.9	257,402	33.9
No	501,634	66.1	501,472	66.1
SelfPay				
Yes	63,091	8.3	63,141	8.3
No	695,783	91.7	695,733	91.7
NoCharge				
Yes	6,833	0.9	6,813	0.9
No	752,041	99.1	752,061	99.1
Other				
Yes	25,759	3.4	25,398	3.4
No	733,115	96.6	733,476	96.7

Table 14 presents the frequencies and percentages of the life factor variables for the sample data and the weighted population. Almost half of the patients in the weighted population had an income of $25,000 or less (48%). Approximately 40% of the patients in the weighted population had Medicaid.

Table 15: *Frequencies and Percentages of Sample and Population Findings for Life Factor Variables, According to Region*

	Sample		**Population**	
Variable/Strata	**Frequency**	**Percent**	**Variable**	**Frequency**
SES - Northeast				
0 to 25,000	79,574	51.3	79,885	51.5
25,001 to 30,000	26,770	17.3	26,434	17.1
30,001 to 35,000	25,078	16.2	25,094	16.2
35,001 and above	23,604	15.2	23,613	15.2
SES - South				
0 to 25,000	205,864	48.0	205,411	47.9
25,001 to 30,000	99,973	23.3	100,073	23.3
30,001 to 35,000	73,679	17.2	73,805	17.2
35,001 and above	49,420	11.5	49,647	11.6
SES - Midwest				
0 to 25,000	63,364	55.7	63,396	55.7
25,001 to 30,000	26,408	23.2	26,490	23.3
30,001 to 35,000	17,517	15.4	17,446	15.3
35,001 and above	6,445	5.7	6,403	5.6
SES - West				
0 to 25,000	17,951	29.3	17,978	29.4
25,001 to 30,000	16,167	26.4	16,275	26.6
30,001 to 35,000	16,306	26.7	16,188	26.5
35,001 and above	10,754	17.6	10,737	17.6
Medicare				
Northeast	17,737	11.4	17,739	11.4
South	53,653	12.5	53,919	12.6
Midwest	17,660	15.5	17,674	15.5
West	7,600	12.4	7,615	12.5
Medicaid				
Northeast	67,494	43.5	67,785	43.7
South	168,368	39.3	167,865	39.1
Midwest	45,367	39.9	45,359	39.9
West	28,072	45.9	28,067	45.9
PrivInsurance				
Northeast	54,697	35.3	54,416	35.1
South	146,713	34.2	147,103	34.3
Midwest	38,088	33.5	28,028	33.4
West	17,742	29.0	17,711	29.0

	Sample		Population	
Variable/Strata	**Frequency**	**Percent**	**Variable**	**Frequency**
SelfPay				
Northeast	11,537	7.4	11,493	7.4
South	39,272	9.2	39,307	9.2
Midwest	8,811	7.8	8,854	7.8
West	3,471	5.7	3,527	5.8
NoCharge				
Northeast	268	0.2	274	0.2
South	5,545	1.3	5,545	1.3
Midwest	825	0.7	837	0.7
West	195	0.3	204	0.3
Other				
Northeast	3,293	2.1	3,319	2.1
South	15,385	3.6	15,197	3.5
Midwest	2,983	2.6	2,983	2.6
West	4,098	6.7	4,055	6.6

Table 15 presents the frequencies and percentages of the life factor variables for the sample data and the weighted population. Almost half of the patients in the weighted population had an income of $25,000 or less for the Northeast, South, and Midwest regions. The patients in the West region were more evenly distributed across the four SES income levels. The majority of patients in all four regions, from 73% to 79% of patients, had Medicaid or private insurance.

5.3 Assumptions

The data set was investigated to ensure that it satisfied the assumptions of the multiple regression and correlational analyses of this study: absence of missing data, absence of outliers, normality, linearity, and homoscedasticity as relates to the two dependent variables of LOS and Cost.

Only complete record sets were used, therefore the absence of missing data assumption was met. Outliers in a dataset have the potential to distort results of an inferential analysis. A check of standardized scores and box plots for the LOS and Cost variables was performed to inspect the data for outliers. LOS and Cost values with a standardized score of a magnitude of 3 or greater were classified as outliers. 11,446 records (1.5% of all records) had outliers on the LOS variable. 11,032 records (1.5% of all records) had outliers on the Cost variable. Multiple regression analyses are robust to the presence of outliers if the homoscedasticity assumption is met. Homoscedasticity of the residuals was investigated by computing regression models using the raw data, and visually inspecting scatterplots and histograms of the residual distributions. The assumption of homoscedasticity was met for both the LOS and Cost models. Additionally, all outlying values were within the acceptable ranges of their associated variables. Because the homoscedasticity assumption was met, and all outliers were in acceptable ranges of the LOS and Cost variables, all records were retained for analysis and the outlier assumption was considered not violated.

Normality for the LOS and Cost variables was investigated with SPSS Explore. The Kolmogorov-Smirnov test (K-S) for normality indicated that both the LOS and Cost variables were not normally distributed ($p < .01$). However, statistical tests performed on a very large sample, like the one in this study, will return significance even on very small effects. A visual check of histograms and Normal Q-Q plots for the two variables indicated distributions right skews on both the LOS and Cost variables. A comparison of the median and mean values for the LOS variable indicated that both of the measures of central tendency were similar in value, suggesting that the skew, outliers, and non-normality were not adversely affecting the distribution of the LOS variable ($Mdn = 3.0$, $M = 4.15$). However, the median and mean for the Cost variable were not close in value

(*Mdn* = 15,010.00, *M* = 25,502.19) and indicated that the right skew was pulling the mean higher than the true center of the distribution for the Cost variable. Logarithmic and square root transformations were performed on the Cost variable in an attempt to reduce the skew and bring the distribution closer to normal. However, the transformations did not improve the distribution. Regression models were computed for the raw and transformed Cost variables, and the model findings were similar across all models. Therefore, since the assumption of homoscedasticity was met for both the LOS and Cost variables, and the transformation of the Cost variable did not improve the data distribution, the assumption of normality was considered tenable for the study. All inferential tests were performed using the raw, untransformed data.

Assumptions of linearity between study variables and homoscedasticity were checked with scatterplots and histograms of the residuals for the LOS and Cost variables. The assumptions of linearity and homoscedasticity were not violated. Multicollinearity diagnostics for the multiple linear regression models were performed using STATA and the “svy” command on the weighted dataset. No violations were noted, and the assumption of an absence of multicollinearity met.

The sample size of this study was very large and therefore significance was found on very small effects. Therefore, in addition to reporting the p-values of the inferential tests, also reported was the effect size of each test. Cohen (1988) defined strength of association defined by correlation coefficients (effect size) as small (+/- .10 - .29), medium (+/- .30 - .49) and large (+/- .50 to 1.0). Squared semi-partial correlation coefficients were computed to derive the effect sizes for each of the independent variables in the regressions. The squared semi-partial correlation coefficient is a measure of the amount of variance in the dependent variable that is accounted for by an independent variable, and therefore is a function of the R-squared value of the regression model.

5.4 Multiple regression analysis for Research Question 1

Research Question 1 (RQ1). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital length of stay (LOS) among African American females?

Null Hypothesis 1 (H01). There is not a statistically significant relationship between either of the individual health factors of interest (obesity and diabetes) and hospital LOS among African American females.

Alternative Hypothesis 1 (HA1). There is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital LOS among African American females.

