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Coronary heart disease (CHD) was the number one cause of death in the United States. The main CHD symptom was a heart attack. The most common form of a heart attack was chest pain and shortness of breath, which occurred in men. However, women did not usually have chest pain, but other symptoms such as abdominal pain or indigestion. This could lead women to perceive or believe that they would not have heart disease or heart attacks. This thought could lead women to not obtaining health care, such as surgical procedures, for CHD.

Health professionals knew the signs and symptoms of CHD in men, but they may be uncertain in their diagnosis in women. This could lead to women not asking their health care professional about heart attacks or other symptoms. The purpose of this dissertation analyzed CHD in two areas in all women 18 years and older. These two areas were: (a) comparing hospital length of stay between men and women who had either coronary artery bypass grafting (CABG) or percutaneous transluminal coronary angioplasty (PTCA); and (b) women's perceptions about CHD.

Data for the surgical procedures study came from the 2006 National Hospital Discharge Survey (NHDS) and for the perception study came from the 2007 Behavioral Risk Factor Surveillance System (BRFSS). The results showed for the surgical procedures men and women had increased hospital days of care (DOC) for all surgical procedures. The results for the perception study showed women's perception of heart attack symptom knowledge varied by age, race-ethnicity, education, income, and other factors.

These two studies had the following conclusions. The results for increased hospital DOC had implications, such as increased health utilization, for present and future hospitalizations. The results for heart attack symptom knowledge showed a need for more awareness and communication of heart attack symptoms among all women across the United States.

ADULT WOMEN AND CORONARY HEART DISEASE: STUDIES ON SURGICAL PROCEDURES AND PERCEPTION

Patricia J. Schlorke, MPH

APPROVED:

Major Professor

Committee Member

Committee Member

Department Chair

Dean, School of Public Health

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CHAPTER 1

INTRODUCTION TO THE TWO PAPERS

Cardiovascular disease (CVD) was the main cause of death in women within the United States. CVD caused health problems in the heart, arteries, veins, venules, arterioles, and capillaries. The American Heart Association (2009, Facts about women and cardiovascular disease) stated, "…37% of all female deaths in America occur from CVD, which includes coronary heart disease…, stroke and other cardiovascular diseases." CVD was a major health problem for minority women. Death rates between white and black women showed black women had a higher death rate than white women (American Heart Association, 2009, Facts about women and cardiovascular diseases). Although CVD was an important health problem, in women, the greater part of CVD deaths came from coronary heart disease (CHD).

CHD concentrated on the heart, the outer sac called the pericardium, coronary arteries, and the major arteries and veins entering and leaving the heart. In 2003, CHD "…caused the deaths of more than 233,800 women..." (American Heart Association, 2009, What we don't know about women & cvd). An update of CHD deaths in 2007 showed "…1.2 million Americans will have a first or recurrent coronary attack. About 452,000 of these people will die. Coronary heart disease is the nation's **single** leading cause of death" (American Heart Association & American Stroke Association, 2007, 2007 Heart disease and stroke statistics, p. 4). Three categories of risk factors caused these deaths. The first category was risk factors that can not be changed, such as genetics, age, and gender. The second category was factors changed by either lifestyle changes, such as exercise and eating healthy foods, or medical interventions, such as lowering blood pressure through medication. The third category was risk factors that increased due to other contributing health causes such as too much stress and alcohol (American Heart Association, 2009, Risk factors and coronary heart disease). These categories could show up individually or in combination within patients.

Although physicians explained the risk factors of CHD to all patients in hospitals, clinics, and physician offices across the United States, research about these risk categories was from past studies where the majority of participants were men. The Framingham Heart Study, started in 1948, was one of the studies that looked at how and when a person had heart disease over time (American Heart Association, 2009, Framingham heart study). The results from this study raised awareness or updated information among researchers, physicians, and other medical personnel. However, the Framingham Heart Study and similar studies focused on male CHD.

Male CHD research unknowingly created an imbalance or a disparity in heart disease research in women. Other definitions of disparity were unequal, or inequality. Inequalities caused different groups of people to be missed in health research. These groups could have more health problems in the future if not caught in time. The major forms of disparity were health, gender, and race-ethnicity.

Gender disparity came from traditional societal roles in the United States. Traditional roles showed men provided for the family by working outside the home, and women stayed home to take care of the house and any children. These roles had consequences for heart disease research between men and women. The research thoughts from traditional roles were that men had heart disease due to stressful jobs. Researchers thought, since women did not “work” outside the home, women were not under stress, and therefore did not have heart disease. If women complained to a doctor about discomfort in the chest area, it was passed off as something else, such as indigestion. Then a few days or a week later, the woman died from a heart attack.

CHD gender disparity research was the norm until women became the majority of CHD participants in the middle part of the 1990’s. Women in these studies were older (55 to 85 years) and compared with men of the same age groups. The majority of the results showed women were more likely to die from a first time heart attack than men. In a later comparison between men and women 40 years and older showed, “…23 percent of women compared with 18 percent of men will die within one year after a heart attack” (American Heart Association, 2009, Women and coronary heart disease).

In early 2000, few research studies compared women with women. These studies compared older women over the age of 50, as previous research studies. These results showed older women had more heart attacks and more risk factors (Wenger, Shaw, & Vaccarino, 2008, p. 48). These results led to the assumption that younger women did not have CHD problems. The assumption and research results led to younger women not properly diagnosed with CHD by the physician, and also CHD symptoms were missed by the doctor and patient (Wenger et al., 2008, p. 49).

As researchers started to discover why women were not properly diagnosed with CHD by physicians, they found women did not believe CHD was a health threat and did not know the risk factors for CHD (American Heart Association, 2009, Women and coronary heart disease). In 2003, the American Heart Association surveyed 1,000 women across the United States about CHD knowledge. The study results showed only 13 percent of American women believed heart disease and stroke were a health threat (American Heart Association, 2009, Facts about women and cardiovascular disease). The study also found minority women had the lowest risk factor awareness, even though these women had the highest risk of death from heart disease (American Heart Association, 2009, Facts about women and cardiovascular disease). The lack of awareness led to other issues of CHD in women. One major issue was women postponed or did not receive medical treatment for heart attacks (American Heart Association, 2009, Is it gender difference or gender bias?).

The purpose of this dissertation was to look at two areas of CHD in all women 18 years and older. These facets are: (a) Comparing hospital length of stay between men and women who had coronary artery bypass surgery (CABG) or percuataneous transluminal coronary angioplasty (PTCA); and (b) women's perceptions about CHD.

CHAPTER 2

COMPARISON OF HOSPITAL LENGTH OF STAY BETWEEN MEN AND WOMEN UNDERGOING CORONARY ARTERY BYPASS SURGERY (CABG) OR PERCUTANEOUS TRANSLUMINAL CORONARY ANGIOPLASTY (PTCA)

Introduction

Coronary heart disease (CHD) was the number one cause of death in the United States for men and women. Previous research on CHD focused on men, which resulted in clinicians and society to think CHD was only in men (American Heart Association, 2009, Is it gender differences or gender bias?). When women started to show symptoms of CHD in the hospitals, researchers found men and women had similar CHD risk factors. These similarites were family history, obesity, diabetes, stress, too much alcohol, high blood pressure, high cholesterol, and age (American Heart Association, 2009, Risk factors and coronary heart disease; Anderson & Kessenich, 2001, Gender Differences). Men, at an earlier age, had the greatest risk and died of CHD. However, women, at an older age, had the greatest risk and died of CHD (American Heart Association, 2009, Facts about women and cardiovascular diseases; Anderson & Kessenich, 2001, Abstract).

Heart attacks were the major CHD symptom that came from CHD risk factors. A heart attack happened when the coronary arteries were not able to bring oxygen to the heart muscle. The most common sign of a heart attack was upper chest, arm, or neck pain (American Heart Association, 2009, Is is gender difference or gender bias?).

Although some women could experience the typical heart attack, the majority of women did not experience chest, arm, or shoulder pain. Nguyen et al. (2008, pp. 863-864) using the Minnesota Heart Survey found women had less chest pain than men (68% women vs. 75.6% men) and reported other symptoms such as nausea, weakness, and back pain. The American Heart Association (2009, Is it gender difference or gender bias?) also pointed out women had more uncommon symptoms such as abdominal pain, nausea, unexplained fatigue, difficulty breathing, or atypical chest pain than men. Other studies showed women had atypical pain throughout the chest than men (Anderson and Kessenich, 2001, Signs and Symptoms; Canto et al., 2007). However, Wenger, Shaw, and Vaccarino (2007, p. 49) reported younger women with CHD had different symptoms due to "…unknown genetic cause, faulty estrogen mechanisms, and/or premature menopause". Differences in CHD symptoms and not knowing about them could postpone treatment for heart attacks (Canto et al., 2007, p. 1049; Wenger et al., 2008, p. 49).

Symptom differences between men and women led to differences in medical care. The most common CHD medical care in the United States comprised of drug therapy, surgery, or both. Drug therapy for CHD included aspirin, beta- receptor antagonists (β-blockers), statins, and angiotensin-converting enzyme (ACE) inhibitors (Enriquez, Pratap, Zbilut, Calvin, & Volgman, 2008, p. 54). Even though CHD drugs were available to patients, they were not given as frequently to women as they were to men (Enriquez, et al., 2007, p. 54). Women admitted to the hospital for CHD had fewer opportunities than men to obtain beta-blocker and/or statins (Dey et al., 2008, Table 5).

Hospital surgery was another form of medical care for CHD. What type of surgery depended on how much blockage there was in the coronary arteries. Clinical literature used the term revascularization procedure for heart surgery since blood was restored to the clogged arteries. Two common revascularization procedures were coronary artery bypass grafting (CABG) and percutaneous transluminal coronary angioplasty (PTCA). CABG used "…a shunt that permits blood to travel from the aorta or internal mammary artery to a branch of the coronary artery at a point past an obstruction." (Venes, 2005, p. 485) PTCA used an implement to pierce the skin (called percutaneous) to clean the clogged coronary artery opening (called a lumen). However, the majority of clinical literature used the term percutaneous coronary interventions (PCI) as a generalized term for PTCA. PCI used catheters to either open up or study coronary arteries (Venes, 2005, p. 1624).

CABG and PCI differed in how they were administered to men and women in hospitals across the United States. Harrold et al. (2003, p. 426, Table 2), using the Worcester Heart Attack Study from 1990-1999, observed women were less likely than men to have either CABG or PCI (10.9% (female) vs. 16.4% (men) for PCI; 3.5% (female) vs. 6.7% (male) for CABG).   Another study by Hahn et al. (2007, p. 595, Table 1) using the Worcester Heart Attack Study from 1986-2003 found women were less likely than men to have either PCI or CABG (13.6% (female) vs. 19.5% (male) for PCI; 3.4% (female) vs. 5.3% (male) for CABG). However, Nguyen et al. using the Minnesota Heart Study (2008, pp. 864-865) showed, using an unadjusted analysis, that women were more likely to have PCI than CABG. When adjusted to the study's confounders, PCI and

CABG rates were the same between men and women. Takakuwa, Shofer, Limkakeng, & Hollander (2008, p.548, Sex results, Figures 3 A and B) found that without a doctor's recommendation, the majority of the sample group (55% (men) vs. 54% (women)) preferred to have PCI, and men were still more likely to have CABG than women (26% (men) vs. 16% (women)). 16% men and 14% women had no surgical preference. However, with a doctor's recommendation, women were more likely to prefer PCI and CABG than men (5% (women) vs. 4% (men) for CABG; 21% (women) vs. 16% (men) for PCI). 3% women and 1% men had no surgical preference. However, Dey et al. (2008, Table 4) found that men were more likely to undergo PCI than women (17% (men) vs. 7% (women)), but CABG was the same for both men and women.

Age groups were different in PCI and CABG in hospitals in the United States. Two articles compared age groups with PCI and CABG came from the Worcester Heart Attack Study. Harrold et al. (2003, p. 425, Table 1) broke age into four groups (<55 years, 55-64 years, 65-74 years, and ≥75 years). The other study by Hahn et al. (2007, p. 596, Table 1) broke age into five groups (<55 years, 55-64 years, 65-74 years, 75-84 years, and ≥85 years).

PCI procedures had the highest percentage completion among men and women less than 55 years old (28.1% (female) and 29.6 % (male)) (Harrold et al., 2003, p. 426, Table 2). However, the older the patient, PCI use decreased (Harrold et al., 2003, p. 426, Table 2). CABG procedures had the highest percentage completion among men and women 55-64 years old (8.3% (female) and 7.8% (male)) (Harrold et al., 2003, p. 426, Table 2). CABG procedures decreased as age increased, but for women, there was a sharp drop from 5.0% (65-74 years) to 1.9% (≥75 years). Men of the same age groups had a decrease of CABG procedures from 6.5% (65-74 years) to 3.4 % (≥75 years) (Harrold et al., 2003, p. 426, Table 2). Women less than 55 years had a low CABG procedure rate (2.9%) than men of the same age (5.7%) (Harrold et al., 2003, p. 426, Table 2).

Even though there were five age categories for the second study, PCI decreased in men and women as age increased with the majority of PCI procedures under 55 years of age (31.9%) (Hahn et al., 2007, p. 596, Table 1). However, for CABG patients between 55-64 years had the most procedures (6.3%). Patients less than 55 years had fewer CABG procedures (4.6%) (Hahn et al., 2007, p. 596, Table 1).

Differences in CHD drug therapy and surgical procedures led to differences in how men and women looked at their health, and how health effects their overall life. This view, called health-related quality of life (HRQOL), came from different factors such as society, socioeconomic status, and how well a person functions in day to day life. As illness and age increased in the population, HRQOL developed into an important outcome for patients with CHD (Christian, Cheema, Smith & Mosca, 2007, Abstract, Background; Unsar, Sut & Durna, 2007, Abstract, Background and Research Objectives).

One HRQOL outcome predicted how men and women viewed life after PCI or CABG. Previous research showed women who had CABG had worse HRQOL from six months to one year or more after the surgery (Christian, Cheema, Smith, & Mosca, 2007; Norris, Ghali, Galbraith, Graham, Jensen, & Knudtson, 2004; Peric, et al., 2008; Unsar, Sut, & Durna, 2007). However, one previous research article found there were better HRQOL outcomes for patients who had CABG or PCI procedures (Loponen et al., 2009, Conclusions). These predictions could have an effect how health professionals gave care to patients for heart surgeries, especially CABG (Gao, Yao, Tsai, & Wang, 2009, p. 190, Conclusions).

Another HRQOL outcome, length of stay (LOS) determined how long a person stayed in the hospital after either surgical procedure. LOS varied by type of illness, the severity of illness, age, gender, and hospital. The average LOS in hospitals decreased from 7.3 days in 1980 to 5.0 days in 1999 due to new surgical techniques, including less invasive surgeries, and other treatements, such as new drug therapies (Department of Health and Human Services, Centers for Disease Control and Prevention, 2001).

Although there was a decline in LOS across the United States, LOS varied in patients who had PCI (Bartholomew et al., 2003, p. 832). 50% of patients stayed in the hospital 3-4 days. 21% of patients stayed in the hospital 5-6 days. Two groups (9% each) stayed in the hospital from 7-8 days and over 8 days. 2% stayed from 0-2 days (Bartholomew, et al., 2003, p. 831, Figure 1). Stays longer than 5 days had a deteriorated health outcome 1 year after discharge (Bartholomew et al., 2003, p. 832).

Clinical literature showed the importance of CABG and PCI between men and women, but they focused on health outcomes 6 months to 1 year after hospital discharge. Articles like Bartholomew et al. (2003) focused on patient health outcomes while the patient was in the hospital by focusing on LOS and one surgical procedure. However, none of the articles compared men and women who had either CABG or PCI with LOS in the same article. Also, none of the articles focused on one PCI like PTCA.