A check of the full correlation table (Appendix C) was performed prior to building the regression model, in order to check for primary diagnoses, comorbidities, and life factor variables that had a correlation with LOS of a magnitude of .30 or greater. The variables of TOTCHG ($r = .650$, $p < .0005$) and Severity ($r = .338$, $p < .0005$) were directly correlated with LOS at the $r \geq .30$ threshold, and none of the other variables met the criteria. However, the correlations between LOS and the variables of NumProc and NumChronic were close in value to the $r \geq .30$ threshold, with correlation coefficients for NumProc and NumChronic of $r = .280$ and $r = .226$ respectively. The NumProc variable met the $r \geq .30$ criteria for the regression model of Research Question 2, and the NumChronic was also used in the regression model of Research Question 2. Therefore, I decided to use the NumProc and NumChronic variables in the multiple regression of Research Question 1 also. The decision to do so was twofold; (1) to preserve uniformity between the regression models, and (2) to investigate the relationships of the NPR and NCHRONIC variables to the other predictors and outcomes of both regression models. A multiple regression was performed to test the null hypothesis of Research Question 1. The dependent variable was LOS. Independent variables included the individual health factors of Obesity and Diabetes. Independent variable controls included Cost, Severity, NumProc, and NumChronic. The variables of Cost, NumProc, and NumChronic were mean centered for use in the regression model. The DISCWT variable was used as the weighting variable, and Region was used as the stratification variable. Results of the regression are presented in Table 16 and include the unstandardized model coefficients (B*)* and associated standard errors (*SE* B), standardized regression coefficients (β), and t-statistics and significance values for the predictor variables.

Table 16*: Results of Multiple Regression of Research Question 1, LOS Regressed on Health Factors of Interest and Correlated Covariates. See appendix for SPSS output 333*

					95% Confidence Interval	
Variable	**B**	***SE* B**	***t***	***p***	Upper	Lower
Diabetes	-0.22	0.02	-12.24	<.0005	-0.26	-0.19
Obesity	-0.20	0.02	-11.84	<.0005	-0.23	-0.17
Cost	<0.005	<0.005	81.80	<.0005	<0.005	<0.005
Severity	0.98	0.01	91.02	<.0005	0.96	1.00
NumProc	-0.01	0.01	-0.95	.344	-0.03	0.01
NumChronic	0.03	<0.005	10.25	<.0005	0.03	0.04
Constant	2.41	0.02	115.58	<.0005	2.37	2.45
Model Summary						
F (6, 758,865) = 13,394.00						
$p < .0005$						
$R^2 = .440$						

Note. B = Unstandardized Regression Coefficient; *SE* B = Standard Error; *t* = t-test statistic; *p* = p-value.

The test of the model indicated that at least one predictor was significantly different from zero [*F* (6, 758,865) = 13,394.00, $p < .0005$], with R^2 of .440. The R-square value of .440 indicated that approximately 44% of the variability in the dependent variable of LOS was predicted by the six independent variables in the model. Five predictors were significant for the outcome of LOS, (a) Diabetes [B = -0.22, 95% CI (-0.26, -0.19); *t* (758,865) = -12.24, $p < .0005$], (b) Obesity [B = -0.20, 95% CI (-0.23, -0.17); *t* (758,865) = -11.84, $p < .0005$], (c) Cost [B < .01, 95% CI ($7e^{-5}$-, $8e^{-5}$); *t* (758,865) = 81.80, $p < .0005$], (d) Severity [B = 0.98, 95% CI (0.96, 0.99); *t* (758,865) = 91.02, $p < .0005$], and (e) NumChronic [B = 0.03, 95% CI (0.03, 0.04); *t* (758,865) = 10.25, $p < .0005$]. The squared semi-partial correlation for the predictor of Cost was .267, indicating that this variable contributed 27% of unique variance to the LOS outcome. The squared semi-partial correlations for the predictors of Diabetes and NumChronic were .020 each, indicating that each of the variables provided 2% unique variance to the LOS model. Obesity and Severity each had squared semi=partial correlations of .010 and .014 respectively, indicating that each of the variables provided 2% unique variance to the LOS model. The size and direction of the relationship between LOS and the independent variables of Diabetes and Obesity suggests that length of stay in the hospital decreased for patients with diabetes or obesity compared to patients without the conditions. Increases in Cost were associated with increased LOS. Increases in level of Severity and the number of chronic conditions for a patient were also associated with a longer length of stay.

Conclusion as relates to Null Hypothesis 1: Reject Null Hypothesis 1. There is sufficient evidence to indicate that there is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital LOS among African American females.

5.5 Multiple regression analysis for Research Question 2

Research Question 2 (RQ2). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital costs among African American females?

Null Hypothesis 2 (H02). There is not a statistically significant relationship between either of the individual health factors of interest (obesity and diabetes) and hospital costs among African American females.

Alternative Hypothesis 2 (HA2). There is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital costs among African American females.

A check of the full correlation table (Appendix C) was performed prior to building the regression model, in order to check for primary diagnoses, comorbidities, and life factor variables that had a correlation with Cost of a magnitude of .30 or greater. The variables of LOS ($r = .650$, $p < .0005$), NumProc ($r = .433$, $p < .0005$), and Severity ($r = .320$, $p < .0005$) were directly correlated with Cost at the $r \geq .30$ threshold, and none of the other variables met the criteria. However, the correlation between Cost and the variable of NumChronic was close in value to the $r \geq .30$ threshold ($r = .240$, $p < .0005$). The NumChronic variable was included in the regression model of Research Question 1. Therefore, I decided to use the NumChronic variable in the multiple regression of

Research Question 2 also. The decision to do so was twofold; (1) to preserve uniformity between the regression models, and (2) to investigate the relationships of the NPR and NCHRONIC variables to the other predictors and outcomes of both regression models.

A multiple regression was performed to test the null hypothesis of Research Question 2. The dependent variable was Cost. Independent variables included the individual health factors of Obesity and Diabetes. Independent variable controls included LOS, Severity, NumProc, and NumChronic. The variables of Cost, NumProc, and NumChronic were mean centered for use in the regression model. The DISCWT variable was used as the weighting variable, and Region was used as the stratification variable. Results of the regression are presented in Table 17 and include the unstandardized model coefficients (B*)* and associated standard errors (*SE* B), standardized regression coefficients (β), and t-statistics and significance values for the predictor variables.

Table 17*: Results of Multiple Regression of Research Question 2, Cost Regressed on Health Factors of Interest and Correlated Covariates.*

					95% Confidence Interval	
Variable	**B**	***SE* B**	***t***	***p***	Upper	Lower
Diabetes	-503.26	130.48	-3.86	<.0005	-758.99	-247.52
Obesity	-1,490.01	115.90	-12.86	<.0005	-1,717.17	-1,262.86
LOS	3,958.53	55.42	71.43	<.0005	3,849.91	4,067.15
Severity	2,673.29	100.30	26.65	<.0005	2,476.71	2,869.88
NumProc	6,592.79	64.03	102.97	<.0005	6,467.30	6,718.28
NumChronic	1,339.45	24.33	55.05	<.0005	1,291.76	1,387.14
Constant	21,040.40	187.40	112.28	<.0005	20,673.11	21,407.69
Model Summary						
F (6, 758,865) = 10,171.23						
$p < .0005$						
$R^2 = .502$						

Note. B = Unstandardized Regression Coefficient; *SE* B = Standard Error; *t* = t-test statistic; *p* = p-value.