The purpose of this paper was to compare hospital LOS between men and women 18 years and older who had either CABG or PTCA. The hypothesis of this paper was to analyze whether men or women, who went through CHD surgical procedures, stayed the longest in the hospital. In keeping with the clinical literature, surgical procedures were defined as CABG, PCI, or PTCA.

Methods

A cross-sectional study examined whether men and women 18 years and older, who went through CHD surgical procedures, stayed the longest in the hospital using the 2006 National Hospital Discharge Survey (NHDS) (Centers for Disease Control and Prevention, National Center for Health Statistics, 2006). The NHDS, a public data survey, looked at inpatient care for hospital utilization across the United States (DeFrances, Lucas, Buie, & Golosinskiy, 2008). Data for the NHDS came from short-stay, general, and children's general hospitals across all 50 states and the District of Columbia. The data did not include institutional, Federal, military, and Veteran's Administration hospitals (Centers for Disease Control and Prevention, National Center for Health Statistics, 2006, Survey Methodology, Source of the Data).

The sample size for the 2006 NHDS started with 501 hospitals. However, 23 of the 501 hospitals were ineligible due to being out of business or did not meet the NHDS requirements for eligibility. After the 23 hospitals were out of the sample, 478 hospitals qualified to participate in the NHDS. Out of these 478 qualified hospitals, 438 (92%) responded to the survey (Centers for Disease Control and Prevention, National Center for Health Statistics, 2006, Survey Methodology).

In order to avoid bias in collecting hospital discharge information, the NHDS used a three stage survey design. This type of design started with putting the United States into geographical regions defined by the United States Bureau of the Census. In the second stage, hospitals were randomly selected within these geographical regions. In the third stage, hospital discharge information was randomly chosen from the eligible hospitals (Centers for Disease Control and Prevention, National Center for Health Statistics, 2006, Sample design and data collection; DeFrances, Lucas, Buie, & Golosinskiy, 2008).

The NHDS used primary sampling units (psu) and sample weights to infer the sample size to the United States population. Psu stratified the data into its various stages. However, whoever used the NHDS could find out which discharge went with which hospital in a particular region. The National Center for Health Statistics (NCHS) did not allow psu use in the public data set and was not used for the study's analysis.

Sample weights calculated the number of patients discharged from the hospital (Centers for Disease Control and Prevention, National Center for Health Statistics, 2006, Sample design and data collection). The NHDS survey reflected a sample of hospital discharges across the United States. However, in order to infer information from the sample to the entire population, a weight variable was used on the survey sample data. The weight variable calculated the population of all hospital discharges in 2006. The statistical analyses for the study used a SAS command called PROC SURVEYFREQ (SAS Institute, 2006). This command analyzed tables for the variables of interest in the study. If the weight variable was used in the command, the table showed weighted percents and frequencies for the entire population. If the weight variable was not used, then the table showed only the information from the sample data.

Although the NHDS quantitatively observed hospital utilization of discharged patients, the survey may only give a partial explanation as to why health use differed between men and women for the same disease. Other reasons why health use was different included variations in symptoms, diagnosis, and treatment of CHD (American Heart Association, 2009, Is it gender differences or gender bias?; Canto, et al., 2007; Solimene, 2010), socioeconomic factors (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Shaw, et al., 2008), different regions (Laskey, et al., 2010), and where patients went to obtain health care (The Joint Commission, 2009). These utilization differences led to an unequal view called a disparity (Venes, 2005, p. 619). Disparities, for this study, included health, gender, income, education, health insurance, and geographic regions (Department of Health and Human Services, 2010, Healthy People 2010).

Gender disparity in CHD outcomes came from differences in genetics, hormones, responses to medications (Solimene, 2010), and from past CHD research on symptom presentation (American Heart Association, 2009, Is is gender difference or gender bias?; Anderson & Kessenich, 2001; Canto et al., 2007; Wenger et al., 2008). Another possible gender disparity could be how the physician promotes disease prevention to individual patients during a medical exam (Department of Health and Human Services, 2010, Healthy People 2010; Department of Health and Human Services, 2009, Healthy People 2020 public meetings).

Income and education disparities, too, increased health disparities in the United States (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Department of Health and Human Services, 2010, Healthy People 2010; Shaw, et al., 2008). Income and education were "…associated with differences in the occurrence of illness and death, including heart disease…" (Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement). Income was also an indicator for access to health care (Department of Health and Human Services, 2010, Healthy People 2010, Leading health indicators).

Health insurance was another form of health disparity that predicted whether or not an individual used health services (Department of Health and Human Services, 2010, Leading health indicators). Men and women with health insurance were more likely to have a health care professional and could obtain necessary tests for diseases such as heart disease (Department of Health and Human Services, 2010, Healthy People 2010, Leading health indicators). However, the lack of health insurance caused barriers to getting necessary health care (Department of Health and Human Services, 2010, Healthy People 2010, Leading health indicators).

Another explanation as to why health services differed between men and women was to look at health services consumption. Health services consumption differed from individual to individual and from family to family (Andersen, 1968). However, Andersen (1968) proposed there were similarities in families and individuals who consumed health care. The original proposal examined how three major categories with its corresponding subgroups influenced health utilization in the United States. These major categories were predisposing, enabling, and need (Andersen, 1968). Predisposing looked at characteristics already established in the individual or family member. Enabling showed how individuals or families obtained and paid for health services. Need examined how severe an illness or disease of an individual or family members affected health services consumption (Andersen, 1968).

Over time, Andersen's (1968) original major categories and subgroups were adjusted for different health outcomes. For this study, the major categories and subgroups were adapted to compare LOS between men and women 18 years and older who had either PTCA or CABG. The variables for the subgroups and health outcome came from the NHDS.

The original study health outcome was LOS, since clinical literature used LOS as the dependent variable (Bartholomew, et al., 2003; Chen, et al., 2007). However, the NHDS listed LOS as a dichotomous (0= less than 1 day; 1= more than 1 day) response. The problem with LOS as a dichotomous response was that the outcome would not mean anything for later interpretation.

In order to counteract the LOS dilemma, the NHDS listed another variable called days of care (DOC) to consider as the health outcome for this study. DOC was a discrete count variable from 0 to 30 days after hospital admittance. By counting the number of days in the hospital, DOC could find disparities between men and women who had any of the CHD surgical procedures.

DOC was a health indicator for two other views: 1) how well hospitals treated patients before and after hospital admittance using inpatient quality indicators (IQIs) (Agency for Healthcare Research and Quality, 2006), and 2) from the patient's view in the hospital before and after either surgical procedure (Jha, Orav, Zheng, & Epstein, 2008). According to the Agency for Healthcare Research and Quality (AHRQ) (2006), IQIs were markers that looked at the quality of care patients had while in the hospital. These markers included volume of medical processes, under or over use of medical procedures, and inpatient mortality (Agency for Healthcare Research and Quality, 2006).

Patient viewpoints, which also determined DOC, differed from not only heart disease patients in one hospital, but from all hospitals in different geographic regions (Jha, Orav, Zheng, & Epstein, 2008; The Joint Commission, 2009). Hospital performance for surgical procedures was usually tied to patient viewpoints (Jha, Orav, Zheng, & Epstein, 2008). If patients were not satisfied with their quality of health care in the hospital while undergoing any CHD surgery, these patients would not likely to refer friends or loved one to that hospital for any future health service (Jha, Orav, Zheng, & Epstein, 2008; The Joint Commission, 2009).

Although DOC differed between patients and hospitals for surgical procedures, patients within hospitals showed similar characteristics. The similar features determined DOC (Chen, et al., 2007; Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Laskey, et al., 2010; Shaw, et al., 2008). These characteristics were sex (gender), race-ethnicity, age, principle expected source of payment, diagnosis-related groupings (DRG), geographic regions, and hospital ownership (Bartholomew, et al., 2003; Centers for Disease Control and Prevention, National Center for Health Statistics, National Hospital Discharge Survey, 2006; Chen, et al., 2007; Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Jha, Orav, Zheng, & Epstein, 2005; Laskey, et al., 2010; Shaw, et al., 2008).

These variables fitted Andersen's (1968) adapted model by placing each characteristic with its corresponding major category. The predisposing category included age, gender, and race-ethnicity. Age was an important piece of baseline demographic information since it not only described how old hospital patients were in the study, but also to compare which ages had which cardiac surgeries (Chen, et al., 2007; Hahn, et al., 2007; Harrold, et al., 2003; Laskey, et al., 2010; Shaw, et al., 2008). In one targeted study, age was one of the inclusion criteria (Chen, et al., 2007). Another use for age was to find trends in cardiac revascularization procedures (Hobbs, McCaul, Knuiman, Rankin, & Gilfillan, 2004). Age groups were also used to compare survival rates among women with heart attacks and CHD (Solimene, 2010).

Gender was another demographic characteristic heart disease studies use to compare different cardiac symptoms and revascularization procedures between men and women, men only, or women only (Bartholomew, et al., 2003; Chen, et al., 2007; Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Dey, et al., 2008; Hobbs, McCaul, Knuiman, Rankin, & Gilfillan, 2004; Shaw, et al., 2008; Solimene, 2010). Gender was also used as a way to identify health disparities (American Heart Association, 2009, Framingham heart study; Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement). Gender was used in past cardiac research to look at quality of life issues between men and women (Christian, Cheema, Smith, & Mosca, 2007; Norris, Ghali, Galbraith, Graham, Jensen, & Knudtson, 2004; Peric, et al., 2008; Unsar, Sut, & Durna, 2007).

Race-ethnicity, a third demographic feature heart disease studies used to compare symptoms and revascularization procedures among cultural groups of people (Laskey, et al., 2010; Shaw, et al., 2008). Past cardiac research may compare non-Hispanic Whites with non-Hispanic African Americans, and if there were other ethnic groups within the data, studies may put these groups into an unknown or other category (Cram, Rosenthal, & Vaughan-Sarrazin, 2005). However, research may include Whites, African-Americans, and Hispanics and put other cultural groups not belonging to any category into an other group (Christian, Cheema, Smith, & Mosca, 2007). Along with gender, race-ethnicity helped to identify disparities among cultural groups within the United States (Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement).

The enabling category looked into type of health insurance, geographic region, and hospital ownership. Health insurance was a socioeconomic feature that was used to determine who had the highest risk of CHD (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Laskey, et al., 2010; Shaw, et al., 2008). In some studies that used health insurance as a variable in the study, the two main health insurance categories were Medicare and Medicaid (Hahn, et al., 2007; Laskey, et al., 2010; Shaw, et al., 2008). Insurance could also determine access to a hosptial for coronary revascularization procedures (Department of Health and Human Services, 2010, Healthy People 2010, Leading health indicators). In one study, health insurance was a variable to describe patients who received coronary revascularization and prevention procedures (Hahn, et al., 2007).

Geographic region divided the United States into the following sections: Northeast, Midwest, South, and West (United States Census Bureau, 2009). Regions could vary in DOC and the type of hospital (ie: teaching or for profit) (Laskey, et al., 2010). According to the Joint Commission (2009), hospital quality varied by the region the patients lived in at the time of surgery.

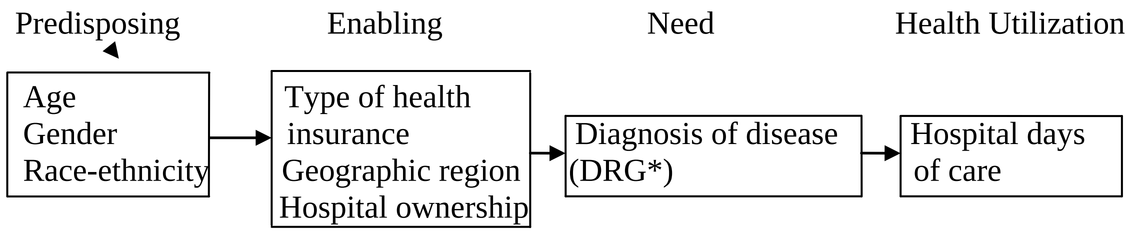
What type of hospital, called hospital ownership, had an influence on patient perception about the services rendered before, during, and after coronary surgical procedures (Jha, Orav, Zheng, & Epstein, 2008). There were different types of hospitals: teaching, for-profit, not-for-profit (Jha, Orav, Zheng, & Epstein, 2008). All hospitals have performance measures to show improvements and to ensure quality in patient care (The Joint Commission, 2009).

The need category observed the severity of an illness or disease and the individual's or family's response to any sign of CHD. The International Classification of Disease (ICD) codes gave information about which coronary surgical procedure was used on hospital patients (Cram, Rosenthal, & Vaughan-Sarrazin, 2005; Hobbs, McCaul, Knuiman, Rankin, & Gilfillan, 2004). However, if someone was not familiar with the ICD codes, these codes could be confusing. An alternative to the ICD was the diagnosis-related grouping (DRG).

DRG was "…a classification system that groups patients according to principal diagnosis, presence of a surgical procedure, age, presence of absence of significant comorbidities or complications and other relevant criteria." (U.S. Congress, Office of Technology Assessment, 1983, Glossary of Terms) This classification system varied year to year as new procdures, diagnoses, complications, and other relevant criteria developed throughout the health care system. In 2006 there were 559 DRG classifications (Department of Health and Human Services, Centers for Medicare and Medicaid Services, 2006). This study used the DRG instead of the ICD codes to avoid confusion. Figure 1 showed how these variables fitted to the adapted model.

Figure 1

Patient Characteristics Impacting Hospital Days of Care



Note. From "A behavioral model of families' use of health services" by R. Andersen (1968) from the Centers for Health Administration and Services, University of Chicago. Author's drawing.

*DRG=Diagnosis-Related Group

The NHDS used the following codes for the majority of these independent variables: (a) Sex was coded 1=Males and 2=Females; (b) race-ethnicity coded as 1=White, 2=Black/African-American, 3=American Indian/Alaskan Native, 4=Asian, 5=Native Hawaiian or other Pacific Isldr [islander], 6=Other, 8=Multiple race indicated, and 9=Not stated; (c) principal expected source of payment was coded 01=Worker's Compensation, 02=Medicare, 03=Medicaid, 04=Other government, 05=Blue Cross/Blue Shield, 06=HMO/PPO, 07=Other private insurance, 08=Self-pay, 09=No charge, 10=Other, and 99=Not stated; (d) geographical regions were coded as 1=Northeast, 2=Midwest, 3=South and 4=West; and (e) hospital ownership was coded as 1=Proprietary, 2=Government, and 3=Nonprofit, including church (Centers for Disease Control and Prevention, National Center for Health Statistics, 2006).

Age was a continuous variable in the NHDS. Some cardiac studies used the mean age with the standard deviation as part of the demographic information (Chen, et al., 2007; Shaw, et al., 2008). However, for this study, the range of age would not be useful as part of the demographic information. In order to make comparisons between men and women easier by age, age became a categorical variable.

DRG in the NHDS showed just the DRG classification number. These classification numbers came from a list of all DRGs for a particular year (Department of Health and Human Services, Centers for Medicare and Medicaid Services, 2006). Instead of listing individual DRGs for surgical procedures for heart disease, the DRGs were put into ranges according to different areas of the human body. The DRG classification ranges for CABG, PCI, and PTCA were shown in Tables 1 and 1.1.

Table 1

Diagnosis Related Group (DRG) Classification Range for Coronary Heart Disease (CHD) Surgical Procedures

DRG Range	Human Body Area	Procedure	Brief Description
106	Chest (coronary arteries)	Surgical	Coronary bypass with percutaneous transluminal coronary angioplasty (PTCA)
518	Heart	Surgical	Percutaneous cardiovascular procedure without stent or acute myocardial infarction (AMI)

Table 1.1

DRG Classification Range for CHD Surgical Procedures

DRG Range	Human Body Area	Procedure	Brief Description
547-550	Heart (coronary arteries)	Surgical	Coronary bypass with cardiac catheter; coronary bypass without cardiac catheter with or without major cardiovascular diagnosis
555-558	Heart (coronary arteries)	Surgical	Percutaneous cardiovascular procedure with major cardiovascular diagnosis; percutaneous cardiovascular procedure with non-drug-eluting-stent and drug-eluting stent with or without major cardiovascular diagnosis

Note. For detailed descriptions about individual DRGs, please see the *List of Diagnosis Related Groups (DRG), FY 2006* from the Centers for Medicare and Medicaid at http://www.cms.hhs.gov/MedicareFeeforSvcPartsAB/Downloads/DRGdesc06.pdf

Before the final statistical model was determined for this study, the study's explanatory variables were analyzed by finding the non-weighted frequencies and the weighted percents. The variables were placed in their respective categories of predisposing, enabling, and need. Then the study's final statistical model was determined and analyzed.

Since DOC counted the days from hospital admittance to discharge, two statistical models could be the final study model. These two models were the Poisson regression model (PRM) and the negative binomial regession model (NBRM). A basic understanding of the PRM started with a discussion of the Poisson distribution.

The Poisson distribution examined the relationship between the estimated number of times an event will occur over a given interval (μ) and a random variable representing the number of times the event did occur (y) (Long & Freese, Chapter 8: Models for count outcomes, 2006). The Poisson distribution formula

$$\Pr(y \mid \mu) = \frac{e^{-\mu}\,\mu^{y}}{y!} \text{ where } y = 0, 1, 2, \ldots \tag{1}$$

had four key points to be used as regression models for all count data. These points were 1) μ was the mean of the distribution; 2) μ was also the variance for the distribution; 3) As μ increases, the probability of having a zero count decreased; and 4) As μ increased, the Poisson distribution nears a normal distribution (Long & Freese, Chapter 8: Models for count outcomes, 2006, p. 350).

The PRM took the Poisson distribution further by allowing observed data to have different values of μ. The main assumption of the PRM was that the count for each observed datum (i) comes from the Poisson distribution with mean μ_i, where μ_i was approximated from the observed variables (Long & Freese, Chapter 8: Models for count outcomes, 2006, p. 356). The PRM formula

$$\mu_i = E\,(y_i \mid x_i) = \exp\,(x_i\beta) \tag{2}$$

included the observed heterogeneity (or observed differences) of the sample. However, the PRM would fail to be the correct regression model if there was too much variability, or overdispersion, within the data (Coxe, West, & Aiken, 2009).

Another model derived from the Poisson distribution, called the NBRM, took care of the overdispersion problem within the PRM by using an error term (Coxe, West, & Aiken, 2009; Long & Freese, Chapter 8: Models for count outcomes, 2006, pp. 372). The error term clarified the unexplained heterogeneity among the independent variables (Coxe, West, & Aiken, 2009; Long & Freese, Chapter 8: Models for count outcomes, 2006, pp. 372). However, since each independent variable could have its own Poisson distribution with its own mean parameter, the variation among the variables' means followed a different distribution called the gamma distribution (Coxe, West, & Aiken, 2009). Gamma distribution was not discussed further in this study due to the complex mathematical derivations.

In the NBRM, the parameter for the overdispersion was denoted as α (Coxe, West, & Aiken, 2009; Long & Freese, Chapter 8: Models for count outcomes, 2006, p. 372). The α parameter also determined the amount of dispersion in the NBRM (Long & Freese, Chapter 8: Models for count outcomes, 2006, pp. 372). The parameter could also be used to find which model, the PRM or the NBRM, was the best for the data used in this study. The NBRM formula,

$$\Pr(y \mid x) = \frac{\Gamma(y + \alpha^{-1})}{y!\,\Gamma(\alpha^{-1})} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \mu}\right)^{1/\alpha} \left(\frac{\mu}{\alpha^{-1} + \mu}\right)^{y} \tag{3}$$

where Γ represents the gamma distribution, had three main assumptions. They were 1) the NBRM followed both a Poisson and gamma distributions with mean = μ (or μ_i) and variances of $\mu_i + \alpha\mu_i^2$ (or $\mu + \alpha\mu^2$) and $\mu_i + \alpha\mu_i$ (or $\mu + \alpha\mu$); 2) If $\alpha = 0$, then the NBRM converted back to the PRM; 3) Error terms were uncorrelated with the independent variables of interest (Coxe, West, & Aiken, 2009; Long & Freese, Chapter 8: Models for count outcomes, 2006, pp. 372-374). The variance of $\mu_i + \alpha\mu_i^2$ was dispersion around the mean, and the variance of $\mu_i + \alpha\mu_i$ was dispersion around a constant (Long & Freese, Chapter 8: Models for count outcomes, 2006, p. 374).

Three tests determined which statistical model was the final study model. The first tested the PRM. The second test graphed the observed and predicted probabilities from the PRM to detect any under or over dispersion of the data. The third tested the NBRM.

The PRM hypothesis tested if the variance of a random variable in the data (y) was equal or greater than the distribution variance (μ). The null and alternative hypotheses were written as

$$H_0\text{: } \mathrm{Var}(y) = \mu \text{ (equal dispersion)}$$

$$H_1\text{: } \mathrm{Var}(y) > \mu \text{ (overdispersion)}$$

The PRM used a maximum-likelihood ratio (MLR) estimate that followed a χ^2 distribution with degrees of freedom. If the data were equally dispersed, the null would not be rejected, and the PRM would be the study's final model. However, if the data were over dispersed, the null would be rejected, and the NBRM would be the study's final model.

Graphing the data also determined whether or not either model became the final study model. The graph compared the predicted values of DOC with the observed proportion values of DOC. The graph also answered the question "…of the N cases, how many cases have a predicted outcome value of 0, of 1, of 2, and so forth?" (Coxe, West, & Aiken, 2009) If the graph was not overdispersed, then the PRM would be the correct final model. However, if the graph was overdispersed, then the NBRM would be the correct final model.

The third test analyzed the NBRM. The hypothesis test used α, which was the unobserved heterogeneity of the observed data. The hypothesis test for the NBRM was

$$H_0\text{:}\ \ \alpha = 0 \text{ (equal dispersion)}$$

$$H_1\text{:}\ \ \alpha \neq 0 \text{ (overdispersion)}$$

The NBRM used $\bar{\chi}^2$ (chibar square) as the test statistic for α. $\bar{\chi}^2$ came from the MLR test that tests an estimated variance was different from zero (StataCorp, 2010). The MLR estimate of the parameter used in the test came from a normal distribution that was halved at zero (StataCorp, 2010). This caused the $\bar{\chi}^2$ test statistic to come from a chi-square distribution with 0 and 1 degrees of freedom (StataCorp, 2010). Like the PRM, if the data were equally dispersed in the NBRM, the null hypothesis was not rejected. On the other hand, if the data were not equally dispersed in the NBRM, the null hypothesis was rejected.

After the testing of the PRM and the NBRM for the study's final statstical model, the predisposing, enabling, and need categories were separately analyzed with DOC to look at which categorical variables were signficant or insignificant before the final model was analyzed with DOC. If a category was significant in one model, but not significant in the full model, then there could be interaction or confounding with another variable in the full model. These interactions would also be determined for further interpretation of the study.

After the four models were analyzed, estimates from either the PRM or the NBRM could be used to interpret the categories of each variable by taking the exponential of the estimates to obtain a predicted count (Coxe, West, & Aiken, 2009). The interpretation of these predicted counts could be stated as "[f]or a 1-unit increase in X_1, the predicted count ($\hat{\mu}$) is *mutliplied by* e^{b1}, holding all other variables constant." (Coxe, West, & Aiken, 2009, p.124) Another interpretation for predicted counts, for the same 1-unit increase in X, could be stated as "…the expected counts increases by a factor of e^b, while holding all other variables constant." (Long & Freese, Chapter 8: Models for count outcomes, 2006)

All data management and testing if PRM or NBRM was the study's final model was analyzed using STATA 10.1 SE (StataCorp, College Station, TX, 2008). Demographic tables and the final study model were analyzed using SAS 9.1 (SAS Institute, Cary, NC, 2006). The tests were two-sided and a significance level of 0.05.

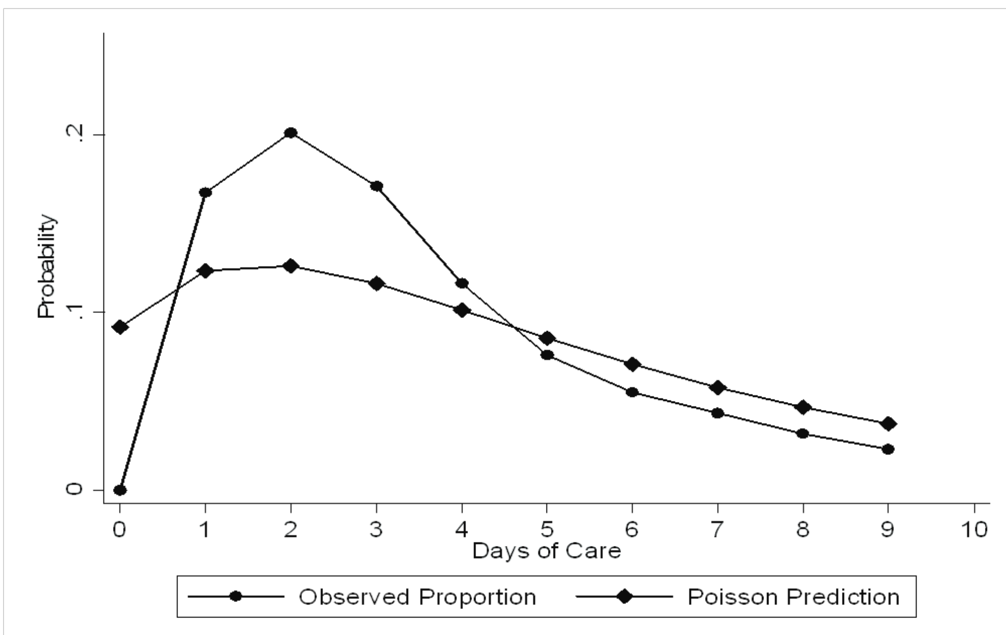
Results

The PRM was the first statistical test to find the correct final study model. The hypothesis of dispersion with the PRM was rejected ($p < .05$). Since there was strong significance in overdispersion, the NBRM was the preferred statistical model to the PRM.

The second test to support the NBRM as the final study model was by graphing the observed proprtion of the number of DOC with predictions from the PRM estimates. Figure 2 exhibited over prediction in the PRM for zero DOC, but under prediction from days 1 through 4. From days 5 through 10, the PRM over predicts DOC. The under and over prediction of the PRM and DOC observations illustrated that the NBRM was the preferred statistical model over the PRM.

Figure 2

Predicting Patient Hospital Days of Care



The third and final test to support the first two tests was to analyze the NBRM. The hypothesis of $\alpha = 0$ was rejected ($p < .05$). Again, since there was strong significance in overdispersion, the NBRM was the preferred model to the PRM.

Patient demographics were shown in Tables 2, 2.1, and 2.2. Out of the 306,927 observed discharged patients, the main characteristiscs of hospital patients from the predisposing category were 75 years and older (25.87%), women (60.93%), and were White (70.41%). From the enabling category, the main characteristics of hospital patients were Medicare (47.69%), lived in the South (37.33%), and the hospital was owned by a nonprofit organization (76.02%). From the need category, the main surgical procedure was PCI with or without stents (69.25%).

Table 2

Patient Demographics from the 2006 National Hospital Discharge Survey (NHDS)

Characteristics	n[a]	%[b]
Predisposing		
Age categories		
18-24	22,937	7.9852
25-34	39,369	12.6974
35-44	36,544	11.3224
45-54	41,390	13.1095
55-64	43,096	14.0365
65-74	44,861	14.9788
75 and older	78,730	25.8702
Gender		
Male	118,924	39.0738
Female	188,003	60.9262

Table 2.1

Patient Demographics from the NHDS

Characteristics	n[a]	%[b]
Predisposing		
Race-ethnicity		
White	164,120	79.4055
African American/Black	41,639	15.8080
Other, including Hispanic	14,210	4.7865
Enabling		
Health insurance		
Medicare	130,749	47.6681
Medicaid	41,919	16.0932
Private	102,496	36.2387
Geographic region		
Northeast	72,681	20.9136
Midwest	84,822	23.8309
South	113,338	37.3158
West	36,086	17.9397
Hospital ownership		
Proprietary	32,059	11.5932
Government	26,023	12.3836
Nonprofit, including church	248,845	76.0232

Table 2.2

Patient Demographics from the NHDS

Characteristics	n[a]	%[b]
Need		
Diagnosis-related groups		
PCI[c] without stent or heart attack	650	7.6153
Coronary bypass with PTCA[d]	55	0.5410
CABG[e] with or without catheter	1,897	22.5940
PCI with or without stents	6,484	69.2497

[a]n = unweighted frequencies; [b]% = weighted percents; [c]PCI = percutaneous coronary intervention; [d]PTCA = percutaneous transluminal coronary angioplasty; [e]CABG = coronary artery bypass grafting

The effects from analyzing age, gender, and race-ethnicity on DOC showed strong significance ($p < .05$). As shown in Table 3, when age 18-24 was compared with age 75 and older, expected DOC counts decreased by a factor of 0.5961 ($p < .05$), while holding all other variables constant. Patients 18-24 spend less time in the hospital than patients who were 75 years and older. When females were compared with males, the expected DOC counts decreased by a factor of 0.8892 ($p < .05$), while all other variables were held constant. Women spend less time in the hospital than men. However, when compared with Whites, African-American patients stayed in the hospital longer since the expected DOC counts increased by a factor of 1.2128 ($p < .05$), while holding all other variables constant.

Table 3

Model 1: Analysis of Predisposing Characteristics with Hospital Days of Care (DOC) using a Simultaneous Negative Binomial Regression Model (NBRM)

Predisposing characteristics	B[a]	e^{b} [b]	p-value	Wald 95% CI
Age			< 0.0001	
18-24	-0.5174	0.5961	< 0.0001	(-0.5314, -0.5033)
25-34	-0.5034	0.6045	< 0.0001	(-0.5150, -0.4918)
35-44	-0.3240	0.7233	< 0.0001	(-0.3354, -0.3126)
45-54	-0.2080	0.8122	< 0.0001	(-0.2187, -0.1973)
55-64	-0.1316	0.8767	< 0.0001	(-0.1420, -0.1213)
65-74	-0.0965	0.9080	< 0.0001	(-0.1067, -0.0864)
Gender			< 0.0001	
Female	-0.1174	0.8892	< 0.0001	(-0.1240, -0.1108)
Race-ethnicity			< 0.0001	
Black/African-American	0.1929	1.2128	< 0.0001	(0.1844, 0.2013)
Other, including Hispanic	0.0936	1.0981	< 0.0001	(0.0795, 0.1078)

[a]B = raw coefficient; [b]e^{b} = exponential of B

The effects of health insurance, geographic region, and hospital ownership when analyzed with DOC were strongly significant ($p < .05$). Table 4 showed patients with Medicare had 1.4454 ($p < .05$) times more DOC than patients with private health insurance, while holding all other variables constant. Patients in the Midwest had 0.9814 ($p < .05$) times less DOC than patients who lived in the West, while holding all other variables constant. Patients in a nonprofit hospital had 0.9023 ($p < .05$) times less DOC than patients in a proprietary hospital, while holding all other variables constant. Patients in a government hospital had 1.0024 times more DOC than patients in a proprietary hosptial, while holding all other variables constant.