The test of the model indicated that at least one predictor was significantly different from zero [F (6, 758,865) = 10,171.23, p < .0005], with R^2 of .502. The R-square value of .502 indicated that approximately 50% of the variability in the dependent variable of Cost was predicted by the six independent variables in the model. All six predictors were significant for the outcome of Cost; (a) Diabetes [B = -503.26, 95% CI (-758.99, -247.52); t (758,865) = -3.86, p < .0005], (b) Obesity [B = -1490.01, 95% CI (-1717.73, -1262.86); t (758,865) = -12.86, p < .0005], (c) LOS [B 3958.53, 95% CI (3849.91, 4067.15); t (758,865) = 71.43, p < .0005], (d) Severity [B = 2673.29, 95% CI (2476.71, 2869.88); t (758,865) = 26.65, p < .0005], (e) NumProc [B = 6592.79, 95% CI (6467.30, 6718.28); t (758,865) = 102.97, p < .0005], and (f) NumChronic [B = 1339.45, 95% CI (1291.76, 1387.14); t (758,865) = 55.05, p < .0005]. The squared semi-partial correlation for the predictor of LOS was .238, indicating that this variable contributed 24% of unique variance to the Cost outcome. The squared semi-partial correlation for the predictor of NumProc was .067, indicating that NumProc contributed 7% of unique variance to Cost. NumChronic had a squared semi-partial correlation coefficient of .004, which meant that NumChronic contributed about 4% unique variance to the Cost outcome. Diabetes, Obesity, and Severity contributed less than 1% unique variance each to the Cost outcome. The size and direction of the relationship between Cost and the independent variables of Diabetes and Obesity suggests that hospital cost of care decreased for patients with diabetes or obesity compared to patients without the conditions. Increases in LOS were associated with increased cost of care. Increases in levels of Severity, the number of procedures, and the number of chronic conditions for a patient were also associated with increased costs of care.

Conclusion as relates to Null Hypothesis 2: Reject Null Hypothesis 2. There is sufficient evidence to indicate that there is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital costs among African American females.

5.6 Correlational analysis findings for Research Question 3

Research Question 3 (RQ3). How co-morbidities and life factors are related to individual health factors of interest (obesity and diabetes) among African American females?

Null Hypothesis 3 (H03). There is not a statistically significant correlation between both co-morbidities and life factors, and either of the individual health factors of interest (obesity and diabetes).

Alternative Hypothesis 3 (HA3). There is a statistically significant correlation between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes).

The corr_svy procedure for Stata v12 was used to compute bi-variate correlations between the individual health factors of diabetes and obesity and the comorbidity and life factor variables. Table 18 presents the correlation coefficients. The sample size was very large and therefore correlations of $r = .005$ or less were statistically significant at the $p < .05$ level. Cohen (1988) defined strength of association of correlation coefficients (effect size) as small (+/- .10 - .29), medium (+/- .30 - .49) and large (+/- .50 to 1.0). Correlations of a magnitude of .10 or greater involving the variables of diabetes and obesity are presented here. Diabetes had correlations of small direct effects with the variables of obesity ($r = .192$, $p < .0005$), CHF ($r = .140$, $p < .0005$), ChronLung ($r =$

.102, $p < .0005$), Electrolyte ($r = .101$, $p < .0005$), PeriVasc ($r = .116$, $p < .0005$), and Medicare ($r = .178$, $p < .0005$). Diabetes had a medium direct correlation with RenalFailure ($r = .201$, $p < .0005$), and Hypertension ($r = .342$, $p < .0005$). The positive directions of the correlations suggest that when diabetes is present in a patient, the correlated comorbidities and life factors are also present. Obesity was directly correlated with ChronLung ($r = .111$, $p < .0005$), and Hypertension ($r = .197$, $p < .0005$). The positive directions of the correlations suggest that when obesity is present in a patient, chronic lung disease and hypertension also tend to be present.

Conclusion as relates to Null Hypothesis 3. Reject Null Hypothesis 3. There is sufficient evidence to indicate that there is a statistically significant correlation between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes).

Table 18: *Correlations for Bivariate Relationships of Health Factors, Comorbidities, and Life Factors*

Variable	Diabetes	Obesity	Arthritis	CHF	ChronLung	Depression	Hypertension	Hyperthyroidi	Liver	Electrolyte	PeriVasc	RenalFailure	SES	Medicare	Medicaid	PrivInsurance	SelfPay	NoCharge	Other
Diabetes	1.000																		
Obesity	0.192	1.000																	
Arthritis	0.021	0.004	1.000																
CHF	0.140	0.083	0.043	1.000															
ChronLung	0.102	0.111	0.027	0.088	1.000														
Depression	0.081	0.053	0.038	0.040	0.085	1.000													
Hypertension	0.342	0.197	0.085	0.145	0.134	0.119	1.000												
Hyperthyroidism	0.074	0.053	0.036	0.040	0.033	0.041	0.094	1.000											
Liver	0.045	0.001	0.013	0.036	0.034	0.034	0.056	0.014	1.000										
Electrolyte	0.101	0.042	0.055	0.089	0.049	0.068	0.150	0.041	0.066	1.000									
PeriVasc	0.116	0.024	0.020	0.061	0.024	0.028	0.099	0.022	0.012	0.044	1.000								
RenalFailure	0.201	0.027	0.106	0.176	0.033	0.040	0.283	0.051	0.050	0.146	0.146	1.000							
SES	-0.052	-0.021	0.001	-0.039	-0.046	-0.024	-0.065	0.009	-0.015	-0.024	-0.016	-0.038	1.000						
Medicare	0.178	0.062	0.113	0.123	0.079	0.097	0.198	0.071	0.035	0.108	0.094	0.290	-0.053	1.000					
Medicaid	-0.059	-0.043	-0.042	-0.009	0.018	-0.007	-0.128	-0.045	0.002	-0.050	-0.025	-0.068	-0.154	-0.317	1.000				
PrivInsurance	-0.058	0.004	-0.021	-0.065	-0.070	-0.060	-0.027	0.005	-0.031	-0.050	-0.031	-0.099	0.210	-0.274	-0.594	1.000			
SelfPay	-0.004	0.003	-0.019	-0.010	-0.001	-0.003	0.028	-0.012	0.007	0.045	-0.010	-0.038	-0.034	-0.115	-0.250	-0.216	1.000		
NoCharge	0.003	0.000	-0.007	-0.005	-0.006	-0.003	0.010	-0.005	0.005	0.007	-0.001	-0.013	-0.022	-0.036	-0.079	-0.068	-0.029	1.000	
Other	-0.010	-0.011	-0.007	-0.013	-0.005	0.004	0.007	0.000	0.000	-0.002	-0.008	-0.027	0.030	-0.072	-0.156	-0.134	-0.056	-0.018	1.000

5.7 Correlational analysis findings for Research Question 4

Research Question 4 (RQ4). How primary diagnoses are related to individual health factors of interest (obesity and diabetes) for African American females?

Null Hypothesis 4 (H03). There is not a statistically significant correlation between diagnoses and either of the individual health factors of interest (obesity and diabetes).

Alternative Hypothesis 4 (HA3). There is a statistically significant correlation between diagnoses and at least one of the individual health factors of interest (obesity and diabetes).

The corr_svy procedure for Stata v12 was used to compute bi-variate correlations between the individual health factors of diabetes and obesity and the primary diagnosis variables. Table 19 presents the correlation coefficients. The sample size was very large and therefore correlations of $r = .005$ or less were statistically significant at the $p < .05$ level. Cohen (1988) defined strength of association of correlation coefficients (effect size) as small (+/- .10 - .29), medium (+/- .30 - .49) and large (+/- .50 to 1.0). Correlations of a magnitude of .10 or greater involving the variables of diabetes and obesity are presented here. Diabetes had correlations of small direct effects with the variables of obesity ($r = .192$, $p < .0005$) and Severity ($r = .246$, $p < .0005$). The positive direction of the correlation suggests that when a patient is diagnoses as diabetic, they are also more likely to be obese and have greater severity of limits in their functioning. A large indirect effect was noted between the variables of Diabetes and

OtherDiagn ($r = -.854$, $p < .0005$), which indicated that when a patient was classified as diabetic, they were not classified as having a diagnosis of "other".