Table 4

Model 2: Analysis of Enabling Characteristics with Hospital Days of Care (DOC) using a Simultaneous Negative Binomial Regression Model (NBRM)

Enabling characteristics	B[a]	e^{b} [b]	p-value	Wald 95% CI
Health insurance			< 0.0001	
Medicaid	0.1438	1.1547	< 0.0001	(0.1349, 0.1527)
Medicare	0.3684	1.4454	< 0.0001	(0.3620, 0.3748)
Geographic region			< 0.0001	
Northeast	0.1952	1.2156	< 0.0001	(0.1855, 0.2048)
Midwest	-0.0188	0.9814	0.0001	(-0.0286,-0.0091)
South	0.0941	1.0987	< 0.0001	(0.0850, 0.1033)
Hospital ownership			< 0.0001	
Government	0.0024	1.0024	0.7185	(-0.0106, 0.0153)
Nonprofit, including church	-0.1028	0.9023	< 0.0001	(-0.1126, -0.0930)

[a]B = raw coefficient; [b]e^{b} = exponential of B

The effect of DRGs for the three surgical procedures when analyzed with DOC were strongly significant ($p < .05$) (Table 5). Patients who had CABG with or without catheters had an increased expected DOC by a factor of 3.8543 ($p < .05$), when compared with patients who had PCI without stents or heart attack, while holding all other variables constant. Patients who had PCI with or without stents had an increased expected DOC by a factor of 1.2225 ($p < .05$), when compared with patientes who had PCI without stents or heart attack, while holding all other variables constant.

Table 5

Model 3: Analysis of Need Characteristics with Hospital Days of Care (DOC) using a Simultaneous Negative Binomial Regression Model (NBRM)

Need characteristics	B[a]	e[b b]	p-value	Wald 95% CI
Diganosis-related groups			< 0.0001	
CABG[c] with or without catheter	1.3492	3.8543	< 0.0001	(1.2828, 1.4156)
Coronary bypass with PTCA[d]	1.2913	3.6375	< 0.0001	(1.1342, 1.4483)
PCI[e] with or without stents	0.2009	1.2225	< 0.0001	(0.1362, 0.2656)

[a]B = raw coefficient; [b]e[b] = exponential of B; [c]coronary artery bypass grafting; [d]percutaneous transulminal coronary angioplasty; [e]percutaneous coronary intervention

The effects of all the study's variables when analyzed with DOC were significant ($p < .05$) (Tables 6 and 6.1). Patients age 25-34, compared with patients age 75 and older, had a decreased expected DOC by a factor of 0.9084 ($p > .05$), while all other variables were held constant. However, females, when compared with males, had an increased DOC by a factor of 1.1374 ($p < .05$), while all other variables were held constant. African-American patients had 1.1989 ($p < .05$) times more DOC than White patients while holding all other variables constant. Patients who had coronary bypass with PTCA had 3.9302 ($p < .05$) times more DOC than patients who had PCI without stent or heart attack.

Table 6

Model 4: Analysis of All Study Characteristics with Hospital Days of Care (DOC) using a Simultaneous Negative Binomial Regression Model (NBRM)

Characteristics	B[a]	e^{b} [b]	p-value	Wald 95% CI
Predisposing				
Age			< 0.0001	
18-24	-0.1292	0.8788	0.4968	(-0.5017, 0.2433)
25-34	-0.0960	0.9084	0.4607	(-0.3509, 0.1590)
35-44	-0.2446	0.7830	< 0.0001	(-0.3576, -0.1316)
45-54	-0.2225	0.8005	< 0.0001	(-0.2949, -0.1500)
55-64	-0.1970	0.8211	< 0.0001	(-0.2591, -0.1350)
64-74	-0.1983	0.8201	< 0.0001	(-0.2471, -0.1494)
Gender			< 0.0001	
Female	0.1288	1.1374	< 0.0001	(0.0896, 0.1680)
Race-ethnicity			< 0.0001	
Black/AA[c]	0.1814	1.1989	< 0.0001	(0.1204, 0.2424)
Other[d]	-0.0440	0.9570	0.3096	(-0.1288, 0.0409)

Table 6.1

Model 4: Analysis of All Study Characteristics with Hospital DOC using a Simultaneous NBRM

Characteristics	B[a]	e[b b]	p-value	Wald 95% CI
Enabling				
Health insurance			< 0.0001	
Medicaid	0.1891	1.2082	< 0.0001	(0.1066, 0.2716)
Medicare	0.0886	1.0926	0.0009	(0.0365, 0.1407)
Geographic region			0.0011	
Northeast	-0.0886	0.9152	0.0090	(-0.1551, -0.0221)
Midwest	-0.1269	0.8808	0.0002	(-0.1940, -0.0598)
South	-0.0511	0.9502	0.0899	(-0.1101, -0.0079)
Hospital ownership			< 0.0001	
Government	-0.0990	0.9057	0.0240	(-0.1850, -0.0130)
Nonprofit[e]	-0.1537	0.8575	< 0.0001	(-0.2150, -0.0923)
Need				
Diganosis-related groups			< 0.0001	
CABG[f] with or without catheter	1.3653	3.9169	< 0.0001	(1.2822, 1.4485)
Coronary bypass with PTCA[g]	1.3687	3.9302	< 0.0001	(1.1692, 1.5682)
PCI[h] with or without stents	0.2327	1.2620	< 0.0001	(0.1521, 0.3134)

[a]B = raw coefficient; [b]e[b] = exponential of B; [c] African-American; [d] including Hispanic; [e] including church; [f]coronary artery bypass grafting; [g]percutaneous transulminal coronary angioplasty; [h]percutaneous coronary intervention

Interactions between gender and the other independent variables were shown in Tables 7, 7.1, 7.2 and 7.3. The effects between gender and age, race-ethnicity, health insurance, geographic region, hospital ownership, and DRG were strongly significant ($p < .05$). Women age between 35-44 years when compared with males 75 and older had a decreased hospital DOC by a factor of 0.9357 ($p > .05$) when all other variables were held constant. However, males age between 25-34 years when compared with males 75 and older had an increased hospital DOC by a factor of 1.104 ($p > .05$) when all other variables were held constant. When compared with White females, Black/African-American women had an increased hospital DOC by a factor of 1.2101 ($p < .05$) when holding all other variables constant. Black/African-American males when compared with White males had an increased hospital DOC by a factor of 1.2027 ($p < .05$) when holding all other variables constant.

Females who had Medicare compared with females who had private insurance had an increased DOC by a factor of 1.0661 ($p > .05$) when holding all other variables constant. However, men with Medicaid compared with males who had private insurance had an increased hospital DOC by a factor of 1.3209 ($p < .05$) when holding all other variables constant. Compared with women in the West, women who lived in the South had a decreased hospital DOC by a factor of 0.8670 ($p < .05$) when holding all other variables constant. Men who lived in the South compared with men who lived in the West had an increased DOC by a factor of 1.0068 ($p > .05$) when holding all other variables constant. Compared with females who went to a proprietary hosptial, women who went to a nonprofit hospital had a decreased DOC by a factor of 0.7629 ($p < .05$)

when holding all other variables constant. Men who went to a nonprofit hospital compared with men who went to a proprietary hospital had a decreased DOC by a factor of 0.9256 ($p > .05$) when holding all other variables constant. Males who went to a government run hospital also had a decreased DOC by a factor of 0.0889 ($p > .05$) when holding all other variables constant.

When looking at surgical procedures, women who had CABG with or without catheters compared with women who had PCI without stent or heart attack had an increased hospital DOC by a factor of 3.7188 ($p < .05$) when all other variables were held constant. Women who had PCI with or without stents compared with the same group also had an increased hospital DOC by a factor of 1.2502 when holding all other variables constant. Men who had coronary bypass with PTCA compared with men who had PCI without stent or heart attack had an increased hospital DOC by a factor of 4.3903 when holding all other variables constant. Men who had PCI with or without stents compared with the same group had an increased hospital DOC by a factor of 1.2468 ($p < .05$) when holding all other variables constant.

Table 7

Analysis of Interactions between Gender and Independent Characteristics with Days of Care (DOC) using a Simultaneous Negative Binomial Regression Model (NBRM)

Characteristics		B[a]	e[b b]	p-value	Wald 95% CI
Predisposing					
Age*Gender				<0.0001	
18-24	Female	0.5561	1.7439	0.0224	(0.0787, 1.0335)
18-24	Male	-0.5821	0.5587	0.0796	(-1.2328, 0.0686)
25-34	Female	-0.2256	0.7980	0.3902	(-0.7402, 0.2890)
25-34	Male	0.0966	1.1014	0.5303	(-0.2051, 0.3983)
35-44	Female	-0.0671	0.9351	0.6619	(-0.3680, 0.2338)
35-44	Male	-0.1857	0.8305	0.0060	(-0.3182, -0.0532)
45-54	Female	0.1901	1.2094	0.1300	(-0.0560, 0.4361)
45-54	Male	-0.2521	0.7772	<0.0001	(-0.3401, -0.1641)
55-64	Female	0.3203	1.3775	0.0066	(0.0892, 0.5514)
55-64	Male	-0.2685	0.7645	<0.0001	(-0.3467, -0.1903)
65-74	Female	0.2303	1.2590	0.0613	(-0.0109, 0.4714)
65-74	Male	-0.2267	0.7972	<0.0001	(-0.2899, -0.1635)
75 and older	Female	0.3890	1.4755	0.0016	(0.1479, 0.6302)
75 and older	Male	—	—	—	—

Table 7.1

Analysis of Interactions between Gender and Independent Characteristics with DOC using a Simultaneous NBRM

Characteristics		B[a]	e[b b]	p-value	Wald 95% CI
Predisposing					
Race-ethnicity*Gender				<0.0001	
Black/AA[c]	Female	0.1907	1.2101	<0.0001	(0.0990, 0.2824)
Other[d]	Female	-0.1259	0.8817	0.0963	(-0.2742, 0.0225)
White	Female	—	—	—	—
Black/AA	Male	0.1846	1.2027	<0.0001	(0.1025, 0.2667)
Other	Male	-0.0050	0.9950	0.9243	(-0.1086, 0.0986)
White	Male	—	—	—	—
Enabling					
Health insurance*Gender				<0.0001	
Medicaid	Female	0.0519	1.0533	0.4615	(-0.0863, 0.1901)
Medicare	Female	0.0640	1.0661	0.1614	(-0.0256, 0.1537)
Private	Female	—	—	—	—
Medicaid	Male	0.2783	1.3209	<0.0001	(0.1746, 0.3819)
Medicare	Male	0.0887	1.0928	0.0067	(0.0246, 0.1529)
Private	Male	—	—	—	—

Table 7.2

Analysis of Interactions between Gender and Independent Characteristics with DOC using a Simultaneous NBRM

Characteristics		B[a]	e[b b]	p-value	Wald 95% CI
Enabling					
Geographic region*Gender				0.0006	
Midwest	Female	-0.1542	0.8571	0.0090	(-0.2700, -0.0384)
Northeast	Female	-0.1920	0.8253	0.0012	(-0.3078, -0.0762)
South	Female	-0.1427	0.8670	0.0057	(-0.2440, -0.0415)
West	Female	—	—	—	—
Midwest	Male	-0.1026	0.9025	0.0150	(-0.1852, -0.0200)
Northeast	Male	-0.0279	0.9725	0.5012	(-0.1093, 0.0535)
South	Male	0.0068	1.0068	0.8549	(-0.0660, 0.0796)
West	Male	—	—	—	—
Hospital owner*Gender				<0.0001	
Government	Female	-0.1080	0.8976	0.1355	(-0.2499, 0.0338)
Nonprofit[e]	Female	-0.2706	0.7629	<0.0001	(-0.3711, -0.1702)
Proprietary	Female	—	—	—	—
Government	Male	-0.0889	0.9149	0.1078	(-0.1973, 0.0195)
Nonprofit	Male	-0.0773	0.9256	0.0517	(-0.1551, 0.0006)
Proprietary	Male	—	—	—	—

Table 7.3

Analysis of Interactions between Gender and Independent Characteristics with DOC using a Simultaneous NBRM

Characteristics		B[a]	e^b [b]	p-value	Wald 95% CI
Need					
DRG[f]*Gender				<0.0001	
CABG[g] with or without catheter	Female	1.3134	3.7188	<0.0001	(1.1808, 1.4460)
Coronary bypass with PTCA[h]	Female	1.2064	3.3414	<0.0001	(0.9099, 1.5028)
PCI[i] with or without stents	Female	0.2233	1.2502	0.0005	(0.0976, 0.3489)
PCI without stent or heart attack	Female	—	—	—	—
CABG with or without catheter	Male	1.3748	3.9543	<0.0001	(1.2674, 1.4822)
Coronary bypass with PTCA	Male	1.4794	4.3903	<0.0001	(1.2088, 1.7499)
PCI with or without stents	Male	0.2206	1.2468	<0.0001	(0.1150, 0.3261)
PCI without stent or heart attack	Male	—	—	—	—

Note. Dashes represented reference categories.

[a]B = raw coefficient; [b]e^b = exponential of B; [c]African-American; [d]including Hispanic; [e]including church; [f]Diagnosis-related group; [g]Coronary artery bypass grafting; [h]Percutanceous transluminal coronary angioplasty; [i]Percutaneous coronary intervention

Discussion

This study showed that hospital DOC between men and women undergoing CABG and PTCA differed with each study model. When the model that examined only the predisposing factors, females had a decreased hospital DOC than men. However, when the all the study characteristics were examined, females had an increased hospital DOC than men.

Though the categories in the models showed differences in hospital DOC, interactions between gender and the majority of the study variables showed differences in increase or decrease of hospital DOC. When gender and DRG was analyzed, men and women had increased hospital DOC. The increase depended on which surgical procedure was conducted on the patient. PCI with or without stents had the lowest increase of hospital DOC for both males and females. CABG with or without catheters had the highest increase of hospital DOC for females. Coronary bypass with PTCA had the highest increase of hospital DOC for males.

Previous studies on CHD surgical procedures focused on the two most common: PCI and CABG (Hahn, et al., 2007; Harrold, et al., 2003; Nguyen, Berger, Duval, & Luepker, 2008). These surgeries usually differed in hospital DOC since one did not require opening the chest, and the other procedure did require opening the chest. Nevertheless, hospital DOC differed in previous studies between men and women (Hahn, et al., 2007; Harrold, et al., 2003; Nguyen, Berger, Duval, & Luepker, 2008).

However, there were other factors that influenced hospital DOC, which also had implications for public health. These factors were age, race-ethnicity, hospital ownership, geographic region, and health insurance (Bartholomew, et al., 2003; Chen, et al., 2007; Cram, Rosenthal, & Vaughan-Sarrazin, 2005; Dey, et al., 2008; Jha, Li, Orav, & Epstein, 2005; Laskey, et al., 2010). The results showed some differences in age, race-ethnicity, hospital ownership, geographic region, and health insurance. However, when these variables were closely examined with the interactions, age showed changes in increased and decreased DOC among women from 18-75 and older. The majority of past studies focused on older adults usually age 50 and older (Bartholomew, et al., 2003; Chen, et al., 2007; Dey, et al., 2008; Hahn, et al., 2007; Harrold, et al., 2003; Nguyen, Berger, Duval, & Luepker, 2008; Takakuwa, Shofer, Limkakeng, & Hollander, 2008), which may cause disparities in different groups of people (Department of Health and Human Services, 2010, A systematic approach to health improvement).

This study had strengths and limitations. The first limitation was the NHDS used paper chart data, which could have left out information such as ethnic groups. The start of chart data came from self-reporting information from the patients or family members. Second limitation was the study used DRGs instead of the clinical codes used in CHD studies. DRGs change from year to year, but the main disease codes used in hospitals and doctor's offices usually stay the same from year to year (U. S. Congress, Office of Technology Assessment, 1983). A third limitation was the sample size from the NHDS. The huge sample size made the majority of analyses significant.

The strengths of this paper was looking at the 0 to 30 days for DOC instead of a dichotomous response as with LOS. By using the range of DOC, the analysis gave a more thorough view of how long patients stayed in the hospital. Another strength was examining gender disparitiy, since this disparity was in all communities across the United States (Department of Health and Human Services, 2010, A systematic approach to health improvement).

Conclusion

This study showed differences in DOC between men and women across the United States. However, the interaction between gender and DRG showed an increase in DOC in men and women for all surgical procedures. The implications, such as increased utilization of health services, of this increase in DOC would be not only for present hospitalizations, but for future hospitalizations as the population of the United States grows older.

CHAPTER 3

WOMEN'S PERCEPTIONS ABOUT CORONARY HEART DISEASE

Introduction

Coronary heart disease (CHD) was still the number one cause of death in women, even though CHD research in women started to become a priority for clinicians across the United States (American Heart Association, 2009, Facts about women and cardiovascular diseases; American Heart Association, 2009, Women and coronary heart disease; American Heart Association & American Stroke Association, 2007, 2007 Heart disease and stroke statistics). According to the American Heart Association (2009, Risk factors and coronary heart disease) deaths from CHD were due to three categories of risk factors: (a) Risk factors that could not change, such as genetics, age, and gender; (b) risk factors that changed by either lifestyle changes or medical intervention, such as excersice, eating healthy foods, and lowering blood pressure; and (c) risk factors that were increased due to other contributing causes such as too much stress and too much alcohol. These risk factors explained part of the reason why women die from CHD, but there was another important risk factor that may further explain these deaths: perception about CHD in women.

The word perception had different meanings for each person. In a study done by Jensen and Moser (2008, p. 78), the word perception mixed with other words such as knowledge, attitudes, and beliefs. However, attitudes, knowledge, and beliefs could have different meanings to different people. Mixing similar words for perception led women to experience one area of health care, but ignore other areas due to outside influences.

One health area women gained experience about over the years was breast cancer. Heart (2005, p. 170) pointed out “[e]vidence shows that women perceive breast cancer as a greater risk than CHD. These misperceptions may lead women to underestimate their risk for CHD so that they fail to seek early interventions to prevent unnecessary morbidity and mortality”. Mosca et al. (2000, p.508) found “…61% of the women noted cancer as the greatest health problem for women, whereas only 8% reported heart disease…”. The American Heart Association (2009, Women and coronary heart disease) found “[o]ne in 2.6…die of heart disease, stroke and other cardiovascular disease compared with one in 30 who die of breast cancer”.

Women’s perceptions about dying of breast cancer before dying of CHD influenced their decision to obtain the appropriate health care for CHD (Heart, 2005, p. 170). When asked about perceptions of heart disease and prevention 91% of women knew heart disease developed over time and went easily undetected (Mosca et al., 2000, p. 511). Northrup (2006, p. 483) agreed by stating “[m]any women never realize that they have a heart problem until the disease is well established”. Women may not remember being told by a physician or other medical personnel they were at risk for CHD (Jensen & Moser, 2008, p. 100).

The lack of CHD perception could lead to a lack of CHD knowledge and awareness among women. CHD knowledge included reasoning factors for CHD prevention behavior, how a spouse influenced CHD prevention behavior, and how health beliefs and values influenced women’s thoughts of CHD risks (Heart, 2005, p. 175). Gaps in CHD awareness remained for minority women, and the majority of women perceived CHD as a greater threat for men than themselves (Mosca et al., 2006, p. 532). Litchman, et al. (2007) did a pilot study of 24 women who had a heart attack in two Conneticut hospitals. The researchers asked these women, individually, if she knew about her risk for heart disease. The result of this question showed "…less than half considered themselves at risk for heart disease." (Lichtman, et al., 2007, Most young women don't recognize heart attack warning signs)

Another area of CHD knowledge women lacked was in CHD symptom presentation. Before 2007, studies that focused on CHD symptom presentation did not have standardized distinguishing CHD presentation, data collection, and symptom reporting (Canto, et al., 2007, p. 2405, Abstract, Results section). The problems of not reporting symptom presentation in women may cause underdiagnosis and undertreatment of major heart troubles (Northrup, 2006, 494). Women who had pains either in the chest or abdominal area may have anxiety and depression, and heart disease may not be the first diagnosis considered by a physician or other medical personnel (Northrup, 2006, p. 494). Miller (2002, p. 22, Discussion) pointed out that even though chest pain was an important diagnosis, women may not consider the pain as an important symptom for CHD. Dracup et al. (2008, p. 1049) commented that if women did not think they were at risk for CHD and did not know typical or atypical CHD symptoms, then they had other reasons for these symptoms.

However, women who were informed and aware of CHD recognized atypical symptoms of back pain, jaw pain, heartburn, unexplained nausea, and neck pain than men (Canto, et al., 2007, p. 1051). The characteristics of these women had a higher education level, under the care of a cardiologist, young age, and were in cardiac rehabilitation (Canto, et al., 2007, p. 1051). In a heart attack emergency, CHD symptom knowledge could influence women's comprehension of exposure for a possible future attack (Canto et al., 2007, p. 1053). Heart (2005, pp. 174-175) supported the recognition of less typical CHD and advocated for more CHD education to prevent and improve awareness of lowering CHD risk and increase better health behavior in women.

Another area to increase better health behavior in women was to look at the socioeconomic status (SES) in women. SES in this study included income and education (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Shaw, et al., 2008). Poor and minority women experienced more stress, lived in unfavorable conditions, had less opportunites to obtain positive health behavior and outcomes, and may live in the lower levels of the social status hierarchy (Fleury, Keller, & Murdaugh, 2000, Abstract). Egan, Tannahill, Petticrew, and Thomas (2008, Abstract, Conclusion) agreed with this by stating "…unfavourable psychosocial risk factors linked to poorer health, particularly among socially disadvantaged groups."

One of the unfavorable psychosocial risks linked to poorer health among all women was stress. How much stress women had depended on how they coped with day to day decisions (Northrup, 2006, p. 493). These decisions that caused stress were conflicts with others, marital discord, health care crises, social and econmic trials (Venes, 2005, pp. 2086-2087). Women who had exposure to chronic stress and had CHD increased the risk of future CHD occurances (Aboa-Éboulé et al., 2007, p. 1658).

Another side effect of stressful situations were anger, resentment, and frustration and had an impact on CHD. The majority of young girls were brought up to believe that venting anger, resentment, and frustration was not normal (Northrup, 2006, p. 495). Women who were not happy with their jobs, felt they could not leave their positions, and could not communicate this anger and frustration caused problems for their heart (Northrup, 2006, p. 510). Even though this paper focused on women, Northrup (2006) looked at the effects of anger and resentment between men, women and CHD:

> Let's use the analogy of two pots of water on a stove. The pot on the right-the woman-is on simmer, with a lid on top. The pot on the left-the male-has no lid, and the heat is on high. The heat of the male's anger will cause the water in the pot to boil vigorously, with a lot of steam and noise. In a typical male heart attack, the pot boils over. The woman's pot will never boil over, but the heat is there nonetheless, and the next thing you know, the water has evaporated and the pot has cracked. But because there was no noise and steam, no one was alerted to the problem. The same thing happens with a woman's cardiovascular system (p. 495).

Depression was another unfavorable psychosocial factor that could result in CHD. Depression had several definitions, but the broad definition was a loss of pleasure in living (Venes, 2005, p. 563). If women lost their delight in life and became depressed, then they could increase their risk for cardiovascular morbidity and mortality (Skodova et al., 2008, p. 204). Another aspect of depression was it occurred constantly in CHD in women (Stafford, Berk, & Jackson, 2009, Abstract, Objective). Women diagnosed with CHD were usually anxious and depressed (Wenger et al., 2008, p. 49). Depression also caused women to have higher unfavorable outcomes of CHD after a heart attack (Wenger et al., 2008, p. 49). In a Swedish study by Blom et al. (2007, p. 1314) showed women who were employed and under 65 years had less depression and more social support than unemployed women.

Life experiences about CHD risk and psychosocial factors have an effect on communication between women and physicians and other health personnel (Christian, Mochari, & Mosca, 2005). Women may have a difficult time in talking about CHD symptoms to a doctor since the majority of women did not realize they had a chance of CHD due to lifestyle behaviors (Oliver-McNeil & Artinian, 2002, Abstract, Conclusions). Women may also have a difficult time in communicating CHD risk in surveys due to the way the surveys asked these types of questions (Christian, Mochari, & Mosca, 2005). Women preferred to have an uncomplicated method of CHD risk questions asked in a survey (Christian, Mochari & Mosca, 2005, p. 1597, Discussion).

The lack of risk communication in women may impact their health-related quality of life (HRQOL). HRQOL was women's perceptions about their health that affects satistifaction with life (Venes, 2005, p. 1835). A qualitative study by Norris and King (2009) discussed how nine women, with different age groups, viewed HRQOL in their lives. All nine women described HRQOL as having a social network, able to do something, and ways to maintain quality of life (Norris & King, 2009).

CHD perceptions were a complex issue that encompased everyday lives of women. Beliefs, knowledge, and attitudes about CHD made a mulitfacted issue even more difficult since the majority of women were not aware they had the disease (Northrup, 2006). Part of the difficulty was that women knew more about other diseases, such as breast cancer, than they did about CHD (Mosca, et al., 2000). This in turn led women to underestimate their risk and symptoms of CHD (Canto, et al., 2007).

Women who underestimated their CHD risk, may not communicate possible symptoms to a physician (Jensen & Moser, 2008). Symptoms could be ignored since a woman may not believe she had a heart attack (Heart, 2005). Physician knowledge of CHD symptoms could also influence the way women communicate their symptoms (Maserejian, Link, Lutfey, & Marceau, 2009). The purpose of this study was to compare women's perceptions about CHD knowledge by answering heart attack symptom questions. The hypothesis of this paper was to analyze whether or not women perceive or have knowledge of heart disease, in the form of heart attack symptom knowledge.

Methods

A cross-sectional study compared CHD perceptions in all women 18 years and older by examining knowledge of heart attack symptoms. Heart attack symptom questions included shortness of breath, chest pain, and discomfort in other areas of the body (Centers for Disease Control and Prevention, 2010, Know your signs and symtpoms). Data came from the 2007 Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention, National Center for Health Statistics, 2007).

The BRFSS was a continuing partnership between the Centers for Disease Control and Prevention, states, and United States territories. The collaboration started in 1984 with 15 states surveying health risk behaviors of adults 18 years and older living in households by telephone each month (Centers for Disease Control and Prevention, National Center for Health Statistics, 2007). By 2001, all 50 states, the District of Columbia, the Commonwealth of Puetro Rico, the U. S. Virgin Islands, and Guam participated in the BRFSS (Centers for Disease Control and Prevention, National Center for Health Statistics, 2007).

The survey had three parts: (a) the core component; (b) optional modules; and (c) state-added questions (Centers for Disease Control and Prevention, National Center for Healrh Statistics, 2007, Design of BRFSS). The core component of the BRFSS came from current health issues and demographics of each state. The optional modules asked specific questions about health issues that states may or may not use in their questionnaires. The state-added questions were developed and asked by the state (Centers for Disease Control and Prevention, National Center for Health Statistics, 2007).

The sample size for the 2007 BRFSS was 430,912 and came from a list of randomly selected telephone numbers across all 54 surveillance system. One telephone number from this list was a sample record (Centers for Disease Control and Prevention, National Center for Health Statistics, 2007, Design of the BRFSS). These sample records needed to be "…justifiable as a probability sample of all households with telephones in the state." (Centers for Disease Control and Prevention, National Center for Health Statistics, 2007, Design of the BRFSS). All participants in a particular state's area of interest met this requirement.

There were two different types of sample survey in the BRFSS. These surveys were simple random survey and disproportionate stratified sample (DSS) design. The simple random design randomly picked telephone numbers of households in the state used for the survey. The DSS design divided the telephone numbers into two groups called high and medium density strata and analyzed separately (Centers for Disease Control and Prevention, National Center for Health Statistics, 2007, Design of the BRFSS). In order to determine if a telephone number went under either high or medium density strata, blocks of 100 telephone numbers with the same area code, prefix (the first three numbers), and the first two numbers of the suffix (the last four digits) with all the combinations of the last two numbers were generated. If the picked number was listed in the block, it was put in high density strata. However, if the picked number was not listed in the block, it was put in the medium density strata (Centers for Disease Control and Prevention, National Center for Health Statistics, 2007, Design of the BRFSS).

The BRFSS used primary sampling units (psu) and weights to infer the survey sample to the entire United States population. Psu stratified the data into its various stages. A weight variable was used on the survey sample data, which calculated the population of the United States in 2007.

Two SAS commands, PROC SURVEYFREQ and PROC SURVEYLOGISTIC (SAS Institute, 2008) were used to obtain demographic information and test the study's hypotheses. The psu and final weight were used to calculate the correct number of clusters, percents, estimates, and confidence intervals. For this study used the psu and final survey weight from the BRFSS for statistical analysis.

Though the BRFSS partially explained how women's perceptions of heart attack knowledge influenced health care access in women. There were other reasons why some women had more access to health care more than other women. These reasons included socioeconomic status (SES) (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement; Shaw, et al., 2008), race-ethnicity (Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006; Lutfiyya, Cumba, McCullough, Barlow, & Lipsky, 2008; Shaw, et al., 2008), and physician knowledge and interpretation of CHD in women (Barnhart, Lewis, Houghton, & Charney, 2007; Maserejian, Link, Lutfey, & Marceau, 2009). These utilization differences led to an unequal view called a disparity (Venes, 2005, p. 619).

One major CHD disparity came in the form of SES. SES could be defined as "…an individual's social position relative to other members of a society." (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009) The main two factors of SES were income and education (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvements; Shaw, et al., 2008). According to the Healthy People 2010 study (Department of Health and Human Services, 2010, A systematic approach to health improvement), people who had the worse health outcomes, such as heart disease, had the lowest income level and the smallest amount of education. Other studies have showed the lower the SES, the higher the probability of CHD risk (Brown & O'Connor, 2010; Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Shaw, et al., 2008). Another study, that analyzed only education as a SES, found that a lower education level increased the risk of having a heart attack (Kelly & Weitzen, 2010). One study showed that variations in SES were related to reducing cardiovascular risk factor disparities (Brown & O'Connor, 2010).

Race-ethnicity was another determining factor of CHD disparity in the United States (Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement; Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006; Lutfiyya, Cumba, McCullough, Barlow, & Lipsky, 2008; Shaw, et al., 2008). Women of different ethnic groups may not be aware they had multiple CHD risk factors (Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006). In another study, African-American women faced disparities in knowledge of heart attack symptoms (Lutfiyya, Cumba, McCullough, Barlow, & Lipsky, 2008).