Conclusion as relates to Null Hypothesis 4. Reject null Hypothesis 4. There is sufficient evidence to indicate that there is a statistically significant correlation between diagnoses and at least one of the individual health factors of interest (obesity and diabetes)

Table 19: *Correlations for Bivariate Relationships of Health Factors, Comorbidities, and Life Factors*

Variable	Diabetes	Obesity	Severity	NHCHeart	CorAthero	Asthma	AcuteMyo	ChronPulm	CardiacDys	Gallbladder	OtherDiagn
Diabetes	1.000										
Obesity	0.192	1.000									
Severity	0.246	0.161	1.000								
NHCHeart	0.102	0.062	0.090	1.000							
CorAthero	0.072	0.037	0.011	-0.009	1.000						
Asthma	0.061	0.077	0.006	-0.019	-0.011	1.000					
AcuteMyo	0.052	0.029	0.032	-0.009	-0.005	-0.010	1.000				
ChronPulm	0.078	0.086	0.023	-0.021	-0.013	0.874	-0.012	1.000			
CardiacDys	0.015	0.023	0.022	-0.008	-0.005	-0.009	-0.004	-0.010	1.000		
Gallbladder	-0.001	0.038	-0.020	-0.013	-0.008	-0.015	-0.007	-0.017	-0.006	1.000	
OtherDiagn	-0.854	-0.207	-0.231	-0.254	-0.151	-0.302	-0.141	-0.346	-0.123	-0.207	1.000

CHAPTER 6 DISCUSSION, CONCLUSION, NEXT STEPS

Obesity and diabetes are the major worldwide health problems that are increasing in prevalence each year and affecting the African American population disproportionately. Treatments for managing the effects of obesity and diabetes are improving, but these tend to focus upon remedying individual co-morbidities, rather than treating or reversing the actual cause, obesity. Adding to the challenge of reversing the obesity epidemic is a lack of supportive environment and understanding of societal attitudes and opinions needed to provide motivation at the individual level to execute long term behavior change.

In the African American community, there is a gap between an environment enabling maintenance of a healthy body weight and customs of modern day life. The effects of obesity and diabetes have a sizeable economic burden. Obesity and diabetes are significantly correlated with hospital LOS and hospital costs among African American females.

Previous studies examined the link between obesity and diabetes and hospital LOS and hospital costs. However, there is a gap in the literature about the relationship obesity and diabetes and hospital length of stay (LOS) and hospital costs among African American females. The purpose of this quantitative correlational design was to fill these gaps by determining the relationship between individual health factors of interest (obesity and diabetes) and hospital length of stay (LOS) and hospital costs among African American females. The researcher analyzed data using correlation and regression analyses to assess the correlation between several variables. The researcher conducted the study because she sought to examine 1) whether a correlation existed between individual health factors of interest (obesity and diabetes) and hospital length of stay (LOS) among African American females, 2) whether a correlation existed between individual health factors of interest (obesity and diabetes) and hospital costs among African American females, and 3) whether a correlation existed between co-morbidities and life factors and individual health factors of interest (obesity and diabetes) among African American females .

In the present study, length of stay in the hospital decreased for patients with diabetes or obesity ($p < .05$). Hospital cost of care decreased for patients with diabetes or obesity ($p < .05$). There is a statistically significant correlation between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes).

6.1. Interpretation of the Findings

Research Question 1 (RQ1). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital length of stay (LOS) among African American females?

Null Hypothesis 1 (H01). There is not a statistically significant relationship between either of the individual health factors of interest (obesity and diabetes) and hospital LOS among African American females.

Alternative Hypothesis 1 (HA1). There is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital LOS among African American females.

In the present study, the size and direction of the relationship between LOS and the independent variables of Diabetes and Obesity suggests that length of stay in the hospital decreased for patients with diabetes or obesity (*p* <.05). Findings do not support the findings of the below studies that obese individuals with diabetes experience longer hospital stays than normal weight individuals without diabetes. Thus, findings do not confirm knowledge in the discipline.

Zizza et al. (2004) conducted a longitudinal study to demonstrate a time trend in associations between weight status and length of stay. Zizza et al. (2004) examined where lengths of hospital stay among individuals categorized according to weight status. Zizza et al. (2004) found individuals with body mass indexes (BMIs) of 35 kg/m^2 or above, those with BMIs of 30 to 34 kg/m^2, and those with BMIs of 25 to 29 kg/m^2 had crude length-of-stay rates greater than those of normal-weight individuals. Zizza et al. (2004) concluded that obese individuals experience longer total LOS than normal weight individuals. [10]

Padwal, Wang, Sharma, and Dyer (2012) examined the relationship between obesity and hospital LOS by conducting a T-test [131]. Padwal et al. (2012) randomly selected 42 severely obese subjects and 42 non-obese controls. Padwal et al. (2012) found that obese subjects with diabetes experienced longer hospital stays than non-obese controls without diabetes.

However, in the present study, these findings are consistent according to Betancourt, 2006, which states IOM report, Unequal Treatment, the issue of racial and ethnic disparities in health care in the United States demonstrates that, in addition to racial and ethnic disparities in health status, there is evidence of racial and ethnic disparities in health care quality in hospital treatment. Minorities may receive lower-quality care than their white counterparts, even after taking into account social determinants and insurance status. This unequal treatment identified a set of root causes of racial and ethnic disparities that included, among others: 1. Health system factors to include issues related to the complexity of the health care system and how it may be disproportionately difficult to navigate the system for minority patients, 2. Care-process variables to include issues related to health care providers, including stereotyping, the impact of race/ethnicity on clinical decision-making, and clinical uncertainty due to poor communication, and 3. Patient-level variables to include refusal of services, poor adherence to treatment, and delay in seeking care. In other words, African Americans are pushed through the health care system, not taken as seriously and screened as diligently as their white counterparts when undergoing inpatient services. They are admitted to the hospital, but services and length of stay are shorten due to disparities in offering treatment. [132]

The administrative claims data used might be limited without standardized claims data collection system and standardized data coding excluding ICD-9 codes across hospitals. This study used the claims data obtained from public hospitals and combined into one data set, therefore, unmatched variables were not able to be used for the analysis. Some different coding of administrative claims could exist which would not allow us to identify which type of health-care cost was either diabetic or nondiabetic-related treatment. Thus, in this study, all health-care costs consumed by patients with diabetes were used instead of the costs related to diabetic-related treatment only.

The results of the power analysis indicated that in order to power the multiple regression with the ability to detect small effects, a sample of size *N*=485 is necessary. The results indicated that in order to power this Pearson's r correlational analysis, a sample of size *N*=782 is necessary. The researcher's good power supports the significant findings.

Research Question 2 (RQ2). Is there a relationship between individual health factors of interest (obesity and diabetes) and hospital costs among African American females?

Null Hypothesis 2 (H02). There is not a statistically significant relationship between either of the individual health factors of interest (obesity and diabetes) and hospital costs among African American females.

Alternative Hypothesis 2 (HA2). There is a statistically significant relationship between at least one of the individual health factors of interest (obesity and diabetes) and hospital costs among African American females.

In the present study, hospital cost of care decreased for patients with diabetes or obesity.

Findings do not support the findings of the below studies that hospital cost of care increased for patients with diabetes or obesity. Thus, findings do not confirm knowledge in the discipline.

Vernice (2007) conducted a correlational study. Vernice (2007) examined the relationship between obesity and diabetes and hospital costs [132]. Vernice (2007) extracted totals of 176,540 obese records and 4,480,339 non-obese records. Vernice (2007) found that obesity and diabetes were significantly correlated with hospital costs [133].

Minhas, Chow, Jenkins, Dhingra, Patel (2015) conducted a multiple regression analysis Minhas et al. (2015) randomly selected 1,082 patients. Minhas et al. (2015) examined the relationship between obesity and hospital costs. Minhas et al. (2015) found that hospital costs were significantly correlated with obesity and diabetes. [134].