Physician knowledge and diagnosis of CHD risk factors and symptoms could also lead to a disparity on how women view CHD. One study that surveyed internists and obstetricians and gynecologists (OB/GYNs) at a ground rounds presentation in New York City found a lack of clinical guideline knowledge of treating CHD risk factors (Barnhart, Lewis, Houghton, & Charney, 2007, Results, p. 95). There were also gaps in CHD prevention guidelines among primary care physicians (Barnhart, Lewis, Houghton, & Charney, 2007). Other studies found physician interpretation, and how certain physicians were in their diagnosis of CHD varied by patient characteristics such as gender, SES, age, and race-ethnicity (Lutfey, Link, Grant, Marceau, & McKinlay, 2009; Maserejian, Link, Lutfey, & Marceau, 2009). Physicians were least certain in their CHD diagnosis in women with the same symptom presentation as men (Lutfey, Link, Grant, Marceau, & McKinlay, 2009), in younger women (Lutfey, Link, Grant, Marceau, & McKinlay, 2009; Maserejian, Link, Lutfey, & Marceau, 2009), and in Black patients (Lutfey, Link, Grant, Marceau, & McKinlay, 2009).

Health services utilization was another important explaination of why some women access health care more than other women. Utilizing health services differed from individual to individual and from family to family. However, there were similarities between individuals and families who used health services (Andersen, 1968). Andersen's (1968) original proposal looked at how these similarities influenced health care use in the United States. The three sections were predisposing, enabling, and need. Predisposing examined characteristics of an individual or family already in place. Enabling looked at how individuals or families paid and acquired health services. Need examined how the severity of a disease or illness of an individual or family affects health care use (Andersen, 1968).

Over time, Andersen's (1968) original model was adapted for different health utilization outcomes. In this study, the major categories and subgroups were tailored to examine how women's perceptions of CHD influenced access to health care. The variables for the subgroups and health outcome came from the BRFSS.

The health outcome, heart attack symptom knowledge, may influence women's perceptions about CHD. Heart attack symptom knowledge was limited in women (Thanavaro, Moore, Anthony, Narsavage, & Delicath, 2006). Women may not consider heart attacks as the first sign of CHD problems (Miller, 2002). This could lead to CHD misdiagnosis (Northrup, 2006, 494). Also, if physicians were not certain about CHD diagnosis in women, this could also lead to underdiagnosis of CHD (Maserejian, Link, Lutfey, & Marceau, 2009).

In order to determine whether or not women have heart attack symptom knowledge (hask), the BRFSS had six heart attack symptom knowledge questions (Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). Women from 23 states were asked questions about chest pain, shortness of breath, arm pain, vision problems, and other heart attack symptoms (Centers for Disease Control and Prevention, 2007, Modules by category). All six questions had the same answers and were coded as 1=Yes, 2=No, 7=Don't know or not sure, and 9=Refused (Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). Refused answers were set to missing. These same questions were used in another study on older adult recognition of heart attack symptoms (Bell, Lommel, Fischer, Lee, Reddy, & Johnson, 2009).

These heart attack symptom questions could be condensed into three questions. These new questions could ask about a) chest discomfort, b) discomfort in other areas, and c) other signs of a heart attack (Centers for Disease Control and Prevention, 2010, Know your signs and symptoms). The answers would be the same as the original six heart attack symptom questions of yes, no, and do not know or not sure. However, for the purpose of this paper, the three questions were combined into one general question of "Do women have knowledge of heart attack symptoms?" for the outcome variable. The answer to this question was the same as the three questions of yes, no, and do not know or not sure.

Although women differed in their hask, they had similar characteristics. These characteristics were age, education, employment, marital status, health insurance, health beliefs about general health, income, geographic region, and access to any type of health care provider (Barnhart, Lewis, Houghton, & Charney, 2007; Blom, Gerogiades, Laszlo, Alinaghizadeh, Janszky, & Ahnve, 2007; Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009; Centers for Disease Control and Prevention, National Center for Health Statistics, 2008; Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006; Kelly & Weitzen, 2010; Laskey, et al., 2010; Lutfiyya, Cumba, McCullough, Barlow, & Lipsky, 2008; Shaw, et al., 2008).

These variables fitted Andersen's (1968) adapted model by placing each characteristic with its corresponding major category. Predisposing included age, education, race-ethnicity, employment, marital status, and health beliefs. Age was an important baseline characteristic since it showed not only how old the sample was in a particular study, but to also to compare which ages had one, more than one, or no health care provider (Department of Health and Human Services, 2010, Leading health indicators). In one study, age was used to look at multiple CHD risk factors (Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006).

Education was another important characteristic CHD studies used as a socioeconomic status (SES) indicator (Kelly & Weitzen, 2010; Shaw, et al., 2008). In one study, women who had a low education level had a higher risk of heart attacks or death from CHD (Shaw, et al., 2008). In another study, education was also used to determine which group of women had more than one CHD risk factor (Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006).

Race-ethnicity was used to determine disparities among different ethnic groups (Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement). Race-ethnicity was also used in CHD studies to compare which ethnic group was more likely to have more than one CHD risk factor (Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006). In one study, race-ethnicity was used as a main focus for knowledge of heart attack symptoms (Lutfiyya, Cumba, McCullough, Barlow, & Lipsky, 2008). In another study, race-ethnicity was used as a SES factor to predict CHD outcomes in women (Shaw, et al., 2008).

Employment was another demographic characteristic that had a CHD impact on women (Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009). Women who were employed outside the home had a decreased risk of CHD (Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009). Women who worked had less depression than women who did not work (Blom, Gerogiades, Laszlo, Alinaghizadeh, Janszky, & Ahnve, 2007).

Health beliefs, in the form of general health perception, were another demographic trait that also had a CHD impact on women (Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009). General health was categorized as excellent, good, fair, and poor (Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009, Table 1). In one study, the majority of women claimed their general health was good (Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009, Table 1).

Marital status was another demographic characteristic that CHD studies used to determine CHD outcomes in women (Blom, Gerogiades, Laszlo, Alinaghizadeh, Janszky, & Ahnve, 2007; Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009; Shaw, et al., 2008). Women who were not married had a higher chance of having a worse CHD outcome than women who were married (Shaw, et al., 2008). However, women who had families wanted to lower their risk for CHD (Mosca, et al., 2006).

Enabling included income, health insurance, and geographic region. Income, along with education, was another SES characteristic that was important to CHD outcomes in women (Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009; Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006; Shaw, et al., 2008). Income was also one of the disparities that keep women from obtaining health access (Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement). Many studies have shown that women with lower income levels had higher chances of having CHD or heart attacks (Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009; Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006; Shaw, et al., 2008).

Health insurance was a socioeconomic feature that was used to determine who had the highest risk of CHD (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Laskey, et al., 2010; Shaw, et al., 2008). In some studies that used health insurance as a variable in the study, the two main health insurance categories were Medicare and Medicaid (Hahn, et al., 2007; Laskey, et al., 2010; Shaw, et al., 2008). In another study, health insurance was used to determine which group of women had more than two CHD risk factors (Hayes, Denny, Keenan, Croft, Sundaram, & Greelund, 2006). Health insurance was also an indicator to look at access to health care (Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement).

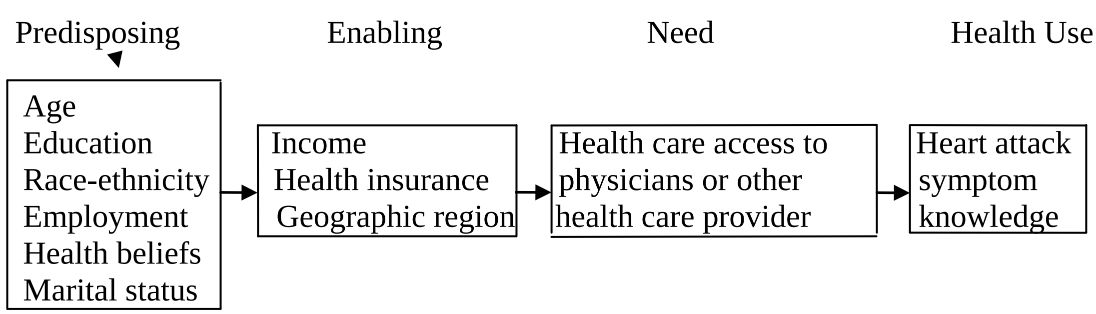
Geographic region was another feature that could impact the number of health care persons women considered their health care provider. There were four regions for this study: Northeast, Midwest, South, and West (United States Census Bureau, 2009). Even though physicians had guidelines in the delivery of health care before, during, and after a heart attack, adhering to these guidelines differed across regions (Laskey, et al., 2010).

Need included PERSDOC2 variable to examine whether or not women had any type of health care access. PERSDOC2 asked the following question: “Do you have one person you think of as your personal doctor or healthcare provider? (If ‘No’ ask ‘Is there more than one or is there no person who you think of as your personal doctor or healthcare provider?’)” (Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). In this study health care provider was a physician, nurse practitioner, or physician assistant (PA). The BRFSS coded the answers as 1=Yes, only one; 2=More than one; 3=No; 7=Don't know/not sure; and 9=Refused (Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). The not sure and refused categories were set to missing.

The number of health care providers women considered as their personal doctor or health care provider was a leading health indicator of gaining access to quality health care (Department of Health and Human Services, 2010, Leading health indicators). Along with a regular health care provider, another indicator of quality of health care access was utilizing clinical preventative services (Department of Health and Human Services, 2010, Leading health indicators). These indicators were either retained or modified to be included in the preliminary stages of the Healthy People 2020 initiative (Department of Health and Human Services, 2009, Healthy People 2020 draft objectives). Figure 3 showed how Andersen's original model fitted with the study's variables of interest.

Figure 3

Women Characteristics that Influence Health Care Access



Note. From "A behavioral model of families' use of health services" by R. Andersen (1968) from the Centers for Health Adminstration and Services, University of Chicago. Author's drawing.

The BRFSS used the following codes for the majority of these variables: a) General health coded as 1=Excellent, 2=Very good, 3=Good, 4=Fair, 5=Poor, 7=Don't know/Not sure, 9=Refused; b) Health insurance coded as 1=Yes, 2=No, 7=Don't know/Not sure, 9=Refused; d) Age coded as 7=Don't know/Not sure, 9=Refused, 18-24, 25-34, 35-44, 45-54, 55-64, 65-99; e) Race-ethnicity coded as 1=White, 2=Black or African American, 3=Asian, 4=Native Hawaiian or Pacific Islander, 5=Native American or Alaska Native, 6=Other; f) Marital status coded as 1=Married, 2=Divorced, 3=Widowed, 4=Sparated, 5=Never Married, 6=A member of an unmarried couple, 9=Refused; g) Education coded as 1=Never attended or only kindergarten, 2=Grades 1 through 8 (Elementary), 3=Grades 9 through 11 (Some high school), 4=Grade 12 or GED (High school grad), 5=College 1 year to 3 years (Some college or techincal school), 6=College 4 years or more (College graduate), 9=Refused; h) Employment coded as 1=Employed for wages, 2=Self-employed, 3=Out of work for more than one year, 4=Out of work for less than one year, 5=A homemaker, 6=A student, 7=Retired, 8=Unable to work, 9=Refused; and i) Income coded as 1=less than $10,000, 2=less than $15,000 ($10,000-$14,999), 3=less than $20,000 ($15,000-$19,999), 4=less than $25,000 ($20,000-$24,999), 5=less than $35,000 ($25,000-$34,999), 6=less than $50,000 ($35,000-$49,999), 7=less than $75,000 ($50,000-$69,999), 8=greater than or equal to $75,000 ($75,000 or more), 77=Don't know/Not sure, 99=Refused (Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). All not sure and refused categories were set to missing.

Geographic regions were not part of the BRFSS. The BRFSS used the Federal Information Processing System (FIPS) codes from the United States Census. However, the FIPS codes did not list the states into their respective regions. The four regions for this study were created by using the United States Census (2009) region codes. The codes for the four regions were 1=Northeast, 2=Midwest, 3= South, and 4=West (United States Census Bureau, 2009).

Since the health outcome variable, hask, had answers of yes, no, and do not know/not sure, there were two possible statistical analyses. These were ordinal logstic regression model (OLRM) and multinomial logistic regression model (MLRM). Since either model was valid for this study, another statistical test called proportional odds model was analyzed to determine the correct, final model.

Proportional odds tested whether or not the regression lines run parallel to each other or if they cross (Long & Freese, Chapter 6: Models for nominal outcomes with case-specific data, 2006). If the proportional odds were not rejected, the lines run parallel to each other, and the OLRM became the final model. However, if the proportional odds were rejected, the lines cross, and the MLRM became the final model. After the final study model was analyzed, odd ratios were used to compare each categorical varariable with not only the category reference, but also with the outcome reference.

Odds ratio could be defined two ways: 1) the chance of having a disease from groups with or without a risk factor; or 2) the probability of being exposed to a risk factor with or without the disease (Le, 1998, p. 36). The values of odds ratio can range from zero to infinity (Daniel, 2005, p. 640). For the purpose of this paper, the risk factor asked this question: Did women have knowledge of heart attack symptoms?

The interpretation of odds ratio used the value of one. The statistical reasoning for this was if a number for the risk factor and a number for the disease were the same number, then by basic math, a number divided by itself equaled one. If the odds ratio was calculated to be one, then there was no association between the risk factor and the disease (Daniel, 2005, p. 640). If the odds ratio had a quantity greater than one, then there was an increased chance of obtaining the disease within the group that had the risk factor. If the odds ratio had a quantity less than one, then there was a decreased probability of obtaining the disease within the group that had the risk factor (Daniel, 2005, p. 640).

For this paper, the interpretation of odds would be that an odds less than one would have more hask since there was a decreased chance of acquiring CHD. An odds more than one would have less hask since there was an increased chance of acquiring CHD. An odds of one would be no association between knowledge and CHD.

All data management, demographic tables, to test which model was the study's final model, and the final study model was analyzed using SAS 9.2 (SAS Institute, Cary, NC, 2008). All tests were two-tailed. The significance level was 0.05 for all tests.

Results

The proportional odds test was the first test to determine if ORLM or the MLRM was the final study model. The hypothesis test of parallel lines was rejected ($p < .05$). Since the hypothesis test was rejected, the MLRM was the final study model.

Women's demographic characteristics were shown in Tables 8, 8.1, 8.2 and 8.3. The majority of women were 35-44 years (19.96%) and White (70.32%). The demographics also showed the majority of women had four or more years of college (32.20%) and were employed (52.87%). They were also married (58.33%) and thought their health was very good (32.13%). A large part of the women had an income of $75,000 or more (28.05%), lived in the South (36.44%), had health insurance (86.24%), have one person they considered their health care provider (76.47%), and had knowledge of heart attack symptoms (84.79%).

Table 8

Women's Demographic Characteristics using the 2007 Behavioral Risk Factor Surveillance System (BRFSS)

Characteristics	n[a]	%[b]
Age		
18-24	9,120	10.1927
25-34	28,894	18.0015
35-44	42,192	19.9565
45-54	54,229	18.6977
55-64	53,659	14.0931
65 and older	79,420	19.0586

Table 8.1

Women's Demographic Characteristics using the 2007 BRFSS

Characteristics	n[a]	%[b]
Race-ethnicity		
White	210,379	70.3175
Black/AA[c]	22,997	10.2328
Hispanic	20,242	14.3940
Other[d]	9,733	5.0557
Education		
K[e] – Grade 11	28,362	11.2254
HS[f] Grad or GED[g]	84,164	29.0192
College 1-3 years	73,816	27.5600
College 4 or more years	83,032	32.1955
Employment		
Employed	131,938	52.8650
Homemaker	34,860	15.9096
Retired	68,721	16.5072
Unemployed	18,958	5.5943
Other	14,672	9.1238
Marital status		
Married	139,704	58.3333
Divorced	39,979	10.2336
Widowed	48,406	10.1084
Never married	40,970	21.3247

Table 8.2

Women's Demographic Characteristics using the 2007 BRFSS

Characteristics	n[a]	%[b]
General health beliefs		
Excellent	49,027	20.0628
Very good	85,410	32.1331
Good	80,937	30.3597
Fair	36,970	12.5230
Poor	16,574	4.9214
Income		
< $10,000	14,260	6.0907
$10,000- < $15,000	15,447	5.6400
$15,000- < $20,000	19,604	7.4558
$20,000- < $25,000	23,611	8.8909
$25,000- < $35,000	29,643	11.7557
$35,000- < $50,000	36,386	15.3352
$50,000- < $75,000	36,737	16.7841
$75,000 or more	51,975	28.0477
Geographic region		
Northeast	50,659	18.9028
Midwest	51,734	22.2026
South	105,030	36.4412
West	58,131	22.4534
Health insurance		
Yes	239,597	86.2413
No	29,999	13.7587

Table 8.3

Women's Demographic Characteristics using the 2007 BRFSS

Characteristics	n[a]	%[b]
Multiple health care professionals		
Yes, only one	214,740	76.4713
More than one	23,865	8.5478
No	30,962	14.9809
Heart attack symptom knowledge[h]		
Yes	44,163	84.7934
No	4,326	8.3696
Don't know/not sure	3,854	6.8371

[a]n = unweighted frequencies; [b]% = weighted percents; [c]African-American; [d]Included Asian, Native Hawiian/Pacific Islander, and Native American/Alaskan Native; [e]Kindergarten; [f]High School; [g]General Education Diploma; [h]N = 52,343

Tables 9, 9.1, 9.2, and 9.3 showed predisposing characteristics of women in the study. The effects of age, education, race-ethnicity, and marital status on hask were strongly significant ($p < .05$). However, the effects of general health and employment on hask were not significant ($p > .05$).

Women who were between 25-34 years of age compared with women who were 65 and older had a 0.909 (CI: (0.689, 1.182)) decrease in odds of CHD due to a possible increase of hask when the question was answered do not know/not sure. Women 35-44 years of age compared with women who were 65 and older had a 0.722 (CI: (0.585, 0.892)) decrease in odds of CHD due to a possible increase of hask when the question was answered no. Women with four or more years of college compared with women with a K – Grade 11 education had a 0.427 (CI: (0.351, 0.519)) decrease in odds of CHD since there was a chance of increased hask when the question was answered no. Hispanic women compared with White women had a 2.376 (CI: (1.807, 3.125)) increased odds of CHD due to a possible decrease of hask when the answer to the question was no. When Black/African-American women were compared with White women, the Black/African-American women had a 1.482 (CI: (1.255, 1.751)) increased odds of CHD due a chance decrease of hask when the answer to the question was do not know/not sure. Divorced women when compared with widowed women had a 1.080 (CI: (0.899, 1.297)) increased odds of CHD since there was a possible decrease of hask when the answer to the question was no. However, married women when compared with widowed women had a 0.771 (CI: (0.665, 0.894)) decreased odds of CHD since there was a possible increase of hask when the answer was no. Women who were never married compared with widowed women had a 1.166 (CI: (0.949, 1.432)) increased odds of CHD since there was a potential decrease of hask when the answer was no. Homemakers when compared with unemployed women had a 1.181 (CI: (0.928, 1.504)) increased odds of CHD since there was a potential diminish of hask when the answer was do not know/not sure. However, women who were employed compared with the same group had a 0.872 (CI: (0.689, 1.104)) decreased odds of CHD since there could be an increased possiblity of hask when the answer was do not know/not sure. Women who thought their general health was excellent compared with women who thought their health was very good had a 1.122 (CI: (0.933, 1.349)) increased odds of CHD since there was possible less hask when the answer was no.

Table 9

Model 1: Analysis of Predisposing Characteristics using a Simultaneous Mulitnomial Logistic Regression Model (MLRM) (N = 50,106)

Predisposing	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Age				<0.0001	
18-24 vs. 65 or older	Dk/ns[d]	0.1111	0.826	0.3857	(0.589, 1.158)
18-24 vs. 65 or older	No	-0.1191	0.616	0.3906	(0.432, 0.878)
25-34 vs. 65 or older	Dk/ns	0.2063	0.909	0.0229	(0.689, 1.182)
25-34 vs. 65 or older	No	0.0666	0.741	0.3652	(0.604, 0.910)
35-44 vs. 65 or older	Dk/ns	-0.2332	0.585	0.0013	(0.476, 0.720)
35-44 vs. 65 or older	No	0.0405	0.722	0.5706	(0.585, 0.892)
45-54 vs. 65 or older	Dk/ns	-0.1709	0.632	0.0105	(0.516, 0.752)
45-54 vs. 65 or older	No	-0.1440	0.600	0.0256	(0.499, 0.723)
55-64 vs. 65 or older	Dk/ns	-0.2155	0.596	0.0016	(0.506, 0.702)
55-64 vs. 65 or older	No	-0.2102	0.562	0.0009	(0.475, 0.665)

Table 9.1

Model 1: Analysis of Predisposing Characteristics using a Simultaneous MLRM

(N = 50,106)

Predisposing	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Education				<0.0001	
College 1-3 years vs. K[e] - Grade 11	Dk/ns[d]	-0.2244	0.464	<0.0001	(0.383, 0.563)
College 1-3 years vs. K - Grade 11	No	-0.3070	0.446	<0.0001	(0.368, 0.540)
College 4 yrs or more vs. K - Grade 11	Dk/ns	-0.3048	0.428	<0.0001	(0.342, 0.536)
College 4 yrs or more vs. K - Grade 11	No	-0.3516	0.427	<0.0001	(0.351, 0.519)
HS[f] Grad/GED[g] vs. K - Grade 11	Dk/ns	-0.0140	0.573	0.7724	(0.484, 0.678)
HS Grad/GED vs. K - Grade 11	No	0.1582	0.710	0.0006	(0.598, 0.844)
Race-ethnicity				<0.0001	
Black/AA[h] vs. White	Dk/ns	0.0450	1.482	0.5921	(1.255, 1.751)
Black/AA vs. White	No	-0.0695	1.436	0.3556	(1.231, 1.676)
Hispanic vs. White	Dk/ns	0.2701	1.856	0.0131	(1.425, 2.419)
Hispanic vs. White	No	0.4338	2.376	<0.0001	(1.807, 3.125)
Other[i] vs. White	Dk/ns	0.0334	1.465	0.8298	(0.978, 2.194)
Other vs. White	No	0.0672	1.647	0.6388	(1.142, 2.374)

Table 9.2

Model 1: Analysis of Predisposing Characteristics using a Simultaneous MLRM

(N = 50,106)

Predisposing	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Marital Status				<0.0001	
Divorced vs. Widowed	Dk/ns[d]	-0.0236	0.825	0.6949	(0.685, 0.992)
Divorced vs. Widowed	No	0.0844	1.080	0.1565	(0.899, 1.297)
Married vs. Widowed	Dk/ns	-0.1446	0.731	0.0033	(0.629, 0.848)
Married vs. Widowed	No	-0.2529	0.771	<0.0001	(0.665, 0.894)
Never married vs. Widowed	Dk/ns	-0.00106	0.843	0.9887	(0.673, 1.056)
Never married vs. Widowed	No	0.1610	1.166	0.0187	(0.949, 1.432)
Employment				0.1863	
Employed vs. Unemployed	Dk/ns	-0.1432	0.872	0.0235	(0.689, 1.104)
Employed vs. Unemployed	No	-0.0445	0.923	0.4471	(0.740, 1.153)
Homemaker vs. Unemployed	Dk/ns	0.1600	1.181	0.0263	(0.928, 1.504)
Homemaker vs. Unemployed	No	0.0453	1.010	0.5387	(0.783, 1.304)
Retired vs. Unemployed	Dk/ns	0.0345	1.042	0.5718	(0.836, 1.299)
Retired vs. Unemployed	No	0.0644	1.030	0.2963	(0.826, 1.283)
Other vs. Unemployed	Dk/ns	-0.0445	0.963	0.7003	(0.687, 1.350)
Other vs. Unemployed	No	-0.1005	0.873	0.3502	(0.638, 1.196)

Table 9.3

Model 1: Analysis of Predisposing Characteristics using a Simultaneous MLRM

(N = 50,106)

Predisposing	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
General Health				0.2789	
Excellent vs. Very good	Dk/ns[d]	-0.1266	0.890	0.1170	(0.742, 1.069)
Excellent vs. Very good	No	0.0650	1.122	0.3626	(0.933, 1.349)
Fair vs. Very good	Dk/ns	0.0780	1.092	0.4142	(0.830, 1.437)
Fair vs. Very good	No	0.0111	1.063	0.8655	(0.880, 1.284)
Good vs. Very good	Dk/ns	0.0671	1.080	0.2340	(0.915, 1.276)
Good vs. Very good	No	0.0912	1.152	0.0899	(0.985, 1.348)
Poor vs. Very good	Dk/ns	-0.00820	1.002	0.9262	(0.775, 1.296)
Poor vs. Very good	No	-0.1171	0.935	0.1478	(0.747, 1.172)

Note. P-values for the categories correspond to the raw coefficient. Confidence intervals correspond to the odds ratio.

[a]heart attack symptom knowledge; [b]B = raw coefficient; [c]odds ratio; [d]Don't know/not sure; [e]Kindergarten; [f]High school; [g]General education diploma; [h]African-American; [i]Included Asian, Native Hawiian/Pacific Islander, and Native American/Alaskan Native

Enabling characteristics were analyzed in Tables 10 and 10.1. The effects of income and geographic region on hask were strongly significant ($p < .05$). However, the effect of health insurance on hask was not significant ($p > .05$).

When analyzing the individual categories, women who had income between $20,000 - <$25,000 compared with women who had an income < $10,000 had a 0.746 (CI: (0.568, 0.978)) decrease of CHD due to possible increase of hask when the answer was no. However, women who had income of $75,000 or more compared with women who had income < $10,000 had a 0.328 (CI: (0.261, 0.411)) decrease odds of CHD since there could be increased hask when the answer was no. Women who had no insurance compared with women who had insurance had a 1.196 (CI: (0.985, 1.453)) increase odds of CHD since there could be decreased hask when the answer was do not know/not sure. Women who in the Northeast compared with women in the West had a 1.706 (CI: (1.293, 2.251)) increase odds of CHD due to a chance of decreased hask when the answer was no. Women in the South compared with women in the West had a 1.428 (CI: (1.128, 1.808)) increase odds of CHD since there was less chance of hask when the answer was no.

Table 10

Model 2: Analysis of Enabling Characteristics using a Simultaneous Multinomial Logistic Regression Model (MLRM) (N = 42,849)

Enabling	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Income[d]				<0.0001	
$10,000- < $15,000	Dk/ns[e]	0.2425	0.745	0.0181	(0.560, 0.991)
$10,000- < $15,000	No	0.3128	0.796	0.0007	(0.616, 1.028)
$15,000- < $20,000	Dk/ns	0.1006	0.646	0.2383	(0.503, 0.830)
$15,000- < $20,000	No	0.2704	0.763	0.0008	(0.601, 0.968)
$20,000- < $25,000	Dk/ns	0.0973	0.644	0.2666	(0.497, 0.835)
$20,000- < $25,000	No	0.2472	0.746	0.0148	(0.568, 0.978)
$25,000- < $35,000	Dk/ns	0.1373	0.670	0.1409	(0.510, 0.882)
$25,000- < $35,000	No	0.0472	0.610	0.5747	(0.479, 0.777)
$35,000- < $50,000	Dk/ns	-0.1918	0.482	0.0179	(0.376, 0.618)
$35,000- < $50,000	No	-0.2986	0.432	<0.0001	(0.346, 0.539)
$50,000- < $75,000	Dk/ns	-0.3164	0.426	<0.0001	(0.333, 0.545)
$50,000- < $75,000	No	-0.5451	0.338	<0.0001	(0.263, 0.433)
$75,000 or more	Dk/ns	-0.6071	0.318	<0.0001	(0.240, 0.422)
$75,000 or more	No	-0.5748	0.328	<0.0001	(0.261, 0.411)
Health insurance				0.1880	
No vs. Yes	Dk/ns	0.0896	1.196	0.0702	(0.985, 1.453)
No vs. Yes	No	-0.00417	0.992	0.9248	(0.834, 1.179)

Table 10.1

Model 2: Analysis of Enabling Characteristics using a Simultaneous MLRM

(N = 42,849)

Enabling	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Geographic region				<0.0001	
Midwest vs. West	Dk/ns[e]	-0.2296	0.933	0.0205	(0.591, 1.475)
Midwest vs. West	No	-0.0448	1.268	0.6394	(0.918, 1.749)
Northeast vs. West	Dk/ns	0.3182	1.614	0.0005	(1.036, 2.516)
Northeast vs. West	No	0.2523	1.706	0.0008	(1.293, 2.251)
South vs. West	Dk/ns	0.0721	1.262	0.3051	(0.834, 1.909)
South vs. West	No	0.0744	1.428	0.1565	(1.128, 1.808)

Note. P-values for the categories correspond to the raw coefficient. Confidence intervals correspond to the odds ratio.

[a]heart attack symptom knowledge; [b]B = raw coefficient; [c]odds ratio; [d]vs. < $10,000; [e]Don't know/not sure

Table 11 showed the need characteristic. The effect of the number of health care providers on hask was strongly significant ($p < .05$). Women who had no health care provider compared with women who had only one health care provider had a 1.641 (CI: (1.355, 1.989)) increase odds of CHD due to a possibility of decreased hask when the answer was do not know/not sure. Women who had more than one health care provider compared with the same group had a 1.069 (CI: (0.893, 1.280)) increase odds of CHD due to possible decreased hask when the answer was do not know/not sure.

Table 11

Model 3: Analysis of Need Characteristic using a Simultaneous Multinomial Logistic Regression Model (MLRM) (N = 52,235)

Need	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Health care providers				<0.0001	
> 1 vs. Yes, only one	Dk/ns[d]	-0.1207	1.069	0.0674	(0.893, 1.280)
> 1 vs. Yes, only one	No	-0.2281	0.807	0.0009	(0.665, 0.978)
No vs. Yes, only one	Dk/ns	0.3082	1.641	<0.0001	(1.355, 1.989)
No vs. Yes, only one	No	0.2414	1.290	0.0002	(1.086, 1.533)

Note. P-values for the categories correspond to the raw coefficient. Confidence intervals correspond to the odds ratio.

[a]heart attack symptom knowledge; [b]B = raw coefficient; [c]odds ratio; [d]Don't know/not sure

Tables 12, 12.1, 12.2, 12.3, and 12.4 examined all the study characteristics. The effects of age, education, race-ethnicity, marital status, income, geographic region, and health care providers on hask were significant ($p < .05$). However, the effects of employment, general health, and health insurance on hask were not significant ($p > .05$).

The individual categories showed women age 18-24 years compared with women 65 or older had a 0.519 (CI: (0.351, 0.769)) decreased odds of CHD due to a possible increase of hask when the answer was no. Women age 54-64 years compared with the same group had a 0.611 (CI: (0.505, 0.739)) decreased odds of CHD, again, due to a possible increase of hask when the answer was no. Women who had 1-3 years of college compared with women who had a K-Grade 11 education had a 0.527 (CI: (0.422, 0.659)) decreased odds of CHD due to a possible increase of hask when the answer was do not know/not sure. Women who ha a high school/GED education compared with women with a K-Grade 11 education had a 0.774 (CI: (0.640, 0.937)) decreased odds of CHD and possible increased hask when the answer was no. Hispanic women when compared with White women had a 2.308 (CI: (1.691, 3.149)) increased odds of CHD and possible decreased hask when the answer was no. Women in the other category compared with White women had a 1.754 (CI: (1.172, 2.625)) increased odds of CHD and possible decreased hask when the answer was no. Married women compared with widowed women had a 0.762 (CI: (0.631, 0.920)) decreased odds of CHD and possible increased hask when the answer was do not know/not sure. Never married women compared with widowed women had a 1.192 (CI: (0.944, 1.504)) increased odds of CHD due to possible decrease in hask when the answer was no.