The present study is significant in that previous research examining the association between weight status and hospital costs has been based on cross-sectional designs. However, cross-sectional studies cannot provide evidence regarding the temporal sequence of an association. The longitudinal investigation enabled the researcher to measure individuals' hospital use patterns subsequent to measurement of their weight.

As Length of Stay is highly correlated with Hospital Cost, the present study may also relatively indicate the issue of inequity in health care rather than disease severity. [132] Hospitalization remains a less discretionary activity, with access and amount being influenced by health professional assessments of severity and type of illness, all of which are subject to personal biases. This present study may be used as the information for health policymakers to solve the inequity problem. An investigation of factors associated with hospitalizations may help health-care providers and administrators intervene to improve patient management and possibly reduce health-care costs in the future. Based on the results of this study, it is suggested that health-care providers and health policymakers may need to focus on the factors associated with an increase in health-care costs and hospitalizations to include disparities in quality of health care delivery to African American women.

Research Question 3 (RQ3). How co-morbidities and life factors are related to individual health factors of interest (obesity and diabetes) among African American females?

Null Hypothesis 3 (H03). There is not a statistically significant correlation between both co-morbidities and life factors, and either of the individual health factors of interest (obesity and diabetes).

Alternative Hypothesis 3 (HA3). There is a statistically significant correlation between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes).

Penn (2009) examined the relationship between co-morbidities and obesity and diabetes by conducting a correlation analysis [135]. Penn (2009) randomly selected 759 participants at senior centers in the United States. Penn (2009) found that obesity and diabetes were significantly correlated with co-morbidities or life factors (i.e., chronic lung disease and hypertension). Diabetes and obesity had a strong direct correlation with hypertension. Diabetes and obesity had had a weak direct correlation with chronic lung disease.

Guh et al. (2009) examined the relationship between co-morbidities and obesity and diabetes by conducting a meta-analysis [136]. Guh et al. (2009) identified 89 studies. Guh et al. (2009) found that co-morbidities or life factors (i.e., chronic lung disease and renal failure) were significantly correlated with obesity and diabetes. Diabetes and obesity had a strong direct correlation with renal failure. Diabetes and obesity had had a weak direct correlation with chronic lung disease.

In the present study, there is a statistically significant correlation between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes). Diabetes had correlations of small direct effects with the variables of obesity ($r = .192$, $p < .0005$), CHF ($r = .140$, $p < .0005$), ChronLung ($r = .102$, $p < .0005$), Electrolyte ($r = .101$, $p < .0005$), PeriVasc ($r = .116$, $p < .0005$), and Medicare ($r = .178$, $p < .0005$). Diabetes had a medium direct correlation with RenalFailure ($r = .201$, $p < .0005$), and Hypertension ($r = .342$, $p < .0005$). The positive directions of the correlations suggest that when diabetes is present in a patient, the correlated comorbidities and life factors are also present.

Obesity was directly correlated with ChronLung ($r = .111$, $p < .0005$), and Hypertension ($r = .197$, $p < .0005$). The positive directions of the correlations suggest that when obesity is present in a patient, chronic lung disease and hypertension also tend to be present. Findings support the findings of the above studies that obesity and diabetes were significantly correlated with co-morbidities or life factors (i.e., chronic lung disease, hypertension, and renal failure). Thus, findings confirm knowledge in the discipline.

The results of the power analysis indicated that in order to power the multiple regression with the ability to detect small effects, a sample of size N=485 is necessary. The results indicated that in order to power this Pearson's r correlational analysis, a sample of size *N*=782 is necessary. The researcher's good power supports the significant findings.

Research Question 4 (RQ4). How primary diagnoses are related to individual health factors of interest (obesity and diabetes) for African American females?

Null Hypothesis 4 (H04). There is not a statistically significant correlation between diagnoses and either of the individual health factors of interest (obesity and diabetes).

Alternative Hypothesis 4 (HA4). There is a statistically significant correlation between diagnoses and at least one of the individual health factors of interest (obesity and diabetes).

The, Richardson, and Gordon-Larsen (2012) examined the relationship between diagnoses and obesity and diabetes by conducting a correlation analysis [137]. The et al. (2012) randomly selected 10,481 participants enrolled in the U.S. National Longitudinal Study of Adolescent Health (1996). The et al. (2012) found that obesity and diabetes were significantly correlated with diagnoses.

Hagerstrom (2010) examined the relationship between obesity and diabetes and diagnoses by conducting a regression analysis [138]. Hagerstrom (2010) randomly selected 713 participants. Hagerstrom (2010) found that obesity and diabetes were significantly correlated with diagnoses.

In the present study, there is a statistically significant correlation between diagnoses and at least one of the individual health factors of interest (obesity and diabetes). Findings support the findings of the above studies that obesity and diabetes were significantly correlated with co-morbidities or life factors. Thus, findings confirm knowledge in the discipline.

The results of the power analysis indicated that in order to power the multiple regression with the ability to detect small effects, a sample of size *N*=485 is necessary. The results indicated that in order to power this Pearson's r correlational analysis, a sample of size *N*=782 is necessary. The present study good power supports the significant findings.

6.2. Limitations

Two limitations have been addressed in this study. First, the administrative claims data used might be limited without standardized claims data collection system and standardized data coding excluding ICD-9 codes across hospitals. This study used the claims data obtained from public hospitals and combined into one data set. Some different coding of administrative claims could exist which would not allow us to identify which type of health-care cost was either diabetic or nondiabetic-related treatment. Thus, in this study, all health-care costs consumed by patients with diabetes were used instead of the costs related to diabetic-related treatment only.

A second limitation is related to threats to external validity. The focus of this study was N=803,163 African American, female inpatients between the ages of 21 and 55 in the United States from 2008 to 2010. The relationship between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes) to African American, female inpatients between the ages of 21 and 55 in the United States from 2008 to 2010 can be generalized. However, the relationship between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes) to people in the age range of 20 years or younger, and 56 years or older cannot be generalized. Thus, the relationship between either co-morbidities or life factors, and at least one of the individual health factors of interest (obesity and diabetes) cannot be generalized to other human beings.

6.3. Recommendations

Health-care providers may set up the interventions such as diabetic patient counseling, pharmaceutical care, or disease management to delay the progression of co-morbidities or complications that diabetic patients may possibly have in hospitalization. As neighborhood socioeconomic conditions were found to contribute to the obesity epidemic in low income neighborhoods, access to nutrition food, safe playgrounds or parts and timely medical care, although challenging, may improve the ability to lead healthy and active life styles. Studies show that obesity impacts both medical-care and lost-productivity outcomes, but we have little data to show that weight loss has an impact on these outcome, in the African American community with diabetes. For short-term and smaller studies, it would be practical to collect pharmaceutical and laboratory cost measures. Inpatient and outpatient use and costs may require larger studies.

Furthermore, it is strongly recommended that lost-productivity outcomes and costs be collected because they are relatively easy to collect and the impact of obesity is well documented. If sample size is limited, it is recommended that obese patients with coronary heart disease, T2DM or hypertension be preferentially evaluated. Additionally, gender differences should be evaluated among lost-productivity outcomes. This study is significant because it demonstrates the validity for use of a single-gender and culturally responsive model of prevention that is critical to health promotion and disease prevention for African American woman. Future directions include the need to further establish and refine community collaboration building and partnership development activities with local organizations and agencies to support health promotion and disease prevention targeted to African American women.

The researcher recommends a quantitative study that examines the impact of racial disparities in health care on lower quality care for African Americans. Future research could use the instrument with African American patients and White patients. The researcher recommends that researchers should apply this significant method of research to African American patients and Caucasian patients by allowing experts to develop an instrument since they could analyze racial disparities in health care to improve quality care for African Americans. Leaders may show appreciation towards African American patients who cope with racial disparities in health care. In future quantitative studies, it would be helpful to examine the impact of a low socioeconomic status for most African Americans on access to health care by performing a regression analysis. Future research can bring about more knowledge that would help narrowing the gap. Future research may bridge the gap by examining challenges of African Americans as next steps in forwarding this line of research. Future research may show that a low socioeconomic status for most African Americans hinders access to health care.