Employed women compared with unemployed women had a 0.932 (CI: (0.700, 1.239)) decreased odds of CHD due to a chance of increased hask when the answer was do not know/not sure. Homemakers compared with unemployed women had a 1.225 (CI: (0.910, 1.650)) increased odds of CHD due to a chance of decreased hask when the answer was do not know/not sure. Women who thought their health was fair compared with women who thought their health was very good had a 1.112 (CI: (0.789, 1.566)) increased odds of CHD due to possible decreased hask when the answer was do not know/not sure. Women who thought their health was good compared with the same group had a 1.071 (CI: (0.881, 1.302)) increased chance of CHD due to possible decreased hask when the answer was do not know/not sure.

Women who had incomes between $50,000 - < $75,000 compared with women with < $10,000 had a 0.584 (CI: (0.426, 0.802)) decreased odds of CHD due to a possible increase in hask when the answer was no. Women who had incomes between $25,000 - < $35,000 had a 0.928 (CI: (0.676, 1.273)) decreased odds of CHD since there was an increased chance of hask when the answer was do not know/not sure. Women who had no health insurance compared with women who had health insurance had a 1.056 (CI: (0.832, 1.340)) increased odds of CHD and possible decrease hask when the answer was do not know/not sure. Women who lived in the Northeast compared with women who lived in the West had a 1.437 (CI: (1.110, 1.955)) increased odds of CHD and a possible decrease of hask when the answer was no. Women who had more than one health care provider compared with women who only had one health care provider had a 1.070 (CI: (0.862, 1.329)) increased odds of CHD and a possible decrease of hask when the answer was do not know/not sure. Women who did not have a health care provider compared with the same group had a 1.566 (CI: (1.189, 2.062)) increased odds of CHD and a decreased chance of hask when the answer was do not know/not sure.

Table 12

Model 4: Analysis of All Study Characteristics using a Simultaneous Multinomial Logistic Regression Model (MLRM) (N = 41,394)

Characteristics	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Predisposing					
Age[d]				<0.0001	
18-24	Dk/ns[e]	0.1186	0.869	0.4133	(0.595, 1.267)
18-24	No	-0.2742	0.519	0.0723	(0.351, 0.769)
25-34	Dk/ns	0.1685	0.913	0.0860	(0.687, 1.215)
25-34	No	0.0637	0.728	0.4265	(0.578, 0.917)
35-44	Dk/ns	-0.2220	0.618	0.0054	(0.487, 0.785)
35-44	No	0.0501	0.718	0.4826	(0.580, 0.889)
45-54	Dk/ns	-0.1422	0.669	0.0560	(0.536, 0.835)
45-54	No	-0.1090	0.613	0.1177	(0.497, 0.755)
54-64	Dk/ns	-0.1822	0.643	0.0161	(0.529, 0.782)
54-64	No	-0.1116	0.611	0.1013	(0.505, 0.739)
Education[f]				<0.0001	
College 1-3 yrs	Dk/ns	-0.1850	0.527	0.0027	(0.422, 0.659)
College 1-3 yrs	No	-0.2579	0.531	<0.0001	(0.425, 0.664)
College ≥ 4 yrs	Dk/ns	-0.2217	0.508	0.0023	(0.395, 0.655)
College ≥ 4 yrs	No	-0.2369	0.542	0.0003	(0.429, 0.685)
HS[g] Grad/GED[h]	Dk/ns	-0.0484	0.604	0.3853	(0.495, 0.738)
HS Grad/GED	No	0.1197	0.774	0.0156	(0.640, 0.937)

Table 12.1

Analysis of All Study Characteristics using a Simultaneous MLRM (N = 41,394)

Characteristics	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Predisposing					
Race-ethnicity[i]				<0.0001	
Black/AA[j]	Dk/ns[e]	0.0264	1.429	0.7857	(1.179, 1.732)
Black/AA	No	-0.0454	1.500	0.6029	(1.272, 1.769)
Hispanic	Dk/ns	0.2293	1.751	0.0747	(1.284, 2.387)
Hispanic	No	0.3854	2.308	0.0026	(1.691, 3.149)
Other[k]	Dk/ns	0.0749	1.500	0.6726	(0.952, 2.364)
Other	No	0.1110	1.754	0.4911	(1.172, 2.625)
Marital Status[l]				0.0022	
Divorced	Dk/ns	-0.0158	0.828	0.8162	(0.668, 1.026)
Divorced	No	0.0292	1.038	0.6515	(0.847, 1.272)
Married	Dk/ns	-0.0985	0.762	0.1011	(0.631, 0.920)
Married	No	-0.1880	0.836	0.0007	(0.696, 1.003)
Never married	Dk/ns	-0.0587	0.793	0.4817	(0.613, 1.026)
Never married	No	0.1672	1.192	0.0265	(0.944, 1.504)

Table 12.2

Analysis of All Study Characteristics using a Simultaneous MLRM (N = 41,394)

Characteristics	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Predisposing					
Employment[m]				0.5825	
Employed	Dk/ns	-0.1209	0.932	0.0958	(0.700, 1.239)
Employed	No	-0.0111	0.973	0.8602	(0.751, 1.260)
Homemaker	Dk/ns	0.1532	1.225	0.0720	(0.910, 1.650)
Homemaker	No	-0.0157	0.968	0.8411	(0.728, 1.289)
Retired	Dk/ns	0.0307	1.084	0.6667	(0.829, 1.418)
Retired	No	0.0412	1.025	0.5606	(0.794, 1.324)
Other	Dk/ns	-0.0131	1.038	0.9174	(0.710, 1.516)
Other	No	-0.0308	0.954	0.7847	(0.678, 1.341)
General Health[n]				0.2996	
Excellent	Dk/ns[e]	-0.1158	0.897	0.2361	(0.731, 1.101)
Excellent	No	0.0933	1.096	0.2360	(0.895, 1.343)
Fair	Dk/ns	0.0987	1.112	0.4081	(0.789, 1.566)
Fair	No	0.0615	1.062	0.4048	(0.859, 1.314)
Good	Dk/ns	0.0613	1.071	0.3594	(0.881, 1.302)
Good	No	0.0589	1.059	0.3019	(0.899, 1.248)
Poor	Dk/ns	-0.0369	0.971	0.7375	(0.705, 1.336)
Poor	No	-0.2150	0.805	0.0159	(0.628, 1.034)
Enabling					
Health coverage				0.7266	
No vs. Yes	Dk/ns	0.0271	1.056	0.6557	(0.832, 1.340)
No vs. Yes	No	-0.0330	0.936	0.5327	(0.761, 1.152)

Table 12.3

Analysis of All Study Characteristics using a Simultaneous MLRM (N = 41,394)

Characteristics	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Enabling					
Income[o]				0.0470	
\$10,000- < \$15,000	Dk/ns[e]	-0.0370	0.770	0.7379	(0.571, 1.040)
\$10,000- < \$15,000	No	0.0779	0.827	0.4414	(0.632, 1.082)
\$15,000- < \$20,000	Dk/ns	-0.1149	0.713	0.2237	(0.541, 0.939)
\$15,000- < \$20,000	No	0.0600	0.812	0.4873	(0.628, 1.051)
\$20,000- < \$25,000	Dk/ns	-0.0150	0.788	0.8674	(0.586, 1.059)
\$20,000- < \$25,000	No	0.1629	0.900	0.1199	(0.676, 1.199)
\$25,000- < \$35,000	Dk/ns	0.1488	0.928	0.1192	(0.676, 1.273)
\$25,000- < \$35,000	No	0.0317	0.790	0.7111	(0.604, 1.032)
\$35,000- < \$50,000	Dk/ns	-0.0129	0.789	0.8779	(0.583, 1.068)
\$35,000- < \$50,000	No	-0.1509	0.658	0.0528	(0.499, 0.867)
\$50,000- < \$75,000	Dk/ns	-0.00148	0.798	0.9874	(0.573, 1.112)
\$50,000- < \$75,000	No	-0.2693	0.584	0.0057	(0.426, 0.802)
\$75,000 or more	Dk/ns	-0.1911	0.660	0.1116	(0.454, 0.961)
\$75,000 or more	No	-0.1803	0.639	0.0592	(0.466, 0.876)
Geographic region				0.0104	
Midwest vs. West	Dk/ns	-0.1585	0.992	0.1170	(0.625, 1.574)
Midwest vs. West	No	0.0119	1.248	0.9033	(0.896, 1.739)
Northeast vs. West	Dk/ns	0.2766	1.532	0.0028	(0.980, 2.395)
Northeast vs. West	No	0.1772	1.473	0.0228	(1.110, 1.955)
South vs. West	Dk/ns	0.0320	1.200	0.6587	(0.790, 1.823)
South vs. West	No	0.0210	1.260	0.6900	(0.922, 1.600)

Table 12.4

Analysis of All Study Characteristics using a Simultaneous MLRM (N = 41,394)

Characteristics	hask[a]	B[b]	OR[c]	p-value	Wald 95% CI
Need					
Health care providers				0.0019	
> 1 vs. Yes, only one	Dk/ns[e]	-0.1041	1.070	0.2167	(0.862, 1.329)
> 1 vs. Yes, only one	No	-0.2041	0.768	0.0086	(0.620, 0.951)
No vs. Yes, only one	Dk/ns	0.2762	1.566	0.0049	(1.189, 2.062)
No vs. Yes, only one	No	0.1441	1.088	0.0490	(0.896, 1.321)

Note. P-values for the categories correspond to the raw coefficient. Confidence intervals correspond to the odds ratio.

[a]heart attack symptom knowledge; [b]B = raw coefficient; [c]odds ratio; [d]vs. 65 or older; [e]Don't know/not sure; [f]vs. K-Grade 11; [g]High school; [h]General education diploma; [i]vs. White; [j]African-American; [k]Included Asian, Native Hawiian/Pacific Islander, and Native American/Alaskan Native; [l]vs. Widowed; [m]vs. Unemployed; [n]vs. Very good; [o]vs. < $10,000

Discussion

The results from this study showed heart attack symptom knowledge varied by women's characteristics such as age, income, education, race-ethnicity, geographic region, marital status, and the number of health care providers. Some women could have decreased knowledge of heart attack symptoms since they had an increase in the risk of CHD. Other women could have increased knowledge of heart attack symptoms since they had a decrease in the risk of CHD.

Previous studies showed this variation. One study showed African-American women having less knowledge of CHD than other women (Lutfiyya, Cumba, McCullough, Barlow, & Lipsky, 2008). Another study showed employed women had less risk of CHD (Carson, Rose, Catellier, Diez-Roux, Muntaner, & Wyatt, 2009), which may in turn increase women's chances of heart attack symptom knowledge. Another study on marital status showed that women who were not married had an increase risk of CHD (Shaw, et al., 2008). This could lead to a decrease in heart attack symptom knowledge. Another study on age showed younger women may not have knowledge of heart attack symptoms (Lichtman, et al., 2007), in turn may cause an increased risk of CHD. Studies on education and income showed that women with lower income and education had a higher risk of CHD, which in turn could lead to possible decreased knowledge of heart attack symptoms (Clark, DesMeules, Luo, Duncan, & Wielgosz, 2009; Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement). Studies on the role of the physician's diagnosis also showed if the diagnosis was uncertain in women, the more likely women may not ask her doctor about heart attack symptoms (Barnhart, Lewis, Houghton, & Charney, 2007; Lutfey, Link, Grant, Marceau, & McKinlay, 2009; Maserejian, Link, Lutfey, & Marceau, 2009).

This study was also important for public health studies. Public health looked at how different groups of women have better health outcomes than other women (Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement). The results from this study showed other race-ethnic groups may have a better CHD risk than African-American women. Other results showed women who have better incomes and worked also had lower risk of CHD and in turn may have an increased chance of heart attack symptom knowledge.

Another area that public health examined was how healthy communities were across the United States (Department of Health and Human Services, 2010, Healthy People 2010, A systematic approach to health improvement). One study showed that geographic regions vary in hospital care for CHD (Jha, Orav, Zheng, & Epstein, 2008), which could influence women's perceptions about CHD, and as a result could influence the health of the community. The results from this study showed that possible healthy communities depended on how well women knew about heart attack symptoms across geographic regions.

There were three major limitations to this study. The first was the BRFSS used self-reported data from telephone interviews. Women may not recall information and may pick the answer that was the closest to what they heard from their physician or may not want to divulge information such as income to someone they did not know. The second major limitation was that only 23 states asked cardiovascular questions in the 2007 BRFSS (Centers for Disease Control and Prevention, 2007). This reduced the sample size dramatically and may have influenced the full model results. The third limitation was the Southern region was the largest region in the United States, which could make any interpretations about geographic regions skewed more to the South.

Conclusion

The findings from this study showed that heart attack symptom knowledge was as varied as the women answering the survey. This variation of knowledge could lead some women not to think about their hearts, and other women to take action about their heart health. If more awareness of not only chest pain knowledge, but other heart attack symptom knowledge was communicated by physicians and other health care providers, then women in the present time and in the future would be able to save their lives.

CHAPTER 4

CHD IN WOMEN: THE OVERALL PICTURE

Women and CHD was a complex topic that encompassed many facets of health care. One facet was examining three main CHD categories: risk factors such as blood pressure, cholesterol, and diabetes; lifestyle behaviors such as exercise, smoking, and diet; and other factors such as too much stress, age, and genetics. Another area included medical interventions such as drugs or surgical procedures. A third area was examining attitudes or knowledge about CHD and different symptoms of a heart attack.

Symptoms of a heart attack in men was dissimilar than in women. The most common form of a heart attack was chest pain. However, women usually did not experience chest pain when having a heart attack. Women may have nausea, indigestion, or abdominal pain. Not having the same symptoms as men could lead women of all age, race-ethnic, income, and educational groups to believe that they would not have heart disease and/or heart attacks. This thought could lead to women not obtaining health care, such as surgical procedures, for CHD.

Health professionals have knowledge of CHD, the signs and symptoms of a heart attack in men, but may be uncertain in their diagnosis in women. As with the symptoms of heart attack, women may not believe they have CHD or heart attack symptoms. This in turn could lead women to not ask their health care professionals about heart attacks or other CHD symptoms. Uncertainty in diagnosis in women could also lead health care professionals to not order more tests, recommend surgical procedures, or prescribe medications for CHD.

These areas may create a cycle in all women across the United States. The cycle could start with women realizing the individual heart disease risk factors such as high blood pressure and high cholesterol, but may not recognize diet, stress, and age as possible risk factors for CHD. Also, women may not know if they had family members, such as parents or grandparents, affected by CHD due to their genetics.

The next phase of the cycle could lead to women not to understand or not believe they could have heart problems until they either were going to the hospital or die from the heart attack. These attitudes also influence how women obtain medical interventions. If a woman does not believe she was at risk for CHD, then she may not have a conversation with her doctor. The doctor, in turn, may not catch overall heart problems, but only pieces of risk factors. Also, if the doctor was uncertain about diagnosing symptoms not normally associated with CHD, the doctor could miss overall heart problems. Then the cycle may start again.

In order to break the cycle of CHD, a major focus should be awareness of the common aspects of women's lives across the United States. Public health, in past research, examined heart problems on a risk factor level, which is part of public health's focus of prevention of disease in the community. In order to slow down or prevent CHD in women of all communities, women need to be conscious of what they did in their everyday lives affect their hearts.

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