Present research has acknowledged the need to ensure physicians have the necessary medical and cultural information required to provide exceptional care to all. Physicians need to be recognized and rewarded for closing the biggest disparities in care gaps. We must agree that unequal care is unacceptable. Only then can we make all of the improvements our nation needs. Future studies, it would be useful to examine if African American diabetic patients would receive less intensive pharmacological treatment than Caucasian diabetic patients by performing ANOVA.

It is well established that in most health measures, African Americans have worse outcomes than whites. Study after study has shown that blacks are more likely to be diagnosed with health conditions like diabetes, high blood pressure and diabetes and are also more likely to die from cancer, stroke and heart disease A study that involves an exploration to understand whether African American diabetic patients would receive less intensive pharmacological treatment than Caucasian diabetic patients may result in the development of additional theory. African American diabetic patients who receive less intensive pharmacological treatment are relevant.

Measure of central tendency for LOS, Cost, Age, Num Proc, and NumChron, patients had on average two procedures and three chronic conditions on average with medical cost of 25,6K. This supports that there are substantial variations existing in inpatient treatment patterns, among patients with obesity and or diabetes. Further research on the determinants of the resource utilization could be helpful in predicting and alleviating these costs and improving patient care in African American women. Further research is needed to obtain greater knowledge about strategies for prevention and management of obesity and diabetes; decreased blood pressure, weight, and body mass index levels and to develop a replicable approach for improving the health and wellbeing of African American women.

In the present study, the positive directions of the correlations suggest that when obesity and diabetes are present in a patient, hypertension also tend to be present. In future studies, it would be useful to examine the impact of obesity and diabetes on co-morbidities or life factors such as cancer. Future research may show that obesity and diabetes significantly affect cancer.

Final recommendation is related to a quantitative study that examines the relationship between abdominal obesity and diabetes. Future research may bridge the gap in literature by examining the relationship between abdominal obesity and diabetes. Future research may show that there is no association with abdominal obesity and diabetes.

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APPENDIX A

Operationalization of Variables of Study

Variable Name	Description	Type	Coding	HCUP Variable Derived From
LOS	Length of stay in hospital, measured in days. This Variable will be used as the dependent variable in one of the two multiple regression models and the correlational analysis.	Contin uous	Range from 0-365	LOS
Cost	Monetary cost for hospital care, measured in US dollars. This variable will be used as the dependent variable in the other multiple regression model and the correlational analysis.	Contin uous	Range from 0-1,500,000	TOTCHG
Diabetes	Indicates if the patient has diabetes. This variable will be used as an independent variable in both multiple regressions and the correlational analysis.	Dichot omous	1 = yes 0 = no	CM_DM and CM_DMX
Obesity	Indicates if the patient suffers from the comorbidity of obesity. This variable will be used as an independent variable in both multiple regressions and the correlational analysis.	Dichot omous	1 = yes 0 = no	CM_OBESE

(cont'd)

Variable Name	Description	Type	Coding	HCUP Variable Derived From
Age	Measures the age in years of the patient. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the variable with the strong correlation as the dependent variable.	Continuous	Range from 21-55	AGE
NumProc	NumProc is a count of the number of procedures. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the variable with the strong correlation as the dependent variable.	Ordinal	Range from 0-30	NPR
NumChronic	Count of the number of chronic conditions of the patient. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the variable with the strong correlation as the dependent variable.	Ordinal	Range from 0-30	NCHRONIC

(cont'd)

Variable Name	Description	Type	Coding	HCUP Variable Derived From
Depression	Indicates if the patient has the comorbidity of depression. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	CM_DEPRESS
Hypertension	Indicates if the patient has the comorbidity of hypertension. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	CM_HTN_C

(cont'd)				
Variable Name	Description	Type	Coding	HCUP Variable Derived From
Hypothyroidism	Indicator for the comorbidity of hypothyroidism. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	CM_HYPOTHY
Liver	Indicates if the patient has the comorbidity of liver disease. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	CM_LIVER

(cont'd)

Variable Name	Description	Type	Coding	HCUP Variable Derived From
Electrolyte	Indicates if the patient has the comorbidity of a fluid and electrolyte disorder. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	CM_LYTES
PeriVasc	Indicator for comorbidity of peripheral vascular disorders. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	CM_PERIVASC

(cont'd)

Variable Name	Description	Type	Coding	HCUP Variable Derived From
RenalFailure	Indicator for comorbidity of renal failure. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	CM_RENLFAIL
SES	Social economic status of patient. Measured using the median household income in US dollars for the patient's zip code. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Ordinal	1 = 0 to 25,000 2 = 25,001 to 30,000 3 = 30,001 to 35,000 4 = 35,001 and above	ZIPINC4

(cont'd)

Variable Name	Description	Type	Coding	HCUP Variable Derived From
Severity	Classifies the severity of illness of the patient. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Ordinal	0 = No specification 1 = Minor loss of fn. 2=Moderate loss of fn. 3 = Major loss of fn. 4=Extreme loss of fn.	APRDRG_ Severity
Primary Diagnosis	This variable categorizes the primary diagnosis. Due to this variable being categorical, it will be broken up into the following eight indicator variables for each category.			

Variable Name	Description	Type	Coding	HCUP Variable Derived

Variable Name	Description	Type	Coding	HCUP Variable Derived From
1. NHCHeart	Indicator for primary diagnosis being Non-Hypertensive Congestive Heart Failure. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	DX1
2. CorAthero	Indicator for primary diagnosis being coronary atherosclerosis. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	DX1

(cont'd)				
Variable Name	Description	Type	Coding	HCUP Variable Derived From
3. Cardiac dysrhythmias	Indicator for primary diagnosis being cardiac dyshythmias. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	DX1
4. AcuteMyo	Indicator for primary diagnosis being acute myocardial infraction. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	DX1

(cont'd)

Variable Name	Description	Type	Coding	HCUP Variable Derived From
5. ChronPulm	Indicator for primary diagnosis being chronic obstructive pulmonary disease. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	DX1
6. Asthma	Indicator for primary diagnosis being Asthma. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	DX1

(cont'd)				
Variable Name	Description	Type	Coding	HCUP Variable Derived From
7. Gallbladde r	Indicator for primary diagnosis being gallbladder disease. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	DX1
8. OtherDiagn	Indicator for primary diagnosis being a diagnosis other than those included in the multiple regression. This variable will be created and used as a reference group for primary diagnosis within the regression analysis.	Dichotomous	1 = yes 0 = no	DX1
PrimaryPay	This variable indicates who the primary payer was for the patient's treatment. Due to the categorical nature of this variable, it will be broken up into the following six indicator variables for each category.			

Variable Name	Description	Type	Coding	HCUP Variable Derived From
1. Medicare	Indicator for the primary pay being from Medicare. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	PAY1
2. Medicaid	Indicator for the primary pay being from Medicaid. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	PAY1

(cont'd)

Variable Name	Description	Type	Coding	HCUP Variable Derived From
3. PrivInsurance	Indicator for the primary pay being from private insurance. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	PAY1

(cont'd)

Variable Name	Description	Type	Coding	HCUP Variable Derived From
4. SelfPay	Indicator for the primary pay being self-pay. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	PAY1

(cont'd)

Variable Name	Description	Type	Coding	HCUP Variable Derived From
5. NoCharge	Indicator for there being no charge to patient. This variable will be used in the correlational analysis. If a strong correlation with LOS and/or Cost is indicated, then it will be included as an independent (control) variable in the multiple regression which includes the strongly correlated variable as the dependent variable.	Dichotomous	1 = yes 0 = no	PAY1
6. Other	Indicator for the primary pay being from a source other than the five listed above. This variable will be used in the correlational analysis. For the multiple regression analysis, this variable will be included as the reference group for PrimaryPay. It will be made to include all groups except for those selected for analysis.	Dichotomous	1 = yes 0 = no	PAY1

APPENDIX B

Tables and Charts for Preliminary Results

Measures of Central Tendency for Continuous Variables and Counts

Variable: LOS (derived from HCUP variable of LOS)

Descriptives

			Statistic	Std. Error
LOS	Mean		4.20	.007
	95% Confidence Interval for Mean	Lower Bound	4.19	
		Upper Bound	4.22	
	5% Trimmed Mean		3.39	
	Median		3.00	
	Variance		35.993	
	Std. Deviation		5.999	
	Minimum		0	
	Maximum		362	
	Skewness		10.886	.003

Variable: Cost (derived from HCUP variable of TOTCHG)

Descriptives

			Statistic	Std. Error
Cost	Mean		25390.27	46.508
	95% Confidence Interval for Mean	Lower Bound	25299.11	
		Upper Bound	25481.42	
	5% Trimmed Mean		19684.70	
	Median		14910.00	
	Variance		1.711E+9	
	Std. Deviation		41358.562	
	Minimum		106	
	Maximum		1469196	
	Skewness		9.842	.003

Variable: Age (derived from HCUP variable of AGE)

Descriptives

			Statistic	Std. Error
Age	Mean		37.27	.012
	95% Confidence Interval for Mean	Lower Bound	37.24	
		Upper Bound	37.29	
	5% Trimmed Mean		37.19	
	Median		37.00	
	Variance		110.706	
	Std. Deviation		10.522	
	Minimum		21	
	Maximum		55	
	Skewness		.081	.003

Variable: NumProc (derived from HCUP variable of NPR, measures number of procedures)

Descriptives

			Statistic	Std. Error
NumProc	Mean		1.55	.002
	95% Confidence Interval for Mean	Lower Bound	1.54	
		Upper Bound	1.55	
	5% Trimmed Mean		1.36	
	Median		1.00	
	Variance		2.985	
	Std. Deviation		1.728	
	Minimum		0	
	Maximum		31	
	Skewness		2.357	.003

Variable: NumChronic (derived from HCUP variable of NCHRONIC, measures the number of chronic conditions)

Descriptives

			Statistic	Std. Error
NumChronic	Mean		2.86	.003
	95% Confidence Interval for Mean	Lower Bound	2.85	
		Upper Bound	2.86	
	5% Trimmed Mean		2.63	
	Median		2.00	
	Variance		7.477	
	Std. Deviation		2.734	
	Minimum		0	
	Maximum		22	
	Skewness		1.083	.003

Frequencies percentages for Categorical and Ordinal Variables

Variable: Diabetes (derived from HCUP variables CM_DM and CM_DMX, diabetes is an indicator for if the patient has diabetes)

Diabetes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	683863	85.1	85.1	85.1
	Yes	119300	14.9	14.9	100.0
	Total	803163	100.0	100.0	

Variable: Obesity (derived from HCUP variable CM_OBESE, indicates if the patient suffers from the comorbidity of obesity)

Obesity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	691067	86.0	86.0	86.0
	Yes	112096	14.0	14.0	100.0
	Total	803163	100.0	100.0	

Both Diabetes and Obesity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	767708	95.6	95.6	95.6
	Yes	35455	4.4	4.4	100.0
	Total	803163	100.0	100.0	

Variable: Primary Diagnosis (derived from HCUP variable of DX1)

PrimaryDiagn

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NHCHeart	12152	1.5	1.5	1.5
	CorAthero	4330	.5	.5	2.1
	Pneumonia	973	.1	.1	2.2
	AcuteMyo	3769	.5	.5	2.6
	ChronPulm	22635	2.8	2.8	5.5
	DiabRetino	11	.0	.0	5.5
	Gallbladder	8110	1.0	1.0	6.5
	OtherDiagn	751183	93.5	93.5	100.0
	Total	803163	100.0	100.0	

Variable: Primary Pay (derived from HCUP variable of PAY1)

Primary Pay

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Medicare	100732	12.5	12.6	12.6
	Medicaid	327694	40.8	40.9	53.5
	PrivInsurance	270267	33.7	33.7	87.2
	SelfPay	68666	8.5	8.6	95.8
	NoCharge	7045	.9	.9	96.7
	OtherPay	26660	3.3	3.3	100.0
	Total	801064	99.7	100.0	
Missing	System	2099	.3		
Total		803163	100.0		

Variable: SES (derived from HCUP variable of ZIPINC4, gives the median household income for the patients zip code)

SES

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 to 25000	370702	46.2	48.0	48.0
	25001 to 30000	172662	21.5	22.3	70.3
	30001 to 35000	136164	17.0	17.6	87.9
	35001 and above	93525	11.6	12.1	100.0
	Total	773053	96.3	100.0	
Missing	System	30110	3.7		
Total		803163	100.0		

Variable: Severity (derived from HCUP variable of APRDRG_Severity, classifies the severity of the patient's illness in terms of loss of function)

Severity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No loss	332	.0	.0	.0
	Minor Loss	319977	39.8	39.8	39.9
	Moderate Loss	319182	39.7	39.7	79.6
	Major Loss	138342	17.2	17.2	96.8
	Extreme Loss	25330	3.2	3.2	100.0
	Total	803163	100.0	100.0	

Variable: Arthritis (derived from HCUP variable of CM_ARTH, indicates if the patient has the comorbidity of rheumatoid arthritis/collagen vascular diseases)

Arthritis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	781281	97.3	97.3	97.3
	Yes	21882	2.7	2.7	100.0
	Total	803163	100.0	100.0	

Variable: CHF (derived from HCUP variable of CM_CHF, indicates if the patient has the comorbidity of congestive heart failure)

CHF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	776696	96.7	96.7	96.7
	Yes	26467	3.3	3.3	100.0
	Total	803163	100.0	100.0	

Variable: ChronLung (derived from HCUP variable of CM_CHRNLUNG, indicates if the patient has the comorbidity of chronic pulmonary disease)

ChronLung

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	697777	86.9	86.9	86.9
	Yes	105386	13.1	13.1	100.0
	Total	803163	100.0	100.0	

Variable: Depression (derived from HCUP variable of CM_DEPRESS, indicates if the patient has the comorbidity of depression)

Depression

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	749220	93.3	93.3	93.3
	Yes	53943	6.7	6.7	100.0
	Total	803163	100.0	100.0	

Variable: Hypertension (derived from HCUP variable of CM_HTN_C, indicates if the patient has the comorbidity of hypertension)

Hypertension

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	544639	67.8	67.8	67.8
	Yes	258524	32.2	32.2	100.0
	Total	803163	100.0	100.0	

Variable: Hypothyroidism (derived from HCUP variable of CM_HYPOTHY, indicator for the comorbidity of hypothyroidism)

Hypothyroidism

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	777482	96.8	96.8	96.8
	Yes	25681	3.2	3.2	100.0
	Total	803163	100.0	100.0	

Variable: Liver (derived from HCUP variable of CM_LIVER, indicates if the patient has the comorbidity of liver disease)

Liver

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	789480	98.3	98.3	98.3
	Yes	13683	1.7	1.7	100.0
	Total	803163	100.0	100.0	

Variable: Electrolyte (derived from HCUP variable of CM_LYTES, indicates if the patient has the comorbidity of a fluid and electrolyte disorder)

Electrolyte

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	690902	86.0	86.0	86.0
	Yes	112261	14.0	14.0	100.0
	Total	803163	100.0	100.0	

Variable: PeriVasc (derived from HCUP variable of CM_PERIVASC, indicator for comorbidity of peripheral vascular disorders)

PeriVasc

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	793740	98.8	98.8	98.8
	Yes	9423	1.2	1.2	100.0
	Total	803163	100.0	100.0	

Variable: RenalFailure (derived from HCUP variable of CM_RENLFAIL, indicator for comorbidity of renal failure)

RenalFailure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	754494	93.9	93.9	93.9
	Yes	48669	6.1	6.1	100.0
	Total	803163	100.0	100.0	

APPENDIX C

Correlation Table

Variable	LOS	Cost	Diabetes	Obesity	Age	NumProc	NumChroni	Arthritis	CHF	ChronLung	Depression	Hypertension	Hyperthyroidi	Liver	Electrolytes	PeriVasc	RenalFailure	SES	Severity	NHCHeart	CorAthero	Asthma	AcuteMyo	ChronPulm	CardiacDys	Gallbladder	OtherDiagn	Medicare	Medicaid	PrivInsurance	SelfPay	NoCharge	Other
LOS	1.000																																
Cost	0.650	1.000																															
Diabetes	0.079	0.087	1.000																														
Obesity	0.042	0.048	0.192	1.000																													
Age	0.113	0.165	0.301	0.138	1.000																												
NumProc	0.280	0.433	-0.019	0.000	-0.026	1.000																											
NumChronic	0.226	0.240	0.469	0.333	0.524	0.027	1.000																										
Arthritis	0.040	0.050	0.021	0.004	0.070	0.007	0.181	1.000																									
CHF	0.080	0.084	0.140	0.083	0.150	0.014	0.304	0.043	1.000																								
ChronLung	0.043	0.052	0.102	0.111	0.148	-0.024	0.329	0.027	0.088	1.000																							
Depression	0.036	0.033	0.081	0.053	0.121	-0.030	0.278	0.038	0.040	0.085	1.000																						
Hypertension	0.083	0.119	0.342	0.197	0.474	-0.016	0.563	0.085	0.145	0.134	0.119	1.000																					
Hyperthyroidism	0.030	0.032	0.074	0.053	0.119	-0.008	0.192	0.036	0.040	0.033	0.041	0.094	1.000																				
Liver	0.044	0.050	0.045	0.001	0.095	0.015	0.158	0.013	0.036	0.034	0.034	0.056	0.014	1.000																			
Electrolytes	0.154	0.155	0.101	0.042	0.169	0.010	0.269	0.055	0.089	0.049	0.068	0.150	0.041	0.066	1.000																		
PeriVasc	0.058	0.072	0.116	0.024	0.105	0.073	0.199	0.020	0.061	0.024	0.028	0.099	0.022	0.012	0.044	1.000																	
RenalFailure	0.111	0.125	0.201	0.027	0.164	0.092	0.384	0.106	0.176	0.033	0.040	0.283	0.051	0.050	0.146	0.146	1.000																
SES	-0.018	-0.008	-0.052	-0.021	-0.015	0.035	-0.083	0.001	-0.039	-0.046	-0.024	-0.065	0.009	-0.015	-0.024	-0.016	-0.038	1.000															
Severity	0.338	0.320	0.246	0.161	0.235	0.153	0.535	0.137	0.264	0.149	0.090	0.251	0.067	0.129	0.374	0.114	0.334	-0.051	1.000														
NHCHeart	0.012	0.024	0.102	0.062	0.106	-0.035	0.186	0.016	-0.018	0.086	0.012	0.116	0.027	0.018	0.036	0.030	0.125	-0.028	0.090	1.000													
CorAthero	-0.008	0.040	0.072	0.037	0.081	0.123	0.082	0.004	-0.013	0.015	0.009	0.079	0.013	-0.003	-0.004	0.056	0.023	-0.008	0.011	-0.009	1.000												
Asthma	-0.020	-0.020	0.061	0.077	0.081	-0.098	0.087	-0.002	0.050	-0.057	0.029	0.066	0.008	-0.007	0.015	-0.008	-0.019	-0.025	0.006	-0.019	-0.011	1.000											
AcuteMyo	0.004	0.052	0.052	0.029	0.066	0.130	0.093	0.007	-0.010	0.110	0.003	0.063	0.008	-0.002	0.009	0.037	0.027	-0.010	0.032	-0.009	-0.005	-0.010	1.000										
ChronPulm	-0.019	-0.018	0.078	0.086	0.115	-0.110	0.118	0.002	0.088	-0.064	0.037	0.089	0.014	-0.003	0.020	-0.005	-0.014	-0.032	0.023	-0.021	-0.013	0.874	-0.012	1.000									
CardiacDys	-0.005	0.013	0.015	0.023	0.049	-0.009	0.055	0.003	-0.010	0.014	-0.001	0.040	0.013	-0.001	0.009	0.006	0.018	-0.004	0.022	-0.008	-0.005	-0.009	-0.004	-0.010	1.000								
Gallbladder	-0.010	0.017	-0.001	0.038	0.009	0.018	-0.025	-0.005	-0.005	0.001	-0.006	0.008	-0.002	0.011	0.001	-0.005	-0.013	0.002	-0.020	-0.013	-0.008	-0.015	-0.007	-0.017	-0.006	1.000							
OtherDiagn	-0.060	-0.088	-0.854	-0.207	-0.334	0.022	-0.478	-0.024	-0.133	-0.091	-0.081	-0.357	-0.075	-0.045	-0.104	-0.109	-0.191	0.061	-0.231	-0.254	-0.151	-0.302	-0.141	-0.346	-0.123	-0.207	1.000						
Medicare	0.112	0.094	0.178	0.062	0.225	-0.011	0.335	0.113	0.123	0.079	0.097	0.198	0.071	0.035	0.108	0.094	0.290	-0.053	0.229	0.053	0.022	0.018	0.011	0.031	0.012	-0.013	-0.169	1.000					
Medicaid	-0.003	-0.050	-0.059	-0.043	-0.265	-0.017	-0.106	-0.042	-0.009	0.018	-0.007	-0.128	-0.045	0.002	-0.050	-0.025	-0.068	-0.154	-0.028	-0.008	-0.024	-0.005	-0.022	-0.003	-0.020	-0.020	0.068	-0.317	1.000				
PrivInsurance	-0.063	-0.005	-0.058	0.004	0.067	0.059	-0.133	-0.021	-0.065	-0.070	-0.060	-0.027	0.005	-0.031	-0.050	-0.031	-0.099	0.210	-0.120	-0.035	0.005	-0.026	0.002	-0.037	0.006	0.016	0.061	-0.274	-0.594	1.000			
SelfPay	-0.017	-0.017	-0.004	0.003	0.057	-0.055	0.016	-0.019	-0.010	-0.001	-0.003	0.028	-0.012	0.007	0.045	-0.010	-0.038	-0.034	-0.003	0.014	0.006	0.031	0.020	0.030	0.008	0.020	-0.022	-0.115	-0.250	-0.216	1.000		
NoCharge	-0.006	-0.002	0.003	0.000	0.025	-0.016	0.002	-0.007	-0.005	-0.006	-0.003	0.010	-0.005	0.005	0.007	-0.001	-0.013	-0.022	-0.009	0.001	0.001	0.009	0.003	0.010	0.003	0.007	-0.009	-0.036	-0.079	-0.068	-0.029	1.000	
Other	-0.006	0.002	-0.010	-0.011	0.029	0.004	-0.007	-0.007	-0.013	-0.005	0.004	0.007	0.000	0.000	-0.002	-0.008	-0.027	0.030	-0.024	-0.005	0.000	-0.001	0.001	-0.003	0.001	0.003	0.008	-0.072	-0.156	-0.134	-0.056	-0.018	1.000